TETRA TECH

Donna Davies
Project Manager

April 16, 2010

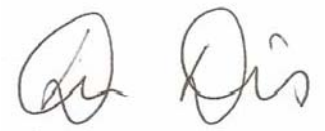
Ms. Dawn Fulsher (3HS12)
Site Assessment Manager
U.S. Environmental Protection Agency Region 3
1650 Arch Street
Philadelphia, PA 19103

Subject: Final Site Inspection Report for the
Battlefield Golf Club Site
EPA Contract No. EP-S3-05-02
Technical Direction Document No. E43-030-09-07-004
Document Tracking No. 0978

Dear Ms. Fulsher:

Tetra Tech EM Inc. (Tetra Tech) is submitting the final site inspection report for the Battlefield Golf Club site. If you have any questions regarding this deliverable, please contact me at (215) 669-0069.

Sincerely,



Donna Davies
Project Manager

Enclosure
cc: TDD File

Tetra Tech, Inc.
7 Creek Parkway, Suite 700, Boothwyn, PA 19061
Tel 610.485.6410 | Fax 610.485.8587
www.tetratech.com

FINAL SITE INSPECTION
FOR THE
BATTLEFIELD GOLF CLUB SITE
CITY OF CHESAPEAKE, VIRGINIA

Prepared for

U.S. Environmental Protection Agency Region 3
1650 Arch Street
Philadelphia, Pennsylvania 19103

Submitted by

Tetra Tech EM Inc.
7 Creek Parkway
Boothwyn, Pennsylvania 19061

EPA Contract No. EP-S3-05-02

Technical Direction Document No. E43-030-09-07-004
Document Tracking No. 0978

April 16, 2010

FINAL SITE INSPECTION REPORT
FOR THE
BATTLEFIELD GOLF CLUB SITE
CITY OF CHESAPEAKE, VIRGINIA

Prepared for

U.S. Environmental Protection Agency Region 3
1650 Arch Street
Philadelphia, Pennsylvania 19103

Submitted by

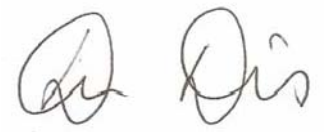
Tetra Tech EM Inc.
7 Creek Parkway
Boothwyn, Pennsylvania 19061

EPA Contract No. EP-S3-05-02

Technical Direction Document No. E43-030-09-07-004
Document Tracking No. 0978

April 16, 2010

Prepared by



Donna Davies
Project Manager

Approved by

Andy Mazzeo
Philadelphia Operations Manager

CONTENTS

Appendix

A. FIGURES
B. ANALYTICAL DATA SUMMARY TABLES

Attachment

Validated Analytical Data Packages – August/September 2009

TABLES

1.0 INTRODUCTION

Under Eastern Area Superfund Technical Assessment and Response Team (START) Contract No. EP-S3-05-02, Technical Direction Document (TDD) Nos. E33-024-08-09-006 and E43-030-09-07-004, U.S. Environmental Protection Agency (EPA) Region 3 tasked Tetra Tech EM Inc. (Tetra Tech), to conduct a site inspection (SI) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) for the Battlefield Golf Club site located at 1001 South Centerville Turnpike, Chesapeake, Virginia. EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database identifies the site as the Battlefield Golf Club, EPA Identification No. VAN000306614 (Reference [Ref.] 1).

This SI was conducted in accordance with EPA's "Guidance for Performing Preliminary Assessments Under CERCLA" and "Guidance for Performing Site Inspections Under CERCLA" (Ref. 2; Ref. 3). The scope of the SI for the Battlefield Golf Club site was to determine the need for additional action under CERCLA. Activities completed as part of this SI included a review of available information regarding the site; identification and evaluation of potential targets; completion of field activities, including the collection of groundwater, surface water, sediment and soil samples; and the evaluation of laboratory analytical data.

Section 1.0 of this report provides the introduction, which presents the purpose of the SI and outlines the organization of the report. This report summarizes site background information in Section 2.0; describes the source characteristics, and groundwater and surface water migration pathways in Sections 3.0, 4.0, and 5.0, respectively; discusses soil and air migration pathways in Section 6.0, and summarizes conclusions from this SI in Section 7.0. A list of references cited in the text is provided in Section 8.0 and electronic copies of all non-confidential references are included on the compact diskettes that accompany this document. All figures are provided in Appendix A. Analytical data summary tables for samples collected as part of this SI are presented in Appendix B. The Contract Laboratory Program (CLP) analytical data package summary for samples collected as part of this SI is presented in this report is provided as an attachment.

2.0 BACKGROUND

This section provides background information on the site, including its location, description, and history of site activities and investigations.

2.1 SITE LOCATION

The Battlefield Golf Club site is located at 1001 South Centerville Turnpike in Chesapeake, Virginia, as shown on Figure 1, Site Location Map in Appendix A. The geographic coordinates of the approximate center of the site are 36.68982° north latitude and 76.17790° west longitude (Ref. 4). The site is surrounded by residential and agricultural properties, and is bordered to the north by Whittamore Road, to the south by Murray Drive, and to the west by South Centerville Turnpike. Residential homes are located adjacent to the site to the east and southeast (along Whittamore Road), to the south (along Murray Drive), and to the west (along Centerville Pike South) (see Figure 2 in Appendix A). The Naval Auxiliary Landing Field (NALF) Fentress (Fentress) is located directly east of the site property. NALF Fentress comprises 2,560 acres with an additional 8,780 acres in restrictive easements (Ref. 5).

2.2 SITE DESCRIPTION

The 216-acre property is the location of the currently active Battlefield Golf Club, which opened to the public on October 13, 2007. The golf course is described as a "links-style" golf course, which is the oldest style of golf course first developed in Scotland. The term "links" refers to an area of coastal sand dunes in the Scots language (Ref. 6; Ref. 7; Ref. 8). The course consists of 18 holes built around seven man-made lakes. The original elevation of the property has been altered to create elevations up to 40 feet above sea level (Ref. 6). In addition to the course, a trailer that functions as an office/club house and parking area are located on the site (Ref. 9). Figure 2, 2009 Aerial Photograph, in Appendix A provides an aerial photograph showing the features of the site.

2.3 SITE BACKGROUND AND PREVIOUS SITE INVESTIGATIONS

Prior to development as a golf course, the site was owned by Weaver Fertilizer Company, Inc., and was cultivated for agricultural use, as shown on Figure 3, 1994 Aerial Photograph, in Appendix A. In early 2001, Combustion Products Management Virginia LLC (CPM) approached the City of Chesapeake about constructing a golf course on the site. On March 27, 2001, a public meeting was held to invite comment and participation from nearby citizens, the City of Chesapeake, and local Virginia Department of Environmental Quality (VADEQ) representatives. A second public meeting was held on April 11, 2001. On June 20, 2001, the

Chesapeake City Council voted unanimously to approve the golf course project (originally called the Etheridge Greens Golf Course) (Ref. 6).

The property purchased by CPM to be used for the golf course is located on Tax Map 62, Parcel 2. At the time of purchase, the property consisted of 215 acres of agricultural land and 1 acre of forested land. CPM purchased the property from Weaver Fertilizer Company, Inc., on March 15, 2002 (Ref. 11).

As part of the initial investigations conducted prior to CPM's purchase of the property, Stokes Environmental Associates, Ltd. (Stokes) was retained to conduct a Phase I environmental site assessment (ESA) of the property. Stokes completed the Phase I investigation in 2001. No recognized environmental conditions were documented during the Phase I ESA (Ref. 12).

Stokes contracted McCallum Testing Laboratories (McCallum) to advance three hand auger borings at the site on February 1, 2001. The borings were installed to depths of 4.5 to 5.5 feet. Groundwater was encountered at between 2 to 2.5 feet below ground surface (bgs). Soil horizons encountered were described as moist silty sand and moist sandy loam, followed by wet loamy sand and/or wet sand (Ref. 13). McCallum returned to the site in March 2001 to complete a subsurface exploration at the site. A total of 12 soil test borings were drilled to depths of 25.5 feet bgs. Temporary monitoring wells were installed at 4 of the 12 boring locations. Groundwater was encountered at depths ranging from 2 to 6.5 feet bgs. The soil encountered predominantly consisted of moist and wet sand or moist sandy clay (Ref. 14).

CPM contracted Stokes to perform a baseline drinking water quality survey in the vicinity of the site in November 2001 (Ref. 15). The objective of the survey was to document existing groundwater conditions and use in the vicinity of the site. As part of the survey, Stokes collected 40 groundwater samples from nearby private drinking water wells at randomly selected properties located within 2,000 feet of the site. The samples were analyzed for the following inorganic substances: antimony; arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, fluoride, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc. Arsenic was detected in two wells, beryllium was detected in two wells, cadmium was detected in 21 wells, chromium was detected in five wells, copper was detected in ten wells, lead was detected in 20 wells, manganese was detected in 13 wells, mercury was detected in one well, thallium was detected in 11 wells and zinc was detected in eight wells. Antimony, barium, nickel, selenium, or cyanide were not detected in any of the 40 groundwater samples collected. The copper levels detected in two of the samples were above EPA's maximum contaminant level (MCL) of 1,300 parts per billion (ppb) and one sample revealed levels of thallium that were above the MCL of 2.0 ppb. No other inorganic substance was detected above EPA's MCL or action levels (Ref. 15).

In 2001, prior to fly ash characterization and placement on the site property, Dominion contracted URS to provide engineering support services including groundwater modeling and an assessment to determine the impact fly ash may potentially have on groundwater in the vicinity of the site (Ref. 39; Ref. 40). Specific work completed by URS included an investigation of the hydrogeology of the site, determination of the stabilization requirements of the ash, completion of groundwater modeling, and preparation of a risk assessment. As part of their hydrogeologic evaluation, URS advanced seven soil borings at the site; five of the borings were completed as groundwater monitoring wells. Soil and groundwater samples were collected from each location and submitted for laboratory analysis for selected metals (Ref. 39, p. 7). The soil analytical results from this investigation (included in Section 3.3, Table 2 of this report) were used to establish background metal concentrations in soils prior to the placement of the fly ash. The five monitoring wells installed on the site were screened at depths of 15 to 25 feet bgs (Ref. 39, p.8, 10). Four groundwater samples were collected from the wells and submitted to a laboratory for selected metals analysis. The analytical results (discussed in Section 4.6.1 of this report) are used to assist in establishing background levels of metals in groundwater prior to placement of the fly ash.

In addition to the hydrogeologic investigation, URS also prepared an ash stabilization, groundwater modeling and risk evaluation report in December 2001 (Ref. 40). The purpose of this report was to evaluate the leachability of metals from amended and unamended fly ash and predict the maximum concentration of ash-related compounds in groundwater at the property boundary (Ref. 40, Section 1.1). During this study, URS developed an Integrated Pathway Model for the identified compounds of potential concern present in the fly ash. The risk evaluation portion of the report was completed to determine the risk associated by the migration of compounds detected in the fly ash to off-site receptors (Ref. 40).

CPM began constructing the golf course on the property in spring 2002,. To alter the surface topography for the golf course, CPM used approximately 1.5 million cubic yards of coal combustion byproducts (CCB) from Dominion Power's Chesapeake Energy Center power plant. As recommended in the URS fly ash stabilization report, the CCB was blended with a cement kiln dust at the power plant prior to hauling to the property for placement (Ref. 6; Ref. 41). Samples from each batch of the blended CCB were collected and analyzed prior to placement on the property. Laboratory test results for these samples confirm that the CCB had been blended with cement kiln dust at 1.7% to 2.3% by weight on average (Ref. 41). The CCB consisted of fly ash commingled with small amounts of bottom ash. EPA's toxicity characteristic leaching procedure (TCLP) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) analysis was completed for both the fly ash and bottom ash. TCLP test results indicated that the fly ash and bottom ash did not exceed Resource Conservation and Recovery Act

(RCRA) regulatory levels and were therefore not characterized as a hazardous waste based on toxicity characteristics under RCRA regulations (Ref. 6; Ref. 34).

Upon completion of the CCB placement and compaction at the site, a 12-inch earthen infiltration layer was placed directly above the CCB fill. This was initially to be followed by a 12-inch earthen erosion control layer capable of sustaining growth of indigenous plants and grasses. On January 31, 2007, CPM sold the property to MJ Global (Ref. 10). On March 3, 2007, MJ Global submitted a request to VADEQ to modify the thickness of the final cover from 24 inches to 18 inches (Ref. 6; Ref. 10). The Virginia closure requirement regulating use of CCB (9 VAC 20-85-120, "Regulation Governing Management of Coal Combustion By-Products") specifies a minimum of 18 inches of cover material; therefore, VADEQ approved the requested modification (Ref. 10).

In February and May 2007, inspections of the site were completed to support the requirements of the site's closure plan. Soil borings were dug at randomly selected locations throughout the site. Each of the borings revealed at least 18 inches of earthen material located throughout the site, as required by the closure plan (Ref. 16). The results of the closure investigations were submitted to VADEQ and VADEQ issued the closure certificate for the site on October 4, 2007. This certificate indicated that the requirements for closure of the site were met (Ref. 17).

Kimley-Horn, a consultant retained by the City of Chesapeake, collected samples of the fly ash located on the site, off-site soil samples, and on and off-site surface water and groundwater samples from on and off-site monitoring wells in April, May, and July 2008. The fly ash samples were collected from eight hand auger borings installed on the site. In addition, three off-site background soil samples were collected from borings advanced during the installation of off-site monitoring wells MW-4 and MW-5. Soil samples were collected from the borings advanced during the installation of MW-4 and MW-5 at 8 to 9 feet bgs, 9 to 11 feet bgs, and 29 to 31 feet bgs. The fly ash and off-site soil samples were analyzed for total organic carbon, metals by TCLP and synthetic precipitation leaching procedure (SPLP) and RCRA metals (Ref. 18, Tables 4A, 4B, 4C and 5A). Figure 1 in Reference 18 (Sampling Location Map) illustrates the fly ash and off-site sampling locations for this investigation. The analytical results of this investigation are discussed in Section 3.0, Source Characteristics, of this report.

Kimley-Horn collected groundwater samples from three on-site and two off-site monitoring wells and one well located at the fire service facility located at the NALF Fentress in July 2008,. The samples were analyzed for boron, molybdenum, and most EPA target analyte list (TAL) metals (with the exception of calcium, potassium, and sodium) (Ref. 18). The results of this investigation are discussed in Section 4.0, Groundwater Migration Pathway, of this report.

During the July 2008 sampling event, Kimley-Horn also collected surface water samples from an on-site pond and one off-site background sample from an unnamed pond located off of Etheridge Manor Boulevard, approximately 1 mile southwest of the site. The surface water samples were analyzed for the same parameters as the groundwater samples. The analytical results of these surface water and background samples are discussed in Section 5.0, Surface Water Migration Pathway, of this report.

In July 2008, EPA tasked Tetra Tech to complete a removal assessment at the Battlefield Golf Club site. The details and analytical results reported for this sampling event are discussed in the Final Trip Report for the Battlefield Golf Club Fly Ash Assessment (Ref. 9). In August 2008 as part of the removal assessment, to determine if there was evidence of fly ash migration Tetra Tech advanced 13 borings to approximately 12 feet bgs along the perimeter of the site. Tetra Tech conducted continuous sampling using 4-foot acetate sleeves, which allowed for documentation of soil lithology and sampling of soil cores at depth. Water was encountered in the borings between 4.5 and 7 feet bgs. Temporary groundwater monitoring points were installed in the 13 borings. Tetra Tech collected one soil sample from each boring in the zone directly above the water table. Tetra Tech also collected groundwater samples from each of the 13 borings. The soil and groundwater samples were submitted under EPA's Contract Laboratory Program (CLP) for TAL metals (dissolved and total for the groundwater samples), boron, and molybdenum analyses.

In addition to the soil and groundwater samples, Tetra Tech also collected surface water samples from two locations along the unnamed perennial stream that flows west to east along the southern boundary of the site. The surface water samples were also submitted through EPA's CLP for TAL metals, boron, and molybdenum analyses. Finally, Tetra Tech collected groundwater samples from 55 residential potable wells located in the vicinity of the site. The residential well samples were also submitted for TAL metals, boron, and molybdenum analyses. There was no visual evidence of fly ash encountered in the soil borings advanced around the perimeter of the site (Ref. 9, Appendix B). A review of the analytical results from the soil and groundwater samples collected from the borings installed around the perimeter of the site did not indicate any evidence of the migration of fly ash constituents (Ref. 9, p. 19, Appendix C, Table 2).

In December 2008, Dominion Power contracted MACTEC Engineering and Consulting, Inc. (MACTEC), to install 18 monitoring wells around the perimeter of the site and one in the southwest portion. Tetra Tech returned to the property in April 2009 to collect groundwater samples from 12 of the 19 monitoring wells installed by MACTEC and from five nearby residential wells. The soil and groundwater samples were submitted under EPA's CLP for TAL total metals and boron. The details and analytical results reported for this sampling event are

discussed in the Trip Report for the Battlefield Golf Club Site, dated June 19, 2009 (Ref. 38) and in Section 4.0 of this report.

On August 11, 2009 as part of the field activities completed for this SI, Tetra Tech returned to the site to obtain split samples of fly ash collected by the City of Chesapeake's contractor, CDM, Inc. (CDM). On this date, CDM advanced three soil borings to be used as leachate collection wells. Tetra Tech accepted five fly ash split samples (Ash-01 through Ash-05) collected by CDM from these three borings. The fly ash samples were submitted to an EPA-assigned CLP laboratory for TAL metals and boron analysis (Ref. 36). Details regarding the fly ash sampling event and analytical results are discussed in Section 3.3.

During the weeks of September 7 and 14, 2009 the final portion of field activities was completed for this SI. At this time, Tetra Tech obtained split samples of groundwater collected by CDM from the 22 on-site monitoring wells. Tetra Tech also collected 18 surface water and 17 sediment samples from off and on-site ponds and the adjacent perennial stream, and five surface soil samples. In August and September 2009, Tetra Tech also collected groundwater from eight residential wells located in the vicinity of the site. All samples collected were submitted to EPA CLP laboratories for TAL metals and boron analyses (Ref. 37; Ref. 32). The analytical results reported for these samples are discussed in the sections below.

3.0 SOURCE CHARACTERISTICS

This section discusses the source area, source sampling locations, analytical results, and source conclusions for the Battlefield Golf Course site.

3.1 SOURCE AREA

The source identified at this site is the 1.5 million cubic yards of CCB (referred to as fly ash in the remainder of this report) placed on the property during the construction of the golf course.

3.2 SOURCE SAMPLING LOCATIONS

Kimley-Horn, a consultant retained by the City of Chesapeake, collected samples of the fly ash that was placed on site in April, May, and July 2008,. The fly ash samples were collected from eight hand auger borings installed throughout the site. In addition, three off-site soil samples were collected from borings advanced during the installation of off-site monitoring wells (MW-4 and MW-5). Soil samples were collected from MW-4 and MW-5 borings at 8 to 9 feet bgs, 9 to 11 feet bgs, and 29 to 31 feet bgs. The fly ash and off-site soil samples were analyzed for total organic carbon and metals using TCLP and SPLP methods and RCRA metals using EPA analytical Method 6010B (Ref. 18, Tables 4A, 4B, 4C, and 5A). Figure 1 in Reference 18 (Sampling Location Map) illustrates the fly ash and off-site soil sampling locations for this sampling event. The analytical results are discussed in Section 3.3 of below.

Tetra Tech obtained split samples of fly ash collected by the City of Chesapeake's contractor, CDM. CDM collected the samples during the installation of three leachate collection wells on August 11, 2009,. Tetra Tech was on site to observe the drilling activities and recorded the lithology of the soil encountered in each boring. In the first hole drilled, native soil was encountered from the surface to approximately 14 inches bgs; from 14 inches to approximately 10.5 feet bgs fly ash was encountered. Tetra Tech obtained a composite split sample from the 4 to 8-foot zone and 8 to 10.5-foot zone. A duplicate sample was also collected from 4 to 8 feet bgs. In the second boring advanced, fly ash was encountered at 4.5 feet bgs to the boring bottom (12 feet bgs). A fly ash sample was collected from this boring from the 4 to 8-foot bgs zone. Fly ash was encountered in the third boring at 10.75 inches bgs to 12 feet bgs with a sandy clay layer encountered from 12 feet bgs to the bottom of the hole at 15 feet bgs. The final fly ash sample was collected from the third boring at a depth of 8 to 10.75 feet bgs. The five fly ash samples obtained were submitted to an EPA CLP laboratory for TAL metals analysis plus boron. Analytical results from the five fly ash samples are included in Appendix B, Table 1 and are discussed in Section 3.3 below. Soil boring locations where the fly ash samples were collected can be found in Appendix A, Figure 4, Fly Ash Sampling Location Map.

To provide additional analytical data to assist in the determination of the significance of metal levels in the fly ash samples, Tetra Tech collected five background soil samples in September 2009. The soil samples were collected in areas outside the influence of the site and represent background levels of metals in soils in the vicinity of the site. The five background samples were submitted to an EPA CLP laboratory for TAL metals and boron analyses. The background soil sampling locations are shown in Appendix A, Figure 5, Soil and Surface Water Sampling Location Map.

3.3 ANALYTICAL RESULTS

The analytical results for the fly ash samples collected by Tetra Tech in 2009 are presented in Appendix B, Table 1. The analytical results for the fly ash samples collected by Kimley-Horn in 2008 are provided in Reference 18, Tables 5A and 5B. The analytical results for the background subsurface soil samples collected by Kimley-Horn are presented in Reference 18, Table 4B, and the background surface soil samples collected by Tetra Tech are provided in Appendix B, Table 2, of this report.

In accordance with the SI guidance, representative background levels of metals were established for comparison to the fly ash samples to determine which compounds are present at the source at levels three times the level detected in the background sample; or if the compound is not detected in the background sample, detected above the laboratory detection limit (Ref. 3 p. 59). Table 1 summarizes the highest concentrations of metals detected in fly ash samples, and the range of metal concentrations detected in background surface and subsurface soil collected during the various investigations conducted at the site. Fly ash samples were collected by Kimley-Horn in 2008 and by Tetra Tech in 2009.

Although the SI guidance indicates that maximum background levels should be used for comparison to source samples, Tetra Tech used the average metal levels in background samples to provide a more conservative comparison. Tetra Tech averaged the results from the five background surface soil samples collected in September 2009 (Appendix B, Table 2) and the surface and subsurface soil samples collected from the site by URS in 2001 prior to placement of the fly ash (Ref. 39, Table 4). Tables 1 and 2 below provide a summary of the analytical results for the fly ash and background soil samples. As shown in Table 2, concentrations of arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, mercury, nickel, selenium and vanadium detected in fly ash samples were at least three times above the average metals concentrations detected in background soil samples.

TABLE 1
FLY ASH SAMPLE
METALS CONCENTRATIONS
ANALYTICAL RESULTS SUMMARY

Compound	Maximum Concentration Fly Ash 2009[1] (mg/kg)	Maximum Concentration Fly Ash 2008[2] (mg/kg)
Aluminum	13,300	12,900
Antimony	ND	1.06
Arsenic	81.0	54.9
Barium	684	478
Beryllium	4.1	3.19
Boron	40.2	55.7
Cadmium	1.2	ND
Chromium	29.4	21.2
Cobalt	17.2	10.3
Copper	48.2	36.7
Iron	8,690	10,500
Lead	23.4	15.3
Magnesium	1,640	1,680
Manganese	89.4	80.9
Mercury	0.32	0.34
Nickel	25.1	20.7
Selenium	13.2	9.49
Silver	ND	ND
Thallium	ND	ND
Vanadium	69.5	61.9
Zinc	35.2	29.6

Notes: 1 = Analytical results reported from fly ash samples collected in August 2009 (Appendix B, Table 1)
2 = Analytical results reported from fly ash samples collected in April 2008 (Ref. 18, Table 5B)
mg/kg = milligrams per kilogram
ND = Not detected above the laboratory detection limit or contract-required quantitation limit

TABLE 2
FLY ASH AND BACKGROUND SOIL SAMPLE
METALS CONCENTRATIONS
ANALYTICAL RESULTS SUMMARY

Compound	Maximum Concentration Fly Ash (mg/kg)	Highest Background Soil Sample Concentration (mg/kg)	Average Background Soil Sample Concentration (mg/kg)	Range in Background Surface Soil Samples 2009[1] (mg/kg)	Range in Background Subsurface Soil Samples 2001[2] (mg/kg)
Aluminum	13,300	10,400	4,608	5,130 – 10,400	287 – 6,860
Antimony	1.06	13.1	2.62	ND – 13.1	NA
Arsenic	**81.0**	7.6	2.48	1.2 J – 7.6	ND – 1.9
Barium	**684**	44.2	38.35	29.3 – 44.2	ND – 41.7
Beryllium	**4.1**	0.33 J	0.11	0.21J – 0.33 J	ND – 0.54
Boron	**55.7**	ND	ND	ND	ND
Cadmium	**1.2**	1.1	0.19	0.81 – 1.1	ND
Chromium	**29.4**	13.9	6.9	6.8 – 13.9	1.3 – 7.9
Cobalt	**17.2**	ND	ND	ND	NA
Copper	**48.2**	8.8	3.25	2.9 J – 8.8	ND
Iron	**10,500**	9,580	3,117	2,910 – 9,580	1,250 – 2,800
Lead	23.4	43.1	13.36	7.7 – 43.1	0.48 – 5.1
Magnesium	**1,680**	458 J	154.6	266J – 458 J	ND
Manganese	**89.4**	53.3	23.99	14.2 – 53.3	11.2 – 27.1
Mercury	**0.34**	0.094 J	0.047	0.058J –0.094J	ND
Nickel	**25.1**	4.2 J	1.57	1.8 J – 4.2 J	ND
Selenium	**13.2**	6.0	0.066	ND – 6.0	ND – 0.64
Silver	ND	ND	ND	ND	ND
Thallium	ND	12.2	1.2	7.6 – 12.2	ND
Vanadium	**69.5**	11.9	5.53	7.6 – 11.9	ND – 8.5
Zinc	35.2	39.2	13.43	7.5 – 39.2	2.9 – 16.6

Notes: Shaded cell indicates concentration is at least three times the average background concentration with consideration of laboratory data qualifiers
[1] = Based on analytical results reported from soil samples collected in Sept. 2009 (Appendix B, Table 2)
[2] = Based on analytical results reported from subsurface soil samples collected in 2001(Ref. 39, Table 4)
mg/kg = milligrams per kilogram
Conc. = concentration
J = Analyte present. Concentration reported may not be precise or accurate
L = Analyte present. Concentration reported is biased low. Actual concentration is expected to be higher.
NA = Compound not analyzed for
ND = Not detected above the laboratory detection limit or contract-required quantitation limit

In April 2008, Kimley-Horn collected fly ash samples and submitted them to a laboratory for TCLP analysis (Ref. 18, Table 5A). URS completed TCLP analysis of fly ash samples collected in August and October 2001, as part of the ash stabilization study (Ref. 40, Table 2.4). The samples analyzed by TCLP in 2001 were of fly ash with no added cement kiln dust collected from Dominion's Chesapeake Energy Center, the same source of fly ash that was eventually placed on the site. Table 3 presents a summary of the 2001 and 2008 TCLP analytical results for fly ash samples and the corresponding regulatory limits provided in the RCRA regulations (40 Code of Federal Regulations [CFR], Part 261.24) (Ref. 34). The TCLP analysis is designed to determine the mobility of compounds present in waste. A waste is considered hazardous due to toxicity if it exhibits results exceeding the regulatory limits provided in Table 1 of RCRA Part 261.24. There were no compounds reported in the fly ash results analyzed by TCLP above RCRA regulatory levels; therefore, the fly ash would not be characterized as a RCRA hazardous waste based on toxicity (Ref. 34).

TABLE 3
FLY ASH TCLP ANALYTICAL RESULTS

Compound	Maximum Reported TCLP Result in Fly Ash Sample 2001[1] (mg/L)	Maximum Reported TCLP Result in Fly Ash Sample 2008[2] (mg/L)	Regulatory Level[3] (mg/L)
Arsenic	0.400	0.667	5.0
Barium	1.2	0.918	100.0
Cadmium	ND	0.0015	1.0
Chromium	0.15	0.0316	5.0
Lead	0.040	0.0209	5.0
Mercury	ND	ND	0.2
Silver	ND	ND	5.0

Notes: 1 = Results reported from fly ash samples collected from Chesapeake Energy Center in 2001
2 = Results reported from fly ash samples collected from site in April 2008
3 = Table 1 - Maximum Concentration of Contaminants For The Toxicity Characteristic, 40 CFR, Section 261.24 (Ref. 34)
Compounds not listed have no corresponding regulatory level established in 40 CFR Section 261.24 (Ref. 34)
mg/L = milligrams per liter
ND = Not detected
TCLP = Toxicity characteristic leaching procedure

In 2001, an ash stabilization study was performed using both fly ash amended with different types of kiln dust and unamended fly ash (Ref. 40). The purpose of this study was to evaluate the leachability of metals from the fly ash and predict the maximum concentration of ash-related constituents in groundwater at the property boundary (Ref. 40, Section 1.1). Soil-water partition

coefficients (Kd) were determined for the seven compounds of potential concern identified in the fly ash which may pose a threat to human health. The Kd value is used to predict how likely a chemical is to travel into groundwater. The Kd values calculated in the URS study were based on site-specific data and therefore the results are considered more accurate and reliable than Kd values based on generic data. Of the seven compounds of potential concern identified (arsenic, beryllium, chromium, lead, selenium, thallium, and vanadium) in the fly ash, arsenic and selenium were determined to be the two most mobile compounds found in both the amended and unamended fly ash (Ref. 40, Section 4.1).

3.4 SOURCE CONCLUSIONS

As shown in Table 2, metals such as arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, mercury, nickel, selenium and vanadium were detected (above the laboratory detection limit) in fly ash samples at concentrations at least three times above the average background soil concentrations. Of these compounds, based on the TCLP results and a review of the site-specific Kd values, arsenic and selenium are the most mobile of the compounds of potential concern identified in the fly ash. See Reference 40 and Section 4.6.3, Integrated Pathway Model Results for a discussion of the ash stabilization study.

4.0 GROUNDWATER MIGRATION PATHWAY

This section describes the regional and site-specific geologic and hydrogeologic settings, monitoring well details, targets associated with the groundwater migration pathway, sampling locations and analytical results, and conclusions that can be made for the groundwater migration pathway.

4.1 GEOLOGIC SETTING

The Battlefield Golf Club site is located within the Coastal Plain Physiographic Province of Virginia. The Coastal Plain is comprised of a seaward-thickening wedge of regionally extensive, eastward-dipping strata of largely unconsolidated Coastal Plain sediments of Cretaceous and younger age. The sediments unconformably overlie the basement bedrock of the Piedmont Formation. The surface of the Piedmont Formation slopes southeastwardly beneath a progressively thicker cover of Coastal Plain sediments. The Coastal Plain sediment wedge extends from Cape Cod, Massachusetts, southward to the Gulf of Mexico and offshore to the Continental Shelf. The thickness of the sediment wedge in Virginia ranges from 0 feet at its western margin along the Fall Line, to more than 6,000 feet along the Atlantic coast. The Fall Line is the separation between the Coastal Plain and the Piedmont Physiographic Province (Ref. 27, p. 4; Ref. 28, p. 9).

The sediments were deposited by seaward progradation of fluvial plains and deltas along the North American continental margin, followed by a series of transgressions and regressions by the Atlantic Ocean in response to changes in sea level. A thick sequence of nonmarine clays, sands, and gravel of primarily Cretaceous age is overlain by a much thinner sequence of marine strata of Tertiary age, which is in turn overlain by a veneer of nearly flat-lying terrace and flood-plain deposits primarily of Quaternary age (Ref. 27, pp. 4, 7; Ref. 29, p. C7). The geologic formations and their correlation to aquifers in Virginia are depicted in Ref. 27, Figures 2 and 3. These figures represent a compilation of the most recent geologic and hydrogeologic studies in Virginia.

4.2 HYDROGEOLOGIC SETTING

Hydrogeologic information regarding the aquifers underlying the site was obtained from the Water Supply Feasibility Study (FS) conducted in 2009 by URS (Ref. 30). The information in the FS study was verified by U.S. Geological Survey (USGS) hydrogeologic reports. URS's FS is the most comprehensive and recent report describing the hydrogeology underlying the site and surrounding area. The aquifer nomenclature identified in the 2006 USGS publication, "The Virginia Coastal Plain Hydrogeologic Framework," was used to identify the aquifers underlying

the site. Earlier USGS publications identify the aquifers by different names. Figure 3 of Reference 27 correlates former names of the aquifers with the current nomenclature (Ref. 27, pp. 6, 7).

The hydrogeologic units or aquifers underlying the site include a complex network of Coastal Plain aquifers separated by clay and silt-confining units of various thicknesses and permeabilities. The various geologic formations and correlated hydrogeologic units (aquifers) are identified in Figures 2 and 3 of Reference 27. A description of each aquifer is provided in the following paragraphs in stratigraphic order, from oldest to youngest.

The Potomac aquifer is the deepest aquifer in the area and directly overlies bedrock. In the area of the site, the Potomac aquifer is a single aquifer (Ref. 27, p. 29; Ref. 30, p. 9). It is comprised predominantly of coarse-grained quartz and feldspar sands and gravels with interbedded clays. The top of the Potomac aquifer is encountered at a depth of approximately 1,065 feet bgs, and extends to depths greater than 3,000 feet bgs. Because of its large lateral extent and coarse-grained sediments, this aquifer is one of the most predominantly used aquifers in the Virginia Coastal Plain. The aquifer provides large quantities of groundwater for domestic and public water supplies. In the area of the site, saltwater intrusion compromises the aquifer (Ref. 27, pp. 35, 36; Ref. 30, p. 9-10).

The Potomac Aquifer is overlain by the Potomac confining unit in the western part of the Coastal Plain and the Upper Cenomanian confining unit in the central and eastern Coastal Plain. The Potomac and Upper Cenomanian confining units form a 200-foot-thick sequence of fine-grained sandy and silty clays (Ref. 27, pp. 37, 38; Ref. 30, p. 10).

The upper Cenomanian and Potomac confining units are stratigraphically overlain by the Virginia Beach aquifer. The aquifer is comprised of well-sorted sands. It extends across most of the city of Virginia Beach and westward across the cities of Chesapeake and Suffolk into the southeastern corner of Southampton County, Virginia. The thickness of the Virginia Beach aquifer ranges up to approximately 70 feet, and it is found at depths as great as several hundred feet. The Virginia Beach aquifer provides public water supplies to some small towns and light commercial and industrial operations. The Virginia Beach aquifer is overlain almost completely by the Virginia Beach confining zone. The Virginia Beach confining zone is of limited extent, is moderately deep, and locally impedes groundwater flow in the Virginia Coastal Plan. The Virginia Beach confining zone extends across most of the city of Virginia Beach and westward across the cities of Chesapeake and Suffolk. Thickness is as much as several tens of feet at depths of several hundred feet (Ref. 27, pp. 37, 40 and 44; Ref. 30, p. 10).

The Virginia Beach confining zone is overlain by the Peedee and Aquia aquifers. The Peedee aquifer is approximately 60 feet thick and is comprised of interbedded fine to coarse sediments. The aquifer is not used as a source of groundwater in Virginia (Ref. 27, p. 47; Ref. 30, p. 10).

The Peedee confining zone overlies the Peedee aquifer and represents a transition to the overlying Aquia aquifer. The Peedee confining zone is several tens of feet thick, has limited extent, and locally impedes groundwater flow (Ref. 27, pp. 49; Ref. 30, p. 10).

The Aquia aquifer overlies the Peedee confining zone and extends from depths of approximately 665 to 690 feet bgs. The Aquia aquifer is a widespread aquifer in the Virginia Coastal Plain, and is comprised of medium to coarse-grained sand. The Aquia aquifer is not a major water supply source and contains brackish water, requiring the need for treatment prior to potable use (Ref. 27 pp. 52, 54; Ref. 30, p. 10).

The Nanjemony-Marlboro confining unit overlies the Aquia aquifer and is approximately 15 feet thick (Ref. 27, pp. 59, 60; Ref. 30, p. 10).

The Piney Point aquifer overlies the Nanjemony-Marlboro confining unit, and extends from depths of approximately 630 to 650 feet bgs. The Piney Point aquifer consists predominantly of fossiliferous marine sands and is laterally extensive. It is a moderately used aquifer that provides water to small towns and can be used for low-density residential development. However, south of the James River, the Piney Point aquifer is not considered to be a productive groundwater source (Ref. 27, pp. 56, 60; Ref. 30, p. 10).

The Calvert confining unit overlies the Piney Point aquifer and is approximately 15 feet thick. In limited areas, the Calvert confining unit overlies the Saint Mary's aquifer. The Calvert confining unit and, where present, Saint Mary's aquifer are overlain by the Saint Mary's confining unit, which is approximately 425 feet thick. Together the Calvert and Saint Mary's confining units comprise an extensive confining zone that separates the underlying Piney Point aquifer from the overlying Yorktown-Eastover aquifer (Ref. 27, pp. 76, 78; Ref. 30, p. 10).

The Yorktown-Eastover aquifer extends from depths of approximately 85 to 185 feet bgs. The aquifer is comprised of interbedded fossiliferous sands. It is laterally extensive across the Virginia Coastal Plain and is heavily used as a groundwater supply source. Water supply wells completed in the Yorktown-Eastover aquifer typically have yields ranging from 10 to 300 gallons per minute (gpm), with and average nearly 90 gpm, and with larger production wells located along the eastern shore of Virginia producing up to 300 gpm. Water quality of the Yorktown-Eastover aquifer is typically good, although salinity is reported to increase with depth, particularly if wells are drilled into the finer-grained and less productive Calvert confining unit

that underlies the aquifer. Iron and manganese may also be present in local areas, and poses taste and staining issues (Ref. 27, pp. 75, 78, 80, 87, 91; Ref. 30, p. 10-11).

The Yorktown confining zone overlies the Yorktown-Eastover aquifer and is approximately 15 feet thick. The amount of silt and clay present in this unit varies laterally and in certain locations where coarser sediments are present, it does not serve as a confining unit between the Yorktown-Eastover aquifer and the Surficial aquifer (Ref. 27, pp. 92, 95; Ref. 30, p. 11).

The Surficial aquifer (formerly referred to as the Columbia aquifer) lies above the Yorktown confining zone. It is an unconfined, water table aquifer that consists of sands interbedded with laterally discontinuous silts and clays. The Surficial aquifer extends to a depth of approximately 70 feet bgs and serves as a water supply source of shallow water, although sustained well yields are typically less than 25 gpm. As a result of its existence as a water table aquifer, it is continuously recharged as fresh water infiltrations from precipitation. In general, the water quality is good, although iron, manganese, and sulfate may pose taste and discoloration issues locally, and because the aquifer is not confined, it may be subject to degradation from pollution (Ref. 27, pp. 97, 98; Ref. 30, p. 11).

A review of 17 residential well logs of wells located within 4 miles of the site indicate that ten of the wells are screened in the Surficial (Columbia) Aquifer between 20 and 53 feet bgs. Five of the residential wells are screened between 70 to 90 feet bgs and two between 122 to 130 feet bgs. These deeper wells are completed in the upper confining unit of the Yorktown Formation (Yorktown aquifer) (Ref. 39, p. 6).

