

QUALITY ASSURANCE PROJECT PLAN

REMEDIAL INVESTIGATION AT THE NIAGARA FALLS STORAGE SITE NIAGARA COUNTY, NEW YORK

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Prepared For:

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1.0 INTRODUCTION

The September 1999 Final Draft *Quality Assurance Project Plan* (QAPP) for the Phase I Remedial Investigation (RI) at the Niagara Falls Storage Site was used as a guide during the Phase I RI. This Addendum addresses modifications to the existing plan, based on information gained during the Phase I sampling activities, comments on the existing plan with regards to the scheduled Phase II sampling event, or both.

The addendum addresses each revised section of the QAPP separately and revised documentation has been included as Appendix A. Revisions are noted in *italics* in Appendix A.

2.0 DISCUSSION OF CORRESPONDING QAPP SECTIONS AND CHANGES

2.1 Changes to Section 3 "DATA QUALITY OBJECTIVES FOR MEASUREMENT OF DATA"

Modifications were necessary and are documented herein.

2.1.1 GC/MS VOA in Soils by 5035/8260B

Method 5035 is the SW-846 methodology for the separation and trapping of organic volatile compounds in soil media, prior to chromatographic separation by gas chromatography. This method also includes protocol for the sample collection and preservation of solid samples (i.e., soil, sediments, waste, debris) to be analyzed for organic volatile compounds by gas chromatography. The method mandates the use of sodium bisulfate as a preservative for solid sample matrices requiring low-level volatile organic analysis (VOA). Sodium bisulfate, when reacted with water, forms a weak monoprotic acid that stabilizes and prevents biological degradation of the volatile compounds within the sample media.

Addition of the sodium bisulfate preservative to a solid matrix containing reactive constituents such as calcium/magnesium carbonates can produce an initial reaction that produces carbon dioxide, evidenced by bubbling, frothing, and/or effervescing. This initial acid/base reaction and subsequent production of carbon dioxide within the sample vial can result in the effective purging of volatile organic compounds from the sample media and was observed by the reporting laboratory. In some cases the reaction was slow with slight bubbling whereas in other cases the reaction was fast with vigorous bubbling, frothing and effervescing.

Surrogate recoveries also indicated the preservative method could result in loss of volatiles. Surrogate compounds were added to the preservative solution before the sodium bisulfate preservation process.

A noticeable loss of these surrogate compounds was detected upon analysis in the laboratory. This loss of surrogate compounds has been attributed to purging caused by chemical preservation, specifically sodium bisulfate preservation.

Information provided by field personnel indicated that the majority of field-preserved volatile samples preserved showed signs of acid/base reaction including bubbling, frothing and/or effervescing. The USACE Project Chemist, Mr. Fred Kozminski, agreed that the current low-level soil VOA sample preservation protocol should be discontinued based upon the high amounts of reactive constituents within the soil sample media at the NFSS. During the Phase I sampling activities, he agreed that the soil samples for low-level VOA should be collected without chemical preservation and forwarded to the laboratory for volatile analysis by method 5030 (heated purge and trap) and 8260B (VOA by Gas Chromatography/Mass Spectrometry (GC/MS)).

In an effort to comply with current SW-846 methodologies for the evaluation of volatile organic compounds in soil media and logistic problems associated with shipping non-preserved samples to the laboratory, the low-level soil VOA samples will be preserved in the field with water. This arrangement for preservation is consistent with Update III of SW846 and will also allow a degree of flexibility for overnight shipping of VOA samples to the laboratory to meet laboratory preservation requirements.

Approximate 5 gram sample aliquots of soil samples (soil, aggregate, debris, etc.) will be collected by use of disposable syringes and the contents will be placed into pre-tared 40 ml sample bottles, equipped with magnetic stir-bars. Five (5) milliliters of reagent-free water (supplied in Teflon-lined sealed ampoules) will be added to the sample vials and the bottles will be sealed, stored and shipped to the laboratory on ice for chemical analysis. The methanolic extracts will be utilized if the sample concentrations of volatile compounds exceed the low-level linear calibration range for analysis. The additional soil aliquot collected in a 4 oz. glass bottle will be utilized for the determination of moisture content, used to correct moisture content in soil data and allow data to be reported on a dry-weight basis.

Table 3-3 ("Summary of Soil Collection, Preservation and Storage Requirements for Each Sample") has been revised to incorporate this modification.

2.1.2 Additional Radionuclides for Analysis

During development of the Phase II sampling and analysis plans, the list of radionuclides by gamma spectroscopic methods was expanded based on SAIC's recommendations (Appendix B, previously presented in the *Draft Field Sampling Plan Addendum Phase II Edition Remedial Investigation At The Niagara Falls Storage Site Niagara County, New York*, June 2000). During the Phase I RI, select nuclides were analyzed (isotopic U, isotopic Th and Ra-226) by alpha spectroscopy, including radon emanation for Ra-226 in water samples. Isotopic radium in soil samples will be determined by

gamma spectroscopy. The following radionuclides will be analyzed by gamma spectroscopy in the Phase II RI:

- | | | | |
|----|--------|-----|--------|
| 1) | Ac-227 | 8) | Th-228 |
| 2) | Am-241 | 9) | U-235 |
| 3) | Co-60 | 10) | U-238 |
| 4) | Cs-137 | | |
| 5) | Pa-231 | | |
| 6) | Ra-226 | | |
| 7) | Ra-228 | | |

Based on historical and site data collected during the Phase I RI, Sr-90, Pu, and Pb-210 were excluded from the list of analytes. Sr-90 and Pu will not be analyzed because historical data do not indicate the presence of fission products. Pb-210 will not be analyzed by gamma spectroscopy because Pb-210 unit activity can be determined using Ra-226 data.

