QUALITY ASSURANCE PROJECT PLAN
RESOURCE CONSERVATION AND RECOVERY ACT
PHASE II FACILITY INVESTIGATION
QUEMETCO INC.
INDIANAPOLIS, INDIANA

U.S. EPA ID # IND000199653

REVISION 6.0

DECEMBER 18, 2009

Prepared for

U.S. Environmental Protection Agency, Region 5

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Quality Assurance Project Plan
for the
Phase II RCRA Facility Investigation
Quemetco Inc., Facility
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December 17, 2009

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Quality Assurance Project Plan Distribution List

Name	Project Responsibility	Affiliation
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Terry Cirone	Overall Project Management	RSR Corporation
Allen Debus	Project Quality Assurance Scientist	U.S. EPA Region 5
Terrie Baranek	Quality Assurance Officer	ECT. CON, Inc.

1 Project Description

This QAPP presents the organization, objectives, planned activities, and specific Quality Assurance/ Quality Control (QA/QC) procedures associated with the Phase II RFI for the Quemetco, Inc. facility located in Indianapolis, Marion County, Indiana and in response to comments and supplemental information requested by U.S. EPA, Region 5 regarding a Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) for the referenced site submitted on October 19, 2006. The most recent comments from U.S. EPA are dated October 8, 2009.

Specific rationale for sample collection, protocols for sampling, sample handling and storage, chain-of-custody, and laboratory and field analyses are described in this QAPP. All QA/QC procedures will be structured in accordance with applicable technical standards, U.S. EPA's requirements, regulations, guidance, and technical standards. This QAPP has been prepared in accordance with the U.S. EPA Region 5 QAPP policy as presented in *U.S. EPA RCRA QAPP Instructions, April 1998* and other relevant guidance documents, including previous environmental reports, ASTM standards and individual laboratory information and operating procedures.

1.1 INTRODUCTION

This QAPP has been prepared by WSP Environment & Energy LP (WSP) on behalf of Quemetco, Inc., a subsidiary of RSR Corporation. This QAPP, a Health and Safety Plan, and WSP's Standard Operating Procedures (SOPs) are appended to the *Workplan to Address Outstanding Detailed Ecological Risk Assessment (DERA) Issues, Quemetco, Inc., Indianapolis, Indiana,* dated May 19, 2008.

1.1.1 Overall Project Objectives and Decision Statements

The purpose of the workplan and this QAPP is to address outstanding DERA issues identified by U.S. EPA in a letter dated February 13, 2008 and to address U. S. EPA's October 8, 2009 comments to the May 2008 revised workplan. This will be achieved through the collection and analysis of additional samples from various environmental media including soil, surface water, and sediment, both on and offsite. The data will be used to evaluate the lateral and vertical extent of lead contamination and the potential migration pathways for lead and other site-related constituents identified as potential risks in the 2006 DERA (Cantox Environmental, October 19, 2006, Executive Summary, page vi). These other constituents include: tin, arsenic, barium, cadmium, chromium, nickel, zinc and mercury. A summary of the proposed samples and analysis for this investigation is presented in Table 1-1.

The Decision Statement for this investigation is as follows: Additional soil, surface water, and sediment samples will be collected from various locations throughout the site. These samples will be used to further delineate the lateral and vertical extent of contamination at the site. The chemical of concern is predominately lead; however, the additional investigation will also address how other chemicals of concern have impacted the site. Results from the analyses will be used to determine whether the 2006 ERA should be revised. Results from the analysis will also be used to determine if other areas of the site require additional sampling or corrective actions.

The target action levels for each parameter are presented in Table 1-2.

Table 1-1. Summary of Sample Collection and Analysis

Sample type	Analysis	# of samples	Method	Notes
soil	Sb, As, Ba, Cd, Cr, Cu, Pb, Ni, Zn	46	EPA 200.8	12 (NE) + 8 (SP) + 12 (ponds) + 7 (JC) + 7 (worm toxicity tests)
soil	Hg	46	EPA 7471	
soil	pH; soil moisture; water holding capacity; cation exchange capacity	46	NUT.02.05; NUT.02.36; NUT.02.68; EPA 9081	
soil	Organic matter	46	Walkley-Black procedure-NUT.02.09	
soil	Texture	7	ASTM D 422-63	Conducted on earthworm toxicity test soil only
soil	14-day earthworm survival and biomass toxicity test	7	EPA 600/3-88-029	
water	Fathead minnow and C. dubia (chronic) toxicity test	6	EPA-821-R-02-013/ 1000.0	Six from Julia Creek
water	Interstitial pore water ammonia, pH	6	SM 4500-NH_3 D and EPA 350.3	
water	Metals (Pb, Cd , Sb, As, Ba, Cr, Cu)	6	EPA 200.8/6020	
sediment	Metals (As, Cd, Cu, Pb, Ni)	15	EPA 6020	Two (Pond 1), three (Pond 2), four (Pond 3), six (Julia Creek)
sediment	Phenol	15	EPA 8270 C	
sediment	*H. azteca* and *C. tentens* (10 day) toxicity tests	15	EPA/600/R-99/064 100.1 and 100.2	
sediment	AVS/SEM	15	EPA draft 1991	
sediment	TOC	15	SM 5310C	
sediment	Particle size	15	ASTM D422	
sediment	Water moisture analysis	15	EPA 160.3	
sediment	Cation exchange capacity	15	EPA 9081	

1.1.2 Project Status

In February 1989, Quemetco entered into a Consent Decree with U.S. EPA Region 5, which required the investigation and remediation of the blast furnace slag pile and adjacent ponds. In accordance with the Consent Decree, Quemetco initiated a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and has implemented several of the various investigation requirements.

On October 19, 2006, a revised HHRA and ERA for the referenced site were submitted by WSP Environmental Strategies LLC (now WSP Environment & Energy) to the U.S. EPA Region 5. The U.S. EPA responded to the risk assessments with comments in a May 29, 2007 letter to RSR Corporation. Supplemental information was provided August 10, and October 11, 2007. U.S. EPA responded on December 12, 2007 and WSP responded to the December 12, 2007 letter on January 11, 2008. Based on these comments and the letter from U.S. EPA dated February 13, 2008, a draft workplan for additional sampling was completed on May 16, 2008. On October 8, 2009, EPA issued comments on the revised workplan and the quality assurance documents submitted on May 19, 2008. The results of the October 8, 2009 letter include the proposed x-ray fluorescence (XRF) sampling described below and included in Appendix C. Additionally, following the XRF sampling, a revised workplan will be submitted to address the soil, surface water and sediment sampling outlined below and in this QAPP. Based on EPA's responses, the following activities will be conducted:

- Soils analysis for lead using x-ray fluorescence (XRF). Soil samples will be analyzed in a grid formation from the Northeast Area (to the south and west of the Slag Pile and east of previous samples to the railroad berm), to the east of the Slag Pile area to Pond 3 and Quemetco Drive, around all three ponds, including to the east of Ponds 1 and 2 and south of Pond 3, and along Julia Creek including to the northeast and offsite locations, by alternating surface sampling and at depths of 0 to 6 inches below ground surface (bgs).
- Soil samples will be collected from various areas of site and analyzed for lead and the site-related constituents discussed in Section 1.1.1 and presented in Table 1-1.
- Soils will be collected for earthworm toxicity tests.
- Surface water samples will be collected from Pond 3 and Julia Creek for chemistry and toxicity testing using *P. promelas and C. dubia*.
- Sediment samples will be collected from all three ponds and Julia Creek for chemistry, physical characterization and *Chironomus* and *Hyalella* toxicity tests.
- The endangered species Indiana bat will be assessed.

Data from these investigations will be analyzed to determine whether a revised ERA should be prepared. Additionally, analytical results will be used to determine whether additional sampling and/or corrective action should be conducted at the site. A RFI Phase II Supplemental report presenting the additional data collected will be prepared and submitted to U.S. EPA Region 5 for review and approval.

1.1.3 QAPP Preparation Guidelines

This QAPP has been prepared in accordance with the *U.S. EPA Region 5 RCRA QAPP Instructions.* Furthermore, WSP incorporated comments from U.S. EPA Region 5, dated October 8, 2009.

1.2 FACILITY DESCRIPTION

Quemetco manufactures lead and lead alloys, and reclaims polypropylene from a variety of materials. The process materials used at the facility include spent automobile, truck, and industrial lead-acid batteries, factory scrap, coal fines, coke, hard rubber battery cases, pebble lime, sodium carbonate, red phosphorous, pyrite, sulfur, sodium nitrate, sodium hydroxide, tin, antimony, arsenic, and copper. Wastewater treatment materials used onsite include Soda ash, ferric sulfate, hydrogen peroxide, sodium carbonate, sodium hydroxide, ferric chloride, and flocculants. The facility operates under the primary standard industrial classification (SIC) code 3341, which is specific to establishments primarily engaged in secondary smelting and refining of nonferrous metals.

1.2.1 Location

Quemetco, Inc., a subsidiary of RSR Corporation, operates a secondary lead smelting facility located at 900 Quemetco Drive, in Indianapolis, Marion County, Indiana (Figure 1). The study area includes approximately 8.0 acres and encompasses the Northeast area, Slag Pile area, onsite Ponds 1, 2, and 3 and Julia Creek (Figure 2).

1.2.2 Facility Size and Borders

The Quemetco facility is 408 acres and is located in an area of mixed industrial, residential, and agriculture land use. The portion of the site developed for industrial use is approximately 8.0 acres in size. The immediate area consists of undeveloped woodlands and land zoned for industrial use. Property zoned for residential use is located approximately 0.5 mile northeast, northwest, and southwest of the facility. To prevent future residential development, additional land surrounding the property has been purchased creating an approximately 400-acre buffer zone around the facility.

The facility is bordered to the north by a railroad line and the Power Transmission Company facility; to the northeast by West Park View residential area; to the south by Heritage Environmental, a hazardous waste treatment facility; to the east by farmland, a furnace and air conditioning manufacturing facility, and a freight carrier company; and to the west by the Pennsylvania Railroad, and farmland.

1.2.3 Natural and Manmade Features

Natural features of the facility include an approximately 400-acre undeveloped buffer zone owned by subsidiaries of the RSR Corporation. The buffer zone was created to prevent encroachment and minimize citizen complaints. Julia Creek lies adjacent to the southeast side of the facility's parking lot.

Manmade features of the facility include a concrete containment channel bordering the main processing areas. Two man-made ponds (Ponds 1 and 2) are east of the main parking area, and one man-made pond (Pond 3) is located west of the main parking area, adjacent to the blast furnace slag pile. The man-made ponds and their adjacent soil hills were excavated for the storage of slag wastes, but were never used.

1.2.4 Topography

Marion County is located in the southern portion of the Tipton Till Plain physiographic unit of Indiana. This region is characterized by relatively flat surface topography with few abrupt changes in elevation. The till plain is dissected by numerous perennial and seasonal creeks, streams, and rivers (Figure 1).

1.2.5 Local Geology and Hydrogeology

Marion County is located in the southern portion of the Tipton Till Plain physiographic unit of Indiana. This region is characterized by relatively flat surface topography with few abrupt changes in elevation. The till plain is dissected by numerous perennial and seasonal creeks, streams, and rivers.

1.2.5.1 Regional Geology

The geology of the Indianapolis area consists of unconsolidated Pleistocene glacial drift and alluvial sediments overlying Middle to Late Paleozoic sedimentary rocks. The following sections summarize the geology of the unconsolidated deposits and underlying bedrock.

The unconsolidated deposits range in thickness from approximately 10 to 400 feet over Marion County. Glacial drift is present over the entire area, whereas the alluvial deposits form a relatively thin veneer over the glacial drift in major stream valleys.

The majority of the glacial cover consists of unstratified drift or till, a poorly sorted aggregation of clay, silt, sand, and gravel sediments that was deposited during the last (Wisconsin) glacial episode. Thin lenses of moderate to well sorted silt, sand, and gravel sediments may be present within the finer grained till deposits. The till lithology, which appears to be fairly uniform over the area, is predominately silt and fine to medium sand with less than 20 percent clay. The stratigraphic boundary between the Wisconsin and older tills in the Indianapolis area is typically marked by a layer of hard, indurated gravelly clay.

Stratified glacial drift is also present in certain areas of Marion County. The most voluminous of these deposits consists of outwash sediments which originated from glacial melt water streams. These deposits consist of relatively well sorted sands and gravels and are typically found along the major stream valleys in the area (e.g., Eagle Creek, White River). Regional studies indicate that some sand and gravel layers within the till interfinger with these outwash deposits. Recent alluvial deposits typically form a thin surface cover over the outwash sediments. These fine to coarse grained sediments are the result of the erosion and redeposition of the older glaciogenic materials.

1.2.5.2 Regional Hydrogeology

Groundwater will not be addressed for this project. For information regarding the site groundwater system, please review the previous QAPP for the Phase II RFI, dated September 9, 1995 (Environmental Strategies Corporation).

1.2.5.3 Site Geology

The following sections summarize the relevant data on subsurface conditions from previous work. Where site-specific data are lacking, published information is used.

Based on boring logs, the subsurface geology to a depth of approximately 50 feet consists of a silty loam soil underlain by weathered to unweathered, generally fine grained till. These geologic conditions are consistent with the location of the Quemetco facility in the till plain. Sand and gravel layers representing the confined water-bearing zones of the Pleistocene Aquifer were not encountered, nor were any bedrock encountered during the hydrogeologic investigations.

The soil horizon ranges from 4 to 6 feet in thickness and consists of an upper sandy silt and clay which grades downward to predominantly sand and silt sediments. The contact between the soil and underlying glacial till is distinctive and characterized by moist to very moist conditions.

Subsurface samples indicate the till consist primarily of brown to gray fine grained (silt and clay) sediments with occasional thin sand laminae and lenses. The transition from brown to gray colored

sediments marks the base of the weathered (or oxidized) till at the site. Discontinuous clayey-silty sand to sand to gravelly sand layers greater than 2 feet thick were encountered at depths below 20 feet around the slag pile. However, based upon regional information, these sand and gravel layers do not represent the confined water-bearing sand zones in the Pleistocene Aquifer.

1.2.5.4 Site Hydrogeology

Groundwater will not be addressed for this project. For information regarding the site groundwater system, please review the previous QAPP for the Phase II RFI, dated September 9, 1995 (Environmental Strategies Corporation).

1.2.6 Ecological Communities and Habitats

The ecological communities and habitats at the site are addressed in detail in the Final Ecological Risk Assessment for Quemetco, Inc., prepared by Cantox Environmental, dated October 19, 2006.

1.3 FACILITY HISTORY

1.3.1 General History

The site contains 408 acres and was constructed on farmland in 1972 as a secondary lead smelter. Quemetco purchased the newly constructed facility from St. Joe Minerals in 1972. Up until 1976, the facility operated a blast furnace. Approximately 15,000 cubic feet of lead-bearing slag and refractory brick from the former blast furnace operations is still stored on the west side of Pond 3.

In 1996, a slag reduction furnace was installed and as a result, the facility's coal-charge electric arc furnace (EAF) has not been used since approximately 1998.

In 2001, a hole was discovered in a secondary containment system. As a result, solid lead material impacted onsite soils. Facility personnel removed the lead material and excavated soil to approximately 3 feet below ground surface. The area was backfilled with clean soil and a new secondary containment steel shell was installed.

Based on the previous releases onsite and results from the RFI conducted onsite in 1996-1997, elevated levels of lead are present in surficial soils near the process areas of the plant, in sediments and surface water in the nearby manmade ponds and Julia Creek, and in unfiltered groundwater samples.

1.3.2 Past Data Collection Activities

The Quemetco facility has been subject to many investigations since 1989. The following summaries are based on a review of reports and supporting documents prepared by WSP and its contracted laboratories and consultants. The results from the referenced investigations have been evaluated in accordance with the *Region 5 Memorandum Concerning the Use of Historical Data*. None of the investigation results will be used to substitute for data needed for the proposed additional sampling discussed in this workplan and QAPP. However, the site-related constituents list, which is based on site operational history and waste management practices, is consistent with the results of historical data from previous investigations.

Beginning in 1982, Quemetco has contracted with several consulting firms to assess the degree of contamination at the facility, and evaluate potential remedial actions for the identified contamination, which is primarily lead.

Three investigations were conducted between 1982 and 1987 and are further described below:

- The first investigation was performed in September 1982 by NFS Services, Inc. and included the installation of one groundwater monitoring well (MW-1) and periodic sampling of the ponded surface waters.
- The second investigation, conducted in August 1985 by Resource Consultants, Inc., included tests pits excavated from the slag pile and samples were collected from to determine its leaching potential.
- A third investigation, conducted in April 1987 by the National Enforcement Investigation Center (NEIC) of the EPA, was conducted to determine the effect of the blast furnace slag pile on the surrounding area and the adjacent ponds. The investigation included sampling of the slag pile, pond sediments, and pond water.

The sampling results from these investigations indicate that the slag pile contains residual amounts of lead at levels exceeding EPA's limit for determining whether a waste is hazardous. Elevated levels of lead were also detected in pond sediments. Ponds 3 and 2 had total lead concentrations up to 2,660 mg/kg and 1,830 mg/kg, respectively. Water samples collected from Ponds 3 and 2 had lead concentrations up to 50 µg/l and 900 µg/l, respectively. **References**: Update Phase I Environmental Site Assessment, Quemetco, Inc., prepared by Environmental Strategies Corporation (currently known as WSP), dated February 2002 and incorporated by reference: NFS Services, Inc., 1982; Resource Consultants, Inc., 1985; and National Enforcement Investigation Center, 1987).

In 1991, Quemetco entered into a consent agreement with the EPA that provided for the investigation and remediation of the area in the vicinity of the blast furnace slag pile and ponds. Canonie Environmental was retained to implement the RFI which included the following activities:

- installation of three borings and four monitoring wells to characterize the soil lithology
- collection and analysis of groundwater samples from the existing well (MW-1) and from the newly installed wells (MW-2 through MW-5)
- performance of slug tests on MW-2 through MW-5
- collection and analysis of shallow soil samples in the vicinity of the containment trench and the three soil hills adjacent to the ponds
- collection and analysis of sediment and surface samples from the three ponds and Julia Creek
- collection and analysis of samples from the slag pile.

Results of the investigation and remediation indicated pond sediments exceeded the hazardous waste criteria for lead by using the toxicity characteristic leaching procedure (TCLP). Additionally, the surface water samples collected from the three ponds and Julia Creek indicated lead was above the maximum contaminant level (MCL). **References**: Update Phase I Environmental Site Assessment, Quemetco, Inc., prepared by Environmental Strategies Corporation (currently known as WSP), dated February 2002 and incorporated by reference: Canonie Environmental, 1991.

In September 1993, Environmental Strategies Corporation (now known as WSP) conducted limited soil sampling and soil excavation in conjunction with the closure of the hard rubber bins and assessment of the soil quality in the area of the former underground storage tanks. The soils were analyzed for total antimony, cadmium, chromium, copper, lead, nickel, and zinc. Additionally, clean up goals for the soils at the site were established. Based on the analytical results of soils collected as part of the preliminary investigation, the area underlying the storage bin was excavated to a depth of 4 feet, and the eastern area

of the work zone was excavated to a depth of 6.5 feet. The analytical results for the soil samples collected from depths greater than 6 feet in the eastern portion of the bin indicate total metal concentrations below the soil cleanup levels. All soils within the excavation zone were remediated to below the proposed cleanup goals.

RSR received a No Further Action notice from IDEM that certified the closure is complete. **References:** Quality Assurance Project Plan, Revision 4.0, Quemetco, Inc., prepared by Environmental Strategies Corporation (currently known as WSP), dated September 9, 1995.

In May 1994, August Mack Environmental conducted an investigation of Julia Creek to determine whether lead contamination was present in the stream. Sediment, surface water, and soil samples were collected and analyzed for total lead only. The investigation focused on the portion of Julia Creek on Quemetco property. The surface water results from Julia Creek found that all metals were below their respective MCLs with the exception of lead. The composite sediment sample from Julia Creek contained lead at 354 mg/kg with relatively low concentrations of other metals. TCLP concentrations in the sediment sample did not cause the material to exhibit the characteristic of toxicity.

References: Quality Assurance Project Plan, Revision 4.0, Quemetco, Inc., prepared by Environmental Strategies Corporation (currently known as WSP), dated September 9, 1995; Update Phase I Environmental Site Assessment, Quemetco, Inc., prepared by Environmental Strategies Corporation (currently known as WSP), dated February 2002 and incorporated by reference: August Mack Environmental, Inc., 1994.

In May 1996 through April 1997, ESC performed soil sampling as part of the Phase II RFI to characterize site-wide conditions. The following activities were conducted as part of the RFI:

- Soil samples were collected at the slag pile, containment trench, along Julia Creek, in the Northeastern area and throughout the property for background data.
- Groundwater samples were collected from six wells and nine piezometers including all of the groundwater monitoring wells required for the quarterly groundwater monitoring program.
- Surface water and sediment samples were collected from all three ponds and the stream and a weir was installed onsite.

The soil, sediment, surface water, and groundwater sampling results were compared to regulatory screening criteria (human health and ecological screening levels) or background levels for the constituents of concern. These standards are used as screening levels to eliminate samples that clearly do not pose a threat to human health or the environment.

Results of the Phase II RFI indicated that metals, and primarily lead, are the primary constituents of concern in the soil, sediment and surface water at the site. The Phase II RFI included an ERA and recommended a DERA be conducted onsite. **References**: Final Remedial Investigation Report and Risk Assessment, Quemetco, Inc., Indianapolis, Indiana, prepared by Environmental Strategies Corporation, July 30, 1999.

In June 1999, a Supplemental Sampling Investigation was conducted and involved the collection and analysis of soil samples from the northeast area and adjacent to a former drainage ditch, the installation of three new groundwater monitoring wells, and the collection and analysis of groundwater samples from all of the monitoring wells and two piezometers at the site.

Results indicated antimony, arsenic, cadmium, copper, lead, mercury, nickel, and zinc were detected in one or more soil samples at levels exceeding background concentrations in the northeast area. Lead

was detected at the highest concentrations, ranging from 76.6 mg/kg to 22,700 mg/kg. Levels of other metals in each sample generally varied according to the relative lead content of the sample.

Much lower metal concentrations were detected in soil samples collected adjacent to the former drainage ditch. Only chromium and zinc were detected at concentrations marginally above background levels in any of the soil samples. None of the primary constituents of concern (lead, arsenic, cadmium, and antimony) were detected in the groundwater sample and no constituents exceeded maximum contaminant levels. **References**: Final Remedial Investigation Report and Risk Assessment, Quemetco, Inc., Indianapolis, Indiana, prepared by Environmental Strategies Corporation, July 30, 1999.

1.3.3 Current Status

Based on the results of the Phase II RFI and DERA, the letter from U.S. EPA dated February 13, 2008, and the October 8, 2009 comments to the revised workplan, dated May 19, 2008, the following areas of the Quemetco site will be further investigated:

- West Side of the Slag Waste Pile. The soil sampling data indicate the probable release of metals, primarily lead, from the slag waste pile located on the south side of the plant. Precipitation runoff and windblown transport of fine particulate matter may have been responsible for the release of metals from this material. Constituents may also have entered the environment during transport of the slag material from the production area in open-bed trucks. Soil samples of the area to the west of the slag pile indicate that other metals, in addition to lead, including tin, arsenic, barium, cadmium, chromium, nickel, zinc and mercury, may have been released.
- Man-made Ponds. Even though the three onsite ponds were constructed for the storage of slag waste, facility records indicate that no materials were ever placed in these areas. However, the location of these surface water bodies and the presence at the site since the early 1970's suggests the possibility that site-related constituents may have accumulated in the areas. The presence of metals in the ponds may be related to runoff from the slag waste pile (Pond No. 3 only), airborne particulate emissions and general facility runoff.
- Julia Creek. Julia Creek is an intermittent stream that flows across the southeastern portion of the Quemetco property. The creek flows west onto the property, and then south parallel to Quemetco Drive. There are two discharge locations identified in the facility's National Pollutant Discharge Elimination System (NPDES) permit: the discharge for NPDES 001 is not used by the facility, and NPDES outfall 002 receives outflow from Pond 3. The shallow swale at the southeastern portion of Pond 3 flows into a 30-inch sewer line that leads to Julia Creek. Constituents may have entered Julia Creek from Pond 3.

Given the available sampling data, the historical releases of constituents from the slag waste pile may have impacted onsite soils. Near-surface soils from some areas of the facility have been remediated, through excavation and offsite disposal during past investigations and remediation activities; however, surficial soils in certain parts of the facility may contain elevated levels of lead and other metals. Additionally, surface water and sediments in the ponds and Julia Creek may have been impacted by facility operations and historical releases.

1.4 PROJECT OBJECTIVES AND INTENDED DATA USAGES

The scope of the Phase II RFI involves the collection of sufficient information to assess potential impacts from facility operations within and around the slag waste pile, man-made ponds, Julia Creek, and the

northeastern area. As requested by the U.S. EPA, additional soil, sediment and surface water samples will be collected to clearly define the nature and extent of contamination at the site.

The data collection activities will specifically address the following concerns:

1. To evaluate the impact of soil and surface water contamination on human health risk, and
2. To evaluate the impacts of sediment, soil, and surface water contamination on ecological receptors.

Parameters listed in Table 1-1 are the proposed critical measurement parameters for this project. In order to determine the lateral extent of lead contained in soil, XRF sampling will be utilized to obtain samples for laboratory analysis. Additional soil samples will be collected using a hand trowel to determine the vertical extent of contamination at the previously discussed locations.

The nature and extent of contamination in surface water and sediments will be determined by collecting samples from each media for field and laboratory analysis and also conducting ecological, biological and toxicology analysis on surface water and sediment samples from the onsite ponds and several areas along Julia Creek.

The decision rules associated with these sampling activities are that if any constituents from Table 1-1 are identified above the ecological screening levels, ecological soil screening levels (also known as project action levels) and the analytical reporting limits listed in Table 1-2, in any location, then the data will be evaluated as part of a revision to the DERA conducted in 2008.

1.4.1 Chemical Analysis

1.4.1.1 Project Target Parameters

Based on historical data from the site, the project target parameters for chemical analysis are lead, antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, zinc and phenols. Based on current and historical operations conducted by RSR, other metals found in Appendix IX for RCRA metals analysis have been eliminated (See Ecological Risk Assessment, October 19, 2006, prepared by Cantox and WSP Environmental Strategies). A list of the target parameters for the site is included in Table 1-1.

Cleanup levels of the target parameters at the facility will be determined by U.S. EPA Region 5 and the facility, based on regulatory and background levels. A comparison of ecological screening levels (ESLs), ecological soil screening levels (EcoSSLs), and laboratory reporting levels for the target parameters at the facility is provided in Table 1-2. The project action levels are the ESLs and EcoSSLs presented in Table 1-2.

Table 1-2 Comparison of Screening Levels: Ecological Screening Levels (ESLs[a]), Ecological Soil Screening Levels (EcoSSLs[b]), and Laboratory Reporting Limits

Parameter	Surface Water ESL (µg/L)	Surface Water Laboratory Reporting Limits (µg/L)	Sediment ESL (µg/kg)	Sediment Laboratory Reporting Limits (µg/kg)	Soil ESL (µg/kg)	Soil EcoSSL (µg/kg)	Soil Laboratory Reporting Limits (µg/kg)
Antimony	80	0.05	NA	NA	142	270	50
Arsenic	148	0.5	9,790	500	5,700	18,000	500
Barium	220	0.05	NA	NA	1,040	330,000	50
Cadmium	0.15	0.02	990	20	2.22	360	20
Chromium	42	0.2	43,400	200	400	26,000	200
Copper	1.58	0.1	31,600	100	5400	28,000	100
Lead	1.17	0.02	35,800	50	53.7	11,000	50
Mercury	0.0013	0.2	174	20	100	NA	20
Nickel	28.9	0.2	22,700	200	13,600	NA	200
Zinc	65.7	0.5	121,000	500	6,620	NA	500
Phenol	180	10	49.1	30	120,000	NA	NA
Ammonia	NS	50	NS	NS	NS	NS	NS
TOC	NS	NS	NA	50	NS	NS	NS
CEC	NS	NS	NA	500	NA	NA	NA
AVS-metals	NS	NS	NA	500	NS	NS	NS
SEM-Antimony[c]	NS	NS	NA	0.004	NS	NS	NS
SEM-Arsenic[c]	NS	NS	NA	0.02	NS	NS	NS
SEM-Cadmium[c]	NS	NS	NA	0.0004	NS	NS	NS
SEM-Chromium[c]	NS	NS	NA	0.001	NS	NS	NS
SEM-Copper[c]	NS	NS	NA	0.002	NS	NS	NS
SEM-Lead[c]	NS	NS	NA	0.002	NS	NS	NS
SEM-Mercury[c]	NS	NS	NA	0.00004	NS	NS	NS
SEM-Nickel[c]	NS	NS	NA	0.003	NS	NS	NS
SEM-Silver[c]	NS	NS	NA	0.0009	NS	NS	NS
SEM-Zinc[c]	NS	NS	NA	0.002	NS	NS	NS

NA indicates no screening value is available; NS indicates media was not sampled for this parameter
[a] U.S. EPA Region V, Ecological Screening Levels (2003) and the project action levels
[b] U.S. EPA, 2005, and the project action levels
[c] Columbia Laboratories Analytical Reporting Limit is stated as µmol/g

1.4.1.2 Field Parameters

In order to preliminarily determine the lateral extent of soils contaminated with lead, field analyses will be performed using XRF. XRF soil sampling will be conducted in accordance with SW-846. Soil samples will be analyzed in a grid formation from the Northeast Area (to the south and west of the Slag Pile and east of previous samples to the railroad berm); to the east of the Slag Pile area to Pond 3 and Quemetco Drive; around all three ponds, including to the east of Ponds 1 and 2 and south of Pond 3; and along Julia Creek including to the northeast and offsite locations, by alternating surface sampling and at depths of 0 to 6 inches below ground surface (bgs). The XRF sampling locations and grids are included in WSP's XRF Sampling Workplan, submitted to U.S. EPA and dated December 11, 2009. The rationale for conducting XRF soil sampling is derive preliminary data as to whether or not an area has been impacted by lead. Furthermore, the results of the XRF analysis will assist in the delineation the lateral extent of lead contamination.

Surface water samples will be collected with a glass or plastic jar and in accordance with WSP's SOP number four. Surface water will be analyzed for general chemistry parameters including pH, temperature, specific conductivity, oxidation-reduction (redox) potential, and turbidity. The samples will be analyzed and reported in the field using a YSI 556 handheld multiparameter instrument. The rationale for conducting surface water sampling is to further delineate the lateral and vertical extent of contamination in surface waters at the site.

Sediment samples will be collected using a trowel and placed in a glass or plastic jar in accordance with WSP's SOP number four (#4). Sediment will be analyzed for pH and oxidation-reduction potential and reported in the field using a YSI 556 handheld multi-parameter instrument. The rationale for collecting sediment samples is to determine the extent of contamination in the sediments onsite and how surface water contamination has impacted the sediment samples. One of the most significant contamination conditions in sediments involves the adsorption of dissolved metallic ions to naturally occurring particulate organic matter. In addition, selected dissolved metals may precipitate as coatings on sediment particles depending on the pH and redox conditions in the water and sediment. The analysis of sediment samples for these general parameters will provide additional information on the processes that could influence the fate of metals in the onsite ponds.

1.4.1.3 Laboratory Parameters

During XRF sampling approximately 5% of the sampled grids will be sampled and shipped to an offsite laboratory for further analyses for lead using EPA Method 200.8. This verification sampling procedure is further described in WSP's XRF Sampling and Analysis Plan, dated November 16, 2009. Future soil samples for laboratory analysis will be handled in a similar manner.

Sediment samples collected from the three ponds and Julia Creek will be analyzed for total metals (including arsenic, cadmium, copper, lead and nickel) and phenols using EPA Methods 6020 and 8270 C, respectively. The sediment samples will also be analyzed for acid volatile sulfide/ simultaneously extracted metals (AVS/SEM) using the methods outlined in EPA's 1991 draft protocols.

The decision rule associated with the outlined laboratory analytical procedures is that if any constituents in Table 1-2 are identified at concentrations exceeding the project action levels (ESLs and EcoSSLs) indicated in Table 1-2, then the corresponding data will be evaluated as part of a revision to the human health risk assessments completed in 2006. If any constituents are identified at concentrations exceeding the ecological action levels indicated in Table 1-2, then the corresponding data will evaluated as part of a revision to the ecological risk assessment completed in 2006.

1.4.2 Ecology-Biology-Toxicology Analysis

1.4.2.1 Project Target Parameters

Based on historical data collected from the site, the ecological-biological-toxicology project target parameters will include lead in surface water and lead, arsenic, cadmium and nickel in sediments. Onsite soils will be collected for earthworm toxicity testing. The following ecological-biological-toxicology parameters will be analyzed:

- Soils will be collected for earthworm toxicity tests.
- Surface water samples will be collected from Pond #3 and Julia Creek for chemistry and toxicity testing using *P. promelas and C. dubia*.
- Sediment samples will be collected from all three ponds and Julia Creek for chemistry, physical characterization and *Chironomus* and *Hyalella* toxicity tests.
- The endangered species Indiana bat will be assessed in the DERA.

1.4.2.2 Field Parameters

Surface water samples will be collected from Pond #3 and Julia Creek and analyzed for the following constituents in the field:

- pH, dissolved oxygen, temperature, specific conductivity, redox potential, and water hardness

A study of the Indiana bat, an endangered species will be conducted through modeling. The specific details of the modeling parameters are included in Section 6.0 of the Workplan to Address Outstanding DERA Issues (WSP, May 19, 2008).

The rationale for choosing the field parameters include results from the 2006 ERA (Cantox, 2006) and to address comments from U.S. EPA, dated October 8, 2009.

1.4.2.3 Laboratory Parameters

Surface water and sediment samples will be collected from the onsite ponds and Julia Creek, since these features may serve as accumulation areas for constituents present from the slag waste pile and other facility production areas transported via wind or surface runoff. The surface water samples will be analyzed for toxicity by using *P. promelas and C. dubia*. Analysis of the sediment samples will be limited to *Chironomus* and *Hyalella* toxicity tests as well as other selected parameters including total organic carbon (TOC), particle size, water moisture analysis, and cation exchange capacity (CEC). The analysis of sediment samples for TOC and grain size will provide additional information on the processes that could influence the fate of metals in the onsite ponds. TOC concentrations will be compared with the metal concentrations detected in sediment samples for each pond. The presence of relatively high metal concentrations with elevated organic carbon levels may indicate that organic complexation is a primary mechanism affecting the transport of these constituents.

A limited number of the soil samples from the slag waste pile, the northeast area, the pond areas, and along Julia Creek will be analyzed for soil pH, organic matter, soil moisture, water holding capacity and CEC. Additionally, soils will be collected for earthworm toxicity tests. These parameters have been selected based on the results of the 2006 ERA (Cantox, 2006), and were not eliminated as a chemical of concern in the ERA. Additionally, other test parameters, such as hardness and TOC, have been selected to assist in the interpretation of the toxicity testing results.

1.5 SAMPLING LOCATIONS

A map showing intended soil, sediment and surface water sampling locations is provided on Figure 2 of this QAPP and on Figure 2 of the XRF Sampling and Analysis Plan (WSP, December 11, 2009, Appendix C). It is possible, however, that depending on the nature of encountered field conditions, sampling locations may be changed. The person responsible for making such decisions will be the Site Field Manager whose responsibilities are described in Section 2 of this QAPP. Any changes to the sampling strategy will only be implemented after receipt of approval of the XRF Sampling and Analysis Plan from the U.S. EPA RCRA Project Manager.

1.5.1 Rationale of Selected Sampling Locations

Based on the results of the previous investigations, the 2006 ERA, and discussions with U.S. EPA, the rationale for the selected sampling media and locations are described in previous sections and are based on the data needed to supplement and revise the ERA. Additionally, the sampling locations will further delineate onsite contamination and will be used for corrective action measures at the site, if applicable.

1.6 PROJECT SCHEDULE

The earliest date for which surface water and soil sampling (excluding XRF) will be conducted is April-May 2010.

2 Project Organization and Responsibility

WSP is the principal consultant to Quemetco and will be responsible for the performance of all services required to address the outstanding DERA issues, including field operations, laboratory testing, data management, data evaluation and reporting. The various quality assurance, field, laboratory and management responsibilities of key project personnel are defined below. Additionally, the key personnel addresses and telephone numbers are provided in Table 2-1. Resumes for the key personnel have been included in Appendix A.

2.1 PROJECT ORGANIZATION CHART

The project organization chart is provided on Figure 3.

Table 2-1 Contact Information for Key Project Personnel

Name of Key Project Personnel	Contact Information
Therese Cirone-RSR Quemetco	2777 Stemmons Freeway Suite 1800 Dallas, TX 75207 214-583-0232
Richard Freudenberger-WSP	2025 Gateway Place, Suite 435 San Jose, CA 95110 408-453-6100
Ruth Hull-Intrinsik Environmental	Intrinsik Environmental 6605 Hurontario Street, Suite 500 Mississauga, Ontario L5T 0A3 Canada 905-364-7800 ext. 207
Allen Debus-EPA Region 5	U. S.EPA, REGION 5 77 W. Jackson Blvd. Chicago, IL 60604
Lorena Benitez-WSP	2025 Gateway Place, Suite 435 San Jose, CA 95110 408-453-6100
Terrie Baranek-ECT.CON, Inc.	3531 Fox Chase Drive Imperial, PA 15126 724-695-8042
Bill Walsh-Microbac Laboratory	250 West 84th Drive Merrillville, IN 46410 219-769-8378
Richard Caldwell-Northwestern Aquatic Services	3814 Yaquina Bay Road Newport, OR 97365 541-265-7225
Jeff Christian-Columbia Analytical	1317 S. 13th Ave Kelso, WA 98626 360-577-7222

2.2 MANAGEMENT RESPONSIBILITIES

2.2.1 U.S. EPA RCRA Project Coordinator

Nate Nemani, the EPA project manager, has the overall responsibility for all phases of the investigation.

2.2.2 RSR Project Coordinator

Terry Cirone is RSR's project coordinator. She will be responsible for providing site information and history and logistical assistance, specifying sites requiring investigation, reviewing all results and recommendations and providing management and technical oversight, ensuring proper review and distribution of all documents, communicating comments from technical reviewers to contractors, ensuring that contractors address all comments and take appropriate corrective actions, and coordinating with regulatory agencies.

2.2.3 WSP Project Director

Richard E. Freudenberger, P.E., vice president of WSP, will be WSP's Project Director. He has the authority to commit the firm's resources to accomplish the project objectives. He will have ultimate responsibility for WSP and subcontractor performance. In addition, he will be responsible for the direction and management of all WSP's field, laboratory, and office activities. Mr. Freudenberger has the responsibility and authority to procure the necessary support services and equipment for implementing each phase of the investigative effort. He will also be responsible for staffing and scheduling all of WSP's activities.

2.3 QUALITY ASSURANCE RESPONSIBILITIES

2.3.1 WSP's Quality Assurance Officer

Terrie Baranak of ECT.CON Inc., will be the Quality Assurance Officer (QAO) during the project and will be responsible for all QA/QC aspects of the work, including data validation. The QAO will remain independent of direct job involvement and day-to-day operations, will report to the WSP Project Director and will resolve any QA disputes. Additionally, the QAO will be responsible for auditing the implementation of the QA program in conformance with the Quemetco policies and U.S. EPA requirements. The Project QAO has sufficient authority to stop work on the investigation as deemed necessary in the event of serious QA/QC issues. The QAO will be responsible for the following activities during the project:

- Performing QA audits on various phases of the field operations;
- Reviewing and approving plans and procedures;
- Providing QA technical assistance to project staff;

2.4 LABORATORY RESPONSIBILITIES

Three laboratories will be used to complete the analytical work for this project. Northwestern Aquatic Sciences and Columbia Analytical Services will perform water, soil and sediment analyses and Microbac Laboratories will perform soil analysis during the XRF investigation. Columbia Analytical Services and Microbac Laboratories are National Environmental Laboratory Accreditation Program (NELAP) certified

laboratories. Northwestern Aquatic Sciences is a state certified laboratory. The laboratory certifications are included in Appendix D. Table 2-2 provides a summary of sample type, analysis, and the associated laboratory performing the analysis.

Table 2-2. Summary of Sample Analysis and Associated Laboratory

Sample type	Analysis	Laboratory
soil	Sb, As, Ba, Cd, Cr, Cu, Pb, Ni, Zn	Columbia
soil	Hg	Columbia
soil	pH, organic matter, soil moisture, water holding capacity, cation exchange capacity	Columbia
soil	Texture	Columbia
soil	14-day earthworm survival and biomass toxicity test	Northwestern Aquatic
soil	XRF analysis for lead	Microbac
water	Fathead minnow (chronic) and C. dubia toxicity test	Northwestern Aquatic
water	Interstitial pore water ammonia, pH	Columbia
water	Metals (Pb, Cd)	Columbia
sediment	Metals (As, Cd, Cu, Pb, Ni)	Columbia
sediment	Phenol	Columbia
sediment	*H. azteca* and *C. tentens* (10 day) toxicity tests	Northwestern Aquatic
sediment	AVS/SEM	Columbia
sediment	TOC, particle size, water moisture analysis, cation exchange capacity	Columbia

2.4.1 Columbia Analytical Services, Inc.

Columbia Analytical Services, Inc. (CAS) will perform soil, water and sediment analysis. The following soil analyses will be performed by CAS: metals (including antimony, arsenic, barium, cadmium, chromium, lead, nickel, zinc and mercury); pH; organic matter; soil moisture; water holding capacity; cation exchange capacity; and texture.

The following water analyses will be conducted by CAS: interstitial pore water ammonia and pH; and metals in water including lead, cadmium, tin, arsenic, barium, chromium and copper.

CAS will analyze sediment samples for total metals including arsenic, cadmium, copper, lead and nickel; phenols; AVS/SEM, total organic carbon (TOC), particle size, water moisture, and cation exchange capacity (CEC).

CAS is comprised of a Laboratory Director, Quality Assurance Manager, Client Services and Sample Management Office Manager, Project Chemists, Department Managers and Technical Staff Members.

2.4.1.1 Laboratory Director

The Laboratory Director is provides leadership and support for the QA program and is responsible for overall laboratory efficiency and financial performance. The Laboratory Director also provides resources for implementation of the QA program, reviews and approves the QA Manual, reviews and approves standard operating procedures (SOPs). The Laboratory Director will be responsible for ensuring all the resources of the laboratory will be available on a as-required basis.

2.4.1.2 Quality Assurance Manager

The responsibility of the Quality Assurance Manager (QAM) is to oversee implementation of the quality program and to coordinate QA activities within the laboratory. The QAM works with laboratory production units to establish effective quality control and assessment plans. The QAM reports directly to the Laboratory Director.

2.4.1.3 Client Services and Sample Management Office Manager

The Client Services and Sample Management Office Manager is responsible for the Client Services Department (customer services/project chemists, and Electronic Data Deliverables) and the sample management office/bottle preparation sections. The Client Services Department provides a complete interface with clients from initial project specification to final deliverables.

2.4.1.4 Project Chemist

The Project Chemist is a senior-level scientist assigned to each client to act as a technical liaison between the client and the laboratory. The project chemist is responsible for ensuring that the analyses performed by the laboratory meet all project, contract, and regulatory-specific requirements.

2.4.1.5 Department Manager

The Department Manager has the responsibility to ensure that quality control functions are carried out as planned, and to guarantee the production of high quality data. Department managers have the responsibility to monitor the day-to-day operations to ensure that productivity and data quality objectives are met.

2.4.1.6 Technical Staff Members

Technical Staff Members will be responsible for sample preparation and producing data that meets the requirements of CAS's Standard Operating Procedures and Quality Assurance Plan. These staff members will report to their Department Manager.

2.4.2 Northwestern Aquatic Sciences

Northwestern Aquatic Sciences (NAS) will perform soil, water and sediment analysis. NAS will perform the 14-day earthworm survival and biomass toxicity test for soil; Fathead minnow and C. dubia chronic toxicity test for water; and the10-day toxicity tests using *H.azteca* and *C.tentens* for sediment.

NAS is comprised of a Laboratory Director, Quality Assurance Officer, Technical Director and Technical Staff.

2.4.2.1 Laboratory Director

The Laboratory Director is responsible for ensuring that the responsibility, authority and interrelationships of all personnel who manage, perform, or verify work affecting the quality of tests are specified and documented, including a clear description of the lines of responsibility in the laboratory to ensure adequate supervision, and job descriptions for all positions.

2.4.2.2 Quality Assurance Officer

The Quality Assurance Officer is responsible for evaluating data objectively and performing assessments independent of managerial influence. Additional tasks include coordinating quality assurance/quality control (QA/QC) procedures and data corrective action process, conducting internal audits, and the maintenance of NAS's Quality Assurance Plan. The Quality Assurance Officer reports directly to the Laboratory Director.

2.4.2.3 Technical Director

The Technical Director is responsible for monitoring standards of performance in quality control and quality assurance, and monitoring the validity of analyses performed and data generated. The Technical Director reports directly to the Laboratory Director.

2.4.2.4 Technical Staff

The Technical staff is responsible for sample analysis and identification of corrective actions. The staff report directly to the Laboratory Director. All personnel are responsible for complying with all QA/QC requirements that pertain to their organizational/technical function.

2.4.3 Microbac Laboratories

Microbac Laboratories (Microbac) will perform total lead analysis for soil samples collected during XRF sampling.

Microbac is comprised of a Managing Director, QA/QC Manager, Client Services Manager, Project Managers, Unit Supervisors and Technical Staff.

2.4.3.1 Managing Director

The Managing Director is responsible for overall laboratory activities and exercises day-to-day supervision of laboratory operations and reporting of results. Key responsibilities include monitoring the performance of QA/QC activities and monitoring the validity of analyses performed and data generated. The Director will report to the Project QAO and will be responsible for ensuring all the resources of the laboratory will be available on an as-required basis; and overseeing the preparation of final analytical reports.

2.4.3.2 QA/QC Manager

The Quality Assurance Manager is responsible for monitoring QA policies and procedures as well as documenting the quality of data reported by the laboratory. Additional tasks include coordinating QA/QC procedures and data corrective action process, conducting internal audits, and the maintenance of Microbac's Quality Assurance Plan.

2.4.3.3 Client Services Manager

The Client Services Manager is responsible for all aspects of client services, including project management, report generation, supervision of the project management team and overall client service. The Client Services Management reports to the Managing Director.

2.4.3.4 Project Managers

Project Managers are responsible for coordinating projects with the clients and the Unit Supervisors. Individual Project Managers are under the direct supervision of the Client Services Manager, who reports directly to the Managing Director. Project Managers are responsible for overseeing the specified project requirements starting with the initial client contact through the generation of the final report.

2.4.3.5 Unit Supervisors (Inorganics Manager and Organics Manager)

Unit Supervisors are the Technical Directors for their respective departments and are responsible for the production of analytical data, supervision of analysts and for reviewing the data produced within their designated section. Unit Supervisors report directly to the Managing Director.

2.4.3.6 Technical Staff Members

Technical Staff Members will be responsible for sample preparation and producing data that meets the requirements of Microbac's Standard Operating Procedures and Quality Assurance Plan. These staff members will report to their Unit Supervisor.

2.5 FIELD RESPONSIBILITIES

2.5.1 WSP Field Leader

The WSP project director will be supported by the WSP field team leader. He/she is responsible for leading and coordinating the day-to-day activities of the various resource specialists under his/her supervision. The WSP field team leader is a highly experienced environmental professional and will report directly to the WSP project director. Specific field team leader responsibilities include:

- Provision of day-to-day coordination with the Facility project manager on technical issues in specific areas of expertise

- Developing and implementing of field-related work plans, assurance of schedule compliance, and adherence to management-developed study requirements
- coordinating and managing of field staff including sampling, drilling, and supervising field laboratory staff
- implementing of QC for technical data provided by the field staff including field measurement data
- adhering to work schedules provided by the project manager
- authoring, writing, and approving of text and graphics required for field team efforts
- coordinating and overseeing of technical efforts of subcontractors assisting the field team
- identifying problems at the field team level, resolving difficulties in consultation with the WSP project director, implementing and documenting corrective action procedures, and provision of communication between team and upper management
- participating in preparation of the final report

2.5.2 WSP Field Technical Staff

The technical staff (team members) for this project will be drawn from WSP's resources. The technical team staff will be utilized to gather and analyze data, and to prepare various task reports and support materials. All of the designated technical team members are experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

The responsibility of key WSP personnel is described below:

2.5.2.1 Richard E. Freudenberger - Project Director

All activities carried out will be under the overall direction of the Project Director. The Project Director's responsibilities include, but are not limited to the following:

- overall project coordination and implementation
- final review of all project reports
- field operations and testing
- laboratory analysis
- data processing activities
- all other project-related activities

2.5.2.2 To be determined - Health and Safety Officer

The Health and Safety Officer is responsible for the following:

- preparing the Health and Safety Plan and ensuring that it is followed
- ensuring that all site activities are performed in a safe manner to eliminate danger to personnel performing the field activities
- providing guidance to the injured for immediate medical attention
- filing personnel injury reports to the Project Director

2.5.2.3 Terrie Baranek - Quality Assurance Officer

The QAO will be responsible for meeting QA goals during investigations. She will serve as overall QAO for all sampling and analyses. In addition, the QAO will be responsible for ensuring that all contractors designate a project QAO where relevant and that each contractor complies fully with all aspects during each phase of the effort. In particular, the QAO will work closely with the QAO of the contract analytical laboratory QAO to ensure that all QA/QC requirements are being met. The QAO's overall responsibilities include, but are not limited to the following:

- field operations QC
- sampling QC
- laboratory QC
- data processing QC
- review and confirmation of tentatively identified compounds (TICs), including phenols
- data quality review
- overall QA

The QA/QC activities for the investigation and the designated QC representative(s) are given below:

Overall QA/QC	Terrie Baranek, ECT.CON Inc. Richard E. Freudenberger, WSP
Sampling Operations	Richard E. Freudenberger, WSP
Sampling QC	Terrie Baranek, ECT.CON, Inc.
Data Review	Richard E. Freudenberger, WSP Terrie Baranek, ECT.CON, Inc.

2.6 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATIONS

During this investigation, XRF sampling and analysis will be completed and requires training on the proper use of the sampling equipment.

2.6.1 Training

Training is required for non-routine sampling procedures including XRF. WSP staff received internal training on the proper use of the XRF machine and proper sample collection and analysis.

2.6.2 Certifications

Certifications maintained by project participants have been attained prior to implementation of the Workplan and in accordance with Quemetco, WSP and contractor laboratory policies.

3 Quality Assurance Objectives for Measurement Data

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law and support the decision rules outlined in Section 1.4. Specifically, the data collected should be of sufficient quantity and quality to assess potential impacts (vertical and lateral extent of contamination) from facility operations within and around the slag waste pile, man-made ponds, Julia Creek, and the northeastern area. Lead is considered the target parameter; however, based on the results of the investigations, if any constituents from Table 1-1 are identified above the project action levels (identified as ESLs and EcoSSLs) listed in Table 1-2, in any location, then the data will be added to the DERA conducted in 2008.

3.1 PRECISION

3.1.1 Definition

Precision is a measure of the degree to which two or more measurements are in agreement. Precision will be measured for the chemical analyses through the collection and analysis of duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples. Precision will be measured for the ecological-biological-toxicology analyses through the comparison of data for a specific toxicant that is collected both upstream and downstream of the project location.

3.1.2 Field Precision Objectives

Field precision for the chemical analyses will be assessed through the collection and analysis of field duplicate samples. Duplicates and MS/MSD samples will be collected at the frequency of one duplicate per ten samples collected for each matrix. The duplicate or MS/MSD will then be analyzed for identical metals as the associated sample. A summary of QA/QC sample collection and analysis for the chemical analysis portion, including the total number of duplicate and MS/MSD samples to be collected, is provided in Table 3-1.

Field precision for the ecological-biological-toxicology portion of the project is not applicable.

3.1.3 Laboratory Precision Objectives

Precision in the laboratory for the chemical analyses is assessed through the calculation of the relative percent differences (RPD) and relative standard deviations (RSD) for three or more replicate samples. The equations used to calculate precision can be found in Section 12.2 of this QAPP.

Laboratory precision for the ecological-biological-toxicology analyses will be conducted by comparing analytical results to a referenced toxicant.

3.2 ACCURACY

3.2.1 Definition

Accuracy is the degree of agreement between an observed value and an accepted reference value.

3.2.2 Field Accuracy Objectives

Accuracy in the field for the chemical analyses is assessed through adherence to all sample handling, preservation and holding time requirements and the collection of field and trip blanks.