4.3 SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

The most recent site-specific geologic and hydrogeologic investigation conducted in the area of the site was prepared in 2009 by URS for the City of Chesapeake. URS completed a comprehensive water supply FS to evaluate existing conditions and assess viable alternatives capable of delivering potable water to residents located within the study area. URS collected and evaluated existing local hydrogeologic data, water well information, and recent well water quality data to determine suitable water sources, well yield limits, and potential compounds requiring treatment to comply with drinking water standards. Tetra Tech reviewed the data collected as part of 2009 FS; this information is summarized below (Ref. 30).

As part of the FS, URS installed two monitoring wells (MW-1 and MW-2) on the site to gain an understanding of the local stratigraphy and hydrogeologic relationship between the Surficial aquifer and the underlying Yorktown-Eastover aquifer. Based on the lithologic logs from the wells, the Surficial aquifer was found to extend to a depth of 52 feet bgs where lean clays indicative of the Yorktown confining zone were encountered. These clays extended for 10 feet,

below which sands indicative of the Yorktown-Eastover aquifer were encountered. URS also collected two undisturbed tube samples from the Yorktown confining zone for vertical permeability tests. The permeability tests of the samples collected from 55 to 57 feet bgs and 60 to 62 feet bgs indicated hydraulic conductivities of 8.3×10^{-7} centimeters per second (cm/sec) and 1.7×10^{-6} cm/sec, respectively (Ref. 30, p. 11).

URS collected water level measurements from wells MW-1 and MW-2 from December 10, 2008 through January 15, 2009. Well MW-1 was installed into the Yorktown-Eastover aquifer and well MW-2 was installed into the Surficial aquifer. The portion of the Yorktown-Eastover aquifer screened in well MW-1 was comprised of lean clays, clayey sand, and silty sand, and was not a productive water-bearing zone. Consequently, during well development, the well was pumped dry and the water level recovery was very slow, as evidenced by the water levels recorded in well MW-1 that slowly rose over the monitoring period. Based on the water levels measured in these two wells, and the reduced rate of recovery of the water level in well MW-1, the potentiometric surface of groundwater in the Yorktown-Eastover aquifer appears to be approximately 1.5 feet lower than the water level in the Surficial aquifer (Ref. 30, p. 13).

URS calculated a downward vertical gradient of approximately 0.03 feet/feet using the mid-point of the screened intervals of the two monitoring wells (40 feet bgs at MW-2 and 85 feet bgs in MW-1). This gradient indicates that the Yorktown confining zone retards the vertical migration of groundwater from the Surficial aquifer downward into the Yorktown-Eastover aquifer at the location of these wells. These findings were expected, given the low vertical permeability of the lean clays encountered between the Surficial and Yorktown-Eastover aquifers. While at the location of wells MW-1 and MW-2 the Yorktown confining zone appears to act as a confining unit, this unit is typically not extensively mappable as a confining unit, and when present, is usually leaky (Ref. 27, p. p. 92, 94, 95; Ref. 30, p. 12).

A review of lithologic logs obtained from residential wells in the area did not identify the Yorktown confining zone as being present. However, residential well logs are typically made from soil cuttings observed during drilling and may not be an accurate representation of the stratigraphy in the area (Ref. 30, p. 12).

The data gathered during the FS indicate that, where present, the Yorktown confining zone may serve to retard the migration of groundwater from the Surficial aquifer downward into the Yorktown-Eastover aquifer. However, leakage through the Yorktown confining zone occurs, albeit slowly, and if this confining zone is not present or has a higher sand content, groundwater in the Surficial aquifer will migrate into the underlying Yorktown-Eastover aquifer (Ref. 30, p. 12).

Tetra Tech created groundwater potentiometric surface maps using surveyed elevations and depth to water measurements collected from the on-site monitoring wells on July 15, 2009. Monitoring wells MW-1, MW-2, and MW-3 were not included in potentiometric surface calculations because the depth to water measurements was not collected in these wells on July 15, 2009. The potentiometric surface and groundwater flow directions represented in Appendix A, Figure 6, Groundwater Contour Map, Surficial Aquifer, Shallow Wells, were derived from groundwater elevations in shallow wells (total depth less than or equal to 20 feet bgs). The potentiometric surface and groundwater flow directions represented in Appendix A, Figure 7, Groundwater Contour Map, Surficial Aquifer, Deep Wells, were derived from groundwater elevations in intermediate wells (total depth between 35 and 44 feet bgs). Both shallow and intermediate wells are believed to be completed in the Surficial aquifer, and both potentiometric surface maps indicate a groundwater flow direction in the Surificial aquifer towards the southeast. Groundwater flow figures previously prepared by Kimley-Horn (Ref. 18, Figure 2), URS (Ref. 39, pp. 18 and Figure 2) and Tetra Tech (based on groundwater gauging data and an elevation survey of temporary monitoring points completed during the August 2008 assessment) also indicated that groundwater flowed to the southeast (Figure 4 in Reference 9, August 2008 Groundwater Elevation Map).

4.4 MONITORING WELL DETAILS

A total of 22 monitoring wells have been installed on the site. In May 2008, Kimley-Horn (consultants to the City of Chesapeake) installed three monitoring wells on the site (MW-1, MW-2, and MW-3 and two background wells (MW-4 and MW-5D). In December 2008, MATEC (consultants to Dominion Power) installed an additional 19 monitoring wells around the perimeter of the site. Eight of these monitoring wells (MW-5 through MW-12) were installed as clustered pairs, one screened at a shallower depth and one screened at a deeper depth. Monitoring wells designated with an "A" suffix (e.g. MW-5A) denote the shallow wells; monitoring wells designated with a "B" suffix (e.g. MW-5B) denote the deeper wells. The available details for MW-1, MW-2, MW-3, MW-4, and MW-5D are found in Reference 18, Tables 2A and 6, and the construction specifications for the MACTEC-installed wells are included as Reference 31. Figure 8 in Appendix A presents the monitoring well locations.

4.5 GROUNDWATER TARGETS

In accordance with the SI guidance, Tetra Tech evaluated drinking water supply wells within a 4-mile radius of the site. Within this 4-mile radius, six target distance limit categories were defined to identify drinking water wells located closest to the source. The categories include concentric rings with radii ¼, ½, 1, 2, 3, and 4 miles from the source. The aquifer from which the drinking water wells obtain their water supplies was also identified. Individual aquifers and

their associated wells are evaluated separately unless there is evidence that the aquifers are interconnected. If the aquifers are interconnected, the aquifers are evaluated as one aquifer.

The aquifers underlying the source at the site from which potable drinking water is withdrawn are the Surficial (Columbia) and Yorktown aquifers. These two aquifers are considered one aquifer, Surificial-Yorktown aquifer, because the aquifers are interconnected, as documented in Sections 4.2 and 4.3. The targets discussed in this section include targets obtaining drinking water from this aquifer.

Residents living within the 4-mile radius of the source obtain drinking water from both public and private sources. Figure 9 in Appendix A provides the 4-mile radius map for the site and includes the locations of the public supply wells and the area currently relying on private domestic wells (Ref. 19; Ref. 25). There are three public water supply wells located within the 4-mile distance category from the site. The nearest public supply well is located within the 2 to 3-mile distance category and supplies approximately 50 people at NALF Fentress. The second and third public supply wells are located within the 3 to 4-mile distance category and supply 25 and 50 people (Ref. 19).

The population residing adjacent to the site to the north, south, and east currently rely on private residential wells for their drinking water (Ref. 25). In September 2008, the City of Chesapeake passed a resolution requesting the planning commission to extend the public utility franchise area to include properties fronting Whittamore Road, Centerville Turnpike, and Murray Drive, so that public water could be provided to residents in the area surrounding the site to avoid potential health risks. On September 23, 2008, the City of Chesapeake chose an engineering firm and the process of providing public water to the area is proceeding forward. The City of Chesapeake anticipates that the project will be completed and the area surrounding the Battlefield Golf Course will have public water by January 2011 (Ref. 20; Ref. 21; Ref. 22; Ref. 35).

The populations located within each distance category that currently rely on wells for their potable supply are summarized below in Table 4. Figure 9 in Appendix A provides the 4-mile target distance limit map for the site showing the location of the public supply wells and the area currently relying on private domestic wells (Ref. 19; Ref. 25).

TABLE 4
DRINKING WATER WELLS WITHIN 4 MILES OF SITE
SURFICIAL-YORKTOWN AQUIFER

Radial Distance from Site (miles)	Number of Residential Wells	Population Served by Residential Wells*	Number of Public Supply Wells	Population Served by Public Supply Wells	Total Population Served by Groundwater Sources
0.00 to 0.25	52	145	0	0	145
0.25 to 0.50	14	39	0	0	39
0.50 to 1.0	22	61	0	0	61
1.0 to 2.0	20	56	0	0	56
2.0 to 3.0	21	59	1	50	109
3.0 to 4.0	115	321	2	75	396
TOTAL	**244**	**681**	**3**	**125**	**806**

Notes: * = Based on average population per household for Chesapeake County, Virginia of 2.79 persons

4.6 SAMPLING LOCATIONS AND ANALYTICAL RESULTS

This section describes the groundwater sampling locations and analytical results obtained from samples collected from on and off-site monitoring wells and nearby residential wells.

4.6.1 MONITORING WELL SAMPLE RESULTS

The on-site monitoring wells have been sampled on numerous occasions in 2008 and 2009. In May, July, and August 2008, Kimley-Horn (consultants for the City of Chesapeake) collected groundwater samples from the three on-site monitoring wells (MW-1, MW-2, and MW-3) that existed at that time. Groundwater samples were also collected from off-site monitoring wells MW-4 and MW-5D, and one groundwater sample was collected off-site at the fire service facility located at the NALF Fentress. All of the samples were analyzed for most TAL metals, boron, and molybdenum (Ref. 18, Tables 2A and 2B).

In August 2008, as part of the EPA removal assessment completed by Tetra Tech, 13 temporary groundwater monitoring points were installed around the perimeter of the site. Tetra Tech collected groundwater samples from each of the 13 monitoring points as well as the three monitoring wells that existed on the site at that time (MW-1, MW-2, and MW-3). The groundwater samples were submitted under EPA's CLP for total and dissolved metals analyses (Ref. 9).

On April 30, 2009, Tetra Tech returned to the site and collected a total of 13 groundwater samples (including one duplicate sample) from 12 of the 16 monitoring wells that currently exist on site. The monitoring wells that were sampled are identified as MW-7A, MW-7B, MW-8A,

MW-8B, MW-9A, MW-9B, MW-10A, MW-10B MW-11A, MW-11B, MW-12A, and MW-12B The groundwater samples were submitted under EPA's CLP for total metals analysis (Ref. 38).

Finally, on September 9 through 11, and September 14, 2009, Tetra Tech collected split samples of groundwater obtained by the City of Chesapeake's contractor CDM from the 22 on-site monitoring wells. Samples collected during the April and September 2009 sampling events were analyzed by an EPA CLP laboratory for total metals analysis (Ref. 32).

To determine the significance of metals detected in groundwater collected from on-site shallow monitoring wells (MW-1, MW-2, MW-3, MW-13, MW-14, MW-15, and wells designated with an "A" suffix [e.g. MW-5A]) screened from 4 to 22 feet bgs, the levels were compared to the concentrations reported in the shallow off-site background monitoring well MW-4, screened at 5 to 25 feet bgs. MW-4 is being used during this assessment to represent background groundwater conditions because it is located hydrologically upgradient to the area where fly ash was placed and the Total Suspended Solids (TSS) measured in the sample collected from this well was 14 mg/L, indicating that the sample did not contain an excessive amount of suspended solids (Ref. 18, Table 3B).

A review of the water quality parameters reported for the on-site monitoring well samples collected by Kimley-Horn in 2008 reveal elevated TSS measurements (above 1,000 mg/L) for many of the samples collected (Ref. 18, Table 3A). This amount of TSS indicates that the samples contained excessive amounts of suspended solids. The metals laboratory analytical results for groundwater samples containing high amounts of suspended solids are biased high because in addition to the dissolved metals concentration in the groundwater, the analytical results will also include the amount of metal bound on the suspended solids located in the sample. Groundwater samples that contain significant amounts of suspended solids are not comparable to background samples that do not because it cannot be determined what concentration is present in the groundwater and what is the concentration due to the suspended solids present in the groundwater (Ref. 3, p. 61). Excessive amounts of suspended solids present in samples may be due to inadequate or improper purging of the well prior to sampling or improper well installation. EPA did not oversee or observe the Kimley-Horn 2008 sampling event; therefore, it cannot be determined what caused some of the MW-1, MW-2 and MW-3 samples to contain high amounts of suspended solids.

Due to the reasons outlined above the analytical results reported from wells with TSS reported above 1,000 mg/L (MW-1, MW-2, and MW-3 sampled in May 2008 and MW-3 sampled in July and one of the samples collected in August 2008) during the 2008 sampling events may be biased high due to excessive amounts of suspended solids and may not accurately reflect the concentrations of metals in these wells. As further evidence of the relationship between

suspended solids and metals concentration, one of the samples collected from MW-3 collected on August 25, 2008 contained 560 mg/L of TSS and arsenic was not detected above the laboratory detection limit. The sample from MW-3 collected in May 2008 that contained 2,600 mg/L of TSS contained 103 µg/L of arsenic. Tetra Tech resampled MW-1, MW-2 and MW-3 in August 2008 and collected split samples from these wells in September 2009. Standard operating procedures were followed during these sampling events that produced samples with low turbidity (low suspended solids), as documented by the Nephelometric Turbidity Units (NTU) readings recorded prior to sample collection. As shown in Table 5, the resulting analytical data obtained from samples containing acceptable levels of suspended solids were significantly lower than the May 20, 2008 sample that contained high TSS.

TABLE 5
MW-3 TOTAL METALS ANALYTICAL DATA

Compound	Concentration Reported 5/20/08[1] (µg/L)	Concentrations Reported Other Sampling Events (µg/L)		
		8/25/08[1]	8/29/08[2]	9/10/09[2]
Arsenic	103	ND	3.0	ND
Copper	44.8	ND	ND	1.7 J
Iron	229,000	26,000	6,970	6,800
Lead	106	7.0	ND	ND
Vanadium	384	39	ND	ND

Notes: [1] = Ref. 18, Table 2B
[2] = Appendix B, Tables 3 and 4
µg/L = micrograms per liter
J = Analyte present. Reported value may not be accurate or precise
ND = Not detected above the laboratory detection limit

For the reasons outlined above analytical results from samples with TSS results above 1,000 mg/L (MW-1, MW-2, and MW-3 sampled in May 2008 and MW-3 sampled in July and one of the samples collected in August 2008) were not considered comparable to the samples in Table 6 and therefore they are not included.

Table 6 below summarizes the 2008 and 2009 data for the shallow on-site monitoring wells and background groundwater concentrations. As presented in Table 6, concentrations of arsenic, boron, chromium, copper, lead, and vanadium were elevated above background levels in shallow monitoring wells located on the site. Tables 3 and 4 in Appendix B of this report present all of the analytical data for the groundwater samples collected from on and off-site monitoring wells in April and September 2009. Figure 8 in Appendix A presents the monitoring well locations.

TABLE 6
SHALLOW MONITORING WELL
TOTAL METALS ANALYTICAL DATA
COMPARISION TO BACKGROUND

Compound	Maximum Background Concentration 2001[1] (µg/L)	Background Concentration 2008 (MW-4)[2] (µg/L)	On-Site Shallow Monitoring Wells With Levels Above Background[3]		
			Well ID	Date Sampled	Concentration (µg/L)
Aluminum	1,440	5,670 (17,010)*	None	None	None
Antimony	ND	ND	None	None	None
Arsenic	**1.2 (3.6)**	**ND**	**MW-7A**	**4/30/09**	**4.1**
			MW-8A	**4/30/09**	**4.1**
			MW-12A	**4/30/09**	**3.4**
			MW-1	**9/09**	**3.9**
			MW-2	**9/09**	**2.5**
			MW-5A	**9/09**	**1.8**
			MW-6A	**9/09**	**2.4**
			MW-7A	**9/09**	**10.7**
			MW-8A	**9/09**	**1.6**
			MW-11A	**9/09**	**1.5**
			MW-12A	**9/09**	**3.6**
			MW-13	**9/09**	**1.3**
			MW-14	**9/09**	**2.0**
			MW-15	**9/09**	**21.5**
			MW-20	**9/09**	**7.1**
Beryllium	ND	8.10 (24.3)*	None	None	None
Boron	**ND**	**17.5 (52.5)***	**MW-02**	**9/09**	**146 K**
			MW-05A	**9/09**	**72 K**
			MW-15	**9/09**	**144 K**
Cadmium	ND	ND	None	None	None
Chromium	**ND**	**ND**	**MW-8A**	**4/30/09**	**2.0 J**
			MW-15	**9/09**	**2.7**
Cobalt	NA	132 (396)*	None	None	None
Copper	**ND**	**ND**	**MW-2**	**9/09**	**1.7**
			MW-6A	**9/09**	**4.7**
			MW-15	**9/09**	**18.5**
Iron	**12,900**	**53,600 (160,800)***	**None**	**None**	**None**
Lead	**ND**	**ND**	**MW-2**	**9/09**	**1.3**
			MW-6A	**9/09**	**1.1**
			MW-14	**9/09**	**1.6**
Magnesium	17,200	59,400 (178,200)*	None	None	None
Manganese	429	1,190 (3,570)*	None	None	None

TABLE 6
SHALLOW MONITORING WELL
TOTAL METALS ANALYTICAL DATA
COMPARISION TO BACKGROUND (Continued)

Compound	Maximum Background Concentration 2001[1] (µg/L)	Background Concentration 2008 (MW-4)[2] (µg/L)	On-Site Shallow Monitoring Wells With Levels Above Background[3]		
			Well ID	Date Sampled	Concentration (µg/L)
Mercury	ND	ND	None	None	None
Nickel	ND	294 (882)*	None	None	None
Selenium	ND	ND	None	None	None
Vanadium	**ND**	**ND**	**MW-15**	**9/09**	**17.3**
Zinc	ND	485 (1,455)*	None	None	None

Notes: Shaded cell indicates concentration is at least three times the highest background concentration or above the detection limit if the compound is not detected in the background sample
* = Number in parenthesis denotes 3X background level
[1] = Ref. 39, Table 5 and Ref. 40, p. 3-5
[2] = Ref. 18, Table 2B
[3] = Determined by review of analytical data in Ref. 18, Table 2A and Appendix B, Tables 3 and 4. In accordance with the SI guidance (Reference 3) above background is defined as 3 times the maximum background concentration if detected or above the detection limit if not detected in the background samples
µg/L = micrograms per liter
J = Analyte present. Reported value may not be accurate or precise
K = Analyte present. Reported value may be biased high, actual value is expected to be lower
ND = Not detected above the laboratory detection limit
None = No on-site shallow monitoring well samples had metals 3X background levels

Deeper on-site monitoring wells (designated with a "B" suffix [e.g. MW-5B]) are screened from 25 to 44 feet bgs. The levels of compounds reported in the deeper on-site wells were compared to the deeper background well, MW-5D, screened at 55 to 65 bgs, and the URS analytical results from 2001.

Table 7 below summarizes analytical data from samples collected from the deep on-site monitoring wells. None of the groundwater samples collected from the deep on-site monitoring wells contained metals at three times the reported maximum concentration background levels. Tables 3 and 4 in Appendix B of this report present all of the analytical data for the groundwater samples collected from on and off-site monitoring wells in April and September 2009. Figure 8 in Appendix A presents the monitoring well locations.

TABLE 7
DEEP MONITORING WELL TOTAL METALS ANALYTICAL DATA
COMPARISION TO BACKGROUND

Compound	Maximum Background Concentration 2001[1] (µg/L)	Background Concentration 2008 MW-5D[2] (µg/L)	On-Site Deep Monitoring Wells With Levels Above Background Level[3] (µg/L)
Aluminum	1,440	16,100 (48,300)*	None
Antimony	ND	ND	None
Arsenic	1.2	6.0 (18)*	None
Barium	ND	80.7 (242.1)*	None
Beryllium	ND	ND	None
Boron	ND	65.9 (197.7)*	None
Cadmium	ND	ND	None
Chromium	ND	39.5 (118.5)*	None
Cobalt	NA	10.6 (31.8)*	None
Copper	ND	8.40 (25.2)*	None
Iron	10,200	43,400 (130,200)*	None
Lead	ND	19.9 (59.7)*	None
Magnesium	17,200 (51,600)*	7,760	None
Manganese	429	443 (1,329)*	None
Mercury	ND	ND	None
Molybdenum	NA	ND	None
Nickel	ND	25.2 (75.6)*	None
Selenium	ND	ND	None
Vanadium	ND	41.1 (123.3)*	None
Zinc	ND	138 (414)*	None

Notes: * = Number in parenthesis denotes 3X background level
1 = Analytical results provided in Ref. 39, Table 5 and Ref. 40, p. 3-5
[2] = 2008, Kimley-Horn, Ref. 18, Table 2B
[3] = Determined by review of analytical data in Appendix B, Tables 3 and 4
µg/L = micrograms per liter
NA = Not analyzed for
ND = Not detected above the laboratory detection limit
None = No on-site deep monitoring well samples had metals 3X background levels

4.6.2 RESIDENTIAL WELL SAMPLE RESULTS

Groundwater samples from residential wells located in the vicinity of the site have been collected in 2001 prior to placement of the fly ash at the site, and in 2008 during the EPA removal assessment completed by Tetra Tech. A summary of the results of each of these two sampling events is provided below. The addresses associated with the residential well sampling locations are confidential and therefore not included in this report.

4.6.2.1 2001 Residential Well Sampling Summary

CPM contracted Stokes to perform a baseline drinking water quality survey in the vicinity of the site in November 2001 (Ref. 15). The objective of the survey was to document existing groundwater conditions and use in the vicinity of the site. As part of the survey, Stokes collected 40 groundwater samples from nearby private drinking water wells at randomly selected properties located within 2,000 feet of the site. The samples were analyzed for the following inorganic substances: antimony; arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, fluoride, iron, lead, manganese, mercury, nickel, selenium, silver, thallium, and zinc. As shown in Reference 15, Table 4, arsenic was detected in two wells, beryllium was detected in two wells, cadmium was detected in 21 wells, chromium was detected in five wells, copper was detected in ten wells, lead was detected in 20 wells, manganese was detected in 13 wells, mercury was detected in one well, silver was detected in one well, thallium was detected in 11 wells and zinc was detected in eight wells. Antimony, barium, nickel, selenium, or cyanide were not detected in any of the 40 groundwater samples collected. The copper levels detected in two of the samples were above EPA's maximum contaminant level (MCL) of 1,300 ppb and one sample revealed levels of thallium that were above the MCL of 2.0 ppb. No other inorganic substance was detected above EPA's MCL or action levels (Ref. 15, Table 4).

4.6.2.2 2008 EPA Removal Assessment Residential Well Sampling Summary

Tetra Tech and EPA collected groundwater samples from 55 residences located in the vicinity of the site between August 2 and 29, 2008,. The objective of the sampling event was to determine if there was an imminent threat to any residents drinking the water obtained from their potable wells. The samples were analyzed for EPA TAL metals, boron, and molybdenum. To determine if there was an issue with these wells, EPA compared the results to EPA MCLs. Lead was reported above the EPA MCL in groundwater samples collected from four residences (detected at 67.1 ppb, 18.6 ppb, 17.9 ppb, and 18.9 ppb). No other compound was detected above the corresponding EPA MCL (Ref. 9). EPA's removal section has offered to sample the wells with elevated lead on a quarterly basis.

4.6.2.3 Residential Well Results Comparison

The results of the 2001 and 2008 residential well sampling events were reviewed to determine whether there was indication that constituents of fly ash were migrating off site and impacting surrounding residential wells. Analytical results of samples collected of the fly ash indicate concentrations of arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, mercury, nickel, selenium and vanadium in the fly ash samples above the levels that would be expected in background soils.

In accordance with the SI guidance, concentrations of metals detected in residential well samples are considered to be significantly above background if the reported concentration is at or above three times the concentration detected in the background residential wells, or above the laboratory detection limit (CRQL) if not detected in the background sample. Data to determine background levels for this comparison include the 2001 residential well data collected prior to placement of the fly ash or data reported from two wells located on

which is upgradient to the site. Tetra Tech determined the significance of concentrations of metals detected in residential well samples through two different comparisons: (1) comparison of the background residential analytical data collected by Stokes in 2001 (prior to placement of fly ash) to the 2008 residential well analytical data collected during EPA's removal assessment, and (2) comparison of upgradient residential well analytical data to downgradient residential well analytical results collected during EPA's removal assessment completed in 2008. These two comparisons area discussed in detail in the sections that follow.

Comparison of 2001 Analytical Data to 2008 Analytical Data

Tetra Tech re-sampled groundwater at 19 residential locations sampled in 2001 by Stokes, Inc., prior to placement of the fly ash, in 2008,. Tetra Tech completed a comparison of the results collected from these two sampling events to determine whether there was a trend of increasing levels of metals in these wells subsequent to placement of the fly ash. Table 5 in Appendix B of this report compares the analytical results from these two sampling events. Only compounds detected above both the EPA CRQL and the detection level reported by Stokes are considered for comparison. Copper, lead and zinc concentrations were detected in some wells in 2008 above the concentrations reported in 2001; however, in other wells copper, lead and zinc were detected at higher concentrations in 2001 then the concentration reported in 2008. Iron and manganese were the only compounds found in 2008 wells consistently above the levels found in 2001. This increase cannot be attributed to the fly ash because these metals are known to exist in the drinking water aquifer at levels significant enough to impact taste (Ref. 30, p. 11). Additionally, iron and manganese were not elevated above background in on-site monitoring wells, indicating that these compounds are not migrating from the fly ash. Finally, the compounds determined to have the highest potential to migrate from the fly ash and into underlying groundwater (arsenic and selenium) were not detected above the 2001 DL in any of the samples analyzed in 2008. This comparison does not indicate an increase in residential well metal concentrations from 2001 prior to placement of fly ash to 2008, after placement of the fly ash.

Comparison of Upgradient and Downgradient 2008 Analytical Data

Tetra Tech also compared the analytical data from the groundwater samples collected from 55 residences during the 2008 assessment. To determine a suitable background well for this sampling event, Tetra Tech reviewed the five groundwater gradient maps created for the site indicating that groundwater flows to the southeast. Based on this groundwater flow, two wells located at a residence located on are upgradient from the site and can be used to document background levels. A review of the 2008 data indicted that groundwater samples collected from nine of the 55 wells had metals levels three times the levels detected in the background well . These included (magnesium), (zinc), (zinc), (magnesium and boron), (magnesium), (nickel), (cobalt), (nickel and cobalt), and (boron). Table 6 in Appendix B of this report summarizes the residential well data obtained during the 2008 site assessment.

Comparison of Residential Analytical Results to MCLs and Screening Levels

Finally, Tetra Tech compared the 2008 analytical data with EPA MCLs and screening levels for tapwater (Ref. 33). The only compound reported above the corresponding MCL was lead. Lead was detected above the EPA MCL of 15 µg/L in residential wells: , and . Lead was also detected in the background well. In 2009, EPA has subsequently collected several rounds of samples from these and other residential wells. The analytical sampling results have indicated lead levels above the MCL in three residential wells, (b) (6) (b) (6)(b) (6) The source of this elevated concentration of lead is possibly related to the home's plumbing system. Lead is a common contaminant introduced through problems with residential plumbing systems of sediments in the well holding tank. Further evidence that the lead issue detected in these wells is not due to migration from the fly ash is based on a review of the residential well analytical data collected by Stokes in 2001. This data indicated the presence of lead in 20 of the 40 residential well samples collected in 2001 (Ref. 15, Table 4). These samples were collected prior to the placement of the fly ash at the site. The lead concentrations reported in these residential wells in 2001 ranged from 1 to 10 µg/L. Lead has been detected at very low levels above the detection limit of 1.0 µg/L in three monitoring wells surrounding the site (in MW-2 at 1.3 µg/L, MW-6A at 1.1 µg/L, and MW-14 at 1.6 µg/L). None of the other monitoring well samples had lead levels reported above 1.0 µg/L. Lead was not reported above background levels in the fly ash samples analyzed, or above corresponding RCRA regulatory limits in the samples analyzed by TCLP.

The only compound reported above a corresponding EPA screening level for tapwater was arsenic. Arsenic was detected in every well sampled (including the background well) above the

screening level of 0.045 µg/L (Ref. 33). The arsenic levels reported were consistent in all of the wells, ranging from 1.2 µg/L to 2.6 µg/L.

4.6.3 INTEGRATED PATHWAY MODEL RESULTS

Prior to placement of the fly ash on the site, a risk evaluation was completed to determine the predicted impact of fly ash constituents mobilizing into underlying groundwater. An Integrated Pathway Model was used to provide scientifically-defensible estimations for the concentrations of fly ash constituents that could be expected in groundwater at the site property boundary. The Integrated Pathway Model relied on the input of site-specific data to predict the maximum concentration of each compound that would leach from the fly ash through the subsurface soil, enter groundwater and be transported to the site boundary. The first step in the risk evaluation was the selection of compounds of potential concern. The compounds of potential concern were determined based on the leachability of the compound and the ability of the compound to be transported through the soil to groundwater. Leachate data for both unamended and amended fly ash was evaluated to determine those chemicals that had the potential to leach from the fly ash and be present in groundwater above corresponding EPA MCLs or regional screening levels. Leachability tests were conducted on 26 chemicals present in the fly ash. Of these 26 chemicals, seven were determined to be compounds of potential concern: arsenic, beryllium, chromium, lead, selenium, thallium, and vanadium (Ref. 40, Section 4.1).

Based on partition coefficient (Kd) values, arsenic and selenium would be expected to be the first compounds of potential concern to leach from the fly ash and reach the site boundary. The Integrated Groundwater Pathway modeling exercise predicted that the total maximum concentration of arsenic will be detected at the southern site boundary in 455 years and selenium will be detected at the maximum concentration after 365 years. After this time, the concentrations will begin to decrease due to the effects of dilution by the regional groundwater flow (Ref. 40, Section 3.4.5). Due to consistently higher Kd values for the other compounds of potential concern, the predicted results will be equal to or lower than that seen for arsenic or selenium (Ref. 40, Section 3.5). The total maximum predicted concentrations (includes baseline concentration of compound in groundwater) for the seven identified compounds of potential concern were determined for unamended fly ash and fly ash amended with 1%, 3%, and 5% cement kiln dust. The maximum concentrations predicted at the site boundary based on 1% amended fly ash include: arsenic at 10.7 µg/L, selenium at 21.3 µg/L, beryllium at 0.16 µg/L, chromium at 1.4 µg/L, lead (not detected), thallium at 0.93 µg/L, and vanadium (4.3 µg/L) (Ref. 40, Section 4.2 and Table 4.3). A calculation for the maximum concentration of arsenic expected at the site boundary based on the addition of 1.5% cement kiln dust amendment by weight was also determined with the model. The model predicted this concentration to be 9.5

µg/L (Ref. 40, Section 5.2.1, Figure 5.1). Based on the actual average range of cement kiln dust amendment added to the fly ash placed on the site (1.7% to 2.3% by weight on average) this concentration is expected to be the most accurate as it relates to actual site conditions (Ref. 41).

4.7 GROUNDWATER CONCLUSIONS

The source identified at this site is the 1.5 million cubic yards of fly ash placed on the property during the construction of the golf course. Analytical results of fly ash samples collected indicate levels of arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, mercury, nickel, selenium and vanadium in the fly ash samples above the average background soil levels. Of the seven compounds of potential concern with associated health risk assessed in 2001, the most mobile (based on the site-specific determination of the partition coefficient factors) of these compounds are arsenic and selenium.

Groundwater samples have been collected from the monitoring wells located on and surrounding the site. A review of the groundwater analytical data collected from site investigations in 2008 and 2009 (excluding specific samples collected in May 2008 and July 2008 for reasons outlined in Section 4.6.1) indicates levels of arsenic in monitoring well samples three times above background levels in two samples collected in April 2009 and five samples collected in September 2009. The maximum level of arsenic was reported in MW-15 at 21.5 µg/L. Other compounds detected in the shallow monitoring wells three times background include boron in three wells (up to 146 µg/L K [estimated high]), chromium in two wells (up to 2.7 µg/L), copper in three wells (up to 18.5 µg/L), lead in three wells (up to 1.6 µg/L), molybdenum in one well (at 9.6 µg/L), and vanadium in one well (at 17.3 µg/L). No compounds were detected at three times the background levels in any of the deep monitoring wells.

A comparison of the residential well data collected in 2001 (prior to placement of the fly ash at the site) and 2008 does not indicate elevated levels of compounds attributable to the site. The concentrations of iron and manganese reported in 2008 were the only compounds elevated in a majority of the wells sampled. Both of these compounds are documented to exist in the Surficial aquifer in the area of the site at a levels significant enough to stain and potentially impact the taste of drinking water (Ref. 30, p. 11). Additionally, iron and manganese were not elevated above background in on-site monitoring wells, indicating that these compounds are not migrating from the fly ash. Finally, the compounds determined to have the highest potential to migrate from the fly ash and into underlying groundwater (arsenic and selenium) were not detected above the 2001 detection limit in any of the samples analyzed in 2008.

A comparison of the results of the 2008 analytical results reported for the 55 downgradient and two upgradient residential well samples indicated magnesium (in three wells), cobalt (in two

wells), zinc (in two wells), boron (in two wells), and nickel (in two wells) to be elevated above the concentrations detected in the two background samples. The two compounds determined to be the best indicators of metals with potential health effects leaching from the fly ash and impacting groundwater at the site boundary are arsenic and selenium. Arsenic and selenium were not elevated in any downgradient residential well sampled.

5.0 SURFACE WATER MIGRATION PATHWAY

This section describes the site's hydrologic setting, targets associated with the surface water migration pathway, sampling locations and analytical results, and conclusions made for the surface water migration pathway.

5.1 HYDROLOGIC SETTING

Overland flow of surface water off of the property flows either into the on-site ponds or wetlands or enters the stream that flows along the southern boundary of the site. The unnamed stream flows to the southeast and then north, eventually discharging into the Pocaty River, approximately 3 miles from the site. The Pocaty River flows east approximately 7.1 miles until discharging into the North Landing River. Figure 10 in Appendix A shows the surface water migration pathway evaluated for this site.

5.2 SURFACE WATER TARGETS

In accordance with the SI guidance, targets associated with perennial surface waters located within 15-miles downstream of the site are identified. These targets include drinking water intakes, fisheries and sensitive environments. There are no surface water intakes located within 15-miles downstream of the site (Ref. 19). The Pocaty and North Landing Rivers are utilized for recreational purposes, including fishing and boating (Ref. 24). There is no evidence that the perennial stream that flows along the southern boundary of the site is utilized for fishing. The on-site ponds are not used for fishing. Sensitive environments located within 15-miles downstream of the site include approximately 23 miles of wetland frontage and habitat known or likely to be used by the state and federally listed threatened or endangered species summarized in Table 8 below.

TABLE 8
STATE AND FEDERAL ENDANGERED AND THREATENED SPECIES

Species Scientific Name	Species Common Name	Status
Falco peregrinus	Falcon, peregrine	State Threatened
Haliaeetus leucocephalus	Eagle, bald	Federal/State Threatened

5.3 SAMPLING LOCATIONS AND ANALYTICAL RESULTS

In April, May, and July 2008, Kimley –Horn (a consultant to the City of Chesapeake) collected surface water samples from the on-site ponds and one off-site background sample from an unnamed pond located off of Etheridge Manor Boulevard, approximately 1 mile southwest of the

site. The sampling locations are shown in Reference 18, Figure 1. The surface water samples were analyzed for most EPA TAL metals (with the exception of calcium, potassium, and sodium), boron, and molybdenum.

Tetra Tech also collected two surface water samples from the perennial stream located south of the site during the 2008 removal assessment. Tetra Tech returned to the site in September 2009 and collected six additional surface water and four sediment samples from the perennial stream. Two of the surface water and sediment samples were collected to document background levels in locations that would most likely not receive runoff or groundwater discharge from the site in order. During the September 2009 sampling event, Tetra Tech also collected 12 surface water and sediment samples from on-site ponds. To document background conditions for pond samples, Tetra Tech collected a surface water and sediment sample from a pond located off of Laurel Ridge Lane. All surface water and sediment sampling locations sampled by Tetra Tech in September 2009 are presented in Figure 5 in Appendix A of this report.

Aluminum, cobalt, chromium and iron were reported in the surface water samples collected by Kimley-Horn from on-site ponds above EPA's CRQL and three times the levels reported in the background sample collected during the same sampling event. The levels reported were compared to EPA Region 3's Freshwater Screening Benchmarks developed by the Biological Technical Assistance Group (BTAG) (Ref. 23). Aluminum and iron were reported above the corresponding BTAG screening criteria for freshwater.

A summary of the analytical results from the surface water samples collected in August 2008 are provided in Table 7 in Appendix B of this report. No suitable background sample was collected during this sampling event, therefore the background samples collected in September 2009 are used to compare data. No metals were detected in surface water samples above the CRQL and three times the background level during this sampling event.

As shown in Table 8 in Appendix B of this report, aluminum and barium were the only compounds reported above the CRQL and three times the level reported in the background pond surface water sample collected in September 2009. The levels reported were also above the corresponding BTAG screening criteria for freshwater (Ref. 23). As shown in Table 9 in Appendix B of this report, arsenic, iron and manganese were detected in on-site pond sediments collected in September 2009 at three times the levels detected in the background off-site pond sediment sample. The levels reported were not above corresponding EPA Region 3 BTAG sediment screening criteria.

As shown in Tables 10 and 11 in Appendix B of this report, no compound reported in the surface water or sediment samples collected from the stream adjacent to the site were elevated above

three times the levels reported in the background samples. Although not three times background, the levels of aluminum, iron and manganese were above EPA Region 3 BTAG sediment screening criteria. Tetra Tech observed significant amounts of orange discoloration of the sediments in the stream indicative of the presence of iron-fixing bacteria.

5.4 SURFACE WATER CONCLUSIONS

The September 2009 analytical results for surface water samples collected from on-site ponds indicate aluminum and barium concentrations are three times the level detected in the background pond sample. The levels were also above the corresponding BTAG screening criteria for fresh water. Results from sediment samples collected from the on-site ponds indicate the presence of elevated arsenic, iron and manganese concentrations when compared to the background pond sediment sample. The levels of these compounds detected in the sediment pond samples were not above the corresponding BTAG screening criteria. Due to the potential for recreational users of the golf course to contact the pond water and sediments, the levels were also compared to the Agency of Toxic Substances and Disease Registry (ATSDR) drinking water and soil screening values (ATSDR has not developed health-based screening values for surface water or sediments). The levels of metals detected are below ATSDR's screening values for children and adults and therefore exposure to these concentrations would not likely produce adverse health effects. No compounds were reported above background levels in the perennial stream that flows along the southern boundary of the site.

6.0 SOIL EXPOSURE AND AIR MIGRATION PATHWAYS

This section provides information regarding physical conditions and targets associated with the soil exposure and air migration pathways. The analytical results for soil samples collected at the site were discussed in Section 3.3.

6.1 PHYSICAL CONDITIONS

URS advanced seven soil borings on the property prior to the placement of fly ash in 2001,. Soil horizons encountered indicate the presence of silty clay, sandy silt and/or clayey sandy silt to approximately 10 feet followed by fine to medium to medium sand (Ref. 39, Appendix B). Also in 2001, McCallum advanced borings at the site. Soil horizons encountered were described as moist silty sand, moist sandy loam, followed by wet loamy sand, wet sand, and/or moist sandy clay (Ref. 13; Ref. 14). Tetra Tech recorded similar soil horizons during the advancement of soil borings around the perimeter of the site in August 2008 (Ref. 9, Appendix B). The VADEQ closure requirement regulating use of fly ash at the site specifies a minimum of 18 inches of cover material; however, during Tetra Tech's site investigation in 2008, fly ash was observed at approximately 4 inches bgs at the top of higher elevated areas on site. The site owner was notified and covered the areas with soil. Fly ash was encountered at 10.75 inches, 14 inches, and 4.5 feet bgs in the borings installed by CDM in August 2009.