Further information concerning the rationale for inclusion of those radioisotopes listed above that were not included in Phase I is presented in Appendix B of the Phase II FSP Addendum. The inclusion of these additional analytes in soil analyses will be at no additional cost, while for groundwater samples these analyses will be at a nominal additional cost.

Table 3-2 ("Summary of Water Collection, Preservation and Storage Requirements for Each Sample"), Table 3-3 ("Summary of Soil Collection, Preservation and Storage Requirements for Each Sample", and Table 3-10A and 3-10B ("Radiological Testing/Minimum Detectable Activities (MDA's) for Reporting") have been revised to incorporate these modifications.

2.2 Changes to Section 5 "SAMPLE CUSTODY"

Section 5.1.3 ("Sample Preservation") references Tables 3-2 and 3-3 for information regarding sample containers and preservation requirements. Tables 3-2 and 3-3 have been revised as indicated in Appendix A.

2.3 Changes to Section 6 "ANALYTICAL PROCEDURES"

Section 6.1 references Table 3-10 ("Radiological Testing/Minimum Detectable Activities (MDA's) for Reporting"), Table 6-1 ("Analytical Methods") and Table 6-2 (Summary of GEL Laboratory Standard Operating Procedures (SOP's)). These tables have been revised as indicated in Appendix A.

2.4 Changes to Section 11 "DATA REDUCTION, VERIFICATION AND REPORTING"

Section 11.5.1 ("Electronic Data Deliverable"), references Windows-compatible spreadsheet data files. The EDD field specifications are included in Table 11-1, as presented in Appendix A.

2.5 Changes to Appendices

Appendix C includes the resume of additional key project personnel not included in the Phase I QAPP. Appendix D includes comments and responses on the QAPP Addendum.

3.0 LIST OF UNCHANGED QAPP SECTIONS

- Section 1 "PROJECT DESCRIPTION"
- Section 2 "PROJECT ORGANIZATION AND RESPONSIBILITY"
- Section 4 "SAMPLING PROCEDURES"
- Section 7 "CALIBRATION PROCEDURES AND FREQUENCY"
- Section 8 "INTERNAL QUALITY CONTROL CHECKS"
- Section 9 "SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS"
- Section 10 "CORRECTIVE ACTIONS"
- Section 12 "PREVENTATIVE MAINTENANCE PROCEDURES"
- Section 13 "PERFORMANCE AND SYSTEM AUDITS"
- Section 14 "QUALITY ASSURANCE REPORTS TO MANAGEMENT"

APPENDIX A

**REVISED PORTIONS OF THE SEPTEMBER 1999
QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION
AT THE
NIAGARA FALLS STORAGE SITE
NIAGARA COUNTY, NEW YORK**

TABLE 3-2 (*REVISED*)

**SUMMARY OF WATER COLLECTION, PRESERVATION
AND STORAGE REQUIREMENTS FOR EACH SAMPLE**

Parameter	Preservative	Holding Time	Containers	Container Preparation
Volatile TCL Organics, Compounds (VOCs)	4EC, No headspace, HCL, pH <2 and Na ₂ S ₂ O ₃ , if chlorinated	14 days	Three 40 ml glass vials, with Teflon-lined septum and screw caps	Precleaned bottles from supplier
Semi-Volatile TCL Organic Compounds (SVOCs)	4EC	7 days until extraction, 40 days after extraction	Two 1-liter amber with Teflon-lined lid (Three 1-liter for QC)	Precleaned bottles from supplier
Total Metals	HNO ₃ , pH <2	6 months, except Hg 28 days	One 1-liter (64 oz) high density polyethylene bottles with Teflon-lined lids	Precleaned bottles from supplier
Dissolved Metals	Field filtered, HNO ₃ pH <2	6 months, except Hg 28 days	One 1-liter (64 oz) high density polyethylene bottles with Teflon-lined lids	Precleaned bottles from supplier
Radionuclides <i>(includes expanded list of isotopes by gamma spectroscopy)</i>	HNO ₃ , pH <2	6 months	<i>Two</i> 1-gallon, high density polyethylene bottles with Teflon-lined lids	Precleaned bottles from supplier
Gross alpha (α) and beta (β)	HNO ₃ , pH <2	6 months	One 1-liter, high density polyethylene bottles with Teflon-lined lids	Precleaned bottles from supplier
Total Organic Carbon (TOC)	H ₂ SO ₄ , pH <2, (no headspace), 4EC	28 days	One 250-ml amber glass with Teflon-lined lids	Precleaned bottles from supplier
Pesticides/PCBs	4EC	7 days until extraction, 40 days after extraction	Two 1-liter (three for QC) amber with Teflon-lined lids	Precleaned bottles from supplier
Nitroaromatics	4EC	7 days until extraction, 40 days after extraction	Two 1-liter (four for QC) amber with Teflon-lined lids	Precleaned bottles from supplier
TCLP* The following pertains to analysis of liquid wastes generated during the RI:				
TCLP-VOCs	No headspace	14 days until TCLP, 14 days after TCLP	500-ml amber glass with Teflon-lined septum and screw lids	Precleaned bottles from supplier
TCLP-SVOCs	None	TCLP Extraction - 14 days, Extraction /Analysis	Two 1-liter amber with Teflon-lined lids	Precleaned bottles from supplier