Accuracy in the field for the ecological-biological-toxicology analyses is not applicable.

3.2.3 Laboratory Accuracy Objectives

Laboratory accuracy for the chemical analyses is assessed through the analysis of MS/MSD samples, laboratory control samples (LCS) or blank spikes, surrogate standards, and method blanks. As previously discussed duplicates and MS/MSD samples are analyzed at a frequency of 5 percent; LCS or blank spikes at a frequency of 5 percent; and surrogate standards, where available, are added to every sample analyzed for organic constituents. Appropriate levels for spike and surrogate standards will be added such that a mid-calibration level is present in the sample at the time of analysis. The results of spiked samples will be expressed as percent recovery and will provide information on positive and negative bias. The equation for determination of percent recoveries can be found in Section 12.1 of this QAPP.

Laboratory accuracy in the ecological-biological-toxicology analyses will be conducted by comparing results to a referenced toxicant.

3.3 COMPLETENESS

3.3.1 Definition

Completeness is a measure of the number of valid measurements obtained from a measurement system compared to the number that was expected to be obtained under normal conditions.

3.3.2 Field Completeness Objectives

Field completeness is a measure of the number of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in Section 12.3 of this QAPP. Field completeness for the chemical analysis for this project will be greater than 90 percent.

Field completeness for the ecological-biological-toxicology analysis is not applicable for this project.

3.3.3 Laboratory Completeness Objectives

Laboratory completeness is a measure of the number of valid measurements obtained from all the measurements taken in the project. The equation for completeness is presented in Section 12.3 of this QAPP. Laboratory completeness for this project, as it applies to the parameters outlined in Table 1-1, will be greater than 95 percent.

Laboratory completeness for the ecological-biological-toxicology analysis is not applicable for this project.

3.4 REPRESENTATIVENESS

3.4.1 Definition

Representativeness expresses the degree to which data accurately and precisely represent characteristics 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

All proposed field testing and measurement procedures are designed to maximize the goal that the field data will represent the conditions found at the site. All sampling efforts will be conducted using procedures designed to maximize the goal that the sample be representative of the matrix from which it was taken.

3.4.3 Measures to Ensure Representativeness of Laboratory Data

All analytical activities are designed to produce data representative of the samples submitted for analysis. The proper execution of field activities, including sample collection, handling, field blanks, trip blanks and meeting holding times will ensure data representativeness. During development of these protocols, consideration was given to previous investigation areas, previous analytical results, operations conducted onsite and physical site settings.

3.5 DECISION RULES

3.5.1 Definition

A Decision Rule is a statement which allows for a course of action or non-action to be taken, based on assumptions made to draw out and test its logical or empirical consequences. The decision rules for this project are outlined in Section 1.1. Specifically, the decision rules for this project are:

- Additional soil, surface water, and sediment samples will be collected from various locations throughout the site. These samples will be used to further delineate the lateral and vertical extent of contamination at the site.
- The chemical of concern is predominately lead; however, this project will also address how other chemicals of concern have impacted the site.
- Results from the chemical and ecological-biological-toxicology analyses will be used to determine whether the Ecological Risk Assessment (ERA) should be revised.
- Results from the chemical and ecological-biological-toxicology analyses will also be used to determine if other areas of the site require additional sampling or corrective actions.

3.5.2 Decision Rule Objectives

The decision rule objectives for this project address the following:

- For this project, samples shall be collected discretely to provide greater indication of contaminated areas and delineate boundaries of contamination.
- Compare ESLs, EcoSSLs and analytical reporting limits to determine if a constituent should be added to the ERA.
- Develop "if/then" statements defining conditions that would cause the decision maker to choose among alternative remediation strategies.

Decision levels, expressed as human health or ecological target decision levels, for each critical measurement parameter are specified in Table 1-1.

3.6 COMPARABILITY

3.6.1 Definition

Data comparability expresses the confidence with which one data set can be compared to another. All data collection mechanisms are designed to produce comparable data.

3.6.2 Measures to Ensure Comparability of Field Data

Procedures for field measurements are provided in Section 7.1. These procedures will be implemented to ensure that tests performed at the designated locations across the site are conducted using accepted procedures for the media that will be sampled. In order to ensure comparability of field data for the chemical and ecological-biological-toxicology analyses, all data will be collected in a consistent manner between locations, over time, and will include appropriate QA/QC procedures (i.e., instrument calibration). The data collected during this investigation will be compared with previous data collected from the site. Any limitations on the comparability of test data will be noted and test results will be evaluated on that basis.

3.6.3 Measures to Ensure Comparability of Laboratory Data

Any soil, surface water, and sediment samples collected will be analyzed by a laboratory using consistent protocols for holding times, sample preparation, analytical methods, and QC as described in the approved U.S. EPA analytical procedures.

The data will be reduced, reported, and documented consistently throughout the study and consistent with previous data collected for the site. For example, surface water and sediment quality data will be reported using a consistent set of units throughout the study. Any deviations from established protocols will be noted so that data comparability can be maintained.

3.7 LEVEL OF QUALITY CONTROL EFFORT

The QAPP addresses evidentiary considerations by defining how the acquisition and handling of samples and the reporting and review of data will be documented. Examples of the documentation include field notebook records, chain-of-custody forms, CLP-specified formats for data reporting, and the requirements for a "sign off" by the laboratory manager and QA reviewer of the data packages. These forms of documentation could be used, if necessary, to support the integrity of the data generated.

Chemical analyses for samples collected during the investigation will be performed using U.S. EPA-approved methods and protocols. The different types of samples that will be collected will be analyzed for the parameters indicated in Table 1-1. The number of QC samples scheduled for collection is shown on Table 3-1 below. Coordination between WSP and the laboratories will be emphasized. When the laboratory encounters problems such as difficult sample matrices, WSP (with U.S. U.S. EPA assistance, if required) will provide professional guidance on how to continue without excessive cost increases or compromise of the data quality.

For purposes of QC, a minimum of 10 percent of all samples collected in the field for laboratory analyses will be replicated; i.e., there will be 1 duplicate sample for every 10 samples collected for each matrix. The duplicate will then be analyzed for the same parameters as the associated sample. These replicates will be submitted to the laboratory. Internal laboratory replicates will be analyzed at the rate of 1 for every 20 samples analyzed.

Matrix spike samples will be prepared and analyzed by the laboratory at the rate of 1 per 20 samples of the same matrix. Sample matrices will thus be examined to evaluate their effects on the analytical protocols.

Trip blanks will not be prepared and analyzed for this project. Additionally, equipment blanks will not be collected and analyzed as all equipment used in the field will be discarded after one use.

Laboratory blanks will be analyzed with each run to detect sample preparation, reagent, or system contamination.

Laboratory QC reference samples will be integrated into the analytical scheme to assess accuracy. All field and laboratory QC samples will be analyzed using the same method protocols as regular samples, including all spikes, dilutions, and processing.

All QC samples will be evaluated based on the CLP National Functional Guidelines for Organic Data Review, CLP National Functional Guidelines for Inorganic Data Review, or method criteria specified in the associated U.S. U.S. EPA-approved methods.

Table 3-1 Summary of QAQC Sample Collection and Analysis

Sample type	Analysis	# of samples	Sample Type	Method
soil	Sb, As, Ba, Cd, Cr, Cu, Pb, Ni, Zn	5	Duplicate	EPA 200.8
soil	Sb, As, Ba, Cd, Cr, Cu, Pb, Ni, Zn	2	MS/MSD	EPA 200.8
soil	Hg	5	Duplicate	EPA 7471
soil	Hg	2	MS/MSD	EPA 7471
soil	Cation exchange capacity	5	Duplicate	EPA 9081
soil	Cation exchange capacity	2	MS/MSD	EPA 9081
soil	Texture (of earthworm toxicity test soil only)	Not Applicable for toxicity tests. Quality Control checks will be conducted by the lab. See Section 9.2.	N/A	ASTM D 422-63
soil	pH, total organic matter, water holding capacity	5	Duplicate	NUT.02.05; Walkley-Black procedure; NUT.02.68
soil	pH, total organic matter, water holding capacity	2	MS/MSD	NUT.02.05; Walkley-Black procedure; NUT.02.68
soil	14-day earthworm survival and biomass toxicity test	Not Applicable for toxicity tests. Quality Control checks will be conducted by the lab. See Section 9.2.	N/A	EPA 600/3-88-029

Table 3-1 Summary of QAQC Sample Collection and Analysis

water	Metals (Pb, Cd, Sb, As, Ba, Cr, Cu)	1	Duplicate	EPA 200.8/6020
water	Metals (Pb, Cd, Sb, As, Ba, Cr, Cu)	1	MS/MSD	EPA 200.8/6020
water	Chronic toxicity tests using P. promelas (Fathead minnow) & C. dubia	Not Applicable for toxicity tests. Quality Control checks will be conducted by the lab. See Section 9.2.	N/A	EPA 1000
water	Interstitial pore water	1	Duplicate	SM 4500-NH_3 D; EPA 350.3
water	Interstitial pore water	1	MS/MSD	SM 4500-NH_3 D;350.3
Sample type	**Analysis**	**# of samples**	**Sample Type**	**Method**
sediment	Metals (Sb, As, Ba, Cd, Cr, Cu, Ph, Ni)	1	Duplicate	EPA 6020
sediment	Metals (Sb, As, Ba, Cd, Cr, Cu, Ph, Ni)	1	MS/MSD	EPA 6020
sediment	10-day toxicity test using H.azteca & C. tentens	Not Applicable for toxicity tests. Quality Control checks will be conducted by the lab. See Section 9.2.	N/A	EPA 600/R-99/064/100.1/100.2
sediment	AVS/SEM	1	Duplicate	EPA 1991 draft method
sediment	AV/SEM	1	MS/MSD	EPA 1991 draft method
sediment	TOC, particle size, water moisture analysis, CEC	2	Duplicate	SM 5390; ASTM D422-63; EPA 160.2; EPA 9081
sediment	TOC, particle size, water moisture analysis, CEC	1	MS/MSD	SM 5390; ASTM D422-63; EPA 160.2; EPA 9081
sediment	Phenols	1	Duplicate	EPA 8270C

4 Sampling Procedures

The sampling procedures to be used during this site investigation will be consistent for the objectives and decision rules of this project. The procedures for XRF sampling are included in the XRF Sampling and Analysis Plan, dated December 11, 2009 (Appendix B). The procedures for sediment and surface water sampling are included in WSP's Workplan to Address Outstanding DERA Issues, dated May 19, 2008. The SOPs for sediment and surface water sampling are also presented in Appendix C of this QAPP.

The specific field SOPs to be used during this project are listed below in Table 4.1.

Table 4-1 Project Sampling Procedures

SOP Number	Matrix	Field Activity/Parameter	Referenced Document
SW-846, WSP SOP #4	Soil	XRF Sampling	XRF Sampling and Analysis Plan, prepared by WSP, dated November 16, 2009
EPA Method 200.8, WSP SOP #11	Soil	Metals (Sb, As, Ba, Cd, Cr, Cu, Pb)	
NUT.02.05, Walkley-Black procedure, NUT.02.36, NUT.02.68, WSP SOP #11	Soil	pH, organic matter, soil moisture, water holding capacity	Workplan to Address Outstanding DERA Issues, May 19, 2008
EPA Method 9081, WSP SOP #11	Soil	Cation exchange capacity	Workplan to Address Outstanding DERA Issues, May 19, 2008
EPA Method 7471, WSP SOP #11	Soil	Hg	
ASTM D 422-63, WSP SOP #11	Soil	Texture (conducted on earthworm toxicity test soil only)	
EPA Method 600/3-88-029, WSP SOP #11	Soil	14-day earthworm survival and biomass toxicity test	
EPA 1000 (EPA-821-R-02-13) and EPA 1002.0 (EPA-821-R-02-13)	Water	Chronic toxicity tests using *P. promelas* & *C. dubia*	
SM 4500-NH_3 D; EPA 350.3; WSP SOP #4	Water	Interstitial pore water ammonia, pH	
EPA Method 200.8/6020, WSP SOP #4	Water	Metals (Sb, As, Ba, Cd, Cr, Cu, Pb)	
EPA Method 6020, WSP SOP #4	Sediment	Metals (Sb, As, Ba, Cd, Cr, Cu, Pb, Ni)	
EPA Method 600/R-99/064/100.1/100.2, WSP SOP #4	Sediment	10 day toxicity test using *H. azteca* & *C. tentens*	

Table 4-1 Project Sampling Procedures

SOP Number	Matrix	Field Activity/Parameter	Referenced Document
EPA draft Method 1991, WSP SOP #4	Sediment	AVS/SEM	
GEN-ASTM, WSP SOP #4	Sediment	TOC, particle size, water moisture analysis, cation exchange capacity	Workplan to Address Outstanding DERA Issues, May 19, 2008
EPA 8270C	Sediment	Phenols	
WSP SOP #19	Various	Equipment Decontamination	Workplan to Address Outstanding DERA Issues, May 19, 2008
WSP SOP #26	Various	Investigation-Derived Waste	

5 Custody Procedures

Sample custody is controlled and maintained through the chain-of-custody procedures. Chain-of-custody is the means by which the possession and handling of samples will be tracked from the source (field) to their final disposition, the laboratory. A sample is considered to be in a person's custody if it is in the person's possession, or it is in the person's view after being in his or her possession, or it was in that person's possession and that person has locked it in the sampling vehicle or office to prevent tampering.

Sample containers will be preserved at the laboratory before shipment to the site. Other chain-of-custody supplies, such as shipping containers (coolers), sample labels, custody seals, and ice packs, will also be provided by the laboratory. Sample containers will be new, and certification that they are contaminant-free will be provided by the manufacturer for each lot number.

5.1 FIELD CUSTODY PROCEDURES

5.1.1 Field Notebook

WSP personnel will maintain a Field Notebook which will be used to record data collection activities including conditions of the site, issues encountered during sampling activities and any decisions made in the field during the investigation. Entries in the Field Notebook will include as many details as possible so that persons returning to the facility could reconstruct a particular situation without reliance on memory.

Field Notebooks will be bound field survey books and will be stored in the document control center when not in use. Each logbook will be identified by the project-specific document number and will contain, at a minimum, the following information:

- Person to whom the logbook is assigned.
- Logbook number
- Date, arrival time onsite, weather/conditions
- Personnel onsite
- Time of departure
- Page numbers and signature on each page

5.1.2 Custody of Samples

WSP personnel will be responsible for the custody of samples from the time they are collected until they are transferred to the sample shipper for delivery to the laboratory. The chain-of-custody procedures for the sampling activities are given below.

The sample will be placed in a thermal shipping container with ice and otherwise be preserved as required. The container will remain within the sampler's view or locked in the sampling vehicle for temporary storage and transport to the sample staging area.

On arrival at the sample staging area, the sampler will fill out chain-of-custody form(s) to account for each sample (Figure 4). Blanks and QC samples may be sent with each group of samples as described in Section 3.0. Field duplicate samples will be sent as "blind duplicates" (e.g., the laboratory will be unable to distinguish a field duplicate from any other sample). The identity of the field duplicate sample will be

recorded in the WSP field notebook. The WSP copy of the chain-of-custody form will be retained as a permanent record in the project files.

The location of sampling points in the field will be documented in accordance with the procedures described in Sections 2.4, 3.1, and 4.1 of the Work Plan prepared to address outstanding DERA issues. These procedures are designed to ensure that sampling points for the Phase II investigations can be relocated in the future and are accurately represented in subsequent reports. Briefly, each sampling location will be horizontally surveyed to the nearest 0.1 foot relative to the facility or state coordinate system. The ground surface elevation, when relevant, will be determined to the nearest 0.01 foot using either a U.S. Geological Survey (USGS) or a U.S. Costal and Geodetic Survey (USCGS) benchmark. The record of the sampling locations will be retained as a permanent record in the project files.

Following sample collection, the sampler will record the date and time and sign in the appropriate block of the form to relinquish custody. The sample carrier will sign and record the date and time in the appropriate box to accept custody. The original chain-of-custody record will be placed inside the shipping package. The shipping container will then be sealed with custody seals and secured with strapping tape. The seals will indicate if the samples have been tampered with during transport to the laboratory. The sample shipping receipt will be retained as part of the permanent chain-of-custody documentation. A sample tag will be attached to each sample container.

The laboratory will assume custody of the samples on receipt. A designated laboratory sample coordinator will record the date and time and sign the chain-of-custody form on receipt.

The sample coordinator will immediately inspect the shipment for damage and completeness and report any problems to the Project QAO. The laboratory sample coordinator will then complete the appropriate lab tracking forms and logs.

5.2 LABORATORY CUSTODY PROCEDURES

The laboratory sample coordinator is responsible for custody of the samples from the time of sample receipt to the time of discard. Each laboratory has established procedures for sample handling and tracking. Many of the parameters that will be analyzed under this project require special chemical preservatives and holding samples at cool temperatures (4°C). Each laboratory will be responsible for providing pre-preserved containers. All containers will be brand new from the manufacturer and documentation for each lot number will ensure that they are free of contamination. Holding conditions of the samples will be checked and recorded. Preservation of the samples is verified by the lab sample coordinator when the samples are received.

5.3 FINAL EVIDENCE FILES

Chain-of-custody protocols also involve maintaining a project evidence file. 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. WSP's administrative staff will coordinate with WSP's project director, Richard E. Freudenberger, to act as custodians of the evidence file and will maintain the contents of evidence files for the RFI, including all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and data reviews in a secured, limited access area and under custody of the WSP facility manager.

The final evidence file will include at a minimum:

- field logbooks
- field data and data deliverables
- photographs
- drawings
- laboratory data deliverables
- data validation reports
- data assessment reports
- progress reports, QA reports, interim project reports, etc.
- all custody documentation (tags, forms, airbills, etc.)

The project evidence file will be maintained at WSP's Reston, Virginia, office in a secure, limited access area for two (2) years after the completion of the project. After two years, the entire project evidence file, consisting of the items listed above, will be placed in cardboard boxes that are each assigned a WSP document control number. The contents of each box and its assigned document control number are recorded by WSP personnel and this information is maintained at the Reston office. The boxes containing the project file are then transported to an offsite storage area located in Manassas Park, Virginia, where they will be maintained for an additional three (3) years. The offsite storage area is a high-security, fireproof, climate-controlled records center. Using the WSP document control number, WSP can retrieve the project file from the storage center within 48 hours of a request. The file will be offered to U.S. EPA prior to disposal by WSP.

6 Calibration Procedures and Frequency

The calibration procedures and schedules established for the measuring instruments apply to all field and laboratory equipment. Specific calibration procedures for each instrument to be used are detailed in the following sections.

6.1 FIELD INSTRUMENT CALIBRATION

Field parameters that will be measured include: pH, temperature, turbidity, dissolved oxygen, specific conductivity, and redox potential. WSP will use a YSI 556 Water Quality Checker for all field measurements except turbidity. Turbidity will be analyzed using a LaMotte 2020e Turbidity Meter.

Field instruments will be calibrated in accordance with the manufacturer's instruction manual. All the calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, temperature at which readings were taken and the readings. Multiple readings on one sample or standard, as well as readings on replicate samples, will likewise be documented.

6.2 LABORATORY INSTRUMENT CALIBRATION

Calibration procedures for each laboratory will be specific to the instruments used and the analyses performed by each laboratory. Each laboratory's QA/QC manual is presented in Appendix D. The specific calibration methods used by each laboratory for this project are described below.

6.2.1 Columbia Analytical Services

CAS will be performing the following analyses: soil analyses include metals (including antimony, arsenic, barium, cadmium, chromium, lead, nickel, zinc and mercury); pH; organic matter; soil moisture; water holding capacity; cation exchange capacity; and texture. The following water analyses will be conducted by CAS: interstitial pore water ammonia and pH; and metals in water including lead, cadmium, tin, arsenic, barium, chromium and copper. CAS will analyze sediment samples for total metals; phenols; AVS/SEM; TOC, particle size, water moisture analysis, cation exchange capacity.

All equipment and instruments used at CAS are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Records are maintained to provide traceability of reference materials. A brief description of the calibration procedures for the major laboratory equipment and instruments are described below:

- **Inductively Coupled Plasma-Mass Spectrometer (ICP-MS)**
  Each element of interest is calibrated for using a blank and a single standard. Prior to calibration, a short-term stability check is performed on the system. Following calibration, an independent check standard is analyzed, and a continuing calibration verification standard (CCV) is analyzed with every ten samples.

- **GC/MS Systems**
  All GC/MS instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise) using procedures outlined in Standard Operating

Procedures and/or appropriate USEPA method citations. All reference materials used for this function are vendor-certified standards. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method. Compounds selected as system performance check compounds (SPCCs) must show a method-specified response factor in order for the calibration to be considered valid. Calibration check compounds (CCCs) must also meet method specifications for percent difference from the multipoint calibration. For isotope dilution procedures, the internal standard response(s) and labeled compound recovery must meet method criteria. Method-specific instrument tuning is regularly checked using bromofluorobenzene (BFB) for volatile organic chemical (VOC) analysis, or decafluorotriphenylphosphine (DFTPP) for semi-volatile analysis. Mass spectral peaks for the tuning compounds must conform both in mass numbers and in relative intensity criteria before analyses can proceed. Calibration policies for organics chromatographic analyses are described in the SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).

- **Atomic Absorption Spectrophotometers (AAS)**
These instruments are calibrated daily using a minimum of four standards and a blank. Calibration is validated using reference standards, and is verified at a minimum frequency of once every ten samples. Initial calibration points cannot be "dropped" from the resulting calibration curve.

- **Gas Chromatographs and High Performance Liquid Chromatographs**
Calibration and standardization follow SOP guidelines and/or appropriate USEPA method citations. All GC and HPLC instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise). The lowest standard is equivalent to the method reporting limit; additional standards define the working range of the GC or LC detector. Results are used to establish response factors (or calibration curves) and retention-time windows for each analyte. Calibration is verified at a minimum frequency of once every ten samples, unless otherwise specified by the reference method SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).

- **UV-Visible Spectrophotometer (manual colorimetric analyses)**
Routine calibrations for colorimetric and turbidimetric analyses involve generating a 5-point calibration curve including a blank. Initial calibration points cannot be "dropped" from the resulting calibration curve. Correlation coefficients must meet method or SOP specifications before analysis can proceed. Independent calibration verification standards (ICVs) are analyzed with each batch of samples. Continuing calibration is verified at a minimum frequency of once every ten samples. Typical UV-Visible spectrophotometric methods at CAS include total phenolics, phosphates, surfactants and tannin-lignin.

- **Pipets**
The calibration of pipets and autopipettors used to make critical-volume measurements is verified following the SOP for Checking Pipet Calibration. Both accuracy and precision verifications are performed, at intervals applicable to the pipet and use. The results of all calibration verifications are recorded in bound logbooks.

- **Other Instruments**
Calibration for the total organic carbon (TOC), total organic halogen (TOX), and other instruments is performed following manufacturer's recommendations and applicable SOPs.

Any item of the equipment which has been subjected to overloading or mishandling, or has been shown

by verification or otherwise to be defective; is taken out of service until it has been repaired. The equipment is placed back in service only after verifying by calibration that the equipment performs satisfactorily.

An evaluation of the effect of this defect on previous calibrations or tests is made and documented appropriately.

Calibration verification is performed according to the applicable analytical methodology. Calibration verification procedures and criteria are listed in laboratory Standard Operating Procedures. Documentation of calibration verification is maintained in appropriate reference files. For NELAP accredited methods, the concentration of calibration verification standards are varied within the calibration range periodically.

6.2.2 Northwestern Aquatic Sciences

NAS will be conducting the 14-day earthworm survival and biomass toxicity test in soil; Fathead minnow and C. dubia chronic toxicity test in water; and the10-day toxicity tests using *H.azteca* and *C.tentens* in sediment. Instruments used by NAS during all testing procedures include pH/temperature meters, dessicator, microbalance, light box, drying oven, autopipetter, light meter, dissecting microscope and a water purification system. All equipment is properly and frequently calibrated to ensure accurate and reliable measurements. All measuring operations and testing equipment having an effect on the accuracy or validity of tests are calibrated and/or verified before putting into use and on a continuing basis. Calibration frequency and procedures for balances, pH meters, thermometers, and other support equipment are included as part of the procedure manual and/or in standard operating procedures.

Wherever applicable, calibration of analytical support equipment and instruments is traceable to national standards of measurement. Reference standards of measurement (such as Class S or equivalent weights or traceable thermometers) are used for calibration only. Reference standards are subjected to in-service checks between calibrations and verifications. NAS maintains a contract with Quality Control Services, Portland, Oregon for regular calibration of reference thermometers (every three years), Class S weights, and laboratory balances (annually). Standards and other reagents are labeled when received. The label includes receipt date, date opened, and expiration date. Normally reagents expire one year after opening unless otherwise indicated.

Reference toxicants are weighed using an analytical balance accurate to the nearest 0.1 mg. Balances are checked before and after each use using weights traceable to NIST standards. Balances are serviced annually by QC Services, Portland, Oregon. Effluent and reference toxicant dilutions are made using Class A volumetric flasks and pipettes and graduated cylinders.

6.2.3 Microbac Laboratories

Instruments and support equipment used by Microbac are calibrated in accordance with the referenced analytical methods. Details of the calibration criteria are contained in the QC Table for metals included in the SOPs (Appendix C). Where available, the calibration standards and instruments are checked through the use of second source standards. Certified titrants do not require verification provided they are used within the manufacturer specified expiration date. Unless stated otherwise in the appropriate SOP, the lowest standard in the calibration curve must be at or below the PQL for that analyte.

7 Analytical Procedures

Soil, surface water, and sediment samples will be collected from the Quemetco facility and sent to three laboratories for analysis. The laboratories used for this project include Columbia Analytical Services (CAS), Northwestern Aquatic Sciences (NAS), and Microbac Laboratories (Microbac). Specific laboratory responsibilities are described in Section 2.4 of this QAPP. Specific QA criteria for all analytical procedures are included in Table 3-1.

7.1 FIELD ANALYTICAL PROCEDURES

Field analytical procedures for this project include XRF soil sampling and surface water sampling. Field measurements will be obtained in accordance with the manufacturer's standard operating procedures for the respective instrument. XRF sampling will be conducted in the Surficial Zone and Subsurface Zone soils at approximately 284 locations throughout the site. Specific sampling procedures are included in the XRF Sampling and Analysis Plan, dated December 11, 2009 (Appendix B) and in Table 4-1.

Surface water field measurements will include pH, dissolved oxygen, temperature, specific conductivity and redox potential. Water samples will be collected in a polyethylene cup and the probe of one instrument at a time will be inserted in the cup. Readings will be taken after the instrument stabilizes and recorded in the Field Notebook. Sampling equipment will be decontaminated between each sample point. Specific sampling procedures are included in the Workplan to Address Outstanding DERA Issues (May 19, 2008), Table 4-1, and in Appendix C.

Table 7-1 Summary of Field Analytical Procedures

Matrix	Field Analytical Procedure	Parameters Analyzed	SOP
Soil	XRF	Lead	SW-846, WSP #11
Sediment	Polyethylene Cup	pH, redox potential	WSP #4
Surface Water	Polyethylene Cup	pH, dissolved oxygen, temperature, specific conductivity, redox potential	WSP #4

7.2 LABORATORY ANALYTICAL PROCEDURES

The laboratories named above will implement the project required SOPs as described in Section 6.2. Laboratory analytical procedures for this project will include soil, sediments and surface water. Each matrix will be analyzed for both chemical and ecological-biological-toxicology parameters as described below in Table 7-2. Specific SOPs for collecting each sample is presented in Section 4 and Appendix C. The SOPs for each laboratory are presented in Appendix C.

Table 7-2 Summary of Laboratory Analytical Procedures

Matrix	Analysis	Method	Laboratory
soil	Sb, As, Ba, Cd, Cr, Cu, Pb, Ni, Zn	EPA 200.8	Columbia
soil	Hg	EPA 7471	Columbia
soil	pH, organic matter, soil moisture, water holding capacity, cation exchange capacity	NUT.02.05, Walkley-Black procedure, NUT.02.36, NUT.02.68, and EPA 9081	Columbia
soil	Texture	ASTM D 422-36	Columbia
soil	14-day earthworm survival and biomass toxicity test	EPA 600/3-88-029	Northwestern Aquatic
soil	XRF Analysis for lead	EPA 6020	Microbac
water	Fathead minnow (chronic) toxicity test	EPA 821-R-02-013 Method 1000.0	Northwestern Aquatic
water	Interstitial pore water ammonia, pH	SM 4500-NH_3 D and EPA 350.3	Columbia
water	Metals (Sb, As, Ba, Cd, Cr, Cu, Pb)	EPA 200.8 Method 6020	Columbia
sediment	Metals (As, Cd, Cu, Cr, Pb, Ni)	EPA 6020	Columbia
sediment	Phenols	EPA 8270C	Columbia
sediment	*H. azteca* and *C. tentens* (10 day) toxicity tests	EPA 600/R-99/064 Method 100.1/100.2	Northwestern Aquatic
sediment	AVS/SEM	EPA Draft 1991	Columbia
sediment	TOC, particle size, water moisture analysis, cation exchange capacity	SM 5390; ASTM D422-63; EPA 160.2; EPA 9081	Columbia

7.2.1 Project Target Compounds and Detection Limits

A complete listing of project target compounds, project action levels (identified as ESLs and EcoSSLs) for each analyte group is listed in Table 1-2 and can be found in Section 1.4 of this QAPP.

7.2.2 List of Associated Quality Control Samples

Section 3 of this QAPP contains a complete listing of the associated QC samples for each parameter and matrix.

8 Internal Quality Control Checks

8.1 FIELD QUALITY CONTROL CHECKS

QC procedures for XRF determination of lead, chemical and ecological-biological-toxicology analysis for the project specific parameters include calibrations as described in Section 6.0 of the QAPP. Measuring duplicate samples and checking the reproducibility of the measurements will be completed by taking multiple readings on a single sample or reference standard. The QC criteria for each field measurement are provided in Table 3-1 of this QAPP. Assessment of field sampling precision and bias will be made by collecting field duplicates and field blanks for laboratory analysis. Collection of the QC samples will be in accordance with the applicable SOPs discussed in Section 3.0 and at the frequency indicated in Table 3-1 of this QAPP.

8.2 LABORATORY QUALITY CONTROL CHECKS

Each laboratory for this project has a QC program it uses to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as laboratory SOPs or in respective EPA-approved methods. The internal quality control checks might differ slightly for each individual procedure but in general the QC requirements include the following:

- Method blanks
- Reagent/preparation/calibration blanks (applicable to inorganic analysis)
- Instrument blanks
- MS/MSDs
- Surrogate spikes
- Analytical spikes
- Field duplicates
- Laboratory duplicates
- Laboratory control standards
- Internal standard areas for gas chromatography/mass spectrometry (GC/MS) analysis; control limits
- Mass tuning for GC/MS analysis

QC requirements for this investigation are included in Table 3-1.

All data obtained will be properly recorded. The data package for the chemical analysis, including the phenol parameter isolated in EPA Method 8270C, will include a full Contract Laboratory Program (CLP)-type deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC criteria. The data package for the chemical analysis is sometimes referred to as a Level IV package and includes all raw data applicable to the samples analyzed. The raw data includes chromatograms and quantitation reports for tuning (for GC/MS analyses), calibration standards, field samples and quality control samples including blanks, spikes, duplicate analyses, and laboratory control samples.

In a similar fashion, ecological-biological-toxicology standard reports include copies of all raw data for the toxicity tests including endpoint data and water quality data, as well as all raw data for reference toxicant tests conducted with the toxicity test, including control charts to evaluate the reference toxicant test results. An outside reviewer will be able to review and validate the data with the information included in each report. The ecological-biological-toxicology reports could therefore be considered "Level IV-type deliverable packages"; however, CLP does not apply to ecological-biological-toxicology testing.

Any samples analyzed in nonconformance with the QC criteria will be reanalyzed by the laboratory, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

9 Data Reduction, Validation and Reporting

Samples will be collected by WSP personnel and sent by overnight carrier with the proper chain-of-custody documentation to the specified laboratory indicated in Table 7-2.

9.1 DATA REDUCTION

9.1.1 Field Data Reduction Procedures

All field data will be written into field log books immediately after measurements are taken. If errors are made, results will be legibly crossed out, initialed and dated by the field member, and corrected in a space adjacent to the original (erroneous) entry. Later, it can be determined whether any errors have been made by the field crew.

9.1.2 Laboratory Data Reduction Procedures

WSP and each laboratory will attempt to minimize manual data entry through the use of personal computers and software packages. Each laboratory will supply packages of all raw data to WSP. Also, analytical data results will be supplied on compact disks. WSP and the Project QAO will review all data supplied by the laboratories and perform data validation, as required. Laboratory data will be reduced by each laboratory, as necessary. It is not expected that data from the direct reading instruments will require data reduction.

All data produced during the investigations will be organized as tables of analytical results and may be stored in a computerized database system at WSP. Hard copies of all analytical data will be stored in WSP's filing system. It is anticipated that the data reduction will consist primarily of tabulating analytical results from the laboratory's report forms into summary forms through the use of computerized spreadsheet software.

Data will be reported in micrograms per liter (µg/l) or milligrams per liter (mg/l) for aqueous samples and micrograms per kilogram (µg/kg) or milligrams per kilograms (mg/kg) dry weight for solid samples. The procedures used to calculate concentrations will be the same as those specified in the specific analytical methodology used.

9.2 DATA VALIDATION

9.2.1 Procedures Used to Validate Field Data

Procedures to validate field data for this project are provided in the project-specific validation protocols provided in the laboratory SOPs included in Appendix C of this QAPP. Validation of the analytical data obtained in the field will be performed by WSP's Field Manager and under the supervision of the Project QAO. One hundred percent of the field analytical data will be validated. The procedures to evaluate field data for this investigation include checking for proper instrument function, transcription errors, and review of field log books, on the part of field crew members. This task will be the responsibility of the Field Manager, who will otherwise not participate in making any of the field measurements, or in adding notes, data or other information to the log book.

9.2.2 Procedures Used to Validate Laboratory Data

Criteria for accepting and rejecting all data will be based on U.S. EPA CLP National Functional Guidelines for Organic Data Review (10/99), U.S. EPA CLP National Functional Guidelines for Inorganic Data Review (10/04), and method specific criteria for general chemistry data. CLP qualifiers will be used for all data.

The project-specific data validation protocols are presented in Appendix C of this QAPP.

Data validation will be accomplished by the Project QAO. All data will be validated by the Project QAO (or designated staff) using the original laboratory reports. Essentially, for chemical analysis, the following areas will be validated by trained reviewers independent of the laboratories:

- Technical Holding Times
- Initial Calibration
- Continuing Calibration
- Method and Calibration Blanks
- Interference Check Sample
- Matrix Spikes
- Duplicates
- Blank Spikes
- ICP Serial Dilution
- Raw Data
- Sample Result Verification
- Field Duplicates

The laboratories will produce data reports for all chemical and ecological-biological-toxicology analytical results that allow for validation as described in Table 3-1. For the ecological-biological-toxicology analytical results, all data entry from bench sheets will be compared against printouts from data analyses software and from all software printouts against the report data. All entries are checked for transcription errors and corrected. Ecological-biological-toxicology data is checked to verify that controls passed acceptability criteria and that reference toxicant test results were within laboratory control chart limits. Ecological-biological-toxicology data will be validated by Ruth Hull of Intrinsik Environmental, the ecotoxicology QAO.

Based on the review of the chemical analytical data, a QA report will be prepared. The report will consist of a general introduction section, followed by qualifying statements that should be taken into consideration for the analytical results to be best used. Based on the QA review, qualifier codes will be placed next to specific sample results on the data summary table(s). These qualifier codes will serve as an indication of the qualitative and quantitative reliability of the reported analytical results.

During the course of the data review, a support documentation package will be prepared that will include backup information to support all qualifying statements presented in the QA review. The data reporting packages will be reviewed thoroughly by the Project QAO.

When the review has been completed, the QAO will submit the validated data to the Project Director for subsequent evaluation and interpretation.

If field or laboratory data is determined to be unusable, corrective action will be implemented as outlined in Section 11.0 of this document.

9.3 DATA REPORTING

9.3.1 Field Data Reporting

Field data reporting shall be conducted principally through recording results of all measurements made in the field and documentation of all field calibration activities.

Additionally, the documentation of sample collection will include the use of bound field logbooks in which all information on sample collection will be entered in indelible ink. Appropriate information will be entered to reconstruct the sampling event, including site name (top of each page), sample identification, brief description of sample, date and time of collection, sampling method, field measurements and observations, and sampler's initials and date on the bottom of each page.

9.3.2 Laboratory Data Reporting

Analytical data for the chemical analyses will be summarized in tabular form with sample number, sample matrix description, parameters analyzed and their corresponding detected concentrations, CLP qualifiers where appropriate, and the detection limit. Each laboratory will be required to provide WSP with "CLP-type" Level IV data packages for the chemical analyses that will provide all the necessary information for validation as detailed in Section 8.2. CLP Standard Reporting Forms for all data reporting will be used. Additionally, a Level IV data package will be included for the phenols that were detected during the analysis using EPA Method 8270C.

As specified in Section 8.2, CLP reporting is not generated for the ecological-biological-toxicology analyses.

The results from the sampling activities will be incorporated into reports as data tables and maps showing sampling locations and analyte concentrations.

WSP will implement a rigorous data control program that will ensure that all documents are accounted for following completion of the investigation. Accountable documents include items such as logbooks, field data records, laboratory data packages, photographs, computer disks, and reports. The Project Director will be responsible for maintaining a central file in which all documents will be inventoried.

10 Performance and Systems Audits and Frequency

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 Workplan and this QAPP. The audits of field and laboratory activities include two independent parts: internal and external audits.

10.1 FIELD PERFORMANCE AND SYSTEMS AUDITS

10.1.1 Internal Field Audits

Internal audits of field activities including sampling and field measurements, will be conducted by the WSP Field Manager and the Project QAO. These audits will verify that all established procedures are being followed.

10.1.1.1 Internal Field Audit Frequency

Internal field audits will be conducted at least once at the beginning of a sampling event. If equipment or sampling protocols have been significantly modified, an additional internal audit will occur before samples are collected for analysis.

10.1.1.2 Internal Field Audit Procedures

The audits will include examination of field sampling records, field instrument operating records, sample collection procedures, handling and packaging in compliance with the established procedures, maintenance of QA procedures, chain-of-custody records, and field notebook entries. The audits will involve review of field measurement records, instrumentation calibration records, and sample documentation. Follow-up audits will be conducted to correct deficiencies, and to verify that QA procedures are maintained throughout the investigation.

10.1.2 External Field Audits

External field audits may be conducted by the U.S. EPA Project Manager.

10.1.2.1 External Field Audit Frequency

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

10.1.2.2 External Field Audit Process

External field audits will be conducted according to the planned sampling activities presented in this QAPP. The external field audit process can include (but not be limited to): sampling equipment decontamination procedures, sample bottle preparation procedures, sampling procedures, examination of field sampling, review of site safety plans, sample vessel cleanliness, QA procedures, procedures for verification of field duplicates, sample preservation, and sample preparation for shipment.

10.2 LABORATORY PERFORMANCE AND SYSTEMS AUDITS

10.2.1 Internal Laboratory Audits

The internal laboratory audits will be conducted by the Project QAO or a designated representative of the Project QAO.

10.2.1.1 Internal Laboratory Audit Frequency

The internal system audits will be done on an annual basis.

10.2.1.2 Internal Laboratory Audit Procedures

The internal laboratory audits will include an examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedures, sample preparation and analysis, instrument operating records, and mandatory equipment maintenance.

The internal laboratory audits will involve preparing blind QC samples and submitting them along with project samples to each laboratory for analysis throughout the project. The Project QAO will evaluate the analytical results of these blind performance samples to ensure that the laboratories maintain acceptable QC performance.

10.2.2 External Laboratory Audits

An external audit will be conducted as required, by appropriate QA staff of the Waste, Pesticides and Toxics Division, U.S. EPA Region 5.

10.2.2.1 External Laboratory Audit Frequency

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

10.2.2.2 Overview of the External Laboratory Audit Process

External audits may include any or all of the following: review of laboratory analytical procedures, laboratory on-site visits, and/or submission of performance evaluation samples to the laboratory for analysis.

Failure of any or all audit procedures chosen can lead to laboratory disqualification, and the requirement that another suitable laboratory be chosen.

An external on-site review can consist of: sample receipt procedures, custody and sample security and log in procedures, sample through-put tracking procedure, review of instrument calibration records, instrument logs and statistics (number and type), review of QA procedures, log books, sample prep procedures, sample analytical SOP review, instrument (normal or extended quantitation report) reviews, personnel interviews, review of deadlines and glassware prep, and a close-out to offer potential corrective action.

It is common practice when conducting an external laboratory audit to review one or more data packages from sample lots recently analyzed by the laboratory.

This review will most likely include but not be limited to;

- Comparison of resulting data to the SOP or method, including coding for deviations
- Verification of initial and continuing calibrations within control limits
- Verification of surrogate recoveries and instrument timing results where applicable
- Review of extended quantitation reports for comparisons of library spectra to instrument
- spectra, where applicable.
- Recoveries on control standard runs
- Review of run logs with run times, ensuring proper order of runs
- Review of spike recoveries/QC sample data
- Review of suspected manually integrated GC data and its cause (where applicable)
- Review of GC peak resolution for isolated compounds as compared to reference spectra
- Assurance that samples are run within holding times

Ideally, the audit data should be reviewed while on the premises, so that any data called into question can be discussed with the staff.

11 Preventative Maintenance

11.1 FIELD INSTRUMENT PREVENTATIVE MAINTENANCE

The field equipment for this project includes an XRF field screening system, water chemistry testing equipment, and ecological-biological-toxicology sampling equipment.

Specific preventative maintenance procedures to be followed for the XRF equipment are based on those recommended by the manufacturer. Field instruments will be checked and calibrated daily before use. Calibration checks will be documented in the Field Notebooks.

The maintenance schedule and trouble-shooting procedures for field instruments will be conducted according to manufacturer specifications. Critical spare parts, such as batteries, will be kept on-site to reduce potential downtime. Backup instruments and equipment will be available on-site or within 1-day shipment to avoid delays in the field schedule.

11.2 LABORATORY INSTRUMENT PREVENTATIVE MAINTENANCE

A routine preventative maintenance program is conducted by each laboratory to minimize the occurrence of instrument failure and other system malfunctions. Designated laboratory employees regularly perform routine scheduled maintenance and schedule necessary repair of all instruments. All maintenance that is performed is documented in the laboratory's operating record. All laboratory instruments are maintained in accordance with manufacturer's specifications.

11.3 INSPECTION/ACCEPTANCE REQUIREMENTS OF SUPPLIES AND CONSUMABLES

For this project, all supplies and consumables will be inspected upon receipt from the vendor and any discrepancies will be noted in the Field Notebook. If necessary, contaminated or incorrectly shipped supplies will be returned to the vendor or sent offsite for disposal, if deemed inadequate for the planned sampling activities.

12 Specific Routine Procedures Used to Evaluate Data Precision, Accuracy and Completeness

The purpose of this section is to indicate the methods by which it will be ensured that the data collected for this investigation is in line with the data quality objectives (DQOs) for the site. Factors considered in this assessment include, but are not limited to:

- Expansion of chemical and ecologicaly-biological-toxicology data to further delineate contamination at the site. The parameters evaluated are known contaminants identified in the 2006 ERA.
- The choice of analytical and sample preparation methods for contaminants of concern, whose method detection limits will meet or exceed the data quality level concentrations for those contaminants.

Analytical data quality will be assessed to determine if the objectives of the investigation have been met. In addition, the data will be reviewed for indications of interferences to results caused by sample matrices, cross contamination during sampling, cross contamination in the laboratory, and sample preservation and storage anomalies (i.e. samples holding time or analytical instrument problems).

12.1 ACCURACY ASSESSMENT

12.1.1 Accuracy for Chemical Analysis

Accuracy for the chemical analysis (metals and phenols) will be evaluated based on the results of the matrix spike samples and blanks. The percent recovery (%R) for a spiked sample is calculated using the following equation:

$$\%R = \frac{\text{Amount in Spiked Sample - Amount in Sample}}{\text{Known Amount Added}} \times 100$$

12.1.2 Accuracy for Ecological-Biological-Toxicology Analysis

Accuracy criteria are not applicable to toxicity testing endpoints because there are no standard organism responses against which to compare test results. One method of testing accuracy in toxicity testing will be to compare results to a referenced toxicant.

12.2 PRECISION ASSESSMENT

12.2.1 Precision for Chemical Analysis

Precision in the chemical analysis can be determined by the measurement of MS/MSD samples. A sample is divided into equal aliquots and spiked with known concentrations of a given analyte(s). Evaluation of the MS/MSD results allows the analyst to determine the precision of the preparation and analytical techniques associated with the sample matrix. The RPD between the matrix spike and matrix spike duplicate samples is calculated using the following equation:

$$RPD = \frac{\text{Amount in Spike 1 - Amount in Spike 2}}{0.5(\text{Amount in Spike 1 + Amount in Spike 2})} \times 100$$

12.2.2 Precision for Ecologicial-Biological-Toxicology Analysis

A standard toxicity test automatically implies an acceptable degree of precision at both the intra- and inter-laboratory level. Intra-laboratory precision can be determined on an on-going basis through the use of control charts to evaluate reference toxicant tests.

12.3 COMPLETENESS ASSESSMENT

12.3.1 Completeness for Chemical Analysis

Completeness for the chemical analysis is the ratio of the number of valid sample results to the total number of samples analyzed for a specific matrix or analytical method. The percent completeness is calculated by the following equation:

$$\text{Completeness} = \frac{\text{(number of valid measurements)}}{\text{(number of measurements planned)}} \times 100$$

12.3.2 Completeness for Ecological-Biological-Toxicology Analysis

The goal is for 100% completeness for any set of samples that are requested to be tested.

12.4 ASSESSMENT OF DATA

The field and laboratory data collected during this investigation will be used to further delineate the nature and extent of contamination at the site. The QC results associated with each analytical parameter for each matrix will be compared to the objectives presented in Section 3 of this QAPP.

Only data generated in association with QC results meeting these objectives will be considered useable for decision making purposes. In addition, the data obtained will be both qualitatively and quantitatively assessed on a project-wide, matrix-specific basis. This assessment will be performed by the Project QAO. The results will be presented and discussed in detail in the updated ERA report.

13 Corrective Action

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable procedures or out of quality control 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 should be documented in the regular quality assurance reports to management. Corrective action should only be implemented after approval by Richard Freudenberger, WSP's project director.

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 Mr. Freudenberger, who in turn will notify Nate Nemani, U.S. EPA's project manager. If the problem is analytical in nature, information on these problems will be promptly communicated to the U.S. EPA, Quality Assurance Section. Implementation of corrective action will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP or Workplan will be identified and corrected in accordance with the QAPP. Mr. Freudenberger, or his designee, will issue a nonconformance report for each nonconformance condition.

13.1 FIELD CORRECTIVE ACTION

Corrective action in the field can be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the QAPP, etc.), sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. In general, WSP's field team leader, project director, health and safety officer or quality assurance officer may identify the need for corrective action. The field staff, in consultation with the field team leader, will recommend a corrective action. WSP's project director will approve the corrective measure which will be implemented by the field team. It will be the responsibility of the WSP project director to ensure the corrective measure has been implemented.

If the corrective action will supplement the existing sampling plan (i.e., additional soil borings) using existing and approved procedures in the QAPP, the corrective action approved by the field team leader will be documented. If corrective actions resulting in less samples (or analytical fractions), alternate locations, etc. which may cause project quality assurance objectives not to be achieved, it will be necessary that all levels of project management, including Terry Cirone from RSR, and Nate Nemani, the U.S. EPA project manager, concur with the proposed action.

Corrective action will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. WSP's quality assurance officer will identify deficiencies and recommend corrective action to WSP's project director. Implementation of corrective actions will be performed by the field team leader and field team. Corrective action will be documented in quality assurance reports to the entire project management.

Corrective actions will be implemented and documented in the field record book. 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 project manager.

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 lab analysts and section leaders, it may be necessary for the laboratory Quality Control Coordinator to approve the implementation of corrective action. Conditions that may warrant corrective action include dilution of samples, additional sample extract cleanup, and automatic re-injection/reanalysis when certain quality control criteria are not met, etc.

The bench chemist will identify the need for corrective action. The laboratory manager, will approve the required corrective action to be implemented by the laboratory staff. The laboratory QA manager will ensure implementation and documentation of the corrective action. If the nonconformance causes project objectives not to be achieved, it will be necessary to inform all levels of project management including the U.S. EPA Project Manager 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 log (signed by analyst, section leader and quality control coordinator), and the narrative data report sent from the laboratory to the WSP data validator. If corrective action does not rectify the situation, the laboratory will contact WSP's project director.

13.3 CORRECTIVE ACTION DURING DATA VALIDATION AND DATA ASSESSMENT

The facility may identify the need for corrective action during either the data validation or data assessment. Potential types of corrective action may include re-sampling by the field team or reinjection/reanalysis of samples by the laboratory.

These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required quality assurance objectives (e.g., the holding time for samples is not exceeded, etc.) When WSP's data assessor identifies a corrective action situation, it is WSP's project director who will be responsible for approving the implementation of corrective action, including re-sampling, during data assessment. All corrective actions of this type will be documented by WSP's quality assurance officer and project director.

14 Quality Assurance Reports to Management

The deliverable associated with the tasks identified in the RFI Workplan will contain a separate QA section in which data quality information collected during the task is summarized. This report will be the responsibility of Richard E. Freudenberger, the WSP project director, and will include a section by the Project QAO, on the accuracy, precision, and completeness of the data and any corrective action needed or taken during the project.

14.1 CONTENTS OF PROJECT QUALITY ASSURANCE REPORTS

The QA report will contain information reflecting the achievement of specific data quality objectives, and a summary of corrective action that was implemented, and its immediate results on the project. The final QA report will be prepared in written, final format by WSP.

14.2 FREQUENCY OF QUALITY ASSURANCE REPORTS

The QA Reports will be prepared on a monthly basis and will be delivered to all recipients by the end of the first full week of the month. The reports will continue without interruption, until this investigation has been completed.

14.3 INDIVIDUALS RECEIVING/REVIEWING QUALITY ASSURANCE REPORTS

All individuals identified on the Title Page will receive copies of the final QA report.

15 References

Cantox Environmental. 2006. Ecological Risk Assessment for Quemetco, Inc., Indianapolis, Indiana. October 19.

Columbia Analytical Services, Inc. 2007. Quality Assurance Manual. January 12.

Environmental Strategies Corporation. 1995. Quality Assurance Project Plan, Revision 4.0, Resource Conservation and Recovery Act, Phase II Facility Investigation, Quemetco, Inc., Indianapolis, Indiana. September 9.

Environmental Strategies Corporation. 2002. Phase I Environmental Site Assessment, Quemetco Inc., Indianapolis, Indiana. May 17.

Harrison, W. 1963. Geology of Marion County, Indiana. Indiana Geological Survey, Bulletin 28.

Hartke, E.J.; Ault, C.H.; Austin, G.S.; Becker, L.F.; Bleuer, N.K.; Herring, W.C.; and Moore, M.C. 1980. Geology for Environmental Planning in Marion County, Indiana. Indiana Geological Survey, Special Report 19.

Microbac Laboratories. 2009. Quality Assurance Plan, Revision 8.2. February 3.

Meyer, W.; Reussow, J.P.; and Gillies, D.C. 1975. Availability of Groundwater in Marion County, Indiana. U.S. Geological Survey, Open-File Report 75-312.

Northwestern Aquatics Sciences. 2008. Quality Assurance/Quality Control Manual for Aquatic Toxicology Studies. March 25.

Roberts, C.M.; Widman, L.E.; and Brown, P.N. 1955. Water Resources of the Indianapolis Area, Indiana. U.S. Geological Survey, Circular 366.

U.S. EPA. March 1983. Methods for Chemical Analysis of Water Wastes. Prepared by U.S. EPA Environmental Monitoring and Support Laboratory.

U.S. EPA. 1998. RCRA Quality Assurance Project Plan Instructions, Region 5. May.

U.S. EPA. November 1986. Test Methods for Evaluating Solid Waste, Third Edition SW-846. Prepared by the Office of Solid Waste and Emergency Response.

WSP Environment & Energy. 2008. Workplan to Address Outstanding DERA Issues, Quemetco, Inc., Indianapolis, Indiana. March.

WSP Environment & Energy. 2009. XRF Sampling and Analysis Plan, Quemetco, Inc., Indianapolis, Indiana. December 11.