6.2 SOIL AND AIR TARGETS

The site is currently used as an active golf course with no access restrictions. The population residing within a 4-mile radius of the site is summarized below in Table 9 (Ref. 26). In addition to the human population, other targets identified to the soil and air migration pathways within a 4-mile radius of the site include approximately 8,950 acres of wetlands, as shown in Table 10 below (Ref. 3).

TABLE 9
POPULATION WITHIN 4 MILES OF SITE

Radial Distance from Site (miles)	Population (number of persons)
0.00 - 0.25	92
0.25 - 0.50	122
0.50 - 1.0	623
1.0 - 2.0	11,499
2.0 - 3.0	6,174
3.0 - 4.0	9,929

TABLE 10
WETLAND ACREAGE WITHIN 4 MILES OF SITE

Radial Distance from Site (miles)	Wetlands (acreage)
0.00 - 0.25	0
0.25 - 0.50	49.98
0.50 - 1.0	105.71
1.0 - 2.0	989.88
2.0 - 3.0	3,319.27
3.0 - 4.0	4,485.04

7.0 SUMMARY

The Battlefield Golf Club is a 216-acre site located at 1001 South Centerville Turnpike in Chesapeake, Virginia, that was developed as a golf course. The site is surrounded by residential and agricultural properties. Residential homes are located adjacent to the site to the south, west, east, and southeast. The Naval Auxiliary Landing Field (NALF) Fentress (Fentress) is located directly east of the site property.

Combustion Products Management Virginia LLC (CPM) used 1.5 million cubic yards of amended fly ash covered with 18 inches of soil to alter the surface topography during construction of the golf course. Fly ash is a by-product of the combustion of coal used to generate electricity. The fly ash was amended with 1.7% to 2.3% cement kiln dust to reduce the potential for fly ash constituents to leach and migrate to groundwater underlying the site and adjacent residential wells.

As part of this SI, EPA's contractor Tetra Tech reviewed analytical data from fly ash, soil, surface water, sediment, and groundwater sampling events completed in 2001, 2008 and 2009. Also reviewed was existing information including a fly ash stabilization study completed in 2001. The fly ash stabilization study was completed to evaluate the potential for metals contained in the fly ash to leach and migrate into underlying groundwater. The study identified arsenic and selenium to be the two most mobile compounds detected in both the amended and unamended fly ash that may pose a potential threat to human health.

Tetra Tech compared the concentrations of metals in fly ash samples to the metal concentrations detected in background soil samples to determine if the fly ash contained metals above the level that would be expected in soils located in areas that do not contain fly ash. The fly ash sample results indicate that several metals such as arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, magnesium, manganese, mercury, nickel, selenium and vanadium were detected in fly ash above the average background soil concentrations.

To determine whether compounds in the fly ash have affected groundwater in the vicinity of the site, Tetra Tech collected groundwater samples from on-site monitoring wells and off-site residential wells in August 2008, April 2009, and September 2009. Groundwater samples were analyzed for metals, including boron. The sampling results indicated that the highest detections of metals occurred in monitoring wells located on the golf course property. The concentrations of arsenic, boron, chromium, copper, lead and vanadium detected in groundwater collected from on-site monitoring wells were considered to be significantly above background concentrations and are considered a "release" as defined in EPA's "*Guidance for Performing Site Inspections Under CERCLA*".

Of the on-site groundwater monitoring wells where metals significantly exceeded background in 2009, only two wells had metals above the Safe Drinking Water Act (SDWA) Maximum Contaminant Level (MCL). Arsenic was detected in MW-15 at 21.5 µg/L, which is above the MCL for arsenic of 10 µg/L. Arsenic was also detected in MW-7A at 10.7µg/L; however, the duplicate sample collected from MW-7A during this sampling event only contained 7.1 µg/L. MW-7A is located on the western portion of the golf course adjacent to commercial areas and one property serviced by public water. The EPA removal program sampled residential wells in this area in 2008 and arsenic levels in the residential wells along Centerville Turnpike were all well below EPA drinking water standards. MW-15 is located in the southwestern portion of the property. The monitoring well located between MW-15 and the nearest residential well, MW-8, did not contain elevated concentrations of arsenic.

Metal concentrations were not significantly above background, MCLs or action levels in the deeper groundwater monitoring wells, so based on the data it does not appear the metals are migrating vertically at this time.

The residential well data reviewed as part of this SI indicates that metals are not migrating from the fly ash to residential wells. Arsenic, boron, chromium, copper and vanadium were detected above background concentrations in the fly ash samples and were also detected above background levels in on-site shallow monitoring wells. Of these compounds only boron was elevated above background levels in two of the 55 residential wells sampled. The highest level of boron reported in a residential well was 596 µg/L which was significantly below the health-based regional screening level for boron in tap water of 7,300 µg/L.

Metal contaminants were below MCLs and Safe Drinking Water Act (SDWA) action levels in all residential wells that EPA tested, except for lead. Lead has been detected during EPA sampling events above the action level of 15 µg/L in six residential wells. EPA has offered to test the water of the residences with elevated lead on a quarterly basis.

The lead in these wells, however, does not appear to come from the fly ash. Lead concentrations are lower in groundwater collected from monitoring wells on the golf course (1.1 to 1.6 µg/L) than in these residential wells. Lead concentrations in the fly ash are not higher than background concentrations of lead in soil. Therefore, the lead in these residential wells appears to come from a source other than the fly ash.

The September 2009 analytical results for surface water samples collected from on-site ponds indicate aluminum and barium concentrations were significantly above the level detected in the background pond sample. The levels reported were also above the corresponding EPA Biological Technical Assistance Group (BTAG) screening criteria for fresh water. EPA BTAG

screening levels are used to evaluate sediment and surface water to determine the potential for contaminants to pose a risk to aquatic organisms. The sediment pond samples indicate elevated arsenic, iron and manganese levels when compared to the background pond sediment sample. The levels of these compounds detected in the sediment pond samples were not above the corresponding BTAG screening criteria and it is not expected that metals in the sediments pose a risk to aquatic organisms inhabiting ponds and streams located on or near the golf course.

Due to the potential for recreational users of the golf course to contact the pond water and pond sediments, the levels were also compared to ATSDR drinking water and soil screening values as ATSDR has not developed health-based screening values for surface water or sediments. The levels of metals detected are below ATSDR's screening values for children and adults and therefore exposure to these concentrations would not be expected to produce adverse health effects in children or adults coming in contact with surface water or sediments from the golf course ponds. No compounds were reported above background levels in the perennial stream that flows along the southern boundary of the site.

In conclusion, while some groundwater wells, sediments, and surface water located on the golf course property are considered to show a release as the levels of some metals were detected above background, there is no significant threat to public health or the environment from site-related contaminants at this time for the following reasons:

- Metal contaminants were below MCLs and Safe Drinking Water Act (SDWA) action levels in all residential wells that EPA tested, except for lead. Lead has been detected during EPA sampling events above the action level of 15 µg/L in six residential wells, but the lead does not appear to be from the fly ash. EPA has offered to test the water of the residences with elevated lead on a quarterly basis.
- The residential well data reviewed as part of this SI indicates that metals are not migrating from the fly ash to residential wells.
- There are no adverse health effects expected from human exposure to surface water or sediments on the Battlefield Golf Course site as the metal concentrations were below the ATSDR standards for drinking water and soil. Additionally, the sediments samples in the ponds were below EPA BTAG screening levels and are not expected to pose a threat to ecological receptors.

8.0 REFERENCES

1. U.S. Environmental Protection Agency. (EPA). Superfund Site Information. Battlefield Golf Club. EPA ID. VAN000306614.

2. EPA. Guidance for Performing Preliminary Assessments Under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Hazardous Site Evaluation Division. Office of Solid Waste and Emergency Response. Washington, D.C. September 1991.

3. EPA. Guidance for Performing Site Inspection Under CERCLA. Hazardous Site Evaluation Division. Office of Solid Waste and Emergency Response. Washington, D.C. September 1992.

4. U.S. Geological Survey (USGS). 7.5-Minute Series Topographic Map for the Fentress, Virginia, Quadrangle. 1954. Photorevised 1986.

5. GlobalSecurity.org. Naval Auxilliary Landing Field (NALF) Fentress summary. On-Line Address: www.globalsecurity.org/military/facility/fentress.htm.

6. Combustion Products Management, Inc. Submission Information Regulations Governing Management of Coal Combustion By-Products 9 VAC 20-85. March 7, 2002.

7. Battlefield Golf Club at Centerville Summary. On-Line Address: www.playthebattlefield.com/.

8. Wikipedia. Links (Golf). On-Line Address: http://en.wikipedia.org/wiki/links_(golf).

9. Tetra Tech EM Inc. (Tetra Tech). Final Trip Report for Battlefield Golf Fly Ash Assessment. Technical Direction Document (TDD) No. E33-020-08-007-027. December 11, 2008.

10. Commonwealth of Virginia Department of Environmental Quality (VADEQ). Correspondence. To Mike Waugh, Professional Golf Association (PGA) Golf Professional. From: Milton L. Johnston, Regional Waste Programs Manager. Regarding Change of Ownership and Final Cover Modification. April 2, 2007.

11. First Amendment to Purchase Agreement between Weaver Fertilizer Company, Inc. (Seller) and Combustion Products Management, Inc. (CPM) (Purchaser). January 31, 2002.

12. Stokes Environmental Associates, Ltd. (Stokes). Phase I Environmental Site Assessment Conducted at Etheridge Green. August 23, 2001.

13. McCallum Testing Laboratories, Inc. Subsurface Exploration Proposed Etheridge Greens Golf Course. February 9, 2001.

14. McCallum Testing Laboratories, Inc. Subsurface Exploration Proposed Etheridge Greens Golf Course. April 5, 2001.

15. Stokes. Baseline Drinking Water Quality Survey Conducted at Etheridge Greens Site. February 27, 2002.

16. Blake Engineering Services of Tidewater (BEST), PLLC. Correspondence. To Milt Johnston, Waste Compliance Manager, Department of Environmental Quality. From John W. Blake, II, P.E., BEST. August 13, 2007.

17. VADEQ. Correspondence. To Mike Waugh, Etheridge Greens Golf Course. From Milton Johnston, Waste Programs Manager. October 4, 2007.

18. Kimley-Horn and Associates, Inc. Analytical Summary Data Sheets and Figures. 2008.

19. EPA. Safe Drinking Water Information System (SDWIS). Region 3 Water Protection Division. 2006.

20. City of Chesapeake, Virginia. Memorandum. To William E. Harrell, City Manager. From James Walski, Director of Public Utilities. September 12, 2008.

21. City of Chesapeake, Virginia. Correspondence To Dolores A. Moore, City Clerk. From Ronald S. Hallman, City Attorney. September 5, 2008.

22. City of Chesapeake, Virginia. Manager Agenda Item 7, Docket Item CM-7. September 23, 2008.

23. EPA Region 3 Biological Technical Assistance Group. Freshwater and Freshwater Sediment Screening Benchmarks. On-line Address: http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/fw/screenbench.htm

24. Virginia Department of Game and Inland Fisheries. North Landing and Northwest Rivers. On-Line Address: www.dgif.virginia.gov/fishing/waterbodies. Created on March 9, 2009.

25. City of Chesapeake, Virginia. Public Utility Water Line Existing Facilities as of October 1, 2009. March 31, 2010.

26. Tetra Tech. Project Note Regarding Population within Distance Rings for the Battlefield Golf Club Site. March 25, 2009.

27. McFarland, E. Randolph and Bruce, T. Scott. The Virginia Coastal Plain Hydrogeologic Framework. Professional Paper 1731. U.S. Department of the Interior. 2006.

28. Maryland Geological Survey (MGS). Bulletin 34, Water Resources and Estimated Effects of Groundwater Development, Cecily County, Maryland. 1988.

29. Meng, Andrew A., and John F. Harsh. Hydrogeological Framework of the Virginia Coastal Plain. Regional Aquifer-System Analysis. 1988.

30. URS. Battlefield Golf Water Project. Water Supply Feasibility Study. April 10, 2009.

31. MACTEC. Monitoring Well Construction Details – Battlefield Golf Club. July 17, 2009.

32. Tetra Tech. Abbreviated Sampling and Analysis Plan. Battlefield Golf Club Site. September 2, 2009.

33. EPA. Soil Screening Levels Master Table April 2009. May 19, 2009. On-Line Address: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_April 2009.pdf

34. EPA. Resource Conservation and Recovery Act (RCRA). 40 CFR Part 261.24.

35. City of Chesapeake, Virginia. Update to the Community Living near Battlefield Golf Club. September 8, 2009.

36. Tetra Tech. Abbreviated Sampling and Analysis Plan. Battlefield Golf Club Site. July 27, 2009.

37. Tetra Tech. Abbreviated Sampling and Analysis Plan. Battlefield Golf Club Site. August 17, 2009.

38. Tetra Tech. Draft Assessment Report for Battlefield Golf Fly Ash Assessment. TDD No. E33-020-09-04-003. June 19, 2009.

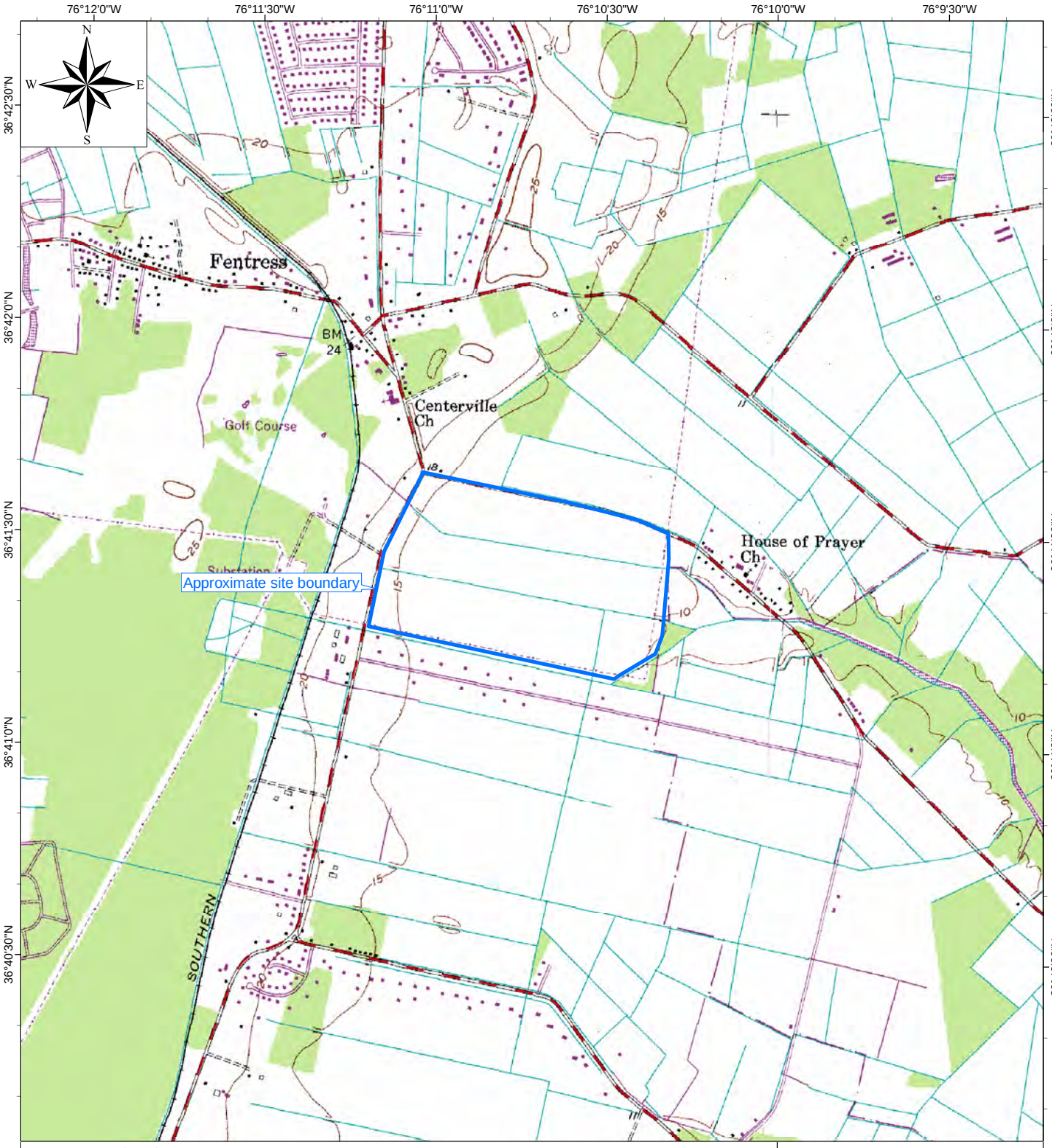
39. URS. Hydrogeologic Investigation. Chesapeake Energy Center, Chesapeake, Virginia. September 21, 2001.

40. URS. Ash Stabilization, Groundwater Modeling & Risk Evaluation. Updated Final Report. Chesapeake Energy Center. Proposed Golf Course Project. December 2001.

41. McCallum Testing Laboratories, Inc. Correspondence. To Mark L. Baker, P.E., Combustion Products Management, Inc. From Douglas S. Kinloch, P.E. Chief Engineer. May 17, 2002.

APPENDIX A

FIGURES

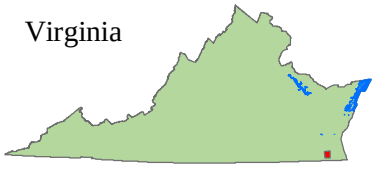


Source: Modified from USGS 7.5-Minute Series Topographic Quadrangle; Fentress, Virginia, 1954, Photorevised 1986

0 0.25 0.5 Miles

Quadrangle Location = ■

Virginia

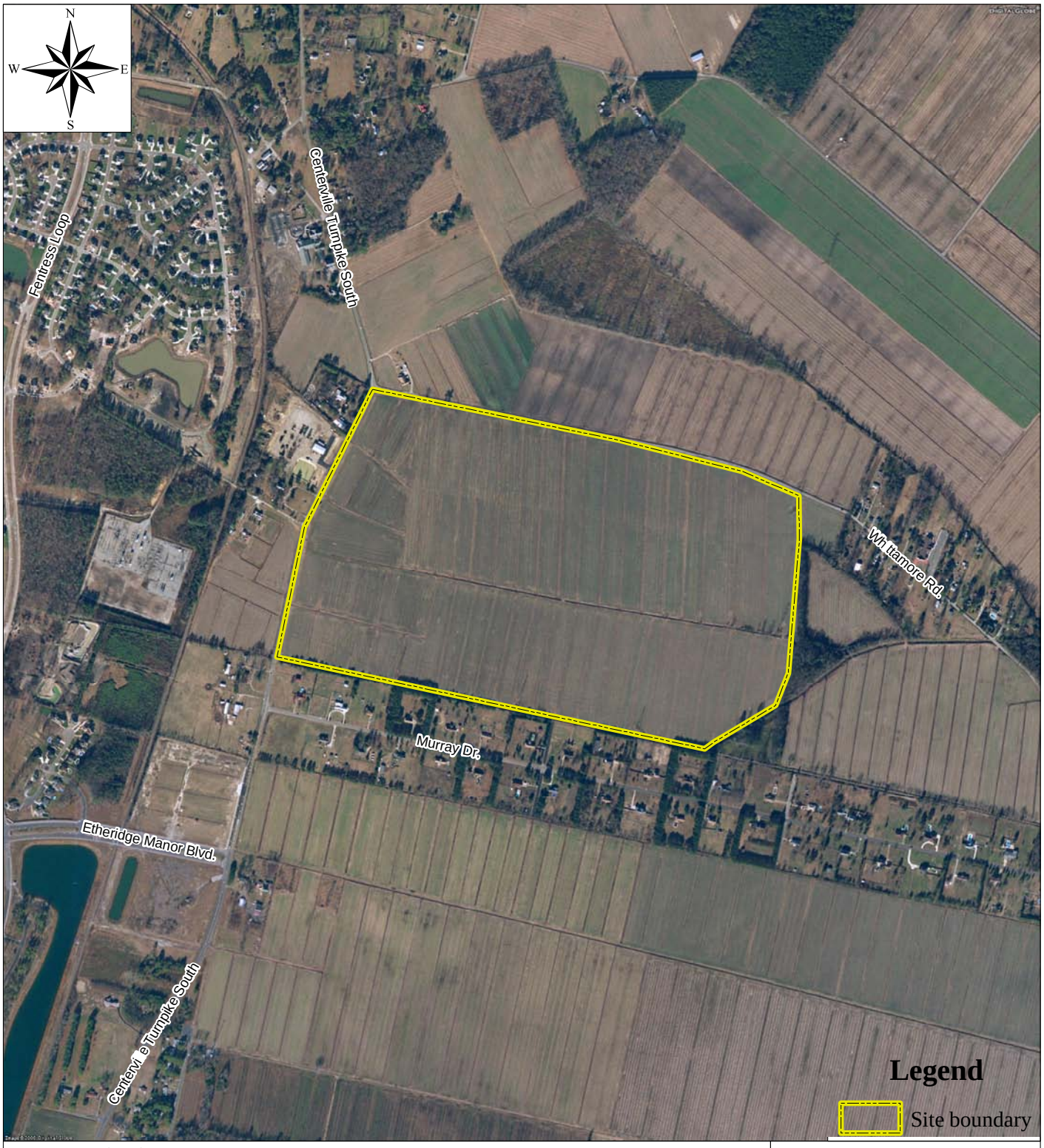


Battlefield Golf Club
Chesapeake, Virginia

Figure 1
Site Location Map

TDD No. E43-030-09-07-004 EPA Contract No. EP-S3-05-02	Map created on December 3, 2009 by D. Call, Tetra Tech EM Inc.

TETRA TECH

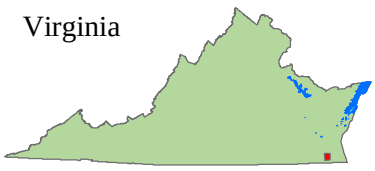


Source: Modified from DigitalGlobe aerial photography, December 1, 2000.

0 500 1,000
Feet

Approximate Site Location =

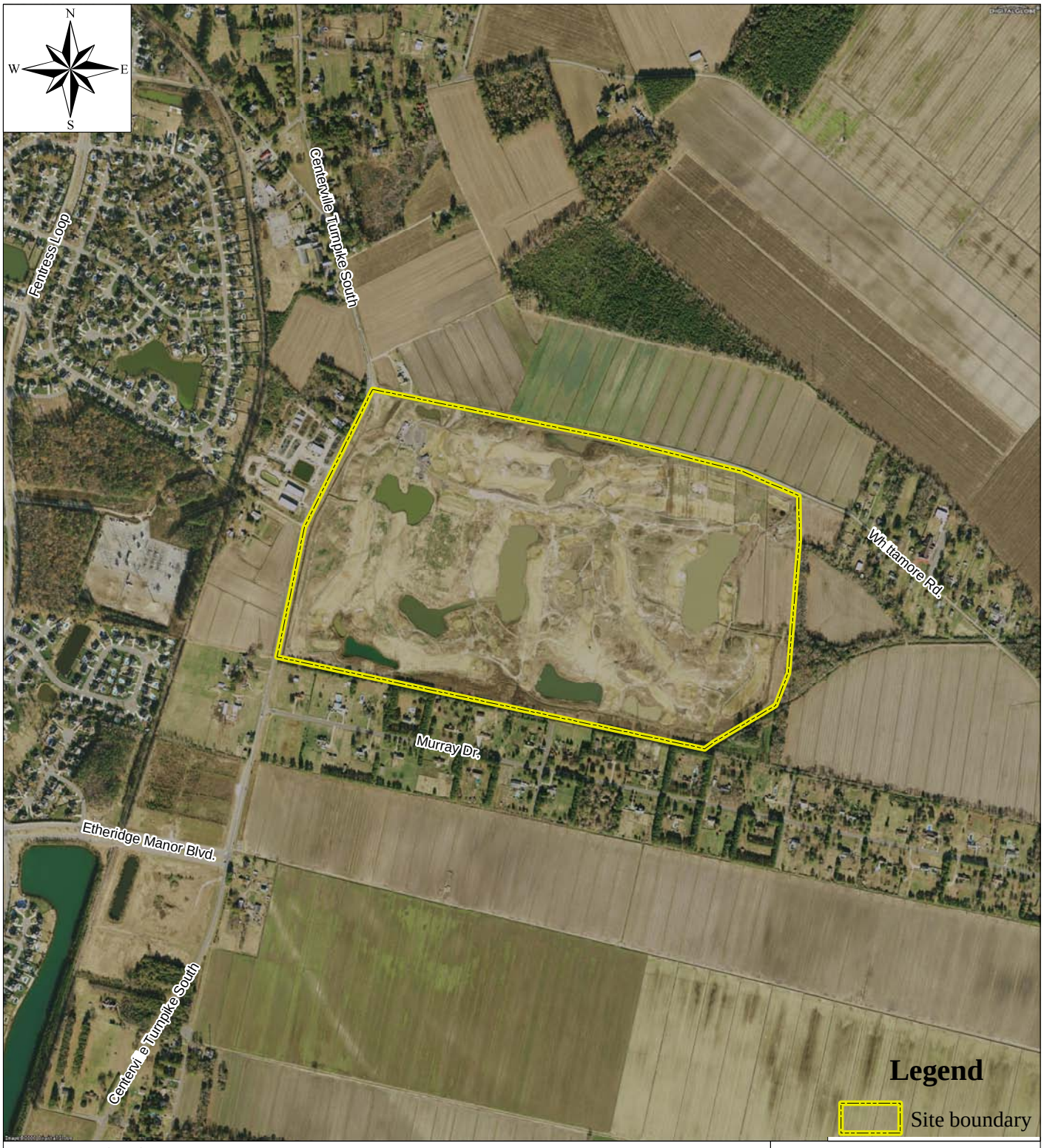
Virginia



Battlefield Golf Club
Chesapeake, Virginia

Figure 2
2000 Aerial Photograph

TDD No. E43-030-09-07-004 EPA Contract No. EP-S3-05-02	Map created on December 2, 2009 by D. Call, Tetra Tech EM Inc.	TETRA TECH

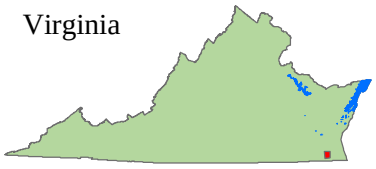


Source: Modified from DigitalGlobe aerial photography, January 1, 2009.

0 500 1,000
Feet

Approximate Site Location =

Virginia



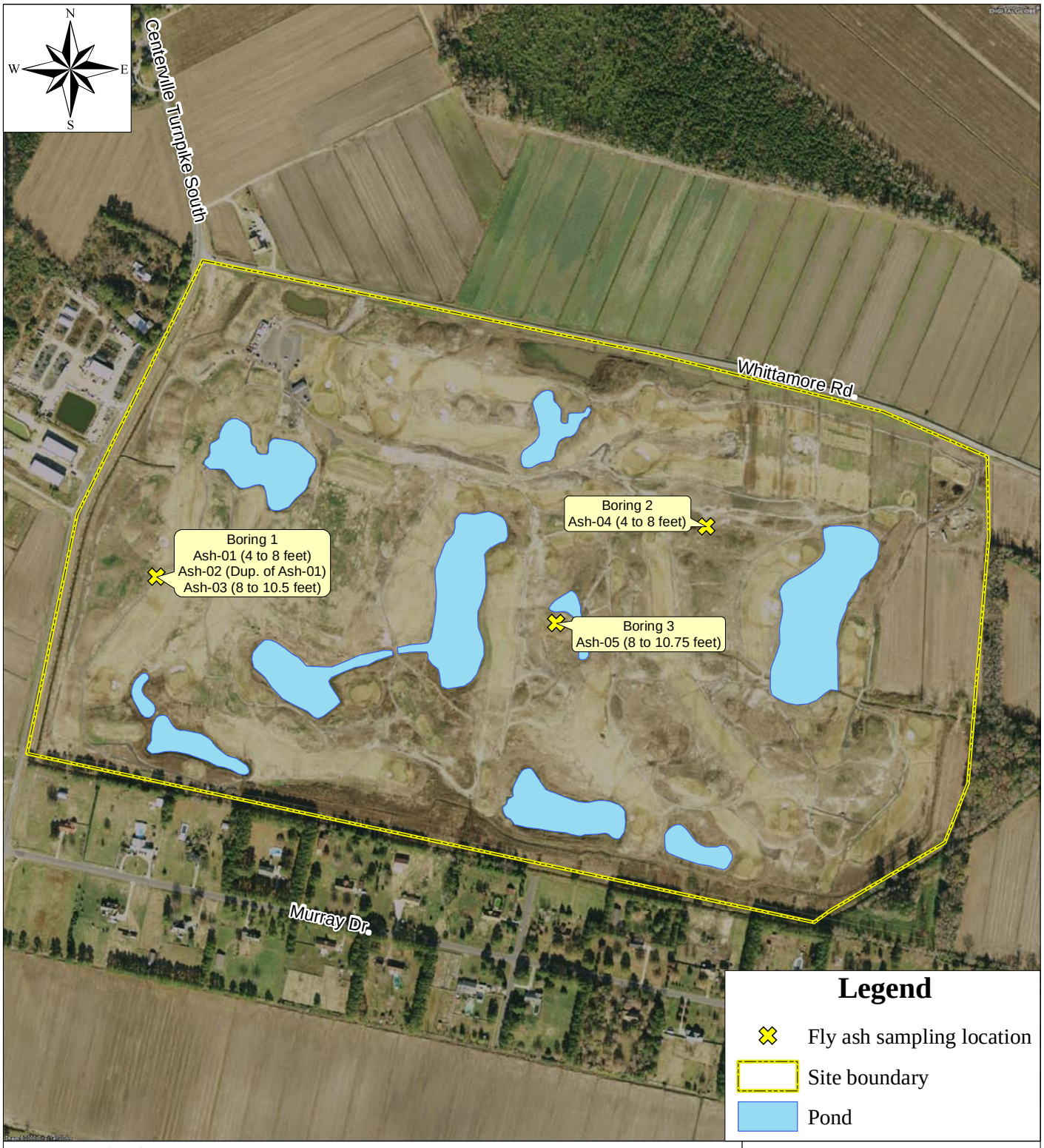
Battlefield Golf Club
Chesapeake, Virginia

Figure 3
2009 Aerial Photograph

TDD No. E43-030-09-07-004
EPA Contract No. EP-S3-05-02

Map created on December 2, 2009
by D. Call, Tetra Tech EM Inc.

TETRA TECH

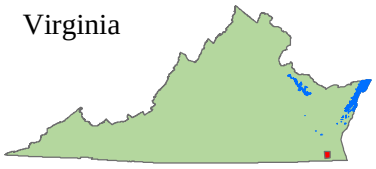


Source: Modified from DigitalGlobe aerial photography, January 1, 2009.
Dup. = Duplicate sample

0 500 1,000
Feet

Approximate Site Location =

Virginia



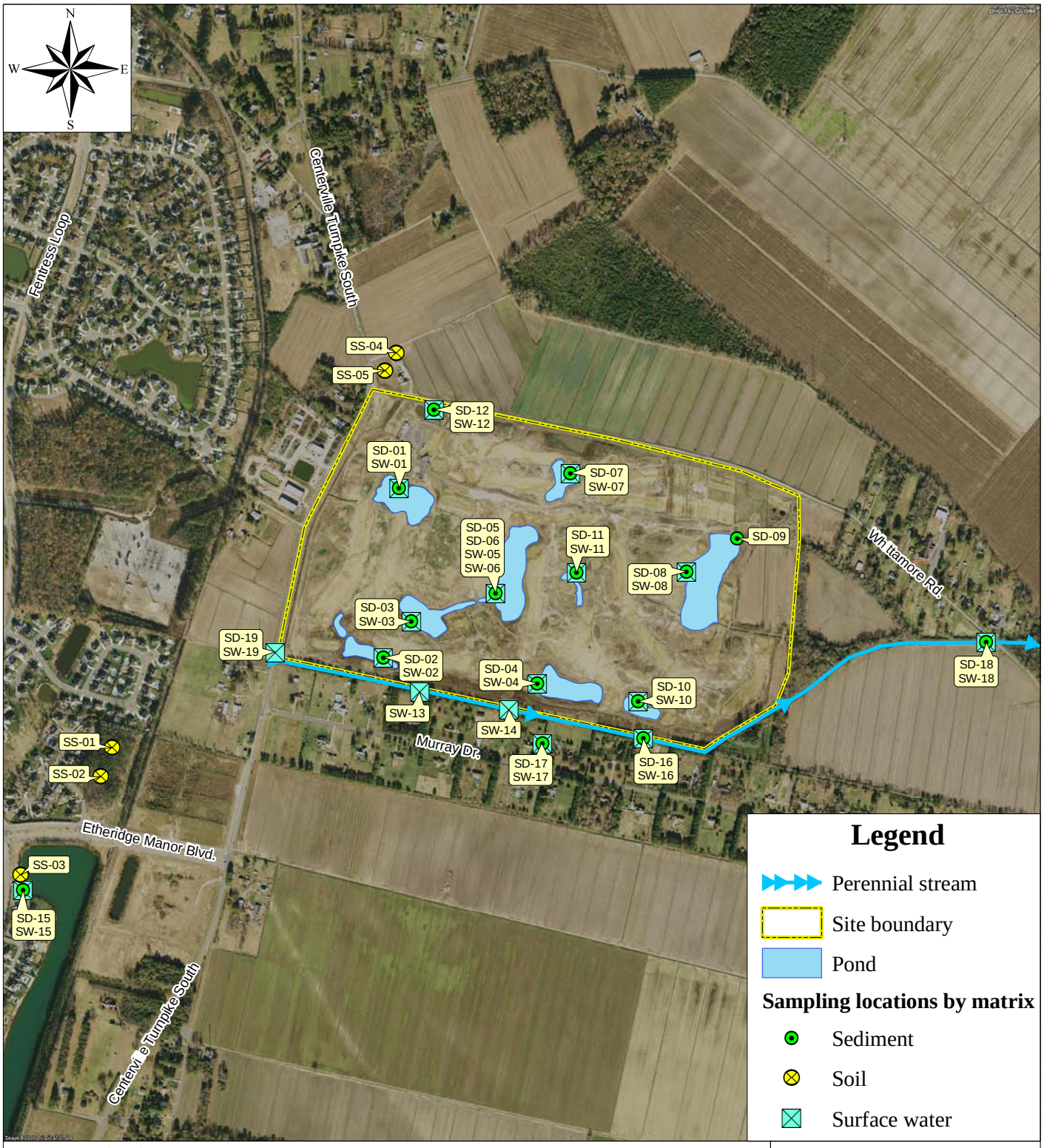
Battlefield Golf Club
Chesapeake, Virginia

Figure 4
Fly Ash Sampling Location Map

TDD No. E43-030-09-07-004
EPA Contract No. EP-S3-05-02

Map created on December 2, 2009
by D. Call, Tetra Tech EM Inc.

TETRA TECH

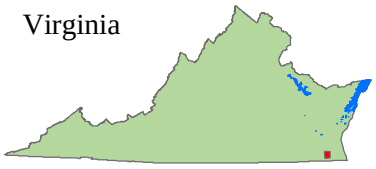


Source: Modified from DigitalGlobe aerial photography, January 1, 2009.

0 500 1,000
Feet

Approximate Site Location =

Virginia



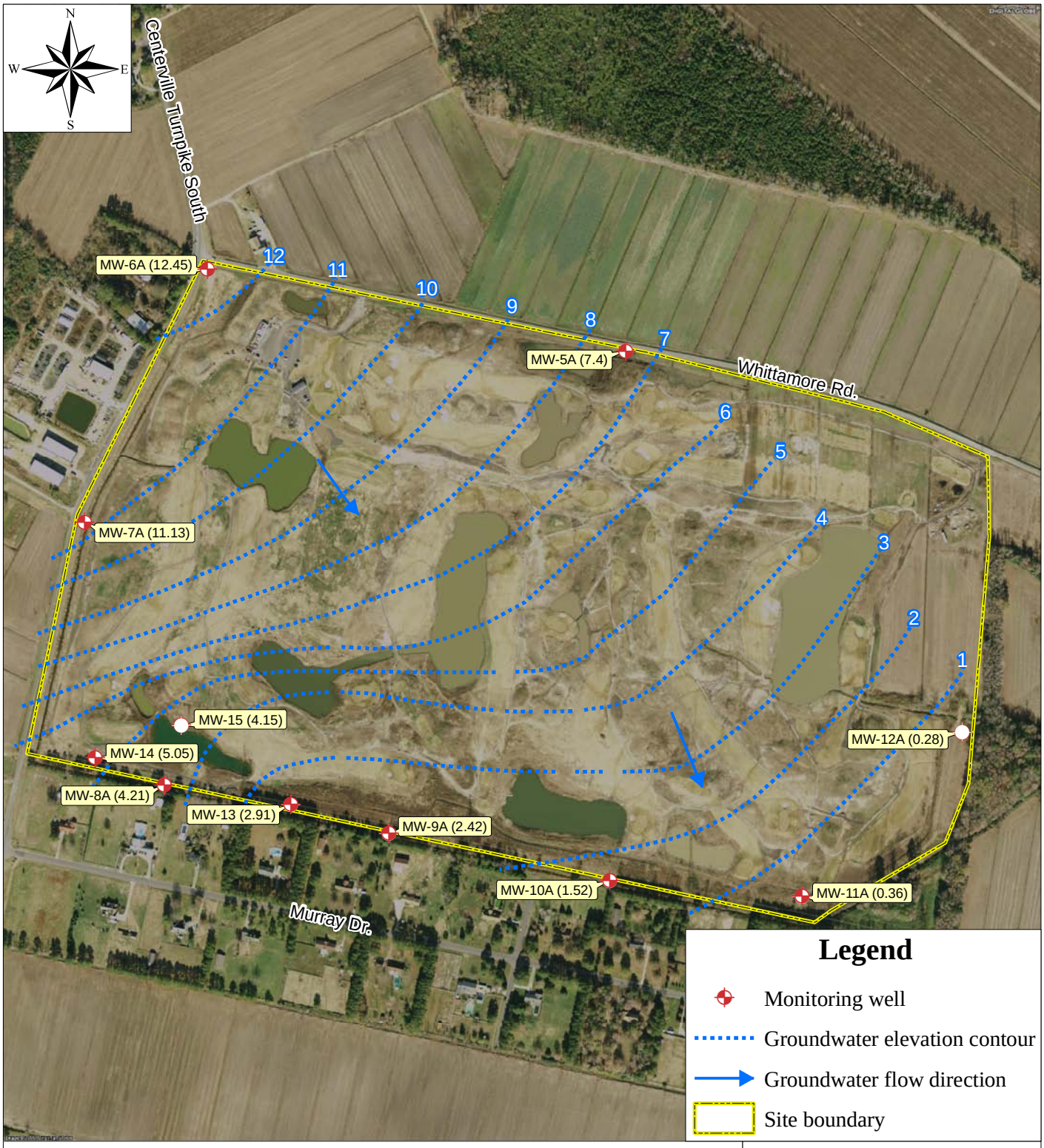
Battlefield Golf Club
Chesapeake, Virginia

Figure 5
Soil, Surface Water and Sediment Sampling Location Map

TDD No. E43-030-09-07-004
EPA Contract No. EP-S3-05-02

Map created on December 2, 2009
by D. Call, Tetra Tech EM Inc.