TABLE 3-2 (*REVISED*)**SUMMARY OF WATER COLLECTION, PRESERVATION
AND STORAGE REQUIREMENTS FOR EACH SAMPLE**

Parameter	Preservative	Holding Time	Containers	Container Preparation
		7/40 days		
TCLP-Pesticides	None	TCLP Extraction - 14 days, Analysis Extraction - 7 days after TCLP Extraction, Analysis - 40 days after Analysis Extraction	Two 1-liter amber with Teflon-lined lids	Precleaned bottles from supplier
TCLP-Herbicides	None	TCLP Extraction - 14 days, Analysis Extraction - 7 days after TCLP Extraction, Analysis - 40 days after Analysis Extraction	Two 1-liter amber with Teflon-lined lids	Precleaned bottles from supplier
TCLP-Metals	None	6 months (28 days for Hg) until TCLP Extraction, 6 months (28 days for Hg) until analysis.	One 1-liter high density polyethylene bottles with Teflon-lined lids	Precleaned bottles from supplier
Reactivity	4EC	7 days	One-gallon amber glass (reactivity sample container)	Precleaned bottles from supplier
Corrosivity	4EC	7 days	Taken from reactivity sample container	Precleaned bottles from supplier
Ignitability	4EC	7 days	Taken from reactivity sample container	Precleaned bottles from supplier

*TCLP will be required for analysis of samples of investigation-derived waste. These samples are not currently included in the scope of work.

TABLE 3-3 (REVISED)

**SUMMARY OF SOIL COLLECTION, PRESERVATION
AND STORAGE REQUIREMENTS FOR EACH SAMPLE**

Parameter	Preservative	Holding Time	Containers	Container Preparation
Total Metals	4EC	6 months, except Hg 28 days	8-oz. glass with Teflon-lined lid (inorganic sample container)	Precleaned bottles from supplier
Radionuclides <i>(includes expanded list of radioisotopes by gamma spectroscopy)</i>	None	6 months	8-oz. glass wide-mouthed with Teflon-lined lids	Precleaned bottles from supplier
Gross alpha (α) and beta (β)	None	6 months	4-oz. glass wide-mouthed with Teflon-lined lid	Precleaned bottles from supplier
Cation Exchange Capacity	4EC	None specified	Taken from inorganic sample container	Precleaned bottles from supplier
Pesticides/PCBs	4EC	14 days before extraction, 40 days after extraction	8-oz. amber glass wide-mouthed container (organic sample container)	Precleaned bottles from supplier
Volatile TCL Organics	4EC, Water-Low Level Methanol-High Level ¹	14 days	<u>Two 40ml VOA (water preserved)</u> <u>One 40 ml VOA (methanol preserved)</u> <u>One 4oz glass bottle</u>	Precleaned bottles from supplier, pre-weighed at laboratory (for water or methanol preservation)
Semi-Volatile Organic Compounds (SVOCs)	4EC	14 days before extraction, 40 days after extraction	Taken from organic sample container	Precleaned bottles from supplier
Nitroaromatics	4EC	14 days before extraction, 40 days after extraction	Taken from organic sample container	Precleaned bottles from supplier
TOC	4EC	28 days	Taken from inorganic sample container	Precleaned bottles from supplier
TCLP ² - The following pertains to the analysis of solid waste generated during the RI:				
TCLP-VOCs	no headspace	TCLP - extraction 14 days, Analysis - 14 days after extraction.	Two 4-oz. wide-mouth glass containers with Teflon-lined lids	Precleaned bottles from supplier
TCLP-SVOCs	None	TCLP extraction - 14 days, Analysis extraction - 7 days after TCLP extraction, Analysis - 40 days after TCLP extraction.	Two 16-oz. amber wide-mouth glass with Teflon-lined lids (TCLP organic container)	Precleaned bottles from supplier

TABLE 3-3 (REVISED)**SUMMARY OF SOIL COLLECTION, PRESERVATION
AND STORAGE REQUIREMENTS FOR EACH SAMPLE**

Parameter	Preservative	Holding Time	Containers	Container Preparation
TCLP-Pesticides	None	TCLP extraction - 14 days, Analysis extraction - 7 days after TCLP extraction, Analysis - 40 days after TCLP extraction.	Taken from TCLP organic container	Precleaned bottles from supplier
TCLP-Herbicides	None	TCLP extraction - 14 days, Analysis extraction - 7 days after TCLP extraction, Analysis - 40 days after TCLP extraction.	Taken from TCLP organic container	Precleaned bottles from supplier
TCLP-Metals	None	6 months (28 days for Hg) for TCLP-extraction, Analysis within 6 months (28 days Hg) after TCLP extraction.	Taken from TCLP organic container	Precleaned bottles from supplier
Reactivity	4E	7 days	8-oz. amber wide-mouth glass with Teflon-lined lid (reactivity container)	Precleaned bottles from supplier
Corrosivity	4E	7 days	Taken from reactivity container	Precleaned bottles from supplier
Ignitability	4E	7 days	Taken from reactivity container	Precleaned bottles from supplier

¹ **Two 5 gram aliquots preserved in water will be collected in 40 ml VOA vials fitted with magnetic stir-bars for VOA. In addition, one 5-gram sample aliquot will be collected and preserved with methanol in a pre-weighed 40 ml VOA vial with magnetic stir bar. One additional 4-qz. bottle should also be collected if VOA is the only parameter of analysis for any given sample (allowance for moisture correction).**

² TCLP will be required analysis for samples of investigation derived waste. These samples are not currently included in the scope of work.