Appendix A – Statement of Qualifications of Key Personnel

Curriculum Vitae

Rick Freudenberger, PE
VICE PRESIDENT

SUMMARY

Mr. Freudenberger has over 30 years of experience in performing environmental assessments and remedial investigations, in waste treatment process design, and in technical management programs. He directs the technical staff in a wide range of projects and is currently serving as General Manager in the WSP Environment & Energy's San Jose office.

KEY PROJECTS AND ACHIEVEMENTS

- Expert Witness Testimony: Mr. Freudenberger has served as an expert witness in various environmental litigation matters. He has extensive experience in insurance related matters and environmental claims, having worked both with the insured and insurers. This insurance work has included issues involving trigger of coverage, fate and transport modeling, and Superfund PRP cases.

- Environmental Investigations: Mr. Freudenberger has been most heavily involved in the design of groundwater cleanup and Superfund remedial investigation programs, assessments for mergers and acquisitions, environmental audits, and environmental assessments for major corporate clients. His previous service with local governments qualifies him to represent clients effectively in negotiations with regulatory agencies. One of Mr. Freudenberger's major clients is an international lead company with smelting operations in the United States and Europe. Mr. Freudenberger has directed extensive RCRA Facility Investigations and Corrective Actions at the client's three U.S. smelters.

- RCRA and CERCLA Investigations: Mr. Freudenberger has worked with Environmental Strategies clients in various industries in designing and planning extensive investigations and cleanups under CERCLA (Superfund), RCRA, and ECRA regulations. These industries have included secondary lead smelters, wood preserving, petroleum refineries, telecommunications, electric utilities, automotive parts manufacturing, and industrial chemicals. Specifically, in two Superfund projects, he directed the preparation of remedial investigations and feasibility studies to address the characterization and remediation of groundwater contamination by chlorinated organics.

- Health and Safety: He has designed detailed health and safety and soil sampling plans for dioxin, performed field sampling programs, and directed the remedial activities in the field for the cleanup and secure storage of the dioxin-contaminated soils.

- Remedial Investigations: Mr. Freudenberger has designed sampling and remedial action programs for groundwater and soil contamination at numerous industrial sites and has performed more than 500 industrial site surveys and risk assessments for a variety of industrial clients. He also oversaw a wastewater facility construction management contract for the city of Baltimore from 1979 to 1981.

- Environmental Management: Mr. Freudenberger was Director of Public Works for Howard County, Maryland, with management responsibility for solid waste collection and disposal, environmental engineering, wastewater treatment, road maintenance, engineering, and capital projects. He also was Project Engineer for a $50-million expansion of the county's wastewater treatment plant and successfully directed the permitting and siting process for a new 600-acre sanitary landfill. He spent 3 years as Superintendent of Operations and Maintenance for a 10-million-gallon per day secondary wastewater treatment plant.

EDUCATION

B.S. Civil Engineering
University of Maryland

M.S. Environmental Engineering
University of Maryland

PROFESSIONAL CREDENTIALS

- Registered Professional Engineer: Maryland, New York, Virginia, Georgia, Kentucky, Indiana, Minnesota, and Ohio
- Maryland Certified Wastewater Treatment Plant Operator
- Diplomate of the American Academy of Environmental Engineers
- California Registered Environmental Assessor

Curriculum Vitae

Lorena M. Benitez
CONSULTANT

SUMMARY

At WSP Environment & Energy, Ms. Benitez conducts Phase I Environmental Site Assessments in accordance with ASTM and various regulatory requirements. The site assessments evaluate historical property uses, current material and wasted handling and storage practices; air emissions; and the presence of polychlorinated biphenyls, asbestos and lead based paint. Ms. Benitez has utilized regulatory databases to identify environmental issues for us in site assessments. Ms. Benitez has conducted site assessments at numerous facilities including commercial and vacant properties, product warehouses and residential apartments. The results of the assessments have been used to negotiate transactions and define areas of investigation and potential remediation.

KEY PROJECTS AND ACHIEVEMENTS

- Site Investigation: Ms. Benitez has experience conducting investigative field sampling, including soil, surface water, groundwater, and air sampling. She also has experience in soil and groundwater investigation coordination including work plan preparation, permit acquisition, field coordination, well installation, well abandonment, collecting soil samples using hand augers, drilling rigs, and Geoprobe technology, and analytical interpretation. Ms. Benitez has prepared technical reports presenting and summarizing data obtained from sampling events.

- Health and Safety: Ms. Benitez has prepared workplans and health and safety plans for numerous sites contaminated with lead, petroleum, and VOCs. In addition, Ms. Benitez routinely serves as the onsite health and safety coordinator when she is conducting field work.

- Soil Scientist: As a soil scientist, Ms. Benitez has been employed with the state and federal government. Duties included implementing soil and water conservation practices, resource planning, wetland delineations, soil quality testing and compiling soil survey handbooks by studying, investigation, and mapping soils.

EDUCATION

B.S. Soil Science with a concentration in Land Resource Management
California Polytechnic State University San Luis Obispo

PROFESSIONAL CREDENTIALS

- AHERA Certified Asbestos Building Inspector
- OSHA 40-Hour Hazardous Waste Operations and Emergency Response

ECT.CON INC.

Terrie M. Baranek

Years of Experience: 25

Education:
The American University
M.S. Physical Chemistry
1987

University of Maryland
Institute of Physical
Science and Technology
Chemical Physics
1983-1984

Washington & Jefferson
College
B.A., ACS, Chemistry
1983

CCAC
A.A. Computer Science &
Information Technology
1998

General Qualifications

Ms. Baranek is the President of ECT.CON INC. with experience in the performance of a variety of environmental assessments. Her responsibilities include risk assessment, data evaluation and management, sampling design, environmental compliance, and software/program design and development. Ms. Baranek has extensive experience in all facets of these technical areas. Examples of her experience in these areas are presented below.

Experience

Risk Assessment

- Risk Assessment Manager in the preparation of a public health evaluation for the Los Angeles Unified School District. The evaluation was conducted to identify potential health impacts on children if a joint elementary/high school was to be constructed in an industrial area of Southgate, California. The primary route of exposure was inhalation. The major contributing contaminants impacting health risks were benzene and particulate matter (PM_{10}). Air monitoring data were used to determine exposure point concentrations and calculate risk. In addition to the quantitative human health risk assessment, a probabilistic risk analysis was conducted. The two primary concerns in the analysis were an oil/fuel pipeline and a railroad that were adjacent to the proposed school site. The analysis identified the probability of an accident occurring with the pipeline or railroad and subsequent health impacts. The results of these assessments were presented to the School Board at a public meeting.

Streamlined risk assessment using the landfill presumptive remedy guidance

- Project Manager for the conduct of a streamlined risk assessment in accordance with the landfill presumptive remedy. Negotiated with USEPA Region I on the strategy of the risk assessment the elimination of detected constituents from inclusion in the risk assessment as constituents of concern.

- Risk Assessor for a Pennsylvania Act 2 site. Primary constituents of concern were volatile organic compounds and petroleum products. The exposure pathways were indoor air - residential and commercial, ambient air, direct contact with and ingestion of soil. The only pathway associated with groundwater was volatilization into air.

- Project Manager for the conduct of a risk assessment under the Indiana Voluntary Remediation Program. Tier II cleanup levels were used for a demonstration of compliance with soil. Tier III cleanup levels were developed for groundwater. A preferential migration pathway along a sewer line was included in the risk evaluation.

Incorporate CERCLA analytical and risk assessment strategy into a RCRA program

Use Monte Carlo simulations to calculate PAH media protection standards

- Project Manager for the conduct of a Morgantown, West Virginia RCRA Corrective Action RFI Phase I Risk Assessment and Analytical Program. This site was unique in that it was surrounded by a Superfund NPL site. Refined existing workplan with respect to analytical program to incorporate both RCRA and CERCLA issues. Managed analytical data and evaluated data with respect to nature and extent of contamination. Performed risk assessment in line with the Superfund site risk assessment. Used Monte Carlo to address PAH contamination. Presented and negotiated findings with USEPA Region III.

Develop risk communication information to explain results to the surrounding community

- Task Manager for the conduct of a human health risk assessment for the Federal Energy Technical Center (FETC) in Pittsburgh, PA. Data were received electronically from the laboratory and managed. Analytical and statistical summary tables were developed. Statistical information were electronically incorporated into the risk spreadsheets. A quantitative uncertainty analysis using Monte Carlo simulations (@Risk) was performed. A risk communication pamphlet was developed to explain the results to the surrounding community.

- Project Manager for the Indoor Air Quality program of residential homes downgradient of a VOC groundwater plume from a fortune 500 company located in USEPA Region I. Developed the workplan, QAPP, and risk assessment exposure scenarios for the program. Per a consent order, interim measures were taken to reduce contaminant migration from the site. Indoor air samples via summa canister are taken in the basement of nearby homes. The data are evaluated in a risk assessment to determine the effectiveness of the interim measures.

- Under the Pennsylvania Department of Environmental Protection (PADEP) General Technical Assistance Contract (GTAC), conducted a variety of human health and ecological risk assessments. Risk assessments were performed for abandoned sites, active sites, and residential areas. Risk assessments were conducted in accordance with Risk Assessment Guidance for Superfund (RAGS).

Negotiate risk assessment strategy and media protection standards with OEPA to achieve clean closure of the lagoons

- Project Manager for the development of cleanup standards for a RCRA closure of several lagoons at the Aristech Chemical Corporation, Haverhill, Ohio facility. The primary constituents of concern were phenol, acetone, acetophenone, and bis(2-ethyl hexyl) phthalate. Bioremediation activities were conducted in the lagoons. The closure plan was amended to incorporate information after remedial activities. The risk assessment and media protection standards were updated to achieve clean closure of the RCRA units. Negotiated risk assessment strategy and media protection standards with OEPA.

- Risk Assessment and chemistry Peer Technical Reviewer for the West Virginia Voluntary Remediation and Redevelopment Act Guidance Manual.
- Under the IDEM Brownfields program, review risk assessments to ensure completeness and accuracy. Ensure that work was performed in accordance with the IDEM RISC guidance.

- Task leader in the preparation of risk assessments for four Iowa and Illinois Gas and Electric (IIG&E) sites. The primary constituents were coal gasification wastes such as polynuclear aromatic hydrocarbons (PAHs), benzene, xylene, and heavy metals. Evaluated exposure pathways and quantified risk. Prepared a risk communication pamphlet to explain risk assessment results to the public.

Conduct real-time risk assessment to monitor health impacts during remediation activities

- Project scientist for a real-time risk assessment for a CILCO MGP site in Streator, Illinois. This risk assessment was to monitor health impacts during investigative/remedial activities. On-site Health & Safety Officers conducted air monitoring. Data were electronically transferred back to the office for evaluation. Risk assessment was conducted on the data to determine the impact of field activities on site personnel and the surrounding community. Work was stopped when exceedances of acceptable risk levels existed.

- Provided technical review of a risk assessment conducted for a Federal NPL site in Ohio. Conducted the review to provide insight for the cost allocation among the PRPs.

- Risk assessor for a West Virginia Pipeline site. The risk assessment was conducted under the West Virginia Voluntary Remediation Program. Both industrial and construction workers were evaluated. Exposure pathways included inhalation to ambient and indoor air, ingestion and dermal contact. The impact of groundwater discharging into surface water was evaluated. The site characterization report and risk assessment were approved by the West Virginia Department of Environmental Protection.

- Risk assessor for a metal facility located in North Chicago, Illinois. Responsible for overseeing the data management. Prepared the conceptual site model. Exposure scenarios were indoor industrial worker, outdoor worker and trespasser. Primary constituents of concern were volatile organics and metals. The risk assessment was part of an EE/CA. Met with USEPA Region V to negotiate exposure pathways and receptors.

Develop initial risk assessment guidance provided by EPA

- Working with members from ICF Clement, developed for EPA the "Superfund Public Health Evaluation Manual." The was the first risk assessment guidance manual distributed by EPA Headquarters.

- Wrote Acutely Toxic Chemical Profiles for the USEPA's Chemical Emergency Preparedness Program (CEPP). Profiles contained chemical/physical properties, fire fighting procedures, health hazards (acute and chronic), emergency first aid, and safe handling procedures. This expanded into to profiles for the extremely hazardous substances under the SARA Title III amendments.

Conduct a transportation route risk assessment

- Prepared chemical profiles on liquid nitrous oxide (N_2O_4) and liquid fluorine (F_2) for a transportation route risk assessment. Profiles contained chemical/physical properties, health concerns, emergency first aid, and personal protection procedures.

Chemistry

- Performed data usability and validation for a variety of projects. Data validation was conducted in accordance with the project-specific QAPP, National Functional Guidelines, State and USEPA Regional requirements and the analytical method. The following analytical fractions in aqueous and solid media were validated: VOCs, SVOCs, PCBs, TPH (GRO/DRO), metals (including mercury and cyanide), white phosphorous, and explosives.

- Conduct technical audits of analytical environmental laboratories. Review processes to ensure that the laboratory uses Good Laboratory Practices (GLP) and performs activities in accordance with industry standards.

- Prepared a QAPP for an IDEM state-lead Superfund site. The QAPP was developed in accordance with USEPA Region V guidance. The document addressed both on-site (mobile lab) and off-site analytical procedures. Coordinate with laboratories to incorporate their QA/QC information and SOPs.

- Project Scientist for the development of a Region V QAPP for an Ohio Superfund site. Attended the Pre-QAPP meeting and prepared the QAPP in accordance with the USEPA Region V CERCLA QAPP guidance. Coordinate with laboratories to incorporate their QA/QC information and SOPs.

- Developed a statistical sampling plan for a Federal Superfund site located in Lake Charles, Louisiana. Developed the plan on-site to accommodate limited time access to the site, which was a lagoon. Conducted field work in Level B from a pontoon boat. A ponar sampling device was used to ensure the integrity of the sediment sample from the bottom of the lagoon.

Conduct data quality objective assessment to develop cost-effective sampling and analysis plans

- Based on the data quality objectives (DQOs) for the project, prepared numerous field sampling plans to gather information to conduct risk assessment. The plans included the number, type and location of samples. Statistical sampling approaches were used, when appropriate. Identified the analytical parameters to be include in the sampling program. Cost-effective analytical methods (e.g., field testing, mobile lab, CLP, etc.) to meet the DQOs were identified.

Reduce analytical cost by implementing field analytical programs

- Developed a cost-effective analytical strategy for the RFI Phase II investigation at a large aerospace manufacturing facility. Reduced analytical costs while still obtaining quantitative data to delineate horizontal extent of contamination at a SWMU. Used a field UV spec (metals) and field GC (VOCs). Incorporated these data into a GIS system and prepare 3D visual illustrations to assist in determining volume of soil for in-situ remediation.

- For a Navy Installation in Indiana, a field investigation for a Dye Burial Ground was to be conducted. In the planning stages, analytical method development for dyes and smoke-

related dyes needed to be conducted. Responsible for providing management oversight on the method development to ensure that it meet the method development requirements of the RCRA Program as stipulated in SW-846 Method Development and Performance guidance.

- Analyzed EPA's regional laboratory's capabilities and role in support of selected RCRA, TSCA, CERCLA, CWA, and CAA programs

- Developed the implementation strategy for the Toxicity Characteristic Leaching Procedure (TCLP). Interviewed affected parties to identify major issues which include notification, education, compliance and monitoring of the regulated community; and preventing laboratory capacity shortfalls arising from the rule. Developed options paper for these major issues.

- Participated in EPA's Region II Environmental Services Division (ESD) Program Review. Developed questionnaires regarding analytical instrumentation; interviewed Program Directors on their section's capabilities; statistically analyzed information; compiled the data; and prepared the review document. The document highlighted current ESD problems, initiatives for addressing the problems, and opportunities for improving the quality of ESD services.

Data Management

- Project Manager for the data management of several Pennsylvania State-lead Superfund sites. Responsibilities included tracking, compilation, validation, evaluation, reduction, and summarization. Generated analytical and statistical summary tables. In addition, conducted an ARAR/TBC comparison. Presented the information in a user-friendly format to expedite review of data and ensure continuity throughout the RI/RA/ FS process.

- Data Manager for a RCRA Corrective Action Program at United Technologies Corporation - Hamilton Standard Division. Combined historical data with current data. Evaluated soil, sediment, and surface water data on a SWMU-specific basis. Managed groundwater data site-wide. Prepared data for incorporation to groundwater flow and contaminant fate and transport models. Developed the criteria for reducing the data set to assure that only the appropriate data would be used to draw conclusions.

Developed an analytical program to ensure that data were defensible

- Project Manager for an environmental assessment conducted on property leased to develop a marina. The assessment required data to be technically and legally defensible. Prepared a sampling and analysis plan. Used a statistical approach to determine the number of samples required.

- Prepared the Quality Assurance Project Plan (QAPP) for the the correct analytical protocols would be employed to obtain quantitatively usable data. Tracked samples from the field chain-of-custody to receipt from the data validators. Reviewed data and reduced the data set according to EPA guidance. Generated analytical and statistical tables.

- Senior technical advisor for the purchase, installation, and implementation of an Environmental permit tracking management information system for Kennametal, Inc. conducted a needs assessment to establish criteria to select a commercial package. Addressed both environmental and computer needs. Coordinate software training.

Software/Program Design and Development

Designed and developed an environmental analytical data MIS with direct input into risk assessments (Copyright Registration No. TX3693681)

- Designed, wrote, and implemented a centralized analytical management information system (MIS). Coordinated with laboratories and validators to receive user ready data. The management include tracking, compilation, validation, evaluation, reduction, and summarization. Analytical and statistical summary tables were generated. ARAR/TBC comparisons were performed as part of this MIS. Prepared data to be readily used by geologist, engineers, and CADD operators. Directly import data into GIS systems to prepare spatial illustration of data.

- Designed, wrote, and implemented a software package that compares site-specific analytical results to Federal and State ARARs/TBCs. The output is a summary table that identifies the ARAR/TBC and the analytical results that exceeded the criteria.

- Developed, implemented, and managed a hazardous materials inventory system. The system is a PC-based front end to a VAX system. The PC-based portion is user-friendly to assist operations personnel in updating their hazardous material inventory.

- Developed, implemented, and managed a coating/solvent usage air tracking system. The mainframe based system incorporates state and local air requirements. I t generates

daily coating/solvent usage reports as required by law, and determines compliance status by comparing usage levels to air permit conditions.

- Developed a user-friendly database application to obtain information on the SARA Title III extremely hazardous substances. Wrote the user's manual for the program.

- Developed a dBaseIII+® PC based toxicological database for the SARA Section 313 chemicals. This was used to develop the criteria for listing chemicals.

- Designing and developing a database system to handle the information collected for the environmental module of the Pitttsburgh International Airport. The database system facilitates data entry and access of information.

RCRA Corrective Action

Negotiate reduction in field QA/QC samples to reduce program costs

- Senior QA/QC Advisor for the Bethlehem Steel Corporation (BSC) Burns Harbor, Indiana RCRA RFI. Responded to USEPA Region V comments on the workplan and further developed the existing workplan to enhance the efficiency of the field program. Additionally, conduct field and laboratory audits to ensure adherence of the program to the approved workplan. Respond to questions from the staff on clarification of workplan intent. Review field and analytical data for accuracy and completeness. Evaluate conclusions drawn from the data for validity.

- Assistance Program Director for the development of the RCRA Facility Investigation (RFI) Phase I report for the Hamilton Standard, Windsor Locks, Connecticut facility. The seven volume report included: Environmental Setting, source and Waste Characterization, Nature and Extent of Contamination, Public Health and Ecological Risk Evaluation (PHERE), Interim Measures, Corrective Measures Screening, and Conclusions. Provided oversight and QA/QC for the report. Served as Task Manager for the Source and Waste Characterization and PHERE. The primary issues covered in the Source and Waste Characteristic study included the statistical determination of background and off-site sources and release pathways from SWMUs.

- Senior technical lead for the preparation of the Phase I and II RCRA RFI for Marathon Oil in USEPA Region V. Interpreted analytical data in conjunction with the site's physical setting to characterize nature and extent (i.e., vertical

and horizontal) of contamination. Based on data gaps identified from the results of Phase I data, develop Phase II field program.

- Project scientist for the GE Morgantown, West Virginia RFI Phase I investigation. Streamlined analytical program to reduce investigation cost. Coordinate with laboratory on specific analytical requirements. Evaluate results to determine nature and extent of contamination. Present results to USEPA Region III. Negotiate with USEPA on potential further activities.

- Project Scientist for the development of the Current Assessment Study (CAS) which is part of the RFI workplan. Identified SWMUs and ACs. Gathered historical information such as monitoring data, chemicals that may have been released to the area, activities conducted in the area, and physicochemical properties of materials known to be present at the site.

- Project scientist for the cleanup of a SWMU at Hamilton Standard, Windsor Locks, Connecticut facility. Developed a cost-effective analytical program by utilizing a field GC to determine extent of contamination. Verification samples were sent to an off-site laboratory. Responsibilities included the preparation of a sampling plan to ensure that representative samples were taken of the study area. The number and location of samples were statistically determined. After samples were analyzed, the results were statistically reviewed to determine if cleanup levels were obtained.

Streamline groundwater analytical program to reduce overall investigation costs

- Project Manager for the preparation of a RFI Phase I and II Sampling and Analysis Program proposal. The proposal was based on the analytical results of the RFI Phase I Round I sampling effort. Determined sample locations and analytical parameters by reviewing the Round I data against criteria such as frequency of detection, relationship to background concentrations, and physicochemical properties. The report consisted of matrices identifying sample location and corresponding analytical parameters. Substantiation for the deletion of any sampling points and/or parameters was detailed in the text.

- Developed Phase II investigation field sampling strategy for three SWMUs. Negotiated with USEPA Region I on the workplans. Task manager for the risk assessment and analytical program. The landfill risk assessment was

conducted in a streamlined approach in accordance with the landfill presumptive remedy guidance. Currently, evaluating the necessity/feasibility of making the landfill a CAMU to reduce PCB remediation costs for the facility.

Utilize GPS to survey in sample locations

- Field scientist for a RFI site investigation conducted at Roosevelt Roads Naval facility in Puerto Rico. Responsible for collecting surface water, sediment, soil and groundwater samples; surveying sample locations using Global Positioning System (GPS); and assisting in geophysical surveys.

Participate in USEPA Region 5 Pre-QAPP Meeting and Negotiate Screening Criteria and Analytical Methods

- For a Navy Installation located in Indiana, prepared the Quality Assurance Project Plan (QAPP) for a RCRA field investigation. This QAPP was developed in accordance with USEPA Region 5's 1998 QAPP Guidance and Policy Manual. Development of the QAPP including the analysis and incorporation of historical data. This information was used in the DQO process to develop the sampling plan for the project.

Environmental Compliance

- Project Manager for the development of a Part B Permit Waste Analysis Plan for Hamilton Standard, Windsor Locks, CT. This project involved sampling and analysis for waste stream determination and development of the waste analysis plan. Provided on-site review of processes, interviewed personnel, collected samples and interfaced with the laboratory. Updated the waste analysis plan as operations/processes changed at the facility. Prepared waste analysis plans for four other Hamilton Standard facilities that sent their waste to the Windsor Locks site. An integral part of the plan was to ensure that all parties were meeting the requirements of their plans.

- Project Manager for the preparation of a Part B Permit Waste Analysis plan for Aristech Chemical Corporation and Bayer Polymer Division. Reviewed process lines at the facilities to identify waste streams and the management/tracking of the waste. Several streams were directly piped to the on-site boiler for process fuel. Material Safety Data Sheets and analytical results were used as the basis of determination of the waste streams.

- Task leader for the preparation of the Waste Analysis Plan as part of the Part B Permit application for the Waste Technologies, Inc. (WTI), East Liverpool, Ohio. WTI is an incineration treatment facility. The waste analysis plan provided procedures for ensuring that waste received at the facility complied with the physical/chemical properties

required for incineration. Most processes at the facility were automated including sample management/tracking and waste blending, which was explained in the plan.

- Prepared Part B Permit Applications for the following: Annapolis Naval Yard, Aristech Chemical Corporation, GE Plastics, Hamilton Standard, Horsehead Research and Development, Hughes Aircraft, and Waste Technologies, Inc.

- Senior QA/QC technical advisor for the development of a solid and hazardous waste management plan for ALCOA, Ceveland, Ohio. The purpose of the project was to prepare a waste management manual including waste stream profiles, waste generation points, satellite accumulation areas, and transporters and disposal vendors used by the sites. Provided a database containing all relevant information to facilitate efficient updating of waste stream related information. Additionally, developed a waste analysis plan meeting the requirements of OEPA. Provided a database containing all relevant information to facilitate efficient updating of waste stream related information.

- Task manager responsible for preparing a sampling plan for a wastestream determination. Used a statistical approach to determine the number of samples required and sample location to adequately characterize a waste pile. Evaluated the analytical results to determine if the wastestream was RCRA hazardous.

- Prepared the industrial wastewater, UST, and spill response sections of an environmental audit manual for several Fortune 500 companies. The manual is to be used at over 200 facility locations to evaluate the facility's compliance status relative to RCRA, SARA, SPCC, OSHA, CWA and CAA.

Design, develop and implement training programs

- Project manager for the development of an RCRA hazardous waste management training program. Responsible for developing the program, facility-specific training manual, and training course script. As the course instructor, presented two sessions of the RCRA training to approximately 60 attendees.

- Project manager for the development of a procedures manual for the proper management of hazardous waste in a waste storage area. The manual included the handling of known and unknown waste. Conducted a one-day seminar for the implementation of these procedures.

- Managed and conducted comprehensive environmental audits

for various industries such as wood-burning power generators, deep coal-mines, electronic manufacturers, tubular steel mills, aircraft manufacturers and chemical manufacturers. Areas of responsibility included hazardous waste, air , clean and drinking water, radioactive materials, TSCA (PCBs), community right-to-know, UST, wastewater discharge, dams and waterways, surface mining, and land farming. The audits consisted of two phases: records/file search and site visit. The audit reports outlined areas of deficiencies and recommended compliance strategies.

- Project scientist for developing an Emergency and Spill Response plan for a large chemical manufacturer. Prepared an SPCC plan as an attachment. The plan identified major vessels, reactors, tank, pipelines, and boilers; material in the equipment; and disposition of material if it were released from the equipment. Developed a matrix that facilitated the identification of equipment and pertinent information.

Maintain regulatory compliance for an active manufacturing facility

Review pilot processes to ensure that they comply with environmental requirements

- Served as senior environmental engineer for Hughes Aircraft Company, Radar Systems Group in Southern California. Responsible for ensuring regulatory compliance in the areas of emergency planning and community right-to-know(federal and state), Safe Drinking Water and Toxic Enforcement Act (Proposition 65), underground storage tanks (USTs), wastewater discharge, and hazardous waste management. Developed a group-wide compliance strategy for toxic air contaminant regulations. Reviewed pilot processes for environmental concerns such as permits, health risks, and disposal. Developed and Implemented the hazardous waste management training course.

- Project manager for the conduct of four Phase I site assessments for PPG. The sites were located in Ohio, Texas, Pennsylvania, and Indiana. Performed and reported results of the assessments in accordance with ASTM standards.

- Conducted audits of treatment, storage, and disposal facilities (TSDFs) for various clients who were considering sending waste to the facility. Based on the audit, informed clients of their potential liability as a result of sending materials to the TSDF.

- Conducted several real estate transaction audits. Responsible for the review of public documents, site visit, and site history. Recommended the need for a site investigation. Prepared sampling plan for investigation and analyzed results.

Regulatory Development and Analysis

Member of the team that wrote the SARA Title III regulations

- Served as a member of the EPA Toxic Release Inventory Committee (TRIC). The committee developed SARA Title III Section 313 regulations and EPA Form R.
- Analyzed the duplication of Section 313 reporting requirements with other regulatory requirements.
- Participated in developing the regulations and Regulatory Impact Analysis (RIA) for SARA Title III Emergency Planning Sections 302, 303, and 304.
- Served as task leader on the categorization and response to public comments received on the proposed SARA Title III Section 302,303,304,311, and 312 regulations.
- Developed options for the testing\certification requirements for the reproposed rule making for RCRA's Organic Toxicity Characteristic (OTC).
- Responded to public comments received on the first proposed RCRA OTC regulations.
- Developed an industry out reach program for the California Department of Health Services. The program aids industries to determine compliance requirements. Conducted interviews with business trade associations to identify major compliance issues. Developed brochures, workbooks, and educational slide presentations.

Collegiate Instructor
(1998 to 2001)

Instructor in the Environmental Science and Chemistry Departments at the Community College of Allegheny County.

Continuing Education

Practical Environmental Sampling and Analysis - ACS
Environmental Data Validation - ACS
Water Quality Modeling with (WASP4) - EPA
Global Positioning System/Pathfinder Software - Trimbal Navigation
40-Hour OSHA Health and Safety Training

Computer Science
Languages/Applications

Languages:	C, C++ and Visual Basic
Operating Systems:	DOS, Windows 3.X, and Windows 95/98
Applications:	Word, WordPerfect, Excel, Quattro, Lotus 1-2-3, Access, dBase, StatMost, Bestfit, and @Risk

Presentations/Copyright

Baranek, T.M. "Data Validation" Presented at the Water and Environment Federation International Technical Conference, Atlanta, Georgia, October, 2001.

Baranek, T.M. Chairperson for the Environmental Software Showcase Environmental Resources in the Information Age Technical Sessions at the Air and Waste Management Association/Duquense University Co-Sponsored Conference, May 1999.

Baranek, T.M. "Understanding and Using the Data Life Cycle." Presented at the Air and Waste Management Association Western Pennsylvania Meeting, March 1998.

Baranek, T.M. "WILLIE - Welcome to the World of Data Management." Registration No. TX3693681, Dec. 1993.

Baranek, T.M. "Technical and Regulatory Considerations for Environmental Sampling and Analysis Plans." Presented at the American Chemical Society 25th Central Regional Meeting, October 1993.

Baranek, T.M. Chairperson for the Environmental Chemistry and Industrial Chemistry Sessions at the American Chemical Society 25th Central Regional Meeting, October 1993.

Baranek, T.M. and Carfagna, P.F. "Data Management and Risk Assessment." Presented to the Pennsylvania Department of Environmental Resources as a Technology Transfer Seminar, August 1993.

Baranek, T.M. "Sampling Strategies for CERCLA RI/FS Programs." Presented at the PPG Industries RI/FS Technology Transfer Seminar, March 1993.

Baranek, T.M. "The Emergency Planning and Community Right-to-Know Act of 1986." Presented at the 12th Annual Pacific Southwest Health & Safety Seminar, April 1989.

Baranek, T.M. "SARA Title III and Small Companies." Presented at the Carnation Company National Conference, October 1988.

Baranek, T.M. "Meeting the Reporting Requirements of SARA Title III." Presented at the National Safety Managers Society, May 1988.

Baranek, T.M. and Waters, P.F. "Slag Encapsulation of Toxic Metal Salts." Presented at ACS Washington, DC Chapter. 1987.

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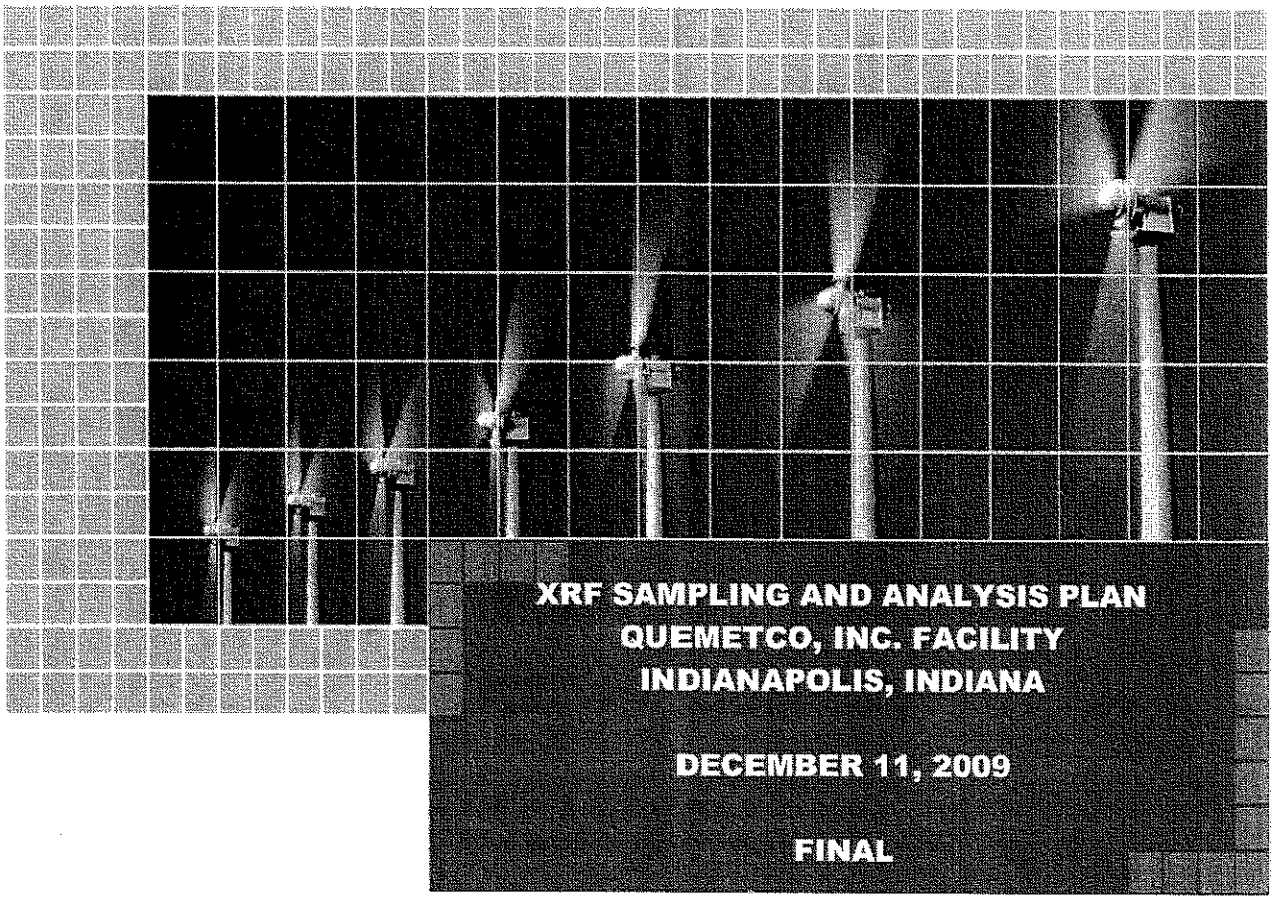
Appendix B – XRF Sampling and Analysis Plan, dated December 11, 2009



XRF SAMPLING AND ANALYSIS PLAN
QUEMETCO, INC. FACILITY
INDIANAPOLIS, INDIANA

DECEMBER 11, 2009

FINAL

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WSP

XRF Sampling and Analysis Plan
for the
Quemetco Inc., Facility
Indianapolis, Indiana

U.S. EPA ID# IND000199653

Prepared by
WSP Environment & Energy
2025 Gateway Place, Suite 435
San Jose, CA 95110

Prepared for
U.S. Environmental Protection Agency, Region V

December 11, 2009

Terry Cirone, Vice President of RSR, Facility Project Manager	Date
Richard E. Freudenberger, Vice President of WSP Environment & Energy, Project Manager	Date
Terrie Baranek, ECT.CON Inc. Project QA Officer	Date
Ruth Hull, Ecotoxicology Quality Assurance Officer, Intrinsik Environmental	Date
Bill Walsh, Managing Director, Microbac Laboratory	Date
Nate Nemani, U.S. EPA Region 5 RCRA Project Manager	Date

Allen Debus, U.S. EPA Region 5 RCRA QA Manager — Date

Hak Cho, U.S. EPA Region 5 RCRA Manager — Date

Jose Cisneros, U.S. EPA Region 5 RCRA Manager — Date

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Figure 1 – Site Location
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Appendices

Appendix A – WSP Environment and Energy's SOP
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1 Introduction

On behalf of Quemetco Inc. (Quemetco), WSP Environment & Energy (WSP) has prepared this XRF Sampling and Analysis Plan for the Quemetco facility located at 900 Quemetco Drive, in Indianapolis, Indiana (Site) (Figure 1). WSP prepared and submitted a revised Work Plan dated May 19, 2008 for additional sampling at the Quemetco facility. The Work Plan included collecting soil samples from the northeast area, slag waste pile area, around the ponds and along Julia Creek. Surface water samples were to be collected from Pond #3 and Julia Creek. Collection of sediment samples were proposed for all three ponds and Julia Creek. The United States Environmental Protection Agency Region 5 (U.S. EPA) provided comments for the revised Work Plan in a letter dated October 8, 2009. In their letter, U.S. EPA requested that soil samples be collected and analyzed using X-ray fluorescence (XRF) technology. This Sampling and Analysis Plan was prepared in accordance with the U.S. EPA request. The letter describes a grid-space sampling approach for completing site-wide characterization and requests Quemetco perform investigative activities using X-ray fluorescence (XRF) for field sampling of lead. This Sampling and Analysis Plan describes the methodology for collecting and analyzing soil samples to further delineate the extent of soil impacted by lead.

The work described in this XRF Sampling and Analysis Plan will be performed in advance of revising the May 19, 2008 revised Work Plan and in accordance with U.S. EPA's letter dated October 8, 2009.

2 Soil Investigation

2.1 SAMPLING STRATEGY AND APPROACH

The investigation will consist of Surficial Zone and Subsurface Zone soil sampling. WSP estimates that up to 426 soil samples from approximately 284 locations will be collected during this investigation. Samples in each grid will alternate between (1) collection of a surficial sample (Surficial Zone) and (2) collection of both a surficial sample and a 0 to 6 inch depth sample (Subsurface Zone). Soil samples will be collected at 70 foot intervals from exposed soil in Zone-1, Zone-2, Zone-3, and Zone-4 of the Site (Figure 2).

Each of the four Zones contains a grid of squares 70 feet by 70 feet in size with the exception of some areas bordering the slag waste pile, ponds, and Julia Creek. Zone-1 includes the area north of the facility extending beyond the northern property boundary and the area west of the facility extending to the railroad berm. Zone-2 includes the area around Pond #3, bordering the slag waste pile to the west and Quemetco Drive to the east. Zone-3 starts at sample location NE-SS-31 and extends east to the western bank of Julia Creek and south to the southern fence line. Zone-4 includes the area around Pond #1 and Pond #2 and extends east to the western bank of Julia Creek.

Each sample location will be recorded using a GPS device. A map depicting all sample locations and surrounding areas will be provided with the final report. WSP will notify U.S. EPA at least 48 hours before any scheduled fieldwork. The following sections describe the sampling strategy, investigation methods and procedures, sample analyses, sample handling, decontamination procedures, and quality assurance and quality control.

2.1.1 Surficial Zone Soil Sampling

Surficial Zone soil sampling will be conducted at up to 284 locations . Surface soil samples for lead analysis will be collected in accordance with SW-846, Guidance Method 6200, section 11.3 (Feb. 2007). A dedicated hand trowel or stainless steel spoon will be used to collect surface soil samples. The trowels or spoons will be decontaminated before use. To minimize cross contamination, a new trowel or spoon will be used for each subsequent sampling location. Decontamination procedures are described in Section 2.5. Surficial zone sampling will be conducted as follows:

- Clear the sample area of debris, rocks, pebbles, and organic matter.
- The soil surface must be smooth to provide good contact with the soil sampling protection plate of the XRF device. If necessary, the surface will be leveled with a stainless-steel trowel or spoon.
- The surface will be tamped to increase soil density, based on the SW-846 protocol; this process will allow better repeatability and ensure that the sample is representative.
- The XRF does not perform well for saturated soils; WSP field representatives will ensure soil is not saturated prior to XRF analysis.
- The field lead analysis will be performed in accordance with the manufacturer's manual for operation of XRF instrumentation. The XRF device (along with a soil sampling protection plate) will be placed directly on the sampling location for a minimum of 60 nominal seconds (i.e., 60 seconds counted by the XRF device). Based on manufacturer's specifications, this method of analysis detects lead in the upper few millimeters of soil in contact with the soil protection plate.

The following sampling information will be recorded in a field notebook: sample zone location; sample GPS coordinates; sample identification numbers; date and time; sample depth; field lead concentration; and description of any visible evidence of soil contamination (i.e., odor, staining).

2.1.2 Subsurface Zone Soil Sampling

Subsurface soil samples for lead analysis will be collected in accordance with SW-846, Guidance Method 6200, Section 11.4 (Feb. 2007). Under Section 11.4, ex-situ soil samples should be homogenized, dried, and ground before XRF analysis. WSP contacted EPA requesting a variance for the homogenization and drying techniques described in Sections 11.4 and 11.5, respectively. With EPA's approval, WSP will not be utilizing fluorescent dye and ultraviolet light for homogenization or the drying technique using an oven and two to four hours of drying time.

Subsurface Zone soil sampling will be conducted at up to 142 locations. All subsurface soil samples will be collected at the same locations as the Surficial Zone sampling locations at a sample interval depth of 0 to 6 inches below ground surface (bgs). Subsurface soil samples for lead analysis will be collected with a dedicated hand trowel or stainless steel spoon. The trowels or spoons will be decontaminated before use. To minimize cross contamination, a new trowel or spoon will be used for each subsequent sampling location. Decontamination procedures are described in Section 2.5. Subsurface Zone sampling will be conducted as follows:

- Place the blade tip of trowel into the soil and push firmly until a sampling depth of approximately six inches is reached.
- Lift a portion of the soil out with the blade and place in a new plastic bag.
- Homogenize the sample in a plastic bag before drying.
- The field lead analysis will be performed in accordance with the manufacturer's manual for operation of XRF instrumentation. The XRF device will be placed directly on the plastic bags for a minimum of 60 nominal seconds according to manufacturer's specifications.
- For samples requiring fixed-laboratory analysis, transfer the plastic bag contents to a laboratory provided sample container using the sampling trowel or spoon.
- Label and place the sample in a cooler containing ice as described in Section 2.3.2.

After XRF analysis, 5% of sampled grids will be sampled for fixed-laboratory analysis of total lead according to the SW-846 guidance method using inductively coupled plasma-mass spectrometry (ICP-MS). As described above, all samples collected for fixed-laboratory analysis of total lead will be sub-sampled from the homogenized field sample. The field samples will be removed from plastic bags and placed into pre-cleaned, laboratory-supplied glass jars and stored in a thermally insulated cooler for transport to Microbac Laboratories.

The following sampling information will be recorded in a field notebook: sample zone location; sample GPS coordinates; sample identification numbers; date and time; sample depth; field lead concentration; and description of any visible evidence of soil contamination (i.e., odor, staining). Upon completion of all sampling activities, all sampling-holes will be backfilled with soil cuttings and compacted with a heavy blunt object.

2.2 SAMPLE ANALYSES

Soil samples collected at the Site will be analyzed by Microbac Laboratories (Microbac) at 250 West 84th Drive in Merrillville, Indiana using inductively coupled plasma-mass spectrometry (ICP-MS) listed in SW-846, Guidance Method 6200, Section 1.2 (Feb. 2007). Microbac is accredited by the National

Environmental Laboratory Accreditation Program (NELAP) (Appendix C). The following samples will be collected and analyzed as part of this investigation effort:

- Up to 15 Surficial Zone soil samples will be analyzed for lead by EPA method 200.8
- Up to 7 Subsurface Zone soil samples will be analyzed for lead by EPA method 200.8

Microbac will provide a CLP-level IV data package.

2.2.1 Quality Control Samples

Equipment Blanks

Dedicated sampling equipment will be used to collect samples at each location, for that reason, equipment blanks will not be collected for this investigation.

Trip Blanks

The use of trip blanks is typically limited to volatile organic compound (VOC) analysis. Because VOC analysis was not proposed for this investigation, trip blanks will not be analyzed for this investigation.

2.3 SAMPLE HANDLING PROCEDURES

2.3.1 Soil Sample Containers and Preservatives

The laboratory will provide soil sample containers. The containers will be pre-cleaned and will not be rinsed before sample collection.

2.3.2 Sample Packaging and Shipment

To identify and manage samples obtained in the field, a sample label will be affixed to each sample container. The sample labels will include the following information:

- Site name
- Zone number
- Sample identification number
- Sampler's initials
- Date and time of collection
- Preservative, if any

Following collection and labeling, samples will be immediately placed in a sample cooler for temporary storage. The following protocol will be followed for sample packaging:

1. Samples to be shipped will be placed in the cooler and packed with packaging materials to minimize the potential for disturbance and/or breakage of the sample containers.
2. Ice or "Blue Ice" packs will be placed in leak-resistant plastic bags and added to the coolers to chill the samples during transportation to the analytical laboratory.
3. The chain-of-custody form will be placed in a water-resistant plastic bag and taped on the inside of the lid of the cooler.

All samples will be maintained in the custody of the sampling team. The samples will be transported to the analytical laboratory at the end of the sampling day under appropriate chain-of-custody procedures.

2.4 SAMPLE DOCUMENTATION

2.4.1 Field Logbooks

Field logbooks will document where, when, how, and from whom any vital project information was obtained. Logbook entries will be bound with consecutively numbered pages. Each page will be dated and the time of entry noted in military time.

At a minimum, the following information will be recorded during the collection of each sample:

- Zone number
- Sample identification number
- GPS location coordinates
- Date and time of sample collection
- Type of sample (i.e., matrix)
- Type of sampling equipment used
- Field observations and details important to analysis or integrity of samples (e.g., heavy rains, odors, colors, etc)

2.4.2 Chain-of-Custody Records

Chain-of-custody (COC) records are used to document sample collection and shipment to the laboratory for analysis. All sample shipments will be accompanied by a COC record. The COC record will identify the contents of each shipment and maintain the custodial integrity of the samples.

2.5 DECONTAMINATION PROCEDURES

All equipment that comes into contact with potentially contaminated soil will be decontaminated before use. Disposable or dedicated equipment intended for one time use will not be decontaminated, but will be packaged in Quemetco's PPE refuse containers for appropriate disposal. All non-disposable sampling devices will be decontaminated using the following procedures:

- Non-phosphate detergent and tap water wash, using a brush if necessary
- Tap-water rinse

2.6 INVESTIGATION WASTE MANAGEMENT

In the process of collecting environmental samples during the proposed field sampling program, different types of potentially contaminated investigation-derived wastes (IDW) will be generated. The wastes will be handled as follows:

- Soil will be placed back into their respective sample-holes.
- Decontamination fluids will be processed through the wastewater treatment plant.
- Used personal protective equipment (PPE) and disposable equipment (used sampling trays) will be placed in Quemetco, Inc.'s PPE refuse containers. Used PPE will be handled as hazardous waste consistent with Quemetco, Inc.'s waste handling practices.

3 Reporting

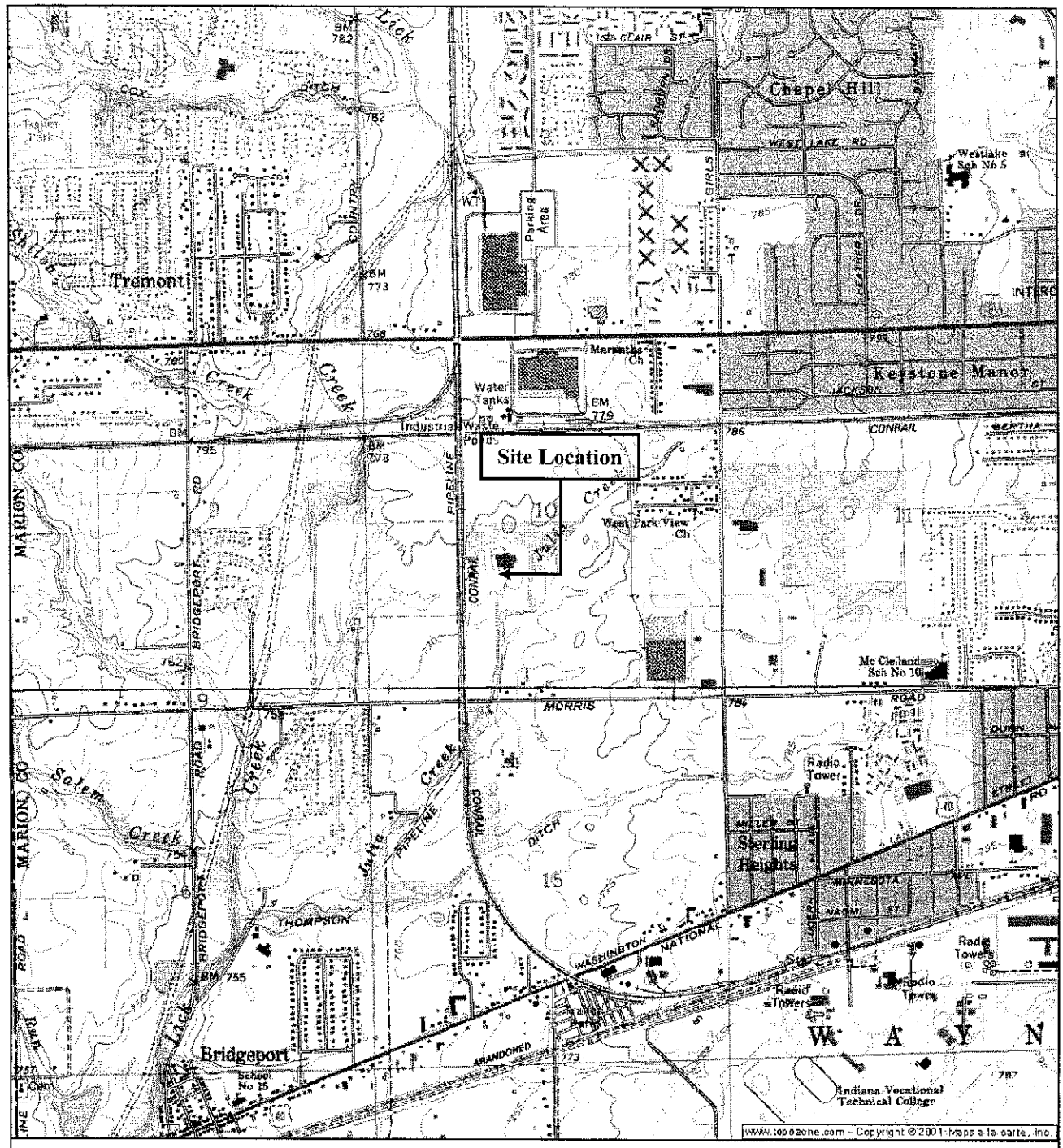
Upon completion of the sampling activities, a report detailing the investigation efforts will be prepared and submitted to U.S. EPA. The report will include sample methodology, summarized sample results, laboratory analytical and quality assurance and quality control review, and a map depicting GPS-recorded sample locations.

Terrie Baranek of ECT.CON Inc., will be the Quality Assurance Officer (QAO) during the project and will be responsible for all QA/QC aspects of the work, including data validation of both field and laboratory data. The QAO will remain independent of direct job involvement and day-to-day operations, report to the WSP Project Director, and resolve any QA disputes.

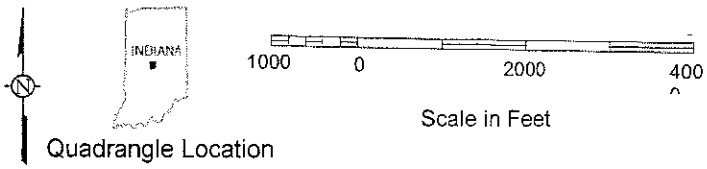
Following a review of the data collected according to this Sampling and Analysis Plan, WSP will prepare a revision to the May 19, 2008 revised Work Plan to address any remaining data gaps and U.S. EPA's comments in their letter dated October 8, 2009.