TETRA TECH

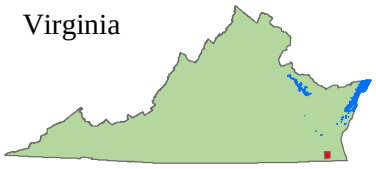


Source: Modified from DigitalGlobe aerial photography, January 1, 2009.
Note: Groundwater elevations (in feet) are given in parentheses after each monitoring well ID, and adjacent to each contour line.

0 500 1,000 Feet

Approximate Site Location =

Virginia



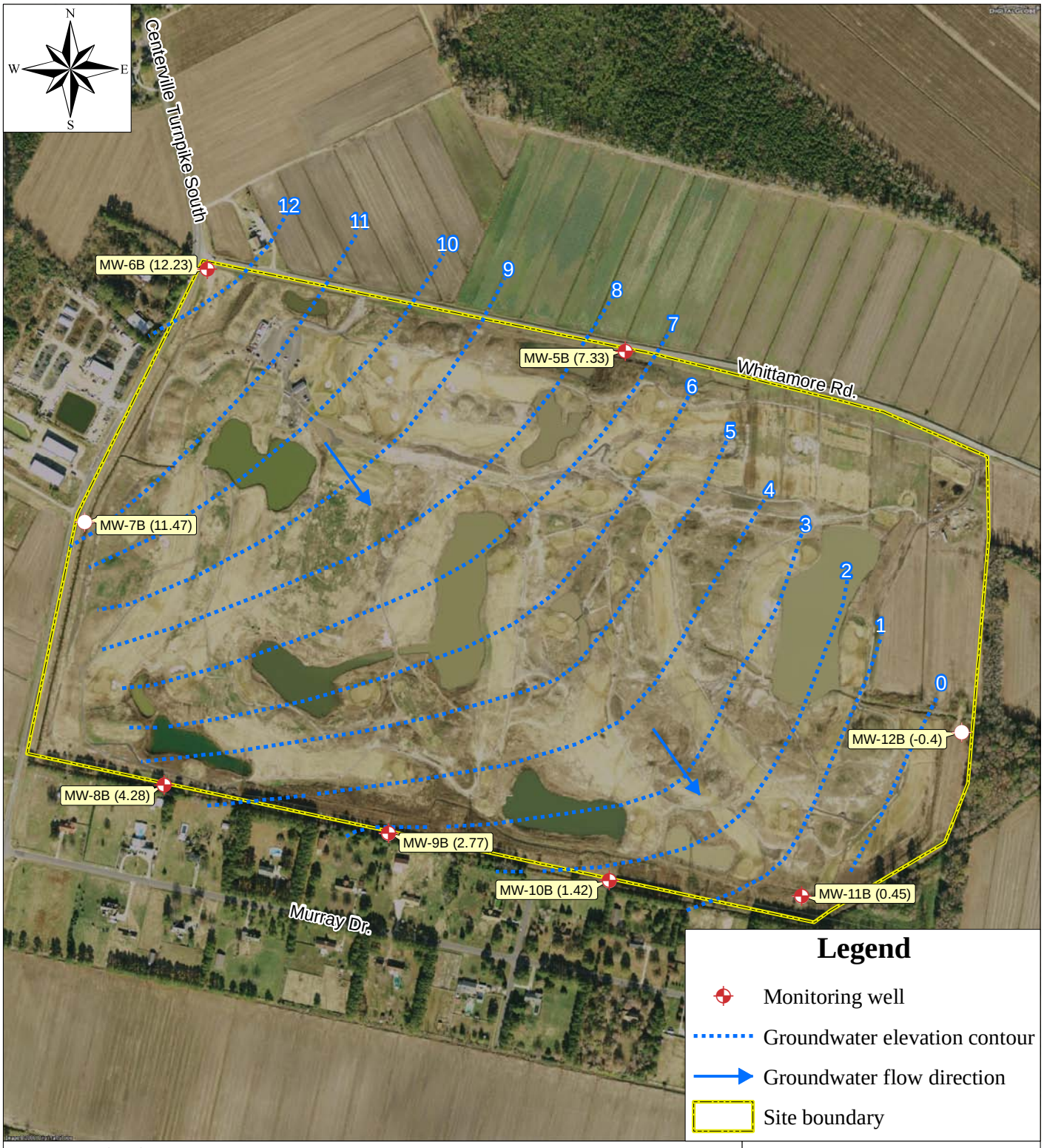
Battlefield Golf Club
Chesapeake, Virginia

Figure 6
Groundwater Contour Map
Surficial Aquifer - Shallow Wells

TDD No. E43-030-09-07-004
EPA Contract No. EP-S3-05-02

Map created on December 2, 2009
by D. Call, Tetra Tech EM Inc.

TETRA TECH



Legend

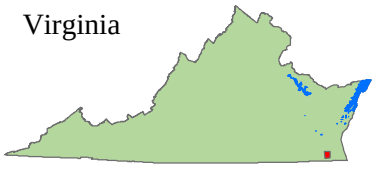
- Monitoring well
- Groundwater elevation contour
- Groundwater flow direction
- Site boundary

Source: Modified from DigitalGlobe aerial photography, January 1, 2009.
Note: Groundwater elevations (in feet) are given in parentheses after each monitoring well ID, and adjacent to each contour line.

0 500 1,000 Feet

Approximate Site Location =

Virginia



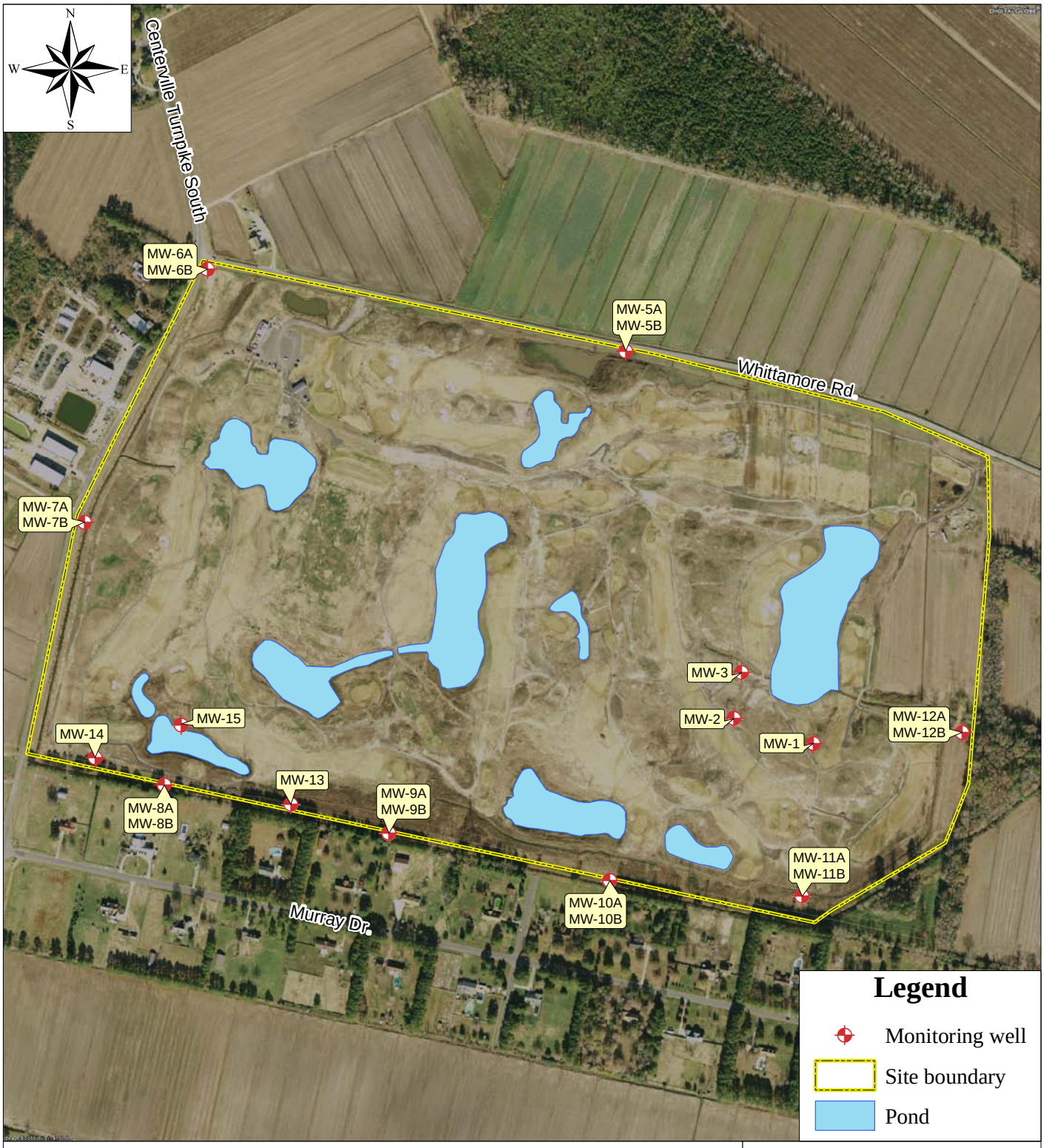
Battlefield Golf Club
Chesapeake, Virginia

Figure 7
Groundwater Contour Map
Surficial Aquifer - Intermediate Wells

TDD No. E43-030-09-07-004
EPA Contract No. EP-S3-05-02

Map created on December 3, 2009
by D. Call, Tetra Tech EM Inc.

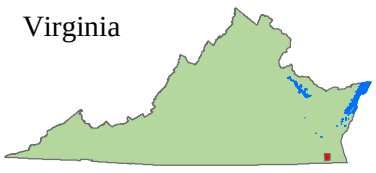
TETRA TECH



Source: Modified from DigitalGlobe aerial photography, January 1, 2009.

0 500 1,000 Feet

Approximate Site Location =



Battlefield Golf Club
Chesapeake, Virginia

Figure 8
Monitoring Well Sampling Location Map

TDD No. E43-030-09-07-004
EPA Contract No. EP-S3-05-02

Map created on April 15, 2010
by D. Call, Tetra Tech EM Inc.

TETRA TECH

Warning! This is security sensitive information. No part of the electronic data, in whole or in part, nor detailed maps can be shared outside of the Federal or state agencies who have received this data without express written consent of the US Environmental Protection Agency Region III Drinking Water Branch Chief.

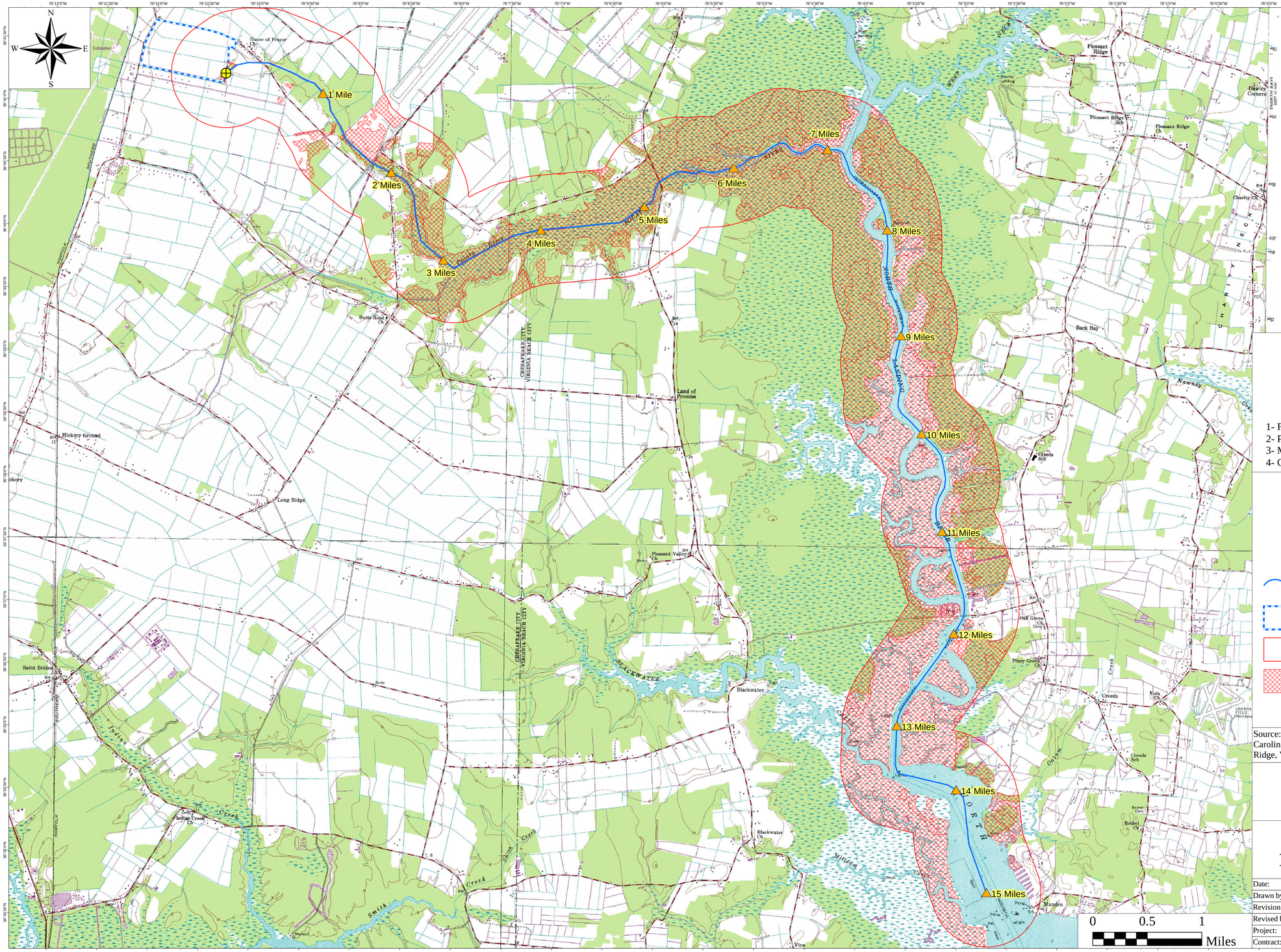
0 0.5 1 Miles

Battlefield Golf Club
Chesapeake, Virginia

Figure 9
4-Mile Radius Map

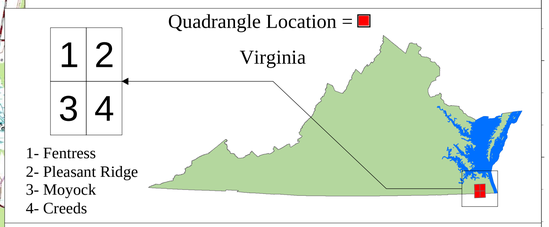
Date:	April 1, 2010
Drawn by:	D. Call
Revision date:	
Revised by:	
Project:	TDD No. E43-030-09-07-004
Contract:	EPA Contract No. EP-S3-05-02

TETRA TECH
7 Creek Parkway, Suite 700
Boothwyn, PA 19061
(610) 485-6410



Quadrangle Location =

Virginia



1- Fentress
2- Pleasant Ridge
3- Moyock
4- Creeds

Legend

- Probable point of entry (PPE)
- 15-mile distance marker
- Surface water pathway
- Approximate site boundary
- 0.5-Mile buffer of surface water pathway
- Wetlands *

* For the sake of clarity, wetlands further than 0.5 miles from the surface water pathway are not displayed on this map.

Source: Modified from USGS 7.5-minute topographic quadrangles: Creeds, Virginia-North Carolina, 1979; Fentress, Virginia, 1986; Moyock, Virginia-North Carolina, 1973; Pleasant Ridge, Virginia, 1980

Battlefield Golf Club
Chesapeake, Virginia

Figure 10
15-Mile Target Distance Limit Map

Date:	March 26, 2009
Drawn by:	D. Call
Revision date:	
Revised by:	
Project:	TDD No. E43-030-09-07-004
Contract:	EPA Contract No. EP-S3-05-02

TETRA TECH
7 Creek Parkway, Suite 700
Boothwyn, PA 19061
(610) 485-6410

APPENDIX B

ANALYTICAL DATA SUMMARY TABLES

TABLE 1
METALS ANALYTICAL RESULTS
FLY ASH - AUGUST 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :		MC00S8		MC00S9		MC00T0		MC00T1		MC00T2	
Sampling Location :		Ash-01		Ash-02		Ash-03		Ash-04		Ash-05	
Field QC		Dup of MC00S9		Dup. of MC00S8							
Matrix		Waste		Waste		Waste		Waste		Waste	
Date Sampled :		8/11/2009		8/11/2009		8/11/2009		8/11/2009		8/11/2009	
Time Sampled :		1457		1600		1510		1721		1701	
% Solids		74.4		73.1		73.1		68.7		70	
Units:	CRQL	mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
ANALYTE	(mg/Kg)	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	13300		13200		12600		11400		8520	
ANTIMONY	6										
ARSENIC	1	80.9		77.9		81.0		76.6		33.5	
BARIUM	20	565		561		684		448		346	
BERYLLIUM	0.5	4.1		4.1		3.9		3.2		2.2	
BORON	5	40.2		39.5		33.3		35.3		26.2	
CADMIUM	0.5	1.2		1.2		1.2		1.1		0.55	J
CALCIUM	500	14800		14800		13800		10100		14100	
CHROMIUM	1	29.4		27.3		25.4		16.4		13.0	
COBALT	5	17.2		17.1		16.3		11.3		8.9	
COPPER	2.5	48.2		47.8		45.9		37.0		27.4	
IRON	10	9730		9630		9470		8690		6480	
LEAD	1	23.4		23.0		22.2		15.8		12.0	
MAGNESIUM	500	1640		1630		1550		1330		1310	
MANGANESE	1.5	91.1		89.4		89.2		65.8		52.1	
MERCURY	0.1	0.26		0.27		0.27		0.32		0.24	
NICKEL	4	25.1		24.7		24.0		18.2		14.0	
POTASSIUM	500	2130		2140		2300		1930		1250	
SELENIUM	3.5	13.2		13.1		12.3		9.3		9.0	
SILVER	1										
SODIUM	500	1050		1060		1400		1540		1730	
THALLIUM	2.5										
VANADIUM	5	69.5		68.0		66.2		57.2		37.5	
ZINC	6	35.2		34.7		34.0		27.4		20.2	

Notes:

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

mg/kg = milligrams per kilogram

CRQL = Contract-required quantitaion limit

Dup. = Duplicate sample

J = Analyte present. Reported concentration may not be accurate or precise.

TABLE 2
METALS ANALYTICAL RESULTS
BACKGROUND SOIL SAMPLES - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :		MC01B8		MC01B9		MC01C0		MC01C1		MC01C2	
Sampling Location :		SS01		SS02		SS03		SS04		SS05	
Field QC											
Matrix		Soil		Soil		Soil		Soil		Soil	
Date Sampled :		9/10/2009		9/10/2009		9/10/2009		9/10/2009		9/10/2009	
Time Sampled :		16:07		16:09		16:17		16:47		16:49	
% Solids		71.7		74.4		81.5		68.0		74.3	
Units:		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Dilution Factor	CRQL	1.0		1.0		1.0		1.0		1.0	
ANALYTE	mg/kg	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	7300		8570		10400		5130		6970	
ANTIMONY	6							13.1			
ARSENIC	1	1.2	J	2.0		1.2	J	4.0		7.6	
BARIUM	20	30.6		32.1		38.8		29.3		44.2	
BERYLLIUM	0.5					0.21	J			0.33	J
BORON	5										
CADMIUM	0.5							1.1		0.81	
CALCIUM	500	247	J	415	J	558	J	792		2370	
CHROMIUM	1	6.8		10.1		11.4		13.0		13.9	
COBALT	5										
COPPER	2.5	6.6		7.7		2.9	J	6.5		8.8	
IRON	10	3090		9580		2910		3590		2980	
LEAD	1	19.7		23.5		7.7		32.0		43.1	
MAGNESIUM	500			266	J	451	J	371	J	458	J
MANGANESE	1.5	31.6		14.2		18.1		45.4		53.3	
MERCURY	0.1	0.058	J	0.094	J			0.060	J	0.079	J
NICKEL	4	2.9	J	4.2	J	3.8	J	1.8	J	3.0	J
POTASSIUM	500			267	J	360	J	267	J	564	J
SELENIUM	3.5							6.0			
SILVER	1										
SODIUM	500										
THALLIUM	2.5							12.2			
VANADIUM	5	8.8		11.9		10.6		7.6		7.9	
ZINC	6	12.6		11.3		7.5		30.3		39.2	

Notes:

Empty cell indicates compound not detected.

Flag indicates analytical data qualifier

mg/kg = milligrams per kilogram

Dup. = Duplicate sample

CRQL = Contract-required quantitaion limit

J = Analyte present. Reported concentration may not be accurate or precise.

TABLE 3
METALS ANALYTICAL RESULTS
GROUNDWATER - APRIL 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC0153		MC0154		MC0155		MC0156		MC0157		MC0158		MC0183		MC0146	
Sampling Location : (Prefix : BG0904				MW-7A		MW-7B		MW-8A		MW-8B		MW-8BD		MW-9A		MW-9B		MW-10A	
Field QC										Dup of MC0157		Dup of MC0156							
Matrix :				Water		Water		Water		Water		Water		Water		Water		Water	
Units :				ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :				4/30/2009		4/30/2009		4/30/2009		4/30/2009		4/30/2009		4/30/2009		4/30/2009		4/30/2009	
Time Sampled :		3x Background		08:25		08:30		10:30		10:40		10:45		12:10		11:55		13:35	
Dilution Factor :		Level		1.0		2.0 / 1.0		1.0		2.0 / 1.0		2.0 / 1.0		2.0 / 1.0		2.0 / 1.0		1.0	
ANALYTE	CRQL	Shallow	Deep	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	17010	48,300			+			UJ	+		+		+		+			
ARSENIC	1	3.6	ND	4.1		1.3+	B	4.1	J	+		+		+		+		0.67	B
BARIUM	10	ND	18	67.3		17.2+	J	11.9	J	18.8+	J	17.1+	J	31.2+		14.0+	J	12.5	
BERYLLIUM	1	24.3	ND			+		9.9	J	+		+		+		+			UJ
CADMIUM	1	ND	ND			+		0.87	J	+		+		+		+			UJ
CHROMIUM	2	ND	118.5		UL	+	UL	2.0	J	+	UL	+	UL	+	UL	1.6+	J		UJ
COBALT	1	396	31.8	3.3		+		258	J	+		+		+		+		0.66	J
COPPER	2	ND	25.2		UL	+	UL		UJ	+	UL	+	UL	+	UL	+	UL		UJ
LEAD	1	ND	59.7			+		0.51	J	+		+		+		+			
MANGANESE	1	3570	1329	19.4	J	121+	J	718	J	261+	J	259+	J	164+	J	56.1+	J	205	J
MERCURY	0.2	ND	ND																
NICKEL	1	882	75.6	2.5	L	0.66+	J	297	J	0.86+	J	+	UL	+	UL	1.8+	J		UJ
SELENIUM	5	ND	ND			+			UJ	+		+		+		+			UJ
SILVER	1	ND	ND			+			UJ	+		+		+		+			UJ
VANADIUM	5	ND	123.3		UL	+	UL	4.5	J	+	UL	+	UL	+	UL	+	UL		UJ
ZINC	2	1455	414	6.1	B	5.8+	B	267	J	12.2+	B	11.1+	B	1.8+	B	4.9+	B	1.1	B
BORON	7	52.5	197.7	13.6	K	6.1+	J	12.8	J	35.0+	K	33.3+	K	42.6+	K	77.9+	K	24.5	J

Notes:
CRQL = Contract Required Quantitation Limit
Prefix : All sample locations are prefixed BG0904-
+ = Result reported from diluted analysis.
Flag indicates analytical data qualifier
B = Analyte not detected substantially above level reported in field or laboratory blank.
J= Analyte present. Reported value may not be accurate or precise
K= Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L= Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UJ= Not detected, quantitiation limit may be inaccurate or imprecise.
UL= Not detected, quantitation limit is probably higher
Shaded cell indicates compound reported > 3x background level

TABLE 3
METALS ANALYTICAL RESULTS
GROUNDWATER - APRIL 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC0148		MC0149		MC0150		MC0151		MC0152		MC0147		MC0160	
Sampling Location : (Prefix : BG09 0				MW-10B		MW-11A		MW-11B		MW-12A		MW-12B		FB		RB	
Field QC :														Field Blank		Rinsate Blank	
Matrix :				Water		Water		Water		Water		Water		Water		Water	
Units :				ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :				4/30/2009		4/30/2009		4/30/2009		4/30/2009		4/30/2009		5/1/2009		5/1/2009	
Time Sampled :		3x Background Level		13:35		14:40		14:35		16:25		16:20		09:00		09:35	
Dilution Factor :				2.0 / 1.0		2.0 / 1.0		2.0 / 1.0		2.0 / 1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Shallow	Deep	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	17010	48,300	+		+		+		+							
ARSENIC	1	3.6	ND	+		1.4+	B	0.99+	B	3.4+	B	1.6	B	0.47	J		
BARIUM	10	ND	18	8.3+	J	10.2+	J	22.6+		25.8+		23.7					
BERYLLIUM	1	24.3	ND	+		+		+		+			UJ				
CADMIUM	1	ND	ND	+		+		+		+			UJ				
CHROMIUM	2	ND	118.5	+	UL	+	UL	+	UL	+	UL	0.66	J		UL		UL
COBALT	1	396	31.8	+		+		+		0.99+	J		UJ				
COPPER	2	ND	25.2	+	UL	+	UL	+	UL	+	UL		UJ		UL		UL
LEAD	1	ND	59.7	+		+		+		+							
MANGANESE	1	3570	1329	66.3+	J	81.7+	J	137+	J	113+	J	98.0	J			0.53	J
MERCURY	0.2	ND	ND														
NICKEL	1	882	75.6	+	UL	+	UL	0.88+	J	4.0+	L	0.39	J		UL		UL
SELENIUM	5	ND	ND	+		+		+		+			UJ				
SILVER	1	ND	ND	+		+		+		+			UJ				
VANADIUM	5	ND	123.3	+	UL	+	UL	+	UL	+	UL		UJ		UL		UL
ZINC	2	1455	414	1.7+	B	+	UL	3.8+	B	9.7+	B	4.2	B	1.5	J	2.9	L
BORON	7	52.5	197.7	97.4+	K	16.8+	K	83.0+	K	6.7+	J	44.2	J				

Notes:

CRQL = Contract Required Quantitation Limit

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Flag indicates analytical data qualifier

B = Analyte not detected substantially above level reported in field or laboratory blank.

J= Analyte present. Reported value may not be accurate or precise

K= Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L= Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ= Not detected, quantitiation limit may be inaccurate or imprecise.

UL= Not detected, quantitation limit is probably higher

Shaded cell indicates compound reported > 3x background level

TABLE 4
METALS ANALYTICAL RESULTS
GROUNDWATER - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC0187		MC0188		MC0190		MC01G1		MC01G2		MC0191	
Sampling Location :				BG0909-MW-01		BG0909-MW-02		BG0909-MW-03		BG0909-MW-05A		BG0909-MW-05B		BG0909-MW-06A	
Field QC															
Date Sampled :				9/10/2009		9/10/2009		9/10/2009		9/16/2009		9/16/2009		9/11/2009	
Time Sampled :		3x Background		10:38		12:30		12:17		15:00		15:06		08:35	
Units:		Level													
ANALYTE	CRQL	Shallow	Deep	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	17010	48,300		UL	476		101	J		UL		UL	393	
ANTIMONY	2	ND	ND											0.77	J
ARSENIC	1	3.6	18	3.9		2.5		0.82	J	1.8		0.76	J	2.4	
BERYLLIUM	1	24.3	ND	0.6	J										
CADMIUM	1	ND	ND												
CHROMIUM	2	ND	118.5			1	J							1.1	J
COBALT	1	396	31.8	14		1.6		0.8	J	0.31	J				
COPPER	1	ND	25.2			1.7	J							4.7	
IRON	100	160800	130200	8930		747		6800		7520		623		102	B
LEAD	1	ND	59.7	0.41	J	1.3								1.1	
MAGNESIUM	5000	178200	23280	20000		6430		19000		16900		9600		3580	J
MANGANESE	1	3570	1329	171		61.3		151		277		49.0		32.9	
MERCURY	0.2	ND	ND		UL		UL		UL						UL
NICKEL	1	882	75.6	24	J	5.7	J	1.1	J	0.99	J			0.82	J
SELENIUM	5	ND	ND												
SILVER	1	ND	ND												
VANADIUM	5	ND	123.3			2.1	J							2.5	J
ZINC	2	1455	414	75.9		416		19.2		4.0	B	203		119	
BORON	7	52.5	197.7	9.8	K	146	K	22.2	K	72	K	68.9	K	12.9	K

Notes:
µg/L = Micrograms per liter
CRQL = Contract required quantitation limit
Flag indicates laboratory data qualifier
J = Analyte Present. Reported value may not be accurate or precise.
K = Analyte Present. Reported value may be biased high. Actual value is expected to be lower.
B = Analyte not detected substantially above level reported in field or laboratory blank.
L= Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UL= Not detected, quantitation limit is probably higher
Shaded cell indicates compound reported > 3x background level

TABLE 4
METALS ANALYTICAL RESULTS
GROUNDWATER - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC0192		MC0193		MC0194		MC0195		MC0196		MC0197	
Sampling Location :				BG0909-MW-06B		BG0909-MW-07A		BG0909-MW-07B		BG0909-MW-08A		BG0909-MW-08B		BG0909-MW-09A	
Field QC						Dup MC0189									
Date Sampled :				9/11/2009		9/11/2009		9/11/2009		9/10/2009		9/10/2009		9/10/2009	
Time Sampled :		3x Background		08:41		10:23		10:25		15:08		15:05		17:20	
Units:		Level													
ANALYTE	CRQL	Shallow	Deep	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	17010	48,300	327		445		107	J	584			UL		UL
ANTIMONY	2	ND	ND												
ARSENIC	1	3.6	18	1.4		10.7				1.6				0.68	J
BERYLLIUM	1	24.3	ND	0.63	J	0.41	J			0.76	J				
CADMIUM	1	ND	ND												
CHROMIUM	2	ND	118 5			0.8	J			0.63	J				
COBALT	1	396	31 8	5.1		3.9				6.4					
COPPER	1	ND	25 2												
IRON	100	160800	130200	3890		5270		6170		10100		8250		14700	
LEAD	1	ND	59.7			0 53	J	0.46	J						
MAGNESIUM	5000	178200	23280	3580	J	2720	J	2930	J	4350	J	8850		15400	
MANGANESE	1	3570	1329	119		29		146		280		282		246	
MERCURY	0.2	ND	ND		UL		UL		UL		UL		UL		UL
NICKEL	1	882	75.6	6.2	J	3.2	J	0.33	J	3.8	J				
SELENIUM	5	ND	ND												
SILVER	1	ND	ND												
VANADIUM	5	ND	123 3	2.4	J	2.9	J								
ZINC	2	1455	414	21.5		9.1		4.6		8.8		30.9		5.8	
BORON	7	52.5	197.7	5.6	J	14.3	K			17.3	K	39.3	K	38.6	K

Notes:
µg/L = Micrograms per liter
CRQL = Contract required quantitation limit
Flag indicates laboratory data qualifier
J = Analyte Present. Reported value may not be accurate or precise.
K = Analyte Present. Reported value may be biased high. Actual value is expected to be lower.
B = Analyte not detected substantially above level reported in field or laboratory blank.
L= Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UL= Not detected, quantitation limit is probably higher
Shaded cell indicates compound reported > 3x background level

TABLE 4
METALS ANALYTICAL RESULTS
GROUNDWATER - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC0198		MC0199		MC01A0		MC01G3		MC01G4		MC01G5	
Sampling Location :				BG0909-MW-09B		BG0909-MW-10A		BG0909-MW10B		BG0909-MW-11A		BG0909-MW-11B		BG0909-MW-12A	
Field QC															
Date Sampled :				9/10/2009		9/10/2009		9/10/2009		9/16/2009		9/16/2009		9/16/2009	
Time Sampled :		3x Background		17:00		19:18		19:05		10:15		10:05		11:57	
Units:		Level													
ANALYTE	CRQL	Shallow	Deep	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	17010	48,300		UL		UL		UL		UL		UL		UL
ANTIMONY	2	ND	ND												
ARSENIC	3.6	3.6	18							1.5				3.6	
BERYLLIUM	1	24.3	ND												
CADMIUM	1	ND	ND												
CHROMIUM	2	ND	118.5												
COBALT	1	396	31.8											1.6	
COPPER	1	ND	25.2												
IRON	100	160800	130200	315		9000		416		4200		3430		4570	
LEAD	1	ND	59.7												
MAGNESIUM	5000	178200	23280	13300		13000		19900		20600		19800		17000	
MANGANESE	1	3570	1329	69.4		173		72		74.2		211		97.2	
MERCURY	0.2	ND	ND		UL		UL								
NICKEL	1	882	75.6											6.7	
SELENIUM	5	ND	ND												
SILVER	1	ND	ND												
VANADIUM	5	ND	123.3												
ZINC	2	1455	414	2.3		6.1		1.3	J	2.5	B	3.9	B	21.2	
BORON	7	52.5	197.7	99.3	K	21.9	K	116	K	18.4	K	78.3	K	10.6	K

Notes:
µg/L = Micrograms per liter
CRQL = Contract required quantitation limit
Flag indicates laboratory data qualifier
J = Analyte Present. Reported value may not be accurate or precise.
K = Analyte Present. Reported value may be biased high. Actual value is expected to be lower.
B = Analyte not detected substantially above level reported in field or laboratory blank.
L= Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UL= Not detected, quantitation limit is probably higher
Shaded cell indicates compound reported > 3x background level

TABLE 4
METALS ANALYTICAL RESULTS
GROUNDWATER - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC01G6		MC01G0		MC01G7		MC01G8		MC0189		MC0185		MC01G9	
Sampling Location :				BG0909-MW-12B		BG0909-MW-13		BG0909-MW-14		BG0909-MW-15		BG0909-MW-20		BG0909-FB01		BG0909-FB03	
Field QC												Dup MC0193		Dup MC0193		Field Blank	
Date Sampled :				9/16/2009		9/16/2009		9/16/2009		9/16/2009		9/11/2009		9/8/2009			
Time Sampled :		3x Background		11:55		16:29		16:17		17 50		15:13		13:10		9/15/2009	
Units:		Level														12:00	
ANALYTE	CRQL	Shallow	Deep	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	17010	48,300		UL	706			UL	3300		244			UL		UL
ANTIMONY	2	ND	ND														
ARSENIC	1	3.6	18	0.76	J	1.3		2.0		21.5		7.1					
BERYLLIUM	1	24.3	ND			13.0				1.5							
CADMIUM	1	ND	ND														
CHROMIUM	2	ND	118.5			1.7	J			2.7							
COBALT	1	396	31.8			24.7				2.1		3.6					
COPPER	1	ND	25.2							18.5						0.79	J
IRON	100	160800	130200	6130		39800		8050		64100		4010		42.9	J		UL
LEAD	1	ND	59.7					1.6									
MAGNESIUM	5000	178200	23280	18900		25800		4280	J	27200		2660	J				
MANGANESE	1	3570	1329	143		469		203		269		25.9				0.32	J
MERCURY	0.2	ND	ND										UL		UL		
NICKEL	1	882	75.6			45.2				2.5		2.8	J				
SELENIUM	5	ND	ND							9.0							
SILVER	1	ND	ND														
VANADIUM	5	ND	123.3			2.0	J			17.3							
ZINC	2	1455	414	2.2	B	115		4.1	B	49.5		7.6				0.90	J
BORON	7	52.5	197.7	51.4	K	18.5	K	14.9	K	144	K	15	K				

Notes:
µg/L = Micrograms per liter
CRQL = Contract required quantitation limit
Flag indicates laboratory data qualifier
J = Analyte Present. Reported value may not be accurate or precise.
K = Analyte Present. Reported value may be biased high. Actual value is expected to be lower.
B = Analyte not detected substantially above level reported in field or laboratory blank.
L= Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UL= Not detected, quantitation limit is probably higher
Shaded cell indicates compound reported > 3x background level

TABLE 5
METALS ANALYTICAL RESULTS COMPARISION
RESIDENTIAL WELL SAMPLES
2001 AND 2008

Sample Number :				(b) (6)		(b) (6)		(b) (6)									
Sampling Location :				(b) (6)		(b) (6)		(b) (6)									
Date Sampled :				2001		8/25/2008		2001		8/25/2008		2001		8/25/2008		2001		8/25/2008	
Units:				µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	DL	CRQL	MCL	Result	Flag	Result	Flag	Result	Flag	Result	Flag			Result	Flag	Result	Flag	Result	Flag
ARSENIC	2	1	10			1.5				1.6				1.2				1.4	
BARIUM	100	10	2000			27.2								76.5					
BERYLLIUM	0.1	1	4																
CADMIUM	0.1	1	5																
CHROMIUM	0.5	2	NS																
COPPER	15	2	1300	**51**										**45.6**		**1623**		17.1	
IRON	100	100	NS	160		**615**		320		180		190		**12900**		1070		1980	
LEAD	1	1	15													**6**		1.0	
MANGANESE	30	1	NS			**14.4**				**8.0**				**230**		110		186	
MERCURY	0.2	0.2	2																
NICKEL	50	1	NS																
SELENIUM	2	5	50																
ZINC	15	2	NS			2.0	J			7.7				**29.1**				6.6	

Notes:

See SI report Section 4.6.2 for explanation of comparison. (2001) and (2008) collected at same location.

µg/L = Micrograms per liter (2001) and (2008) collected at same location.

CRQL = 2008 Contract required quantitation limit (2001) and (2008) collected at same location.

Bold value = value is above both CRQL and DL and is 3 X level detected in other sampling event. (2001) and (2008) collected at same location.

TABLE 5
METALS ANALYTICAL RESULTS COMPARISION
RESIDENTIAL WELL SAMPLES
2001 AND 2008

Sample Number :				(b) (6)		(b) (6) (b) (6)		(b) (6)											
Sampling Location :																			
Date Sampled :				2001		8/25/2008		2001		8/25/2008		2001		8/26/2008		2001		8/26/2008	
Units:				µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	DL	CRQL	MCL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ARSENIC	2	1	10			1.4													
BARIUM	100	10	2000			11.6													
BERYLLIUM	0.1	1	4																
CADMIUM	0.1	1	5																
CHROMIUM	0.5	2	NS																
COPPER	15	2	1300			4.0				**55.7**		**1540**		95.6				2.6	
IRON	100	100	NS			**6600**		7500		8060				**4390**		190		161	
LEAD	1	1	15	**2**						**4.9**				**10.8**					
MANGANESE	30	1	NS			**256**				**281**				**219**				5.5	
MERCURY	0.2	0.2	2								3								
NICKEL	50	1	NS							1.1				1.2					
SELENIUM	2	5	50																
ZINC	15	2	NS			10.2				**60.2**				**61.3**				2.3	

Notes:

See SI report Section 4.6.2 for explanation of comparison. (2001) and (2008) collected at same location.

µg/L = Micrograms per liter (2001) and (2008) collected at same location.

CRQL = 2008 Contract required quantitation limit (2001) and (2008) collected as same location.

Bold value = value is above both CRQL and DL and is 3 X level detected in other sampling event. 2001) and (2008) collected as same location.