TCLP = Toxic Characteristic Leachate Procedure

TABLE 3-10A (REVISED)
RADIOLOGICAL TESTING
MINIMUM DETECTABLE ACTIVITIES (MDA's)
FOR REPORTING

PARAMETER	METHOD (water)	METHOD (soil)	MDA (water pCi/L	MDA (soil) pCi/g
<i>Th-228 (alpha spec)</i>	<i>HASL 300</i>	<i>HASL 300</i>	<i>1.0 pCi/L</i>	<i>1.0 pCi/g</i>
<i>Th-230 (alpha spec)</i>	<i>HASL 300</i>	<i>HASL 300</i>	<i>1.0 pCi/L</i>	<i>1.0 pCi/g</i>
<i>Th-232 (alpha spec)</i>	<i>HASL 300</i>	<i>HASL 300</i>	<i>1.0 pCi/L</i>	<i>1.0 pCi/g</i>
<i>U-233/234 (alpha spec)</i>	<i>DOE/EML HASL 300</i>	<i>EPI A-011B</i>	<i>1.0 pCi/L</i>	<i>1.0 pCi/g</i>
<i>U-235 (alpha spec)</i>	<i>DOE/EML HASL 300</i>	<i>EPI A-011B</i>	<i>1.0 pCi/L</i>	<i>1.0 pCi/g</i>
<i>U-238 (alpha spec)</i>	<i>DOE/EML HASL 300</i>	<i>EPI A-011B</i>	<i>1.0 pCi/L</i>	<i>1.0 pCi/g</i>
<i>Ra-226 Soil (gamma) Water (Radon Emanation)</i>	<i>Gel-epi-e-a- 008</i>	<i>HASL 300</i>	<i>1.0 pCi/L</i>	<i>0.1 pCi/g</i>
Total U (metal)	ASTM D5174	ASTM D5174	1.0 ug/L	1.0 ug/g
Gross Alpha (α) Gel-epi-a-001b	EPA 900	EPA 900 mod	2 pCi/L	4 pCi/g
Gross Beta (β) Gel-epi-a-001b	EPA 900	EPA 900 mod	4 pCi/L	10 pCi/g

Isotopic Th and U MDA's are based upon 4-8 hour count times.
Ra-226 (soil) MDA is based upon 8 hour count time.
Ra-226 (water) MDA is based upon 15 minute count time.
Gross alpha and beta are based upon 1-2 hour count times.

TABLE 3-10B (REVISED)
RADIOLOGICAL TESTING
MINIMUM DETECTABLE ACTIVITIES (MDA's)
FOR REPORTING

ADDITIONAL RADIONUCLIDES BY GAMMA SPECTROSCOPY

PARAMETER	METHOD (water)	METHOD (soil)	MDA (water) pCi/L	MDA (soil) pCi/g
<i>U-238</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>225</i>	<i>1.5</i>
<i>Ra-226</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>N/A</i>	<i>0.1</i>
<i>Ra-228</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>25</i>	<i>0.2</i>
<i>Th-228</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>10</i>	<i>0.1</i>
<i>U-235</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>30</i>	<i>0.5</i>
<i>Pa-231</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>250</i>	<i>1.0</i>
<i>Ac-227</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>75</i>	<i>0.5</i>
<i>Co-60</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>5</i>	<i>0.1</i>
<i>Cs-137</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>5</i>	<i>0.1</i>
<i>Am-241</i>	<i>HASL-300</i>	<i>HASL-300</i>	<i>30</i>	<i>0.1</i>

All gamma MDA's are based on 100 g sample weight and 8 hour count time.

TABLE 11-1
ELECTRONIC DATA DELIVERABLE (EDD)
FIELD SPECIFICATIONS

FIELD NAME	FIELD TYPE	WIDTH
ID	supplied by program	N/A
Sample_No	Text	15
Lab_ID	Text	15
Laboratory	Text	25
Batch_No	Numeric	Dbl Precision
Assoc_Blnk	Text	15
QC-Type	Text	15
Coll_Date	Date	NA
Rec_Date	Date	NA
Ext_Date	Date	NA
Anal_Date	Date	NA
SDG	Text	15
Parameter	Text	45
Fraction	Text	5
Method	Text	20
Lab_Result	Numeric	Dbl Precision
Uncertainty	Text	5
Tic_type	Text	20
Cas_num	Text	25
Units	Text	5
Lab_Qual	Text	2
Data_Qual	Text	2

TABLE 11-1
ELECTRONIC DATA DELIVERABLE (EDD)
FIELD SPECIFICATIONS

FIELD NAME	FIELD TYPE	WIDTH
IDL	Numeric	Dbl Precision
MDL	Numeric	Dbl Precision
CRDL_CRQL	Numeric	Dbl Precision
Dil_Factor	Numeric	Dbl Precision
Samp_Vol	Numeric	Dbl Precision
Samp_Wt	Numeric	Dbl Precision
Extr_Vol	Numeric	Dbl Precision
Level	Text	3
Pct_Moist	Numeric	Dbl Precision
Comments	Text	20
Validated	Yes/No	NA
OK_to_Use	Yes/No	NA
Verified	Yes/No	NA

Note: The reporting laboratory will deliver a hard copy and electronic deliverable without discrepancies. The EDD will be in MS Excel format, where each field is consistent throughout the database (e.g., all data in the LAB_RESULT field will be numeric, all data in the CAS_NUM field will be text and will contain dashes, all chemical names will be spelled and capitalized consistently when comparing various Sample Delivery Groups (SDGs), sample names will be spelled, spaced, and capitalized consistently when comparing various Sample Delivery Groups (SDGs), etc.). Field names and types will be reported as specified in the table above. Multiple results from one location will be distinguishable from one another in the EDD to determine which would be most appropriate to use for a specific location or task (e.g., dissolved and total water data, re-extractions, dilutions, radionuclides reported in both alpha and gamma spectroscopy, etc.).