Figure 1 – Site Location

q:\client\quemetco\indiana\indianapolis, in figure 1



Reference
7.5 Minute Series Topographic Quadrangle
Clermont, Indiana
Photorevised 1984 Scale 1:25,000

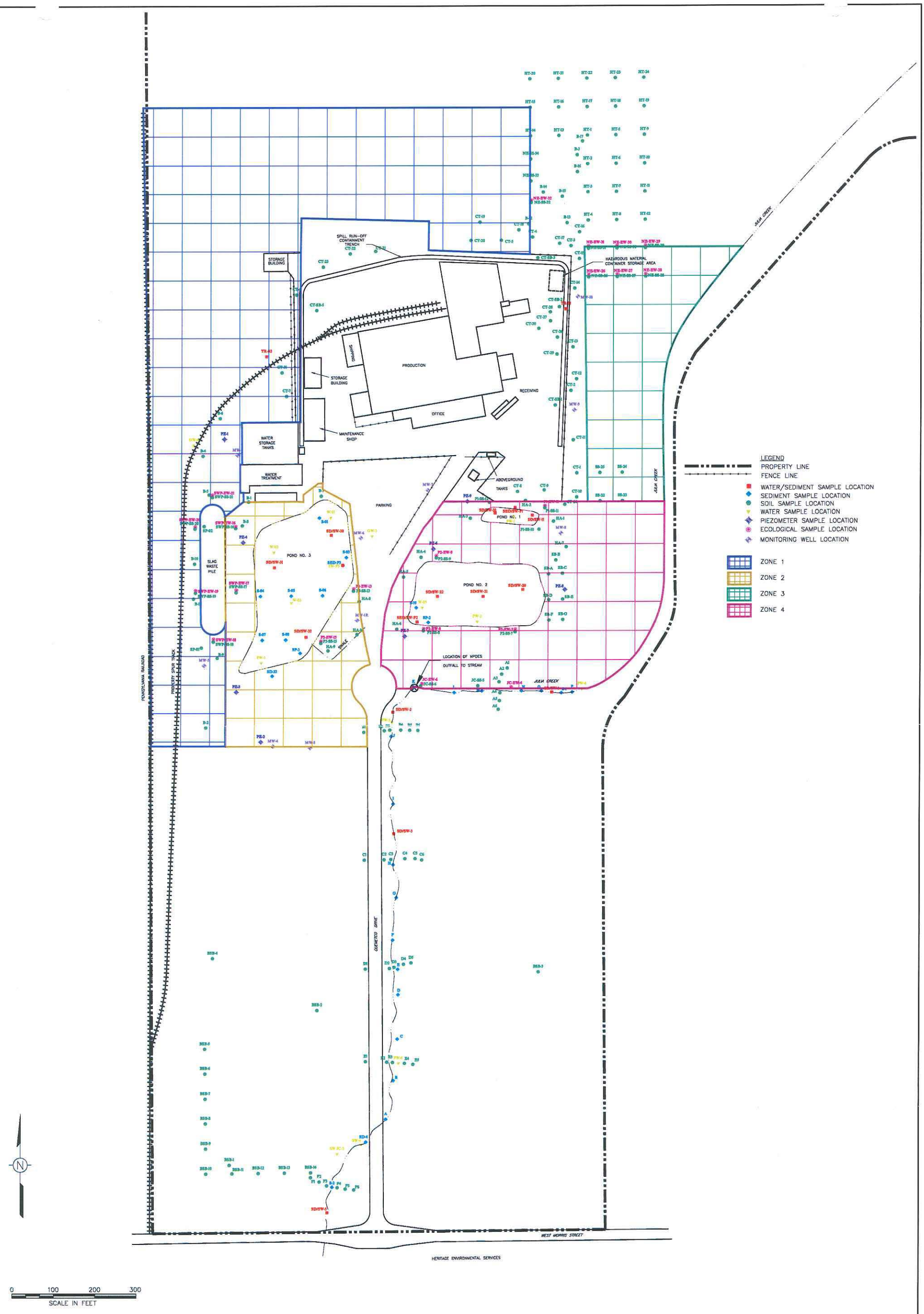


Quadrangle Location

WSP Environment & Energy
2025 Gateway Place, Suite 435
San Jose, California
(408) 453-6100

Figure 1
Site Location
Location of Quemetco Facility
Indianapolis, Indiana

Figure 2 – Sampling Grid for XRF



Drawing Number 21481415	FIGURE 2	WSP WSP ENVIRONMENT & ENERGY 2025 GATEWAY PLACE SUITE 435 SAN JOSE, CALIFORNIA 95110 (408) 453-6100	SAMPLING GRID FOR XRF 900 QUEMETCO DRIVE INDIANAPOLIS, INDIANA PREPARED FOR INDIANAPOLIS, INDIANA	DRAWN BY: JME CHECKED: LB APPROVED:	SEAL DATE

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REVISIONS

REV	DESCRIPTION		
1	Revised:	Chkd:	Appr.:
2	Revised:	Chkd:	Appr.:
3	Revised:	Chkd:	Appr.:

Appendix C – Field Standard Operating Procedures

Standard Operating Procedure – 1

Note Taking and Log Book Entries

Materials:

Permanently bound log book (no spiral-bound log books)
Black or blue ballpoint pen (waterproof ink)

Procedure:

1. Use black or blue ballpoint pen with waterproof ink. Felt-tip pens should not be used.

2. Reserve the inside front cover for business cards from key personnel who visit the site (including the person in charge of the log book).

3. On the first page of the log book, place a return for reward notice, WSP's phone number, and the project manager's name.

4. Enter the following on the second page of the log book: project name, project number, project manager's name, onsite contacts, onsite telephone number and address, telephone numbers for all key personnel, and emergency fire and medical telephone numbers.

5. Number each page, initial each page, and put the date at the top of each page. Start a new page for each day. At the end of a day, summarize the day's activities, sign the page, and put a slash through the rest of the blank lines. Start the next day on a new page.

6. Enter the time (in military time, e.g., 0830) in the left column of each page when an entry is recorded in the field notebook.

7. If a mistake is made in an entry, cross out the mistake with one line and initial the end of the line.

8. At all times, maintain the chain of custody on the field log book.

Content:

1. Be sure that log book entries are LEGIBLE and contain accurate and inclusive documentation of project field activities.

2. Provide sufficient detail to enable others to reconstruct the activities observed.

3. Thoroughly describe all field activities while onsite. Be objective, factual, and thorough. Language should be free of personal feelings or other terminology that might prove inappropriate.

4. Describe problems, delays, and any unusual occurrences such as wrong equipment or breakdowns along with the resolutions and recommendations that resulted.

5. Fully document any deviations from or changes in the work plan.

6. Describe the weather and changes in the weather, particularly during sampling events.

7. Sketch a map of the facility or areas onsite where activities are occurring, especially the location of sampling points.

8. During sampling activities, record all information pertaining to the sampling event. Include descriptive locations and diagrams of the sample locations, time, sample media, analysis, sampling procedure, equipment used, sizes and types of containers, preservation and any resulting reactions, sampling identification (especially for duplicate samples), shipping procedures (record airbill numbers), and addresses.

9. Note decontamination or disposal procedures for all equipment, samples, and protective clothing and how effectively each is performed.

10. If possible, photograph all sample locations and areas of interest. Maintain a photographic log in the field log book and include:

    Date, time, photographer, name of site, general direction faced, description of the subject taken, and sequential number of the photograph and the roll number.

11. Record the names and affiliations of key personnel onsite each day.

12. List all field equipment used and record field measurements, including distances, monitoring and testing instrument readings (e.g., photoionization detector (PID), organic vapor analyzer (OVA), pH, conductivity, model numbers, etc.), and calibration activities.

13. Record proposed work schedules and changes in current schedules in the log book.

14. Describe site security measures.

15. Include drum inventory for all investigation-derived waste (IDW) materials generated during site activities. Provide information on how IDW material was labeled.

Standard Operating Procedure - 2

Sample Container, Preservatives, & Holding Times

Scope:

This operating procedure describes the ways and means of selecting the appropriate sampling containers for environmental sampling.

Application:

The purpose of this procedure is to assure that sample volumes and preservatives are sufficient for analytical services required under EPA-approved protocols.

Materials:

Sample containers
Sample container labels
Indelible (waterproof) markers or pens
Clear tape

Procedures:

1. Refer to Table 1 for minimum sample volume and glassware types required for sampling a particular matrix and compound class.

2. Select the appropriate glassware (i.e., bottles or jars) from those provided by the analytical laboratory. Verify that the analytical laboratory has provided the correct number of sample containers and the correct preservatives for the project per the sampling plan requirements.

3. The analytical laboratory should always provide extra sample containers for all analytical parameters in case of breakage or other problems encountered in the field. This is particularly true for VOC sample containers (i.e., 40-ml vials).

4. Report any discrepancies or non-receipt of specific types of sample containers to the Quality Assurance Officer immediately. Arrangements should be made with the laboratory to immediately ship the missing or additional sampling containers to the project site.

5. Apply WSP sample labels to the sample containers.

6. Information on the sample labels should contain the following data:

   Site/Project name
   Project/Task number
   Unique sample identification number
   Sample date
   Time of sample collection (military system, e.g., 0000 to 2400 hours)
   Analytical parameters
   Preservative
   Sampling personnel

7. Once sample containers are properly labeled, the sample labels should be wrapped with clear tape to prevent deterioration of sample label.

8. Proceed with the sample collection per the sampling plan requirements.

9. Collected samples should be immediately placed in an iced cooler to maintain as close as possible a 4°C atmosphere for shipment to the analytical laboratory. Follow sample shipping procedures detailed in Sample Shipping Standard Operating Procedures.

10. Recommended order of sample collection:

    In-situ measurements (e.g., temperature, pH, specific conductance)
    Volatile organic analytes (VOA)
    Purgeable organic carbon (POC)
    Purgeable organic halogens (POX)
    Total organic halogens (TOX)
    Total organic carbon (TOC)
    Extractable organics
    Total petroleum hydrocarbons (TPH)
    Total metals
    Dissolved metals
    Microbiologicals
    Phenols
    Cyanide
    Sulfate and chloride
    Turbidity
    Nitrate and ammonia
    Radionuclides

Table 1 – Sample Containers, Preservatives, and Holding Times

Analytical Parameter	Matrix	Sampling Container Size and Type	Preservatives	Maximum Holding Time
Metals, except mercury and hexavalent chromium	Solid	8-oz. glass jar	Cool to 4o C	180 days
Mercury	Solid	8-oz. glass jar	Cool to 4o C	28 days
Hexavalent chromium	Solid	8-oz. glass jar	Cool to 4o C	24 hours
Metals, except mercury and hexavalent chromium	Aqueous	500-ml plastic container with Teflon-lined plastic cap	HNO3, pH<2 Cool to 4o C	180 days
Mercury	Aqueous	500-ml plastic container with Teflon-lined plastic cap	HNO3, pH<2 Cool to 4o C	28 days
Hexavalent chromium	Aqueous	500-ml plastic container with Teflon-lined plastic cap	Cool to 4o C	24 hours
Volatile organics	Solid	4-oz. glass jar with Teflon-lined cap	Cool to 4o C	14 days
Volatile organics	Aqueous	Three 40-ml glass vials with Teflon-lined caps	HCl, pH<2 Cool to 4o C	14 days

Analytical Parameter	Matrix	Sampling Container Size and Type	Preservatives	Maximum Holding Time
Semivolatile organics	Solid	8-oz. amber glass jar with Teflon-lined cap	Cool to 4o C	14 days to extraction 40 days from extraction to analysis
Semivolatile organics	Aqueous	Two 1,000-ml amber glass jars with Teflon-lined caps	Cool to 4o C	7 days to extraction 40 days from extraction to analysis
Cyanide	Solid	8-oz. glass jar	Cool to 4o C	14 days
Cyanide	Aqueous	One 500-ml plastic container	NaOH, pH>12, Cool to 4o C	14 days
TCLP Volatiles	Solid	8-oz. glass jar with Teflon-lined cap	Cool to 4o C	14 days to TCLP extraction 14 days from extraction to analysis
TCLP Semivolatile Organics	Solid	8-oz. glass jar	Cool to 4o C	14 days for TCLP extraction 7 days for preparative extraction 40 days from extraction to analysis
TCLP Metals, except Mercury	Solid	8-oz. glass jar	Cool to 4o C	180 days for TCLP extraction 180 days from preparative extraction to analysis

Analytical Parameter	Matrix	Sampling Container Size and Type	Preservatives	Maximum Holding Time
TCLP Mercury	Solid	8-oz. glass jar	Cool to 4o C	28 days for TCLP extraction 28 days from preparative extraction to analysis
Total Petroleum Hydrocarbons	Solid	4-oz. glass jar with Teflon-lined cap	Cool to 4o C	14 days for extraction 40 days for analysis
Total Petroleum Hydrocarbons (EPA Method 418.1)	Aqueous	1-liter amber glass jar	Cool to 4o C	14 days for extraction 40 days for analysis
Total Petroleum Hydrocarbons (EPA Method 8015 GRO)	Aqueous	2 40-ml glass vials	Cool to 4o C	14 days for extraction 40 days for analysis
Total Petroleum Hydrocarbons (EPA Method 8015 DRO)	Aqueous	2 40-ml glass vials	Cool to 4o C	14 days for extraction 40 days for analysis

Standard Operating Procedure - 4

Surface Water and Sediment Sampling (using hand trowel)

Surface Water Sampling

Materials:

Nitrile gloves
Saranex or Tyvek suit
Vinyl gloves
Bulldog boots
Hip-waders
Sample containers
Sample labels and indelible marker
Bound field log book

Procedure:

1. Collection of surface water samples should be completed before collection of the stream sediment samples from the same location. This procedure will eliminate the introduction of sediment and turbulence in the surface water that is to be sampled.

2 The sampler should wear hip-waders or rubber boots and gloves, or Saranex or Tyvek sleeves duct taped onto nitrile gloves, to avoid dermal contact with the surface water.

3. Extreme caution should be exercised when wading into the stream at the sampling location to minimize disturbance of the fine sediments.

4. Because of possible unseen water hazards, two people should be present during the collection of surface water samples.

5. If collecting several surface water samples from the same surface water body, start sampling at the downstream location and progressively move upstream. The sampler should always face upstream (i.e., upcurrent) when collecting the surface water sample.

6. The surface water sample container should be placed into the flowing water and the sample should be collected from just beneath the stream surface.

7. The sample container should be labeled before sample collection. After the sample is collected, the container should be sealed, and placed into a cooler for shipment to the analytical laboratory.

8. The sampling location should be described, including width of stream, depth of stream, water color, and approximate surface flow (e.g., slow, fast moving, etc.).

9. Sampling locations should be marked with a stake or flagged for future reference. Locations should be recorded with respect to a permanent feature, if available.

10. Complete chain of custody form with appropriate sampling information.

11. If collecting sediment samples, proceed to collect the sample from this location.

Sediment Sampling

Materials:

Hand trowels (stainless steel or Teflon)
Nitrile gloves
Vinyl gloves
Tray, mixing pans, Ziploc® plastic bags
Stainless steel or Teflon spoons
Aluminum foil
Saranex or Tyvek suit
Hip-waders of rubber boots
Sample containers
Sample labels and indelible marker
Bound field log book

Procedure:

1. The hand trowel can be used to sample shallow stream bottom sediments, where the depth of water does not exceed 1 foot, using the same procedures specified in the Standard Operating Procedures for Collection of Soils Samples Using a Hand Trowel. The sediment corer or other appropriate sampling device should be used in water deeper than 1 foot (see SOP-6).

2. The sampler should wear hip-waders or rubber boots and gloves, or Saranex or Tyvek sleeves duct taped onto nitrile gloves, to avoid dermal contact with the water.

3. Extreme caution should be exercised when wading into the stream at the sampling location to minimize disturbance of the fine sediments.

4. If collecting several sediment samples from the stream, start sampling at the downstream location and progressively move upstream. The sampler should always face upstream (into the current) when collecting the sediment sample.

5. Insert the trowel into the sediment bed and retrieve sediment. Carefully remove the trowel from the water to avoid washing sediment from the blade. The trowel blade should be tilted at a slight angle, if necessary, to drain excess water from the blade before placing the sediment in the mixing tray.

6. If more sediment is needed to provide sufficient sample volume, reinsert trowel at the sample location and retrieve as before.

7. Examine contents of tray. For volatile organic compound (VOC) samples, do not mix the sediment sample in the tray. Transfer sediment directly into sample containers, choosing your sample from various portions of the tray to simulate homogeneity.

8. After the collection of VOC samples and before filling other sample containers, mix the contents of the tray so a homogeneous texture remains.

9. Transfer the tray contents to the sample containers.

10. The sample container should be labeled before sample collection. After the sample is collected, the container should be sealed, wiped clean of excess sediment material, and placed in a cooler with ice or freezer packs for shipment to the analytical laboratory. Complete chain-of-custody form with appropriate sampling information.

11. The sampling location should be described, including width of stream, depth of stream, water color, and approximate surface flow (e.g., slow, fast moving, etc.).

12. Sampling locations should be marked with a stake or flagged for future reference. Locations should be recorded with respect to a permanent feature, if available.

Standard Operating Procedure - 11

Soil Sampling Using Hand Trowel

Application:

To collect surface or shallow subsurface soil samples with a hand trowel.

Materials:

Field log book
Personal protective equipment (PPE)
Stainless steel trowels or spoons
Mixing tray or bowl
Plastic sheeting

Note: Decontamination is not required for dedicated sampling equipment.

Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. Remove the resealable plastic bag and aluminum foil from a decontaminated stainless steel trowel or spoon.

3. Remove any vegetation or other surface material (e.g., gravel) from the sample location with a trowel or other tool (e.g., shovel).

4. Push the trowel or spoon into the soil to the desired sampling depth. If sampling a loose gravelly or sandy soil, carefully remove the trowel so that the blade approaches a horizontal position to prevent soil from falling off the blade. If sampling a stiff silty or clayey soil, it may be necessary to remove and reinsert the trowel to loosen the soil. Shallow subsurface soil samples can be collected by digging a hole (e.g., with a shovel or trowel) and collecting a soil sample at the desired depth. A decontaminated stainless steel trowel or spoon should be used for sample collection.

5. Repeat Step 4 if more soil is needed to provide sufficient sample volume.

6. If required, screen the recovered soil with a PID/OVA or perform headspace analyses in accordance with SOP 22. Record the reading in the field logbook.

7. For VOC samples, transfer soil directly into the sample container with the stainless steel trowel. A closed-system sampler (e.g., Encore Sampler) should be used, if necessary, to collect sludge samples for VOC analysis using EPA Method 5035 for preservation.

8. Describe the remaining sample material in accordance with ASTM International Standard D 2488 and the Unified Soil Classification System. Record the sample description in the field logbook.

9. If soil samples will be collected for non-volatile parameters, use the stainless steel spoon to chop apart clumps of soil material and mix the contents of the tray to a homogeneous particle size and texture.

10. Examine contents of the tray and remove pebbles, organic material, (e.g., roots, grass, and woody material), and other debris with a stainless steel trowel or spoon.

11. Transfer the tray contents to the appropriate sample container using a stainless steel spoon.

12. Label the containers, cover the labels with tape, and immediately place the containers in a cooler maintained at an ambient temperature of 4° Celsius with wet ice. Freezer packs or dry ice should not be used for sample preservation.

13. Record the sample location, sample depth, sampler name, and the requested analytical parameters in the field log book.

14. Complete the chain-of-custody form with appropriate sampling information.

15. Samples should be maintained and shipped in accordance with SOP 20.

16. Properly manage all PPE and investigation-derived wastes in accordance with state and federal requirements.

Standard Operating Procedure - 18

Decontamination of Interface Probe

Materials:

Field logbook
Personal protective equipment (PPE)
Nonphosphate detergent (e.g., Liquinox or Alconox)
Deionized water
Isopropanol
Two buckets
Spray bottles
Paper towels

Decontamination Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. If the groundwater is grossly contaminated (i.e., LNAPL or DNAPL is present), the tape should be pulled out of the well, NOT reeled up, and placed directly into a bucket of nonphosphate detergent and tap water. The tape and probe should be scrubbed with a brush to remove visible contamination. The tape and probe should then be rinsed in a bucket of tap water before proceeding with Step 3. If persistent stains or oily films remain, apply isopropanol to a paper towel and wipe the tape and probe until clean.

3. Thoroughly wet a paper towel with deionized water from a spray bottle. Fold the paper towel over the tape and wipe it as the tape is reeled up.

4. The interface probe should be sprayed with deionized water and wiped dry with a clean paper towel.

5. Place the interface probe in the clean carrying case or in a clean plastic bag to prevent contamination during transportation.

6. Properly manage all PPE, used paper towels, and decontamination rinsates in accordance with state and federal requirements (See SOP 26).

Standard Operating Procedure - 19

Decontamination of Sampling Equipment

Materials:

Field logbook
Personal protective equipment (PPE)
Deionized water
10% nitric acid solution
Nylon brushes
Containers (e.g., garbage cans, buckets, plastic tubs)
Nonphosphate detergent (e.g., Liquinox or Alconox)
Isopropanol
Aluminum foil
Polyethylene sheeting
Plastic garbage bags
Paper towels
Spray bottles
Duct tape

Note: All sampling equipment must be decontaminated before shipment to the office.

Decontamination Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. Prepare a decontamination area by spreading polyethylene sheeting on a firm, flat surface (if possible). Create a berm around the decontamination area to contain inadvertent spillage. A berm can be created by rolling under the edges of the polysheeting or by draping the plastic over a wooden frame, etc.

3. Prepare a solution of nonphosphate detergent and tap water in a container.

4. Wipe sampling equipment with paper towels to remove residual soil or gross contamination. Heavy oils or grease may be removed with paper towels soaked with isopropanol.

5. Disassemble sampling equipment (e.g., split-spoon samplers and bailers). Wash equipment thoroughly in a nonphosphate detergent and hot tap water (if available) solution. Teflon bailers must be disassembled and the inside washed with a long-handled bottle brush or short-handled brush pulled through the bailer with rope.

6. Rinse the equipment with hot tap water (if available).

7. If the equipment will be used to collect samples for metals analysis, follow the tap water rinse with a 10% nitric acid solution rinse. Carbon steel equipment (e.g., bucket augers, split-spoons) should be rinsed with 1% nitric acid solution to reduce the potential for oxidizing the metal surfaces. Collect the nitric acid rinse in a separate bucket for proper disposal. Rinse the equipment with tap water.

8. Thoroughly rinse the equipment with deionized water.

9. Spray the equipment with isopropanol and allow to completely air dry. The solvent rinse must be collected in a separate bucket. Isopropanol is the recommended solvent for organic contaminants because it is readily available and is not a Department of Transportation hazardous material. However, other solvents (e.g., acetone, hexane, methanol) may be more effective in removing certain contaminants, such as oils or PCBs. Please note that many state programs and USEPA regions specify the solvents to be used for equipment decontamination.

10. Rinse the equipment with deionized water using at least five times the volume of solvent used in the previous step.

11. After the equipment has been allowed to completely air dry, each piece must be individually wrapped with aluminum foil (shiny side out), and then wrapped in plastic.

Note: Decontamination solvents may introduce contaminants to environmental samples. It is very important to ensure that the equipment has completely dried before use or storage.

12. After the final decontamination event on a project, label each piece of equipment with the date of decontamination, the initials of decontamination personnel, and the type of decontamination solutions used.

13. Note any discrepancies from standard decontamination procedures in the field logbook.

14. Field decontamination presents unique problems in disposal of decontamination solutions. The spent wash water and rinse water can potentially be placed in the facility's waste water treatment system. However, field personnel should obtain approval from facility personnel and from the local POTW. If no wastewater treatment system is present onsite, or if approval cannot be obtained from the facility and local POTW, the wash water should be containerized for offsite disposal in accordance with state and federal requirements. The volume of spent solvent generated during field decontamination should be minimal. Solvents should be collected in separate buckets and allowed to evaporate. See SOP 26 for information on managing investigation-derived wastes.

15. Paper towels soaked with solvent should be allowed to air dry and be disposed of with the general trash. Under no circumstances should any decontamination solution be disposed of on soil surfaces.

Standard Operating Procedure – 20

Sample Shipping Procedures

Materials:

Suitable shipping container (e.g., plastic cooler or lab supplied styrofoam cooler)
Chain-of-custody forms
Custody seals
WSP mailing labels
Strapping, clear packing, or duct tape
Ziploc® plastic bags
Knife or scissors
Permanent marker
Latex or nitrile gloves
Large plastic garbage bag
Wet ice
Bubble wrap or other packing material
Universal sorbent materials
Sample container custody seals (if required)
Federal Express form (with WSP account number)
Vermiculite (or commercially available cat litter)

Procedures:

For shipping purposes, samples are segregated into two classes; environmental samples and restricted articles (i.e., hazardous materials). Environmental samples can also be categorized based on expected or historical analyte levels (i.e., low or high). An environmental sample is one that is not defined as a hazardous material by the Department of Transportation (DOT, 49 CFR Part 171.8). The DOT defines a "hazardous material" as a substance which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. Any material of a suspected hazardous nature, previously characterized as hazardous, or known to be hazardous is considered a restricted article.

In general, the two major concerns in shipping samples are protecting the samples from incidental breakage during shipment and complying with applicable DOT and courier requirements for restricted article shipments.

Protecting the samples from incidental breakage can be achieved using "common sense." All samples should be packed in a manner that will not allow them to freely move about in the cooler or shipping container. Glass surfaces should not be allowed to contact each other. When possible, repack the samples in the same materials that they were originally received in from the laboratory. Each container should be cushioned with plastic bubble wrap, styrofoam, or other nonreactive cushioning material. Shipping hazardous materials should conform to the packaging, marking, labeling, and shipping instructions identified in 49 CFR Parts 172 & 173.

Environmental samples shall be packed for shipment using the following procedures:

1. Line the shipping container with a large, heavy-duty plastic garbage bag. Place universal sorbent materials (e.g., sorbent pads) between the cooler and the heavy-duty plastic bag. The amount of sorbent material should be sufficient to absorb the volume of wet ice and aqueous samples. If using a plastic cooler, securely tape the drain plug closed on the outside of the cooler.

2. Place 2-4 inches of bubble wrap or other packing material inside the heavy-duty plastic bag in the bottom of the cooler.

3. The sample packer should wear latex or nitrile gloves when handling the samples during the packing process.

4. Place the bottles in the cooler with sufficient space to allow for the addition of more bubble wrap or other packing material between the bottles. Large or heavy sample containers should be placed on the bottom of the cooler with lighter samples (i.e., VOAs) placed on top to eliminate breakage.

5. Place the "wet ice" inside two sealed heavy-duty zipper-style plastic bags and package the bags of ice on top of or between the samples. Pack enough ice in the cooler to chill the samples during transit. If the cooler is shipped on a Friday or Saturday for Monday delivery, double the amount of ice placed in the cooler (Monday delivery should be used only as a last resort). Fill all remaining space with bubble wrap or other packing material. Securely close and seal with tape the top of the heavy-duty plastic bag.

6. Place chain-of-custody form (and, if applicable, CLP traffic reports) into a Ziploc® plastic bag and affix to the cooler's inside lid, then close the cooler. Securely fasten the top of the cooler shut with tape. Place two signed and dated chain-of-custody seals on the top and sides of the cooler so that the cooler cannot be opened without breaking the seals.

7. Once cooler is sealed, shake test the cooler to make sure that there are no loose sample containers in the cooler. If loose samples are detected, open the cooler and repack the samples.

8. Using clear tape, affix a mailing label with WSP's return address to the top of the cooler.

9. Ship samples via priority overnight express to the contracted analytical laboratory for next morning delivery. If applicable, check the appropriate box on the airbill for Saturday delivery.

10. Declare value of samples on the shipping form for insurance purposes. The declared value should reflect the cost to recollect the samples.

11. Record the tracking numbers from the Federal Express forms in the field notebook and on the chain of custody form. Also, retain the customer's copy of the Federal Express airbill.

Hazardous materials should be packed according to the above procedures with the following additions:

1. Place samples in individual Ziploc® plastic bags and secure with a plastic tie or tape.

2. Place samples in paint cans in a manner which would prevent bottle breakage (i.e., do not place glass against glass).

3. Place vermiculite or other absorbent packing material in the paint can around the samples. The amount of packing material used should be sufficient to absorb the entire contents of the sample if the container is broken during shipment.

4. Secure a lid to the paint can with can clips and label the outside of the can with sample numbers and quantity. Mark the paint can with "This End Up" and arrow labels that indicate the proper upward position of the paint can.

5. Package the paint cans in DOT-authorized boxes or coolers, with appropriate DOT shipping labels and markings on two adjacent sides of the box or cooler.

6. Ship the restricted articles via overnight courier following the courier's documentation requirements. A special airbill must be completed for each shipment. Retain a copy of the airbill for WSP records and tracking purposes, if necessary.

Standard Operating Procedure – 21

Field Quality Assurance/Quality Control Samples

Materials:

Field logbook
Personal protective equipment (PPE)
Sample containers
Sample labels
Clear tape
Laboratory analyte free water
Clean or dedicated sampling equipment

Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. Select the appropriate glassware for the field Quality Assurance/Quality Control (QA/QC) samples. Refer to the WSP Standard Operating Procedure for Sample Container, Preservatives, and Holding Times to determine the appropriate bottles to use.

3. Field QA/QC samples include the following:

   trip blanks
   duplicate samples
   equipment blanks

4. Trip blanks should be provided by the analytical laboratory for all projects where samples are being collected for analysis of volatile organic compounds (VOCs). Trip blanks should accompany the sample bottles from the analytical laboratory to the site, accompany the sample containers at all times during the sampling event, and return to the laboratory with the sample containers. One trip blank should be submitted to the analytical laboratory with each shipment containing samples for VOC analysis. The trip blank should be analyzed only for VOCs.

5. One duplicate sample should be collected for every 20 samples of each matrix (e.g., soil and groundwater) collected during each sampling event. Duplicate samples of soil and other solid matrices should be collected by dividing the sample material in half and alternately filling the two sample bottle sets. Duplicate samples of groundwater and other aqueous matrices should be collected by alternately filling the two sample bottle sets from the same sampling vessel (e.g., bailer). The appropriate SOP should be followed for the collection of each sample type (soil, groundwater, sediment, sludge). Duplicate samples should be analyzed for all the analytes that are being analyzed for during the sampling event.

6. One equipment blank should be collected in the field at a rate of one per type of equipment per decontamination event not to exceed one per day. If dedicated sampling equipment is used, the equipment blanks should be prepared in the field before sampling begins. If field decontamination of sampling equipment is required, the equipment blanks should be prepared after the equipment has been used and field-decontaminated at least once. Equipment blanks should be prepared by filling or rinsing the precleaned equipment with analyte-free water and

collecting the rinsate in the appropriate sample containers. The samples should be labeled, preserved, and filtered (if required) in the same manner as the environmental samples. Equipment blanks should be analyzed for all the analytes for which the environmental samples are being analyzed. Decontamination of the equipment following equipment blank procurement is not required.

7. All QA/QC samples should be submitted to the analytical laboratory with unique sample numbers. Therefore, the QA/QC samples should be labeled as separate environmental samples following the same numbering scheme used during that particular sampling event. However, the QA/QC samples should be clearly identified on WSP's copy of the chain-of-custody form and in the field logbook.

Standard Operating Procedure – 26

Managing Investigation Derived Waste

Application:

The purpose of this SOP is to provide instructions for handling, storing, and sampling Investigation Derived Waste (IDW) pending disposal. *All IDW should be handled as hazardous waste unless information exists which would allow it to be classified as non-hazardous waste.* IDW generated during a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response action must be managed in compliance with applicable or relevant and appropriate requirements (ARARs) to the extent practicable and with applicable requirements of the CERCLA offsite policy. (EPA Guidance Document OERR Directive 9345.3-02)

IDW includes soil cuttings, development water, purge water, drilling fluids, decontamination fluids, personal protective equipment, and sampling equipment.

Materials:

Non-Hazardous and Hazardous Waste Labels
Investigation Derived Waste Log (Figure 1)
Permanent Ink Marking Pen Paint Stick/Pen
Sampling Equipment (Refer to Sampling SOPs)
Sample Jars
Chain of Custody Forms
Cooler

Procedure:

Hazardous IDW

1. All IDW should be handled as hazardous waste unless information exists which would allow it to classified as non-hazardous waste. New or existing site data (i.e., soil and groundwater results) and generator knowledge can be used to classify the IDW.

If site data or generator knowledge indicates that the IDW is determined to be hazardous the following procedures will apply:

- The IDW must be placed in DOT approved containers (55-gallon drum, roll-off container, or temporary storage tank).
- The containers must remain closed except when adding, sampling, or inspecting the material.
- All containers must be labeled with the words "Hazardous Waste".
- An accumulation start date and the contents of the container must be included on the label.
- Investigation Derived Waste Logs (Figure 1) must be completed before leaving the site. One copy of the log should be presented to the site contact and the original provided to the project manager. Once the material has been removed from the site, the IDW log should be stamped "Removed" and placed in the project file.

- The IDW containers must be stored in a secure onsite location (facility hazardous waste storage area if one exists).
- Disposal of the IDW must be completed within **90 days** of the date the waste was generated. If the facility is a small quantity generator, 180 days is allowed for shipment of the waste offsite.
- Onsite disposal may be allowed or appropriate under certain conditions. Refer to OERR Directive 9345.3-02 for guidance, especially for CERCLA sites.
- WSP personnel should notify the site contact that weekly inspections of the IDW must be conducted and documented.
- WSP personnel should also instruct the site contact that this waste must be included in the facilities annual or biannual reports.

2. If the IDW is presumed to be hazardous and sampling is required to confirm its classification, it should be labeled Hazardous Waste-Pending Analysis. The waste should be sampled before leaving the site (See sampling SOPs). It should be noted that EPA methods 8260 and 8270 may be more cost effective than running the full Toxicity Characteristic Leaching Procedure (TCLP) scan. TSD Facilities will usually specify the required analysis for their waste profiles.

Non-Hazardous IDW

1. If information exists to classify the IDW as non-hazardous waste, the following procedures can be implemented:

Soil Cuttings

- Spread around the borehole or other onsite location with the approval of facility personnel
- Place back in the boring
- Containerize and dispose offsite

Groundwater

- Pour onto ground next to well to allow infiltration
- Containerize and dispose offsite
- Discharge to POTW with approval of facility personnel
- Discharge to onsite wastewater treatment plant with approval of facility personnel

Decontamination Fluids

- Pour onto ground (from containers) to allow infiltration
- Containerize and dispose offsite
- Discharge to POTW with approval of facility personnel
- Discharge to onsite wastewater treatment plant with approval of facility personnel

PPE

- Double bag and deposit in site dumpster
- Containerize and dispose offsite

If the IDW is containerized and is non-hazardous, the following procedures will apply:

- The non-hazardous IDW must be placed in DOT approved containers (55-gallon drum, roll-off container, or temporary storage tank).
- The containers should remain closed except when adding, sampling, or inspecting the material.
- All containers must be labeled with the words "Non-Hazardous Waste".
- An accumulation date and the contents of the container should be included on the label.
- Complete the IDW log (Figure 1). One copy of the log should be presented to your site contact and the original should be given to the project manager.
- The IDW containers must be stored in a secure onsite location.
- Arrangements for disposal *should* be completed within 90 days of the accumulation start date.

Investigation Derived Waste Log

Date: _____

Site Information

Site Name: _____ Site EPA ID #: _____

Site Contact: _____ Site Address: _____

Contact Telephone No: _____

Waste Identification

Type of Waste Generated (check one of the following):

☐ Soil Cuttings ☐ PPE ☐ Decontamination Water

☐ Groundwater ☐ Storm Water ☐ Drilling Fluids

☐ Other (Describe): _____

Field Activities that generated the Waste:

☐ Soil Borings ☐ Well Sampling ☐ Well Installation

☐ Decon ☐ Excavation ☐ Pumping Tests

☐ Other (Describe): _____

Generation Date: _____ ***90-Day Deadline***: _____

Quantity of Waste Generated and Container Type: _____

_____

_____

Storage Location: _____

Waste Identification (Check One of the Following);

☐ Non Hazardous Waste (pending analysis)
☐ Non Hazardous Waste (based on site information or generator knowledge)
☐ Hazardous Waste (pending analysis)
☐ Hazardous Waste (based on site information or generator knowledge)

If generator knowledge or site information was used for identification, explain: _____

_____

_____

Type of Label Applied to Container: ☐ Non Haz ☐ Hazardous ☐ PCB ☐ Used Oil

WSP Information (Note: One copy to site contact - the original in project file)

Personnel/Contact: _____ Project No.: _____

Telephone: _____

Appendix C – Interstitial Pore Water Preparation Procedure

STANDARD OPERATING PROCEDURE

AMMONIA AS NITROGEN BY ION SPECIFIC ELECTRODE

GEN-350.3
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Approved By: _____ Supervisor — 4/13/07 Date

_____ — 4-13-07 Date

_____ Laboratory Manager — 4/13/07 Date

COPY

COLUMBIA ANALYTICAL SERVICES, INC.
1317 South 13th Avenue
Kelso, Washington 98626

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Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL
NUMBER: _____
Initials: _____ Date: _____

AMMONIA AS NITROGEN BY ION SPECIFIC ELECTRODE

1. SCOPE AND APPLICATION

1.1. This procedure is used to determine Ammonia using Standard Methods 4500-NH_3 D and EPA method 350.3. This method is applicable to the measurement of ammonia in drinking, surface and saline waters, domestic and industrial wastes. The procedure can also be applied to soil/sediment samples by performing a KCl extraction.

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2. SUMMARY OF METHOD

An ammonia selective electrode is used to determine the concentration of ammonia in water samples or in a KCl extract of a soil sample. Soil and sediment samples are extracted with 2M KCL using a wrist action shaker and extracts analyzed using the water procedure. Known additions are used for the quantitation of ammonia in the sample.

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3. DEFINITIONS

3.1. Laboratory Control Sample (LCS) - a solution prepared in the laboratory which goes through all steps of the analysis that a sample does, and is used to determine if the analysis is in control.

3.2. Method Blank (MB) - a solution of the laboratory prepared deionized water that is carried through analysis like a sample, to serve as a measure of contamination associated with laboratory storage, preparation, or instrumentation.

3.3. Continuing calibration verification standard (CCV) - a solution prepared in the laboratory at approximately the midpoint of calibration curves. CCV's are analyzed to verify that the instrument performance has not changed during the course of the analytical run.

3.4. Continuing calibration blank (CCB) - a blank solution of deionized water. CCB's are analyzed to verify that the instrument has not become contaminated during the course of the analytical run.

3.5. Sample Duplicate - a second aliquot of a sample that is treated exactly the same throughout laboratory analytical procedures. The purpose is to verify the precision

associated with the laboratory procedures. The Relative Percent Difference (RPD) should not exceed 20%.

3.6. Matrix Spike - aliquots of sample to which known amounts of an analyte of interest has been added. These are treated exactly the same throughout laboratory analytical procedures. The purpose of a matrix spike is to determine whether the sample matrix contributes bias to the analytical results.

3.7. Analytical Run Sequence - Samples are analyzed in a set referred to as an analysis sequence. The sequence begins with the instrument calibration or calibration verification followed by samples interspersed with calibration standards. The sequence [illegible]

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4. INTERFERENCES

Volatile amines act as a positive interference. Mercury interferes by forming a strong complex with ammonia. Samples that form a precipitate upon the addition of sodium hydroxide will block the pores on the gas-permeable membrane causing a negative interference, unless the NaOH/EDTA solution is used.

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5. SAFETY

5.1. All appropriate safety precautions for handling solvents, reagents and samples must be taken when performing this procedure. This includes the use of personnel protective equipment, such as, safety glasses, lab coat and the correct gloves.

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

5.3. Sodium Hydroxide (NaOH) is a strong caustic and a severe health and contact hazard. Use nitrile or latex gloves while handling pellets or preparing solutions.

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION AND STORAGE

6.1. Sample containers may be of plastic material or of pyrex glass. Collect a minimum of 50mL of sample, preferably 500 mL.

6.2. Samples may be preserved with 2 mL of concentrated H_2SO_4 per liter. Store samples in refrigerator at 4 ± 2°C. Samples should be analyzed within 28 days of sampling.

6.3. Soil samples

6.3.1. Samples should be collected in glass jars and stored in a field-moist condition. Ammonia may be lost by volatilization due to drying or thawing.

6.3.2. Extraction is to be performed within 7 days of sampling. If not analyzed within 48 hours of extraction, extracts may be preserved with 9N sulfuric acid and stored for up to 28 days until analysis.

7. APPARATUS AND EQUIPMENT

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7.2. Ammonia-specific electrode, Orion or equivalent.

7.3. 150 mL Beakers

7.4. Volumetric Flasks

7.5. Stir Plate and stir bars

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7.6. 250 mL Plastic Sample

7.7. Wrist action shaker

8. REAGENTS

8.1. 10 N NaOH (400g/L)

8.2. 1,000 mg/L NH_4Cl (3.819g NH_4Cl/L)

8.3. 100 mg/L NH_4Cl (Dilute 10.0 mL of 1,000 mg/L NH_4Cl to 100 mL)

8.4. 10 mg/L NH_4Cl (Dilute 1.0 mL of 1,000 mg/L NH_4Cl to 100 mL)

8.5. Distillation receiving solution - 0.04N H_2SO_4

8.6. NaOH/EDTA Solution, 10N – Dissolve 400g NaOH in 800mL of reagent water. Add 45.2g of ethylenediaminetetraacetic acid, tetrasodium salt, tetrahydrate ($Na_4EDTA \cdot 4H_20$) and stir to dissolve. Cool and dilute to 1000mL.

9. PREVENTIVE MAINTENANCE

Preparation of the electrode is described in the Procedure section below. No specific maintenance steps are needed other than normal cleaning and inspection of the electrodes and apparatus.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to complete all documentation required for data review. Analysis and interpretation of the results are performed by personnel in the laboratory who have demonstrated the ability to generate acceptable results utilizing this SOP. This demonstration is in accordance with [illegible] ormed [illegible]

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10.2. It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in the *SOP for Documentation of Training* is also the responsibility of the department supervisor/manager.

11. PROCEDURE

Note: The distillation described in EPA Method 350.2 is required for all non-SDWA regulatory samples (e.g. NPD[illegible] is not needed, skip to 11.3.

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11.1. Water sample distillation

11.1.1. Sample Dechlorination - If the water sample contains residual chlorine, add a dechlorination agent, such as sodium thiosulfate or ascorbic acid, to the sample. Check for residual chlorine by placing a drop of sample on potassium-iodide test paper. Samples should be dechlorinated at the time of collection.

11.1.2. Adjust the pH of a 50-ml sample aliquot to pH 9.5. Add 6 N NaOH dropwise, with mixing, to the sample to adjust the sample pH to 9.5. Check the sample pH with a narrow range pH paper. Add 2.5 ml borate buffer solution; mix sample. Check pH and re-adjust sample to final pH of 9.5 if necessary.

11.1.3. Place the pH adjusted sample in a boiling tube. Add 2-3 micro-porous boiling stones. Assemble the distillation apparatus in the heater block.

11.1.4. Place 5.0 ml of receiving solution (0.04N H2SO4 solution) in a 50 mL centrifuge tube. Place the centrifuge tube in the base slot of the heating block. Select the receiver solution according to analysis method to be used on distillate.

11.1.5. Place the condenser stem in the centrifuge tube, slide cylinder and stem under condenser, and connect stem to condenser with WestClip. When assembled, the condenser tip of the distillation apparatus will be submerged in the receiving solution contained in the centrifuge tube.

11.1.6. Heat the distillation apparatus - Set heater block temperature controls to the following settings:

RATE1:	15 °C/min	RATE2:	0
TEMP1:	210 °C	TEMP2:	210°C
TIME1:	2.0 Hours (max)	TIME2:	0

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11.1.7. Collect a minimum of 20 ml if distillate.

11.1.8. Discontinue heating. Remove the stopper from the top of the "T"-joint. The stopper removal is needed to prevent the collected distillate from being sucked back into the apparatus during cooling.

11.1.9. Disconnect the stem from the condenser. Remove the graduated cylinder from the apparatus and the collected sample to final volume of 50 ml with deionized water.

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11.2. Soil extraction

11.2.1. Place 20 grams of soil into a 100 mL graduated cylinder. Take to a 50 mL volume with 2 M KCl . Transfer to a 250 mL plastic bottle. Rinse the graduated cylinder with 25 mL of 2 M KCl to remove any remaining soil. Transfer the rinse to the 250 mL bottle.

11.2.2. Shake the bottle on a wrist action shaker for one hour. Remove from shaker and transfer the extract to a centrifuge tube. Centrifuge for approximately 10 minutes.

11.2.3. Filter the extract solution through a glass fiber filter gravimetrically.

11.2.4. If the extract cannot be analyzed within 48 hours, add 0.1 mL/100 mL of extract of 9 N sulfuric acid to the filtered extract, bring the pH < 2.

11.3. Initial Instrument Set Up – Fisher Accumet 50

11.3.1. Push "set up."

11.3.2. Push "5" (ISE Method), then "Enter."

11.3.3. Push "3" (KA/KS Variable), then "Enter."

11.3.4. Push "clear" to back out of the set up screen.

11.4. Calibration

11.4.1. Prepare 10 mg/L and 100 mg/L standard solutions from 1,000 mg/L NH4Cl stock solution.

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[illegible] late. [illegible] the [illegible]

11.4.3. Push "standardize," "2" (Clear existing standards), then "standardize," "1" (update or add standard).

11.4.4. Push "100," for standard concentration, "enter" and "enter."

11.4.5. When mv reading reaches 180, add 1 ml of 10N NaOH and let stabilize (approximately [illegible] er."

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11.4.6. Put 50 mls of [illegible] eaker and set it on the stir plate. Insert ammonia electrode into the solution, making sure no bubbles cling to the membrane. Stir solution slowly.

11.4.7. Push "standardize," "1" (Update or add standard).

11.4.8. Push "10," for standard concentration, "enter" and "enter."

11.4.9. When mv reading reaches 180, add 1 ml of 10N NaOH and let stabilize (approximately 30 to 50 mv), then press "enter." Record this value on the benchsheet.

11.4.10. Push "slope/eff" and record both slope and % efficiency. Efficiency must be greater than or equal to 95%, otherwise recalibrate. The slope will vary depending on the temperature (usually -57 to -59 mv). The instrument then determines concentration based on this calibration.

11.4.11. Replace the 10 standard and the slope values in the mv/apparent concentration spreadsheet in R\Wet\Analysis\TKN\-nh3-tkn.spd and print out this sheet.

11.5. Sample Analysis

11.5.1. Put 50 mls of sample into a 150 ml beaker and set it on the stir plate. Insert ammonia electrode into the solution, making sure no bubbles cling to the membrane. Stir solution slowly.

11.5.2. When the mv reading reaches 180, add 1 ml of 10N NaOH and let mv stabilize, then press "enter." Record this value on the benchsheet. If the presence of solver or mercury is possible, use NaOH/EDTA solution in place of NaOH solution.

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11.5.3. [illegible] mv value [illegible]

11.5.4. Push "ion," enter the concentration of the spiking solution and push "enter." Enter sample volume (50 ml), then "enter."

11.5.5. Add known addition spike, let mv stabilize, then press "enter." Enter value for amount of spike added, then press "enter." Sample result (in solution) will be displayed on the screen. If "The mv change was too small . . ." is displayed rather than a [illegible] a larger spike.

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11.5.6. If sample conc[illegible] te sample appropriately to bring within range.

12. QA/QC REQUIREMENTS

12.1. After the initial calibration of the instrument, the slope is determined and entered into the instrument. The slope will vary depending on the temperature (usually -57 to -59 mV).

12.2. An ICV (Initial Calibration Verification) is analyzed at the start of each analytical batch. The acceptance criteria is ±10%. If outside this limit, the cause of the problem needs to be solved before proceeding.

12.3. An ICB (Initial Calibration Blank) is analyzed following the ICV. It must be less than 0.05 mg/L.

12.4. A CCV (Continuing Calibration Verification) at 10 mg/L is analyzed after the ICB and every ten readings and at the end of the run. It must be ±10%.

12.5. A CCB (Continuing Calibration Blank) is analyzed after each CCV. It must be less than 0.05 mg/L.

12.6. Duplicates and matrix spikes are analyzed at a frequency of 5% (1 in 20 samples).

13. DATA REDUCTION, REVIEW, AND REPORTING

13.1. All data and corrective actions must be recorded, dated, and signed or initialed by the analyst. It is the analyst's responsibility to review analytical data to ensure that all quality control requirements have been met for each analytical run. Results for QC analyses are calculated and recorded as specified above. Average, RPD, and buffer level are entered on the benchsheet for corresponding samples. All data will be initialed, dated and attached to required data quality worksheet.

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13.2. The solution concentration is taken directly from the meter. No calculation is necessary [illegible] The results are transferred to the appropriate report form located in the CAS network directory R:\WET\WIP. These forms are made from templates located in R:\WET\FORMS.

13.4. Refer to the SOP for Laboratory Data Review Process for general guidelines for data review.

13.5. Reporting

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13.5.1. Report results [illegible] n.

13.5.2. The method reporting limit is 0.05 mg/L.

13.5.3. Report results in 3 significant figures.

13.5.4. Round results to the nearest 0.01 unit.

14. CONTENGENCIES FOR HANDLING OUT-OF-CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for Nonconformity and Corrective Action for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for Report Generation or in project-specific requirements.

15. METHOD PERFORMANCE

15.1. Refer to the reference method for additional method performance data available.

15.2. The method detection limit (MDL) is established using the procedure described in the SOP for *The Determination of Method Detection Limits and Limits of Detection* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents and reagents used to perform this method wherever technically sound, feasibly possible, and within method requirements.

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17. WASTE MANAGEMENT

17.1. The laboratory will comply with all Federal, State, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the laboratory Safety Manual, Sections 6 and 7.

17.2. This method uses a b[illegible] the sewer system and to the environment. All was[illegible] of 2.5-12 prior to disposal down the drain. The neutra[illegible]dous waste treatment and must be documented on the treatment by generator record. See the CAS EH&S Manual for details.

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18. REFERENCES

18.1. *Nitrogen, Ammonia (Potentiometric, Ion Selective Electrode),* Method 350.3, Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79-020, Revised March 1983.

18.2. *Nitrogen, Ammonia (Colorimetric, Titrimetric, Potentiometric Distillation Procedure),* Method 350.2, Methods for Chemical Analysis of Water and Wastes, EPA/600/4-79-020, Revised March 1983.

18.3. Method 4500-NH_3 D, *Standard Methods for the Examination of Water and Wastewater*, 20th Ed.

Appendix C – Phenols Preparation SOP (EPA Method 8270C)

STANDARD OPERATING PROCEDURE

SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS
EPA Method 8270C

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Approved By: _____ Supervisor 7/1/09 Date

_____ 7/9/09 Date

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_____ Laboratory Manager 7/9/09 Date

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Kelso, Washington 98626

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Annual review of this SOP has been performed and the SOP still reflects current practice.
Initials: _____ Date: _____
Initials: _____ Date: _____
Initials: _____ Date: _____

DOCUMENT CONTROL
NUMBER: _____
Initials: _____ Date: _____

SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS
Method 8270C

1. SCOPE AND APPLICATION

1.1. This procedure is used to determine the concentrations of Semi-Volatile Organic Compounds in water and soil using EPA Method 8270C. This procedure may also be applicable to various miscellaneous waste samples. Tables 1 and 1A indicate compounds that may be determined by this method and lists their method reporting limits (MRLs) in water and soil. Equivalent nomenclature for MRL includes Estimated Quantitation Limit (EQL), Reporting Limit (RL), Practical Quantitation Limit (PQL), and Reporting Quantitation Limit (RQL). The MRLs are based on the analysis of clean matrices using the prescribed preparation and analytical methods. Method Detection Limits (MDLs) will vary depending on the instrument used and preparation method and may also change slightly as MDL studies are updated.

1.2. This procedure can be used to quantitate most neutral, acidic, and basic organic compounds that are soluble in methylene chloride and capable of being eluted without derivatization as sharp peaks from a gas chromatographic fused-silica capillary column coated with a slightly polar silicone phase. Such compounds include polynuclear aromatic hydrocarbons, chlorinated hydrocarbons and pesticides, phthalate esters, organophosphate esters, nitrosamines, haloethers, chlorinated hydrocarbons, anilines, pyridines, quinolines, aromatic nitro compounds, and phenols, including nitrophenols. Other compounds than those listed in Tables 1 and 1A may be analyzed. Refer to Section 1 of method 8270C.

2. METHOD SUMMARY

2.1. This method provides Gas Chromatography/Mass Spectrometry (GC/MS) conditions for the detection of Semi-volatile Organic Compounds. Prior to the use of this method, an appropriate sample preparation method must be used to recover the analytes of interest. A 1.0 µL aliquot of the extract is injected into the gas chromatograph (GC). The compounds are separated on a fused silica capillary column. Compounds of interest are detected by a mass selective detector. Identification of the analytes of interest is performed by comparing the retention times of the analytes with the respective retention times of an authentic standard, and by comparing mass spectra of analytes with mass spectra of reference materials. Quantitative analysis is performed by using the authentic standard to produce a response factor and calibration curve, and using the calibration data to determine the concentration of an analyte in the extract. The concentration in the sample is calculated using the sample weight or volume and the extract volume.

2.2. The following compounds may require special treatment when being determined by this method. Benzidine can be subject to oxidative losses during solvent concentration and the

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chromatography for this compound is poor. Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the gas chromatograph; to a chemical reaction in acetone, and can undergo photochemical decomposition. N-nitroso-dimethylamine is difficult to separate from the solvent under the chromatographic conditions described. N-nitroso-diphenylamine decomposes in the gas chromatographic inlet and cannot be separated from diphenylamine. Pentachlorophenol, 2,4-dinitrophenol, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.