TABLE 5
METALS ANALYTICAL RESULTS COMPARISION
RESIDENTIAL WELL SAMPLES
2001 AND 2008

Sample Number :				(b) (6)		(b) (6)		(b) (6)											
Sampling Location :				(b) (6)		(b) (6)		(b) (6)											
Date Sampled :				2001		8/26/2008		2001		8/26/2008		2001		8/26/2008		2001		8/26/2008	
Units:				µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	DL	CRQL	MCL	Result	Flag	Result	Flag			Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ARSENIC	2	1	10																
BARIUM	100	10	2000																
BERYLLIUM	0.1	1	4																
CADMIUM	0.1	1	5																
CHROMIUM	0.5	2	NS																
COPPER	15	2	1300			**246**				8.4				**24.4**				**123**	
IRON	100	100	NS			**5750**				**148**				**6280**		230		192	
LEAD	1	1	15			**6.2**						2		4.5				**18.6**	
MANGANESE	30	1	NS			**231**				3.6				**152**				4.3	
MERCURY	0.2	0.2	2																
NICKEL	50	1	NS			1.2												1.3	
SELENIUM	2	5	50																
ZINC	15	2	NS			**552**				12.0				7.2				**41.4**	

Notes:

See SI report Section 4.6.2 for explanation of comparison. (2001) and (2008) collected at same location.

µg/L = Micrograms per liter (2001) and (2008) collected at same location.

CRQL = 2008 Contract required quantitation limit (2001) and (2008) collected at same location.

Bold value = value is above both CRQL and DL and is 3 X level detected in other sampling event. (2001) and collected at same location.

TABLE 5
METALS ANALYTICAL RESULTS COMPARISION
RESIDENTIAL WELL SAMPLES
2001 AND 2008

Sample Number :				(b) (6)		(b) (6)		(b) (6)											
Sampling Location :				(b) (6)		(b) (6)(b) (6)		(b) (6)											
Date Sampled :				2001		8/26/2008		2001		8/26/2008		2001		8/27/2008		2001		8/29/2008	
Units:				µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	DL	CRQL	MCL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ARSENIC	2	1	10																
BARIUM	100	10	2000																
BERYLLIUM	0.1	1	4																
CADMIUM	0.1	1	5																
CHROMIUM	0.5	2	NS									**8**							
COPPER	15	2	1300							2.4		**447**		120		69		22.5	
IRON	100	100	NS	310		177		270		290		240		174				157	
LEAD	1	1	15	**4**								8		8.7		1		1.9	
MANGANESE	30	1	NS			7.6				5.0				**154**				4.3	
MERCURY	0.2	0.2	2																
NICKEL	50	1	NS											**138**					
SELENIUM	2	5	50																
ZINC	15	2	NS	**21**		2.2				3.4		40		**223**				28.1	

Notes:

See SI report Section 4.6.2 for explanation of comparison. (2001) and (2008) collected at same location.

µg/L = Micrograms per liter (2001) and (2008) collected at same location.

CRQL = 2008 Contract required quantitation limit (2001) and (2008) collected at same location.

Bold value = value is above both CRQL and DL and is 3 X level detected in other sampling event. (2001) and (2008) collected at same location.

TABLE 5
METALS ANALYTICAL RESULTS COMPARISION
RESIDENTIAL WELL SAMPLES
2001 AND 2008

Sample Number :				(b) (6)		(b) (6)									
Sampling Location :				(b) (6)		(b) (6)(b) (6)									
Date Sampled :				2001		8/28/2008		2001		8/28/2008		2001		8/28/2008	
Units:				µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	DL	CRQL	MCL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ARSENIC	2	1	10												
BARIUM	100	10	2000												
BERYLLIUM	0.1	1	4												
CADMIUM	0.1	1	5												
CHROMIUM	0.5	2	NS												
COPPER	15	2	1300			**39.5**				16.4				**48.4**	
IRON	100	100	NS	150		240		1170		950				**778**	
LEAD	1	1	15	2		2.2		1		1.0		**10**		1.9	
MANGANESE	30	1	NS			4.4		290		238				**120**	
MERCURY	0.2	0.2	2	**0.7**											
NICKEL	50	1	NS							2.2				3.6	
SELENIUM	2	5	50												
ZINC	15	2	NS			**30.2**				8.4				**31.2**	

Notes:

See SI report Section 4.6.2 for explanation of comparison. (2001) and (2008) collected at same location.

µg/L = Micrograms per liter (2001) and (2008) collected at same location.

CRQL = 2008 Contract required quantitation limit (2001) and (2008) collected at same location.

Bold value = value is above both CRQL and DL and is 3 X level detected in other sampling event.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6)		(b) (6)		(b) (6)		(b) (6)											
Sampling Location :				(b) (6)(b) (6)		(b) (6) (b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)											
Date Sampled :			EPA	8/25/2008		8/25/2008		8/26/2008		8/26/2008		8/25/2008		8/25/2008		8/25/2008		8/25/2008		8/25/2008	
Time Sampled :			Tapwater	09:27		09:59		16:45		16:45		10:43		10:40		11:24		11:31		13:28	
Units:			Screening	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000			21.5	J	22.7	J									20.7	J		
ANTIMONY	2	6	15			0 25	B	1 2	B												
ARSENIC	1	10	0 045	**1.5**		**1.5**		**1.6**		**1.5**		**1.6**		**1.6**		**1.4**		**1.2**	B	**1.4**	
BARIUM	10	2000	7,300	1.5	J	27.2		1.1	B	26.7		12.4		1.4	B	1.2	B	76.5		8.2	J
BERYLLIUM	1	4	73			0.11	B											0.27	J		
CADMIUM	1	5	18			0.11	J	0.16	J	0.12	B										
CHROMIUM	2	NS	11	0.60	B	0.73	B	0.88	J	0.71	B	0.74	J	0.60	B	0.68	B	1.1	J	0.63	B
COBALT	1	NS	11			0.15	B	0.35	B	0.13	B	0.16	B								
COPPER	2	1300	1,500	33.1		1.3	J	2.7		1.4	J	2.5		1.4	J	16.5		45.6		17.1	
IRON	100	NS	26,000	156		615		12.6	J	631		1190		180		175		12900		1980	
LEAD	1	15	NS	2.6		0 29	J	0.31	B	0.25	J	0.11	J	0.24	J	1.1		2.5		1.0	
MAGNESIUM	0	NS	NS	16400		**42000**		**43500**		**44000**		18300		12800		12800		6670		19300	
MANGANESE	1	NS	880	4.3		14.4		18.0		14.7		91.4		8.0		4.7		230		186	
MERCURY	0.2	2	0 57		UL		UL	0.4			UL		UL		UL		UL		UL		UL
NICKEL	1	NS	730	0.57	J	0.75	J	1 3		0.52	J	0.69	J	0.36	B	0.61	J	0.56	J	0.48	B
SELENIUM	5	50	180		UL		UL		UL	1.8	J		UL		UL		UL				UL
SILVER	1	NS	180		UL	0.090	B	0.080	B	0 067	B		UL		UL		UL				UL
THALLIUM	1	2	2.4					0.14	J												
VANADIUM	5	NS	180	0.89	B	0.78	B	0.93	B	0.30	B	0.98	B	0.98	B	0.96	B	1.5	J	1.2	B
ZINC	2	NS	11,000	21.4		2.0	J	18.5		2.9		2.4		7.7		15.4		29.1		6.6	
MOLYBDENUM	5	NS	180																		
BORON	50	NS	7,300	193		275		290		295		113		116		114		29.1	B	107	

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for this compound.

UL = Not detectected, quantitation limit is probably higher.

Exceeds three imes the background concentra ion

Exceeds MCL

Exceeds three imes the background concentra ion and MCL.

Exceeds EPA screening level for tapwater.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6)		(b) (6)		(b) (6)		(b) (6)											
Sampling Location :				(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)											
Date Sampled :			EPA	8/25/2008		8/25/2008		8/25/2008		8/25/2008		8/25/2008		8/25/2008		8/25/2008		8/26/2008		8/26/2008	
Time Sampled :			Tapwater	13:36		14:16		15:15		16:23		19:19		19:19		20:15		07:46		08:19	
Units:			Screening	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000	23.7	J	93.6	J														
ANTIMONY	2	6	15					0.20	B												
ARSENIC	1	10	0.045	**1.3**	B	**1.4**		**1.4**		**1.4**		**1.6**		**1.7**		**1.4**		**1.4**		**1.4**	
BARIUM	10	2000	7,300	10.0	J	19 3		12.9		11.6		88.5		83.7		18.7		2.6	B	4 5	B
BERYLLIUM	1	4	73																		
CADMIUM	1	5	18					0.13	B	0.12	B										
CHROMIUM	2	NS	11	0.65	B	1.0	J	0.59	B	0.62	B	0 91	J	0.61	B	0.56	B	0.46	B	0.45	B
COBALT	1	NS	11					0.13	B												
COPPER	2	1300	1,500	1 5	J	437		3.3		4.0		6 5		9.2		55.7		1.7	J	15.9	
IRON	100	NS	26,000	1760		2830		1420		6600		1660		1560		8060		192		644	
LEAD	1	15	NS	0.15	J	**67.1**		0.15	J	0.40	J	0 30	J	0.42	J	4.9		0.34	J	1.1	
MAGNESIUM	0	NS	NS	19800		17200		18000		18400		12700		12700		23200		28900		5050	
MANGANESE	1	NS	880	107		156		99.5		256		246		236		281		4.4		62.1	
MERCURY	0.2	2	0.57		UL		UL		UL		UL		UL		UL		UL				UL
NICKEL	1	NS	730	0 59	J	1.1		0.69	J	0.54	J	2 8		2.4		1.1		0.32	B	0 37	B
SELENIUM	5	50	180		UL		UL		UL		UL		UL		UL		UL	1.9	J		UL
SILVER	1	NS	180		UL		UL	0.087	B	0 040	B		UL		UL		UL		UL		UL
THALLIUM	1	2	2.4																		
VANADIUM	5	NS	180	0 59	B	0.37	B	0.81	B	0.80	B	0.61	B	0.69	B	0.70	B	0.98	B	0 80	B
ZINC	2	NS	11,000	8 8		**3090**		8.3		10.2		4 0		3.9		60.2		3.0		5 8	
MOLYBDENUM	5	NS	180																		
BORON	50	NS	7,300	124		54 9		94.4		16.9	B	29.8	B	30 8	J	18.4	B	363		26.6	B

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analy ical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quan itation limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for his compound.

UL = Not detectected, quantita ion limit is probably higher.

Exceeds three times the background concentration

Exceeds MCL

Exceeds three times the background concentration and MCL.

Exceeds EPA screening level for tapwater.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6)		(b) (6)		(b) (6)		(b) (6)											
Sampling Location :				(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)											
Date Sampled :			EPA	8/26/2008		8/26/2008		8/26/2008		8/26/2008		8/26/2008		8/26/2008		8/26/2008		8/26/2008		8/26/2008	
Time Sampled :			Tapwater	09:18		09:15		10:26		10:50		11:33		11:26		11:26		13:16		17:18	
Units:			Screening	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000								UL		UL		UL		UL		UL		UL
ANTIMONY	2	6	15							0.37	B	0.99	B	0.21	J						
ARSENIC	1	10	0.045	**1.4**		**1.5**		**1.3**		**1.4**	B	**1.3**	B	**1.4**		**1.6**		**1.5**	B	**1.7**	
BARIUM	10	2000	7,300	4.7	B	21.4		1.8	J	1.7	B	11.4		1.5	J	1.3	B	10.2		1.8	B
BERYLLIUM	1	4	73									0.11	J								
CADMIUM	1	5	18																		
CHROMIUM	2	NS	11	0.61	B	0.49	B	0.49	B	0.81	J	1.4	J	1.0	J	1.0	J	0.96	J	1.1	J
COBALT	1	NS	11							0.20	B	0.21	B	0.14	J	0.11	B			0.17	B
COPPER	2	1300	1,500	8.1		95.6		0.60	J	2.6		246		8.4		63.3		24.4		123	
IRON	100	NS	26,000	194		4390		133		161		5750		148		164		6280		192	
LEAD	1	15	NS	0.95	J	10 8				0.22	B	6 2		0.77	J	6.1		4.5		**18.6**	
MAGNESIUM	0	NS	NS	27100		20200		13900		15400		16300		14700		14700		5310		19100	
MANGANESE	1	NS	880	9.7		219		6.0		5.5		231		3.6		4.3		152		4.3	
MERCURY	0.2	2	0.57		UL		UL		UL												
NICKEL	1	NS	730	0.49	B	1.2		0.34	J	0.74	B	1 2		0.63	J	1.2		0.58	B	1.3	
SELENIUM	5	50	180		UL		UL		UL		UL										UL
SILVER	1	NS	180		UL		UL		UL	0.063	B	0.083	B	0.040	J	0.037	B				UL
THALLIUM	1	2	2.4									0.11	J								
VANADIUM	5	NS	180	0.49	B	1.0	B	0.78	B	1.2	B	1.1	B	1.0	J	1.3	B	0.88	B	1.5	J
ZINC	2	NS	11,000	6.5		61.3		3.5		2.3		**552**		12 0		54.1		7.2		41.4	
MOLYBDENUM	5	NS	180																		
BORON	50	NS	7,300	284		44.2	J	115		146		19.7	J	144		146		26.4	J	207	

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quantita ion limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for this compound.

UL = Not detectected, quantitation limit is probably higher.

Exceeds hree times the background concentration ( )

Exceeds MCL

Exceeds hree times the background concentration and MCL.

Exceeds EPA screening level for tapwater.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6)		(b) (6)		(b) (6)		(b) (6)											
Sampling Loca ion :				(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)											
Date Sampled :			EPA	8/26/2008		8/26/2008		8/26/2008		8/26/2008		8/26/2008		8/27/2008		8/27/2008		8/27/2008		8/27/2008	
Time Sampled :			Tapwater	17:50		17:50		18:51		18:59		19:13		09:18		10:40		10 56		10:19	
Units:			Screening	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000		UL		UL		UL		UL										UL
ANTIMONY	2	6	15			0.21	B														
ARSENIC	1	10	0.045	**1.4**	B	**1.3**	B	**1.3**	B	**1.4**	B	**1.9**		**1.6**		**1.5**	B	**1.5**		**1.5**	B
BARIUM	10	2000	7,300	1.2	B	1.6	B	1.6	B	1 8	B	4.0	B	29.4		6.7	J	5.6	B	5.4	B
BERYLLIUM	1	4	73																		
CADMIUM	1	5	18			0.11	B	0.15	B	0.11	B									0.12	B
CHROMIUM	2	NS	11	0.71	B	0.74	B	0.76	B	0.76	B	0.96	J	0.88	B	0 83	B	0.87	B	0.79	B
COBALT	1	NS	11			0.13	B							0.11	B						
COPPER	2	1300	1,500	32.6		21.6		1.2	J	11.0		2.4		1.3	J	129		58.5		37.5	
IRON	100	NS	26,000	185		187		177		190		290		4800		763		835		804	
LEAD	1	15	NS	1.9		1.4		0.12	B	0.77	J	0.21	B	0.20	B	7.1		4.6		12.0	
MAGNESIUM	0	NS	NS	6710		6730		16900		16900		**45300**		**34600**		2720	J	2700	B	2430	J
MANGANESE	1	NS	880	6.6		6.7		7.6		8 5		5.0		200		44.6		47.2		46.6	
MERCURY	0.2	2	0.57																		
NICKEL	1	NS	730	0.63	J	0.65	B	0.45	B	0 51	B	0.47	B	0.55	B	1.5		1.1		0.85	B
SELENIUM	5	50	180		UL				UL		UL	3.6	J		UL		UL		UL		UL
SILVER	1	NS	180		UL	0.10	B	0.037	B	0.040	B		UL		UL		UL		UL		UL
THALLIUM	1	2	2.4																		
VANADIUM	5	NS	180	0.69	B	1.2	B	0.71	B	0.78	B	0.56	B	0.86	B	0.60	J	1.6	J	0.95	B
ZINC	2	NS	11,000	10.1		8.7		2.2		9 0		3.4		3.5		82.0		44.7		14.4	
MOLYBDENUM	5	NS	180																		UL
BORON	50	NS	7,300	51.4		56.7		131		122		**539**		114		14.0	J	18.3	J	18.3	J

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for this compound.

UL = Not detectected, quan itation limit is probably higher.

Exceeds three times the background concentration

Exceeds MCL

Exceeds three times the background concentration and MCL.

Exceeds EPA screening level for tapwater.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6)		(b) (6)		(b) (6)		(b) (6)											
Sampling Location :				(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)											
Date Sampled :			EPA	8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/26/2008		8/27/2008	
Time Sampled :			Tapwater	11:24		11:56		12:24		13:18		13:39		14:21		14 58		13:20		15:20	
Units:			Screening	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000		UL		UL														
ANTIMONY	2	6	15			0.23	B							0.40	B	1.1	B			0 22	B
ARSENIC	1	10	0.045	**1.6**		**1.5**		**1.6**		**1.4**	B	**1.7**		**1.7**		**1.8**		**1.6**		**1.7**	
BARIUM	10	2000	7,300	44.1		22 2		14.2		3.0	B	1 9	B	36 0		21.1		2.8	J	9 9	J
BERYLLIUM	1	4	73																	0.10	J
CADMIUM	1	5	18	0.13	B	0.16	B	0.10	B											0.10	B
CHROMIUM	2	NS	11	1 5	J	0.99	J	1.1	J	0.93	J	0 83	B	1.1	J	1.4	J	0.74	J	0.75	J
COBALT	1	NS	11																	**1.1**	
COPPER	2	1300	1,500	488		104		120		95.2		51.3		5.7		88.9		12.7		17.5	
IRON	100	NS	26,000	623		521		174		626		685		830		565		350		7640	
LEAD	1	15	NS	7.4		7.7		8.7		**17.9**		1.7		0.27	B	2.4		2.0		1 3	
MAGNESIUM	0	NS	NS	14900		8650		8130		3790	J	5030		9400		9000		3420	J	11800	
MANGANESE	1	NS	880	484		127		154		9.2		5 3		165		169		11.1		232	
MERCURY	0.2	2	0.57																UL		UL
NICKEL	1	NS	730	5 5		1.8		**138**		1.0		0 90	B	2.4		2.6		0.80	J	1.7	
SELENIUM	5	50	180		UL		UL		UL		UL		UL								
SILVER	1	NS	180		UL	0.097	B	0.063	B		UL		UL	0.037	B	0.083	B		UL	0.097	B
THALLIUM	1	2	2.4													0.12	B				
VANADIUM	5	NS	180	1.7	J	1.1	B	1.0	B	1.2	B	1.7	J	1.0	B	1.1	B	1.3	B	1 2	B
ZINC	2	NS	11,000	375		101		223		17.3		11.7		61.7		24.6		12.4		13.8	
MOLYBDENUM	5	NS	180		UL		UL		UL		UL		UL		UL		UL				
BORON	50	NS	7,300	160		26.6	J	24.6	J	45.7	J	111	J	20.1	J	95.4	J	46.8	J	11.7	J

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analy ical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quan itation limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for his compound.

UL = Not detectected, quantita ion limit is probably higher.

Exceeds three times the background concentration

Exceeds MCL

Exceeds three times the background concentration and MCL.

Exceeds EPA screening level for tapwater.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6) (b) (6)(b) (6)		(b) (6) (b) (6)(b) (6)		(b) (6) (b) (6)(b) (6)		(b) (6) (b) (6)(b) (6)											
Sampling Loca ion :																					
Date Sampled :			EPA	8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/27/2008		8/25/2008		8/29/2008	
Time Sampled :			Tapwater	16:39		17:07		17:15		18:18		19:30		19:20		19:15		19:15		10:12	
Units:			Screening	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000																		
ANTIMONY	2	6	15																		
ARSENIC	1	10	0.045	**1.5**		**1.3**		**1.3**		**1.4**		**1.5**		**1.4**		**1.4**		**1.3**		**1.5**	
BARIUM	10	2000	7,300	1.7	J	9.3	J	1.6	J	1 9	J	5.6	J	1.7	J	1.4	J	1 5	J	1.1	J
BERYLLIUM	1	4	73																		
CADMIUM	1	5	18			0.10	B					0.26	J			0.10	B				
CHROMIUM	2	NS	11	0.64	J	0.74	J	0.67	J	0.64	J	0.72	J	1.1	J	0.57	J	0 52	B	0.57	J
COBALT	1	NS	11	0.11	J	0.33	J							0.12	J						
COPPER	2	1300	1,500	10.3		76.0		10.1		6.4		80 5		2.1		97.1		9 3		22 5	
IRON	100	NS	26,000	767		5850		550		150		349		305		322		343		157	
LEAD	1	15	NS	0.20	J	6.0		0.54	J	2 0		6.3		0.22	J	**18.9**		0.49	J	1.9	
MAGNESIUM	0	NS	NS	3160	J	1400	J	3010	J	20000		4140	J	3620	J	4330	J	3590	J	14600	
MANGANESE	1	NS	880	6.9		112		5.9		8.4		11.1		10.2		9.4		9.4		4.3	
MERCURY	0.2	2	0.57				UL		UL		UL		UL		UL		UL		UL		UL
NICKEL	1	NS	730	0.68	J	0.47	J	0.78	J	0 89	J	1.7		0.55	J	1.1		0 54	J	0.67	J
SELENIUM	5	50	180				UL		UL		UL		UL		UL		UL				
SILVER	1	NS	180	0 043	J							0.040	B						UL		UL
THALLIUM	1	2	2.4																		
VANADIUM	5	NS	180	1.2	J	1.5	B	1.1	B	0.63	B	1.2	B	1.3	J	1.1	B	0 90	J	0.69	B
ZINC	2	NS	11,000	2.6		42.3		3.4		7 3		71 5		3.3		66.5		11.6		28.1	
MOLYBDENUM	5	NS	180																UL		
BORON	50	NS	7,300	46.5	J		UL	31.5	J	150		41.6	J	12.4	J	18.9	J	14.5	J	108	J

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for this compound.

UL = Not detectected, quan itation limit is probably higher.

Exceeds three times the background concentration ( )

Exceeds MCL

Exceeds three times the background concentration and MCL.

Exceeds EPA screening level for tapwater.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6)		(b) (6)		(b) (6)											
Sampling Location :				(b) (6)(b) (6)		(b) (6)(b) (6)		(b) (6)(b) (6)											
Date Sampled :			EPA	8/28/2008		8/28/2008		8/26/2008		8/27/2008		8/27/2008		8/28/2008		8/28/2008		8/28/2008	
Time Sampled :			Tapwater	17:47		09:17		10:13		15:41		16:13		09:45		10:23		10:29	
Units:			Screening	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000					17.9	J										
ANTIMONY	2	6	15															0.44	B
ARSENIC	1	10	0.045	**1.6**		**1.4**		**2.6**		**1.5**		**1.5**		**1.6**		**1.6**		**1.6**	
BARIUM	10	2000	7,300	1.7	J	15.0		59.0		33.0		0.50	J	47.8		30.9		27.9	
BERYLLIUM	1	4	73					0.51	J										
CADMIUM	1	5	18			0.12	B	0.16	B									0.16	J
CHROMIUM	2	NS	11	0.65	J	0 52	B	0.99	J	0.69	J	0.75	J	0.63	J	0.71	J	0.76	B
COBALT	1	NS	11	0.12	J			**8.7**				0.11	J						
COPPER	2	1300	1,500	39.5		87.9		55.3		15.6		148		16.4		24.3		48.4	
IRON	100	NS	26,000	240		1150				4930		40.1	J	950		1140		778	
LEAD	1	15	NS	2.2		7 2		12.2		0.67	J	11.8		1.0		2.1		1.9	
MAGNESIUM	0	NS	NS	16400		4960	J			26600				10200		7910		8380	
MANGANESE	1	NS	880	4.4		144		102		178		2.4		238		166		120	
MERCURY	0.2	2	0 57		UL		UL		UL		UL		UL						UL
NICKEL	1	NS	730	0.62	J	1 3		**8.0**		0.66	J	0.82	J	2.2		2.8		3.6	
SELENIUM	5	50	180		UL		UL				UL		UL						UL
SILVER	1	NS	180	0 087	B	0.043	B		UL		UL		UL					0.070	B
THALLIUM	1	2	2.4																
VANADIUM	5	NS	180	1.0	J	1 2	B	2.4	J	0.76	B	0.75	B	0 87	J	1.2	J	1.4	J
ZINC	2	NS	11,000	30.2		73.2		40.0		18.4		16.9		8.4		38.7		31.2	
MOLYBDENUM	5	NS	180		UL		UL		UL		UL		UL						
BORON	50	NS	7,300	145	J				UL	32.3	J		UL	321		**596**		380	

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for this compound.

UL = Not detectected, quantitation limit is probably higher.

Exceeds three times the background concentration (

Exceeds MCL

Exceeds three times the background concentration and MCL.

Exceeds EPA screening level for tapwater.

TABLE 6
METALS ANALYTICAL RESULTS
RESIDENTIAL WELL SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

Sample Number :				(b) (6)		(b) (6)					
Sampling Location :				(b) (6)(b) (6)		(b) (6)(b) (6)					
Date Sampled :			EPA	8/29/2008		8/29/2008		8/28/2008		8/29/2008	
Time Sampled :			Tapwater	11:19		11:30		11:13		11:19	
Units:			Screening	µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	MCL	Level*	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NS	37,000								
ANT MONY	2	6	15	0.23	B	0.22	B			1.2	J
ARSENIC	1	10	0.045	**1.6**		**1.5**		**1.4**	B	**1.4**	
BARIUM	10	2000	7,300	77.0		84.1		14.0		77 9	
BERYLLIUM	1	4	73			0.11	J				
CADMIUM	1	5	18							0.13	J
CHROMIUM	2	NS	11	0.74	B	0.90	J	1 9	J	0.82	J
COBALT	1	NS	11					0.14	B	0.14	B
COPPER	2	1300	1,500	327		133		54.4		441	
IRON	100	NS	26,000	223		5740		**17300**		1230	
LEAD	1	15	NS	1.9		8.4		6.4		10 3	
MAGNESIUM	#REF!	NS	NS	11000		9130		22600		11000	
MANGANESE	1	NS	880	247		213		261		257	
MERCURY	0.2	2	0.57		UL		UL		UL		UL
NICKEL	1	NS	730	1.1		2.0		1.1		1.1	
SELENIUM	5	50	180		UL		UL				UL
SILVER	1	NS	180	0.050	B	0.047	B	0.040	B	0.067	B
THALLIUM	1	2	2.4							0.11	B
VANADIUM	5	NS	180	0.99	B	1.3	J	1 2	J	0.64	B
ZINC	2	NS	11,000	16.8		140		1360		17.4	
MOLYBDENUM	5	NS	180								
BORON	50	NS	7,300	107		137		4.4	J	108	

Notes:

* = Regional Screening Level Table Master April 2009

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

Dup. = Duplicate sample

µg/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte Present. Reported value may not be accurate or precise.

NS = No MCL/screening level established for this compound.

UL = Not detectected, quantitation limit is probably higher.

Exceeds three times the background concentration

Exceeds MCL

Exceeds three times the background concentration and MC

Exceeds EPA screening level for tapwater.

TABLE 7
METALS ANALYTICAL RESULTS
SURFACE WATER SAMPLES - AUGUST 2008
BATTLEFIELD GOLF CLUB SITE

		TOTAL		TOTAL		TOTAL		DISSOLVED		DISSOLVED		DISSOLVED	
Sample Number :		MC02B8		MC02B9		MC02L5		MC1GG8		MC1GG9		MC1GH13	
Sampling Location :		BG08-SW-SW01		BG08-SW-SW02		BG08-SW-SW02S		BG08-SW-SW01		BG08-SW-SW02		BG08-SW-SW02S	
Date Sampled :		8/29/2008		8/29/2008		8/29/2008		8/29/2008		8/29/2008		8/29/2008	
Time Sampled :		12:51		15:40		15:40		12:51		15:40		15:40	
Units:		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	403		630		622		319		478		531	
ANTIMONY	60							5.9	J				
ARSENIC	10												
BARIUM	200	30.0	J	37.9	J			33.3	J	40.6	J		
BERYLLIUM	5	0.59	J	0.55	J			0.52	J	0.50	J		
CADMIUM	5												
CALCIUM	5000	19300		24900		25900		18400		23300		24600	
CHROMIUM	10												
COBALT	50	5.6	J	9.2	J			4.8	J	8.2	J		
COPPER	25												
IRON	100	996		1140	B	422		665	B	254	B	265	
LEAD	10	4.8	J	1.4	J								
MAGNESIUM	5000	7250		8530		8940		6520		7510		8590	
MANGANESE	15	360		358		378		346		339		363	
MERCURY	0.2												
NICKEL	40	3.6	J	4.9	J	15.2	J	11.3	J	13.1	J	14.6	J
POTASSIUM	5000	2620	J	4680	J	4990	J	2700	J	4610	J	4740	J
SELENIUM	35												
SILVER	10												
SODIUM	5000	14600		23400		25900		15700		24400		24700	
THALLIUM	25												
VANADIUM	60				UL								
ZINC	60	24.7	J	26.0	J	28.0	J	22.1	J	22.8	J	27.4	J
MOLYBDENUM	5				UL								
BORON	50	25.6	J	22.1	J	39.9	J	34.8	B	30.9	B	38.2	J

Notes:

Empty cell indicates compound not reported.

Flag indicates analytical data qualifier

µg/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte Present. Reported value may not be accurate or precise.

UL = Not detectected, quantitation limit is probably higher.

TABLE 8
METALS ANALYTICAL RESULTS
SURFACE WATER - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC01C9		MC01C3		MC01D4		MC01D5		MC01D6		MC01D7		MC01D8	
Sampling Loca ion :				BG0909-SW-015		BG0909-SW-01		BG0909-SW-02		BG0909-SW-03		BG0909-SW-04		BG0909-SW-05		BG0909-SW-06	
Matrix :				Background Water		Water		Water		Water		Water		Water		Water	
Units :			EPA*	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :			Freshwater	9/10/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009	
Dilution Factor :			Screening	1.0		1.0		1 0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	MCL	Criteria	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NA	87	80.2	J			**520**				**898**		**122**	J	**141**	J
ANTIMONY	60	6 0	30														
ARSENIC	10	10	5											3.8	J		
BARIUM	200	2000	4			**63.5**	J	**75.0**	J								
BERYLLIUM	5	4 0	66														
BORON	7		NA	31.1		44.0		38.1		40.4		24.9		45.0		41.1	
CADMIUM	5	5 0	0 25														
CALCIUM	5000	NA	NA	17200		26600		34400		19200		10600		17300		16300	
CHROMIUM	10	NA	85														
COBALT	50	NA	23														
COPPER	25	1300	9														
IRON	100	NA	300	**665**		**416**		**1360**		284		123		**772**		**663**	
LEAD	10	15.0	2.5														
MAGNESIUM	5000	NA	82000	6660		4980	J	7370		4690	J	3580	J	4300	J	3940	J
MANGANESE	15	NA	120	**256**		52.5		**235**		16.1		10.9	J	50.4		46.1	
MERCURY	0.2	2 0	0 026														
NICKEL	40	NA	52														
SELENIUM	35	50.0	1														
SILVER	10	NA	3.2														
THALLIUM	25	2 0	0.8														
VANADIUM	50	NA	20														
ZINC	60	NA	120														

Notes:

* =Screening benchmark established by EPA Region 3 for freshwater.

Empty cell indicated substance not reported above detection limit.

Flag indicates analytical data qualifier

ug/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte present. Reported value may not be accurate or precise.

NA = Not applicable, screening criteria not established for this substance

Exceeds three times he background concentration

Exceeds screening criteria

Exceeds three times he background concentration and screening criteria

TABLE 8
METALS ANALYTICAL RESULTS
SURFACE WATER - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC01C9		MC01E9		MC01E0		MC01C4		MC01C5		MC01C6	
Sampling Loca ion :				BG0909-SW-015		BG0909-SW-07		BG0909-SW-08		BG0909-SW-010		BG0909-SW-011		BG0909-SW-012	
Matrix :				Background Water		Water		Water		Water		Water		Water	
Units :			EPA*	ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :			Freshwater	9/10/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009	
Dilution Factor :			Screening	1.0		1.0		1 0		1.0		1.0		1.0	
ANALYTE	CRQL	MCL	Criteria	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NA	87	80.2	J	**755**		**214**		**335**		**336**		**234**	
ANTIMONY	60	6 0	30												
ARSENIC	10	10	5												
BARIUM	200	2000	4												
BERYLLIUM	5	4 0	66												
BORON	7		NA	31.1		473		35.5		31.1		43.4		26.8	
CADMIUM	5	5 0	0 25												
CALCIUM	5000	NA	NA	17200		11700		12900		4690	J	3090	J	12100	
CHROMIUM	10	NA	85												
COBALT	50	NA	23												
COPPER	25	1300	9												
IRON	100	NA	300	**665**		**785**		**345**		**326**		**439**		**312**	
LEAD	10	15.0	2.5			**4.8**	J								
MAGNESIUM	5000	NA	82000	6660		2020	J	4440	J					2150	J
MANGANESE	15	NA	120	**256**		53.5		21.6		11.8	J	8.0	J	32.7	
MERCURY	0.2	2 0	0 026												
NICKEL	40	NA	52												
SELENIUM	35	50.0	1												
SILVER	10	NA	3.2												
THALLIUM	25	2 0	0.8												
VANADIUM	50	NA	20												
ZINC	60	NA	120												

Notes:

* =Screening benchmark established by EPA Region 3 for freshwater.

Empty cell indicated substance not reported above detection limit.

Flag indicates analytical data qualifier

ug/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte present. Reported value may not be accurate or precise.

NA = Not applicable, screening criteria not established for this substance

Exceeds three times he background concentration

Exceeds screening criteria

Exceeds three times he background concentration and screening criteria

TABLE 9
METALS ANALYTICAL RESULTS
POND SEDIMENT SAMPLES - SEPTEMBER 2009
BATTELFIELD GOLF CLUB SITE

Sample Number :			MC01A5		MC01A1		MC01B0		MC01B1		MC01B2		MC01B3		MC01B4	
Sampling Location : (Prefix : BG0909-)			SED-015		SED-01		SED-02		SED-03		SED-04		SED-05		SED-06	
Field QC :			Background										Dup. of MC01B4		Dup. of MC01B3	
Matrix :			Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009	
Time Sampled :		EPA Region 3*	16:18		13:14		13:22		13:33		13:45		14:48		14:50	
%Solids :		Sediment Screening	69.3		75.0		76.3		76.2		79.2		71.3		72.0	
Dilution Factor :		Criteria	1.0		1.0		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRDL	mg/kg	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	NA	11800		7370		1970		6330		4570		9800		10300	
ANTIMONY	6	2														
ARSENIC	1	9.8	1.2	J	**8.2**		0.54	J	**3.9**		0.88	J	1.9		1.6	
BARIUM	20	NA	37.2		29.0		10.7	J	44.9		35.8		67.9		76.3	
BERYLLIUM	0.5	NA	0.23	J	0.35	J			0.39	J	0.26	J	0.70		0.77	
BORON	5.0															
CADMIUM	0.5	0.99														
CHROMIUM	1	43.4	10.5		12.5		3.3		9.1		8.3		13.8		16.0	
COBALT	5	50														
COPPER	2.5	31.6	2.6	J	5.5				4.7		1.8	J	1.3	J	2.0	J
IRON	10	20000	1830		2760		4120		3570		4050		**14100**		**15300**	
*LEAD	1	35.8	8.0		10.1		1.9		6.8		3.6		6.8		7.1	
MAGNESIUM	500	NA	249	J	393	J			481	J	509	J	494	J	593	J
MANGANESE	1.5	460	6.4		19.9		4.7		18.9		10.8		9.5		10.4	
MERCURY	0.1	0.18	0.054	J	0.053	J			0.042	J						
NICKEL	4	22.7	3.9	J	2.9	J			4.1	J	2.9	J	4.6	J	5.3	J
SELENIUM	3.5	2														
SILVER	1	1														
THALLIUM	2.5	NA														
VANADIUM	5	NA	9.4		12.5		6.1	J	11.5		10.3		18.5		20.4	
ZINC	6	121	4.8	J	7.0	J			12.4		12.4		4.6	J	5.6	J

Notes:

* =Screening benchmark established by EPA Region 3 for freshwater.

Empty cell indicated substance not reported above detection limit.

Flag indicates analytical data qualifier

ug/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte present. Reported value may not be accurate or precise.

NA = Not applicable, screening criteria not established for this substance

Shaded cell indicates level exceeds three times the background.

TABLE 9
METALS ANALYTICAL RESULTS
POND SEDIMENT SAMPLES - SEPTEMBER 2009
BATTELFIELD GOLF CLUB SITE

Sample Number :			MC01A5		MC01E8		MC01B6		MC01B7		MC01A2		MC01A3		MC01A4	
Sampling Location : (Prefix : BG0909-)			SED-015		SED-07		SED-08		SED-09		SED-010		SED-011		SED-012	
Field QC :			Background													
Matrix :			Soil		Soil		Soil		Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009	
Time Sampled :		EPA Region 3	16:18		14:57		15:14		15:21		15:32		15:40		15:51	
%Solids :		Sediment Screening	69.3		80.6		79.1		69.9		75.7		76.5		61.2	
Dilution Factor :		Criteria*	1.0		1.0		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	mg/kg	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	NA	11800		4790		8110		5900		8240		8610		6890	
ANTIMONY	6	2														
ARSENIC	1	9.8	1.2	J	1.4		2.5		1.7				2.1		3.5	
BARIUM	20	NA	37.2		32.4		48.1		39.8		62.9		66.9		58.0	
BERYLLIUM	0.5	NA	0.23	J	0.28	J	0.38	J	0.30	J	0.37	J	0.47	J	0.57	J
BORON	5.0															
CADMIUM	0.5	0.99														
CHROMIUM	1	43.4	10.5		10.7		16.5		11.9		12.6		17.4		13.2	
COBALT	5	50					2.5	J					2.8	J		
COPPER	2.5	31.6	2.6	J	2.1	J	3.5		3.4	J			3.7		5.0	
IRON	10	20000	1830		**6350**		**8290**		**5580**		**6380**		**11100**		**5450**	
*LEAD	1	35.8	8.0		3.4		4.9		4.7		5.1		4.9		11.9	
MAGNESIUM	500	NA	249	J	488	J	858		548	J	440	J	1070		595	J
MANGANESE	1.5	460	6.4		10.7		**21.0**		16.9		9.5		21.3		27.1	
MERCURY	0.1	0.18	0.054	J												
NICKEL	4	22.7	3.9	J	2.8	J	5.6		4.0	J	3.8	J	6.8		3.8	J
SELENIUM	3.5	2														
SILVER	1	1														
THALLIUM	2.5	NA														
VANADIUM	5	NA	9.4		12.2		18.1		14.3		13.1		21.1		14.5	
ZINC	6	121	4.8	J	5.4	J	11.5		9.1		4.3	J	12.0		13.5	

Notes:

* =Screening benchmark established by EPA Region 3 for freshwater.

Empty cell indicated substance not reported above detection limit.

Flag indicates analytical data qualifier

mg/kg = milligrams per kilogram

CRQL = Contract required quantitation limit

J = Analyte present. Reported value may not be accurate or precise.

NA = Not applicable, screening criteria not established for this substance

Shaded cell indicates level exceeds three times the background.