APPENDIX B

SAIC RECOMMENDATIONS

This information was previously presented in the June 2000 Phase II Edition Field Sampling Plan and is not reproduced in this document.

APPENDIX C

ADDITIONAL KEY PROJECT PERSONNEL

David A. King, CHP

EDUCATION:

University of Tennessee, Knoxville, M.S. Radiation Protection Engineering, 1993, 3.9/4.0 GPA
Middle Tennessee State University, B.S. Physics, 1991, 3.3/4.0 GPA

SECURITY CLEARANCE:

None

WORK SUMMARY:

Mr. King has six years experience as an environmental health physicist. Relevant experience includes risk and dose analysis for Feasibility Studies and Engineering Evaluation/Cost Analyses; preparation of Sampling and Analysis Plans and Characterization Reports for sites with radiological contaminants; serving as field team lead for the characterization of various radiologically contaminated media; preparation of Final Status Survey Plans and Post Remedial Action Reports; and data management.

PROFESSIONAL EXPERIENCE

January 1996 to Present, **Health Physicist, Risk and Dose Assessor, Task Leader**, Science Application International Corporation (SAIC). As a Health Physicist/Risk and Dose Assessor for SAIC's Formerly Utilized Sites Remedial Action Program (FUSRAP), Mr. King supports sites in Massachusetts, Missouri, New Jersey, New York, and Ohio under United States Corps of Engineers (USACE) and Department of Energy (DOE) contracts. Specific responsibilities include conducting CERCLA risk and radiological dose assessments; preparing Sampling and Analysis Plans, Final Status Survey Plans, and Characterization Reports for radiologically contaminated sites; providing general health physics consultation; and acting as task leader for radiological walkover surveys using global positioning system (GPS) technology.

Mr. King has designed and prepared Characterization Plans, Final Status Survey Plans and Post Remedial Action Reports utilizing the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), has participated in workshops on decommissioning under NRC and using the RESRAD or RESRAD-Build codes, and attended a five-day risk assessment course conducted by the Risk Assessment Corporation.

September 1993 to January 1996, **Health Physicist, Task Manager, Field Team Leader**, CH2M Hill. Mr. King served as task lead to measure indoor radon and thoron concentrations using radon progeny integrating sampling units (RPISUs) for the Residential Areas Superfund site in West Chicago, Illinois. His duties consisted of overseeing field efforts, strategic selection of sampling locations, ensuring the implementation of quality assurance/quality control (QA/QC) measures, auditing the RPISU vendor, conducting an inter-comparison experiment at a thoron chamber facility, and performing data validation

David A. King, CHP

and analysis tasks. Mr. King also operated an in situ gamma spectrometry system and performed radiation walkover surveys using GPS as part of the Residential Areas Superfund site characterization effort.

Mr. King planned and executed the radiological characterization of the Kress Creek Superfund Site in West Chicago, Illinois. Duties included the preparation of a SAP and cost estimate, collection of radiation measurements from thorium contaminated creek sediments, collection of sediment samples for radiological analyses, and preparation of a characterization report. Mr. King also oversaw radon/thoron sampling at Reed-Keppler Park in West Chicago, Illinois using E-Perm detectors. Duties included the preparation of a Work Plan and Quality Assurance Project Plan addenda, sample location selection, and data analysis and evaluation.

During Mr. King's employment with CH2M Hill, he provided health physics support to four Superfund sites in West Chicago, Illinois, a Remedial Investigation/Feasibility Study (RI/FS) in Oak Ridge, Tennessee, and the Travis Air Force Base characterization effort.

COMPUTER PROFICIENCIES

IBM compatible experience includes Microsoft Windows and Office applications (Word, Access, Excel and PowerPoint), Lotus 123, Quatro Pro, WordPerfect, RESRAD, RESRAD-Build, MicroShield, DFINT, DFEXT, CPA88-PC, and Q.

MISCELLANEOUS

Certified Health Physicist (1999)

Member, Health Physics Society

Member, East Tennessee Chapter of the Health Physics Society

CUSTOMERS

Department of Energy (DOE)

Environmental Protection Agency (EPA) - Regions II, V and IX

Lockheed Martin Energy Systems (LMES)

United States Army Corps of Engineers (USACE)

REFERENCES

George Stephens, CHP, ETTP (formerly K-25) ES&H Project Supervisor, Bechtel Jacobs, (423) 241-1520

David A. King, CHP

John Waddell, Ph.D., Project Manager for St. Louis District FUSRAP sites, Engineering and Environmental Compliance Group, (888) 470-2330