3. DEFINITIONS

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3.1. **Analysis Sequence** - Samples are analyzed in a set referred to as an analysis sequence. The sequence [illegible] run. The sequence starts [illegible] injection time.

3.2. **Matrix Spike/Duplicate Matrix Spike Analysis** - In the matrix spike analysis, predetermined quantities of target analytes are added to a sample matrix prior to sample extraction and analysis. The purpose of the matrix spike is to evaluate the effects of the sample matrix on the methods used for the analyses. Samples are split into duplicates, then spiked and analyzed. Percent recoveries are calculated for each of the analytes detected. The relative percent difference between the samples is calculated and used to assess analytical precision.

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3.3. **Standard Curve** - A standard curve which plots concentrations of a known analyte standard versus the instrument response to the analyte.

3.4. **Surrogate** - Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. The purpose of the surrogates is to evaluate the preparation and analysis of samples. These compounds are spiked into all blanks, standards, samples and spiked samples prior to analysis. Percent recoveries are calculated for each surrogate.

3.5. **Method Blank** - The method blank is an artificial sample designed to monitor introduction of artifacts into the process. The method blank is carried through the entire analytical procedure.

3.6. **Continuing Calibration Verification Standard (CCV)** - A mid-level standard injected into the instrument at specified intervals and is used to verify the validity of the initial calibration.

3.7. **Independent Calibration Verification Standard (ICV)** - A mid-level standard injected into the instrument after the calibration curve from a different source than the standards in the curve and is used to verify the validity of the initial calibration.

4. INTERFERENCES

4.1. Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Determine if the source of interference is in the preparation of the samples. Corrective action should be taken to eliminate the interferences.

4.2. Accurate determination of phthalate esters can pose difficulties when using this methodology. Common flexible plastics contain varying amounts of phthalates. These phthalates are easily extracted or leached from such materials during laboratory operations. Cross contamination of clean glassware may occur when plastics are handled during extraction steps, especially when solvent-wetted surfaces are handled. Interferences from [illegible] exhaustive [illegible]

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4.3. Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed out between samples with solvent. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of solvent to check for cross contamination.

5. SAFETY

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5.1. All appropriate safety [illegible] its, reagents and samples must be taken when performing [illegible] the use of personal protective equipment, such as, safety glasses, lab coat and the correct gloves.

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

5.3. This method uses Methylene Chloride, a known human carcinogen. Viton brand gloves should be used while rinsing, pouring or transferring the solvent

6. SAMPLE COLLECTION, CONTAINERS, PRESERVATION, AND STORAGE

6.1. Containers used to collect samples should be purchased pre-cleaned. Alternatively, containers used to collect samples for the determination of semivolatile organic compounds may be soap and water washed followed by methanol (or isopropanol) rinsing. The sample containers should be of glass or Teflon and have screw-top covers with Teflon liners. In situations where Teflon is not available, solvent-rinsed aluminum foil may be used as a liner. Highly acidic or basic samples may react with the aluminum

foil, causing eventual contamination of the sample. Plastic containers or lids may not be used for the storage of samples due to the possibility of sample contamination from the phthalate esters and other hydrocarbons within the plastic.

6.2. Sample containers should be filled with care so as to prevent any portion of the collected sample coming in contact with the sampler's gloves, thus causing contamination. Samples should not be collected or stored in the presence of exhaust fumes. If the sample comes in contact with the sampler (e.g., if an automatic sampler is used), run reagent water through the sampler and use the rinseate as a field blank.

6.3. Water and soil samples must be iced or refrigerated at 4 ± 2°C from time of collection until extraction.

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[illegible] analyzed within 40 days following extraction. Extracts are stored at -10°C.

7. APPARATUS AND MATERIALS

7.1. Gas Chromatograph/Mass Spectrometer System

7.1.1. Gas Chromatograph - An analytical system complete with a temperature-programmable [illegible] splitless injection and all required accessories, incl[illegible] ns, and gases. The capillary column should be direc[illegible]

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7.1.2. Column: ZB-5MS with Guardian - 30 m x 0.25 mm ID x 0.25 µm film thickness silicone-coated fused-silica capillary column. Catalog #7HG-G010-11-GGA, or equivalent.

7.1.3. Mass Spectrometer - Capable of scanning from 35 to 500 amu every 1 second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode. The mass spectrometer must be capable of producing a mass spectrum for decafluorotriphenylphosphine (DFTPP) which meets all of the criteria in Table 2 when 1.0 µL of the GC/MS tuning standard is injected through the GC (50 ng of DFTPP).

7.1.4. GC/MS Interface - Any GC-to-MS interface that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria may be used.

7.1.5. Data System - A computer system must be interfaced to the mass spectrometer. The system must allow the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic

program. The computer must have software that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundances in any EICP between specified time or scan-number limits. The most recent version of the EPA/NIST Mass Spectral Library should also be available.

7.2. Appropriate analytical balance (0.0001 g), volumetric flasks, syringes, vials, and bottles for standards preparation.

8. STANDARDS, REAGENTS, AND CONSUMABLE MATERIALS

[illegible] Solvents [illegible]

8.2. Stock Standard Solutions (See Table 3)

8.2.1. Commercially prepared stock standards are typically used when available at a concentration of 1000 ug/ml or more. They must be A2LA or ISO9000 certified by the manufacturer. Standard concentrations can be verified by comparison versus an independently prepared standard. Alternatively, prepare stock standard solutions at a concentration o[illegible]00 g of reference material in methylene chlor[illegible] diluting to volume in a 10mL volumetric flask[illegible] at the convenience of the analyst. When compou[illegible] or greater, the weight can be used without correction to calculate the concentration of the stock standard.

8.2.2. Transfer the stock standard solutions into Teflon-sealed screw-cap bottles. Store at -10°C and protect from light, or store as recommended by the manufacturer. Stock standards should be checked frequently for signs of degradation or evaporation, especially just prior to preparing calibration standards from them.

8.2.3. Stock standard solutions must be replaced after one year, or sooner, if comparison with check standards or samples indicates a problem.

8.3. Internal Standard Solutions (See Table 3) - The internal standards are 1,4-dichlorobenzene-d_4, naphthalene-d_8, acenaphthene-d_{10}, phenanthrene-d_{10}, chrysene-d_{12}, and perylene-d_{12} (See Table 4 for corresponding compounds). The nominal concentration of the standard is 4000 ng/μL. Each 1 ml of sample extract undergoing analysis should be spiked with 10 μL of the internal standard solution, resulting in a concentration of 40 ng/μL of each internal standard. Store at -10°C or less when not being used. When using premixed certified solutions, store according to the manufacturer's recommendations.

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8.4. GC/MS Tuning Standard (See Table 3) - A methylene chloride solution containing 50 ng/µL of decafluorotriphenylphosphine (DFTPP). The standard should also contain 50 ng/µL of benzidine, DDT, and pentachlorophenol, to verify injection port inertness and GC column performance. Store at -10°C or less when not being used, or store according to the manufacturer's recommendations.

8.5. Calibration Standards (See Table 3)

8.5.1. A minimum of five initial calibration standards should be prepared from stock solutions. One of the calibration standards should be at a concentration at or below the method reporting limit; the others should correspond to the range of concentrations found in real samples, but should not exceed the working range of [illegible] Each 1 ml aliquot of calibration standards should be spiked with 10 µL of the internal standard solution prior to analysis. All calibration standards should be stored at -10°C or less and should be freshly prepared once a year, or sooner if check standards indicate a problem.

8.5.2. The daily calibration standard (CCV) is prepared at a nominal 50 ng/µL concentration from stock solutions. The CCV is prepared weekly and can be stored at 4°C ± 2°C, o[illegible] acturer. The DFTPP standard may be combined wit[illegible] ng/µL concentration) providing tuning verificati[illegible] an be done without interferences.

8.6. QC Standards (See Table 4)

8.6.1. Surrogates: Prepare a working solution in methanol containing 2-fluorophenol, phenol-d6, and 2,4,6-tribromophenol at 150 ng/µL and nitrobenzene-d5, 2-fluorobiphenyl, and terphenyl-d14 at 100 ng/µL. Aliquots of the solution are spiked into all extracted samples, blanks, and QC samples according to the extraction SOP used.

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8.6.2. Matrix Spike Standards: Prepare a working solution in methanol containing all target analytes to be reported ("full list spike") at 100 ng/µL. Aliquots of the solution are spiked into the selected QC aliquots according to the extraction SOP used.

Note: The spiking level of surrogate and spike may need to be adjusted according to project requirements, if dilutions are expected due to high levels of extracted components, or if a lower calibration range is used.

9. PREVENTIVE MAINTENANCE

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9.2. Carrier gas - Inline purifiers or scrubbers should be in place for all sources of carrier gas. These are selected to remove water, oxygen, and hydrocarbons. Purifiers should be changed as recommended by the supplier.

9.3. Gas Chromatograph

9.3.1. Whenever GC maintenance is performed, care should be taken to minimize the introduction of air or oxygen into the column. Injection port maintenance includes changing the inj[illegible] -ring, septum, column ferrule, and autosampler syr[illegible] s should be changed when recent sample analyses pred[illegible] ographic performance. In some cases liners and seals may be cleaned and re-used.

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9.3.2. Clipping off a small portion of the head of the column often improves chromatographic performance. When cutting off any portion of the column, make sure the cut is straight and "clean" (uniform, without fragmentation) by using the proper column cutting tool.

9.3.3. Over time, the column will exhibit poorer overall performance, as contaminated sample matrices are analyzed. The length of time for this to occur will depend on the samples analyzed. When a noticeable decrease in column performance is evident and other maintenance options do not result in improvement, the column should be replaced. This is especially true when evident in conjunction with calibration difficulties.

9.4. Mass Spectrometer

9.4.1. Tune the MS as needed to result in consistent and acceptable performance while meeting the required ion abundance criteria given in section 11.

9.4.2. For units under service contract, certain maintenance is performed by instrument service staff, including pump oil changed, vacuuming boards, etc., as recommended by the manufacturer.

9.4.3. MS source cleaning should be performed as needed, depending on the performance of the unit. This may be done by the analyst or by instrument service staff.

10. RESPONSIBILITIES

10.1. It is the responsibility of the analyst to perform the analysis according to this SOP and to [illegible] all [illegible] required for data [illegible] the [illegible] ty to [illegible] with the training program of the laboratory. Final review and sign-off of the data is performed by the department supervisor/manager or designee.

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10.2. It is the responsibility of the department supervisor/manager to document analyst training. Documenting method proficiency, as described in the Sop for Documentation of Training, is also the responsibility of the department supervisor/manager.

11. PROCEDURE

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11.1. Sample Preparation

11.1.1. Water samples

11.1.1.1. Water samples are prepared using continuous liquid-liquid extraction and EPA method 3520C. Refer to the CAS SOP EXT-3520. In some circumstances, such as rush samples or for TCLP leachates, samples may be prepared using separatory funnel procedures (EPA 3510C). Refer to the CAS SOP EXT-3510.

11.1.1.2. Perform the extraction on a 1000mL aliquot of sample. For TCLP leachates, use 100mL of sample.

11.1.2. Soil, sediment, and solid samples are prepared using the either automated soxhlet extraction (SOP EXT-3541) or ultrasonic extraction (SOP EXT-3550). The nominal sample size is 30g. Sample amounts may be decreased in the case of high-concentration waste samples.

11.1.3. Product samples are prepared using EPA method 3580.

11.1.4. Extracts may be screened by GC/FID (SOP SOC-SCR). Cleanup by GPC is optional.

11.1.5. Following sample preparation, sample extracts are then transferred to the extract cold storage unit. Extracts must be analyzed within 40 days of extraction.

11.2. The recommended GC/MS operating conditions are listed below. The GC conditions may be modified to accommodate specific instrument models and configurations.

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Mass range:	35-500 amu		
S[illegible]	[illegible]		
I[illegible]	[illegible]		
I[illegible]	[illegible]		
Final temperature:	300°C, hold until benzo[g,h,i]perylene has eluted		
Injector temperature:	250-300°C		
Detector interface temp:	300°C		
Injector:	Atas Optic 2, split method		
Final time:	32.0 min.		
Equilibration time:	0.20 min.		
Temperature ramp:	Initial temp	150°C	
	[illegible]	3°C/sec.	
	[illegible]	0°C	
Pressure	[illegible]		10 psi
	[illegible]		1.50 min.
	Initial pressure		8.83 psi
	Final pressure		38.50 psi
Split flow:	3.0mL/min. at initial		
Sample volume:	1.0 µL		
Carrier gas:	helium at 35 cm/sec		

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NOTE: The default calibration procedures are given in the following sections and, at the time of this revision, follow Method 8000B due to inconsistent implementation of 8000C across various states/agencies. The analyst should also refer to the CAS *SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOC-CAL)*, where calibration procedures and policies are described. The calibration procedure(s) and options chosen must follow the CAS protocols.

NOTE: Certain state or program protocols have specific procedures for calibration. This may include all or part of Method 8000C. The analyst must ensure that the correct procedures are used. Known exceptions to 8000B are as follows:

- Arizona DHS requires the use of Method 8000C calibration procedures for projects originating in Arizona and under the AZ DHS lab licensure. Refer to the AZDHS calibration guidance document at the following online location: http://www.azdhs.gov/lab/license/tech/8000cmethod.pdf.
- The use of quadratic regression calibration is not allowed for projects (samples) originating from South Carolina and under the SC DHEC lab certification.

Note: The use of 'averaging' of %RSDs or CCV %D (a.k.a grand mean) is not allowed for projects under the DoD QSM protocols. When working on these projects all analytes must pass the %RSD criteria as stated in the method and the average %RSD cannot be used.

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11.3 Initial Calibration

11.3.1. Prior to calibration, analyze the GC/MS tuning standard using instrument conditions used for calibration. Obtain the spectrum for evaluation using one of the following options:

- Three scans (the peak apex scan and the scans immediately preceding and following the apex) are acquired and averaged. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

- Use one scan at the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

- Use one scan either directly preceding or following the apex of the peak. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

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- Use the average across the entire peak up to a total of 5 scans. Peak integration must be consistent with standard operating procedure. If the peak is wider than 5 scans, the tune will consist of the peak apex scan and the two scans immediately preceding and following the apex. Background subtraction is required, and must be accomplished using a single scan acquired no more than 20 scans prior to the elution of DFTPP. The background subtraction should be designed only to eliminate column bleed or instrument background ions. Do not subtract part of the DFTPP peak or part of any other closely eluting peak.

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11.3.2. Evaluate the spectrum obtained for DFTPP against the criteria in Table 2 (see [illegible] injection port inertness, pentachlorophenol and benzidine should be present at an acceptable level and peak tailing should not be excessive. DDT degradation should not exceed 20%. If excessive tailing, poor chromatography, or degradation of >20% is noted, the injection port may require cleaning. It may also be necessary to remove the first 15-30 cm of the GC column. If hardware tuning criteria can not be met, the source may need cleaning, filaments replaced or other maintenance.

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11.3.3. The internal standards should permit most of the components of interest in the chromatogram [illegible] 1.20 relative to one of the internal standards. Refer [illegible] ds and corresponding analytes assigned for qu[illegible] on from the specific internal standard as the primary ion for quantitation (See Table 1 of EPA 8270C). If interferences are noted, use the next most intense ion as the quantitation ion (i.e. for 1,4-dichlorobenzene-d_4, use 152 m/z for quantitation).

11.3.4. Analyze 1.0 µL of each calibration standard (containing internal standards) and tabulate the area of the primary characteristic ion against concentration for each compound (as indicated in Table 1 of EPA 8270C).

11.3.5. Establish the retention time window position for each analyte and surrogate using the midpoint standard of the initial calibration curve.

11.3.6. Calculate response factors (RFs) for each compound relative to one of the internal standards as follows:

$RF = (A_x C_{is})/(A_{is} C_x)$

where:

A_x = Area of the characteristic ion for compound being measured.
A_{is} = Area of the characteristic ion for specific internal standard.
C_{is} = Concentration of the specific internal standard (ng/µL).
C_x = Concentration of the compound being measured (ng/µL).

11.3.7. A system performance check must be performed to ensure that minimum average RFs are met before the calibration curve is used. For semivolatiles, the System Performance Check Compound (SPCCs) are: N-nitroso-di-n-propylamine; hexachlorocyclopentadiene; 2,4-dinitrophenol; and 4-nitrophenol. The minimum acceptable average RF for these compounds is 0.050. The SPCCs typically have very low RFs (0.1-0.2) and tend to decrease in response as the chromatographic system begins to deteriorate or the standard material begins to deteriorate. They are usually the first to show poor performance. Therefore, they must meet the minimum requirement when the system is calibrated. If they are not acceptable, perform GC maintenance (see section 9.3).

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11.3.8 [illegible] each [illegible] compound [illegible] 0.[illegible] relative retention time of each compound in each calibration run should agree within 0.06 relative retention time units.

$$\%RSD = \frac{SD}{\overline{RF}} \times 100$$

where:

RSD = [illegible] on.

$\overline{RF}$ = [illegible] a compound.

SD = [illegible] erage RFs for a compound.

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$$SD = \sqrt{\sum_{i=1}^{N} \frac{(RF_i - \overline{RF})^2}{N - 1}}$$

where:

RF_i = RF for each of the 5 calibration levels

N = Number of RF values (i.e., 5)

Calibration Check Compounds (CCC):

Base/Neutral Fraction	Acid Fraction
Acenaphthene	4-Chloro-3-methylphenol
1,4-Dichlorobenzene	2,4-Dichlorophenol
Hexachlorobutadiene	2-Nitrophenol
(N-Nitroso)-diphenylamine	Phenol
Di-n-octyl phthalate	Pentachlorophenol
Fluoranthene	2,4,6-Trichlorophenol
Benzo(a)pyrene	

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11.3.9. [illegible] the chromatographic system is too reactive for analysis to begin. Clean or replace the injector liner and/or capillary column, then repeat the calibration procedure.

11.3.10. Linearity - If the % RSD of any compound is 15% or less, then the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation.

11.3.11. In those instances [illegible] more analytes exceeds 15%, the initial calibration [illegible] following conditions are met:

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- The mean of the RSD values for all analytes in the calibration is < 15%.
- The mean RSD criteria applies to all target analytes in the calibration standards, regardless of whether or not they are of interest for a specific project.
- The data user must be supplied with an initial calibration summary indicating the compounds which exceed 15% RSD and the result of the mean RSD calculation.

Note: The use of 'averaging' of %RSDs or CCV %D (a.k.a grand mean) is not allowed for projects under the DoD QSM protocols. When working on these projects all analytes must pass the %RSD criteria as stated in the method and the average %RSD cannot be used.

11.3.12. If all of the conditions in Section 11.3.9 are met, then the average response factor may be used to determine sample concentrations as described in Section 11.3.8.

11.3.13. Following initial calibration, analyze an ICV standard. The ICV solution must contain all analytes in the calibration standards. Calculate the concentration using the typical procedure used for quantitation. Calculate the percent difference (%D) from the ICV true value. Evaluate the ICV as described in the CAS Organics Calibration SOP.

Note: DoD project acceptance criteria is ±20% of true value.

11.4. Continuing Calibration

11.4.1. A calibration standard, or standards, at mid-concentration (See Table 3) containing all semivolatile analytes, DFTPP, and all required surrogates, must be analyzed every 12 hours during analysis.

11.4.2. The DFTPP must result in a mass spectrum (see 8270C, Section 7.3.1 for guidance) that meets the criteria given in Table 2. These criteria must be demonstrated during each 12 hour shift. Obtain the DFTPP spectrum as described in section 11.3.1.

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Note: When analyzing samples subject to Wisconsin DNR regulations, a second [illegible] One [illegible] where the curve can no longer be characterized as first order.

11.4.3. The retention time may be updated for all analytes and surrogates using the CCV standard to account for minor fluctuations or after routine system maintenance.

11.4.4. System Performance Check Compounds (SPCCs): For each daily calibration, a system performance check must be made. For each SPCC compound in the daily calibration standard, a minimum response factor of 0.050 must be obtained. This is the same check [illegible] calibration. If the minimum response factors are not [illegible] ed, and corrective action must be taken before sa[illegible] um RF for semivolatile SPCCs is 0.050. Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system. This check must be met before analysis begins.

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11.4.5. Calibration Check Compounds (CCCs): After the system performance check, CCCs listed in Section 11.3.6 are used to check the validity of the initial calibration.

Calculate the percent drift using:

$$\% \, Drift = \frac{C_t - C_m}{C_t} \, x \, 100$$

where:

C_t = Calibration Check Compound standard concentration.

C_m = Measured concentration using selected quantitation method.

If the percent drift for each CCC is less than or equal to 20%, the initial calibration is assumed to be valid. If the criterion is not met (> 20% drift) for any one CCC, corrective action must be taken. Problems similar to those listed under SPCCs could affect this criterion. If no source of the problem can be determined after corrective action has been taken, a new five-point calibration must be generated. This criterion must be met before sample analysis begins. If the % RSD for non-CCC compounds exceeds 30%, the analyst must determine if the response is sufficient to attain MRL for that analyte and any hits for that analyte must be rerun for quantitation.

Note: DoD acceptance criteria is ± 20% from true value for all target compounds and surrogates in the CCV.

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11.[illegible] standard [illegible] time [illegible] seconds from that in the midpoint standard of the most recent initial calibration sequence, the chromatographic system must be inspected for malfunctions and corrective action identified, as required. If the EICP area for any of the internal standards changes by a factor of two (50% to 200%) from that in the midpoint standard of the most recent initial calibration sequence, the chromatographic system must be inspected for malfunctions and corrective action identified, as appropriate. When corrective action is taken, reanalysis of samples analyzed while the system was malfunctioning is required. Update the refe[illegible]s in the quantitation database for the instrument meth[illegible] ation average RF or calibration curve is then used in [illegible] analyses.

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11.4.7. A blank (method blank, GPC blank, or solvent blank) should be analyzed after the CCV to prove the system is free of contaminants. If contaminants are found in a method blank or GPC blank, then a solvent blank should be ran to help isolate the source of contamination.

11.5. GC/MS Analysis

11.5.1. Evaluate FID screen and make proper dilution (See FID screening SOP).

11.5.2. Spike the 1 ml extract obtained from sample preparation with 10 µL of the internal standard solution just prior to analysis. Use the same operating conditions as were used for initial calibration.

11.5.3. If the response for any quantitation ion exceeds the initial calibration curve range of the GC/MS system, extract dilution must take place. Additional internal standard must be added to the diluted extract to maintain the required 40ng/µL of each internal standard in the extracted volume. The diluted extract must be reanalyzed.

11.5.4. Store the extracts at -10°C or less, protected from light in vials equipped with unpierced Teflon lined septa. Archive extracts in freezer for 3 months after analysis in the instrument/date specific storage boxes.

12. QA/QC REQUIREMENTS

12.1. Refer to Section 8.0 of Method 8270C for general QC protocol. In addition to instrument criteria for calibration, the ability of each analyst/instrument to generate acceptable accuracy and precision must be documented prior to sample analysis (IPR study). This must be validated before analyses of samples begin, or whenever significant changes to the procedures have been made. To do this, four tap water samples are spiked with each target analyte, extracted, and analyzed. Refer to Method 8270C Section 8.3 for the [illegible]

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12.2.1. A method detection limit (MDL) study must be undertaken before analysis of samples can begin. To establish detection limits that are precise and accurate, the analyst must perform the following procedure. Spike a minimum of seven blank replicates with a MDL spiking solution (at a level below the MRL) for each target analyte, extract, and analyze. The MDL studies should be done for each matrix, prep method, and instrument. Refer to the CAS SOP *for The Determination of Method Detection Limit* [illegible]

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12.2.2. Calculate the av[illegible] in the *sample concentration*, and the standard de[illegible] for each analyte. Calculate the MDL for each analyte using the correct T value for the number of replicates. The MDL study should be done annually.

12.3. Ongoing QC Samples required are described in the CAS-Kelso Quality Assurance Manual and in the SOP for *Sample Batches*. In general, these include:

12.3.1. Method blank - A method blank is extracted and analyzed with every batch of 20 or fewer samples to demonstrate that there are no method interferences. The method blank must demonstrate that interferences from the analytical and preparation steps minimized. No target analytes should be detected above the MRL in the method blank. For some project specific needs, exceptions may be noted and method blank results above the MRL may be reported for common lab contaminants (phthalate esters, etc.).

Note: DoD requires no analytes detected at > ½ the RL or 1/10 the regulatory limit, which ever is grater. For common laboratory contaminates there should be no detection > the RL.

12.3.2. A lab control sample (LCS) must be extracted and analyzed with every batch of 20 or fewer samples. The LCS is prepared by spiking a blank with the matrix

spike solution, and going through the entire extraction and analysis. Calculate percent recovery (%R) as follows:

$$\%R = X/TV \times 100$$

Where X = Concentration of the analyte recovered
TV = True value of amount spiked

Acceptance criteria for lab control samples are listed in Attachment A. The accuracy of the analysis is controlled on a subset of target analytes. If the project analyte list is fewer than 20 analytes, all are considered control analytes. Analytes which are used for control analytes are listed in Table 6. For DoD projects all [illegible] associated samples is required. If any other analyte fails the advisory acceptance limits, the analyst must evaluate the impact on data quality and take any necessary corrective action, which may include re-extraction of the associated samples. Project-specific requirements may require all compounds to be treated as control analytes, or dictate use of project acceptance criteria.

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12.3.3. A matrix spike/duplicate matrix spike (MS/DMS) must be extracted and analyzed with every batch [illegible] MS is prepared by spiking a sample aliquot [illegible] and going through the entire extraction and [illegible] overy (%R) as follows:

$$\%R = \frac{X - X1}{TV} \times 100$$

Where X = Concentration of the analyte recovered
X1 = Concentration of unspiked analyte
TV = True value of amount spiked

Calculate Relative Percent Difference (RPD) as:

$$\%RPD = \frac{R1 - R2}{(R1 + R2)/2} \times 100$$

Where R1 = recovered concentration in the MS
R2 = recovered concentration in the DMS

The acceptance limits for the MS/DMS recovery are given in Attachment A. If the MS/DMS recovery is out of acceptance limits for reasons other than matrix effects, corrective action must be taken. The RPD acceptance limits are 30% for water and 40% for soils, sediments, and solids. Project-specific requirements may dictate the use of project acceptance criteria.

12.3.4. The acceptance limits for the surrogates are given in Attachment A. If any surrogate recovery is outside acceptance criteria, the sample data must be closely evaluated for possible matrix interferences. If none are present, then corrective action must be taken. The sample should be re-analyzed if instrument factors (calibration, injection port) are suspected. If not, re-extraction and re-analysis is required, except in cases of high recovery and no positive hits in the sample for the analyte class represented [illegible]

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[illegible] 5 [illegible] QA [illegible] as [illegible] ng of QC sample results.

13. DATA REDUCTION, REVIEW, AND REPORTING

13.1. Qualitative Analysis - The qualitative identification of compounds determined by this procedure is based on retention time, and comparison of the sample mass spectrum, after background correction, with characteristic ions in a reference mass spectrum. The reference mass spectrum must be generated by the laboratory using the instrument and conditions used for the s[illegible] T[illegible] e[illegible]istic ions from the reference mass spectrum are defined to [illegible] lative intensity, or any ions over 30% relative intensity if less t[illegible] e reference spectrum. Compounds should be identified as present when the criteria below are met.

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13.1.1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion.

13.1.2. The RRT of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

13.1.3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum.

13.1.4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Sufficient GC resolution is achieved if the height of the valley between two isomer peaks is <25% of the sum of the 2 peak heights. Otherwise, structural isomers are identified as isomeric pairs.

13.1.5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks appear to represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important. Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification. When analytes coelute, the identification criteria can be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.

13.2. For samples containing components not associated with the calibration standards, a library [illegible] methe[illegible] 8270[illegible] for [illegible]

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13.3. [illegible]

13.3.1. The GC/MS data stations, in current use, all use the H-P RTE Integrator to generate the raw data used to calculate the standards $\overline{RF_x}$ values, the sample amounts, and the spike values. The software does three passes through each data file. The first two identify and integrate each internal standard and surrogate. The third pass uses the time-drift information from the first two passes to search for all method analytes in the proper retention times [illegible] quantitation ions.

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When $\overline{RF_x}$ is use[illegible] ation as follows:

$$C_{ex} = \frac{(Resp_x)(Amt_{ISTD})}{(Resp_{ISTD})(\overline{RF_x})}$$

Where: C_{ex} = the concentration in the sample extract (ppm);
$Resp_x$ = the peak area of the analytes of interest;
$Resp_{ISTD}$ = the peak area of the associated internal standard;
Amt_{ISTD} = the amount, in ppm, of internal standard added
$\overline{RF_x}$ = the average response from the initial calibration.

13.3.2. The concentration of analytes in the original sample is computed using the following equations:

Aqueous Samples: $$Concentration\ (\mu g / L) = \frac{(Cex)\ (Vf)\ (D)}{(Vs)}$$

Where	Cex	=	Concentration in extract in μg/mL
	Vf	=	Final volume of extract in mL
	D	=	Dilution factor
	Vs	=	Volume of sample extracted, liters

Nonaqueous Samples: $$Concentration\ (mg / Kg) = \frac{(Cex)\ (Vf)\ (D)}{(W)}$$

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	[illegible]	=	[illegible]
	[illegible]	=	[illegible]
	D	=	Dilution factor
	W	=	Weight of sample extracted in grams.

13.4. Data Review

Following primary data interpretation and calculations, all data is reviewed by a secondary analyst. Following generation of the report, the report is also reviewed. Refer to the SOP for *Laboratory Data R[illegible]*

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13.5. Reporting

13.5.1. Reports are generated in the CAS LIMS by compiling the SMO login, sample prep database, instrument, date, and client-specified report requirements (when specified). This compilation is then transferred to a file that the Stealth reporting system uses to generate a report. The forms generated may be CAS standard reports, DOD, or client-specific reports. The compiled data from LIMS is also used to create EDDs.

13.5.2. As an alternative, reports are generated using Excel© templates located in R:\SVM\forms. The analyst should choose the appropriate form and QC pages to correspond to required tier level and deliverables requirements. The detected analytes, surrogate and matrix spikes are then transferred, by hand or electronically, to the templates.

13.5.3. Sample concentrations are reported when all QC criteria for the analysis have been met or the results are qualified with an appropriate footnote. For Arizona projects the appropriate Arizona qualifier must be used.

14. CONTINGENCIES FOR HANDLING OUT-OF- CONTROL OR UNACCEPTABLE DATA

Corrective action measures applicable to specific analysis steps are discussed in the applicable section of this (and other applicable) SOP(s). Also, refer to the SOP for *Nonconformity and Corrective Action* for correct procedures for identifying and documenting such data. Procedures for applying data qualifiers are described in the SOP for *Report Generation* or in project-specific requirements.

15. METHOD PERFORMANCE

15.1. This method was validated through single laboratory studies of accuracy and precision. Fe[illegible]

15.2. [illegible] using the procedure described in the SOP for *the Determination of Method Detection Limits and Limits of Detection* (ADM-MDL). Method Reporting Limits are established for this method based on MDL studies and as specified in the CAS Quality Assurance Manual.

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16. POLLUTION PREVENTION

It is the laboratory's practice to minimize the amount of solvents and reagents used to perform this method wherever technical [illegible] within method requirements. Standards are prepared in volu[illegible] use in order to minimize the volume of expired standards t[illegible] the environment from solvents and/or reagents used in this method may be minimized when recycled or disposed of properly.

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17. WASTE MANAGEMENT

17.1. The laboratory will comply with all Federal, State, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions as specified in the CAS EH&S Manual.

17.2. This method uses Methylene Chloride and any waste generated from this solvent must be placed in the collection cans in the lab. The solvent will then be added to the hazardous waste storage area and recycled off site.

17.3. This method uses non-halogenated solvents and any waste generated from this solvent must be placed in the collection cans in the lab. The solvent will then be added to the hazardous waste storage area and disposed of in accordance with Federal and State regulations.

18. TRAINING

18.1. Training outline

18.1.1. Review literature (see references section). Read and understand the SOP. Also review the applicable MSDS for all reagents and standards used. Following these reviews, observe the procedure as performed by an experienced analyst at least three times.

18.1.2. The next training step is to assist in the procedure under the guidance of an experienced analyst for a period of 3 months. During this period, the analyst is [illegible] with [illegible]

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18.1.3. Perform initial precision and recovery (IPR) study as described above for water samples. Summaries of the IPR are reviewed and signed by the supervisor. Copies may be forwarded to the employee's training file. For applicable tests, IPR studies should be performed in order to be equivalent to NELAC's Initial Demonstration of Capability.

18.2. Training is documente[illegible] *mentation of Technical Personnel Training*.

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18.2.1. NOTE: When [illegible] ted by the supervisor on internal training documentation forms, the supervisor is acknowledging that the analyst has read and understands this SOP and that adequate training has been given to the analyst to competently perform the analysis independently.

19. REFERENCES

19.1. Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, Method 8270C, EPA Test Methods for Evaluating Solid Waste, SW-846, Final Update III, December 1996.

19.2. 8000C Method criteria, Arizona DHS, 2/13/2007. Available online at http://www.azdhs.gov/lab/license/tech/8000cmethod.pdf

19.3. *DoD Quality Systems Manual for Environmental Laboratories* Version 4.1 4/22/09.

CHANGES SINCE THE LAST REVISION

19.4. Sec 11.2 Removed reference to 8000C and SC.
19.5. Sec 11.3.9 Added DoD calibration requirement not allowing use of grand mean in calibrations.
19.6. Sec 11.3.13 Added DoD ICV acceptance criteria.
19.7. Sec 11.4.5 Added DoD CCV acceptance criteria.
19.8. Sec 12.3 Added DoD MB requirements.
19.9. Sec 18 Added training requirements.
19.10. Sec 19 Added DoD reference.
19.11. Sec 11.3.5 Added retention window positioning steps during ICAL.
19.12. Sec 11.4.3 Added retention window positioning step using CCV.

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TABLE 1

SEMI-VOLATILE ORGANIC COMPOUNDS - STANDARD ANALYTE LIST	METHOD REPORTING LIMITS	
Compound	**Water (µg/L)**	**Soil (mg/Kg)**
N-Nitrosodimethylamine	25	2.0
Aniline	25	1.0
Bis(2-chloroethyl) Ether	10	0.33
1,2-Dichlorobenzene	10	0.33
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
N-Nitrosodi-n-propylamine	10	0.33
Hexachloroethane	10	0.33
Nitrobenzene	10	0.33
Isophorone	10	0.33
Bis(2-chloroethoxy)methane	10	0.33
1,2,4-Trichlorobenzene	[illegible]	0.33
Naphthalene	[illegible]	0.33
4-Chloroaniline	[illegible]	0.33
Hexachlorobutadiene	10	0.33
2-Methylnaphthalene	10	0.33
Hexachlorocyclopentadiene	10	0.33
2-Chloronaphthalene	10	0.33
2-Nitroaniline	25	2.0
Dimethyl Phthalate	10	0.33
Acenaphthylene	10	0.33
3-Nitroaniline	25	2.0
Acenaphthene	10	0.33
Dibenzofuran	10	0.33
2,4-Dinitrotoluene	10	0.33
2,6-Dinitrotoluene	10	0.33
Diethyl Phthalate	10	0.33

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TABLE 1 (continued)

SEMI-VOLATILE ORGANIC COMPOUNDS - STANDARD ANALYTE LIST	METHOD REPORTING LIMITS	
Compound	**Water (µg/L)**	**Soil (mg/Kg)**
4-Chlorophenyl Phenyl Ether	10	0.33
Fluorene	10	0.33
4-Nitroaniline	25	2.0
N-Nitrosodiphenylamine	10	0.33
4-Bromophenyl Phenyl Ether	10	0.33
Hexachlorobenzene	[illegible]	[illegible]
Pentachlorophenol	10	[illegible]
Anthracene	10	0.33
Di-n-butyl Phthalate	10	0.33
Fluoranthene	10	0.33
Pyrene	10	0.33
Butylbenzyl Phthalate	10	0.33
3,3'-Dichlorobenzidine	25	2.0
Benz(a)anthracene	10	0.33
Bis(2-ethylhexyl) Phthalate	[illegible]	0.33
Chrysene	10	0.33
Di-n-octyl Phthalate	10	0.33
Benzo(b)fluoranthene	10	0.33
Benzo(k)fluoranthene	10	0.33
Benzo(a)pyrene	10	0.33
Indeno(1,2,3-c,d)pyrene	10	0.33
Dibenz(a,h)anthracene	10	0.33
Benzo(g,h,i)perylene	10	0.33
Phenol	10	0.33
2-Chlorophenol	10	0.33
Benzyl Alcohol	10	0.33
2-Methylphenol	10	0.33
3- and 4-Methylphenol (coeluting cpds)	10	0.33

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TABLE 1 (continued)

SEMI-VOLATILE ORGANIC COMPOUNDS - STANDARD ANALYTE LIST	METHOD REPORTING LIMITS	
Compound	**Water (μg/L)**	**Soil (mg/Kg)**
2-Nitrophenol	10	0.33
2,4-Dimethylphenol	10	0.33
Benzoic Acid	25	2.0
2,4-Dichlorophenol	10	0.33
[illegible]	[illegible]	[illegible]
2,4,6-Trichlorophenol	[illegible]	[illegible]
2,4-Dinitrophenol	25	2.0
4-Nitrophenol	25	2.0
2-Methyl-4,6-dinitrophenol	25	2.0
Pentachlorophenol	25	2.0

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TABLE 3
8270 STANDARDS

CALIBRATION
Recommended: Supelco catalog #(or equivalent from other vendors*):

Equity CLP SVM Mix, 1000 ppm
Equity Cal Mix 4, 2000 ppm
Equity N-Nitrosodiphenylamine, 5000ppm
Equity Benzidines mix, 2000ppm

Accustandard 8270 surrogate mix, 4000ppm

Prepare [illegible]
Calibrat [illegible]
Add 10[illegible]
Place [illegible] 100 µl in autosample vial insert, run, and discard after verifying data is acceptable.
Store in 5 ml amber mininert vials (2-5 ml vials for 10 ml) at -10°C. Expiration is 1 year from date prepared.
Order more solutions when down to one unopened ampule.

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ICV
The ICV standard is prepared from the following Accustandard stock standards or equivalent from other vendors*:
Accustandard CLP-HC-BNR (2000p[illegible]), Z-014ER3 (2000ppm), Z-014F (2000ppm), M-8270-SS (4000ppm), an[illegible]
Add 10 µl internal standard (Z-014J) f[illegible] each [illegible]
Place in autosampler vial, analyze, recap, and refrigerate.
Expiration is 1 year after ICV was prepared or the expiration date of the stock standard whichever is earliest.

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CCV & TUNE
Use the same solutions that were used for the calibration curve and the following:

AccuStandard (recommended) catalog #(or equivalent from other vendors*):

M-625C-3-1000X 1 ml 25 mg/ml DFTPP

Prepare 1 ml of 50 ppm 8270 CCV standard, place in autosample vial and cap with red crimp top. 50ppm is the nominal concentration.
Expiration date is 1 week after CCV was prepared.

RECAP AND STORE IMMEDIATELY AFTER INJECTING
Store remaining stock solutions in 1 ml amber mininert vial. Expiration date is six months after ampule is opened. Order when down to one unopened ampule.

* Vendor must be A2LA and/or ISO9000 certified.

TABLE 4
QC Standards

Supelco Parent	Initial Concentration	Dilution (mixed)*	Final Conc.
8270 Surrogate			
B/N Surrogate Mix (cat no. 86-1377)	5000 ug/mL	20mL to 1000mL in MeOH	100 ug/mL
Acid Surrogate Mix (cat no 86-1376)	10000 ug/mL	15mL to 1000mL in MeOH	150 ug/mL
8270 Matrix Spike (mixed solution)			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
N-Nitroso-diphenylamine (cat no. 46702-U)	5000 ug/mL	2mL to 100mL in MeOH	100 ug/mL
Misc mix (cat no. 86-1148)	2000 ug/mL	5mL to 100mL in MeOH	100 ug/mL
2,3,4,5-Tetrachlorophenol (cat no. 79131)	1000 ug/mL	10mL to 100mL in MeOH	100 ug/mL
1-Methylnaphthalene (cat no. 48162)	2000 ug/mL	5mL to 100mL in MeOH	100 ug/mL
Appendix 9 Mix (cat. no. App-9-186-20x)	[illegible]	[illegible] L in MeOH	100 ug/mL

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Each time the QC standards are prepared, the supervisor should be made aware so that re-ordering can occur to maintain an adequate backup supply.

* For surrogate solution, split the total volume made into 4 bottles for storage and use. To avoid waste, the quantity made can be varied as anticipated for workload. For spike solution, split the total volume into 2 bottles for storage and use.

Standards Expiration: Unopened = 6 months from preparation date. Opened = 3 months from opening, or original 6 months, whichever is first. When breaking the seal on an unopened bottle, write the new expiration date on the bottle and in the standards logbook, with initial and date. Absolutely no expired standards are to be kept in the refrigerator.

TABLE 5
SEMIVOLATILE INTERNAL STANDARDS WITH CORRESPONDING ANALYTES ASSIGNED FOR QUANTITATION

1,4-Dichlorobenzene-d4 Internal Standard		
N-Nitrosodimethylamine	1,2-Dichlorobenzene	2-Methylphenol
Aniline	1,3-Dichlorobenzene	3- and 4-Methylphenol (coeluting cpds)
2-Fluorophenol (surrogate)	1,4-Dichlorobenzene	2-Picoline
Bis(2-chloroethyl) Ether	N-Nitrosodi-n-propylamine	Bis(2-chloroisopropyl) Ether
Phenol-d5 (surrogate)	Hexachloroethane	N-Nitrosopyrrolidine
Phenol	Me[illegible] M[illegible] [illegible]ifonate	N-[illegible]
2-Chlor[illegible]	[illegible]	[illegible]
Benzyl A[illegible]	[illegible]	[illegible]
Pyridine	N-Nitrosodiethylamine	Pentachloroethane
Naphthalene-d8 Internal Standard		
Nitrobenzene-d5(surrogate)	Hexachlorobutadiene	N-Nitrosodi-*n*-butylamine
Nitrobenzene	2-Methylnaphthalene	N-Nitrosopiperidine
Isophorone	2-Nitrophenol	N,N-Dimethyl-1-phenethylamine
Bis(2-chloroethoxy)methane	2,4-[illegible]	O,O,O-Triethyl Phosphorothioate
1,2,4-Trichlorobenzene	Benz[illegible]	[illegible]xachloropropene
Naphthalene	2,4-[illegible]	[illegible]henylenediamine
4-Chloroaniline	4-Chloro-3-methylphenol	Safrole
	2,6-Dichlorophenol	1,2,4,5-Tetrachlorobenzene
Acenaphthene-d10 Internal Standard		
2-Fluorobiphenyl (surrogate)	2,4-Dinitrotoluene	1-Naphthylamine
Hexachlorocyclopentadiene	2,6-Dinitrotoluene	2-Naphthylamine
2-Chloronaphthalene	Diethyl Phthalate	2,3,4,6-Tetrachlorophenol
2-Nitroaniline	4-Chlorophenyl Phenyl Ether	2,4,6-Tribromophenol (surrogate)
3-Nitroaniline	Fluorene	Pentachlorobenzene
4-Nitroaniline	4-Nitrophenol	1,3-Dinitrobenzene
Dimethyl Phthalate	2,4,6-Trichlorophenol	1,4-Naphthoquinone
Acenaphthylene	2,4,5-Trichlorophenol	5-Nitro-*o*-toluidine
Acenaphthene	2,4-Dinitrophenol	Thionazine
Dibenzofuran	Isosafrole	Diphenylamine

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TABLE 5 continued

Pnenanthrene-d10 Internal Standard		
N-Nitrosodiphenylamine	Pentachlorophenol	Pentachloronitrobenzene
4-Bromophenyl Phenyl Ether	1,3,5-Trinitrobenzene	Disulfoton
Hexachlorobenzene	Phorate	2-sec-Butyl-4,6-Dinitrophenol (Dinoseb)
Phenanthrene	Phenacetin	Methyl Parathion
Anthracene	Diallate	4-Nitroquinoline N-Oxide
Di-n-butyl Phthalate	Dimethoate	Parathion
Fluoranthene	4-Aminobiphenyl	Methapyrilene
2-Methyl[illegible]	Pro[illegible]	Iso[illegible]
[illegible]	[illegible] Stand[illegible]	
Pyrene	[illegible]	[illegible]
Butylbenzyl Phthalate	Chrysene	Kepone
Benzidine	Terphenyl-d14 (surrogate)	3,3'-Dimethylbenzidine
3,3'-Dichlorobenzidine	Total Aramite	Famphur
Benz(a)anthracene	*p*-Dimethylaminoazobenzene	2-Acetylaminofluorene
Perylene-d12 Internal Standard		
Di-n-octyl Phthalate	Inde[illegible]	[illegible]xachlorophene
Benzo(b)fluoranthene	Diben[illegible]	[illegible]ethylcholanthrene
Benzo(k)fluoranthene	Benz[illegible]	
Benzo(a)pyrene	7,12-Dimethylbenz(a)anthracene	

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TABLE 6
Control Analytes for Non-DoD Projects

1,2,4-Trichlorobenzene
1,4-Dichlorobenzene
2,4-Dinitrotoluene
2-Chloronaphthalene
2-Chlorophenol
4-Bromophenyl Phenyl Ether
4-Chloro-3-methylphenol
[illegible]
Benzo(a)pyrene
Diethyl Phthalate
Hexachloroethane
N-Nitrosodi-n-propylamine
Pentachlorophenol
Phenol
[illegible]

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ATTACHMENT A

Method Reporting Limits
Method Detection Limits
QC Acceptance Criteria

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Method Information

Method: 8270C
Prep: EPA 3541
Matrix: SOIL
Title: Base Neutral/Acid Semivolatile Organic Compounds

Source: SW-846
Revision: 7/8/2009

Method ID: MJ250

Optimal Prep
Sample Amount: 30.00 g
Final Volume: 1.00 ml

Hold Time
Analytical : 40 days from date Prep
Preparation : 14 days from date Sampled

Analyte Name	*Parm Type*	*Type*	*MDL*		*Surr/MS Limits*	*DMS RPD*	*LCS Limits*	*DLCS RPD*	*Units*	*Analyte ID*
1,4-Dichlorobenzene-d4	INT_STD				.5-2		-		mg/Kg	3855-82-1
Acenaphthene-d10	INT_STD				.5-2		-		mg/Kg	15067-26-2
Chrysene-d12	INT_STD				.5-2		-		mg/Kg	1719-03-5
Naphthalene-d8	INT_STD				.5-2		-		mg/Kg	1146-65-2
Perylene-d12	INT_STD				.5-2		-		mg/Kg	1520-96-3
Phenanthrene-d10	INT_STD				.5-2		-		mg/Kg	1517-22-2
1,2,4-Trichlorobenzene	MS		0.0110	[illegible]	28-105	4[illegible]	42-91	40	mg/Kg	120-82-1
1,4-Dichlorobenzene	MS	CCC	0.0175	0.33	28-95		41-85	40	mg/Kg	106-46-7
2,4-Dinitrotoluene	MS		0.0149	0.33	36-127	4[illegible]	48-119	40	mg/Kg	121-14-2
2-Chlorophenol	MS		0.0099	0.33	27-96	4[illegible]	42-86	40	mg/Kg	95-57-8
4-Chloro-3-methylphenol	MS	CCC	0.0166	0.33	13-122	[illegible]	44-101	40	mg/Kg	59-50-7
4-Nitrophenol	MS	SPCC	0.146	2.0	12-141	4[illegible]	41-121	40	mg/Kg	100-02-7
Acenaphthene	MS	CCC	0.0134	0.33	30-113	[illegible]	49-97	40	mg/Kg	83-32-9
N,N-Dimethylaniline	MS		0.0604	0.33	70-130	4[illegible]	70-130	40	mg/Kg	121-69-7
N-Nitrosodi-n-propylamine	MS	SPCC	0.0191	0.33	32-107	4[illegible]	41-96	40	mg/Kg	621-64-7
Pentachlorophenol	MS	CCC	0.125	2.0	10-135	[illegible]	39-112	40	mg/Kg	87-86-5
Phenol	MS	CCC	0.0195	0.33	18-106	4[illegible]	40-87	40	mg/Kg	108-95-2
Pyrene	MS		0.0140	0.33	24-126	4[illegible]	45-116	40	mg/Kg	129-00-0

Analyte Name	Parm Type	Type	MDL	MRL	Surr/MS Limits	DMS RPD	LCS mits	DLCS RPD	Units	Analyte ID
2,4,6-Tribromophenol	SURR				20-123		-		PERCENT	118-79-6
2-Fluorobiphenyl	SURR				32-104		-		PERCENT	321-60-8
2-Fluorophenol	SURR				20-83		-		PERCENT	367-12-4
Nitrobenzene-d5	SURR				29-100		-		PERCENT	4165-60-0
Phenol-d6	SURR				23-90		-		PERCENT	13127-88-3
Terphenyl-d14	SURR				37-133		-		PERCENT	1718-51-0
1,2,3,4-Tetrachlorobenzene	TIC_TRG		0.33	0.33	70-130	40	70-130	40	mg/Kg	634-66-2
1,2,3,5-Tetrachlorobenzene	TIC_TRG		0.33	0.33	70-130	40	70-130	40	mg/Kg	634-90-2
1,2,3-Trichlorobenzene	TIC_TRG		0.33	0.33	70-130	40	70-130	40	mg/Kg	87-61-6
1,2,4,5-Tetrachlorobenzene	TIC_TRG		0.020	0.33	70-130	40	70-130	40	mg/Kg	95-94-3
1,3,5-Trichlorobenzene	TIC_TRG		0.33	0.33	70-130	40	70-130	40	mg/Kg	108-70-3
1-Methylnaphthalene	TIC_TRG		0.33		70-130	40	70-130	40	mg/Kg	90-12-0
2,3,7,8-Tetrachlorodibenzo-p-(	TIC_TRG		0.33		-		-		mg/Kg	1746-01-6
Acrylamide	TIC_TRG		50		70-130	40	70-130	40	mg/Kg	79-06-1
Diisobutyl Phthalate	TIC_TRG		0.33		70-130	40	70-130	40	mg/Kg	84-69-5
Diphenylamine	TIC_TRG		0.010		70-130	40	70-130	40	mg/Kg	122-39-4
Hexachlorocyclohexane	TIC_TRG		0.67	0.67	-		-		mg/Kg	608-73-1
HPMO	TIC_TRG		0.121	2.0	-		-		mg/Kg	3375-84-6
OPMO	TIC_TRG		0.0902	2	-		-		mg/Kg	CASID30031
Pentachlorobenzene	TIC_TRG		0.019	3.3	70-130	40	70-130	40	mg/Kg	608-93-5
1,2-Dichlorobenzene	TRG		0.0179		29-93	40	1-86	40	mg/Kg	95-50-1
1,2-Diphenylhydrazine	TRG		0.0146	0.3	44-107	40	4,5-111	40	mg/Kg	122-66-7
1,3,5-Trinitrobenzene	TRG		0.068		70-130	40	70-130	40	mg/Kg	99-35-4
1,3-Dichlorobenzene	TRG		0.0183	0.33	28-91	40	1-84	40	mg/Kg	541-73-1
1,3-Dinitrobenzene	TRG		0.073	0.33	70-130	40	70-130	40	mg/Kg	99-65-0
1,4-Dichlorobutane	TRG		0.33	0.33	70-130	40	70-130	40	mg/Kg	110-56-5
1,4-Dioxane	TRG		0.13	0.67	70-130	40	70-130	40	mg/Kg	123-91-1
1,4-Naphthoquinone	TRG		0.065	0.33	70-130	40	70-130	40	mg/Kg	130-15-4
1-Chloronaphthalene	TRG		0.33	0.33	70-130	40	70-130	40	mg/Kg	90-13-1
1-Methyl-2-pyrrolidinone	TRG		0.095	0.33	70-130	40	55-140	40	mg/Kg	872-50-4
1-Naphthylamine	TRG		0.036	0.33	70-130	40	70-130	40	mg/Kg	134-32-7
2,3,4,6-Tetrachlorophenol	TRG		0.046	1.0	45-110	40	46-110	40	mg/Kg	58-90-2
2,4,5-Trichlorophenol	TRG		0.0171	0.33	27-115	40	46-103	40	mg/Kg	95-95-4
2,4,6-Trichlorophenol	TRG	CCC	0.0143	0.33	24-119	40	46-101	40	mg/Kg	88-06-2
2,4-Dichlorophenol	TRG	CCC	0.0164	0.33	16-119	40	3-94	40	mg/Kg	120-83-2