TABLE 10
METALS ANALYTICAL RESULTS
POND SURFACE WATER SAMPLES - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :				MC01D1		MC01D3		MC01C7		MC01C8		MC01D0		MC01D2	
Sampling Location :				BG0909-SW-017		BG0909-SW019		BG0909-SW-013		BG0909-SW-014		BG0909-SW-016		BG0909-SW-018	
Matrix :				Background Water		Background Water		Water		Water		Water		Water	
Units :				ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :				9/10/2009		9/10/2009		9/10/2009		9/10/2009		9/10/2009		9/10/2009	
Dilution Factor :				1.0		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	MCL	EPA Freshwater Screening Criteria*	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	NA	87	**204**		**264**		**143**	J	**228**		**225**		**316**	
ANTIMONY	60	6.0	30												
ARSENIC	10	10	5												
BARIUM	200	2000	4												
BERYLLIUM	5	4.0	66												
BORON	7		NA	29.2		9.8	L	30.9		28.2		30.3		10.5	
CADMIUM	5	5.0	0.25												
CALCIUM	5000	NA	NA	20100		6840		18800		18100		20400		6850	
CHROMIUM	10	NA	85												
COBALT	50	NA	23												
COPPER	25	1300	9												
IRON	100	NA	300	**1360**		**515**		**1120**		**2030**		**1700**		**551**	
LEAD	10	15.0	2.5												
MAGNESIUM	5000	NA	82000	6610		2190	J	6700		6040		6840		2230	J
MANGANESE	15	NA	120	**250**		38.5		**323**		**234**		**256**		52.6	
MERCURY	0.2	2.0	0.026		UL		UL		UL		UL		UL		UL
NICKEL	40	NA	52												
SELENIUM	35	50.0	1												
SILVER	10	NA	3.2												
THALLIUM	25	2.0	0.8												
VANADIUM	50	NA	20												
ZINC	60	NA	120												

Notes:

* =Screening benchmark established by EPA Region 3 for freshwater.

Empty cell indicated substance not reported above detection limit.

Flag indicates analytical data qualifier

ug/L = Micrograms per liter

CRQL = Contract required quantitation limit

J = Analyte present. Reported value may not be accurate or precise.

NA = Not applicable, screening criteria not established for this substance

Exceeds screening criteria but is not 3X highest background.

TABLE 11
METALS ANALYTICAL RESULTS
STREAM SEDIMENTS - SEPTEMBER 2009
BATTLEFIELD GOLF CLUB SITE

Sample Number :			MC01A7		MC01A9		MC01A6		MC01A8	
Sampling Location : (Prefix : BG0909-)			SED-017		SED-019		SED-016		SED-018	
Sample Location			Background		Background		Stream		Stream	
Matrix :			Soil		Soil		Soil		Soil	
Units :			mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :			9/10/2009		9/10/2009		9/10/2009		9/10/2009	
Time Sampled :		EPA Region 3*	17:32		18:36		17:04		18:31	
%Solids :		Sediment Screening	68.6		47.2		75.7		67.4	
Dilution Factor :		Criteria	1.0		1.0		1.0		1.0	
ANALYTE	CRDL	mg/kg	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	NA	7330		10400		766		3580	
ANTIMONY	6	2								
ARSENIC	1	9.8	2.3		2.1		1.3		0.69	J
BARIUM	20	NA	36.0		79.6				27.5	J
BERYLLIUM	0.5	NA	0.43	J	0.65	J				
BORON	5.0	NA								
CADMIUM	0.5	0.99								
CHROMIUM	1	43.4	15.9		14.1		1.6		4.9	
COBALT	5	50	3.8	J						
COPPER	2.5	31.6	5.9		7.2				2.1	J
IRON	10	20000	11500		7760		3930		2250	
*LEAD	1	35.8	6.0		16.5		1.0	J	5.5	
MAGNESIUM	500	NA	1280		883	J			267	J
MANGANESE	1.5	460	36.5		27.3		5.0		10.8	
MERCURY	0.1	0.18								
NICKEL	4	22.7	8.7		7.3	J			2.2	J
SELENIUM	3.5	2								
SILVER	1	1								
THALLIUM	2.5	NA								
VANADIUM	5	NA	18.9		16.4		2.3	J	5.9	J
ZINC	6	121	22.4		27.2				7.7	J

Notes:

* =Screening benchmark established by

Shaded cell indicates compound reported above screening criteria.

Empty cell indicated substance not reported above detection limit.

Flag indicates analytical data qualifier

mg/kg = milligrams per kilogram

CRQL = Contract required quantitation limit

J = Analyte present. Reported value may not be accurate or precise.

NA = Not applicable, screening criteria not established for this substance

ATTACHMENT

VALIDATED ANALYTICAL DATA PACKAGES

AUGUST/SEPTEMBER 2009

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : September 30, 2008

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Christine Wagner
Regional Project Manager (3HS32)

Attached is the inorganic data validation report for the Battlefield Gulf Club site (Case # 37813 SDG #MC1GF1) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TETRA TECH EMI)

TO File #: 0014 TDF#: 0995

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN
We never forget who we're working for™

Date: September 30, 2008

Subject: Inorganic Data Validation (IM2 Level)
Case: 37813
SDG : MC1GF1
Site : Battlefield Golf Club

From: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

To: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 37813, Sample Delivery Group (SDG) MC1GF1, consisted of seventeen (17) aqueous samples analyzed for aluminum (Al), calcium (Ca), iron (Fe), magnesium (Mg), potassium (K), sodium (Na) and mercury (Hg). In addition, boron (B) and molybdenum (Mo) were analyzed per modification reference number 1629.0. The sample set included one (1) field duplicate pair. Samples were analyzed by ChemTech Consulting Group (CHEM) according to the Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 through the Routine Analytical Services (RAS) program.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Data in this case have been impacted by outliers present in the laboratory blanks, matrix spike and ICP serial dilution analyses. Details of these outliers are discussed under "Major and Minor Problems," specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MAJOR PROBLEM

Matrix spike recoveries were extremely low (<30%) for B and Mo. Low recoveries may be attributed to matrix interferences or analyte lost during the digestion process. The "L" qualifier for positive results for these analytes in affected samples has been superseded by "J" on the DSFs. Quantitation limits for Mo in affected samples may be biased low and has been rejected and qualified "R" on the DSFs.

MINOR PROBLEMS

The Preparation (PB) blank had a reported result greater than the Method Detection Limit (MDL) for Hg. A positive result for this analyte in sample MC1GF3 which is less than or equal to five times (≤5X) the blank concentration may be biased high and has been qualified "B" on the DSFs.

A CCB had a negative result greater than the absolute value of the MDL for Hg. The quantitation limits for this analyte in affected samples may be biased low and have been qualified "UL" on the DSFs.

The percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) for Na. Positive results for this analyte in all samples are estimated due to possible matrix interferences and has been qualified "J" on the DSFs.

NOTES

Results for field duplicate pair MC1GG5/MC1GG6 were comparable.

The post digestion spike analysis reported recoveries of 44% and 93% for B and Mo, respectively: however, data are not qualified based on the post-digestion spike recovery.

The laboratory received samples labeled for dissolved metals without being scheduled for this analysis. Furthermore, the laboratory received samples that have the same sample IDs for the total and dissolved metals fractions. Per Region III, samples listed as groundwater on the COC are to be filtered and analyzed for dissolved metals. The Sample Management Office (SMO) has assigned new sample IDs for the dissolved fraction.

Reported results between MDLs and Contract Required Quantitation Limits (CRQLs) were qualified "J" on the DSFs.

Data for Case 37813, SDG MC1GF1, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

Table 1A	Summary of qualifiers on data summary forms after data validation
Table 1B	Codes used in comments column of Table 1A
Appendix A	Glossary of Data Qualifier Codes
Appendix B	Data Summary Form(s)
Appendix C	Chain of Custody Records
Appendix D	Laboratory Case Narrative

DCN: 37813_MC1GF1

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 37813, SDG MC1GF1

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Hg	MC1GF3	B		High	PB (0.159 J ug/L)
	MC1GG5, MC1GG6, MC1GG7		UL	Low	CBN (-0.110 J ug/L)
Na	All samples	J			ISD (17%)
Mo	MC1GF1, MC1GG2	J			>MDL<CRQL MSE (0%)
	All samples except MC1GF1, MC1GG2		R	Extremely low	MSE (0%)
B	All samples	J			>MDL<CRQL MSE (1%)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

PB	=	Preparation blank had result > MDL [result is in parenthesis]. Positive results which are ≤5X the blank concentration may be biased high.
CBN	=	Continuing calibration blanks had negative results with absolute values > MDL [results are in parenthesis]. The quantitation limit may be biased low.
ISD	=	Percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) [%D is in parenthesis]. Positive results are estimated.
>MDL<CRQL	=	Reported results are greater than MDLs but less than CRQLs and are considered estimated.
MSE	=	Matrix Spike recoveries were extremely low (<30%) [percent recoveries are in parenthesis]. Positive results may be biased low. Quantitation limits are rejected.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION

(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

CODES RELATED TO QUANTITATION

(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

Case #: 37813
SDG : MC1GF1
Number of Soil Samples : 0
Site : BATTLEFIELD GOLF CLUB
Number of Water Samples : 17
Lab. : CHEM

Dissolved Metals

Sample Number :		MC1GF1		MC1GF2		MC1GF3		MC1GF4		MC1GF5	
Sampling Location :		BG08-GW-MP01		BG08-GW-MP02		BG08-GW-MP03		BG08-GW-MP04		BG08-GW-MP05	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		8/28/2008		8/29/2008		8/29/2008		8/28/2008		8/28/2008	
Time Sampled :		12:40		11:15		10:00		14:06		15:50	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200							23.6	J		
BORON	50	27.0	J	17.9	J	20.8	J	19.8	J	26.1	J
CALCIUM	5000	27800		30400		64000		20700		42600	
IRON	100	7430		7460		7440		9790		11700	
MAGNESIUM	5000	5880		11500		34700		3860	J	9630	
MOLYBDENUM	5	1.8	J		R		R		R		R
MERCURY	0.2					0.099	B				
POTASSIUM	5000	5780		1750	J	4270	J	4420	J	6400	
SODIUM	5000	19500	J	12100	J	21900	J	9660	J	13400	J

Sample Number :		MC1GF6		MC1GF7		MC1GF8		MC1GF9		MC1GG0	
Sampling Location :		BG08-GW-MP06		BG08-GW-MP07		BG08-GW-MP08		BG08-GW-MP09		BG08-GW-MP10	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		8/28/2008		8/28/2008		8/29/2008		8/29/2008		8/29/2008	
Time Sampled :		17:47		18:10		09:10		10:50		11:50	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200			48.3	J	73.5	J	95.3	J		
BORON	50	16.0	J	38.7	J	48.8	J	20.3	J	6.8	J
CALCIUM	5000	61200		66700		49200		22000		39100	
IRON	100	15700		39300		12700		8500		6190	
MAGNESIUM	5000	38000		18200		13800		18500		11900	
MOLYBDENUM	5		R		R		R		R		R
MERCURY	0.2										
POTASSIUM	5000	2940	J	1570	J	2540	J	1430	J	1030	J
SODIUM	5000	28200	J	8730	J	12200	J	19200	J	10700	J

CRQL = Contract Required Quantitation Limit
*Action Level Exists
SEE NARRATIVE FOR CODE DEFINITIONS
To calculate sample quantitation limits: (CRQL * Dilution Factor)
Revised 09/99

Case #: 37813 SDG : MC1GF1
Site : BATTLEFIELD GOLF CLUB
Lab. : CHEM

Dissolved Metals

Sample Number :		MC1GG1		MC1GG2		MC1GG3		MC1GG4		MC1GG5	
Sampling Location :		BG08-GW-MP11		BG08-GW-MP12		BG08-GW-MP13		BG08-GW-MW01		BG08-GW-MW02	
Field QC :										Dup. of MC1GG6	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		8/28/2008		8/28/2008		8/28/2008		8/28/2008		8/29/2008	
Time Sampled :		13:48		13:05		13:25		15:55		13:50	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	84.1	J					28.8	J		
BORON	50	35.1	J	64.0		43.1	J	10.3	J	28.6	J
CALCIUM	5000	19900		36200		32800		22600		65600	
IRON	100	13100		5490		12700		4360		4660	
MAGNESIUM	5000	4130	J	5700		4570	J	14600		19300	
MOLYBDENUM	5		R	1.4	J		R		R		R
MERCURY	0.2										UL
POTASSIUM	5000	4490	J	8180		5990		997	J	1460	J
SODIUM	5000	12000	J	35600	J	20900	J	12800	J	30200	J

Sample Number :		MC1GG6		MC1GG7							
Sampling Location :		BG08-GW-MW02D		BG08-GW-MW03							
Field QC :		Dup. of MC1GG5									
Matrix :		Water		Water							
Units :		ug/L		ug/L							
Date Sampled :		8/29/2008		8/29/2008							
Time Sampled :		13:50		14:50							
Dilution Factor :		1.0		1.0							
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200										
BORON	50	29.0	J	22.4	J						
CALCIUM	5000	69600		56000							
IRON	100	4820		6970							
MAGNESIUM	5000	20500		18100							
MOLYBDENUM	5		R		R						
MERCURY	0.2		UL		UL						
POTASSIUM	5000	1460	J	2120	J						
SODIUM	5000	31800	J	23600	J						

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS
To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Appendix C

Chain of Custody Records

U.S. EPA Region III Analytical Request Form

ASQAB USE ONLY		
RAS#	CT4353	Analytical TAT
DAS#		14
NSF#		

Date: 8/21/2008	Site Activity: **Removal Assessment**			
Site Name: **Battlefield Golf Club**		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2008T03 N 302DC6C A3LM RS00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☐ No ☒ Yes	Title: Battlefield Golf Club Fly Ash Assessment SAP		Date Approved: 8/20/2008	
EPA Project Leader: CHRIS WAGNER	Phone#:	Cell Phone #: 804-337-3049	E-mail: Wagner.Christine@epa.gov	
Request Preparer: JOSHUA COPE	Phone#: 610-364-2130	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: ERIK ARMISTEAD	Phone#: 610-364-2151	Cell Phone #: 267 446 2837	E-mail: Erik.armistead@ttemi.com	
Contractor: Tetra Tech EM Inc	EPA CO/PO: Lorrie Murray/Karen Wodarczyk			
#Samples 30-35	Matrix: soil	Parameter: TAL Metals + Boron + Molybdenum + Hg CHEM	Method: ILM05.4 ICPAES+Hg	
#Samples 20-25	Matrix: groundwater	Parameter: TAL Metals + Boron + Molybdenum + Hg	Method: ILM05.4 ICPAES+Hg	
#Samples 90-110	Matrix: potable water	Parameter: TAL metals Low(w/o Al,Ca,Fe,K,Mg,Na)&B,Mo,Hg	Method: ILM05.4 ICPMS & Hg	
#Samples 90-110	Matrix: potable water	Parameter: Al, Ca, Fe, K, Mg, Na	Method: ILM05.4 ICPAES	
#Samples 20-25	Matrix: groundwater	Parameter: TAL metals Low(w/o Al,Ca,Fe,K,Mg,Na)&B,Mo,Hg	Method: ILM05.4 ICPMS & Hg	
#Samples 20-25	Matrix: groundwater	Parameter: Al, Ca, Fe, K, Mg, Na	Method: ILM05.4 ICPAES	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
Ship Date From: 8/29/2008	Ship Date To: 9/3/2008	Org. Validation Level	Inorg. Validation Level IM2	

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☐ 24hrs ☐ 48hrs ☐ 72hrs ☐ 7days ☒ Other (Specify) 14 days

Validated Data Package Due: ☐ 14 days ☐ 21 days ☒ **30days** ☐ 42 days ☐ Other (Specify)

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: See attached DLs.

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: ~~37874~~ 37813 R
DAS No:

Region:	3	Date Shipped:	9/2/2008
Project Code:	CT4354	Carrier Name:	FedEx
Account Code:		Airbill:	961942977974,
CERCLIS ID:	VAN000306614	Shipped to:	ChemTech Consulting Group (CHEMED) 284 Sheffield Street Mountainside NJ 07092 (908) 789-8900
Spill ID:	ALM		
Site Name/State:	Battlefield Golf/VA		
Project Leader:	Erik Armistead		
Action:	Preliminary Assessment		
Sampling Co:	Tetra Tech EM Inc.		

Chain of Custody Record

Sampler Signature: Erik Armistead

Relinquished By	(Date / Time)	Received By	(Date / Time)
1 Erik Armistead	9/2/08 1700		
2.			
3.			
4.			

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC02A1 MC1G-F1	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	777 (HNO3), 891 (HNO3) (2)	BG08-GW-MP01	S: 8/28/2008	12:40		--
MC02A2 MC1G-F2	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	778 (HNO3), 892 (HNO3) (2)	BG08-GW-MP02	S: 8/29/2008	11:15		--
MC02A3 MC1G-F3	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	779 (HNO3), 893 (HNO3) (2)	BG08-GW-MP03	S: 8/29/2008	10:00		--
MC02A4 MC1G-F4	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	780 (HNO3), 894 (HNO3) (2)	BG08-GW-MP04	S: 8/28/2008	14:06		--
MC02A5 MC1G-F5	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	781 (HNO3), 895 (HNO3) (2)	BG08-GW-MP05	S: 8/28/2008	15:50		--
MC02A6 MC1G-F6	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	782 (HNO3), 896 (HNO3) (2)	BG08-GW-MP06	S: 8/28/2008	17:47		--
MC02A7 MC1G-F7	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	783 (HNO3), 897 (HNO3) (2)	BG08-GW-MP07	S: 8/28/2008	18:10		--
MC02A8 MC1G-F8	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	784 (HNO3), 898 (HNO3) (2)	BG08-GW-MP08	S: 8/29/2008	9:10		--
MC02A9 MC1G-F9	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	785 (HNO3), 899 (HNO3) (2)	BG08-GW-MP09	S: 8/29/2008	10:50		--
MC02B0 MC1G-G-C	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	786 (HNO3), 900 (HNO3) (2)	BG08-GW-MP10	S: 8/29/2008	11:50		--
MC02B1 MC1G-G-1	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	787 (HNO3), 901 (HNO3) (2)	BG08-GW-MP11	S: 8/28/2008	13:48		--

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?

TAL DM+B+M = TAL Diss Metals+Boron+Moly, TAL Met+B+ = TAL Metals + Boron + Molybdenum, TAL TM+B+M = TAL Total Metals+Boron+Moly

TR Number: 3-375524367-090108-0001 [redacted] REGION 3

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4) (b) (4) (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: ~~37814~~ 37813 R
DAS No:

Region:	3	Date Shipped:	9/2/2008	Chain of Custody Record	Sampler Signature: Erik Armistead
Project Code: / Account Code:	CT4354	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
CERCLIS ID:	VAN000306614	Airbill:	961942977974,	1	
Spill ID:	ALM	Shipped to:	ChemTech Consulting Group (CHEMED) 284 Sheffield Street Mountainside NJ 07092 (908) 789-8900	2.	
Site Name/State:	Battlefield Golf/VA			3.	
Project Leader:	Erik Armistead			4.	
Action:	Preliminary Assessment				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC02B2 MC16-6-2	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	788 (HNO3), 902 (HNO3) (2)	BG08-GW-MP12	S: 8/28/2008 13:05		recd 9/17/08 ICP-AES
MC02B3 MC16-6-3	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	789 (HNO3), 903 (HNO3) (2)	BG08-GW-MP13	S: 8/28/2008 13:25	--	MC16-241
MC02B4 MC16-6-4	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	790 (HNO3), 904 (HNO3) (2)	BG08-GW-MW01	S: 8/29/2008 15:55	[redacted]	recd 9/17/08 ICP-AES
MC02B5 MC16-6-5	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	791 (HNO3), 905 (HNO3) (2)	BG08-GW-MW02	S: 8/29/2008 13:50	--	MC16-241 ICP-AES
MC02B6 MC16-6-6	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	792 (HNO3), 906 (HNO3) (2)	BG08-GW-MW02D	S: 8/29/2008 13:50	[redacted]	recd 9/17/08 ICP-AES
MC02B7 MC16-6-7	Ground Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	793 (HNO3), 907 (HNO3) (2)	BG08-GW-MW03	S: 8/29/2008 14:50	--	MC16-241 ICP-MS
MC02B8 MC16-6-8	Surface Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	794 (HNO3), 908 (HNO3) (2)	BG08-SW-SW01	S: 8/29/2008 12:51	--	recd 9/17/08 ICP-AES
MC02B9 MC16-6-9	Surface Water/ Erik Armistead	M/G	TAL DM+B+M (14), TAL TM+B+M (14)	795 (HNO3), 909 (HNO3) (2)	BG08-SW-SW02	S: 8/29/2008 15:40	--	[redacted] ICP-AES
(b) (6)	Potable Well/ Erik Armistead	M/G	TAL TM+B+M (14)	796 (HNO3) (1)	[redacted]	S: 8/25/2008 9:27	--	recd 9/17/08 ICP-AES
(b) (6)	Potable Well/ Erik Armistead	M/G	TAL TM+B+M (14)	797 (HNO3) (1)	[redacted]	S: 8/25/2008 9:59	--	[redacted] ICP-MS
(b) (6)	Potable Well/ Erik Armistead	M/G	TAL TM+B+M (14)	798 (HNO3) (1)	[redacted]	S: 8/26/2008 16:45	--	recd 9/18/08 [redacted] ICP-AES

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?

TAL DM+B+M = TAL Diss Metals+Boron+Moly, TAL Met+B+ = TAL Metals + Boron + Molybdenum, TAL TM+B+M = TAL Total Metals+Boron+Moly

TR Number: 3-375524367-090108-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

REGION 3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
Environmental Sciences Center
701 Mapes Road
Fort Meade, Maryland 20755-5350

DATE: May 26, 2009

SUBJECT: Region III Data QA Review

FROM: Colleen Walling
Region III ESAT RPO (3EA20)

TO: Christine Wagner
Regional Project Manager (3HS21)

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case #: 38507; SDG#: MC0146) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call Mike Mahoney at (410)305-2631 or me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO: #0021 TDF: #05035

LOCKHEED MARTIN
We never forget who we're working for™

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

DATE: May 20, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38507
SDG: MC0146
Site: Battlefield Golf Club

FROM: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38507, Sample Delivery Group (SDG) MC0146, consisted of eighteen (18) unfiltered aqueous samples analyzed for total metals and boron (B) by A4 Scientific, Inc. (A4). The sample set included one (1) field blank, one (1) rinsate blank and one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (with modification 1621.0) through the Routine Analytical Services (RAS) program. Modifications include analysis of B at the Contract Required Quantitation Limit (CRQL) of 7.0 µg/L.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Samples in this SDG were analyzed by the ICP-MS method which does not include analysis for aluminum (Al), calcium (Ca), iron (Fe), magnesium (Mg), mercury (Hg), potassium (K) and sodium (Na). Hg was analyzed in this SDG using a cold vapor technique.

Data in this case have been impacted by outliers present in the field and rinsate blanks as well as the matrix spike, ICP serial dilution and ICP-MS internal standard analyses. Details of these outliers are discussed under "Minor Problems", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MINOR PROBLEMS

Field (FB) and/or rinsate (RB) blanks had reported results greater than the Method Detection Limits (MDLs) for the analytes listed below. Positive results for these analytes in affected samples which are less than or equal to five times (≤5X) the blank concentrations may be biased high and have been qualified "B" on the DSFs.

Blank	Affected Analytes
FB	arsenic (As)
RB	manganese (Mn), zinc (Zn)

The matrix spike recovery was high (>125%) for B. Positive results for this analyte in affected samples may be biased high and have been qualified "K" on the DSFs unless superseded by "J".

Matrix spike recoveries were low (<75% but >30%) for chromium (Cr), copper (Cu), nickel (Ni), vanadium (V) and Zn. Low recoveries may be attributed to matrix interferences or analyte lost during the digestion process. Positive results for these analytes in affected samples may be biased low and have been qualified "L" on the DSFs unless superseded by "B" or "J". Quantitation limits for these analytes in affected samples may be biased low and have been qualified "UL" on the DSFs unless superseded by "UJ".

The percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) for Mn. Positive results for this analyte in affected samples are estimated due to possible matrix interferences and have been qualified "J" on the DSFs unless superseded by "B".

Relative intensities for internal standard scandium (Sc)-45 were above the upper QC limit (>125%) for all samples (and the associated matrix spike) except MC0147, MC0153 and MC0160. In addition, the relative intensity for internal standard terbium (Tb)-159 was outside the upper QC limit (>125%) for sample MC0155. Per SOW, these samples were reanalyzed at a two-fold dilution (2X). Internal standard responses in the diluted analysis were within QC limits for samples MC0006, MC0148, MC0149, MC0150, MC0151, MC0154, MC0156, MC0157, MC0158 and MC0183. Results for all analytes except Hg in these samples were reported from the 2X dilution and annotated with a "+" on the DSFs. CRQLs are elevated in these samples due to the dilution. Samples MC0007, MC0008, MC0146, MC0152 and MC0155 had similar internal standard recoveries in the diluted analysis, thus results were reported from the undiluted initial analysis of these samples. Positive results and quantitation limits for analytes with masses greater than six (>6) but less than one hundred fifteen (<115) [less than two hundred nine (<209) in the case of MC0155] in these samples are estimated and have been qualified "J" and "UJ", respectively, on the DSFs unless superseded by "B".

NOTES

Reported results between MDLs and CRQLs were qualified "J" on the DSFs unless superseded by "B".

Reported results for field duplicate pair MC0156/MC0157 were within 20% RPD, ±CRQL for all analytes.

Post-digestion spike recoveries were low (<75% but >30%) for Ni and Zn. No data were qualified based on these findings.

Data for Case 38507, SDG MC0146, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38507.MC0146IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0146

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Sb	MC0155		UJ		ISH (127% - 317%)
As	MC0007, MC0008, MC0146, MC0152	B		High	FB (0.47 J µg/L) ISH (127% - 317%)
	MC0149, MC0150, MC0151, MC0154	B		High	FB (0.47 J µg/L)
	MC0155	J			ISH (127% - 317%)
Ba	MC0155	J			ISH (127% - 317%)
Be	MC0007, MC0008, MC0146, MC0152, MC0155	J	UJ		ISH (127% - 317%)
Cd	MC0007, MC0008, MC0146, MC0152, MC0155	J	UJ		ISH (127% - 317%)
Cr	MC0007, MC0008, MC0146, MC0152, MC0155	J	UJ		ISH (127% - 317%) MSL (68%)
	MC0183	J			>MDL<CRQL MSL (68%)
	All Samples Except MC0007, MC0008, MC0146, MC0152, MC0155, MC0183		UL	Low	MSL (68%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0146

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Co	MC0007, MC0008, MC0146, MC0152, MC0155	J	UJ		ISH (127% - 317%)
Cu	MC0007, MC0008, MC0146, MC0152, MC0155	J	UJ		ISH (127% - 317%) MSL (68%)
	All Samples Except MC0007, MC0008, MC0146, MC0152, MC0155		UL	Low	MSL (68%)
Pb	MC0155	J			ISH (127% - 317%)
Mn	MC0007, MC0008	B		High	RB (0.53 J µg/L) ISH (127% - 317%) ISD (14%)
	MC0146, MC0152, MC0155	J			ISH (127% - 317%) ISD (14%)
	All Samples Except MC0007, MC0008, MC0146, MC0147, MC0152, MC0155	J			ISD (14%)
Ni	MC0007, MC0008, MC0146, MC0152, MC0155	J	UJ		ISH (127% - 317%) MSL (70%)
	MC0150, MC0154, MC0156, MC0183	J			>MDL<CRQL MSL (70%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0146

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Ni	MC0006, MC0147, MC0148, MC0149, MC0151, MC0153, MC0157, MC0158, MC0160	L	UL	Low	MSL (70%)
Se	MC0007, MC0008, MC0146, MC0152, MC0155		UJ		ISH (127% - 317%)
Ag	MC0007, MC0008, MC0146, MC0152, MC0155		UJ		ISH (127% - 317%)
Tl	MC0155		UJ		ISH (127% - 317%)
V	MC0007, MC0008, MC0146, MC0152, MC0155	J	UJ		ISH (127% - 317%) MSL (74%)
	All Samples Except MC0007, MC0008, MC0146, MC0152, MC0155		UL	Low	MSL (74%)
Zn	MC0146, MC0152	B		High	RB (2.9 µg/L) ISH (127% - 317%) MSL (70%)
	MC0148, MC0150, MC0151, MC0153, MC0154, MC0156, MC0157, MC0158, MC0183	B		High	RB (2.9 µg/L) MSL (70%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0146

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Zn	MC0007, MC0008, MC0155	J	UJ		ISH (127% - 317%) MSL (70%)
	MC0147	J			>MDL<CRQL MSL (70%)
	MC0006, MC0149, MC0160	L	UL	Low	MSL (70%)
B	MC0007, MC0008, MC0146, MC0152, MC0155	J			ISH (127% - 317%) MSH (219.1%)
	MC0151, MC0154	J			>MDL<CRQL MSH (219.1%)
	All Samples Except MC0007, MC0008, MC0146, MC0147, MC0151, MC0152, MC0154, MC0155, MC0160	K		High	MSH (219.1%)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

ISH	=	Internal standard had relative intensities above the upper QC limit (>125%) [% relative intensities are in parenthesis]. Positive results and quantitation limits are estimated.
FB	=	Field blank had a result >MDL [result is in parenthesis]. Positive results which are ≤5X the blank concentration may be biased high.
MSL	=	Matrix spike recoveries were low (<75% but >30%) [% recoveries are in parenthesis]. Positive results and quantitation limits may be biased low.
>MDL = <CRQL		Reported results are greater than MDLs but less than CRQLs and are considered estimated.
RB	=	Rinsate blank had results >MDLs [results are in parenthesis]. Positive results which are ≤5X the blank concentrations may be biased high.
ISD	=	Percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) [%D is in parenthesis]. Positive results are estimated.
MSH	=	Matrix spike recovery was high (>125%) [% recovery is in parenthesis]. Positive results may be biased high.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

Case #: 38507 SDG : MC0146 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 18

Lab. : A4

ALL TOTAL METALS

Sample Number :		[redacted]		[redacted]		[redacted]		MC0146		MC0147	
Sampling Location : (Prefix : BG0904-)		[redacted]		[redacted]		[redacted]		MW-10A		FB	
Field QC :										Field Blank	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		5/1/2009		5/1/2009		5/1/2009		4/30/2009		5/1/2009	
Time Sampled :		16:15		16:17		16:19		13:35		09:00	
Dilution Factor :		2.0 / 1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+									
*ARSENIC	1	+		0.67	B	0.62	B	0.67	B	0.47	J
BARIUM	10	16.4+	J					12.5			
BERYLLIUM	1	+			UJ		UJ		UJ		
*CADMIUM	1	+			UJ		UJ		UJ		
*CHROMIUM	2	+	UL		UJ		UJ		UJ		UL
COBALT	1	+			UJ		UJ	0.66	J		
COPPER	2	+	UL	823	J	7.7	J		UJ		UL
*LEAD	1	+		321		0.47	J				
MANGANESE	1	128+	J	0.63	B	0.32	B	205	J		
MERCURY	0.2										
*NICKEL	1	+	UL	0.37	J	0.79	J		UJ		UL
SELENIUM	5	+			UJ		UJ		UJ		
SILVER	1	+			UJ		UJ		UJ		
THALLIUM	1	+									
VANADIUM	5	+	UL		UJ		UJ		UJ		UL
ZINC	2	39.8+	L	50.2	J	16.2	J	1.1	B	1.5	J
BORON	7	35.6+	K	39.6	J	39.1	J	24.5	J		

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Case #: 38507 SDG : MC0146

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

ALL TOTAL METALS

Sample Number :		MC0148		MC0149		MC0150		MC0151		MC0152	
Sampling Location : (Prefix : BG0904-)		MW-10B		MW-11A		MW-11B		MW-12A		MW-12B	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		4/30/2009		4/30/2009		4/30/2009		4/30/2009		4/30/2009	
Time Sampled :		13:35		14:40		14:35		16:25		16:20	
Dilution Factor :		2.0 / 1.0		2.0 / 1.0		2.0 / 1.0		2.0 / 1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+		+		+		+			
*ARSENIC	1	+		1.4+	B	0.99+	B	3.4+	B	1.6+	B
BARIUM	10	8.3+	J	10.2+	J	22.6+		25.8+		23.7	
BERYLLIUM	1	+		+		+		+			UJ
*CADMIUM	1	+		+		+		+			UJ
*CHROMIUM	2	+	UL	+	UL	+	UL	+	UL	0.66	J
COBALT	1	+		+		+		0.99+	J		UJ
COPPER	2	+	UL	+	UL	+	UL	+	UL		UJ
*LEAD	1	+		+		+		+			
MANGANESE	1	66.3+	J	81.7+	J	137+	J	113+	J	98.0	J
MERCURY	0.2										
*NICKEL	1	+	UL	+	UL	0.88+	J	4.0+	L	0.39	J
SELENIUM	5	+		+		+		+			UJ
SILVER	1	+		+		+		+			UJ
THALLIUM	1	+		+		+		+			
VANADIUM	5	+	UL	+	UL	+	UL	+	UL		UJ
ZINC	2	1.7+	B	+	UL	3.8+	B	9.7+	B	4.2	B
BORON	7	97.4+	K	16.8+	K	83.0+	K	6.7+	J	44.2	J

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Case #: 38507 SDG : MC0146

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

ALL TOTAL METALS

Sample Number :		MC0153		MC0154		MC0155		MC0156		MC0157	
Sampling Location : (Prefix : BG0904-)		MW-7A		MW-7B		MW-8A		MW-8B		MW-8BD	
Field QC :								Dup of MC0157		Dup of MC0156	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		4/30/2009		4/30/2009		4/30/2009		4/30/2009		4/30/2009	
Time Sampled :		08:25		08:30		10:30		10:40		10:45	
Dilution Factor :		1.0		2.0 / 1.0		1.0		2.0 / 1.0		2.0 / 1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2			+			UJ	+		+	
*ARSENIC	1	4.1		1.3+	B	4.1	J	+		+	
BARIUM	10	67.3		17.2+	J	11.9	J	18.8+	J	17.1+	J
BERYLLIUM	1			+		9.9	J	+		+	
*CADMIUM	1			+		0.87	J	+		+	
*CHROMIUM	2		UL	+	UL	2.0	J	+	UL	+	UL
COBALT	1	3.3		+		258	J	+		+	
COPPER	2		UL	+	UL		UJ	+	UL	+	UL
*LEAD	1			+		0.51	J	+		+	
MANGANESE	1	19.4	J	121+	J	718	J	261+	J	259+	J
MERCURY	0.2										
*NICKEL	1	2.5	L	0.66+	J	297	J	0.86+	J	+	UL
SELENIUM	5			+			UJ	+		+	
SILVER	1			+			UJ	+		+	
THALLIUM	1			+			UJ	+		+	
VANADIUM	5		UL	+	UL	4.5	J	+	UL	+	UL
ZINC	2	6.1	B	5.8+	B	267	J	12.2+	B	11.1+	B
BORON	7	13.6	K	6.1+	J	12.8	J	35.0+	K	33.3+	K

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Case #: 38507 SDG : MC0146

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

ALL TOTAL METALS

Sample Number :		MC0158		MC0160		MC0183					
Sampling Location :		BG0904-MW-9A		BG0904-RB		BG0904-MW-9B					
Field QC :				Rinsate Blank							
Matrix :		Water		Water		Water					
Units :		ug/L		ug/L		ug/L					
Date Sampled :		4/30/2009		5/1/2009		4/30/2009					
Time Sampled :		12:10		09:35		11:55					
Dilution Factor :		2.0 / 1.0		1.0		2.0 / 1.0					
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+				+					
*ARSENIC	1	+				+					
BARIUM	10	31.2+				14.0+	J				
BERYLLIUM	1	+				+					
*CADMIUM	1	+				+					
*CHROMIUM	2	+	UL		UL	1.6+	J				
COBALT	1	+				+					
COPPER	2	+	UL		UL	+	UL				
*LEAD	1	+				+					
MANGANESE	1	164+	J	0.53	J	56.1+	J				
MERCURY	0.2										
*NICKEL	1	+	UL		UL	1.8+	J				
SELENIUM	5	+				+					
SILVER	1	+				+					
THALLIUM	1	+				+					
VANADIUM	5	+	UL		UL	+	UL				
ZINC	2	1.8+	B	2.9	L	4.9+	B				
BORON	7	42.6+	K			77.9+	K				

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

+ = Result reported from diluted analysis.