Scott R. Hall

Title	Project Manager
Education	B.S., Environmental Chemistry, State University of New York, 1986
Specialized Training	Water Utility Management Institute, American Water Works Association Essentials of Management seminar, New England Water Works Association MSD Operations and Maintenance course, Hewlett-Packard Interpretation of Mass Spectra seminar, Hewlett-Packard PID/ELCD Troubleshooting and Maintenance course, Tracor Fundamentals of Water Treatment course, CT Section, American Water Works Association
Experience and Qualifications	<p><u>General Engineering Laboratories, Inc. Project Manager (February 2000 - Present)</u> As Project Manager, Mr. Hall responds to clients' needs and coordinates with multiple departments to ensure those needs are met. He prepares quotes for new and existing clients, provides technical support and monitors projects through all aspects of the laboratory. In addition, he manages deliverables, including hard copy data packages, electronic data deliverables (EDDs), invoices and monthly performance reports.</p> <p><u>Commonwealth Technology, Inc./EnviroData Group, LLC (1998 - 2000)</u> Initially, Mr. Hall served as a Project Manager for clients from a variety of industrial, municipal water and wastewater, governmental, and engineering/consulting firms. In this role, he provided complete client services, including scheduling sample collection, coordinating laboratory analyses, reviewing data and preparing hard copy and electronic data deliverables. After about a year and a half, he moved into the position of Analyst II in the organic chemistry group. In this position, he was responsible for analyzing drinking water, wastewater, sludge and solid samples. He also maintained instrumentation, performed sample extraction and analysis, and analyzed sample and QA/QC data.</p> <p><u>BHC Company. An Aguaron Company (1997 - 1998)</u> As a Consultant, Mr. Hall was solely responsible for restarting the organic section of the drinking water laboratory after a period of non-activity. He attained re-certification for testing under CTDPHAS, USEPA WP/WS/ICR and NYS-ELAP programs.</p> <p><u>South Central Connecticut Regional Water Authority (1986 - 1997)</u> Mr. Hall worked as a Chemist for four years, during which he was responsible for all activities pertaining to organic and inorganic analyses. For the next five years he served as Chemistry Supervisor of the organic and inorganic sections. He was responsible for scheduling, directing and reviewing the work of three laboratory assistants and two chemists. Then, for two years he was a Senior Chemist serving as the lead analytical person for water quality testing and projects in the chemistry laboratory. His responsibilities included conducting first-level QA reviews for all laboratory reports, maintaining QC database, and coordinating activities of WTP operators at three satellite laboratories.</p>

APPENDIX D

COMMENTS AND RESPONSES TO THIS QAPP ADDENDUM

Comment 1.

Page 2, section 2.1.2 , *Additional Radionuclides for Analysis*, Many of the radionuclides listed for gamma spectroscopy are part of the same decay series but with the series equilibrium disrupted by chemical or physical processes. As a result, the laboratory needs to be careful of which gamma peaks will be used to determine the concentration for each nuclide so that each of the thirteen nuclides' concentration is independently determined and can meet the MDA stated on Table 3-10B.

Response 1.

Acknowledged and understood by laboratory performing radiological testing (General Engineering Laboratories, Inc.).

Comment 2.

Page 2, section 2.1.2, *Additional Radionuclides for Analysis*, last sentence, Change "compounds" to "radionuclides".

Response 2.

*Test has been revised to indicate **radionuclides** instead of compounds.*

Comment 3.

Page 2, section 2.1.2, Additional Radionuclides for Analysis, If Sr-90 and Pu are excluded because historical data did not indicate the presence of fission products, what is the rationale for including Co-60 and Cs-137 in the list of radionuclides for analysis? It appears this section is not in agreement with the SAIC memo "Responses to Maxim's Request for Information Regarding Phase 2 Sampling at NFSS", dated June 6, 2000. The SAIC memo recommends that Th-230 not be analyzed by gamma spectroscopy and stated that Cs-137 (a fission product) was present in a Phase 1 sample.

Response 3.

Co-60 and Cs-137 are retained because they are easily identified using gamma spectroscopy analyses (at no additional cost) and can be used as indicators for non-ore wastes. If Co-60 and/or Cs-137 contamination is identified, other radionuclides such as Sr-90 and Pu may be added to the list of potential contaminants.

U-234, Th-230, and Th-232 have been removed from Table 3-10B. These radionuclides will be analyzed using alpha spec as indicated in Table 3-10A. Footnotes have also been added to the MDA (water) and MDA (soil) headings indicating radiological count times to be used by the laboratory, to meet the referenced MDA's.

Comment 4.

Appendix A, insert “α” and “β” in the appropriate places in the Tables.

Response 4.

Applicable Tables in Appendix A have been revised.

Comment 5.

Appendix A, Table 3-3, Is the holding time for radionuclides sufficient to get all the soil analyses (alpha and gamma spec) done? There is normally no limit on holding time for soil samples for radionuclide analyses. Is the sample size adequate for multiple analyses?

Response 5.

Sample holding times for radiological testing (6 months from date of collection) is based upon EPA 900 and/or DOE/EML-HASL 300 methods. Sample counting times vary from 15 minutes to 8 hours and turnaround is expected within 30 days of sample receipt. This should allow adequate time for any potential reanalysis to be performed, within established holding time criteria.

The sample collection containers for both chemical and radiological analysis, have been recommended by the laboratory and take into account any additional volumes that may be required for sample reanalysis.

COMMENT/RESPONSE PACKAGE

PROJECT:	ADDENDUM, QUALITY ASSURANCE PROJECT PLAN, RI, NFSS		
REVIEWER:	ALFRED C. KOZMINSKI	DATE:	8/4/00

COMMENT NUMBER	SECTION	COMMENT	RESPONSE
1	2.1.2	Water samples will be analyzed for Radon, this should be Radium, by Radon emanation	Acknowledged. Text has been revised to indicate that Ra-226 unit activities will be determined in water samples by Radon Emanation methodology.
2	Table 3-10A	a. Please include Ra-228 with the Ra-226	Ra-228 activities will be determined in aqueous and solid matrices by gamma spectroscopy. Table 3-10B lists the radioisotopes to be determined by gamma spectroscopy, including Ra-228.
		b. Please include the specific lab SOPs for all these procedures	Table 6-2 was revised to list specific laboratory SOP's for all applicable methods and parameters, including radiological analyses.
		c. Total U may be calculated by summation of the alpha spec isotopic results. This fluorescence procedure may not be necessary	The two methods can be used to support correlation between detected isotopic U activities and concentrations of total U. Using the alpha spectroscopy data for uranium, total U can be calculated. Total U samples will be collected during the Phase II investigation to confirm this correlation.
3	Table 6-1	Are these geotechnical methods sufficient parameters for modeling calculations, i.e. RESRAD?	After reviewing RESRAD requirements, Maxim has determined that hydraulic conductivity tests by ASTM 5084 will provide sufficient parameters for modeling calculations. Maxim plans to collect eight samples for ASTM 5084 analysis, four samples from each of the two uppermost geological units at the site.