Analyte Name	Parm Type	Type	MDL	MRL	Surr/MS Limits	DMS RPD	LCS Limits	DLCS RPD	Units	Analyte ID
2,4-Dimethylphenol	TRG		0.0151	0.33	10-117	4[illegible]	[illegible]6-89	40	mg/Kg	105-67-9
2,4-Dinitrophenol	TRG	SPCC	0.112	2.0	10-145	4[illegible]	[illegible]8-116	40	mg/Kg	51-28-5
2,6-Dichlorophenol	TRG		0.016	0.33	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	87-65-0
2,6-Diisopropylnaphthalene	TRG		0.33	0.33	14-136	4[illegible]	[illegible]4-136	40	mg/Kg	24157-81-1
2,6-Dinitrotoluene	TRG		0.0156	0.33	36-125	4[illegible]	[illegible]9-114	40	mg/Kg	606-20-2
2-Acetylaminofluorene	TRG		0.027	4.0	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	53-96-3
2-Chloronaphthalene	TRG		0.0100	0.33	26-114	40	[illegible]44-95	40	mg/Kg	91-58-7
2-Methyl-4,6-dinitrophenol	TRG		0.1434	2.0	10-138	4[illegible]	[illegible]1-119	40	mg/Kg	534-52-1
2-Methylnaphthalene	TRG		0.0110	0.33	30-105	4[illegible]	[illegible]4-95	40	mg/Kg	91-57-6
2-Methylphenol	TRG		0.0167	0.33	14-103	40	[illegible]35-92	40	mg/Kg	95-48-7
2-Naphthylamine	TRG		0.063	0.33	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	91-59-8
2-Nitroaniline	TRG		0.0169	[illegible]	34-121	4[illegible]	[illegible]8-108	40	mg/Kg	88-74-4
2-Nitrophenol	TRG	CCC	0.0139	[illegible]	20-119	4[illegible]	[illegible]4-95	40	mg/Kg	88-75-5
2-Picoline	TRG		0.055	[illegible]	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	109-06-8
3,3'-Dichlorobenzidine	TRG		0.0270	[illegible]	10-120	4[illegible]	[illegible]8-116	40	mg/Kg	91-94-1
3,3'-Dimethylbenzidine	TRG		1.2	[illegible]	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	119-93-7
3-Methylcholanthrene	TRG		0.062	[illegible]	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	56-49-5
3-Nitroaniline	TRG		0.175	[illegible]	15-123	4[illegible]	[illegible]5-111	40	mg/Kg	99-09-2
3-Nitrophenol	TRG		0.33	[illegible]	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	554-84-7
4-Aminobiphenyl	TRG		0.065	[illegible]	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	92-67-1
4-Bromophenyl Phenyl Ether	TRG		0.0122	[illegible]	32-127	4[illegible]	[illegible]9-110	40	mg/Kg	101-55-3
4-Chloroaniline	TRG		0.0144	[illegible]	11-98	4[illegible]	[illegible]7-96	40	mg/Kg	106-47-8
4-Chlorophenyl Phenyl Ether	TRG		0.0160	[illegible]	35-115	40	[illegible]46-105	40	mg/Kg	7005-72-3
4-Methylphenol	TRG		0.0168	0.33	10-111	4[illegible]	[illegible]8-94	40	mg/Kg	106-44-5
4-Nitroaniline	TRG		0.179	2.0	10-137	40	[illegible]9-120	40	mg/Kg	100-01-6
4-Nitroquinoline N-Oxide	TRG		0.068	3.0	70-130	40	[illegible]0-130	40	mg/Kg	56-57-5
5-Nitro-o-toluidine	TRG		0.011	0.33	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	99-55-8
7,12-Dimethylbenz(a)anthrace	TRG		0.015	0.33	70-130	40	[illegible]0-130	40	mg/Kg	57-97-6
a,a-Dimethylphenethylamine	TRG		0.23	1.0	70-130	40	[illegible]0-130	40	mg/Kg	122-09-8
Acenaphthylene	TRG		0.016	0.33	18-128	40	[illegible]46-99	40	mg/Kg	208-96-8
Acetophenone	TRG		0.023	0.33	70-130	40	[illegible]70-130	40	mg/Kg	98-86-2
Aniline	TRG		0.0216	1.0	10-92	40	[illegible]4-92	40	mg/Kg	62-53-3
Anthracene	TRG		0.0139	0.33	21-134	40	[illegible]50-108	40	mg/Kg	120-12-7
Aramite, Total	TRG		0.056	2.0	70-130	40	[illegible]70-130	40	mg/Kg	140-57-8
Atrazine	TRG		0.017	0.33	70-130	4[illegible]	[illegible]0-130	40	mg/Kg	1912-24-9

Analyte Name	Parm Type	Type	MDL	MRL	Surr/MS Limits	DMS RPD	LCS Limits	DLCS RPD	Units	Analyte ID
Azobenzene	TRG		0.0146	0.33	70-130	40	0-130	40	mg/Kg	103-33-3
Benz(a)anthracene	TRG		0.0123	0.33	33-121	4	4-109	40	mg/Kg	56-55-3
Benzaldehyde	TRG		0.021	0.33	70-130	4	0-130	40	mg/Kg	100-52-7
Benzidine	TRG		0.42	2.0	10-81	4	0-81	40	mg/Kg	92-87-5
Benzo(a)pyrene	TRG	CCC	0.0198	0.33	31-122	4	1-114	40	mg/Kg	50-32-8
Benzo(b)fluoranthene	TRG		0.0172	0.33	33-124	4	3-110	40	mg/Kg	205-99-2
Benzo(g,h,i)perylene	TRG		0.0202	0.33	26-126	40	50-110	40	mg/Kg	191-24-2
Benzo(k)fluoranthene	TRG		0.0194	0.33	36-117	4	2-112	40	mg/Kg	207-08-9
Benzoic Acid	TRG		0.139	2.0	0-176	4	0-104	40	mg/Kg	65-85-0
Benzophenone	TRG		0.33	0.33	15-116	40	15-116	40	mg/Kg	119-61-9
Benzyl Alcohol	TRG		0.0168		25-106	4	5-96	40	mg/Kg	100-51-6
Biphenyl	TRG		0.009		70-130	4	0-130	40	mg/Kg	92-52-4
Bis(2-chloroethoxy)methane	TRG		0.0110		33-106	4	5-93	40	mg/Kg	111-91-1
Bis(2-chloroethyl) Ether	TRG		0.0117		29-103	4	2-88	40	mg/Kg	111-44-4
Bis(2-chloroisopropyl) Ether	TRG		0.0141		25-106	4	9-94	40	mg/Kg	39638-32-9
Bis(2-ethylhexyl) Phthalate	TRG		0.0186		35-126	4	1-115	40	mg/Kg	117-81-7
Butyl Benzyl Phthalate	TRG		0.0163	0.33	34-125	4	1-114	40	mg/Kg	85-68-7
Caprolactam	TRG		0.147	0.07	70-130	4	0-130	40	mg/Kg	105-60-2
Carbazole	TRG		0.0112	0	49-118	4	1-113	40	mg/Kg	86-74-8
Chlorobenzilate	TRG		0.020	35	70-130	4	70-130	40	mg/Kg	510-15-6
Chrysene	TRG		0.0118		33-121	4	3-109	40	mg/Kg	218-01-9
Diallate	TRG		0.022	0.2	70-130	4	0-130	40	mg/Kg	2303-16-4
Diazinon	TRG		0.33		22-135	40	22-135	40	mg/Kg	333-41-5
Dibenz(a,h)anthracene	TRG		0.0275	0.33	40-118	4	3-114	40	mg/Kg	53-70-3
Dibenzofuran	TRG		0.0118	0.33	35-112	40	47-101	40	mg/Kg	132-64-9
Dicyclopentadiene	TRG		0.032	0.33	70-130	40	0-130	40	mg/Kg	77-73-6
Diethyl Phthalate	TRG		0.0141	0.33	37-128	4	5-121	40	mg/Kg	84-66-2
Diethylene Glycol Dibenzoate	TRG		0.33	0.33	32-147	40	2-147	40	mg/Kg	120-55-8
Dimethoate	TRG		0.024	0.33	70-130	40	0-130	40	mg/Kg	60-51-5
Dimethyl Phthalate	TRG		0.0164	0.33	36-123	40	48-113	40	mg/Kg	131-11-3
Di-n-butyl Phthalate	TRG		0.0121	0.33	34-139	40	50-124	40	mg/Kg	84-74-2
Di-n-octyl Phthalate	TRG	CCC	0.0240	0.33	36-136	40	51-121	40	mg/Kg	117-84-0
Dinoseb	TRG		0.052	0.33	70-130	40	70-130	40	mg/Kg	88-85-7
Disulfoton	TRG		0.016	0.33	70-130	40	70-130	40	mg/Kg	298-04-4
Ethyl Methanesulfonate	TRG		0.089	0.33	70-130	4	0-130	40	mg/Kg	62-50-0

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Analyte Name	Parm Type	Type	MDL	MRL	Surr/MS Limits	DMS RPD	LCS Limits	DLCS RPD	Units	Analyte ID
Ethylene Glycol Butyl Ether (E	TRG		0.0058	0.33	34-96	[illegible]	34-96	40	mg/Kg	111-76-2
Famphur	TRG		0.071	4.0	70-130	[illegible]	70-130	40	mg/Kg	52-85-7
Fluoranthene	TRG	CCC	0.0115	0.33	25-135	[illegible]	48-116	40	mg/Kg	206-44-0
Fluorene	TRG		0.0130	0.33	31-116	[illegible]	46-103	40	mg/Kg	86-73-7
Hexachlorobenzene	TRG		0.0147	0.33	37-119	[illegible]	50-109	40	mg/Kg	118-74-1
Hexachlorobutadiene	TRG	CCC	0.0141	0.33	27-107	[illegible]	42-91	40	mg/Kg	87-68-3
Hexachlorocyclopentadiene	TRG	SPCC	0.0125	0.33	10-79	[illegible]	10-68	40	mg/Kg	77-47-4
Hexachloroethane	TRG		0.0216	0.33	31-91	[illegible]	40-87	40	mg/Kg	67-72-1
Hexachlorophene	TRG		1.2	6.7	70-130	[illegible]	70-130	40	mg/Kg	70-30-4
Hexachloropropene	TRG		0.019	0.33	70-130	[illegible]	70-130	40	mg/Kg	1888-71-7
Indeno(1,2,3-cd)pyrene	TRG		0.0389	0.33	29-132	[illegible]	53-112	40	mg/Kg	193-39-5
Isodrin	TRG		0.0089	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	465-73-6
Isophorone	TRG		0.0140	[illegible]	33-103	[illegible]	42-93	40	mg/Kg	78-59-1
Isosafrole	TRG		0.017	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	120-58-1
Kepone	TRG		0.39	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	143-50-0
Malathion	TRG		0.83	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	121-75-5
Methapyrilene	TRG		0.091	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	91-80-5
Methyl Methanesulfonate	TRG		0.089	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	66-27-3
Methyl Parathion	TRG		0.013	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	298-00-0
Naphthalene	TRG		0.0144	[illegible]	31-103	[illegible]	44-92	40	mg/Kg	91-20-3
n-Dodecane	TRG		0.33	[illegible]	26-95	[illegible]	26-95	40	mg/Kg	112-40-3
Nitrobenzene	TRG		0.0261	[illegible]	34-99	[illegible]	44-92	40	mg/Kg	98-95-3
N-Nitrosodiethylamine	TRG		0.029	[illegible]	70-130	[illegible]	70-130	40	mg/Kg	55-18-5
N-Nitrosodimethylamine	TRG		0.0251	2.0	20-98	[illegible]	34-93	40	mg/Kg	62-75-9
N-Nitrosodi-n-butylamine	TRG		0.11	0.33	70-130	[illegible]	70-130	40	mg/Kg	924-16-3
N-Nitrosodiphenylamine	TRG	CCC	0.018	0.33	14-143	[illegible]	44-113	40	mg/Kg	86-30-6
N-Nitrosomethylethylamine	TRG		0.099	0.33	70-130		70-130	40	mg/Kg	10595-95-6
N-Nitrosomorpholine	TRG		0.019	0.33	70-130	[illegible]	70-130	40	mg/Kg	59-89-2
N-Nitrosopiperidine	TRG		0.023	0.33	70-130	[illegible]	70-130	40	mg/Kg	100-75-4
N-Nitrosopyrrolidine	TRG		0.092	0.33	70-130	[illegible]	70-130	40	mg/Kg	930-55-2
O,O,O-Triethyl Phosphorothio	TRG		0.022	0.33	70-130	[illegible]	70-130	40	mg/Kg	126-68-1
o-Toluidine	TRG		0.017	0.33	70-130	[illegible]	70-130	40	mg/Kg	95-53-4
Parathion	TRG		0.084	0.33	70-130	[illegible]	70-130	40	mg/Kg	56-38-2
p-Dimethylaminoazobenzene	TRG		0.012	0.33	70-130	[illegible]	70-130	40	mg/Kg	60-11-7
Pentachloroethane	TRG		0.015	1.0	70-130	[illegible]	70-130	40	mg/Kg	76-01-7

Analyte Name	Parm Type	Type	MDL	MRL	Surr/MS Limits	DMS RPD	LCS Limits	DLCS RPD	Units	Analyte ID
Pentachloronitrobenzene	TRG		0.088	2.0	70-130	40	70-130	40	mg/Kg	82-68-8
PGMEA	TRG		0.036	1.0	70-130	40	70-130	40	mg/Kg	108-65-6
Phenacetin	TRG		0.013	2.0	70-130	40	70-130	40	mg/Kg	62-44-2
Phenanthrene	TRG		0.0100	0.33	35-119	40	72-108	40	mg/Kg	85-01-8
Phorate	TRG		0.026	0.33	70-130	40	70-130	40	mg/Kg	298-02-2
Picric Acid	TRG		3.3	3.3	70-130	40	70-130	40	mg/Kg	88-89-1
p-Phenylenediamine	TRG		0.79	2.0	70-130	40	70-130	40	mg/Kg	106-50-3
Pronamide	TRG		0.018	0.33	70-130	40	70-130	40	mg/Kg	23950-58-5
Pyridine	TRG		0.0199	0.33	10-153	40	10-153	40	mg/Kg	110-86-1
Quinoline	TRG		0.33	0.33	70-130	40	70-130	40	mg/Kg	91-22-5
Safrole	TRG		0.013	0.33	70-130	40	70-130	40	mg/Kg	94-59-7
Sulfotep	TRG		0.018		70-130	40	70-130	40	mg/Kg	3689-24-5
Thionazin	TRG		0.017		70-130	40	70-130	40	mg/Kg	297-97-2

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Method Information

Method: 8270C
Prep: EPA 3520C
Matrix: WATER
Title: Base Neutral/Acid Semivolatile Organic compounds

Source: SW-846
Revision: 7/8/2009

Method ID: MJ121

Optimal Prep
Sample Amount: 1,000.00 ml
Final Volume: 1.00 ml

Hold Time
Analytical : 40 days from date Prep
Preparation 7 days from date Sampled

Analyte Name	*Parm Type*	*Type*	*MDL*		*Surr/MS Limits*	*DMS RPD*	*DMS Limits*	*DLCS RPD*	*Units*	*Analyte ID*
1,4-Dichlorobenzene-d4	INT_STD				.5-2		-		ug/L	3855-82-1
Acenaphthene-d10	INT_STD				.5-2		-		ug/L	15067-26-2
Chrysene-d12	INT_STD				.5-2		-		ug/L	1719-03-5
Naphthalene-d8	INT_STD				.5-2		-		ug/L	1146-65-2
Perylene-d12	INT_STD				.5-2		-		ug/L	1520-96-3
Phenanthrene-d10	INT_STD				.5-2		-		ug/L	1517-22-2
1,2,4-Trichlorobenzene	MS		0.355	10	49-97	30	51-103	30	ug/L	120-82-1
1,4-Dichlorobenzene	MS	CCC	0.317	10	47-93	30	54-96	30	ug/L	106-46-7
2,4-Dinitrotoluene	MS		0.274	10	62-123	30	51-126	30	ug/L	121-14-2
2-Chlorophenol	MS		0.311	10	49-100	30	59-101	30	ug/L	95-57-8
4-Chloro-3-methylphenol	MS	CCC	0.490	10	61-111	30	65-111	30	ug/L	59-50-7
4-Nitrophenol	MS	SPCC	1.92	25	57-119	30	55-126	30	ug/L	100-02-7
Acenaphthene	MS	CCC	0.281	10	57-107	30	51-110	30	ug/L	83-32-9
N,N-Dimethylaniline	MS		2.22	10	70-130	30	70-130	30	ug/L	121-69-7
N-Nitrosodi-n-propylamine	MS	SPCC	0.496	10	53-109	30	56-115	30	ug/L	621-64-7
Pentachlorophenol	MS	CCC	2.44	25	42-127	30	50-116	30	ug/L	87-86-5
Phenol	MS	CCC	0.324	10	47-101	30	48-105	30	ug/L	108-95-2
Pyrene	MS		0.731	10	52-121	30	53-124	30	ug/L	129-00-0

Analyte Name	Parm Type	Type	MDL	MRL	Surr/MS Limits	DMS RPD	LCS nits	DLCS RPD	Units	Analyte ID
2,4,6-Tribromophenol	SURR				46-127		-		PERCENT	118-79-6
2-Fluorobiphenyl	SURR				48-114		-		PERCENT	321-60-8
2-Fluorophenol	SURR				39-103		-		PERCENT	367-12-4
Nitrobenzene-d5	SURR				46-115		-		PERCENT	4165-60-0
Phenol-d6	SURR				38-107		-		PERCENT	13127-88-3
Terphenyl-d14	SURR				22-146		-		PERCENT	1718-51-0
1-Methylnaphthalene	TIC_TRG		10	10	-		-		ug/L	90-12-0
2,3,7,8-Tetrachlorodibenzo-p-(	TIC_TRG		50	50	-		-		ug/L	1746-01-6
alpha-Terpineol	TIC_TRG		10	10	-		-		ug/L	10482-56-1
Chloroacetaldehyde	TIC_TRG		10	10	-		-		ug/L	107-20-0
HPMO	TIC_TRG		6.15	25	-		-		ug/L	3375-84-6
OPMO	TIC_TRG		3.86	5	-		-		ug/L	CASID30031
Paraldehyde	TIC_TRG		10	[illegible]	-		-		ug/L	123-63-7
Toluene diisocyanate	TIC_TRG		10		-		-		ug/L	CASID30165
1,2,4,5-Tetrachlorobenzene	TRG		0.26	10	70-130		70-130	30	ug/L	95-94-3
1,2-Dichlorobenzene	TRG		0.431		47-94		55-97	30	ug/L	95-50-1
1,2-Diphenylhydrazine	TRG		0.509	10	54-118		58-117	30	ug/L	122-66-7
1,3,5-Trinitrobenzene	TRG		0.38	20	70-130		70-130	30	ug/L	99-35-4
1,3-Dichlorobenzene	TRG		0.35		45-92		55-95	30	ug/L	541-73-1
1,3-Dinitrobenzene	TRG		0.52	10	70-130		70-130	30	ug/L	99-65-0
1,4-Dichlorobutane	TRG		1	10	70-130		70-130	30	ug/L	110-56-5
1,4-Dioxane	TRG		3.7		70-130	30	70-130	30	ug/L	123-91-1
1,4-Naphthoquinone	TRG		0.21	10	70-130	30	70-130	30	ug/L	130-15-4
1-Chloronaphthalene	TRG		1	10	70-130		70-130	30	ug/L	90-13-1
1-Methyl-2-pyrrolidinone	TRG		2.2	25	70-130	30	70-130	30	ug/L	872-50-4
1-Naphthylamine	TRG		0.70	10	70-130	30	70-130	30	ug/L	134-32-7
2,3,4,6-Tetrachlorophenol	TRG		0.55	10	56-124		56-124	30	ug/L	58-90-2
2,3,5,6-Tetrachlorophenol	TRG		0.62	10	70-130	30	70-130	30	ug/L	935-95-5
2,4,5-Trichlorophenol	TRG		0.381	10	60-112	30	62-117	30	ug/L	95-95-4
2,4,6-Trichlorophenol	TRG	CCC	0.203	10	60-113	30	63-117	30	ug/L	88-06-2
2,4-Dichlorophenol	TRG	CCC	0.297	10	55-105	30	59-107	30	ug/L	120-83-2
2,4-Dimethylphenol	TRG		0.264	10	22-116	30	32-100	30	ug/L	105-67-9
2,4-Dinitrophenol	TRG	SPCC	2.22	25	38-122	30	33-126	30	ug/L	51-28-5
2,6-Dichlorophenol	TRG		0.48	10	70-130	30	70-130	30	ug/L	87-65-0
2,6-Dinitrotoluene	TRG		0.349	10	69-113		65-122	30	ug/L	606-20-2

Analyte Name	Parm Type	Type	MDL	MRL	Surr/MS Limits	DMS RPD	LCS nits	DLCS RPD	Units	Analyte ID
2-Acetylaminofluorene	TRG		0.23	100	70-130	30	70-130	30	ug/L	53-96-3
2-Chloronaphthalene	TRG		0.290	10	48-106	[illegible]	54-107	30	ug/L	91-58-7
2-Methyl-4,6-dinitrophenol	TRG		2.12	25	57-120	[illegible]	51-127	30	ug/L	534-52-1
2-Methylnaphthalene	TRG		0.239	10	57-100	[illegible]	57-106	30	ug/L	91-57-6
2-Methylphenol	TRG		0.328	10	52-100	[illegible]	51-108	30	ug/L	95-48-7
2-Naphthylamine	TRG		1.0	10	70-130	[illegible]	70-130	30	ug/L	91-59-8
2-Nitroaniline	TRG		0.336	25	23-138	30	62-117	30	ug/L	88-74-4
2-Nitrophenol	TRG	CCC	0.373	10	54-104	[illegible]	58-108	30	ug/L	88-75-5
2-Picoline	TRG		4.5	25	70-130	[illegible]	70-130	30	ug/L	109-06-8
3- and 4-Methylphenol Coeluti	TRG		0.478	10	-	[illegible]	-		ug/L	CASID30030
3,3'-Dichlorobenzidine	TRG		0.270	25	12-120	[illegible]	52-120	30	ug/L	91-94-1
3,3'-Dimethylbenzidine	TRG		5.4	[illegible]	70-130	[illegible]	70-130	30	ug/L	119-93-7
3-Methylcholanthrene	TRG		0.31	[illegible]	70-130	[illegible]	70-130	30	ug/L	56-49-5
3-Nitroaniline	TRG		3.25	[illegible]	57-119	[illegible]	63-120	30	ug/L	99-09-2
3-Nitrophenol	TRG		1	[illegible]	70-130	[illegible]	70-130	30	ug/L	554-84-7
4-Aminobiphenyl	TRG		1.4	[illegible]	70-130	[illegible]	70-130	30	ug/L	92-67-1
4-Bromophenyl Phenyl Ether	TRG		0.27	[illegible]	61-114	[illegible]	64-118	30	ug/L	101-55-3
4-Chloroaniline	TRG		0.375	[illegible]	42-117	[illegible]	57-111	30	ug/L	106-47-8
4-Chlorophenyl Phenyl Ether	TRG		0.27	[illegible]	56-116	[illegible]	59-113	30	ug/L	7005-72-3
4-Methylphenol	TRG		0.47	[illegible]	54-108	[illegible]	47-118	30	ug/L	106-44-5
4-Nitroaniline	TRG		4.03	[illegible]	37-130	[illegible]	53-127	30	ug/L	100-01-6
4-Nitroquinoline N-Oxide	TRG		4.6	[illegible]	70-130	[illegible]	70-130	30	ug/L	56-57-5
5-Nitro-o-toluidine	TRG		1.0	[illegible]	70-130	30	70-130	30	ug/L	99-55-8
7,12-Dimethylbenz(a)anthrace	TRG		0.32	10	70-130	[illegible]	70-130	30	ug/L	57-97-6
a,a-Dimethylphenethylamine	TRG		6.4	25	70-130	30	70-130	30	ug/L	122-09-8
Acenaphthylene	TRG		0.236	10	59-101	30	58-109	30	ug/L	208-96-8
Acetophenone	TRG		0.60	10	70-130	[illegible]	70-130	30	ug/L	98-86-2
Aniline	TRG		0.487	25	23-116	30	35-118	30	ug/L	62-53-3
Anthracene	TRG		0.612	10	59-112	30	62-116	30	ug/L	120-12-7
Aramite, Total	TRG		0.52	50	70-130	30	70-130	30	ug/L	140-57-8
Atrazine	TRG		0.46	10	70-130	30	70-130	30	ug/L	1912-24-9
Azobenzene	TRG		0.509	10	70-130	30	70-130	30	ug/L	103-33-3
Benz(a)anthracene	TRG		0.591	10	63-110	30	69-113	30	ug/L	56-55-3
Benzaldehyde	TRG		0.50	10	70-130	30	70-130	30	ug/L	100-52-7
Benzidine	TRG		19	50	10-181	[illegible]	10-181	30	ug/L	92-87-5

Appendix C – Laboratory Calibration SOPs

METHOD SPECIFIC QUALITY CONTROL REQUIREMENTS – METALS ANALYSES		
	EPA Method 200.7 and SW-846 Method 6010B	
QC Parameter	**Requirement**	**Corrective Action**
Calibration	Minimum of blank and one standard. Correlation coefficient criteria is r ≥ 0.995 using two integrations per analysis.	Correct problem and repeat calibration.
Initial Calibration Verification (ICV)	Second source standard analyzed after calibration. Acceptance criteria are the RSD of two integrations < 5%, as well as the method-defined limits of 95.0 to 105% recovery for Method 200.7 and 90.0 – 110% recovery for Method 6010B. Samples with a non-detect concentration may be reported if the ICV fails to meet the acceptance criteria with a positive bias.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, recalibrate.
Initial Calibration Blank (ICB)	Analyzed after the ICV. Acceptance criteria are <PQL or <10% of sample concentration. Samples with a non-detectable concentration may be reported regardless of the ICB result. Analyses applicable to our WI certification must be evaluated down to the current MDL.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, recalibrate, or sample results reported with appropriate data qualifier.
Interference Check Standard (ICS)	Analyze solutions A and AB at the beginning and end of each analytical batch. Acceptance criteria for Solution A are 80.0 – 120% recovery for the spiked elements and <PQL for the others. Acceptance criteria for Solution AB are 80.0 – 120% recovery for the spiked elements. Samples with a non-detect concentration may be reported if the ICS fails to meet the acceptance criteria with a positive bias.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, recalibrate, or sample results reported with appropriate data qualifier.
Method Blank (MBLK)	One per digestion batch of maximum 20 samples with minimum of 1 per day analyzed. Acceptance criteria the same as that required for the ICB.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, all environmental samples associated with the MBLK must be re-digested and analyzed, or sample results reported with appropriate data qualifier.
Laboratory Control Sample (LCS)	One per digestion batch of maximum 20 samples with minimum of 1 per day analyzed. Acceptance criteria are the method-defined limits of 85.0 – 115% recovery for Method 200.7 and 80.0 – 120% recovery for Method 6010B aqueous controls. Acceptance criteria are the vendor supplied limits for solid matrix controls. Samples with a non-detect concentration may be reported if the LCS fails to meet the acceptance criteria with a positive bias.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, all environmental samples associated with the LCS must be re-digested and analyzed, or sample results reported with appropriate data qualifier.
Matrix Spike (MS)	Minimum of one per 20 samples with minimum of 1 per day analyzed. Acceptance criteria are the method-defined limits of 70.0 – 130% recovery for Method 200.7 and 75.0 – 125% recovery for Method 6010B. Samples with a non-detect concentration may be reported if the MS fails to meet the acceptance criteria with a positive bias.	Evaluate the accuracy recoveries of the MS/MSD according to the flow chart at the end of this Appendix. Factors affecting the decision to reprepare a sample or to report data with a qualifier include, but are not limited to, available sample, holding time, and project DQOs.
Matrix Spike Duplicate (MSD)	Required with each MS. If insufficient sample is available for a MSD, a duplicate LCS (LCSD) should be extracted and analyzed. Acceptance criteria are the accuracy criteria for the MS and ≤ 20.0% RPD for precision. Samples with a non-detect concentration may be reported if the MSD fails to meet the accuracy acceptance criteria with a positive bias.	Evaluate the precision recoveries of the MS/MSD according to the flow chart at the end of this Appendix. Factors affecting the decision to reprepare a sample or to report data with a qualifier include, but are not limited to, available sample, holding time, and project DQOs.

METHOD SPECIFIC QUALITY CONTROL REQUIREMENTS – METALS ANALYSES		
	EPA Method 200.7 and SW-846 Method 6010B	
QC Parameter	**Requirement**	**Corrective Action**
Continuing Calibration Verification (CCV)	Second source standard analyzed after every 10 samples and after the last sample. Concentration is different that that of the ICV. Acceptance criteria are the method-defined limits of 90.0 – 110% recovery with the RSD of two integrations < 5%. Samples with a non-detect concentration may be reported if the CCV fails to meet the acceptance criteria with a positive bias.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, recalibrate.
Continuing Calibration Blank (CCB)	Analyzed after every ten samples and the last sample. Acceptance criteria are the same as required for the ICB.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, recalibrate, or sample results reported with appropriate data qualifier.
Post Digestion Spike (PDS)	As needed for matrix interference evaluation. Acceptance criteria are the method-defined limits of 85.0 – 115% recovery for Method 200.7 and 75.0 – 125% recovery for Method 6010B. Samples with a non-detect concentration may be reported if the PDS fails to meet the acceptance criteria with a positive bias.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, a matrix interference should be expected. If acceptable to the project data quality objectives, samples results may be reported with appropriate data qualifier.
Serial Dilution (SD)	As needed for matrix interference evaluation. Acceptance criteria for a 1:5 dilution are ≤ 10% difference between the original and diluted sample concentration.	If acceptance criteria not met, reanalyze. If reanalysis fails to meet acceptance criteria, a matrix interference should be expected. If acceptable to the project data quality objectives, samples results may be reported with appropriate data qualifier.

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Appendix C – Columbia Analytical Calibration SOP

10.0 CALIBRATION PROCEDURES AND FREQUENCY

All equipment and instruments used at CAS are operated, maintained and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Brief descriptions of the calibration procedures for our major laboratory equipment and instruments are described below. Records are maintained to provide traceability of reference materials.

Any item of the equipment which has been subjected to overloading or mishandling, or has been shown by verification or otherwise to be defective; is taken out of service until it has been repaired. The equipment is placed back in service only after verifying by calibration that the equipment performs satisfactorily. An evaluation of the effect of this defect on previous calibrations or tests is made and documented appropriately.

Calibration verification is performed according to the applicable analytical methodology. Calibration verification procedures and criteria are listed in laboratory Standard Operating Procedures. Documentation of calibration verification is maintained in appropriate reference files. For NELAP accredited methods, the concentration of calibration verification standards are varied within the calibration range periodically.

10.1 Temperature Control Devices

Temperatures are monitored and recorded for all of the temperature-regulating support equipment such as sample refrigerators, freezers, and standards refrigerators. Bound record books are kept which contain daily-recorded temperatures, identification and location of equipment, acceptance criteria and the initials of the technician who performed the checks. The procedure for performing these measurements is provided in the *SOP for Support Equipment Monitoring and Calibration (SOP ADM-SEMC).* The SOP also includes the use of acceptance criteria and correction factors.

Where the operating temperature is specified as a test condition (such as ovens, incubators, evaporators) the temperature is recorded on the raw data. All thermometers are identified according to serial number, and the calibration of these thermometers is checked annually against a National Institute of Standards and Technology (NIST) certified thermometer. The NIST thermometer is recertified by a professional metrology organization on an annual basis.

10.2 Analytical Balances

Analytical balances are serviced on a semi-annual basis by a professional metrology organization. New certificates of calibration for each balance are issued to the laboratory on a semi-annual basis. The calibration of each analytical balance is checked by the user each day

of use with three Class S or S-1 weights, which assess the accuracy of the balance at low, mid-level and high levels within the working range. Records are kept which contain the recorded measurements, identification of the balance, acceptance criteria, and the initials of user who performed the check. The weights are recertified using NIST traceable standards by a professional metrology organization on an annual basis.

As needed, the balances are recalibrated using the manufacturers recommended operating procedures. The procedure for performing these measurements and use of acceptance criteria is described in the SOP ADM-SEMC.

10.3 Water Purification System

The water purification system is designed to produce deionized water with specific resistivity no less than 18 megohms-cm at 25°C, meeting specifications for Type I water, as described in *Standard Methods for the Examination of Water and Wastewater (SM1080)*. The system is monitored continuously for conductivity and resistivity with an on-line meter, which is recorded daily in a bound record book. The accuracy of the meter is verified annually. Deionizers are rotated and replaced on a regular schedule, and are monitored by an indicator light on the unit. The status of the system is monitored and recorded daily in a bound record book following a written SOP. Activated carbon filters are also in series with the demineralizers to produce "organic-free" water. Water for microbiology is checked at a point downstream of the purification system at a tap in the laboratory, and the monitoring documented.

10.4 Source and Preparation of Standard Reference Materials

All analytical measurements generated at CAS are performed using materials and/or processes that are traceable to a reference material. Metrology equipment (analytical balances, thermometers, etc.) is calibrated using reference materials traceable to the National Institute of Standards and Technology (NIST). These primary reference materials are themselves recertified on an annual basis. All sampling containers provided to the client by the laboratory are purchased as precleaned (Level 1) containers, with certificates of analysis available for each bottle type. This information is provided to the client when requested.

Consumable reference materials routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by A_2LA. CAS relies on a primary vendor for the majority of its analytical supplies. Consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. Supelco, Ultra Scientific, AccuStandard, Chem Services, Inc., Aldrich Chemical Co., Baker, Spex, etc. are examples of the vendors used. Reference material information is recorded in the appropriate logbook(s) and materials are stored under conditions that provide maximum protection against deterioration and contamination. The logbook entry includes such information as an assigned logbook identification code, the source of the material (i.e. vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis and an assigned expiration date. The date that the standard is received in the laboratory is marked on the container. When the reference material is used for the first time, the date of usage and the initials of the analyst are also recorded on the container.

Stock solutions and calibration standard solutions are prepared fresh as often as necessary according to their stability. All standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s) following the *SOP for Making Entries into Logbooks and onto Benchsheets* (SOP No. ADM-DATANTRY). Prior to sample analysis, all calibration reference materials are verified with a second, independent source of the material (see section 11.3.5).

10.5 Inductively Coupled Plasma-Atomic Emission Spectrograph (ICP-AES)

Each emission line on the ICP is calibrated daily against a blank and against standards. Analyses of calibration standards, initial and continuing calibration verification standards, and inter-element interference check samples are carried out as specified in the applicable method SOP and analytical method (i.e. EPA 200.7, 6010B, 6010C, CLP SOW, etc.).

10.6 Inductively Coupled Plasma-Mass Spectrometer (ICP-MS)

Each element of interest is calibrated for using a blank and a single standard. Prior to calibration, a short-term stability check is performed on the system. Following calibration, an independent check standard is analyzed, and a continuing calibration verification standard (CCV) is analyzed with every ten samples.

10.7 Atomic Absorption Spectrophotometers (AAS)

These instruments are calibrated daily using a minimum of four standards and a blank. Calibration is validated using reference standards, and is verified at a minimum frequency of once every ten samples. Initial calibration points cannot be "dropped" from the resulting calibration curve.

10.8 GC/MS Systems

All GC/MS instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise) using procedures outlined in Standard Operating Procedures and/or appropriate USEPA method citations. All reference materials used for this function are vendor-certified standards. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method. Compounds selected as system performance check compounds (SPCCs) must show a method-specified response factor in order for the calibration to be considered valid. Calibration check compounds (CCCs) must also meet method specifications for percent difference from the multipoint calibration. For isotope dilution procedures, the internal standard response(s) and labeled compound recovery must meet method criteria. Method-specific instrument tuning is regularly checked using bromofluorobenzene (BFB) for volatile organic chemical (VOC) analysis, or decafluorotriphenylphosphine (DFTPP) for semi-volatile analysis. Mass spectral peaks for the tuning compounds must conform both in mass numbers and in relative intensity criteria before analyses can proceed. Calibration policies for organics chromatographic analyses are described in the *SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).*

10.9 Gas Chromatographs and High Performance Liquid Chromatographs

Calibration and standardization follow SOP guidelines and/or appropriate USEPA method citations. All GC and HPLC instruments are calibrated at a minimum of five different concentration levels for the analytes of interest (unless specified otherwise). The lowest standard is equivalent to the method reporting limit; additional standards define the working range of the GC or LC detector. Results are used to establish response factors (or calibration curves) and retention-time windows for each analyte. Calibration is verified at a minimum frequency of once every ten samples, unless otherwise specified by the reference method. *SOP for Calibration of Instruments for Organics Chromatographic Analyses (SOP SOC-CAL).*

10.10 UV-Visible Spectrophotometer (manual colorimetric analyses)

Routine calibrations for colorimetric and turbidimetric analyses involve generating a 5-point calibration curve including a blank. Initial calibration points cannot be "dropped" from the resulting calibration curve. Correlation coefficients must meet method or SOP specifications before analysis can proceed. Independent calibration verification standards (ICVs) are analyzed with each batch of samples. Continuing calibration is verified at a minimum frequency of once every ten samples. Typical UV-Visible spectrophotometric methods at CAS include total phenolics, phosphates, surfactants and tannin-lignin.

10.11 Flow Injection Analyzer (automated colorimetric analysis)

A minimum of six standards and a blank are used to calibrate the instrument for cyanide analysis. A blank and (minimum of) five standards are used to calibrate the instrument for all other automated chemistries. Initial calibration points cannot be "dropped" from the resulting calibration curve. Standard CAS acceptance limits are used to evaluate the calibration curve prior to sample analysis.

10.12 Ion Chromatographs

Calibration of the ion chromatograph (IC) involves generating a 5-point calibration curve. Initial calibration points cannot be "dropped" from the resulting calibration curve. A correlation coefficient of $\geq$ 0.995 for the curve is required before analysis can proceed. Quality Control (QC) samples that are routinely analyzed include blanks and laboratory control samples. The target analytes typically determined by the IC include nitrate, nitrite, chloride, fluoride, sulfate and bromide. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method.

10.13 Turbidimeter

Calibration of the turbidimeter requires analysis of three Nephelometric Turbidity Unit (NTU) formazin standards. Quality Control samples that are routinely analyzed include blanks, Analytical Products Group® QC samples (or equivalent) and duplicates.

10.14 Ion-selective electrode

The method-prescribed number of standards (typically two for Standard Methods and EPA wastewater methods) are used to calibrate the electrodes before analysis. The slope of the curve must be within acceptance limits before analysis can proceed. Quality Control samples that are routinely analyzed include blanks, LCSs and duplicates.

10.15 Pipets

The calibration of pipets and autopipettors used to make critical-volume measurements is verified following the *SOP for Checking Pipet Calibration*. Both accuracy and precision verifications are performed, at intervals applicable to the pipet and use. The results of all calibration verifications are recorded in bound logbooks.

10.16 Other Instruments

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

Appendix C – Northwestern Aquatic Sciences Calibration SOP

Supporting laboratory space and equipment are available such as balances, ovens, inverted and compound microscopes, and a refrigerated centrifuge. The laboratory includes 4°C space for sample chilling and storage.

In addition, NAS has over 500 square feet of modern office space equipped with FAX, internet access, copy machines and a small reference library for support in the toxicity testing program. Offices are equipped to provide everything needed for data reduction and analysis, technical report writing, and other common laboratory and consulting support functions. Networked microcomputers are available for word processing, data analysis and data management. NAS currently has the following software available for data analysis: Microsoft EXCEL 2000, Biostat (U.S. Army Corps of Engineers, Seattle District), ToxCalc v.5.0.23N (Tidepool Scientific), and CETIS software, also by Tidepool Scientific. Efficient literature searching and retrieval is provided through in-house capabilities, as well as access to the Oregon State University library.

B. ENVIRONMENTAL CONTROL

Temperature control of bioassay and culture chambers is achieved by using constant temperature rooms and by immersion of containers in water baths. There are four walk-in temperature-controlled rooms available, each with separate temperature and photoperiod control. Additional testing space is available in the form of temperature-controlled water baths. Water baths are circulated using submersible pumps or by employing a cascading principle for water movement to minimize temperature gradients and stratification. Chilling is accomplished with Blue M portable chillers. Heating employs either stainless steel or Vycor heaters controlled by YSI Model 63RC thermister controllers. Temperature control is easily within the ±1°C limit specified in most bioassay test protocols. Aeration is provided using oil-free air compressors. The laboratory lights are under photoperiod control.

VIII. CALIBRATION PROCEDURES AND FREQUENCY

Analytical measurements routinely used in aquatic toxicology consist of water quality (e.g. temperature, salinity, conductivity, pH, etc.), and weight and volume measurements. Instruments used are properly and frequently calibrated to ensure accurate and reliable measurements. A brief description of the calibration procedures for these instruments is given in this section. All measuring operations and testing equipment having an effect on the accuracy or validity of tests are calibrated and/or verified before putting into use and on a continuing basis.

Calibration frequency and procedures for balances, pH meters, thermometers, and other support equipment are included as part of the procedure manual and/or in standard operating procedures.

A. TRACEABILITY OF CALIBRATION

Wherever applicable, calibration of analytical support equipment and instruments is traceable to national standards of measurement.

B. REFERENCE STANDARDS

Reference standards of measurement (such as Class S or equivalent weights or traceable thermometers) are used for calibration only. Reference standards are subjected to in-service checks between calibrations and verifications. Northwestern Aquatic Sciences maintains a contract with Quality Control Services, Portland, Oregon for regular calibration of reference thermometers (every three years), Class S weights, and laboratory balances (annually).

Standards and other reagents are labeled when received. The label includes receipt date, date opened, and expiration date. Normally reagents expire one year after opening unless otherwise indicated.

C. WATER QUALITY

Temperature is measured to the nearest degree Centigrade using digital or mercury thermometers.. Laboratory thermometers are calibrated annually against a certified Standard Thermometer traceable to National Institute of Standards and Technology (NIST) standards.

Salinity is measured to the nearest 0.5 part per thousand (ppt) using a hand-held temperature-compensated refractometer. The refractometer is zeroed before use and after approximately every twenty measurements.

All pH measurements are made to the nearest 0.1 pH unit using Orion SA250 pH meters and probes. The meters and probes are maintained according to factory specifications. The instrument is calibrated before each day of use with standard buffer solutions that bracket the pH range of the samples (pH 7.0 and 10.0 for seawater samples and pH 7.0 and 4.0 buffers for freshwater samples unless the pH of the samples is expected to be above 7.0). Documentation of satisfactory operation is recorded daily when in use.

Dissolved oxygen is measured to the nearest 0.1 ppm using YSI Model 51B dissolved oxygen meters and probes. The instruments are maintained according to factory specifications and calibrated before each day of use using water-saturated air or air-saturated water as specified in the manufacturer's instructions. Documentation of satisfactory operation is recorded daily when in use.

Specific conductance is measured in umhos/cm using YSI Model 33 S-C-T Meters or an ICM Conductivity Meter. The instruments are maintained according to factory specifications. Operating conditions of the meters (electronic balance and battery condition) are checked prior to each use as specified by the manufacturer. Documentation of satisfactory operation is recorded monthly based on calibration against a NIST traceable standard.

Water hardness and alkalinity are measured in freshwater test solutions using Hach test kits accurate to within 10 mg/L as $CaCO_3$. The kits are based on EPA methods 130.2 and 310.1, respectively, except that the alkalinity measurement employs a chemical indicator rather than an electrometrically determined endpoint of pH 4.5. Measurements are expressed as mg/L of $CaCO_3$. Sulfide and total ammonia-N are also measured when required. The method used for the measurement of total ammonia-N is based on the salicylate colorimetric method of Hach Chemical Co. and was adapted from Clin. Chim. Acta., 14: 403 (1966). The method used for the measurement of dissolved sulfide is the methylene blue colorimetric method based on SM 4500-S^{2-} (Standard Methods 1995, 19th edition) but substituting Hach reagents for color development for those specified in SM 4500-S^{2-}.

D. WEIGHTS AND VOLUMES

Reference toxicants are weighed using an analytical balance accurate to the nearest 0.1 mg. Balances are checked before and after each use using weights traceable to NIST standards. Balances are serviced annually by QC Services, Portland, OR. Effluent and reference toxicant dilutions are made using Class A volumetric flasks and pipettes and graduated cylinders.

IX. TEST ACCEPTABILITY

Test acceptance criteria are specific to the type of toxicity test being performed. The actual test protocol should be consulted in each case. In general, mean mortality in dilution water controls cannot exceed 10-30% in effluent, sediment or reference toxicant tests, depending upon the type of test. Water temperature and other water quality parameters also have criteria for test acceptability which are defined in each test protocol. An individual test may be conditionally acceptable if temperature, DO, and other specified conditions fall outside specifications, depending on the degree of departure and the objectives of the tests. The acceptability of the test will ultimately depend on the best professional judgment of the investigator. Any deviations from test specifications are to be noted when reporting data from the test.

A. DOCUMENTING LABORATORY PERFORMANCE

Reference toxicant tests are used to demonstrate satisfactory laboratory performance. Reference toxicant tests for most test methods are conducted simultaneously with unknown sample toxicity tests. A few test methods have reference toxicant tests run on each batch of animals rather than concurrently with project tests. Control charts are constructed to monitor the performance of bioassay test results using reference toxicants. These charts are used to demonstrate satisfactory laboratory performance. See Section X , D for the use and construction of control charts to evaluate and document laboratory performance.

Appendix C – Laboratory Data Reporting SOPs

25.0 DATA REDUCTION, VALIDATION AND REPORTING

25.1 Data Reduction

Data reduction involves the handling of raw sample data including, but not limited to, detector response, electrode potential readings, titrant volumes, and gravimetric measurements to achieve final sample concentrations. Automated systems are used for calculation and reduction wherever feasible.

25.2 Data Review

A minimum two-tier technical review of all data is performed and documented. This provides for the documentation of data review, verification and cross-checking procedures. The details of this procedure are included in the Peer Review and Electronic QA Validation of Analytical Results SOP.

25.2.1 1st Level Technical Review

The Laboratory Technician performing an analysis reviews all of their own data and is responsible for ensuring that the calculations were properly performed and the quality control requirements were met. All final calculations and the evaluation of quality control samples are performed by the LIMS. A Data Review Checklist is initiated by the Technician to document this review. Results from all measurements (including environmental samples and QC samples) of an in-control batch are now available for entry into the LIMS. The Data Review Checklist is then given to a peer knowledgeable with the current requirements of that analytical procedure, a Senior Technician, Unit Supervisor, the QA/QC Manager, or the Managing Director.

25.2.2 2nd Level Technical Review

A peer, Senior Technician, Unit Supervisor, the QA/QC Manager, or the Managing Director reviews the data by repeating the verification performed by the Laboratory Technician. This step is documented through use of the Data Review Checklist. Data entered into the LIMS via electronic data transfer may be reviewed electronically. Data entered into the LIMS via manual data entry must be reviewed using the raw data, where a representative number of the calculations are verified and the quality control parameters are evaluated. A Project Manager may review Field data entered into the LIMS.

Acceptable data are now available for approval in the LIMS. This is performed through the "QA Validation" function of the LIMS. This step approves the data for release to the client. The ability to perform this approval step is limited through the select issue of rights, and is controlled by use of usernames and passwords. Data not meeting the requirements of the standard operating procedure is appropriately qualified using the narrative function in the LIMS.

25.2.3 Project Manager Review

Before the data is released to the client, a Project Manager will review all final reports for consistency and completeness to ensure that the data meet the overall data quality objectives of the client and the project. This review is intended to verify that those analyses requested have been performed, that the appropriate methods and reporting limits have been applied, the sample information is accurate, and the appropriate data qualifiers have been added.

25.2.4 Quality Assurance Review

In addition to the tiered review process, the quality assurance department will periodically perform data audits. These audits, required as part of our quality systems audit program, can be performed for the generation of reports that include quality control data, and as a troubleshooting measure.

25.3 Reporting

Microbac offers a variety of report packages. The details of these reports are listed below and the procedure for generating these reports found in the Report Generation SOP.

25.3.1 Level I Report – Results Only

Our basic report format is results only. This standard analytical report, accompanied by a cover letter and Work Order Summary, contains the following elements. The cover letter and summary report provide a link to the result page(s). The Project Manager responsible for the generation of the report and its contents signs the cover letter.

- Laboratory name, address, and phone number
- Title of "Analytical Results"
- Date reported
- Client name (with address on the cover letter)
- Client project ID
- Work Order and Sample number (providing a unique report number)
- Client sample identification and description
- Client defined matrix
- Collection date and time
- Date received
- Analyte
- Result (at client requested reporting limits and units)
- Reporting limit
- Units

- Applicable data qualifiers for blank contamination, spike recovery failure, duplicate recovery failure, and identification of values that exceed the linear range of the instrument, as applicable
- Dilution factor
- Date and time of sample preparation
- Preparation and Analytical method references
- Date and time of analysis
- Analyst initials
- Page numbering

The chain of custody form and the LIMS Cooler Inspection Form are returned with each report. Any deviations from the requirements of our Sample Acceptance Policy will be noted in the final report on the Cooler Inspection Form. Quality Control deficiencies having an affect on the data, if present, are identified in a Case Narrative report generated by the LIMS.

25.3.2 Level "II Std" Report

Our Level "II Std" report format includes all elements of the Level I report plus additional quality control data. The quality control data is delivered in the form of QC Summary Reports generated by our LIMS. The QC Summary Reports for a Level II report include the results for the batch controls (i.e. method blank and laboratory control sample) and the matrix controls (matrix spike, duplicate, etc).

25.3.3 Level "III Std" Report

This report format includes all elements of the Level "II Std" report as well as copies of the raw data for Organic analyses. The QC Summary Reports for a "Level III Std" report include the results for the instrument, batch and matrix controls. A Case Narrative report is included for each analytical group and addresses sample receipt conditions, a hold time evaluation, calibration, instrument quality control, batch quality control, and matrix quality control.

25.3.4 Level "IV Std" Report

This report format includes all elements of the Level "II Std" report and copies of the raw data for all analyses. The QC Summary Reports for a Level "IV Std" report include the results for the instrument, batch and matrix controls. A Case Narrative report is included for each analytical group and addresses sample receipt conditions, a hold time evaluation, calibration, instrument quality control, batch quality control, and matrix quality control.

Uncontrolled Copy

25.3.5 Level "III+" Report

This report format includes all elements of the Level "III Std' report as well as copies of the raw calibration data for Inorganic analyses.

25.3.6 Level "IV+" Report

This report format includes all elements of the Level "IV Std" report detailed Quantitation Reports for the GC/MS analyses (to include the ion ratios used for identification). Our Level "IV+" report format is compliant with the requirements of the Indiana Department of Environmental Management (IDEM) Office of Land Quality and Office of Water Quality.

25.3.7 CLP-Like Reports

Our Level III and Level IV report formats can be furnished using CLP-equivalent forms. These forms are included as a replacement to the QC Summary Reports typically supplied in our data packages.

25.3.8 Electronic Data Deliverables (EDD)

Electronic data deliverables are available in various formats depending on project requirements. The content of the EDD reports is verified by the Project Manager prior to issuing the results to the client.

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Appendix C – Columbia Analytical Reporting SOP

12.0 DATA REDUCTION, VALIDATION, AND REPORTING

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

12.1 Data Reduction and Review

Results are generated by the analyst who performs the analysis and works up the data. All data is initially reviewed and processed by analysts using appropriate methods (e.g., chromatographic software, instrument printouts, hand calculation, etc.). Equations used for calculation of results are found in the applicable analytical SOPs. The resulting data set is either manually entered (e.g., titrimetric or microbiological data) into an electronic report form or is electronically transferred into the report from the software used to process the original data set (e.g., chromatographic software). Once the complete data set has been transferred into the proper electronic report form(s), it is then printed. The resulting hardcopy version of the electronic report is then reviewed by the analyst for accuracy. Once the primary analyst has checked the data for accuracy and acceptability, the hardcopy is forwarded to the supervisor or second qualified analyst, who reviews the data for errors. Where calculations are not performed a validated software system, the reviewer rechecks a minimum of 10% of the calculations. When the entire data set has been found to be acceptable, a final copy of the report is printed and signed by the laboratory supervisor, departmental manager or designated laboratory staff. The entire data package is then placed into the appropriate service request file, and an electronic copy of the final data package is forwarded to the appropriate personnel for archival. Data review procedures are described in the *SOP for Laboratory Data Review Process.*

Policies and procedures for manual editing of data are established. The analyst making the change must initial and date the edited data entry, without obliteration of the original entry. The policies and procedures are described in the *SOP for Making Entries into Logbooks and onto Benchsheets* (SOP ADM-DATANTRY).