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507
DAS No:
R

Region:	3
Project Code:	CT34554
Account Code:	
CERCLIS ID:	VAN000306614
Spill ID:	ALM
Site Name/State:	Battlefield Golf Potable/VA
Project Leader:	Ken Eden
Action:	Removal Assessment
Sampling Co:	Tetra Tech EM, Inc

Date Shipped:	5/5/2009
Carrier Name:	FedEx
Airbill:	857499849011
Shipped to:	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277

Chain of Custody Record

Sampler Signature: K Eden

Relinquished By	(Date / Time)	Received By	(Date / Time)
1 K Eden	5/5/09 1800		
2			
3			
4			

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
[redacted]	Potable Well/ Ken Eden	L/G	Metals+BO (7)	120 (HNO3) (1)	[redacted]	S: 5/1/2009 16:15		–
[redacted]	Potable Well/ Ken Eden	L/G	Metals+BO (7)	121 (HNO3) (1)	[redacted]	S: 5/1/2009 16:17		–
[redacted]	Potable Well/ Ken Eden	L/G	Metals+BO (7)	122 (HNO3) (1)	[redacted]	S: 5/1/2009 16:19		–

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____
Metals+BO = ICP Metals + BORON Total			

TR Number: 3-082800255-050509-0001

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: [redacted]

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507
DAS No:
R

Region:	3	**Date Shipped:**	5/4/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:	CT 4554	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:		**Airbill:**	857499683000	1	
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road, Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:	ALM			3	
Site Name/State:	Battlefield Golf - April 2009/VA			4	
Project Leader:	Ken Eden				
Action:	Removal Assessment				
Sampling Co:	Tetra Tech EMI				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0146	Ground Water/ Ken Eden	L/G	Metals+BO (7)	510 (HNO3) (1)	BG0904-MW-10A	S: 4/30/2009	13:35		–
MC0147	Ground Water/ Ken Eden	L/G	Metals+BO (7)	512 (HNO3) (1)	BG0904-FB	S: 5/1/2009	9:00		Field Blank
MC0148	Ground Water/ Ken Eden	L/G	Metals+BO (7)	513 (HNO3) (1)	BG0904-MW-10B	S: 4/30/2009	13:35		–
MC0149	Ground Water/ Ken Eden	L/G	Metals+BO (7)	514 (HNO3) (1)	BG0904-MW-11A	S: 4/30/2009	14:40		–
MC0150	Ground Water/ Ken Eden	L/G	Metals+BO (7)	515 (HNO3) (1)	BG0904-MW-11B	S: 4/30/2009	14:35		–
MC0151	Ground Water/ Ken Eden	L/G	Metals+BO (7)	516 (HNO3) (1)	BG0904-MW-12A	S: 4/30/2009	16:25		–
MC0152	Ground Water/ Ken Eden	L/G	Metals+BO (7)	517 (HNO3) (1)	BG0904-MW-12B	S: 4/30/2009	16:20		–
MC0153	Ground Water/ Ken Eden	L/G	Metals+BO (7)	518 (HNO3) (1)	BG0904-MW-7A	S: 4/30/2009	8:25		–
MC0154	Ground Water/ Ken Eden	L/G	Metals+BO (7)	519 (HNO3) (1)	BG0904-MW-7B	S: 4/30/2009	8:30		–
MC0155	Ground Water/ Ken Eden	L/G	Metals+BO (7)	521 (HNO3) (1)	BG0904-MW-8A	S: 4/30/2009	10:30		–
MC0156	Ground Water/ Ken Eden	L/G	Metals+BO (7)	522 (HNO3) (1)	BG0904-MW-8B	S: 4/30/2009	10:40		–

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:** MC0183	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

Metals+BO = ICP Metals + BORON Total, Metals+BOd = ICP Metals + BORON Dissolved

TR Number: 3-510515489-050109-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

REGION COPY

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507
DAS No:
R

Region:	3	**Date Shipped:**	5/4/2009
Project Code:	CT 4554	**Carrier Name:**	FedEx
Account Code:		**Airbill:**	857499683000
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road, Suite 505 The Woodlands TX 77380 (281) 292-5277
Spill ID:	ALM		
Site Name/State:	Battlefield Golf - April 2009/VA		
Project Leader:	Ken Eden		
Action:	Removal Assessment		
Sampling Co:	Tetra Tech EMI		

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0157	Ground Water/ Ken Eden	L/G	Metals+BO (7)	523 (HNO3) (1)	BG0904-MW-8BD	S: 4/30/2009	10:45		eld Duplicate of BG0904-MW-8
MC0158	Ground Water/ Ken Eden	L/G	Metals+BO (7)	524 (HNO3) (1)	BG0904-MW-9A	S: 4/30/2009	12:10		--
MC0160	Ground Water/ Ken Eden	L/G	Metals+BO (7)	527 (HNO3) (1)	BG0904-RB	S: 5/1/2009	9:35		Rinsate Blank
MC0175	Ground Water/ Ken Eden	L/G	Metals+BOd (7)	556 (HNO3) (1)	BG0904-FBF	S: 5/1/2009	9:00		Field Blank
MC0176	Ground Water/ Ken Eden	L/G	Metals+BOd (7)	557 (HNO3) (1)	BG0904-RBF	S: 5/1/2009	9:35		Rinsate
MC0183	Ground Water/ Ken Eden	L/G	Metals+BO (7)	569 (HNO3), 570 (HNO3) (2)	BG0904-MW-9B	S: 4/30/2009	11:55		--

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:** MC0183	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

Metals+BO = ICP Metals + BORON Total, Metals+BOd = ICP Metals + BORON Dissolved

TR Number: 3-510515489-050109-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

REGION COPY

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASO/AB USE ONLY		
RAS#	CT4554	Analytical TAT
DAS#		7
NSE#		

38507

Date: 4/21/09	Site Activity: Removal ASSESSMENT			
Site Name: Battlefield Golf Club	Street Address: 1001 South Centerville Turnpike			
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DC6C A3LM RS00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START3 QAPP	Date Approved: November 2006		
EPA Project Leader: CHRIS WAGNER	Phone#:	Cell Phone #: 804-337-3049	E-mail: Wagner.Christine@epa.gov	
Request Preparer: JOSHUA COPE	Phone#: 610-364-2130	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: Ken Eden	Phone#: 610-364-2125	Cell Phone #: 215 681 0722	E-mail: Ken.eden@ttemi.com	
Contractor: Tetra Tech EM Inc	EPA CO/PO: Jeff Fang/Karen Wodarczyk			
#Samples 1*	Matrix: potable water	Parameter: TAL metals Low + Hg + B - total A4	Method: ILM05.4 ICPMS	30510
#Samples 1*	Matrix: potable water	Parameter: TAL metals Low +Hg + B - dissolved	Method: ILM05.4 ICPMS	
#Samples 1*	Matrix: non-potable water	Parameter: TAL metals Low + Hg + B - total	Method: ILM05.4 ICPMS	
#Samples 1*	Matrix: non- potable water	Parameter: TAL metals Low +Hg + B - dissolved	Method: ILM05.4 ICPMS	
#Samples	Matrix:	Parameter:	Method:	
Ship Date From: 4/28/09	Ship Date To: 4/30/09	Org. Validation Level	Inorg. Validation Level IM2	

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☐ 14days ☒ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) by ESAT

Validated Data Package Due: ☐ 42 days ☐ 30 days ☒ 21days ☐ 14 days ☐ Other (Specify) 7/14

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached please note addition of Boron analysis. *PLEASE AWARD SPLIT SAMPLES TO A SEPARATE LAB FOR COMPARISON.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
Environmental Sciences Center
701 Mapes Road
Fort Meade, Maryland 20755-5350

DATE: May 26, 2009

SUBJECT: Region III Data QA Review

FROM: Colleen Walling
Region III ESAT RPO (3EA20)

TO: Christine Wagner
Regional Project Manager (3HS21)

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case #: 38507; SDG#: MC0161 and MC0162) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call Mike Mahoney at (410)305-2631 or me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO: #0021 TDF: #05032

LOCKHEED MARTIN
We never forget who we're working for™

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

DATE: May 19, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38507
SDGs: MC0161 and MC0162
Site: Battlefield Golf Club

FROM: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38507, Sample Delivery Groups (SDGs) MC0161 and MC0162, consisted of seven (7) unfiltered aqueous samples analyzed for total metals and boron (B) and nine (9) filtrate samples analyzed for dissolved metals and B. All samples were analyzed by A4 Scientific, Inc. (A4). The sample set included one (1) filtrate field blank and one (1) filtrate rinsate blank. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (with modification 1621.0) through the Routine Analytical Services (RAS) program. Modifications include analysis of B at the Contract Required Quantitation Limit (CRQL) of 7.0 µg/L.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

The field (MC0147) and rinsate (MC0160) blanks associated with the unfiltered samples in SDG MC0161 were analyzed in a separate SDG (MC0146). The results for these blanks are included in Appendix C.

Samples in these SDGs were analyzed by the ICP-MS method which does not include analysis for aluminum (Al), calcium (Ca), iron (Fe), magnesium (Mg), mercury (Hg), potassium (K) and sodium (Na). Hg was analyzed in these SDGs using a cold vapor technique.

Data in this case have been impacted by outliers present in the field and rinsate blanks as well as the matrix spike and ICP-MS internal standard analyses. Details of these outliers are discussed under "Minor Problems", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MINOR PROBLEMS

Field (FB) and/or rinsate (RB) blanks had reported results greater than the Method Detection Limits (MDLs) for the analytes listed below. Positive results for these analytes in affected samples which are less than or equal to five times (≤5X) the blank concentrations may be biased high and have been qualified "B" on the DSFs.

SDG	Blank	Affected Analytes
MC0161	FB	arsenic (As)
	RB	manganese (Mn), zinc (Zn)
MC0162	RB	As, Zn

Matrix spike recoveries were high (>125%) for B in both SDGs. Positive results for this analyte in affected samples in these SDGs may be biased high and have been qualified "K" on the DSFs unless superseded by "J".

Matrix spike recoveries were low (<75% but >30%) for As, chromium (Cr), cobalt (Co), copper (Cu), Mn, nickel (Ni), selenium (Se), vanadium (V) and Zn in SDG MC0161. Low recoveries may be attributed to matrix interferences or analyte lost during the digestion process. Positive results for these analytes in affected samples in this SDG may be biased low and have been qualified "L" on the DSFs unless superseded by "B" or "J". Quantitation limits for these analytes in affected samples in this SDG may be biased low and have been qualified "UL" on the DSFs unless superseded by "UJ".

Relative intensities for internal standard scandium (Sc)-45 were above the upper QC limit (>125%) for all samples and the associated matrix spike and laboratory duplicate in SDG MC0161 as well as for samples MC0162, MC0164, MC0168, MC0170, MC0172 and MC0174 in SDG MC0162. Per SOW, these samples were reanalyzed at a two-fold dilution (2X). Internal standard responses in the diluted analysis were within QC limits for samples MC0161, MC0165, MC0169 and MC0171 in SDG MC0161 and MC0162, MC0164, MC0168, MC0170 and MC0172 in SDG MC0162. Results for all analytes except Hg in these samples were reported from the 2X dilution and annotated with a "+" on the DSFs. CRQLs are elevated in these samples due to the dilution. For samples MC0163, MC0167 and MC0173 in SDG MC0161 and MC0174 in SDG MC0162, Sc-45 was still >125% in the diluted sample analysis, thus results for these samples were reported from the undiluted initial analysis. Positive results and quantitation limits for analytes with masses greater than six (>6) but less than one hundred fifteen (<115) in these samples are estimated and have been qualified "J" and "UJ", respectively, on the DSFs unless superseded by "B".

NOTES

Reported results between MDLs and CRQLs were qualified "J" on the DSFs unless superseded by "B".

In SDG MC0162, the laboratory used the field blank for the matrix spike, laboratory duplicate and ICP serial dilution analyses. The laboratory noted that a Quality Control (QC) sample was not specified by the sampler and was instructed by the Region to choose a sample provided that it was not a PE, blank, or rinsate sample. The laboratory choose sample MC0175, which is a field blank. It may not be obvious to the laboratory which sample is a field QC sample. No data were qualified based on this finding.

Post-digestion spike recoveries were low (<75% but >30%) for Cr, Cu, Mn, V and Zn in SDG MC0161. No data were qualified based on these findings.

Data for Case 38507, SDGs MC0161 and MC0162, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38507.MC0161IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0161

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
As	MC0161	B		High	FB (0.47 J µg/L) MSL (72%)
	MC0163, MC0167, MC0173	B		High	FB (0.47 J µg/L) ISH (130% - 217%) MSL (72%)
	MC0165, MC0169, MC0171		UL	Low	MSL (72%)
Be	MC0163, MC0167, MC0173		UJ		ISH (130% - 217%)
Cd	MC0163, MC0167, MC0173		UJ		ISH (130% - 217%)
Cr	MC0163, MC0167, MC0173		UJ		ISH (130% - 217%) MSL (61%)
	MC0161, MC0165, MC0169, MC0171		UL	Low	MSL (61%)
Co	MC0163, MC0167, MC0173		UJ		ISH (130% - 217%) MSL (63%)
	MC0161, MC0165, MC0169, MC0171		UL	Low	MSL (63%)
Cu	MC0165, MC0169	J			>MDL<CRQL MSL (56%)
	MC0163, MC0167, MC0173	J			ISH (130% - 217%) MSL (56%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0161

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Cu	MC0161, MC0171	L		Low	MSL (56%)
Mn	MC0161, MC0165	B		High	RB (0.53 J µg/L) MSL (61%)
	MC0163, MC0167, MC0173	J			ISH (130% - 217%) MSL (61%)
	MC0169, MC0171	L	UL	Low	MSL (61%)
Ni	MC0165	J			>MDL<CRQL MSL (57%)
	MC0163, MC0167, MC0173	J	UJ		ISH (130% - 217%) MSL (57%)
	MC0161, MC0169, MC0171		UL	Low	MSL (57%)
Se	MC0163, MC0167, MC0173		UJ		ISH (130% - 217%) MSL (70%)
	MC0161, MC0165, MC0169, MC0171		UL	Low	MSL (70%)
Ag	MC0163, MC0167, MC0173		UJ		ISH (130% - 217%)
V	MC0163, MC0167, MC0173		UJ		ISH (130% - 217%) MSL (62%)
	MC0161, MC0165, MC0169, MC0171		UL	Low	MSL (62%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0161

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Zn	MC0161, MC0165, MC0169, MC0171	B		High	RB (2.9 µg/L) MSL (55%)
	MC0163, MC0167, MC0173	B		High	RB (2.9 µg/L) ISH (130% - 217%) MSL (55%)
B	MC0163, MC0167, MC0173	J			ISH (130% - 217%) MSH (265%)
	MC0161, MC0165, MC0169, MC0171	K		High	MSH (265%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0162

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
As	MC0166	B		High	RB (0.78 J µg/L)
	MC0174	B		High	RB (0.78 J µg/L) ISH (135% - 202%)
Be	MC0174		UJ		ISH (135% - 202%)
Cd	MC0174		UJ		ISH (135% - 202%)
Cr	MC0174		UJ		ISH (135% - 202%)
Co	MC0174		UJ		ISH (135% - 202%)
Cu	MC0174		UJ		ISH (135% - 202%)
Mn	MC0174	J			ISH (135% - 202%)
Ni	MC0174		UJ		ISH (135% - 202%)
Se	MC0174		UJ		ISH (135% - 202%)
Ag	MC0174		UJ		ISH (135% - 202%)
V	MC0174		UJ		ISH (135% - 202%)
Zn	MC0162, MC0164, MC0166, MC0168, MC0170, MC0172	B		High	RB (3.1 µg/L)
	MC0174	B		High	RB (3.1 µg/L) ISH (135% - 202%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38507, SDG MC0162

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
B	MC0174	J			ISH (135% - 202%) MSH (259%)
	MC0162, MC0164, MC0166, MC0168, MC0170, MC0172	K		High	MSH (259%)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

FB	=	Field blank had a result >MDL [result is in parenthesis]. Positive results which are ≤5X the blank concentration may be biased high.
MSL	=	Matrix spike recoveries were low (<75% but >30%) [% recoveries are in parenthesis]. Positive results and quantitation limits may be biased low.
ISH	=	Internal standard had relative intensities above the upper QC limit (>125%) [% relative intensities are in parenthesis]. Positive results and quantitation limits are estimated.
>MDL = <CRQL		Reported results are greater than MDLs but less than CRQLs and are considered estimated.
RB	=	Rinsate blanks had results >MDLs [results are in parenthesis]. Positive results which are ≤5X the blank concentrations may be biased high.
MSH	=	Matrix spike recoveries were high (>125%) [% recoveries are in parenthesis]. Positive results may be biased high.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

Case #: 38507 SDG : MC0161 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 7

Lab. : A4

ALL TOTAL METALS

Sample Number :		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	
Sampling Location : (Prefix : BG0904-)		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		4/30/2009		4/30/2009		4/29/2009		4/30/2009		4/30/2009	
Time Sampled :		08:10		08:08		08:16		16:05		14:20	
Dilution Factor :		2.0 / 1.0		1.0		2.0 / 1.0		1.0		2.0 / 1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+				+				+	
*ARSENIC	1	0.85+	B	0.99	B	+	UL	0.51	B	+	UL
BARIUM	10	+		26.3		+				+	
BERYLLIUM	1	+			UJ	+			UJ	+	
*CADMIUM	1	+			UJ	+			UJ	+	
*CHROMIUM	2	+	UL		UJ	+	UL		UJ	+	UL
COBALT	1	+	UL		UJ	+	UL		UJ	+	UL
COPPER	2	4.4+	L	12.5	J	2.3+	J	4.5	J	3.3+	J
*LEAD	1	+		3.3		+				+	
MANGANESE	1	0.84+	B	10.6	J	3.3+	B	5.1	J	+	UL
MERCURY	0.2										
*NICKEL	1	+	UL		UJ	0.74+	J		UJ	+	UL
SELENIUM	5	+	UL		UJ	+	UL		UJ	+	UL
SILVER	1	+			UJ	+			UJ	+	
THALLIUM	1	+				+				+	
VANADIUM	5	+	UL		UJ	+	UL		UJ	+	UL
ZINC	2	3.5+	B	4.6	B	8.0+	B	2.2	B	2.7+	B
BORON	7	204+	K	189	J	158+	K	34.2	J	51.7+	K

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Case #: 38507 SDG : MC0161

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

ALL TOTAL METALS

Sample Number :	[redacted]		[redacted]							
Sampling Location : (Prefix : BG0904-)	[redacted]		[redacted]							
Matrix :	Water		Water							
Units :	ug/L		ug/L							
Date Sampled :	4/30/2009		4/29/2009							
Time Sampled :	14:15		16:40							
Dilution Factor :	2.0 / 1.0		1.0							
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+									
*ARSENIC	1	+	UL	0.47	B						
BARIUM	10	+		10.7							
*BERYLLIUM	1	+			UJ						
*CADMIUM	1	+			UJ						
*CHROMIUM	2	+	UL		UJ						
COBALT	1	+	UL		UJ						
COPPER	2	10.8+	L	342	J						
*LEAD	1	1.3+	J	1.1							
MANGANESE	1	6.9+	L	188	J						
MERCURY	0.2										
*NICKEL	1	+	UL	0.31	J						
SELENIUM	5	+	UL		UJ						
SILVER	1	+			UJ						
THALLIUM	1	+									
VANADIUM	5	+	UL		UJ						
ZINC	2	8.9+	B	3.2	B						
BORON	7	52.3+	K	11.2	J						

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Case #: 38507 SDG : MC0162 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 9

Lab. : A4

ALL DISSOLVED METALS

Sample Number :		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	
Sampling Location : (Prefix : BG0904-)		[redacted]		[redacted]		[redacted]		[redacted]		[redacted]	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		4/30/2009		4/30/2009		4/29/2009		4/30/2009		4/30/2009	
Time Sampled :		08:10		08:08		08:16		16:05		14:20	
Dilution Factor :		2.0 / 1.0		2.0 / 1.0		1.0		2.0 / 1.0		2.0 / 1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+		+				+		+	
*ARSENIC	1	+		+		0.89	B	+		+	
BARIUM	10	+		21.7+				+		+	
BERYLLIUM	1	+		+				+		+	
*CADMIUM	1	+		+				+		+	
*CHROMIUM	2	+		+				+		+	
COBALT	1	+		+				+		+	
COPPER	2	4.8+		7.4+		1.3	J	+		1.5+	J
*LEAD	1	+		+				+		+	
MANGANESE	1	1.2+	J	11.3+		2.5		5.4+		+	
MERCURY	0.2										
*NICKEL	1	+		+				+		+	
SELENIUM	5	+		+				+		+	
SILVER	1	+		+				+		+	
THALLIUM	1	+		+				+		+	
VANADIUM	5	+		+				+		+	
ZINC	2	3.9+	B	3.7+	B	6.0	B	1.8+	B	3.3+	B
BORON	7	222+	K	202+	K	163	K	35.7+	K	54.4+	K

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Case #: 38507 SDG : MC0162

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

ALL DISSOLVED METALS

Sample Number :		[redacted]		[redacted]		[redacted]		MC0176			
Sampling Location : (Prefix : BG0904-)		[redacted]		[redacted]		FBF		RBF			
Field QC :						Field Blank		Rinsate Blank			
Matrix :		Water		Water		Water		Water			
Units :		ug/L		ug/L		ug/L		ug/L			
Date Sampled :		4/30/2009		4/29/2009		5/1/2009		5/1/2009			
Time Sampled :		14:15		16:40		09:00		09:35			
Dilution Factor :		2.0 / 1.0		1.0		1.0		1.0			
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+									
*ARSENIC	1	+		0.55	B	0.61	J	0.78	J		
BARIUM	10	15.2+	J	9.3	J						
BERYLLIUM	1	+			UJ						
*CADMIUM	1	+			UJ						
*CHROMIUM	2	+			UJ						
COBALT	1	+			UJ						
COPPER	2	+			UJ						
*LEAD	1	+									
MANGANESE	1	6.5+		184	J						
MERCURY	0.2										
*NICKEL	1	+			UJ						
SELENIUM	5	+			UJ						
SILVER	1	+			UJ						
THALLIUM	1	+									
VANADIUM	5	+			UJ						
ZINC	2	5.2+	B	4.4	B	2.0		3.1			
BORON	7	50.0+	K	12.0	J						

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507
DAS No:
R

Region:	3	**Date Shipped:**	5/4/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:	CT 4554	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:		**Airbill:**	857499683000	1	
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road, Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:	ALM			3	
Site Name/State:	Battlefield Golf - April 2009/VA			4	
Project Leader:	Ken Eden				
Action:	Removal Assessment				
Sampling Co:	Tetra Tech EMI				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0146	Ground Water/ Ken Eden	L/G	Metals+BO (7)	510 (HNO3) (1)	BG0904-MW-10A	S: 4/30/2009	13:35		–
MC0147	Ground Water/ Ken Eden	L/G	Metals+BO (7)	512 (HNO3) (1)	BG0904-FB	S: 5/1/2009	9:00		Field Blank
MC0148	Ground Water/ Ken Eden	L/G	Metals+BO (7)	513 (HNO3) (1)	BG0904-MW-10B	S: 4/30/2009	13:35		–
MC0149	Ground Water/ Ken Eden	L/G	Metals+BO (7)	514 (HNO3) (1)	BG0904-MW-11A	S: 4/30/2009	14:40		–
MC0150	Ground Water/ Ken Eden	L/G	Metals+BO (7)	515 (HNO3) (1)	BG0904-MW-11B	S: 4/30/2009	14:35		–
MC0151	Ground Water/ Ken Eden	L/G	Metals+BO (7)	516 (HNO3) (1)	BG0904-MW-12A	S: 4/30/2009	16:25		–
MC0152	Ground Water/ Ken Eden	L/G	Metals+BO (7)	517 (HNO3) (1)	BG0904-MW-12B	S: 4/30/2009	16:20		–
MC0153	Ground Water/ Ken Eden	L/G	Metals+BO (7)	518 (HNO3) (1)	BG0904-MW-7A	S: 4/30/2009	8:25		–
MC0154	Ground Water/ Ken Eden	L/G	Metals+BO (7)	519 (HNO3) (1)	BG0904-MW-7B	S: 4/30/2009	8:30		–
MC0155	Ground Water/ Ken Eden	L/G	Metals+BO (7)	521 (HNO3) (1)	BG0904-MW-8A	S: 4/30/2009	10:30		–
MC0156	Ground Water/ Ken Eden	L/G	Metals+BO (7)	522 (HNO3) (1)	BG0904-MW-8B	S: 4/30/2009	10:40		–

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:** MC0183	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

Metals+BO = ICP Metals + BORON Total, Metals+BOd = ICP Metals + BORON Dissolved

TR Number: 3-510515489-050109-0001

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507 **R**
DAS No:

Region:	3
Project Code:	CT 4554
Account Code:	
CERCLIS ID:	VAN000306614
Spill ID:	ALM
Site Name/State:	Battlefield Golf - April 2009/VA
Project Leader:	Ken Eden
Action:	Removal Assessment
Sampling Co:	Tetra Tech EMI

Date Shipped:	5/4/2009
Carrier Name:	FedEx
Airbill:	857499683000
Shipped to:	A4 Scientific 1544 Sawdust Road, Suite 505 The Woodlands TX 77380 (281) 292-5277

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC0157	Ground Water/ Ken Eden	L/G	Metals+BO (7)	523 (HNO3) (1)	BG0904-MW-8BD	S: 4/30/2009 10:45		eld Duplicate of BG0904-MW-8
MC0158	Ground Water/ Ken Eden	L/G	Metals+BO (7)	524 (HNO3) (1)	BG0904-MW-9A	S: 4/30/2009 12:10		–
MC0160	Ground Water/ Ken Eden	L/G	Metals+BO (7)	527 (HNO3) (1)	BG0904-RB	S: 5/1/2009 9:35		Rinsate Blank
MC0175	Ground Water/ Ken Eden	L/G	Metals+BOd (7)	556 (HNO3) (1)	BG0904-FBF	S: 5/1/2009 9:00		Field Blank
MC0176	Ground Water/ Ken Eden	L/G	Metals+BOd (7)	557 (HNO3) (1)	BG0904-RBF	S: 5/1/2009 9:35		Rinsate
MC0183	Ground Water/ Ken Eden	L/G	Metals+BO (7)	569 (HNO3), 570 (HNO3) (2)	BG0904-MW-9B	S: 4/30/2009 11:55		–

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:** MC0183	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

Metals+BO = ICP Metals + BORON Total, Metals+BOd = ICP Metals + BORON Dissolved

TR Number: 3-510515489-050109-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

REGION COPY

Send Copy to: [redacted]

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507 **R**
DAS No:

Region:	3	**Date Shipped:**	5/4/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:	CT 4554	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:		**Airbill:**	8574996822997, 8574996822997	1	
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road, Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:	ALM			3	
Site Name/State:	Battlefield Golf - April 2009/VA			4	
Project Leader:	Ken Eden				
Action:	Removal Assessment				
Sampling Co:	Tetra Tech EMI				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
[redacted]	Potable Well/ Ken Eden	L/G	Metals+BO (7)	529 (HNO3) (1)	[redacted]	S: 4/30/2009 8:10		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BOd (7)	530 (HNO3) (1)	[redacted]	S: 4/30/2009 8:10		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BO (7)	533 (HNO3) (1)	[redacted]	S: 4/30/2009 8:08		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BOd (7)	534 (HNO3) (1)	[redacted]	S: 4/30/2009 8:08		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BOd (7)	538 (HNO3) (1)	[redacted]	S: 4/29/2009 8:16		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BO (7)	541 (HNO3) (1)	[redacted]	S: 4/30/2009 16:05		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BOd (7)	542 (HNO3) (1)	[redacted]	S: 4/30/2009 16:05		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BO (7)	545 (HNO3) (1)	[redacted]	S: 4/30/2009 14:20		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BOd (7)	546 (HNO3) (1)	[redacted]	S: 4/30/2009 14:20		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BO (7)	549 (HNO3) (1)	[redacted]	S: 4/30/2009 14:15		–
(b) (6)	Potable Well/ Ken Eden	L/G	Metals+BOd (7)	550 (HNO3) (1)	[redacted]	S: 4/30/2009 14:15		–

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:**	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

Metals+BO = ICP Metals + BORON Total, Metals+BOd = ICP Metals + BORON Dissolved

TR Number: 3-510515489-050409-0002

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

REGION COPY

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) [redacted] (b) (4)

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507
DAS No:
R

Region:	3
Project Code:	CT 4554
Account Code:	
CERCLIS ID:	VAN000306614
Spill ID:	ALM
Site Name/State:	Battlefield Golf - April 2009/VA
Project Leader:	Ken Eden
Action:	Removal Assessment
Sampling Co:	Tetra Tech EMI

Date Shipped:	5/4/2009
Carrier Name:	FedEx
Airbill:	85749968300, 8574996822997
Shipped to:	A4 Scientific 1544 Sawdust Road, Suite 505 The Woodlands TX 77380 (281) 292-5277

Chain of Custody Record

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

Sampler Signature:

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
[redacted]	Potable Well/ Ken Eden	L/G	Metals+BO (7)	553 (HNO3) (1)	[redacted]	S: 4/29/2009 16:40		–
[redacted]	Potable Well/ Ken Eden	L/G	Metals+BOd (7)	558 (HNO3) (1)	[redacted]	S: 4/29/2009 16:40		–

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:**	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

Metals+BO = ICP Metals + BORON Total, Metals+BOd = ICP Metals + BORON Dissolved

TR Number: 3-510515489-050409-0002

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

REGION COPY

Send Copy to: [redacted]

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38507
DAS No:
R

Region:	3
Project Code:	CT 4554
Account Code:	
CERCLIS ID:	VAN000306614
Spill ID:	ALM
Site Name/State:	Battlefield Golf - April 2009/VA
Project Leader:	Ken Eden
Action:	Removal Assessment
Sampling Co:	Tetra Tech EMI

Date Shipped:	5/4/2009
Carrier Name:	FedEx
Airbill:	857499683000,857499682997
Shipped to:	A4 Scientific 1544 Sawdust Road, Suite 505 The Woodlands TX 77380 (281) 292-5277

Chain of Custody Record

Sampler Signature:

Relinquished By	(Date / Time)	Received By	(Date / Time)
1			
2			
3			
4			

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
[redacted]	Potable Well/ Ken Eden	L/G	Metals+BO (7)	537 (HNO3) (1)	[redacted]	S: 4/29/2009 8:16		–

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:**	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____
Metals+BO = ICP Metals + BORON Total			

TR Number: 3-510515489-050409-0003

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: [redacted]

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASQAB USE ONLY		
RAS#	CT4554	Analytical TAT
DAS#		7
NSF#		

38507

Date: 4/21/09	Site Activity: Removal ASSESSMENT			
Site Name: Battlefield Golf Club	Street Address: 1001 South Centerville Turnpike			
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DC6C A3LM RS00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START3 QAPP	Date Approved: November 2006		
EPA Project Leader: CHRIS WAGNER	Phone#:	Cell Phone #: 804-337-3049	E-mail: Wagner.Christine@epa.gov	
Request Preparer: JOSHUA COPE	Phone#: 610-364-2130	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: Ken Eden	Phone#: 610-364-2125	Cell Phone #: 215 681 0722	E-mail: Ken.eden@ttemi.com	
Contractor: Tetra Tech EM Inc	EPA CO/PO: Jeff Fang/Karen Wodarczyk			
#Samples 1*	Matrix: potable water	Parameter: TAL metals Low + Hg + B - total A4	Method: ILM05.4 ICPMS	
#Samples 1*	Matrix: potable water	Parameter: TAL metals Low +Hg + B - dissolved	Method: ILM05.4 ICPMS	30510
#Samples 1*	Matrix: non-potable water	Parameter: TAL metals Low + Hg + B - total	Method: ILM05.4 ICPMS	
#Samples 1*	Matrix: non- potable water	Parameter: TAL metals Low +Hg + B - dissolved	Method: ILM05.4 ICPMS	
#Samples	Matrix:	Parameter:	Method:	
Ship Date From: 4/28/09	Ship Date To: 4/30/09	Org. Validation Level	Inorg. Validation Level IM2	

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☐ 14days ☒ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) by ESAT

Validated Data Package Due: ☐ 42 days ☐ 30 days ☒ 21days ☐ 14 days ☐ Other (Specify) 7/14

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached please note addition of Boron analysis. *PLEASE AWARD SPLIT SAMPLES TO A SEPARATE LAB FOR COMPARISON.

Case #: 38507 SDG : MC0146 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 18

Lab. : A4

ALL TOTAL METALS

Sample Number :		[redacted]		[redacted]		[redacted]		MC0146		MC0147	
Sampling Location : (Prefix : BG0904-)		[redacted]		[redacted]		[redacted]		MW-10A		FB	
Field QC :										Field Blank	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		5/1/2009		5/1/2009		5/1/2009		4/30/2009		5/1/2009	
Time Sampled :		16:15		16:17		16:19		13:35		09:00	
Dilution Factor :		2.0 / 1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+									
*ARSENIC	1	+		0.67	B	0.62	B	0.67	B	0.47	J
BARIUM	10	16.4+	J					12.5			
BERYLLIUM	1	+			UJ		UJ		UJ		
*CADMIUM	1	+			UJ		UJ		UJ		
*CHROMIUM	2	+	UL		UJ		UJ		UJ		UL
COBALT	1	+			UJ		UJ	0.66	J		
COPPER	2	+	UL	823	J	7.7	J		UJ		UL
*LEAD	1	+		321		0.47	J				
MANGANESE	1	128+	J	0.63	B	0.32	B	205	J		
MERCURY	0.2										
*NICKEL	1	+	UL	0.37	J	0.79	J		UJ		UL
SELENIUM	5	+			UJ		UJ		UJ		
SILVER	1	+			UJ		UJ		UJ		
THALLIUM	1	+									
VANADIUM	5	+	UL		UJ		UJ		UJ		UL
ZINC	2	39.8+	L	50.2	J	16.2	J	1.1	B	1.5	J
BORON	7	35.6+	K	39.6	J	39.1	J	24.5	J		

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Prefix : All sample locations are prefixed BG0904-

+ = Result reported from diluted analysis.

Case #: 38507 SDG : MC0146

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

ALL TOTAL METALS

Sample Number :		MC0158		MC0160		MC0183					
Sampling Location :		BG0904-MW-9A		BG0904-RB		BG0904-MW-9B					
Field QC :				Rinsate Blank							
Matrix :		Water		Water		Water					
Units :		ug/L		ug/L		ug/L					
Date Sampled :		4/30/2009		5/1/2009		4/30/2009					
Time Sampled :		12:10		09:35		11:55					
Dilution Factor :		2.0 / 1.0		1.0		2.0 / 1.0					
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	+				+					
*ARSENIC	1	+				+					
BARIUM	10	31.2+				14.0+	J				
BERYLLIUM	1	+				+					
*CADMIUM	1	+				+					
*CHROMIUM	2	+	UL		UL	1.6+	J				
COBALT	1	+				+					
COPPER	2	+	UL		UL	+	UL				
*LEAD	1	+				+					
MANGANESE	1	164+	J	0.53	J	56.1+	J				
MERCURY	0.2										
*NICKEL	1	+	UL		UL	1.8+	J				
SELENIUM	5	+				+					
SILVER	1	+				+					
THALLIUM	1	+				+					
VANADIUM	5	+	UL		UL	+	UL				
ZINC	2	1.8+	B	2.9	L	4.9+	B				
BORON	7	42.6+	K			77.9+	K				

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

+ = Result reported from diluted analysis.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : October 6, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Christine Wagner
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38928; SDG #MC01F0) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 09109

LOCKHEED MARTIN
We never forget who we're working for™

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

DATE: October 02, 2009

SUBJECT: Level IM2 Inorganic Data Validation for Case 38928
SDG: MC01F0
Site: Battlefield Golf Club Fly Ash Assessment

FROM: [redacted]
Inorganic Data Reviewer

Through: [redacted]
Senior Data Review Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38928, Sample Delivery Group (SDG) MC01F0, consisted of ten (10) aqueous samples submitted to Bonner Analytical Testing (BONNER) for total metals analysis. Samples were analyzed by the ICP-MS method. The sample set included one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (Modified) through the Routine Analytical Services (RAS) program. Modifications included analysis of boron (B) at a Contract Required Quantitation Limit (CRQL) of 7.0 ug/L using modification reference number 1621.0

SUMMARY

Data were validated according to the Region III Modifications to the National Functional Guidelines for Inorganic Data Review, level IM2. Areas of concern with respect to data usability are listed below.

Samples in this SDG were analyzed by the ICP-MS method which does not include analysis for aluminum (Al), calcium (Ca), iron (Fe), magnesium (Mg), potassium (K) and sodium (Na). These analytes were analyzed by the ICP-AES method for which the results are provided in a separate SDG.

Data in this Case have been impacted by outliers present in the laboratory blanks as well as the matrix spike analysis. Details for these outliers are discussed under "Minor Problems", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MINOR PROBLEMS

Preparation (PB) and Continuing Calibration (CCB) Blanks had reported results greater than the Method Detection Limits (MDLs) for analytes listed below. Positive results reported for these analytes in affected samples which are less than five times (< 5X) the blank concentrations may be biased high and have been qualified "B" on the DSFs.

Blank	Affected Analytes
PB	boron (B), nickel (Ni), zinc (Zn)
CCB	antimony (Sb), silver (Ag)

PB and CCB had negative results greater than the absolute values of the MDLs for the analytes listed below. Positive results reported for arsenic (As) in affected samples which are less than two times (< 2X) the absolute value of the blank concentration may be biased low. The "L" qualifier for this outlier has been superseded by "J" on the DSFs. Quantitation limits for these analytes in affected samples may be biased low and have been qualified "UL" on the DSFs.

Blank	Affected Analytes
PB	As, chromium (Cr)
CCB	vanadium (V)

The matrix spike recovery was low (<75% but > 30%) for Ag. The low recovery may be attributed to matrix interferences or analyte lost during the digestion process. Positive results reported for this analyte in all samples may be biased low. The "L" qualifier for this outlier has been superseded by "B" on the DSFs. Quantitation limits for this analyte in affected samples may be biased low and have been qualified "UL" on the DSFs.

The matrix spike recovery was high (>125%) for B. Positive results reported for this analyte may be biased high and have been qualified "K" unless superseded by "B" on the DSFs.

NOTES

Positive results which are less than the Contract Required Quantitation Limits (CRQLs) but greater than MDLs have been qualified "J" on the DSFs unless superseded by "B".

Reported results for the field duplicate pair MC01F7/MC01F9 were within the control limits of 20% RPD, ±CRQL for all analytes.

Data for Case 38928, SDG MC01F0, were reviewed in accordance with Region III Modifications to the National Functional Guidelines for Evaluating Inorganic Analyses, April 1993.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38928_ MC01F0. IM2

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38928, SDG MC01F0

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Sb	MC01F0, MC01F2	B		High	CCB (0.988 J ug/L)
As	All Samples Except MC01F2, MC01F3 MC01F4		UL	Low	PBN (– 0.153 J ug/L)
	MC01F3, MC01F4	J			> MDL < CRQL PBN (– 0.153 J ug/L)
B	MC01F8	B		High	PB (3.084 J ug/L) MSH (273%)
	All Samples Except MC01F8	K		High	MSH (273%)
Cr	All Samples Except MC01F2		UL	Low	PBN (– 0.162 J ug/L)
Ni	All Samples Except MC01F2	B		High	PB (0.531 J ug/L)
Ag	MC01F0, MC01F2, MC01F8	B		High	CCB (0.012 J ug/L) MSL (53%)
	All Samples Except MC01F0, MC01F2, MC01F8		UL	Low	MSL (53%)
V	MC01F5, MC01F6, MC01F7, MC01F8, MC01F9		UL	Low	CBN (– 0.282 J ug/L)
Zn	MC01F0, MC01F7, MC01F9	B		High	PB (0.707 J ug/L)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

CCB	=	Continuing calibration blanks had reported results greater than the MDLs [results are in parenthesis]. Reported results which are less than five times (<5X) the blank concentrations may be biased high.
PBN	=	The preparation blank had reported negative results greater than absolute values of MDLs [result are in parenthesis]. Reported results which are less than two times (<2X) the absolute value of the blank concentrations and quantitation limits may be biased low.
>MDL <CRQL	=	Reported results are between MDL and CRQL and are considered estimated.
PB	=	The preparation blank had reported results greater than the MDLs [results are in parenthesis]. Reported results which are less than five times (<5X) the blank concentrations may be biased high.
MSH	=	The matrix spike recovery was high (>125%) [the %recovery is in parenthesis]. Reported results may be biased high.
MSL	=	The matrix spike recovery was low (>30 % but < 75%) [%recovery is in parenthesis]. Reported results and quantitation limits may be biased low.
CBN	=	The continuing calibration blank had a reported negative result greater than absolute value of MDL [the result is in parenthesis]. Quantitation limits may be biased low.