Comment #1: Page 2; Section 2.1.1: Please clarify the statement “Surrogate compounds were added to the preservative solution before the sodium bisulfate preservation process.” Surrogate compounds are added to the VOC samples just prior to analysis in the laboratory. Typically, the sodium bisulfate preservation is conducted in the field – the soil sample is added to an otherwise empty vial which contains the sodium bisulfate preservative. The statement above does not seem to be consistent with the expected process.

Response 1

The referenced statement is not intended to address what procedures will be used for the collection and analysis of soil samples for VOA, but rather to support the justification for using water for the field preservative instead of sodium bisulfate. The initial demonstration for field preservation with sodium bisulfate resulted in loss of surrogate compounds upon analysis. The sodium bisulfate ampoules also contained the surrogate compounds referenced in SW-846/8260B.

Maxim is not recommending the utilization of sodium bisulfate as a VOA chemical preservative for soil samples. Maxim is recommending that soil samples be preserved in the field with reagent water and the surrogate compounds and internal standards will be added to the sample vials immediately prior to sample analysis.

Comment #2: Page 2; Section 2.1.1: I would strongly advise against analysis of the VOA soil be EPA 5030/8260B. These samples should be analyzed by EPA 5035/8260B – although the sodium bisulfate preservation should not be used. Enclosed is a portion of the e-mail that was sent to Fred Kozminski in Jan-2000 concerning this issue.

EPA promulgated method 5035 because there were significant loss of volatiles from soil samples using the traditional sampling technique (EPA 5030).

Under method 5035, the soil volatiles sampling protocol will depend upon the project DQOs.

The project DQOs will dictate whether the low-level or high-level sampling methods should be used.

If the low-level method is used, you can select to use either

- (2) Sampling Protocol 1 (using the EnCore sampler) or
- (2) Sampling Protocol 2 (using sodium bisulfate preservation)

If the soils are carbonaceous (or effervesce upon addition of the sodium sulfate), then other options should be considered:

- On-site analysis of the samples (e.g. using a field GC)
- Collecting the samples using Sampling Protocol 1
- Preserving the samples with methanol

Note that preserving the soil samples with methanol is the high-level method.

The high-level will have higher detection limits than the low-level method, however, the use of the high-level method is preferable to the traditional sampling technique (EPA 5030) which has significant loss of volatiles.

Also note that we have received word that preservation with sodium bisulfate is being discouraged. Future options may include freezing the sample.

A final option in EPA 5035 includes the collection of a unpreserved soil sample and subsequent analysis in the laboratory (which is essentially EPA 5030). Hence, changing the analysis to method 5030/8260B in the QAPP is not necessary.

Again, I would strongly urge the use of either the Encore sampler or field preservation with methanol.

Response 2

Soil samples will not be analyzed utilizing 5030/8260B methodology but 5035/8260B as stated in Section 2.1.1 of the QAPP Addendum for the Phase II RI at the NFSS. Syringe type samples will be utilized for collection of 5 gram aliquots of soil which will be placed immediately upon collection, into pre-tared 40 ml VOA vials equipped with a magnetic stir-bar. The water preservative will be added to the vials and the vials will be sealed. This alternate preservation procedure is consistent with 5035 methodology. Methanolic preserved sample aliquots will also be generated for use with high-level VOA, if required and an additional unpreserved aliquot will be collected for use with moisture correction determination.

Comment #3: Page 3; Section 2.4: Suggest the use of DEEMS as the electronic data deliverable.

Response 3

The RPP database was used for prior investigative phases at NFSS and was agreed upon as being the most appropriate database and electronic data delivery format for this project.

Comment #4: Appendix A; Table 3-2: Please change “HCL” to “HCl” and “ml” to “mL”.

Response 4

See Response to Comment 3.

Comment #5: Appendix A; Table 3-3: I would strongly encourage the use of the Encore sampler or field preservation with methanol. See the above comment about the analysis of VOA soil samples.

Response 5

See Response to Comment 2.

Comment #6: Appendix A; Table 3-3; Footnote 1: I would strongly encourage the use of the Encore sampler or field preservation with methanol. See the above comment about the analysis of VOA soil samples.

Response 6

See Response to Comment 2.

Comment #7: Appendix A; Table 6-1: The analytical method for VOCs in soil samples should remain as EPA 5035/8260B. See the above comment about the analysis of VOA soil samples.

Response 7

See Response to Comment 2.

Comment #8: Appendix A; Table 6-2: The analytical method for VOCs in soil samples should remain as EPA 5035/8260B. See the above comment about the analysis of VOA soil samples.

Response 8

See Response to Comment 2.

Comment #9: Appendix A; Table 11-1: Suggest the use of DEEMS as the electronic data deliverable.

Response 9

See Response to Comment 2.

Comment 1.