Policies and procedures for electronic manual integration of chromatographic data are established. The analyst performing the integration must document the integration change by printing both the "before" and "after" integrations and including them in the raw data records. The policies and procedures are described in the *SOP for Manual Integration of Chromatographic Peaks* (SOP ADM-INT).

12.2 Confirmation Analysis

12.2.1 Gas Chromatographic and Liquid Chromatographic Analyses

For gas chromatographic (GC) and liquid chromatographic (LC) analyses, all positive results are confirmed by a second column, a second detector, a second wavelength (HPLC/UV), or by GC/MS analysis, unless exempted by one of the following situations:

- The analyte of interest produces a chromatogram containing multiple peaks exhibiting a characteristic pattern, which matches appropriate standards. This is limited to petroleum hydrocarbon analyses (e.g., gasoline and diesel) and does not include polychlorinated biphenyls.

- The sample meets all of the following requirements:

    1. All samples (liquid or solid) come from the same source (e.g., groundwater samples from the same well) for continuous monitoring. Samples of the same matrix from the same site, but from different sources (e.g., different sampling locations) are not exempt.

    2. All analytes have been previously analyzed in sample(s) from the same source (within the last year), identified and confirmed by a second column or by GC/MS. The chromatogram is largely unchanged from the one for which confirmation was carried out. The documents indicating previous confirmation must be available for review.

12.2.2 Confirmation Data

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

- GC and LC Methods

    1. The analyte must fall within plus or minus three times the standard deviation (established for the analyte/column) of the retention time of the daily midpoint standard in order to be qualitatively identified. The retention-time windows will be established and documented, as specified in the appropriate Standard Operating Procedure (SOP).

    2. When sample results are confirmed by two dissimilar columns or detectors, the agreement between quantitative results must be evaluated. The relative percent difference between the two results is calculated and evaluated against SOP and/or method criteria.

- GC/MS Methods - Two criteria are used to verify identification:

  1. Elution of the analyte in the sample will occur at the same relative retention time (RRT) as that of the analyte in the standard.

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

12.3 Data Review and Validation

The integrity of the data generated is assessed through the evaluation of the results of the calibrations and analysis of QC samples (method blanks, laboratory control samples, sample duplicates, matrix spikes, trip blanks, etc.). A brief description of the evaluation of these analyses is described below. Details are provided in applicable SOPs. The numerical criteria for evaluation of these QC samples are listed within each method-specific Standard Operating Procedure. Other data evaluation measures may include (as necessary) a check of the accuracy check of the QC standards and a check of the system sensitivity. Data transcriptions and calculations are also reviewed.

Note: Within the scope of this document, all possible data assessment requirements for various project protocols cannot be included in the listing below. This listing gives a general description of data evaluation practices used in the laboratory in compliance with NELAC Quality Systems requirements. Additional requirements exist for certain programs, such as projects under the DoD QSM protocols, AFCEE QAPP protocols, and project-specific QAPPs.

- Method Calibration – Following the analysis of calibration blanks and standards according to the applicable SOP the calibration correlation coefficient, average response factor, etc. is calculated and compared to specified criteria. If the calibration meets criteria analysis may continue. If the calibration fails, any problems are isolated and corrected and the calibration standards reanalyzed. Following calibration and analysis of the independent calibration verification standard(s) the percent difference for the ICV is calculated. If the percent difference is within the specified limits the calibration is complete. If not, the problem associated with the calibration and/or ICV are isolated and corrected and verification and/or calibration is repeated.

- Continuing Calibration Verification (CCV) – Following the analysis of the CCV standard the percent difference is calculated and compared to specified criteria. If the CCV meets the criteria analysis may continue. If the CCV fails, routine corrective action is performed and documented and a 2nd CCV is analyzed. If this CCV meets criteria, analysis may continue, including any reanalysis of samples that were associated with a failing CCV. If the routine corrective action failed to produce an immediate CCV within criteria, then either acceptable performance is demonstrated (after additional corrective action) with two consecutive calibration verifications, or a new initial calibration is performed. For DoD projects, the concentration of these two consecutive must be varied as required by the DoD QSM, Version 3.

- Method Blank – Results for the method blank are calculated as performed for samples. If results are less than the MRL (<½ MRL for DoD projects), the blank may be reported. If not, associated sample results are evaluated to determine the impact of the blank result. If possible, the source of the contamination is determined. If the contamination has affected sample results the blank and samples are reanalyzed. If positive blank results are reported, the blank (and sample) results are flagged with an appropriate flag, qualifier, or footnote.

- Sample Results (Inorganic) – Following sample analysis and calculations (including any dilutions made due to the sample matrix) it is verified that the result is within the calibration range. If not, the sample is diluted and analyzed to bring the result into calibration range. For sample and sample duplicate analyzed for precision, the calculated RPD is compared to the specified limits. The sample and duplicate are reanalyzed if the criteria are exceeded. The samples may require re-preparation and reanalysis. For metals, additional measures described in the applicable SOP may be taken to further evaluate results (dilution tests and/or post-digestion spikes). Results are reported when within the calibration range, or as estimates when outside the calibration range. When dilutions are performed the MRL is elevated accordingly and qualified. The MRL must meet project requirements.

- Sample Results (Organic) – For GC/MS analyses, it is verified that the analysis was within the prescribed tune window. If not, the sample is reanalyzed. Following sample analysis and calculations (including any dilutions made due to the sample matrix) peak integrations, retention times, and spectra are evaluated to confirm qualitative identification. Internal standard responses and surrogate recoveries are evaluated against specified criteria. If internal standard response does not meet criteria, the sample is diluted and reanalyzed. It is verified that the result is within the calibration range. If not, the sample is diluted and analyzed to bring the result into calibration range. For GC and HPLC tests, results from confirmation analysis are evaluated to confirm positive results and to determine the reported value. If obvious matrix interferences are present, additional cleanup of the sample using appropriate procedures may be necessary and the sample is reanalyzed. Results are reported when within the calibration range, or as estimates when outside the calibration range. When dilutions are performed the MRL is elevated accordingly and qualified. The MRL must meet project requirements.

- Surrogate Results (Organic) – Following sample analysis and calculations the percent recovery of each surrogate is compared to specified control limits. If recoveries are acceptable and other sample evaluation is complete, the results are reported. If recoveries do not fall within control limits, the sample matrix is evaluated. When matrix interferences are present or documented, the results are reported with a qualifier that matrix interferences are present. If no matrix interferences are present and there is no cause for the outlier, the sample is reprepared and reanalyzed. However, if the recovery is above the upper control limit with non-detected target analytes, the sample may be reported. All surrogate recovery outliers are appropriately qualified on the report.

- Duplicate Sample and/or Duplicate Matrix Spike Results – The RPD is calculated and compared to the specified control limits. If the RPD is within the control limits the result is reported. If not, an evaluation of the sample is made to verify that a homogenous sample was used. Despite the use of homogenizing procedures prior to sample preparation or analysis, the sample may not be homogenous or duplicate sample containers may not have been sample consistently. If non-homogenous, the result is reported with a qualifier about the homogeneity of the sample. Also, the results are compared to the MRL. If the results are less than five times the MRL, the results are reported with a qualifier that the high RPD is due to the results being near the MRL. If the sample is homogenous and results above five times the MRL, the samples and duplicates are reanalyzed. If re-analysis also produces out-of-control results, the results are reported with an appropriate qualifier.

- Laboratory Control Sample Results – Following analysis of the LCS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits, the analysis is in control and results may be reported. If not, this indicates that the analysis is not in control. The source of the problem is identified and, depending on the source of the problem, the LCS and the associated batch is reanalyzed or re-prepared and reanalyzed.

- Matrix Spike Results – Following analysis of the MS the percent recovery is calculated and compared to specified control limits. If the recovery is within control limits the results may be reported. If not, and the LCS is within control limits, this indicates that the matrix potentially biases analyte recovery. It is verified that the spike level is at least five times the background level. If not, the results are reported with a qualifier that the background level is too high for accurate recovery determination. If matrix interferences are present or results indicate a potential problem with sample preparation, steps may be taken to improve results; such as performing any additional cleanups, dilution and reanalysis, or re-preparation and reanalysis. Results that do not meet acceptance limits are reported with an appropriate qualifier.

12.4 Data Reporting

When an analyst determines that a data package has met the data quality objectives (and/or any client-specific data quality objectives) of the method and has qualified any anomalies in a clear, acceptable fashion, the data package is reviewed by a trained chemist. Prior to release of the report to the client, the project chemist reviews and approves the entire report for completeness and to ensure that any and all client-specified objectives were successfully achieved. The original raw data, along with a copy of the final report, is filed in project files by service request number for archiving. CAS maintains control of analytical results by adhering to standard operating procedures and by observing sample custody requirements. All data are calculated and reported in units consistent with project specifications, to enable easy comparison of data from report to report.

To the extent possible, samples shall be reported only if all QC measures are acceptable. If a QC measure is found to be out of control, and the data is to be reported, all samples associated with the failed quality control measure shall be reported with the appropriate data qualifier(s). The *SOP for Data Reporting and Report Generation* addresses the flagging and qualification of data. The CAS-defined data qualifiers, state-specific data qualifiers, or project-defined data qualifiers are used depending on project requirements. A case narrative may be written by the project chemist to explain problems with a specific analysis or sample, etc.

For subcontracted analyses, the Project Chemist verifies that the report received from the subcontractor is complete. This includes checking that the correct analyses were performed, the analyses were performed for each sample as requested, a report is provided for each analysis, and the report is signed. The Project Chemist accepts the report if all verification items are complete. Acceptance is demonstrated by forwarding the report to the CAS client.

12.5 Documentation

CAS maintains a records system which ensures that all laboratory records of analysis data retained and available. Analysis data is retained for 5 years from the report date unless contractual terms or regulations specify a longer retention time. The archiving system is described in the *SOP for Data Archiving*.

12.5.1 Documentation and Archiving of Sample Analysis Data

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

- Benchsheets describing sample preparation (if appropriate) and analysis;
- Instrument parameters (or reference to the data acquisition method);
- Sample analysis sequence;
- Instrument printouts, including chromatograms and peak integration reports for all samples, standards, blanks, spikes and reruns;
- Logbook ID number for the appropriate standards;
- Copies of report sheets submitted to the work request file; and
- Copies of Nonconformity and Corrective Action Reports, if necessary.

Individual sets of analyses are identified by analysis date and service request number. Since many analyses are performed with computer-based data systems, the final sample concentrations can be automatically calculated. If additional calculations are needed, they are written on the integration report or securely stapled to the chromatogram, if done on a separate sheet.

12.5.2 Documentation of Batch-related QC and Calibration Data

For organics analysis, data applicable to all analyses within the batch, such as GCMS tunes, CCVs, batch QC, and analysis sequences; are kept using a separate documentation system. This system is used to archive data on a batch-specific basis and is segregated according to the date of analysis. This system also includes results for the most recent calibration curves, as well as method validation results.

12.6 Deliverables

In order to meet individual project needs, CAS provides several levels of analytical reports. Basic specifications for each level of deliverable are described in Table 12-1. Variations may be provided based on client or project specifications. This includes (but is not limited to) to following specialized deliverables:

- ADEC – Alaska Department of Conservation specified data package
- ACOE/HTRW – Army Corps of Engineers HTRW specified data package and reporting requirements
- AFCEE – Air Force Center for Environmental Excellence project-specific reporting

When requested, CAS provides Electronic Data Deliverables (EDDs) in the format specified by client need or project specification. The EDD is prepared by report production staff using the electronic version of the laboratory report to minimize transcription errors. User guides and EDD specification outlines are used in preparing the EDD. The EDD is reviewed and compared to the hard-copy report for accuracy.

Table 12-1
Descriptions of CAS Data Deliverables

Tier I. Routine Certified Analytical Report (CAR) includes the following:

1. Transmittal letter
2. Sample analytical results
3. Method blank results
4. Surrogate recovery results and acceptance criteria for applicable organic methods
5. Chain of custody documents
6. Dates of sample preparation and analysis for all tests

Tier II and IIA. In addition to the Tier I Deliverables, this CAR includes the following:

1. Matrix spike result(s) with calculated recovery and including associated acceptance criteria
2. Duplicate or duplicate matrix spike result(s) (as appropriate to method), with calculated relative percent difference
3. Tier IIA also includes Laboratory Control Sample (LCS) result(s) with calculated recovery and including associated acceptance criteria

Tier III. Data Validation Package. In addition to the Tier II Deliverables, this CAR includes the following:

1. Case narrative
2. Calibration records and results of initial and continuing calibration verification standards, with calculated recoveries
3. Results of laboratory control sample (LCS) or Quality Control check sample, with calculated recovery and/or associated acceptance limit criteria
4. Results of calibration blanks or solvent blanks (as appropriate to method)
5. Summary forms for associated QC and calibration parameters
6. Copies of all raw data, including extraction/preparation bench sheets, chromatograms, and instrument printouts. For GC/MS, this includes tuning criteria and mass spectra of all positive hits. Results and spectra of TIC compounds will be included upon request.

Tier IV. CLP-Level Data Validation Package.

A complete Data Validation Package containing all sample results, quality control and calibration results, and raw data necessary to fulfill all deliverable requirements of an EPA Contract Laboratory Program (CLP) data package.

Appendix C – Northwestern Aquatic Sciences Reporting SOP

X. LABORATORY DOCUMENTATION

Quality assurance programs are dependent on timely and accurate record keeping. Documentation of QA checks and procedures provide proof of performance and a reference to guide future work. This section describes the types of records to be kept and assigns responsibility for record keeping. The laboratory maintains a signature/initial log of all laboratory staff so that personnel initialing any work can be identified.

A. TEST METHODS AND STANDARD OPERATING PROCEDURES (SOPs)

SOPs are documents that contain detailed information on the requirements for the correct performance of laboratory and other procedures. NAS maintains a master list of SOPs that reflect its current and former programs, as well as allowing for growth. The QAO and Lab Director are responsible for developing, writing, and approving SOPs. The types of SOPs at NAS include administrative sops, QA sops, general data sops, microbiology sops, chemistry sops, and toxicology sops. Within the toxicology sops there are currently eight categories of SOPs:

- Laboratory Equipment, Supplies and Materials
- General Laboratory Practices
- QC Program
- Test Methods - WET Testing
- Test Methods - Freshwater Sediment
- Test Methods - Marine Sediment
- Animal Culture and Collection Methods
- Data Analysis, Management, and Reporting

The SOPs at NAS are considered proprietary and not to be given out. For each test method, there is a test protocol that is followed and appended to the final report. The test protocols may be provided to the client for review and/or signature prior to starting a project.

There are three controlled copies of all officially approved SOPs: QA, laboratory, and NAS library. All SOPs are approved by the QA Officer before being implemented. The distribution of current SOPs and archiving of outdated ones is controlled through the QA Officer. Each SOP has a cover sheet with its SOP number, inception date, current revision date, title, file name, references, distribution list, revision summary, and dates and signatures of the Laboratory Director/Technical Director and QAO.

B. LABORATORY BENCH SHEETS

Laboratory bench sheets are used to document information from many routine laboratory operations. For example bench sheets are used to collect required data for all bioassay tests. Other examples of the use of bench sheets include: 1) the collection of culture data; 2) recording data for test animal collections; and 3) laboratory systems operations. Bench sheets are used to insure that the information

is recorded in a complete and organized manner and that the test or other procedure can be reconstructed, if necessary.

All entries to laboratory bench sheets are made in black water-proof ink. No erasures are made on the original data sheets. Corrections are made by crossing one line through the incorrect entry and writing the correct entry, an explanation for the correction, the date, and the initials of the person correcting the error. Error correction codes may be used in explaining corrections.

C. LABORATORY NOTEBOOKS

Laboratory notebooks are used to document information that cannot easily be recorded on bench sheets. Laboratory notebooks are typically maintained for sample logbooks, reagent logbooks, and project notebooks for the collection of data not suitable for bench sheets. Each page in a laboratory notebook is initialed and dated as information is entered. Notebook pages are numbered prior to use. Notebook entries and corrections are made as with bench sheets (see Section IX. B.).

D. CONTROL CHARTS

Control charts are constructed to monitor the performance of bioassay test results using reference toxicants. These charts are used to demonstrate satisfactory laboratory performance. Control charts are prepared for each reference toxicant, test species, test condition, and endpoint combination, and successive toxicity values are plotted and examined to determine if the results are within prescribed limits. A minimum of five reference toxicant tests is needed for constructing a control chart. After two years or a minimum of 20 data points, the control chart is maintained using only the 20 most recent points. The mean and upper and lower control limits ($\pm$ 2 S) are recalculated with each successive test result. If the toxicity value from a given test with a reference toxicant does not fall in the expected range, this is not an automatic cause for rejection of the effluent or sediment test. Chance alone would cause one in 20 tests to fall outside the limits at the $P_{0.05}$ probability level. If more than one out of 20 reference toxicant test fall outside the control limits, the source of the variability is investigated, corrective actions are taken to reduce the variability and another reference toxicant test is performed as soon as possible. If the cause of the outlier can be documented, the outlier should be excluded from future calculations of the control limits. If two or more consecutive tests fall outside the control limits, the results must be explained and the reference toxicant test repeated.

E. PROJECT FILES

A project file is created for each project handled within the laboratory. The project file contains all documents associated with the project. This includes correspondence from the client, chain-of-custody records, raw data, test protocols, bench sheets, copies of laboratory notebook entries pertaining to the project, and a copy of the final report. When a project is complete, all records are passed to the QA Officer who inventories the file, checks for completeness, and puts the file into document archive.

F. CONFIDENTIALITY

Often during the course of business, NAS is privy to data or information that is considered confidential or proprietary to our clients. Such information includes results of their tests, origin of their samples, the fact that we are working with them, any procedures or processes that they conduct or investigate, any information about them or their business, our own laboratory procedures, and clients. All such information must be kept strictly confidential. The information should only be discussed with people designated as technical contacts or purchasing agents for the particular project or corporate officers for the clients' company. The information should not be discussed with anyone else, even people within a client's company not designated as a contact, without written permission from the client.

Access to laboratory records and data is limited to laboratory personnel except with the permission of the QA Officer or Laboratory Director.

Where clients require transmission of test results by telephone, telex, facsimile or other electronic or electromagnetic means, staff will ensure confidentiality is preserved

XI. REPORTING OF TEST RESULTS

The final report of the test results should include all of the following standard information at a minimum: name and identification of the test including a reference to the test protocol; the names of the investigator(s) and laboratory; information on the sample(s) including date of receipt, the type of sample, storage information and any chain-of-custody records; information on the test or dilution water; detailed information about the test organisms including source and acclimation or culture conditions; a description of the experimental design and test chambers and other test conditions including water quality; information about any aeration that may have been required; definition of the effect criteria and other observations; responses, if any, in the control treatment; tabulation and statistical analysis of measured responses; a description of the statistical methods used; any unusual information about the test or deviations from procedures; the results of associated reference toxicant tests.

XII. PERFORMANCE AND SYSTEM AUDITS

NAS participates in available federal and state accreditation and performance audit programs that subject the laboratory to stringent system and performance audits. A system audit is a review of laboratory operations conducted to verify that the laboratory has the necessary facilities, equipment, staff, and procedures in place to generate acceptable data. A performance audit verifies the ability of the laboratory to provide accurate toxicity test results using samples submitted by the auditing agency.

NAS is currently accredited for toxicity testing with the State of Washington (Lab Accreditation No.C1238). The State of Oregon does not currently require accreditation for toxicology laboratories

Appendix D – Laboratory Accreditation Certificates

STATE OF ILLINOIS

ENVIRONMENTAL PROTECTION AGENCY
NELAP - RECOGNIZED
ENVIRONMENTAL LABORATORY ACCREDITATION

is hereby granted to

MICROBAC LABORATORIES, INC.

250 WEST 84TH DRIVE

MERRILLVILLE, IN 46410

NELAP ACCREDITED
ACCREDITATION NUMBER #100435

According to the Illinois Administrative Code, Title 35, Subtitle A, Chapter II, Part 186, ACCREDITATION OF LABORATORIES FOR DRINKING WATER, WASTEWATER AND HAZARDOUS WASTES ANALYSIS, the State of Illinois formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed below.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part 186 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part 186. Please contact the Illinois EPA Environmental Laboratory Accreditation Program (IL ELAP) to verify the laboratory's scope of accreditation and accreditation status. Accreditation by the State of Illinois is not an endorsement or a guarantee of validity of the data generated by the laboratory.

Ron Turpin
Manager
Environmental Laboratory Accreditation Program

Scott D. Siders
Accreditation Officer
Environmental Laboratory Accreditation Program

Certificate No.: 002414
Expiration Date: 01/30/2010
Issued On: 11/19/2009

State of Illinois
Environmental Protection Agency

Certificate No.: 002414

\wards the Certificate of Approval

Microbac Laboratories, Inc.
250 West 84th Drive
Merrillville, IN 46410

According to the Illinois Administrative Code, Title 35, Subtitle A, Chapter II, Part 186, ACCREDITATION OF LABORATORIES FOR DRINKING WATER, WASTEWATER AND HAZARDOUS WASTES ANALYSIS, the State of Illinois formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed below.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part 186 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part 186. Please contact the Illinois EPA Environmental Laboratory Accreditation Program (IL ELAP) to verify the laboratory's scope of accreditation and accreditation status. Accreditation by the State of Illinois is not an endorsement or a guarantee of validity of the data generated by the laboratory.

Drinking Water, Inorganic

SM4500F-C,18Ed

Fluoride

SM4500H-B,18Ed

Hydrogen Ion (pH)

USEPA200.7R4.4

Arsenic	Barium	Beryllium
Cadmium	Calcium	Chromium
Copper	Magnesium	Nickel
Sodium		

USEPA200.8R5.4

Antimony	Arsenic	Barium
Beryllium	Cadmium	Chromium
Copper	Lead	Manganese
Mercury	Nickel	Selenium
Thallium		

USEPA200.9R2.2

Antimony	Arsenic	Cadmium
Lead	Selenium	Thallium

USEPA245.1R3.0

Mercury

USEPA335.4R1.0

Cyanide

USEPA353.2R2.0

Nitrate	Nitrite

USEPA365.1R2.0

Orthophosphate

Hazardous and Solid Waste, Inorganic

1010

Ignitability

1311

TCLP (Organic and Inorganic)

1312

Synthetic Precipitation Leaching Procedure

6010B

Aluminum	Antimony	Arsenic

State of Illinois
Environmental Protection Agency

Certificate No.: 002414

Awards the Certificate of Approval

Microbac Laboratories, Inc.
250 West 84th Drive
Merrillville, IN 46410

Hazardous and Solid Waste, Inorganic

6010B

Beryllium	Cadmium	Barium
Chromium	Cobalt	Calcium
Iron	Lead	Copper
Manganese	Molybdenum	Magnesium
Potassium	Selenium	Nickel
Sodium	Strontium	Silver
Vanadium	Zinc	Thallium

6020A

Aluminum	Antimony	Arsenic
Barium	Beryllium	Cadmium
Calcium	Chromium	Cobalt
Copper	Iron	Lead
Magnesium	Manganese	Mercury
Molybdenum	Nickel	Potassium
Selenium	Silver	Sodium
Thallium	Vanadium	Zinc

7041 (Non-Potable Matrix Only)

Antimony

7060A

Arsenic

7131A

Cadmium

7196A

Chromium VI

7421

Lead

7470A

Mercury

7471A

Mercury

7841

Thallium

9012A

Cyanide

9030B

Sulfides

9034

Sulfides

9041A

Hydrogen Ion (pH)

9045C

Hydrogen Ion (pH)

9066

State of Illinois
Environmental Protection Agency

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Microbac Laboratories, Inc.
250 West 84th Drive
Merrillville, IN 46410

Hazardous and Solid Waste, Inorganic	*9066*	Phenolics
9095A		
Paint Filter		
Chapter 7/9014		
Reactive Cyanide		
Chapter 7/9034		
Reactive Sulfide		
Hazardous and Solid Waste, Organic		
8015B		
Diesel range organics (DRO)	Gasoline range organics (GRO)	
8081A		
4,4'-DDD	4,4'-DDE	4,4'-DDT
Aldrin	alpha-BHC	beta-BHC
Chlordane - not otherwise specified	delta-BHC	Dieldrin
Endosulfan I	Endosulfan II	Endosulfan sulfate
Endrin	Endrin aldehyde	Endrin ketone
gamma-BHC (Lindane)	Heptachlor	Heptachlor epoxide
Methoxychlor	Toxaphene	
8082		
PCB-1016	PCB-1221	PCB-1232
PCB-1242	PCB-1248	PCB-1254
PCB-1260		
8151A		
2,4,5-TP (Silvex)	2,4-D	
8260B		
1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene
1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane (DBCP)	1,2-Dibromoethane (EDB)
1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane
1,3,5-Trimethylbenzene	1,3-Dichlorobenzene	1,3-Dichloropropane
1,4-Dichlorobenzene	2-Butanone (Methyl ethyl ketone, MEK)	2-Chloroethyl vinyl ether
2-Hexanone	2-Nitropropane	2-Pentanone
4-Methyl-2-pentanone (Methyl isobutyl ketone, I	Acetone	Acetonitrile
Acrolein (Propenal)	Acrylonitrile	Benzene
Bromobenzene	Bromodichloromethane	Bromoform
Bromomethane	Carbon disulfide	Carbon tetrachloride
Chlorobenzene	Chlorodibromomethane (Dibromochloromethan	Chloroethane
Chloroform	Chloromethane	cis-1,2-Dichloroethene
cis-1,3-Dichloropropene	Dichloromethane (Methylene chloride)	Ethyl acetate
Ethylbenzene	Isopropylbenzene	Methyl-t-butyl ether
m-Xylene	Naphthalene	n-Butanol
n-Butylbenzene	o-Xylene	p-Xylene
sec-Butylbenzene	Styrene	tert-Butylbenzene
Tetrachloroethene	Toluene	trans-1,2-Dichloroethene

Microbac Laboratories, Inc.
250 West 84th Drive
Merrillville, IN 46410

Hazardous and Solid Waste, Organic

8260B

Trichloroethene
Trichlorofluoromethane
trans-1,3-Dichloropropene
Vinyl chloride
Xylenes (Total)
Vinyl acetate

8270C

1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,2-Diphenylhydrazine
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene (2,4-DNT)
2,6-Dichlorophenol
2,6-Dinitrotoluene (2,6-DNT)
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitroaniline
2-Nitrophenol
3,3'-Dichlorobenzidine
3-Nitroaniline
4,6-Dinitro-2-methylphenol
4-Bromophenyl phenyl ether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenyl phenyl ether
4-Nitroaniline
4-Nitrophenol
Acenaphthene
Acenaphthylene
Acetophenone
Aniline
Anthracene
Benzidine
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perlyene
Benzo(k)fluoranthene
Benzoic acid
Benzyl alcohol
Bis(2-chloroethoxy) methane
Bis(2-chloroethyl) ether
Bis(2-ethylhexyl) phthalate
Butyl benzyl phthalate
Chrysene
Dibenz(a,h)anthracene
Dibenzofuran
Diethyl phthalate
Dimethyl phthalate
Di-n-butyl phthalate
Di-n-octyl phthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd) pyrene
Isophorone
m-Cresol (3-Methylphenol)
Naphthalene
Nitrobenzene
N-Nitrosodimethylamine
N-Nitrosodi-n-propylamine
N-Nitrosodiphenylamine
p-Cresol (4-Methylphenol)
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
Pyridine

Wastewater, Inorganic

SM2120B,18Ed

Color

SM2320B,18Ed

Alkalinity

SM2340B,18Ed

Hardness

SM2340C,18Ed

Hardness

SM2510B,18Ed

Specific Conductance

SM2540B,18Ed

Residue (Total)

SM2540C,18Ed

Residue (TDS)

SM2540D,18Ed

Residue (TSS)

State of Illinois
Environmental Protection Agency

Certificate No.: 002414

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Microbac Laboratories, Inc.
250 West 84th Drive
Merrillville, IN 46410

Wastewater, Inorganic

SM2550B,18Ed

Temperature

SM3500Cr-D,18Ed

Chromium VI

SM4500Cl-B,18Ed

Chloride

SM4500CN-CE,18Ed

Cyanide

SM4500CN-CG,18Ed

Cyanide-amenable to chlorination

SM4500H-B,18Ed

Hydrogen Ion (pH)

SM4500O-C,18Ed

Oxygen - Dissolved

SM5210B,18Ed

Biochemical Oxygen Demand (BOD)

Carbonaceous Biochemical Oxygen Demand (C

USEPA160.4

Residue (Volatile)

USEPA1631E

Mercury

USEPA1664RA

Oil and Grease

USEPA200.7R4.4

Aluminum	Antimony	Arsenic
Barium	Beryllium	Boron
Cadmium	Calcium	Chromium
Cobalt	Copper	Iron
Lead	Magnesium	Manganese
Molybdenum	Nickel	Potassium
Selenium	Silica	Silver
Sodium	Thallium	Tin
Vanadium	Zinc	

USEPA200.8R5.4

Aluminum	Antimony	Arsenic
Barium	Beryllium	Boron
Cadmium	Chromium	Cobalt
Copper	Iron	Lead
Manganese	Molybdenum	Nickel
Selenium	Silver	Thallium
Vanadium	Zinc	

USEPA200.9R2.2

Antimony	Arsenic	Cadmium
Lead	Selenium	Thallium

USEPA245.1R3.0

State of Illinois
Environmental Protection Agency

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Microbac Laboratories, Inc.
250 West 84th Drive
Merrillville, IN 46410

Wastewater, Inorganic	*USEPA245.1R3.0*	Mercury
USEPA350.1R2.0		
Ammonia		
USEPA353.2R2.0		
Nitrate-Nitrite (sum)	Nitrite	
USEPA365.1R2.0		
Orthophosphate (as P)		
USEPA410.4R2.0		
Chemical Oxygen Demand (COD)		
USEPA420.4R1.0		
Phenolics		
Wastewater, Organic		
USEPA608		
4,4'-DDD	4,4'-DDE	4,4'-DDT
Aldrin	alpha-BHC	beta-BHC
Chlordane	delta-BHC	Dieldrin
Endosulfan I	Endosulfan II	Endosulfan sulfate
Endrin	Endrin aldehyde	gamma-BHC (Lindane)
Heptachlor	Heptachlor epoxide	Methoxychlor
PCB-1016	PCB-1221	PCB-1232
PCB-1242	PCB-1248	PCB-1254
PCB-1260	Toxaphene	
USEPA610		
Acenaphthene	Acenaphthylene	Anthracene
Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene
Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene
Dibenz(a,h)anthracene	Fluoranthene	Fluorene
Indeno(1,2,3-cd) pyrene	Naphthalene	Phenanthrene
Pyrene		
USEPA624		
1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane
1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichlorobenzene
1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene
1,4-Dichlorobenzene	2-Chloroethylvinyl ether	Acetonitrile
Acrolein (Propenal)	Acrylonitrile	Benzene
Bromodichloromethane	Bromoform	Bromomethane
Carbon tetrachloride	Chlorobenzene	Chloroethane
Chloroform	Chloromethane	cis-1,3-Dichloropropene
Dibromochloromethane	Dichloromethane (Methylene chloride)	Ethylbenzene
Tetrachloroethene	Toluene	trans-1,2-Dichloroethene
trans-1,3-Dichloropropene	Trichloroethene	Trichlorofluoromethane
Vinyl chloride	Xylenes (total)	
USEPA625		
1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene
1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dichlorophenol

State of Illinois
Environmental Protection Agency

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Microbac Laboratories, Inc.
250 West 84th Drive
Merrillville, IN 46410

Wastewater, Organic

2,4-Dinitrotoluene (2,4-DNT)
2-Chlorophenol
4-Bromophenyl phenyl ether
4-Nitrophenol
Anthracene
Benzo(a)pyrene
Benzo(k)fluoranthene
Bis(2-chloroethyl) ether
Dibenz(a,h)anthracene
Di-n-butyl phthalate
Fluorene
Hexachlorocyclopentadiene
Isophorone
N-Nitrosodimethylamine
Pentachlorophenol
Pyrene

USEPA625

2,6-Dinitrotoluene (2,6-DNT)
2-Nitrophenol
4-Chloro-3-methylphenol
Acenaphthene
Benzidine
Benzo(b)fluoranthene
Benzyl butyl phthalate
Bis(2-ethylhexyl) phthalate
Diethyl phthalate
Di-n-octyl phthalate
Hexachlorobenzene
Hexachloroethane
Naphthalene
N-Nitrosodi-n-propylamine
Phenanthrene

2,4-Dimethylphenol
2-Chloronaphthalene
3,3'-Dichlorobenzidine
4-Chlorophenyl phenyl ether
Acenaphthylene
Benzo(a)anthracene
Benzo(g,h,i)perylene
Bis(2-chloroethoxy) methane
Chrysene
Dimethyl phthalate
Fluoranthene
Hexachlorobutadiene
Indeno(1,2,3-cd) pyrene
Nitrobenzene
N-Nitrosodiphenylamine
Phenol

State of Florida

Department of Health, Bureau of Laboratories

This is to certify that

E87412

COLUMBIA ANALYTICAL SERVICES, INC. - WA
1317 SOUTH 13TH AVENUE
KELSO, WA 98626

has complied with Florida Administrative Code 64E-1,
for the examination of Environmental samples in the following categories

DRINKING WATER - GROUP I UNREGULATED CONTAMINANTS, DRINKING WATER - GROUP II UNREGULATED CONTAMINANTS, DRINKING WATER - GROUP III UNREGULATED CONTAMINANTS, DRINKING WATER - MICROBIOLOGY, DRINKING WATER - OTHER REGULATED CONTAMINANTS, DRINKING WATER - PRIMARY INORGANIC CONTAMINANTS, DRINKING WATER - SECONDARY INORGANIC CONTAMINANTS, DRINKING WATER - SYNTHETIC ORGANIC CONTAMINANTS, NON-POTABLE WATER - EXTRACTABLE ORGANICS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - METALS, NON-POTABLE WATER - MICROBIOLOGY, NON-POTABLE WATER - PESTICIDES-HERBICIDES-PCB'S, NON-POTABLE WATER - VOLATILE ORGANICS, SOLID AND CHEMICAL MATERIALS - EXTRACTABLE ORGANICS, SOLID AND CHEMICAL MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS - PESTICIDES-HERBICIDES-PCB'S, SOLID AND CHEMICAL MATERIALS - VOLATILE ORGANICS, BIOLOGICAL TISSUE - EXTRACTABLE ORGANICS, BIOLOGICAL TISSUE - GENERAL CHEMISTRY, BIOLOGICAL TISSUE - METALS, BIOLOGICAL TISSUE - PESTICIDES-HERBICIDES-PCB'S

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

EFFECTIVE July 01, 2009 THROUGH June 30, 2010

Max Salfinger, M.D.
Chief, Bureau of Laboratories
Florida Department of Health
DH Form 1697, 7/04
NON-TRANSFERABLE E87412-14-07/01/2009
Supersedes all previously issued certificates

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-14, expiration date June 30, 2010. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,1,1-Trichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,1,2,2-Tetrachloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,1,2-Trichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,1-Dichloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,1-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,1-Dichloropropene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2,3-Trichlorobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2,3-Trichloropropane	EPA 504.1	Group II Unregulated Contaminants	NELAP	7/17/2003
1,2,3-Trichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,2,4-Trimethylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,2-Dibromo-3-chloropropane (DBCP)	EPA 504.1	Synthetic Organic Contaminants	NELAP	7/17/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 504.1	Synthetic Organic Contaminants	NELAP	7/17/2003
1,2-Dichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,2-Dichloroethane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,2-Dichloropropane	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
1,3,5-Trimethylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,3-Dichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
2,2-Dichloropropane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
2,4,5-T	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
2,4-D	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
2-Chlorotoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
3-Hydroxycarbofuran	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDD	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDD	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDE	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDE	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDT	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
4,4'-DDT	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
4-Chlorotoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	7/17/2003
4-Isopropyltoluene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-14, expiration date June 30, 2010. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87412 **EPA Lab Code:** WA00035 **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Acetochlor	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Acifluorfen	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Alachlor	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Aldicarb (Temik)	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldicarb sulfone	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldicarb sulfoxide	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldrin	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Aldrin	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Alkalinity as CaCO3	SM 2320 B	Primary Inorganic Contaminants	NELAP	10/8/2001
Aluminum	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Aluminum	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001
Antimony	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Antimony	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Arsenic	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Arsenic	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Atrazine	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Barium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Barium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Benzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Benzo(a)pyrene	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Beryllium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Beryllium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Boron	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2007
Bromate	EPA 300.1	Primary Inorganic Contaminants	NELAP	7/17/2003
Bromide	EPA 300.1	Primary Inorganic Contaminants	NELAP	7/17/2003
Bromoacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Bromobenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Bromochloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Bromochloromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	7/17/2003
Bromodichloromethane	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Bromoform	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Butachlor	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Butyl benzyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003

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Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Cadmium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Cadmium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Calcium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Carbaryl (Sevin)	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Carbofuran (Furadan)	EPA 531.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Carbon tetrachloride	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Chlorate	EPA 300.1	Secondary Inorganic Contaminants	NELAP	12/23/2005
Chlordane (tech.)	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Chloride	EPA 300.0	Secondary Inorganic Contaminants	NELAP	10/8/2001
Chlorite	EPA 300.1	Primary Inorganic Contaminants	NELAP	7/17/2003
Chloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Chlorobenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Chloroethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Chloroform	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Chromium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Chromium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
cis-1,2-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
cis-1,3-Dichloropropene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Color	SM 2120 B	Secondary Inorganic Contaminants	NELAP	7/17/2003
Conductivity	SM 2510 B	Primary Inorganic Contaminants	NELAP	10/8/2001
Copper	EPA 200.7	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	10/8/2001
Copper	EPA 200.8	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	10/8/2001
Copper	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Cyanide	EPA 335.4	Primary Inorganic Contaminants	NELAP	10/8/2001
Dacthal (DCPA)	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Dalapon	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
DCPA di acid degradate	EPA 515.4	Group I Unregulated Contaminants	NELAP	7/17/2003
DCPA mono acid degradate	EPA 515.4	Group I Unregulated Contaminants	NELAP	7/17/2003
Di(2-ethylhexyl)adipate	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Dibromoacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Dibromochloromethane	EPA 524.2	Other Regulated Contaminants,Group II Unregulated Contaminants	NELAP	10/8/2001
Dibromomethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001

Laboratory Scope of Accreditation

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Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Dicamba	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Dichloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Dichlorodifluoromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Dichloromethane (DCM, Methylene chloride)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Dieldrin	EPA 508.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Dieldrin	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Diethyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Dimethyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Di-n-butyl phthalate	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Di-n-octyl phthalate	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Diquat	EPA 549.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Endothall	EPA 548.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Endrin	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Endrin	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
EPTC (Eptam, s-ethyl-dipropyl thio carbamate)	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Escherichia coli	SM 9223 B	Microbiology	NELAP	10/8/2001
Ethylbenzene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Fluoride	EPA 300.0	Primary Inorganic Contaminants,Secondary Inorganic Contaminants	NELAP	10/8/2001
Fluoride	SM 4500 F-C	Secondary Inorganic Contaminants,Primary Inorganic Contaminants	NELAP	10/8/2001
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Glyphosate	EPA 547	Synthetic Organic Contaminants	NELAP	7/17/2003
Hardness	SM 2340 B	Secondary Inorganic Contaminants	NELAP	10/8/2007
Heptachlor	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Heptachlor	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Heptachlor epoxide	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Heptachlor epoxide	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Heterotrophic plate count	SM 9215 B	Microbiology	NELAP	7/17/2003
Hexachlorobenzene	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Hexachlorobutadiene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Hexachlorocyclopentadiene	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Iron	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001

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Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Isophorone	EPA 525.2	Group III Unregulated Contaminants	NELAP	7/17/2003
Isopropylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Lead	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Lead	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Magnesium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Manganese	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Manganese	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001
Mercury	EPA 245.1	Primary Inorganic Contaminants	NELAP	10/8/2001
Methomyl (Lannate)	EPA 531.1	Group I Unregulated Contaminants	NELAP	7/17/2003
Methoxychlor	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Methoxychlor	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Methyl bromide (Bromomethane)	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Methyl chloride (Chloromethane)	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Methyl tert-butyl ether (MTBE)	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Metolachlor	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Metribuzin	EPA 525.2	Group I Unregulated Contaminants	NELAP	4/20/2009
Molinate	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Molybdenum	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2007
Naphthalene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
n-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Nickel	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Nickel	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrate	EPA 300.0	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrate	EPA 353.2	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrite	EPA 300.0	Primary Inorganic Contaminants	NELAP	10/8/2001
Nitrite	EPA 353.2	Primary Inorganic Contaminants	NELAP	10/8/2001
n-Propylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Orthophosphate as P	SM 4500-P F	Primary Inorganic Contaminants	NELAP	10/8/2001
Oxamyl	EPA 531.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Paraquat	EPA 549.2	Synthetic Organic Contaminants	NELAP	12/23/2005
PCBs	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
Pentachlorophenol	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Pentachlorophenol	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Perchlorate	EPA 314.0	Primary Inorganic Contaminants	NELAP	7/17/2003
pH	EPA 150.1	Secondary Inorganic Contaminants,Primary Inorganic Contaminants	NELAP	10/8/2001

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Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
pH	SM 4500-H+-B	Primary Inorganic Contaminants	NELAP	4/11/2007
Picloram	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Potassium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2007
Propachlor (Ramrod)	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
sec-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Selenium	EPA 200.8	Primary Inorganic Contaminants	NELAP	10/8/2001
Selenium	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Silica as SiO2	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Silver	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Silver	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001
Silvex (2,4,5-TP)	EPA 515.4	Synthetic Organic Contaminants	NELAP	7/17/2003
Simazine	EPA 525.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Sodium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2001
Styrene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Sulfate	EPA 300.0	Secondary Inorganic Contaminants,Primary Inorganic Contaminants	NELAP	10/8/2001
Terbacil	EPA 525.2	Group I Unregulated Contaminants	NELAP	7/17/2003
tert-Butylbenzene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Tetrachloroethylene (Perchloroethylene)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Thallium	EPA 200.8	Primary Inorganic Contaminants	NELAP	11/18/2004
Thallium	EPA 200.9	Primary Inorganic Contaminants	NELAP	10/8/2001
Toluene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Total coliforms	SM 9223 B	Microbiology	NELAP	10/8/2001
Total dissolved solids	SM 2540 C	Secondary Inorganic Contaminants	NELAP	10/8/2001
Total haloacetic acids	EPA 552.2	Synthetic Organic Contaminants	NELAP	7/17/2003
Total nitrate-nitrite	EPA 300.0	Primary Inorganic Contaminants	NELAP	10/8/2001
Total nitrate-nitrite	EPA 353.2	Primary Inorganic Contaminants	NELAP	10/8/2001
Total organic carbon	SM 5310C	Primary Inorganic Contaminants	NELAP	4/11/2007
Total trihalomethanes	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Toxaphene (Chlorinated camphene)	EPA 508.1	Synthetic Organic Contaminants	NELAP	7/17/2003
trans-1,2-Dichloroethylene	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
trans-1,3-Dichloropropylene	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Trichloroacetic acid	EPA 552.2	Group I Unregulated Contaminants	NELAP	7/17/2003
Trichloroethene (Trichloroethylene)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Trichlorofluoromethane	EPA 524.2	Group II Unregulated Contaminants	NELAP	10/8/2001
Turbidity	EPA 180.1	Secondary Inorganic Contaminants	NELAP	10/8/2001

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Matrix: Drinking Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Vanadium	EPA 200.7	Primary Inorganic Contaminants	NELAP	10/8/2007
Vinyl chloride	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Xylene (total)	EPA 524.2	Other Regulated Contaminants	NELAP	10/8/2001
Zinc	EPA 200.7	Secondary Inorganic Contaminants	NELAP	10/8/2001
Zinc	EPA 200.8	Secondary Inorganic Contaminants	NELAP	10/8/2001

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E87412
Columbia Analytical Services, Inc. - WA
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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,1-Trichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2,2-Tetrachloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2-Trichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethylene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Dichloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichloropropane	EPA 624	Volatile Organics	NELAP	10/8/2001
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003

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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,4-Dioxane (1,4-Diethyleneoxide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ 180)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5-Trichlorobiphenyl (BZ 18)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3,4,6-Tetrachlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,3-Dichlorobiphenyl (BZ 5)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4',5-Trichlorobiphenyl (BZ 31)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4,5-Trichlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trichlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001

Laboratory Scope of Accreditation

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State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,4,6-Trichlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4-Dichlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dimethylphenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 625	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 625	Extractable Organics	NELAP	10/8/2001
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chlorobiphenyl (BZ 1)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2-Chloroethyl vinyl ether	EPA 624	Volatile Organics	NELAP	10/8/2001
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloronaphthalene	EPA 625	Extractable Organics	NELAP	10/8/2001
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Methyl-4,6-dinitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Naphthylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003

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E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Nitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	7/1/2003
3,3'-Dichlorobenzidine	EPA 625	Extractable Organics	NELAP	10/8/2001
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3,3'-Dimethylbenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3,4,5-Trichlorocatechol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3,4,5-Trichloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3,4,6-Trichlorocatechol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3,4,6-Trichloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
4,4'-DDD	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDE	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDT	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,5,6-Trichloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Bromophenyl phenyl ether	EPA 625	Extractable Organics	NELAP	10/8/2001
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloro-3-methylphenol	EPA 625	Extractable Organics	NELAP	10/8/2001
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorophenyl phenylether	EPA 625	Extractable Organics	NELAP	10/8/2001
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrophenol	EPA 625	Extractable Organics	NELAP	10/8/2001

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E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
a-a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Acenaphthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 625	Extractable Organics	NELAP	10/8/2001
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Acetone	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acetophenone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acidity, as CaCO3	SM 2310 B (4A)	General Chemistry	NELAP	4/11/2007
Acrolein (Propenal)	EPA 624	Volatile Organics	NELAP	7/17/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acrylonitrile	EPA 624	Volatile Organics	NELAP	7/17/2003
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Adsorbable organic halogens (AOX)	EPA 1650	General Chemistry	NELAP	10/8/2001
Aldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Alkalinity as CaCO3	EPA 310.1	General Chemistry	NELAP	10/8/2001
Alkalinity as CaCO3	SM 2320 B	General Chemistry	NELAP	4/11/2007
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	12/23/2005
Aluminum	EPA 200.7	Metals	NELAP	10/8/2001
Aluminum	EPA 200.8	Metals	NELAP	10/8/2001
Aluminum	EPA 6010	Metals	NELAP	7/1/2003
Aluminum	EPA 6020	Metals	NELAP	7/1/2003
Amenable cyanide	EPA 335.1	General Chemistry	NELAP	10/8/2001
Amenable cyanide	SM 4500-CN G	General Chemistry	NELAP	4/11/2007
Ammonia as N	EPA 350.1	General Chemistry	NELAP	10/8/2001
Ammonia as N	EPA 350.3	General Chemistry	NELAP	10/8/2001

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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Ammonia as N	SM 4500-NH3 E (19th, 20th, 21st Ed.)/ISE	General Chemistry	NELAP	10/8/2007
Ammonia as N	SM 4500-NH3 G	General Chemistry	NELAP	4/11/2007
Aniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 625	Extractable Organics	NELAP	10/8/2001
Anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Antimony	EPA 200.7	Metals	NELAP	10/8/2001
Antimony	EPA 200.8	Metals	NELAP	10/8/2001
Antimony	EPA 6010	Metals	NELAP	7/1/2003
Antimony	EPA 6020	Metals	NELAP	7/1/2003
Aramite	EPA 8270	Extractable Organics	NELAP	7/1/2003
Aroclor-1016 (PCB-1016)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1221 (PCB-1221)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1232 (PCB-1232)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1242 (PCB-1242)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1248 (PCB-1248)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1254 (PCB-1254)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1260 (PCB-1260)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Arsenic	EPA 200.7	Metals	NELAP	10/8/2001
Arsenic	EPA 200.8	Metals	NELAP	10/8/2001
Arsenic	EPA 200.9	Metals	NELAP	10/8/2001
Arsenic	EPA 6010	Metals	NELAP	10/8/2001
Arsenic	EPA 6020	Metals	NELAP	7/1/2003
Arsenic	EPA 7060	Metals	NELAP	10/8/2001
Arsenic	EPA 7062	Metals	NELAP	10/8/2007
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Barium	EPA 200.7	Metals	NELAP	10/8/2001
Barium	EPA 200.8	Metals	NELAP	10/8/2001
Barium	EPA 6010	Metals	NELAP	7/1/2003

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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Barium	EPA 6020	Metals	NELAP	7/1/2003
Benzene	EPA 624	Volatile Organics	NELAP	10/8/2001
Benzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Benzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Benzidine	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Beryllium	EPA 200.7	Metals	NELAP	10/8/2001
Beryllium	EPA 200.8	Metals	NELAP	10/8/2001
Beryllium	EPA 6010	Metals	NELAP	7/1/2003
Beryllium	EPA 6020	Metals	NELAP	7/1/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Biochemical oxygen demand	EPA 405.1	General Chemistry	NELAP	10/8/2001
Biochemical oxygen demand	SM 5210 B	General Chemistry	NELAP	4/11/2007
bis(2-Chloroethoxy)methane	EPA 625	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroethyl) ether	EPA 625	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 625	Extractable Organics	NELAP	10/8/2001

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Analyte	Method/Tech	Category	Certification Type	Effective Date
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 625	Extractable Organics	NELAP	10/8/2001
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Boron	EPA 200.7	Metals	NELAP	10/8/2001
Boron	EPA 6010	Metals	NELAP	10/8/2007
Bromide	EPA 300.0	General Chemistry	NELAP	10/8/2001
Bromobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromodichloromethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromoform	EPA 624	Volatile Organics	NELAP	10/8/2001
Bromoform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Butyl benzyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cadmium	EPA 200.7	Metals	NELAP	10/8/2001
Cadmium	EPA 200.8	Metals	NELAP	10/8/2001
Cadmium	EPA 6010	Metals	NELAP	10/8/2001
Cadmium	EPA 6020	Metals	NELAP	7/1/2003
Calcium	EPA 200.7	Metals	NELAP	10/8/2001
Calcium	EPA 6010	Metals	NELAP	10/8/2001
Carbazole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbon tetrachloride	EPA 624	Volatile Organics	NELAP	10/8/2001
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chemical oxygen demand	EPA 410.1	General Chemistry	NELAP	10/8/2001
Chemical oxygen demand	EPA 410.2	General Chemistry	NELAP	12/23/2005
Chemical oxygen demand	SM 5220 C	General Chemistry	NELAP	4/11/2007
Chlordane (tech.)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chloride	EPA 300.0	General Chemistry	NELAP	10/8/2001
Chloride	EPA 325.3	General Chemistry	NELAP	10/8/2001
Chloride	SM 4500 Cl- C	General Chemistry	NELAP	4/11/2007
Chlorobenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chlorobenzilate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-14, expiration date June 30, 2010. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chloroethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Chloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroform	EPA 624	Volatile Organics	NELAP	10/8/2001
Chloroform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroprene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chromium	EPA 200.7	Metals	NELAP	10/8/2001
Chromium	EPA 200.8	Metals	NELAP	10/8/2001
Chromium	EPA 6010	Metals	NELAP	7/1/2003
Chromium	EPA 6020	Metals	NELAP	7/1/2003
Chromium	EPA 7191	Metals	NELAP	10/8/2007
Chromium VI	EPA 7195	Metals	NELAP	7/1/2003
Chromium VI	EPA 7196	General Chemistry	NELAP	7/1/2003
Chrysene	EPA 625	Extractable Organics	NELAP	10/8/2001
Chrysene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Chrysene	EPA 8310	Extractable Organics	NELAP	7/1/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,3-Dichloropropene	EPA 624	Volatile Organics	NELAP	10/8/2001
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Cobalt	EPA 200.7	Metals	NELAP	10/8/2001
Cobalt	EPA 200.8	Metals	NELAP	10/8/2001
Cobalt	EPA 6010	Metals	NELAP	7/1/2003
Cobalt	EPA 6020	Metals	NELAP	7/1/2003
Color	EPA 110.2	General Chemistry	NELAP	10/8/2001
Color	SM 2120 B	General Chemistry	NELAP	4/11/2007
Conductivity	EPA 120.1	General Chemistry	NELAP	10/8/2001
Copper	EPA 200.7	Metals	NELAP	10/8/2001
Copper	EPA 200.8	Metals	NELAP	10/8/2001
Copper	EPA 6010	Metals	NELAP	10/8/2001
Copper	EPA 6020	Metals	NELAP	7/1/2003
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
delta-BHC	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dibenz(a,h)anthracene	EPA 625	Extractable Organics	NELAP	10/8/2001
Dibenz(a,h)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibenz(a,h)anthracene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibromochloromethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dibromomethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dieldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diesel range organics (DRO)	CA-LUFT	Extractable Organics	NELAP	7/1/2003
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	7/28/2003
Diesel range organics (DRO)	NWTPH-Dx	Extractable Organics	NELAP	7/1/2003
Diethyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dimethyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-butyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-octyl phthalate	EPA 625	Extractable Organics	NELAP	10/8/2001
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan I	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan II	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan sulfate	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003

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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin aldehyde	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2007
Enterococci	SM 9223 B /QUANTI-TRAY	Microbiology	NELAP	10/8/2007
Escherichia coli	SM 9223 B	Microbiology	NELAP	10/8/2007
Escherichia coli	SM 9223 B /QUANTI-TRAY	Microbiology	NELAP	10/8/2007
Ethanol	EPA 8015	Volatile Organics	NELAP	7/1/2003
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Ethylbenzene	EPA 624	Volatile Organics	NELAP	10/8/2001
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Ethylene glycol	EPA 8015	Volatile Organics	NELAP	7/1/2003
Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fecal coliforms	SM 9221 E	Microbiology	NELAP	10/8/2001
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fluoranthene	EPA 625	Extractable Organics	NELAP	10/8/2001
Fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluoranthene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 625	Extractable Organics	NELAP	10/8/2001
Fluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Fluoride	EPA 300.0	General Chemistry	NELAP	10/8/2001
Fluoride	EPA 340.2	General Chemistry	NELAP	10/8/2001
Fluoride	SM 4500 F-C	General Chemistry	NELAP	4/11/2007
Formaldehyde	EPA 8315	Extractable Organics	NELAP	7/1/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	12/23/2005

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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Gasoline range organics (GRO)	CA-LUFT	Extractable Organics	NELAP	7/1/2003
Gasoline range organics (GRO)	EPA 8015	Volatile Organics	NELAP	7/17/2003
Gasoline range organics (GRO)	NWTPH-Gx	Extractable Organics	NELAP	7/1/2003
Hardness	EPA 130.2	General Chemistry	NELAP	10/8/2001
Hardness	SM 2340 C	General Chemistry	NELAP	4/11/2007
Hardness (calc.)	EPA 200.7	Metals	NELAP	10/8/2007
Heptachlor	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor epoxide	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Hexachlorobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorocyclopentadiene	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloroethane	EPA 625	Extractable Organics	NELAP	10/8/2001
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Ignitability	EPA 1020	General Chemistry	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Iron	EPA 200.7	Metals	NELAP	10/8/2001
Iron	EPA 6010	Metals	NELAP	7/1/2003
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Isophorone	EPA 625	Extractable Organics	NELAP	10/8/2001
Isophorone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Isosafrole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Kepone	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Kjeldahl nitrogen	ASTM D3590-89A	General Chemistry	NELAP	4/11/2007

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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Kjeldahl nitrogen - total	EPA 351.4	General Chemistry	NELAP	10/8/2001
Lead	EPA 200.7	Metals	NELAP	10/8/2001
Lead	EPA 200.8	Metals	NELAP	10/8/2001
Lead	EPA 200.9	Metals	NELAP	10/8/2001
Lead	EPA 6010	Metals	NELAP	10/8/2001
Lead	EPA 6020	Metals	NELAP	7/1/2003
Lead	EPA 7421	Metals	NELAP	10/8/2001
Magnesium	EPA 200.7	Metals	NELAP	10/8/2001
Magnesium	EPA 6010	Metals	NELAP	7/1/2003
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Manganese	EPA 200.7	Metals	NELAP	10/8/2001
Manganese	EPA 200.8	Metals	NELAP	10/8/2001
Manganese	EPA 6010	Metals	NELAP	7/1/2003
Manganese	EPA 6020	Metals	NELAP	7/1/2003
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Mercury	EPA 1631	Metals	NELAP	10/8/2001
Mercury	EPA 245.1	Metals	NELAP	10/8/2001
Mercury	EPA 7470	Metals	NELAP	10/8/2001
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methanol	NCASI 99.01	Volatile Organics	NELAP	10/8/2001
Methanol	NCASI DI/MEOH-94.03	Volatile Organics	NELAP	10/8/2001
Methapyrilene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Methyl bromide (Bromomethane)	EPA 624	Volatile Organics	NELAP	10/8/2001
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl chloride (Chloromethane)	EPA 624	Volatile Organics	NELAP	10/8/2001
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl mercury	EPA 1630	Metals	NELAP	10/8/2007
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methylene chloride	EPA 624	Volatile Organics	NELAP	10/8/2001
Methylene chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Molybdenum	EPA 200.7	Metals	NELAP	10/8/2001
Molybdenum	EPA 200.8	Metals	NELAP	10/8/2001
Molybdenum	EPA 6010	Metals	NELAP	10/8/2001
Molybdenum	EPA 6020	Metals	NELAP	10/8/2007
Naphthalene	EPA 625	Extractable Organics	NELAP	10/8/2001
Naphthalene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Naphthalene	EPA 8310	Extractable Organics	NELAP	7/1/2003
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Nickel	EPA 200.7	Metals	NELAP	10/8/2001
Nickel	EPA 200.8	Metals	NELAP	10/8/2001
Nickel	EPA 6010	Metals	NELAP	10/8/2001
Nickel	EPA 6020	Metals	NELAP	7/1/2003
Nitrate as N	EPA 300.0	General Chemistry	NELAP	10/8/2001
Nitrate as N	EPA 353.2	General Chemistry	NELAP	7/17/2003
Nitrate-nitrite	EPA 353.2	General Chemistry	NELAP	10/8/2001
Nitrite as N	EPA 300.0	General Chemistry	NELAP	10/8/2001
Nitrite as N	EPA 353.2	General Chemistry	NELAP	7/17/2003
Nitrobenzene	EPA 625	Extractable Organics	NELAP	10/8/2001
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	7/1/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodimethylamine	EPA 625	Extractable Organics	NELAP	10/8/2001
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodi-n-propylamine	EPA 625	Extractable Organics	NELAP	10/8/2001
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine	EPA 625	Extractable Organics	NELAP	10/8/2001
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Oil & Grease	EPA 1664A	General Chemistry	NELAP	10/8/2001
Orthophosphate as P	EPA 365.3	General Chemistry	NELAP	10/8/2001
o-Toluidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Oxygen, dissolved	SM 4500-O G	General Chemistry	NELAP	4/11/2007
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Pentachloronitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pentachlorophenol	EPA 1653	Extractable Organics	NELAP	10/8/2001
Pentachlorophenol	EPA 625	Extractable Organics	NELAP	10/8/2001
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
pH	EPA 150.1	General Chemistry	NELAP	10/8/2001
pH	EPA 9040	General Chemistry	NELAP	7/1/2003
pH	SM 4500-H+-B	General Chemistry	NELAP	4/11/2007
Phenacetin	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Phenanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Phenol	EPA 625	Extractable Organics	NELAP	10/8/2001
Phenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Phosphorus, total	EPA 365.3	General Chemistry	NELAP	10/8/2001
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Potassium	EPA 200.7	Metals	NELAP	10/8/2001
Potassium	EPA 6010	Metals	NELAP	10/8/2001
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Pyrene	EPA 625	Extractable Organics	NELAP	10/8/2001
Pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyrene	EPA 8310	Extractable Organics	NELAP	7/1/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	7/1/2003
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Residual free chlorine	EPA 330.4	General Chemistry	NELAP	10/8/2001
Residue-filterable (TDS)	EPA 160.1	General Chemistry	NELAP	10/8/2001
Residue-filterable (TDS)	SM 2540 C	General Chemistry	NELAP	4/11/2007

Laboratory Scope of Accreditation

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State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Residue-nonfilterable (TSS)	EPA 160.2	General Chemistry	NELAP	10/8/2001
Residue-nonfilterable (TSS)	SM 2540 D	General Chemistry	NELAP	4/11/2007
Residue-settleable	EPA 160.5	General Chemistry	NELAP	10/8/2001
Residue-settleable	SM 2540 F	General Chemistry	NELAP	4/11/2007
Residue-total	EPA 160.3	General Chemistry	NELAP	10/8/2001
Residue-total	SM 2540 B	General Chemistry	NELAP	4/11/2007
Residue-volatile	EPA 160.4	General Chemistry	NELAP	10/8/2001
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Safrole	EPA 8270	Extractable Organics	NELAP	7/1/2003
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Selenium	EPA 200.7	Metals	NELAP	10/8/2001
Selenium	EPA 200.8	Metals	NELAP	10/8/2001
Selenium	EPA 200.9	Metals	NELAP	10/8/2001
Selenium	EPA 6010	Metals	NELAP	10/8/2001
Selenium	EPA 6020	Metals	NELAP	10/8/2007
Selenium	EPA 7740	Metals	NELAP	10/8/2001
Selenium	EPA 7742	Metals	NELAP	7/17/2003
Silica as SiO2	EPA 200.7	Metals	NELAP	10/8/2007
Silver	EPA 200.7	Metals	NELAP	10/8/2001
Silver	EPA 200.8	Metals	NELAP	10/8/2001
Silver	EPA 6010	Metals	NELAP	7/1/2003
Silver	EPA 6020	Metals	NELAP	7/1/2003
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Sodium	EPA 200.7	Metals	NELAP	10/8/2001
Sodium	EPA 6010	Metals	NELAP	7/1/2003
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Strontium	EPA 200.7	Metals	NELAP	10/8/2007
Styrene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Sulfate	EPA 300.0	General Chemistry	NELAP	10/8/2001
Sulfide	EPA 376.1	General Chemistry	NELAP	10/8/2001
Sulfide	SM 4500-S F (20th/21st Ed.)	General Chemistry	NELAP	4/11/2007
Sulfite-SO3	SM 4500-SO3 B	General Chemistry	NELAP	4/11/2007
Surfactants - MBAS	SM 5540 C	General Chemistry	NELAP	4/11/2007
Tannin & Lignin	SM 5550 B	General Chemistry	NELAP	10/8/2007
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetrachlorocatechol	EPA 1653	Extractable Organics	NELAP	10/8/2001

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E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Tetrachloroethylene (Perchloroethylene)	EPA 624	Volatile Organics	NELAP	10/8/2001
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetrachloroguaiacol	EPA 1653	Extractable Organics	NELAP	10/8/2001
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Thallium	EPA 200.7	Metals	NELAP	10/8/2001
Thallium	EPA 200.8	Metals	NELAP	10/8/2001
Thallium	EPA 200.9	Metals	NELAP	10/8/2001
Thallium	EPA 6010	Metals	NELAP	10/8/2007
Thallium	EPA 6020	Metals	NELAP	7/1/2003
Thallium	EPA 7841	Metals	NELAP	7/1/2003
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Tin	EPA 200.7	Metals	NELAP	7/17/2003
Tin	EPA 6010	Metals	NELAP	10/8/2007
Titanium	EPA 200.7	Metals	NELAP	7/17/2003
Titanium	EPA 6010	Metals	NELAP	10/8/2007
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Toluene	EPA 624	Volatile Organics	NELAP	10/8/2001
Toluene	EPA 8021	Volatile Organics	NELAP	7/1/2003
Toluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Total coliforms	SM 9221 B	Microbiology	NELAP	10/8/2001
Total coliforms	SM 9223 B	Microbiology	NELAP	10/8/2007
Total coliforms	SM 9223 B /QUANTI-TRAY	Microbiology	NELAP	10/8/2007
Total cyanide	EPA 335.4	General Chemistry	NELAP	7/17/2003
Total cyanide	EPA 9012	General Chemistry	NELAP	12/23/2005
Total hardness as CaCO3	EPA 200.7	Metals	NELAP	10/8/2001
Total organic carbon	EPA 415.1	General Chemistry	NELAP	10/8/2001
Total organic carbon	EPA 9060	General Chemistry	NELAP	7/1/2003
Total organic carbon	SM 5310C	General Chemistry	NELAP	4/11/2007
Total organic halides (TOX)	EPA 9020	General Chemistry	NELAP	7/1/2003
Total Petroleum Hydrocarbons (TPH)	EPA 1664A	General Chemistry	NELAP	10/8/2001
Total Petroleum Hydrocarbons (TPH)	EPA 8015	Extractable Organics	NELAP	7/1/2003
Total Petroleum Hydrocarbons (TPH)	NWTPH-HCID	Extractable Organics	NELAP	7/1/2003
Total phenolics	EPA 420.1	General Chemistry	NELAP	10/8/2001
Total residual chlorine	SM 4500-Cl F	General Chemistry	NELAP	4/11/2007
Toxaphene (Chlorinated camphene)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

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Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
trans-1,2-Dichloroethylene	EPA 624	Volatile Organics	NELAP	10/8/2001
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,3-Dichloropropylene	EPA 624	Volatile Organics	NELAP	10/8/2001
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichloroethene (Trichloroethylene)	EPA 624	Volatile Organics	NELAP	10/8/2001
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichlorofluoromethane	EPA 624	Volatile Organics	NELAP	10/8/2001
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Trichlorosyringol	EPA 1653	Extractable Organics	NELAP	10/8/2001
Turbidity	EPA 180.1	General Chemistry	NELAP	10/8/2001
Uranium	EPA 200.8	Metals	NELAP	10/8/2001
Vanadium	EPA 200.7	Metals	NELAP	10/8/2001
Vanadium	EPA 200.8	Metals	NELAP	10/8/2001
Vanadium	EPA 6010	Metals	NELAP	7/1/2003
Vanadium	EPA 6020	Metals	NELAP	10/8/2007
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Vinyl chloride	EPA 624	Volatile Organics	NELAP	10/8/2001
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 624	Volatile Organics	NELAP	10/8/2001
Xylene (total)	EPA 8021	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Zinc	EPA 200.7	Metals	NELAP	10/8/2001
Zinc	EPA 200.8	Metals	NELAP	10/8/2001
Zinc	EPA 6010	Metals	NELAP	10/8/2001
Zinc	EPA 6020	Metals	NELAP	7/1/2003

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E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270	Extractable Organics	NELAP	7/17/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	10/8/2001
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	7/17/2003
1-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/17/2003
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001

Laboratory Scope of Accreditation

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State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ 180)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2',5-Trichlorobiphenyl (BZ 18)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	10/8/2001
2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,3-Dichlorobiphenyl (BZ 5)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4',5-Trichlorobiphenyl (BZ 31)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	10/8/2001
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	10/8/2001
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	10/8/2001

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E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Chlorobiphenyl (BZ 1)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	10/8/2001
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
2-Hexanone	EPA 8260	Volatile Organics	NELAP	10/8/2001
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Naphthylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	7/17/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	10/8/2001
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	10/8/2001
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
3,3'-Dimethylbenzidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
3-Methylphenol (m-Cresol)	EPA 8270	Extractable Organics	NELAP	7/17/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	10/8/2001
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	10/8/2001
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
4-Dimethyl aminoazobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	10/8/2001
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001

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Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	10/8/2001
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
a-a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acenaphthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acenaphthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Acetone	EPA 8260	Volatile Organics	NELAP	10/8/2001
Acetonitrile	EPA 8260	Volatile Organics	NELAP	10/8/2001
Acetophenone	EPA 8270	Extractable Organics	NELAP	10/8/2001
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	10/8/2001
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Allyl chloride (3-Chloropropene)	EPA 8260	Volatile Organics	NELAP	10/8/2001
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Aluminum	EPA 6010	Metals	NELAP	10/8/2001
Aluminum	EPA 6020	Metals	NELAP	10/8/2001
Ammonia as N	EPA 350.1	General Chemistry	NELAP	10/8/2007
Aniline	EPA 8270	Extractable Organics	NELAP	10/8/2001
Anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Anthracene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Antimony	EPA 6010	Metals	NELAP	10/8/2001
Antimony	EPA 6020	Metals	NELAP	10/8/2001
Aramite	EPA 8270	Extractable Organics	NELAP	10/8/2001
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Arsenic	EPA 6010	Metals	NELAP	7/1/2003
Arsenic	EPA 6020	Metals	NELAP	10/8/2001
Arsenic	EPA 7060	Metals	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-14, expiration date June 30, 2010. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Arsenic	EPA 7062	Metals	NELAP	10/8/2007
Azinphos-methyl (Guthion)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Barium	EPA 6010	Metals	NELAP	10/8/2001
Barium	EPA 6020	Metals	NELAP	10/8/2001
Benzene	EPA 8021	Volatile Organics	NELAP	10/8/2001
Benzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzo(k)fluoranthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Benzoic acid	EPA 8270	Extractable Organics	NELAP	10/8/2001
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	10/8/2001
Beryllium	EPA 6010	Metals	NELAP	10/8/2001
Beryllium	EPA 6020	Metals	NELAP	10/8/2001
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	10/8/2001
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	10/8/2001
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	10/8/2001
Bolstar (Sulprofos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Boron	EPA 6010	Metals	NELAP	10/8/2007
Bromobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Bromoform	EPA 8260	Volatile Organics	NELAP	10/8/2001
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Cadmium	EPA 6010	Metals	NELAP	10/8/2001
Cadmium	EPA 6020	Metals	NELAP	10/8/2001
Calcium	EPA 6010	Metals	NELAP	10/8/2001
Carbazole	EPA 8270	Extractable Organics	NELAP	10/8/2001

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Carbon disulfide	EPA 8260	Volatile Organics	NELAP	10/8/2001
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Chloride	EPA 300.0	General Chemistry	NELAP	2/17/2006
Chloride	EPA 9056	General Chemistry	NELAP	7/17/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chlorobenzilate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Chloroethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chloroform	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chloroprene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Chlorpyrifos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Chromium	EPA 6010	Metals	NELAP	10/8/2001
Chromium	EPA 6020	Metals	NELAP	10/8/2001
Chromium	EPA 7191	Metals	NELAP	10/8/2007
Chromium VI	EPA 7195	Metals	NELAP	10/8/2001
Chromium VI	EPA 7196	General Chemistry	NELAP	10/8/2001
Chrysene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Chrysene	EPA 8310	Extractable Organics	NELAP	10/8/2001
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	10/8/2001
cis-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Cobalt	EPA 6010	Metals	NELAP	10/8/2001
Cobalt	EPA 6020	Metals	NELAP	10/8/2001
Copper	EPA 6010	Metals	NELAP	10/8/2001
Copper	EPA 6020	Metals	NELAP	10/8/2001
Corrosivity	EPA 1110	General Chemistry	NELAP	10/8/2001
Corrosivity toward steel	EPA 1110	General Chemistry	NELAP	10/8/2001
Coumaphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Demeton-o	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Demeton-s	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Diazinon	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dibenz(a,h)anthracene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dibenz(a,h)anthracene	EPA 8310	Extractable Organics	NELAP	10/8/2001

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Dibenzofuran	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Dibromomethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dichlorovos (DDVP, Dichlorvos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Diesel range organics (DRO)	CA-LUFT	Extractable Organics	NELAP	10/8/2001
Diesel range organics (DRO)	EPA 8015	Extractable Organics	NELAP	7/17/2003
Diesel range organics (DRO)	NWTPH-Dx	Extractable Organics	NELAP	10/8/2001
Diethyl ether	EPA 8260	Volatile Organics	NELAP	7/17/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dimethoate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8270	Extractable Organics	NELAP	10/8/2001
Disulfoton	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2007
EPN	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Ethoprop	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Ethyl acetate	EPA 8260	Volatile Organics	NELAP	7/17/2003
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	10/8/2001
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	10/8/2001
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	10/8/2001
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Ethylene glycol	EPA 8015	Volatile Organics	NELAP	10/8/2001

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Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Fensulfothion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Fenthion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Fluoranthene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Fluoranthene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Fluorene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Fluorene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Fluoride	EPA 300.0	General Chemistry	NELAP	2/17/2006
Fluoride	EPA 9056	General Chemistry	NELAP	7/17/2003
Formaldehyde	EPA 8315	Extractable Organics	NELAP	10/8/2001
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Gasoline range organics (GRO)	CA-LUFT	Extractable Organics	NELAP	10/8/2001
Gasoline range organics (GRO)	EPA 8015	Extractable Organics	NELAP	7/17/2003
Gasoline range organics (GRO)	NWTPH-Gx	Extractable Organics	NELAP	10/8/2001
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Ignitability	EPA 1020	General Chemistry	NELAP	10/8/2001
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Iron	EPA 6010	Metals	NELAP	10/8/2001
Isobutyl alcohol (2-Methyl-1-propanol)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Isophorone	EPA 8270	Extractable Organics	NELAP	10/8/2001
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Isosafrole	EPA 8270	Extractable Organics	NELAP	10/8/2001
Kepone	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Lead	EPA 6010	Metals	NELAP	10/8/2001

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Analyte	Method/Tech	Category	Certification Type	Effective Date
Lead	EPA 6020	Metals	NELAP	10/8/2001
Lead	EPA 7421	Metals	NELAP	10/8/2001
Magnesium	EPA 6010	Metals	NELAP	10/8/2001
Malathion	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Manganese	EPA 6010	Metals	NELAP	10/8/2001
Manganese	EPA 6020	Metals	NELAP	10/8/2001
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Mercury	EPA 1631	Metals	NELAP	10/8/2007
Mercury	EPA 7470	Metals	NELAP	10/8/2001
Mercury	EPA 7471	Metals	NELAP	10/8/2001
Merphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methapyrilene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methyl mercury	EPA 1630	Metals	NELAP	10/8/2007
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	7/17/2003
Methyl parathion (Parathion, methyl)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Methylene chloride	EPA 8260	Volatile Organics	NELAP	10/8/2001
Mevinphos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Molybdenum	EPA 6010	Metals	NELAP	10/8/2001
Molybdenum	EPA 6020	Metals	NELAP	10/8/2007
Naphthalene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Naphthalene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Naphthalene	EPA 8310	Extractable Organics	NELAP	10/8/2001
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Nickel	EPA 6010	Metals	NELAP	10/8/2001
Nickel	EPA 6020	Metals	NELAP	10/8/2001
Nitrate	EPA 9056	General Chemistry	NELAP	7/17/2003
Nitrate as N	EPA 353.2	General Chemistry	NELAP	10/8/2007
Nitrite	EPA 9056	General Chemistry	NELAP	7/17/2003

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Nitrite as N	EPA 353.2	General Chemistry	NELAP	10/8/2007
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	10/8/2001
Nitroglycerin	EPA 8332	Extractable Organics	NELAP	7/17/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
o,o,o-Triethyl phosphorothioate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	10/8/2001
Oil & Grease	EPA 1664A	General Chemistry	NELAP	10/8/2001
Oil & Grease	EPA 9071	General Chemistry	NELAP	10/8/2001
Orthophosphate as P	EPA 365.3	General Chemistry	NELAP	10/8/2007
o-Toluidine	EPA 8270	Extractable Organics	NELAP	10/8/2001
Parathion, ethyl	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
p-Dioxane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Pentachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/17/2003
Pentachloronitrobenzene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
pH	EPA 9040	General Chemistry	NELAP	10/8/2001
pH	EPA 9045	General Chemistry	NELAP	7/17/2003
Phenacetin	EPA 8270	Extractable Organics	NELAP	10/8/2001
Phenanthrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Phenanthrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Phenol	EPA 8270	Extractable Organics	NELAP	10/8/2001
Phorate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Phosphorus, total	EPA 365.3	General Chemistry	NELAP	10/8/2007

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p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Potassium	EPA 6010	Metals	NELAP	10/8/2001
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	10/8/2001
Propionitrile (Ethyl cyanide)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Pyrene	EPA 8270	Extractable Organics	NELAP	10/8/2001
Pyrene	EPA 8310	Extractable Organics	NELAP	10/8/2001
Pyridine	EPA 8270	Extractable Organics	NELAP	10/8/2001
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	10/8/2001
Residue-total	EPA 160.3	General Chemistry	NELAP	10/8/2007
Ronnel	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Safrole	EPA 8270	Extractable Organics	NELAP	10/8/2001
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Selenium	EPA 6010	Metals	NELAP	7/17/2003
Selenium	EPA 6020	Metals	NELAP	10/8/2007
Selenium	EPA 7740	Metals	NELAP	10/8/2001
Selenium	EPA 7742	Metals	NELAP	7/17/2003
Silver	EPA 6010	Metals	NELAP	10/8/2001
Silver	EPA 6020	Metals	NELAP	10/8/2001
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Sodium	EPA 6010	Metals	NELAP	10/8/2001
Stirofos	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Strontium	EPA 6010	Metals	NELAP	10/8/2007
Strontium	EPA 6020	Metals	NELAP	10/8/2007
Styrene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Sulfate	EPA 300.0	General Chemistry	NELAP	2/17/2006
Sulfate	EPA 9056	General Chemistry	NELAP	7/17/2003
Sulfide	EPA 9030/9034	General Chemistry	NELAP	7/17/2003
Sulfotepp	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	7/17/2003
Synthetic Precipitation Leaching Procedure	EPA 1312	General Chemistry	NELAP	7/17/2003
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	7/17/2003
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	10/8/2001
Thallium	EPA 6010	Metals	NELAP	7/17/2003
Thallium	EPA 6020	Metals	NELAP	10/8/2001
Thallium	EPA 7841	Metals	NELAP	10/8/2001

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-14, expiration date June 30, 2010. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87412 **EPA Lab Code:** WA00035 **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: **Solid and Chemical Materials**

Analyte	Method/Tech	Category	Certification Type	Effective Date
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Tin	EPA 6010	Metals	NELAP	10/8/2007
Tokuthion (Prothiophos)	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Toluene	EPA 8021	Volatile Organics	NELAP	10/8/2001
Toluene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Total cyanide	EPA 9012	General Chemistry	NELAP	12/23/2005
Total nitrate-nitrite	EPA 353.2	General Chemistry	NELAP	10/8/2007
Total organic carbon	EPA 9060	General Chemistry	NELAP	10/8/2001
Total organic halides (TOX)	EPA 9020	General Chemistry	NELAP	10/8/2001
Total Petroleum Hydrocarbons (TPH)	NWTPH-HCID	Extractable Organics	NELAP	10/8/2001
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Toxicity Characteristic Leaching Procedure	EPA 1311	General Chemistry	NELAP	10/8/2001
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	10/8/2001
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	10/8/2001
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	10/8/2001
Trichloronate	EPA 8141	Pesticides-Herbicides-PCB's	NELAP	10/8/2001
Vanadium	EPA 6010	Metals	NELAP	10/8/2001
Vanadium	EPA 6020	Metals	NELAP	10/8/2007
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	10/8/2001
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	10/8/2001
Xylene (total)	EPA 8021	Volatile Organics	NELAP	10/8/2001
Xylene (total)	EPA 8260	Volatile Organics	NELAP	10/8/2001
Zinc	EPA 6010	Metals	NELAP	10/8/2001
Zinc	EPA 6020	Metals	NELAP	10/8/2001

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E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Biological Tissue

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ 180)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5',6-Heptachlorobiphenyl (BZ 183)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,4',5'-Hexachlorobiphenyl (BZ 138)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,4,5'-Pentachlorobiphenyl (BZ 87)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5,5',6-Hexachlorobiphenyl (BZ 151)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',3,5'-Tetrachlorobiphenyl (BZ 44)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,4',5,5'-Hexachlorobiphenyl (BZ 153)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',4,5,5'-Pentachlorobiphenyl (BZ 101)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,2',5-Trichlorobiphenyl (BZ 18)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3,3',4',6-Pentachlorobiphenyl (BZ 110)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,3-Dichlorobiphenyl (BZ 5)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4',5-Trichlorobiphenyl (BZ 31)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	7/1/2003

Laboratory Scope of Accreditation

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State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Biological Tissue

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
2-Chlorobiphenyl (BZ 1)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	7/1/2003
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aluminum	EPA 6010	Metals	NELAP	7/1/2003
Aluminum	EPA 6020	Metals	NELAP	7/1/2003
Aniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Antimony	EPA 6010	Metals	NELAP	7/1/2003
Antimony	EPA 6020	Metals	NELAP	7/1/2003

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Matrix: Biological Tissue

Analyte	Method/Tech	Category	Certification Type	Effective Date
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Arsenic	EPA 6010	Metals	NELAP	7/1/2003
Arsenic	EPA 6020	Metals	NELAP	7/1/2003
Arsenic	EPA 7060	Metals	NELAP	7/1/2003
Barium	EPA 6010	Metals	NELAP	7/1/2003
Barium	EPA 6020	Metals	NELAP	7/1/2003
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Beryllium	EPA 6010	Metals	NELAP	7/1/2003
Beryllium	EPA 6020	Metals	NELAP	7/1/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroisopropyl) ether (2,2'-Oxybis(1-chloropropane))	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	7/1/2003
Boron	EPA 6010	Metals	NELAP	10/8/2007
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cadmium	EPA 6010	Metals	NELAP	7/1/2003
Cadmium	EPA 6020	Metals	NELAP	7/1/2003
Carbazole	EPA 8270	Extractable Organics	NELAP	7/1/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chromium	EPA 6010	Metals	NELAP	7/1/2003
Chromium	EPA 6020	Metals	NELAP	7/1/2003
Chromium	EPA 7191	Metals	NELAP	10/8/2007
Chromium VI	EPA 7196	Metals	NELAP	7/1/2003

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Matrix: Biological Tissue

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chrysene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cobalt	EPA 6010	Metals	NELAP	7/1/2003
Cobalt	EPA 6020	Metals	NELAP	7/1/2003
Copper	EPA 6010	Metals	NELAP	7/1/2003
Copper	EPA 6020	Metals	NELAP	7/1/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dibenz(a,h)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Iron	EPA 6010	Metals	NELAP	7/1/2003
Isophorone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Lead	EPA 6010	Metals	NELAP	7/1/2003
Lead	EPA 6020	Metals	NELAP	7/1/2003
Lead	EPA 7421	Metals	NELAP	7/1/2003
Manganese	EPA 6010	Metals	NELAP	7/1/2003

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Kelso, WA 98626

Matrix: Biological Tissue

Analyte	Method/Tech	Category	Certification Type	Effective Date
Manganese	EPA 6020	Metals	NELAP	7/1/2003
Mercury	EPA 1631	Metals	NELAP	10/8/2007
Mercury	EPA 7471	Metals	NELAP	7/1/2003
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Molybdenum	EPA 6010	Metals	NELAP	7/1/2003
Molybdenum	EPA 6020	Metals	NELAP	10/8/2007
Naphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nickel	EPA 6010	Metals	NELAP	7/1/2003
Nickel	EPA 6020	Metals	NELAP	7/1/2003
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	7/1/2003
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	7/1/2003
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Selenium	EPA 6010	Metals	NELAP	7/1/2003
Selenium	EPA 6020	Metals	NELAP	10/8/2007
Selenium	EPA 7740	Metals	NELAP	7/1/2003
Selenium	EPA 7742	Metals	NELAP	7/1/2003
Silver	EPA 6010	Metals	NELAP	7/1/2003
Silver	EPA 6020	Metals	NELAP	7/1/2003
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	7/1/2003
Thallium	EPA 6020	Metals	NELAP	7/1/2003
Thallium	EPA 7841	Metals	NELAP	7/1/2003
Tin	EPA 6010	Metals	NELAP	10/8/2007
Total cyanide	EPA 9012	General Chemistry	NELAP	12/23/2005
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Vanadium	EPA 6010	Metals	NELAP	7/1/2003
Vanadium	EPA 6020	Metals	NELAP	10/8/2007
Zinc	EPA 6010	Metals	NELAP	7/1/2003

Laboratory Scope of Accreditation

Attachment to Certificate #: E87412-14, expiration date June 30, 2010. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87412 **EPA Lab Code: WA00035** **(360) 577-7222**

E87412
Columbia Analytical Services, Inc. - WA
1317 South 13th Avenue
Kelso, WA 98626

Matrix: Biological Tissue

Analyte	Method/Tech	Category	Certification Type	Effective Date
Zinc	EPA 6020	Metals	NELAP	7/1/2003

The State of Washington Department of Ecology

This is to certify that

Northwestern Aquatic Sciences
Newport, OR

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective October 1, 2009, and shall expire September 30, 2010.

Witnessed under my hand on September 23, 2009.

for Stewart M. Lombard
Lab Accreditation Unit Supervisor

Laboratory ID
C1238

Scope of Accreditation

Northwestern Aquatic Sciences

Newport, OR

is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. This Scope of Accreditation may apply to any of the following matrix types: non-potable water, drinking water, solid and chemical materials, and air and emissions. Accreditation for all parameters is final unless indicated otherwise in a note. Accreditation is for the latest version of a method unless otherwise specified in a note. EPA refers to the U.S. Environmental Protection Agency. SM refers to American Public Health Association's publication, Standard Methods for the Examination of Water and Wastewater, 18th, 19th or 20th Edition, unless otherwise noted. ASTM stands for the American Society for Testing and Materials. PSEP stands for Puget Sound Estuary Program. Other references are detailed in the notes section.

Matrix Type/Parameter Name	Reference	Method Number	Notes
Non-potable Water			
Ampelisca abdita	ASTM	E 1367	
Ampelisca abdita	EPA	100.4	4
Ampelisca abdita	PSEP	1995	
Atherinops affinis (West Coast)	EPA	1006.0	6,8
Bioaccumulation, Bedded Sediments	EPA	600/R-93/183	7
Bioaccumulation, Benthic Invert	ASTM	E 1688	
Bioconcentration, Fish, Mollusks	ASTM	E 1022	
Ceriodaphnia dubia	EPA	1002.0	2,8
Ceriodaphnia dubia	EPA	2002.0	1,8
Chironomus tentans	EPA	100.5	5
Chironomus tentans	ASTM	E 1706	
Chironomus tentans	EPA	100.2	5
Corbicula fluminea	ASTM	E 1688	
Crassostrea gigas	PSEP	1995	
Crassostrea gigas (West Coast)	EPA	1005.0	6,8
Cyprinodon variegatus	EPA	2004.0	1,8
Cyprinodon variegatus	EPA	1004.0	3,8
Dangerous Waste Static Salmonid	WDOE	80-12 Part A	
Daphnia magna	EPA	2021.0	1,8

Matrix Type/Parameter Name	Reference	Method Number	Notes
Daphnia pulex	EPA	2021.0	1,8
Dendraster excentricus	ASTM	E 1563	
Dendraster excentricus	PSEP	1995	
Dendraster excentricus (WC)	EPA	600/R-95/136	6,8
Dendraster excentricus (West Coast)	EPA	1008.0	6,8
Eohaustorius estuarius	ASTM	E 1367	
Eohaustorius estuarius	PSEP	1995	
Eohaustorius estuarius	EPA	100.4	4
Hyalella azteca	EPA	100.4	5
Hyalella azteca	EPA	100.1	5
Hyalella azteca	ASTM	E 1706	
Leptocheirus plumulosus	ASTM	E 1367	
Leptocheirus plumulosus	EPA	100.4	4
Lumbriculus variegatus	EPA	100.3	5
Lumbriculus variegatus	ASTM	E 1688	
Macoma spp.	ASTM	E 1688	
Menidia beryllina	EPA	1006.0	3,8
Menidia spp.	EPA	2006.0	1,8
Mysidopsis bahia	EPA	1007.0	3,8
Mysidopsis bahia	EPA	2007.0	1,8
Mytilus spp.	PSEP	1995	
Mytilus spp. (West Coast)	EPA	1005.0	6,8
Neanthes arenaceodentata	PSEP	1995	
Nereis/Neanthes spp.	ASTM	E 1688	
Oncorhynchus mykiss	EPA	2019.0	1,8
Pimephales promelas	EPA	2000.0	1,8
Pimephales promelas, Chronic	EPA	1000.0	2,8
Rhepoxynius abronius	EPA	100.4	4
Rhepoxynius abronius	PSEP	1995	
Rhepoxynius abronius	ASTM	E 1367	

Matrix Type/Parameter Name	Reference	Method Number	Notes
Salvelinus fontinalis	EPA	2019.0	1,8
Strongylocentrotus purpuratus	ASTM	E 1563	
Strongylocentrotus purpuratus (WC)	EPA	1008.0	6,8
Strongylocentrotus purpuratus (WC)	EPA	600/R-95/136	6,8
Strongylocentrotus spp.	PSEP	1995	

Accredited Parameter Note Detail

(1) USEPA. "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms." EPA-821-R-02-012. Fifth Edition. Oct 2002. (2) USEPA. "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms." EPA-821-R-02-013. Fourth Edition. Oct 2002. (3) USEPA. "Short-term Methods for Measuring the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms." EPA-821-R-02-014. Fourth Edition. Oct 2002. (4) USEPA. "Methods for Assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods." EPA 600/R/R-94/025. June 1994. (5) USEPA. "Methods for Measuriing the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates." EPA 600/R-99/064. Second Edition. March 2000. (6) USEPA. "Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms," EPA 600/R-95/136. Third Edition. Aug 1995. (7) USEPA. "Bedded Sediment Bioaccumulation Tests." EPA/600/R-93/183. Sept 1993. (8) Meets requirements of "Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria," Washington Dept. of Ecology, Pub. No. WQ-R-80, Rev. Dec 2008.

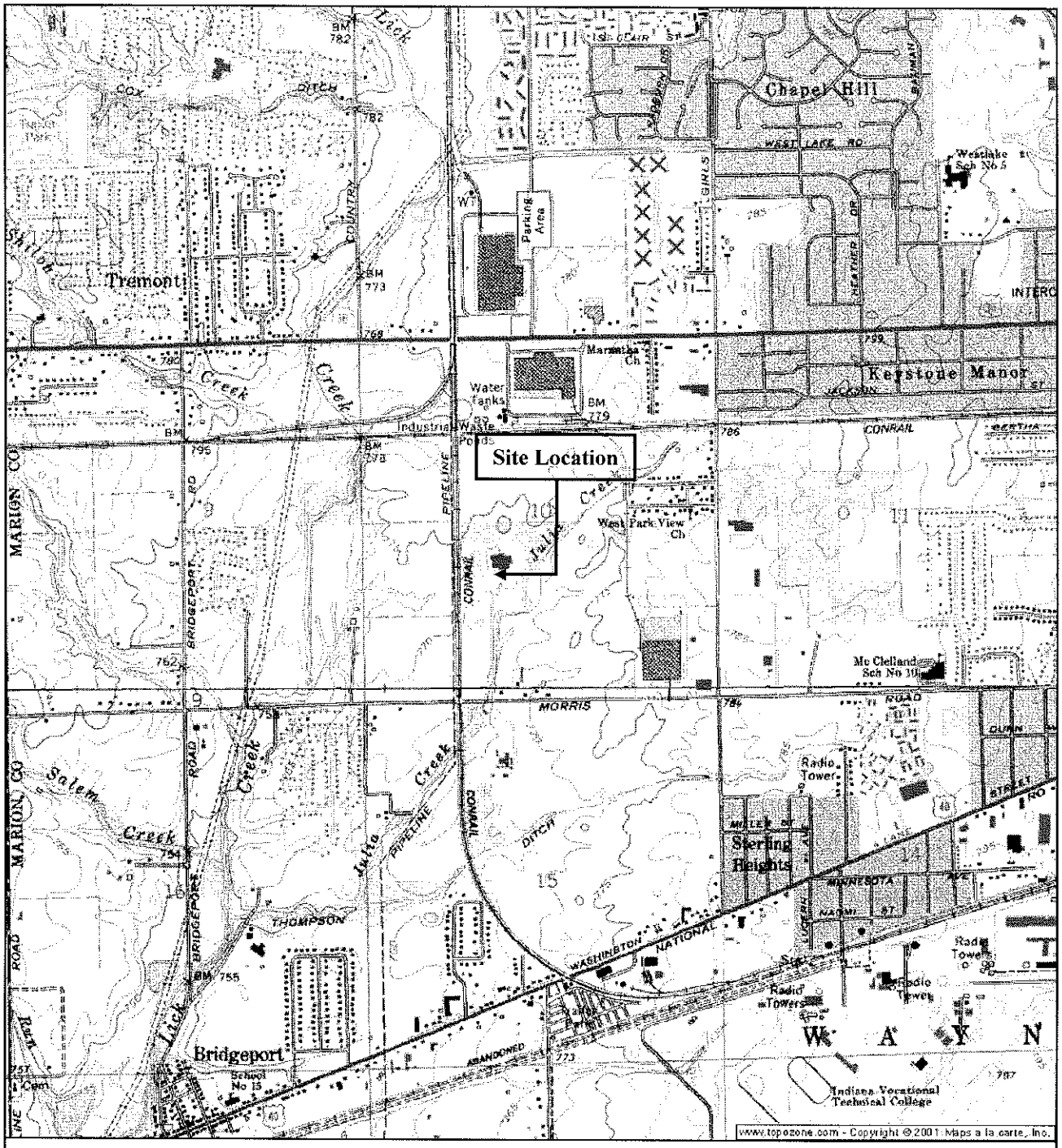
Authentication Signature

9/24/09
Date

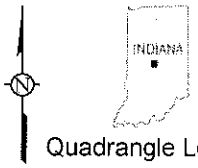
for Stewart M. Lombard, Lab Accreditation Unit Supervisor

Figures

q:\client\quemetco\indiana\indianapolis, in figure 1



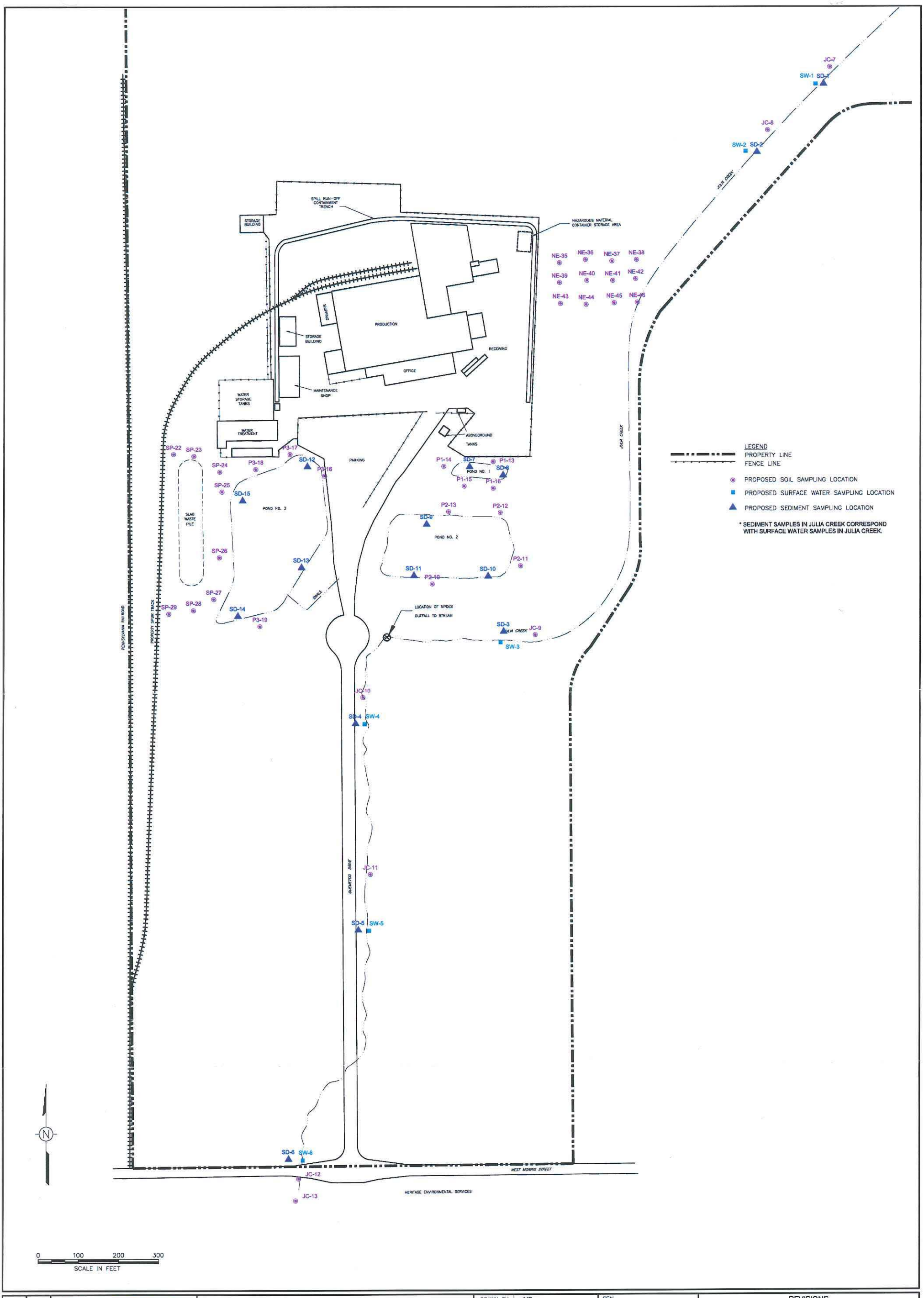
Reference
7.5 Minute Series Topographic Quadrangle
Clermont, Indiana
Photorevised 1984 Scale 1:25,000



1000 0 2000 4000
Scale in Feet

WSP Environment & Energy
2025 Gateway Place, Suite 435
San Jose, California
(408) 453-6100

Figure 1-1
Site Location
Location of Quemetco Facility
Indianapolis, Indiana



Drawing Number 21481416	FIGURE 2	WSP WSP ENVIRONMENT & ENERGY 2025 GATEWAY PLACE SUITE 435 SAN JOSE, CALIFORNIA 95110 (408) 453-6100	PROPOSED SAMPLE LOCATIONS QUEMETCO, INC. INDIANAPOLIS, INDIANA PREPARED FOR INDIANAPOLIS, INDIANA	DRAWN BY JME CHECKED LB APPROVED	SEAL DATE

PROPERTY OF WSP ENVIRONMENT & ENERGY LLC. IMPORTANT: THIS DRAWING PRINT IS LOANED FOR MUTUAL ASSISTANCE AND AS SUCH IS SUBJECT TO RECALL AT ANY TIME. INFORMATION CONTAINED HEREON IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY FORM FOR THE BENEFIT OF PARTIES OTHER THAN NECESSARY SUBCONTRACTORS & SUPPLIERS WITHOUT THE WRITTEN CONSENT OF WSP ENVIRONMENT & ENERGY LLC.

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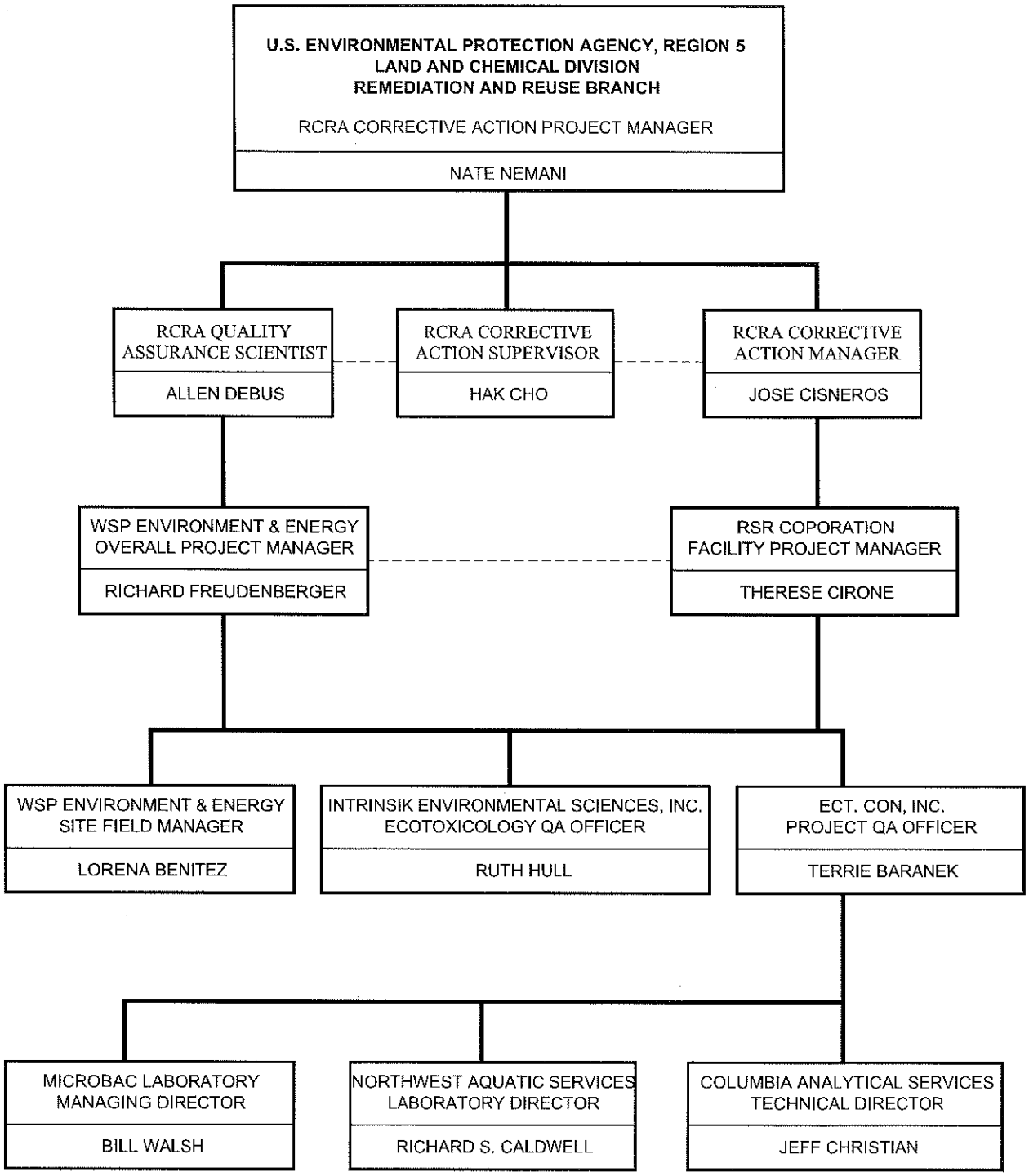
REVISIONS			
REV	DESCRIPTION		
1	Revised:	Chkd:	Appr.:
2	Revised:	Chkd:	Appr.:
3	Revised:	Chkd:	Appr.:

DWG Name: 21481416
Checked:
Approved:
Drawn By: JME



WSP

WSP Environment & Energy
2025 Gateway Place Suite 435
San Jose, California 95110
(408) 453-6100

Figure 3

PROJECT ORGANIZATION CHART

900 QUEMETCO DRIVE
INDIANAPOLIS, INDIANA

PREPARED FOR
QUEMETCO INC.
INDIANAPOLIS, INDIANA

CHAIN OF CUSTODY RECORD

Page ____ of ____

Project Number:	Site and Location:
Contact Name:	Contact Email:
Sampler's Name:	Sampler's Signature:

Matrices:
S = Soil:
Aq = Water
A = Air: Bu = Bulk
W = Wipe
Bi = Biota:
OW = Oily Waste:
O = Other

Requested Analyses

Nº 02678

Sample Identification:	Depth	Date	Time	Matrix	Number of Containers										Remarks

Relinquished by *(Signature)*:	Date | Time	Received by *(Signature)*:	Laboratory Name:
Relinquished by *(Signature)*:	Date | Time	Received by *(Signature)*:	Laboratory Location:
Turn-Around Time:		Tracking Number:	Custody Seal Numbers:
			Method of Shipment:

WSP
WSP Environment & Energy

- ❑ Reston Office: 11190 Sunrise Valley Dr., #300, Reston, VA 20191 / Tel: 703-709-6500
- ❑ Pittsburgh Office: 750 Holiday Dr., #410, Pittsburgh, PA 15220 / Tel: 412-604-1040
- ❑ San Jose Office: 2025 Gateway Place, #435, San Jose, CA 95110 / Tel: 408-453-6100
- ❑ New Jersey Office: 334 Elizabeth Ave., Somerset, NJ 08873 / Tel: 732-564-0888
- ❑ Denver Office: 4600 South Ulster, #930, Denver, CO 80237 / Tel: 303-850-9200
- ❑ Minneapolis Office: 123 North 3rd St., #808, Minneapolis, MN 55401 / Tel: 612-343-0510
- ❑ Boxborough Office: 1740 Massachusetts Ave., Boxborough, MA 01719 / Tel: 978-635-9600
- ❑ Cazenovia Office: 5 Sullivan St., Cazenovia, NY 13035 / Tel: 315-655-3900