In Section 2.1.1 GC/MS VOA

middle of Page 2 of 4

I believe that encore samplers should be used for the unpreserved soil VOA samples. This gets around the chemical reaction problem, while keeping other changes made by SW-846, Update III intact. Going back to a 4 oz. Jar as a collection device could raise questions as to the potential for low biased data due to VOA losses. Also, although the field preserved (MeOH in 40ml vial) sample is an option, depending on the field setting, it may be worth allowing for the option to send 2-3 encore samples to the lab and have one sample MeOH preserved within the 48hrs holding time by the lab.

Response 1.

The primary reason for the proposed use of standard sample bottle collection of soil VOA samples was based upon the restrictive preservation holding times requirements (48 hours from collection) associated with 5035 methodology. Since all samples are shipped to the laboratory for next-day delivery and sample collection is inclusive of weekends, a means is necessary to allow adequate time for preservation/analysis without the utilization of the sodium bisulfate preservative, for reasons stated in the Draft Addendum to the QAPP.

Maxim understands that the proposed alternative, which has been approved by USACE, is not consistent with 5035 methodology since the samples are shipped in 4 oz. bottles without chemical preservation. To comply with the current promulgated version of SW846 for volatiles in soil media Maxim proposes to revise the existing project plan to allow for field preservation of low-level VOA samples with water. The sample aliquots will be placed in 40ml pre-tared sample vials that also contain a small magnetic stir-bar. Five milliliters (5 cc) of reagent water will be added to each sample bottle collected and the bottles will be sealed and transported to the laboratory for analysis. The reagent-free water will be provided in sealed Teflon ampoules that are opened immediately prior to sample preservation. Two low-level (water preserved) aliquots will be collected per sample. In addition, Maxim will also collect one methanol preserved sample for medium-level VOA (for use when required) and one 4 oz. bottle for moisture correction determination.

The applicable section(s) and associated Table(s) have been revised to incorporate this modification to the Draft QAPP.

Comment 2.

In Section 2.1.2 Additional Rad....

Page 2 of 4, next to last sentence starting Water samples.....

Should this read --will be analyzed for Ra-226 by radon emanation.....

It currently reads radon by radon em.....

Response 2.

Test has been revised to clearly indicate methods of analysis.

Comment 3.

Table 3-2 (REVISED)

Middle of table.....Gross and..... Please clarify

Response 3.

The table will be revised to include the words “gross alpha and beta”.

Comment 4.

Bottom of table over to page 2 of 2.

TCLP*

As this information specifies liquid samples, there is no extraction of the samples. Under TCLP, a liquid sample is filtered and defined as the extract and subjected to the appropriate analytical procedure(s).

Response 4.

Under TCLP per SW-846, the extraction of liquid waste samples is regarded as the filtration step of the procedure. The filtrate is then defined as the leachate, if the solids content is less than 0.5%. If the solids content is greater than 0.5% the solids are leached with the appropriate extraction fluid at a 20:1 ratio and the leachate is combined with the original filtrate at the calculated ratio of % solids/total mass. To avoid any confusion generated by the use of these somewhat interchangeable terms, many laboratories have adopted “TCLP extraction” to signify the actual leachate production (whether it be filtration, filtration with leachate generation or leachate generation) and the term “sample extraction” to mean the actual organic extraction of the leachate or sample material prior to instrumental analysis.

Comment 5.

Table 3-3 (REVISED)

Middle of table.....Gross and..... Please clarify

Also see Table 6.1 pages 1 and 2, and Table 6.2 pages 1 and 2.

Response 5.

The tables will be revised to include the words “gross alpha and beta.”

Comment 6.

Table 3-3 (REVISED)

VolatileTCL Organics This section of table should reflect the use of encore samplers *if* there is a decision to use them (as commented on in the text Section 2.1.1)

Response 6.

Soil, sediment, aggregate and/or debris samples for organic volatiles analysis, collected during Phase 2 of the NFSS/RI, will not be collected nor transported in En-Core sample tubes. The method used in Phase I will be used, including revisions explained in the Response to Comment 1. Solid sample aliquots will be collected in disposable syringes (approximately 5 or 10 gram samples) and the sample aliquots will be transferred to 40 ml VOA vials and preserved with reagent-free water (low-level) and/or methanol (high level). The disposable syringe technique for collection of soil VOA samples is consistent with SW-846 sampling protocol as referenced in Method 5035.

Section 2.1.1 has been revised to incorporate this modification to the Draft QAPP for Phase 2 of the RI, as noted in Response 1 of this submittal.

Comment 7.

Table 3-10A (REVISED)

Should this table also include Ra-228?

Response 7.

Ra-228 unit activities will be determined by gamma spectroscopy, in both water and soil matrices, as referenced in Table 3-10B.

Comment 8.

Table 3-10B (REVISED)

Are all of the alpha spec. isotopes (from Table 3-10A) also being analyzed by gamma spectroscopy for soil and water? Especially considering the MDA differences (much higher) for the water matrix for gamma.

Response 8.

*The appropriate method for each analyte yielding the most sensitive detection limit will be used for each isotope. Gamma spectroscopy will not be used to determine concentrations of all isotopes listed for analysis by alpha spectroscopy. However, the list of radioisotopes to be measured by gamma spectroscopy is inclusive of **some** of the radioisotopes listed for measurement by alpha spectroscopic measurement. Select isotopes were included for evaluation during the Phase II Sampling/Analysis activities (Ac-227, Co-60, Cs-137, etc.) Isotopes listed in Tables 3-10A and 3-10B are "standard isotopes" in the gamma spectral library. This additional gamma spectroscopic data may be used for evaluation and comparability of the alpha spectroscopic data and for the radiological risk assessment.*