APPENDIX A

Glossary of Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

APPENDIX B

Data Summary Forms

Case #: 38928 SDG : MC01F0 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 10

Lab. : BONNER

Sample Number :	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sampling Location : (Prefix: BG0909-)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Field QC :					
Matrix :	Water	Water	Water	Water	Water
Units :	ug/L	ug/L	ug/L	ug/L	ug/L
Date Sampled :	9/10/2009	9/10/2009	9/11/2009	9/9/2009	9/9/2009
Time Sampled :	11:38	11:41	08:05	10:17	10:15
Dilution Factor :	1.0	1.0	1.0	1.0	1.0

ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	0.42	B			0.24	B				
*ARSENIC	1		UL		UL	1.4		0.082	J	0.091	J
BARIUM	10	1.5	J	0.13	J	56.5		1.8	J	1.7	J
BERYLLIUM	1					0.44	J				
BORON	7	62.5	K	57.5	K	28.1	K	185	K	187	K
*CADMIUM	1										
*CHROMIUM	2		UL		UL	1.8	J		UL		UL
COBALT	1	0.064	J			6.4		0.036	J	0.045	J
COPPER	2	0.94	J	4.2		292		44.6		0.43	J
*LEAD	1	0.088	J	0.33	J	100		6.9		0.24	J
MANGANESE	1	11.0				89.2		4.0		3.8	
MERCURY	0.2										
*NICKEL	1	0.87	B	0.45	B	8.2		0.79	B	0.53	B
SELENIUM	5										
SILVER	1	0.019	B		UL	0.032	B		UL		UL
THALLIUM	1	0.024	J								
VANADIUM	5					0.97	J				
ZINC	2	3.0	B	5.3		78.3		35.1		18.4	

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38928 SDG : MC01F0
Site : BATTLEFIELD GOLF CLUB
Lab. : BONNER

Sample Number :	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sampling Location : (Prefix: BG0909-)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Field QC :			Dup. of [redacted]		Dup. of [redacted]
Matrix :	Water	Water	Water	Water	Water
Units :	ug/L	ug/L	ug/L	ug/L	ug/L
Date Sampled :	9/9/2009	9/9/2009	9/9/2009	9/9/2009	9/9/2009
Time Sampled :	09:04	09:12	14:17	15:27	14:20
Dilution Factor :	1.0	1.0	1.0	1.0	1.0

ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2										
*ARSENIC	1		UL		UL		UL		UL		UL
BARIUM	10	28.1		0.20	J	2.0	J	10.4		2.0	J
BERYLLIUM	1										
BORON	7	222	K	260	K	45.1	K	13.0	B	44.3	K
*CADMIUM	1										
*CHROMIUM	2		UL		UL		UL		UL		UL
COBALT	1	0.095	J	0.016	J	0.085	J	0.077	J	0.089	J
COPPER	2	50.5		23.7		0.83	J	182		0.65	J
*LEAD	1	16.9		0.34	J	0.089	J	6.4		0.091	J
MANGANESE	1	17.9		0.92	J	8.3		289		8.4	
MERCURY	0.2										
*NICKEL	1	0.71	B	0.38	B	1.3	B	1.7	B	0.94	B
SELENIUM	5										
SILVER	1		UL		UL		UL	0.037	B		UL
THALLIUM	1										
VANADIUM	5		UL		UL		UL		UL		UL
ZINC	2	11.9		10.7		1.2	B	34.8		1.0	B

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

APPENDIX C

Chain of Custody (COC) Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38928 **R**
DAS No:

Region:	3	**Date Shipped:**	9/14/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:		**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:	CT4668	**Airbill:**	869868645830	1 [redacted] 9/14/09 1700	
CERCLIS ID:	VAN000306614	**Shipped to:**	Bonner Analytical Testing Company 2703 Oak Grove Road Hattiesburg MS 39402 (601) 264-2854	2	
Spill ID:				3	
Site Name/State:	Battlefield Golf 9 09 RW Sampling/VA			4	
Project Leader:	Donna Davies				
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EMI				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
[redacted]	Potable Well/ Donna Davies	L/G	Metals + B (14)	1402 (HNO3) (1)	[redacted]	S: 9/10/2009 11:38		--
[redacted]	Potable Well/ Donna Davies	L/G	Metals + B (14)	1403 (HNO3) (1)	[redacted]	S: 9/10/2009 11:41		--
[redacted]	Potable Well/ Donna Davies	L/G	Metals + B (14)	1404 (HNO3) (1)	[redacted]	S: 9/11/2009 8:05		--
[redacted]	Potable Well/ Donna Davies	L/G	Metals + B (14)	1405 (HNO3) (1)	[redacted]	S: 9/9/2009 10:17		--
(b) (6)	Potable Well/ Donna Davies	L/G	Metals + B (14)	1406 (HNO3) (1)	[redacted]	S: 9/9/2009 10:15		--
(b) (6)	Potable Well/ Donna Davies	L/G	Metals + B (14)	1407 (HNO3) (1)	[redacted]	S: 9/9/2009 9:04		--
(b) (6)	Potable Well/ Donna Davies	L/G	Metals + B (14)	1408 (HNO3) (1)	[redacted]	S: 9/9/2009 9:12		--
(b) (6)	Potable Well/ Donna Davies	L/G	Metals + B (14)	1409 (HNO3) (1)	[redacted]	S: 9/9/2009 14:17		Field Duplicate of [redacted]
(b) (6)	Potable Well/ Donna Davies	L/G	Metals + B (14)	1410 (HNO3) (1)	[redacted]	S: 9/9/2009 15:27		--
(b) (6)	Potable Well/ Donna Davies	L/G	Metals + B (14)	1411 (HNO3) (1)	[redacted]	S: 9/9/2009 14:20		Field Duplicate of [redacted]

Shipment for Case Complete? Y	**Sample(s) to be used for laboratory QC:** MC01F3	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key: Metals + B = CLP ICPMS Metals + B	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

TR Number: 3-222665643-091409-0016

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) [redacted] (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

U.S. EPA Region III Analytical Request Form

Revision 10.06

JTS 8-21-09

ASQAB USE ONLY		
RAS#	CT4668	Analytical TAT
DAS#		14
NSF#		

38928

Date: 8/20/09	Site Activity: Removal Assessment			
Site Name: Battlefield Golf Club Site		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DC6C A3LM RS00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP	Date Approved: November 2006		
EPA Project Leader: Christine Wagner	Phone#: 215.814.3261	Cell Phone #: 804-337-3049	E-mail: wagner.christine@epa.gov	
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: Kevin Scott	Phone#: 610.364.2119	Cell Phone #: 856.217.6072	E-mail: Kevin.scott@ttemi.com	
Contractor: Tetra Tech EM Inc.	EPA CO/PO: Andrew Blaney/Karen Wodarczyk			
#Samples 16	Matrix: potable water	Parameter: TAL metals Low + Hg + Boron - total Borree	Method: ILM05.4 ICP-MS 31097	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
Ship Date From: 8/24/2009	Ship Date To: 9/11/2009	Org. Validation Level	Inorg. Validation Level IM2	

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) PR's by ESAT

Validated Data Package Due: ☐ 42 days ☐ 30 days ☒ 21days ☐ 14 days ☐ Other (Specify) 14/7

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis. We expect to ship samples in two batches: one batch of five samples the week of 8/24 and one batch of up to 11 samples the week of 9/8. Saturday delivery is not expected. We will notify CSC if there is a change in this anticipated schedule.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : September 22, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38928; SDG #MC0064) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 09052

LOCKHEED MARTIN
We never forget who we're working for™

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

DATE: September 17, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38928
SDG: MC0064
Site: Battlefield Golf Club

FROM: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38928, Sample Delivery Group (SDG) MC0064, consisted of five (5) aqueous samples analyzed for total metals and boron (B) by Bonner Analytical Testing Company (BONNER). The sample set included one (1) field blank and one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (with modification 1621.0) through the Routine Analytical Services (RAS) program. Modifications include analysis of B at the Contract Required Quantitation Limit (CRQL) of 7.0 µg/L.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Samples in this SDG were analyzed by ICP-MS methodology which does not include analysis for aluminum (Al), calcium (Ca), iron (Fe), magnesium (Mg), mercury (Hg), potassium (K) and sodium (Na). Hg was analyzed in this SDG using a cold vapor technique.

Data in this case have been impacted by outliers present in the laboratory blanks as well as the matrix spike and ICP serial dilution analyses. Details of these outliers are discussed under "Minor Problems", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on a single Data Summary Form (DSF).

MINOR PROBLEMS

Continuing calibration (CCB) and/or preparation (PB) blanks had reported results greater than the Method Detection Limits (MDLs) for the analytes listed below. Positive results for these analytes in affected samples which are less than or equal to five times (≤5X) the blank concentrations may be biased high and have been qualified "B" on the DSF.

Blank	Affected Analytes
CCB	antimony (Sb), thallium (Tl)
PB	arsenic (As), barium (Ba), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), nickel (Ni), vanadium (V), zinc (Zn)

The matrix spike recovery was high (>125%) for B. Positive results for this analyte in affected samples may be biased high and have been qualified "K" on the DSF.

The percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) for Zn. Positive results for this analyte in all samples are estimated due to possible matrix interferences and have been qualified "J" on the DSF unless superseded by "B".

NOTES

Reported results between MDLs and CRQLs were qualified "J" on the DSF unless superseded by "B".

The cooler chest used to transport the samples in this SDG had an interior temperature of 12.0°C, which exceeds the required temperature of 4°C ± 2°C. Due to the thermostability of metals, no data were qualified based on this cooler temperature.

The concentration of Zn in the PB is above the CRQL. The laboratory failed to redigest and reanalyze the samples with concentrations of this analyte less than ten times (<10X) the blank result and above the CRQL as required by the SOW. Samples MC0064 and MC0066 required redigestion. Results for Zn in these samples were qualified "B" as mentioned above.

Reported results for field duplicate pair MC0065/MC0066 were within 20% RPD, ±CRQL for all analytes except Ba, Cu, Pb, Mn and Zn.

Data for Case 38928, SDG MC0064, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38928.MC0064IM2.doc

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38928.MC0064IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38928, SDG MC0064

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Sb	All Samples	B		High	CCB (0.434 J µg/L)
As	All Samples	B		High	PB (0.075 J µg/L)
Ba	MC0068	B		High	PB (0.045 J µg/L)
B	MC0064, MC0065, MC0066, MC0067	K		High	MSH (270%)
Cd	MC0064, MC0065, MC0068	B		High	PB (0.088 J µg/L)
Cr	All Samples	B		High	PB (0.074 J µg/L)
Cu	MC0067, MC0068	B		High	PB (0.310 J µg/L)
Pb	MC0067, MC0068	B		High	PB (0.094 J µg/L)
Mn	MC0068	B		High	PB (0.241 J µg/L)
Ni	MC0065, MC0066, MC0067, MC0068	B		High	PB (0.409 J µg/L)
Tl	All Samples	B		High	CCB (0.125 J µg/L)
V	MC0066, MC0067, MC0068	B		High	PB (0.551 J µg/L)
Zn	MC0064, MC0066, MC0068	B		High	PB (3.765 µg/L) ISD (16%)
	MC0065, MC0067	J			ISD (16%)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

CCB	=	Continuing calibration blanks had results >MDLs [results are in parenthesis]. Positive results which are ≤5X the blank concentrations may be biased high.
PB	=	Preparation blank had results >MDLs [results are in parenthesis]. Positive results which are ≤5X the blank concentrations may be biased high.
MSH	=	Matrix spike recovery was high (>125%) [% recovery is in parenthesis]. Positive results may be biased high.
ISD	=	Percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) [%D is in parenthesis]. Positive results are estimated.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

DATA SUMMARY FORM: INORGANIC

Case #: 38928 SDG : MC0064 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 5

Lab. : BONNER

Sample Number :	[redacted]	[redacted]	[redacted]	[redacted]	MC0068
Sampling Location :	[redacted]	[redacted]	[redacted]	[redacted]	FB
Field QC :		Dup of [redacted]	Dup of [redacted]		Field Blank
Matrix :	Water	Water	Water	Water	Water
Units :	ug/L	ug/L	ug/L	ug/L	ug/L
Date Sampled :	8/24/2009	8/24/2009	8/24/2009	8/24/2009	8/24/2009
Time Sampled :	17:12	17:13	17:15	17:17	17:30
Dilution Factor :	1.0	1.0	1.0	1.0	1.0

ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	0.26	B	0.73	B	0.18	B	0.14	B	0.16	B
*ARSENIC	1	0.14	B	0.17	B	0.12	B	0.12	B	0.088	B
BARIUM	10	17.9		14.6		1.7	J	18.1		0.099	B
BERYLLIUM	1										
BORON	7	54.2	K	54.2	K	52.5	K	54.1	K		
*CADMIUM	1	0.019	B	0.028	B					0.023	B
*CHROMIUM	2	0.23	B	0.22	B	0.24	B	0.22	B	0.13	B
COBALT	1	0.13	J	0.097	J	0.026	J	0.11	J		
COPPER	2	286		1080		86.5		1.3	B	0.14	B
*LEAD	1	24.3		180		3.6		0.12	B	0.20	B
MANGANESE	1	163		136		13.4		161		0.21	B
MERCURY	0.2	0.061	J								
*NICKEL	1	3.4		1.8	B	1.1	B	0.88	B	0.22	B
SELENIUM	5										
SILVER	1	0.040	J	0.21	J	0.012	J				
THALLIUM	1	0.54	B	0.12	B	0.062	B	0.037	B	0.18	B
VANADIUM	5					0.66	B	0.50	B	1.1	B
ZINC	2	12.7	B	50.7	J	9.0	B	93.4	J	0.87	B

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38928
DAS No:
R

Region:	3	Date Shipped:	8/27/2009	Chain of Custody Record	Sampler Signature: K Scott
Project Code: / Account Code:	CT4668	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
CERCLIS ID:	VAN000306614	Airbill:	9619 4298 3053	1 Kevin Scott 8/27/09 18:20	FED-EX
Spill ID:	ALM	Shipped to:	Bonner Analytical Testing Company 2703 Oak Grove Road Hattiesburg MS 39402 (601) 264-2854	2	
Site Name/State:	Battlefield Golf Club Site/VA			3	
Project Leader:	Kevin Scott			4	
Action:	Removal Assessment				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	105 (HNO3) (1)	[redacted]	S: 8/24/2009 17:12		--
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	106 (HNO3) (1)	[redacted]	S: 8/24/2009 17:13		Duplicate of [redacted]
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	107 (HNO3) (1)	[redacted]	S: 8/24/2009 17:15		Duplicate of [redacted]
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	108 (HNO3) (1)	[redacted]	S: 8/24/2009 17:17		--
MC0068	Field QC/ Kevin Scott	L/G	TM+Hg+B (14)	109 (HNO3) (1)	FB	S: 8/24/2009 17:30		Field Blank

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: MC0067	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____
TM+Hg+B = CLP TAL Total Metals, plus Hg and Boron			

TR Number: 3-285618019-082709-0002

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: [redacted]

JTS 8-21-09

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASQAB USE ONLY		
RAS#	CT4668	Analytical TAT
DAS#		14
NSF#		

38928

Date: 8/20/09	Site Activity: Removal Assessment			
Site Name: Battlefield Golf Club Site		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DC6C A3LM RS00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP	Date Approved: November 2006		
EPA Project Leader: Christine Wagner	Phone#: 215.814.3261	Cell Phone #: 804-337-3049	E-mail: wagner.christine@epa.gov	
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: Kevin Scott	Phone#: 610.364.2119	Cell Phone #: 856.217.6072	E-mail: Kevin.scott@ttemi.com	
Contractor: Tetra Tech EM Inc.		EPA CO/PO: Andrew Blaney/Karen Wodarczyk		
#Samples 16	Matrix: potable water	Parameter: TAL metals Low + Hg + Boron - total Boron	Method: ILM05.4 ICP-MS 31097	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
Ship Date From: 8/24/2009	Ship Date To: 9/11/2009	Org. Validation Level	Inorg. Validation Level IM2	

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) PR's by ESAT

Validated Data Package Due: ☐ 42 days ☐ 30 days ☒ 21days ☐ 14 days ☐ Other (Specify) 14/7

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis. We expect to ship samples in two batches: one batch of five samples the week of 8/24 and one batch of up to 11 samples the week of 9/8. Saturday delivery is not expected. We will notify CSC if there is a change in this anticipated schedule.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : November 9, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Christine Wagner
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38928; SDG #MC0065) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 11009

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN
We never forget who we're working for™

Date: November 5, 2009

Subject: Inorganic Data Validation (IM2 Level)
Case: 38928
SDG: MC0065
Site: Battlefield Golf Club

From: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

To: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38928, Sample Delivery Group (SDG) MC0065, consisted of two (2) aqueous samples, which are a field duplicate pair, analyzed for total metals in addition to boron (B) by ICP-MS per modification analysis reference number 1621.0 and for mercury (Hg) by cold vapor technique. Samples were analyzed by Bonner Analytical Testing Company (BONNER) according to Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 through the Routine Analytical Services (RAS) program.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

On October 14, 2009, BONNER received a request from Region 3 for re-analysis of samples MC0065 and MC0066 from Case 38928, SDG MC0064. Samples were initially received by the laboratory August 28, 2009.

Data in this case have been impacted by a holding time infraction as well as outliers present in laboratory blank analyses. Details of these outliers are discussed under "Major and Minor Problem," specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on a single Data Summary Form (DSF).

MAJOR PROBLEM

The holding time of twenty-eight (28) days from the time of sample collection to sample analysis for mercury (Hg) has been exceeded by thirty-two (32) days for both samples in this data set. Quantitation limits for this analyte in both samples has been rejected and qualified "R" on the DSF.

MINOR PROBLEM

Continuing Calibration (CCB) and Preparation (PB) Blanks had reported results greater than the Method Detection Limits (MDLs) for the analytes listed below. Positive results for these analytes in affected samples which are less than five times (<5X) the blank concentrations may be biased high and have been qualified "B" on the DSF.

Blank	Affected Analytes
CCB	Antimony (Sb), thallium (Tl)
PB	Arsenic (As), vanadium (V)

NOTES

Reported results between MDLs and Contract Required Quantitation Limits (CRQLs) were qualified "J" unless superseded by "B" on the DSF.

Results for field duplicate pair samples MC0065/MC0066 were within 20% Relative Percent Difference (RPD), $\pm$ CRQL for all analytes except barium (Ba), copper (Cu), lead (Pb), manganese (Mn), nickel (Ni) and zinc (Zn).

The sample cooler containing all samples had an interior temperature of 12.0°C, which exceeded the required cooler temperature of 4.0°C$\pm$2.0°C. Due to thermostability of metals, no data were qualified based on the sample cooler chest temperature.

Results from the initial analyses of these samples performed September, 2009 were similar with the re-analyses performed October 2009.

Data for Case 38928, SDG MC0065, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

Table 1A	Summary of qualifiers on data summary forms after data validation
Table 1B	Codes used in comments column of Table 1A
Appendix A	Glossary of Data Qualifier Codes
Appendix B	Data Summary Form(s)
Appendix C	Chain of Custody Records
Appendix D	Laboratory Case Narrative

DCN: 38928_ MC0065

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38928, SDG MC0065

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Sb	MC0065, MC0066	B		High	CCB (0.629 J ug/L)
As	MC0065, MC0066	B		High	PB (0.075 J ug/L)
Hg	MC0065, MC0066		R	Low	HT (32 days)
Tl	MC0066	B		High	CCB (0.050 J ug/L)
V	MC0065, MC0066	B		High	PB (0.461 J ug/L)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

CCB	=	Continuing calibration blanks had results >MDLs [results are in parenthesis]. Positive results which are <5X blank concentrations may be biased high.
PB	=	Preparation blank had results > MDLs [results are in parenthesis]. Positive results which are <5X the blank concentration may be biased high.
HT	=	The technical holding time from time of sample collection to sample analysis was exceeded. Quantitation limits are rejected.

Appendix A
Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of compounds)

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B
Data Summary Forms

DATA SUMMARY FORM: INORGANIC

Case #: 38928 SDG : MC0065 Number of Soil Samples : 0
Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 2
Lab. : BONNER

Sample Number :	[redacted]	[redacted]									
Sampling Location :	[redacted]	[redacted]									
Field QC :	Dup. of [redacted]	Dup. of [redacted]									
Matrix :	Water	Water									
Units :	ug/L	ug/L									
Date Sampled :	8/24/2009	8/24/2009									
Time Sampled :	17:13	17:15									
Dilution Factor :	1.0	1.0									
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2	0.82	B	0.17	B						
*ARSENIC	1	0.15	B	0.10	B						
BARIUM	10	15.1		1.7	J						
BERYLLIUM	1										
BORON	7	56.9		55.5							
*CADMIUM	1	0.032	J								
*CHROMIUM	2	0.23	J	0.21	J						
COBALT	1	0.095	J	0.017	J						
COPPER	2	1150		92.2							
*LEAD	1	182		4.3							
MANGANESE	1	141		14.2							
MERCURY	0.2		R		R						
*NICKEL	1	2.5		0.52	J						
SELENIUM	5										
SILVER	1	0.24	J	0.016	J						
THALLIUM	1	0.55	J	0.15	B						
VANADIUM	5	0.52	B	0.60	B						
ZINC	2	53.3		9.3							

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS
To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Appendix C
Chain of Custody Records

EPA USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38928 **R**
DAS No:

Region:	3
Project Code:	CT4668
Account Code:	
CERCLIS ID:	VAN000306614
Spill ID:	ALM
Site Name/State:	Battlefield Golf Club Site/VA
Project Leader:	Kevin Scott
Action:	Removal Assessment
Sampling Co:	Tetra Tech EM Inc.

Date Shipped:	8/27/2009
Carrier Name:	FedEx
Airbill:	9619 4298 3053
Shipped to:	Bonner Analytical Testing Company 2703 Oak Grove Road Hattiesburg MS 39402 (601) 264-2854

Chain of Custody Record

Sampler Signature: K Scott

Relinquished By	(Date / Time)	Received By	(Date / Time)
1 Kevin Scott	8/27/09 18:20	FED-EX	
2			
3			
4			

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	105 (HNO3) (1)	[redacted]	S: 8/24/2009 17:12		–
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	106 (HNO3) (1)	[redacted]	S: 8/24/2009 17:13		Duplicate of [redacted]
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	107 (HNO3) (1)	[redacted]	S: 8/24/2009 17:15		Duplicate of [redacted]
[redacted]	Potable Well/ Kevin Scott	L/G	TM+Hg+B (14)	108 (HNO3) (1)	[redacted]	S: 8/24/2009 17:17		–
MC0068	Field QC/ Kevin Scott	L/G	TM+Hg+B (14)	109 (HNO3) (1)	FB	S: 8/24/2009 17:30		Field Blank

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:** MC0067	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

TM+Hg+B = CLP TAL Total Metals, plus Hg and Boron

TR Number: 3-285618019-082709-0002

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: [redacted]

JTS 8-21-09

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASQAB USE ONLY		
RAS#	CT4668	Analytical TAT
DAS#		14
NSF#		

38928

Date: 8/20/09	Site Activity: Removal Assessment			
Site Name: Battlefield Golf Club ~~Site~~		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DC6C A3LM RS00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP	Date Approved: November 2006		
EPA Project Leader: Christine Wagner	Phone#: 215.814.3261	Cell Phone #: 804-337-3049	E-mail: wagner.christine@epa.gov	
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: Kevin Scott	Phone#: 610.364.2119	Cell Phone #: 856.217.6072	E-mail: Kevin.scott@ttemi.com	
Contractor: Tetra Tech EM Inc.		EPA CO/PO: Andrew Blaney/Karen Wodarczyk		
#Samples 16	Matrix: potable water	Parameter: TAL metals Low + Hg + Boron - total Boron	Method: ILM05.4 ICP-MS 31097	
#Samples 2	Matrix: water MC0065+66	Parameter: TAL+Hg+B 10/14/09	Method: ILM04.4-ICP-MS	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	
#Samples	Matrix:	Parameter:	Method:	

Ship Date From: 8/24/2009	Ship Date To: 9/11/2009	Org. Validation Level	Inorg. Validation Level IM2

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) PR's by ESAT

Validated Data Package Due: ☐ 42 days ☐ 30 days ☒ 21days ☐ 14 days ☐ Other (Specify) 14/7

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis. We expect to ship samples in two batches: one batch of five samples the week of 8/24 and one batch of up to 11 samples the week of 9/8. Saturday delivery is not expected. We will notify CSC if there is a change in this anticipated schedule.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : October 15, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38969; SDG #MC00A1, MC00B1) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 10009

LOCKHEED MARTIN
We never forget who we're working for™

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

DATE: October 07, 2009

SUBJECT: Level IM2 Inorganic Data Validation for Case 38969
SDGs: MC01A1 and MC01B1
Site: Battle Field Golf Club

FROM: [redacted]
Inorganic Data Reviewer

Through: [redacted]
Senior Data Review Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38969, Sample Delivery Groups (SDGs) MC01A1 and MC01B1, consisted of twenty-two (22) soil samples submitted to A4 Scientific, Inc. (A4) for total metals analyses. The sample set included one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (Modified) through the Routine Analytical Services (RAS) program. Modifications included analysis of boron (B) at a Contract Required Quantitation Limit (CRQL) of 5.0 mg/Kg using modification reference number 1803.0

SUMMARY

Data were validated according to the Region III Modifications to the National Functional Guidelines for Inorganic Data Review, level IM2. No problems regarding data usability were noted during the review of this data set. Analytical results for all samples are summarized on the Data Summary Form (DSF).

NOTES

Positive results which are less than the Contract Required Quantitation Limits (CRQLs) but greater than MDLs have been qualified "J" on the DSFs.

No positive result was reported in the analyses of laboratory blanks in both SDGs.

Positive results which are less than the Contract Required Quantitation Limits (CRQLs) but greater than MDLs have been qualified "J" on the DSFs.

No positive result was reported in the analyses of laboratory blanks in both SDGs.

The RPD for laboratory duplicate analysis was outside the contractual control limits (20% RPD, ± CRQL) for chromium (Cr) in SDG MC01A1. The RPD, however, was within Region 3 established control limits (35% RPD, ± 2XCRQL) for soil analysis. No data were qualified for this analyte based on laboratory duplicate precision.

Laboratory Control Samples (LCSs) reported results below MDLs for the analytes listed below. Therefore, LCSs results for these analytes were reported as non-detects on Form 7. Lower acceptance limits for these analytes were also below the laboratory MDLs which make the recoveries of these analytes within the control limits. No data were qualified based on these LCSs recoveries.

SDG	Affected Analytes
MC01A1	barium (Ba), boron (B), potassium (K)
MC01B1	Ba, B, K, sodium (Na)

Reported results for the field duplicate pair MC01B3/MC01B4 were within the control limits of 35% RPD, ±2XCRQL for all analytes.

Data for Case 38969, SDGs MC01A1 and MC01B1, were reviewed in accordance with Region III Modifications to the National Functional Guidelines for Evaluating Inorganic Analyses, April 1993.

ATTACHMENTS

APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38969_ MC01A1 and MC01B1. IM2

APPENDIX A

Glossary of Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

APPENDIX B

Data Summary Forms

Case #: 38969 SDG : MC01A1 Number of Soil Samples : 10

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 0

Lab. : A4

Sample Number :		MC01A1		MC01A2		MC01A3		MC01A4		MC01A5	
Sampling Location : (Prefix : BG0909-)		SED-01		SED-010		SED-011		SED-012		SED-015	
Field QC :											
Matrix :		Soil		Soil		Soil		Soil		Soil	
Units :		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009	
Time Sampled :		13:14		15:32		15:40		15:51		16:18	
%Solids :		75.0		75.7		76.5		61.2		69.3	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	7370		8240		8610		6890		11800	
ANTIMONY	6										
ARSENIC	1	8.2				2.1		3.5		1.2	J
BARIUM	20	29.0		62.9		66.9		58.0		37.2	
BERYLLIUM	0.5	0.35	J	0.37	J	0.47	J	0.57	J	0.23	J
BORON	5.0										
CADMIUM	0.5										
CALCIUM	500	1010		1120		1170		4150			
CHROMIUM	1	12.5		12.6		17.4		13.2		10.5	
COBALT	5					2.8	J				
COPPER	2.5	5.5				3.7		5.0		2.6	J
IRON	10	2760		6380		11100		5450		1830	
*LEAD	1	10.1		5.1		4.9		11.9		8.0	
MAGNESIUM	500	393	J	440	J	1070		595	J	249	J
MANGANESE	1.5	19.9		9.5		21.3		27.1		6.4	
MERCURY	0.1	0.053	J							0.054	J
NICKEL	4	2.9	J	3.8	J	6.8		3.8	J	3.9	J
POTASSIUM	500	307	J			433	J	472	J		
SELENIUM	3.5										
SILVER	1										
SODIUM	500										
THALLIUM	2.5										
VANADIUM	5	12.5		13.1		21.1		14.5		9.4	
ZINC	6	7.0	J	4.3	J	12.0		13.5		4.8	J

CRQL = Contract Required Quantitation Limit SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) / (%Solids/ 100) Revised 09/99

Case #: 38969 SDG : MC01A1

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC01A6		MC01A7		MC01A8		MC01A9		MC01B0	
Sampling Location : (Prefix : BG0909-)		SED-016		SED-017		SED-018		SED-019		SED-02	
Field QC :											
Matrix :		Soil		Soil		Soil		Soil		Soil	
Units :		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :		9/10/2009		9/10/2009		9/10/2009		9/10/2009		9/9/2009	
Time Sampled :		17:04		17:32		18:31		18:36		13:22	
%Solids :		75.7		68.6		67.4		47.2		76.3	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	766		7330		3580		10400		1970	
ANTIMONY	6										
ARSENIC	1	1.3		2.3		0.69	J	2.1		0.54	J
BARIUM	20			36.0		27.5	J	79.6		10.7	J
BERYLLIUM	0.5			0.43	J			0.65	J		
BORON	5.0										
CADMIUM	0.5										
CALCIUM	500			1290		526	J	1660			
CHROMIUM	1	1.6		15.9		4.9		14.1		3.3	
COBALT	5			3.8	J						
COPPER	2.5			5.9		2.1	J	7.2			
IRON	10	3930		11500		2250		7760		4120	
*LEAD	1	1.0	J	6.0		5.5		16.5		1.9	
MAGNESIUM	500			1280		267	J	883	J		
MANGANESE	1.5	5.0		36.5		10.8		27.3		4.7	
MERCURY	0.1										
NICKEL	4			8.7		2.2	J	7.3	J		
POTASSIUM	500			639	J			519	J		
SELENIUM	3.5										
SILVER	1										
SODIUM	500										
THALLIUM	2.5										
VANADIUM	5	2.3	J	18.9		5.9	J	16.4		6.1	J
ZINC	6			22.4		7.7	J	27.2			

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

Case #: 38969 SDG : MC01B1 Number of Soil Samples : 12

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 0

Lab. : A4

Sample Number :		MC01B1		MC01B2		MC01B3		MC01B4		MC01B6	
Sampling Location : (Prefix : BG0909-)		SED-03		SED-04		SED-05		SED-06		SED-08	
Field QC :						Dup. of MC01B4		Dup. of MC01B3			
Matrix :		Soil		Soil		Soil		Soil		Soil	
Units :		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009	
Time Sampled :		13:33		13:45		14:48		14:50		15:14	
%Solids :		76.2		79.2		71.3		72.0		79.1	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	6330		4570		9800		10300		8110	
ANTIMONY	6										
ARSENIC	1	3.9		0.88	J	1.9		1.6		2.5	
BARIUM	20	44.9		35.8		67.9		76.3		48.1	
BERYLLIUM	0.5	0.39	J	0.26	J	0.70		0.77		0.38	J
BORON	5.0										
CADMIUM	0.5										
CALCIUM	500	1330		567	J	1320		1540		783	
CHROMIUM	1	9.1		8.3		13.8		16.0		16.5	
COBALT	5									2.5	J
COPPER	2.5	4.7		1.8	J	1.3	J	2.0	J	3.5	
IRON	10	3570		4050		14100		15300		8290	
*LEAD	1	6.8		3.6		6.8		7.1		4.9	
MAGNESIUM	500	481	J	509	J	494	J	593	J	858	
MANGANESE	1.5	18.9		10.8		9.5		10.4		21.0	
MERCURY	0.1	0.042	J								
NICKEL	4	4.1	J	2.9	J	4.6	J	5.3	J	5.6	
POTASSIUM	500	377	J	241	J	253	J	253	J	394	J
SELENIUM	3.5										
SILVER	1										
SODIUM	500										
THALLIUM	2.5										
VANADIUM	5	11.5		10.3		18.5		20.4		18.1	
ZINC	6	12.4		12.4		4.6	J	5.6	J	11.5	

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

Case #: 38969 SDG : MC01B1

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC01B7		MC01B8		MC01B9		MC01C0		MC01C1	
Sampling Location : (Prefix : BG0909-)		SED-09		SS01		SS02		SS03		SS04	
Field QC :											
Matrix :		Soil		Soil		Soil		Soil		Soil	
Units :		mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :		9/9/2009		9/10/2009		9/10/2009		9/10/2009		9/10/2009	
Time Sampled :		15:21		16:07		16:09		16:17		16:47	
%Solids :		69.9		71.7		74.4		81.5		68.0	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	5900		7300		8570		10400		5130	
ANTIMONY	6									13.1	
ARSENIC	1	1.7		1.2	J	2.0		1.2	J	4.0	
BARIUM	20	39.8		30.6		32.1		38.8		29.3	
BERYLLIUM	0.5	0.30	J					0.21	J		
BORON	5.0										
CADMIUM	0.5									1.1	
CALCIUM	500	549	J	247	J	415	J	558	J	792	
CHROMIUM	1	11.9		6.8		10.1		11.4		13.0	
COBALT	5										
COPPER	2.5	3.4	J	6.6		7.7		2.9	J	6.5	
IRON	10	5580		3090		9580		2910		3590	
*LEAD	1	4.7		19.7		23.5		7.7		32.0	
MAGNESIUM	500	548	J			266	J	451	J	371	J
MANGANESE	1.5	16.9		31.6		14.2		18.1		45.4	
MERCURY	0.1			0.058	J	0.094	J			0.060	J
NICKEL	4	4.0	J	2.9	J	4.2	J	3.8	J	1.8	J
POTASSIUM	500	353	J			267	J	360	J	267	J
SELENIUM	3.5									6.0	
SILVER	1										
SODIUM	500										
THALLIUM	2.5									12.2	
VANADIUM	5	14.3		8.8		11.9		10.6		7.6	
ZINC	6	9.1		12.6		11.3		7.5		30.3	

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

Case #: 38969 SDG : MC01B1

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC01C2		MC01E8							
Sampling Location : (Prefix : BG0909-)		SS05		SED-07							
Field QC :											
Matrix :		Soil		Soil							
Units :		mg/Kg		mg/Kg							
Date Sampled :		9/10/2009		9/9/2009							
Time Sampled :		16:49		14:57							
%Solids :		74.3		80.6							
Dilution Factor :		1.0		1.0							
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	6970		4790							
ANTIMONY	6										
ARSENIC	1	7.6		1.4							
BARIUM	20	44.2		32.4							
BERYLLIUM	0.5	0.33	J	0.28	J						
BORON	5.0										
CADMIUM	0.5	0.81									
CALCIUM	500	2370		480	J						
CHROMIUM	1	13.9		10.7							
COBALT	5										
COPPER	2.5	8.8		2.1	J						
IRON	10	2980		6350							
*LEAD	1	43.1		3.4							
MAGNESIUM	500	458	J	488	J						
MANGANESE	1.5	53.3		10.7							
MERCURY	0.1	0.079	J								
NICKEL	4	3.0	J	2.8	J						
POTASSIUM	500	564	J	269	J						
SELENIUM	3.5										
SILVER	1										
SODIUM	500										
THALLIUM	2.5										
VANADIUM	5	7.9		12.2							
ZINC	6	39.2		5.4	J						

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969 **R**
DAS No:

Region:	3	Date Shipped:	9/14/2009	Chain of Custody Record	Sampler Signature:
Project Code: / Account Code:	CT4682	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
CERCLIS ID:	VAN000306614	Airbill:	857499683835	1 DAS 9/14/09 1700	
Spill ID:		Shipped to:	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Site Name/State:	Battlefield Golf Fly Ash/VA			3	
Project Leader:	Donna Davies			4	
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC01A1	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1349 (Ice Only) (1)	BG0909-SED-01	S: 9/9/2009	13:14		--
MC01A2	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1350 (Ice Only) (1)	BG0909-SED-010	S: 9/9/2009	15:32		--
MC01A3	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1351 (Ice Only) (1)	BG0909-SED-011	S: 9/9/2009	15:40		--
MC01A4	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1352 (Ice Only) (1)	BG0909-SED-012	S: 9/9/2009	15:51		--
MC01A5	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1353 (Ice Only) (1)	BG0909-SED-015	S: 9/9/2009	16:18		--
MC01A6	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1354 (Ice Only) (1)	BG0909-SED-016	S: 9/10/2009	17:04		--
MC01A7	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1355 (Ice Only) (1)	BG0909-SED-017	S: 9/10/2009	17:32		--
MC01A8	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1356 (Ice Only) (1)	BG0909-SED-018	S: 9/10/2009	18:31		--
MC01A9	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1357 (Ice Only) (1)	BG0909-SED-019	S: 9/10/2009	18:36		--
MC01B0	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1358 (Ice Only) (1)	BG0909-SED-02	S: 9/9/2009	13:22		--
MC01B1	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1359 (Ice Only) (1)	BG0909-SED-03	S: 9/9/2009	13:33		--

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: MC01E8	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____

CLP TAL IC = CLP TAL ICPAES + Hg+B, ICPAES Sol = CLP TAL ICPAES + Hg + B

TR Number: 3-222665643-091409-0013

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

REGION COPY

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969 **R**
DAS No:

Region:	3	**Date Shipped:**	9/14/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:	CT4682	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:		**Airbill:**	857499683835	1 [illegible] 9/14/09 1700	
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:				3	
Site Name/State:	Battlefield Golf Fly Ash/VA			4	
Project Leader:	Donna Davies				
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC01B2	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1360 (Ice Only) (1)	BG0909-SED-04	S: 9/9/2009	13:45		--
MC01B3	Field QC/ Donna Davies	L/G	ICPAES Sol (14)	1361 (Ice Only) (1)	BG0909-SED-05	S: 9/9/2009	14:48		Field Duplicate SED 06
MC01B4	Field QC/ Donna Davies	L/G	ICPAES Sol (14)	1362 (Ice Only) (1)	BG0909-SED-06	S: 9/9/2009	14:50		Field Duplicate SED-05
MC01B6	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1364 (Ice Only) (1)	BG0909-SED-08	S: 9/9/2009	15:14		--
MC01B7	Soil/Sediment/ Donna Davies	L/G	ICPAES Sol (14)	1365 (Ice Only) (1)	BG0909-SED-09	S: 9/9/2009	15:21		--
MC01B8	Soil (0"-12")/ Donna Davies	L/G	ICPAES Sol (14)	1366 (Ice Only) (1)	BG0909-SS01	S: 9/10/2009	16:07		--
MC01B9	Soil (0"-12")/ Donna Davies	L/G	ICPAES Sol (14)	1367 (Ice Only) (1)	BG0909-SS02	S: 9/10/2009	16:09		--
MC01C0	Soil (0"-12")/ Donna Davies	L/G	ICPAES Sol (14)	1368 (Ice Only) (1)	BG0909-SS03	S: 9/10/2009	16:17		--
MC01C1	Soil (0"-12")/ Donna Davies	L/G	ICPAES Sol (14)	1369 (Ice Only) (1)	BG0909-SS04	S: 9/10/2009	16:47		--
MC01C2	Soil (0"-12")/ Donna Davies	L/G	ICPAES Sol (14)	1370 (Ice Only) (1)	BG0909-SS05	S: 9/10/2009	16:49		--
MC01E8	Soil/Sediment/ Donna Davies	L/G	CLP TAL IC (14)	1398 (Ice Only), 1399 (Ice Only) (2)	BG0909-SED-07	S: 9/9/2009	14:57		Lab QC

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: MC01E8	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

CLP TAL IC = CLP TAL ICPAES + Hg+B, ICPAES Sol = CLP TAL ICPAES + Hg + B

TR Number: 3-222665643-091409-0013

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : October 22, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38969; SDG #MC01G0) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 10048

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN
We never forget who we're working for™

DATE: October 19, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38969
SDG: MC01G0
Site: Battlefield Golf Club

FROM: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38969, Sample Delivery Group (SDG) MC01G0, consisted of ten (10) aqueous samples analyzed for aluminum (Al), boron (B), calcium (Ca), iron (Fe), magnesium (Mg), mercury (Hg), potassium (K) and sodium (Na) by A4 Scientific, Inc. (A4). The sample set included one (1) field blank. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (with modification 1803.0) through the Routine Analytical Services (RAS) program. Modifications include analysis of B at the Contract Required Quantitation Limit (CRQL) of 7.0 µg/L.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Data in this case have been impacted by outliers present in the laboratory blanks as well as the matrix spike analysis. Details of these outliers are discussed under "Minor Problems", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on a single Data Summary Forms (DSF).

MINOR PROBLEMS

A continuing calibration blank (CCB) had negative results greater than the absolute values of the Method Detection Limits (MDLs) for Al and Fe. Quantitation limits for these analytes in affected samples may be biased low and have been qualified "UL" on the DSF.

The matrix spike recovery was high (>125%) for B. Positive results for this analyte in affected samples may be biased high and have been qualified "K" on the DSF.

NOTES

Reported results between MDLs and CRQLs were qualified "J" on the DSF.

The laboratory failed to record the pH values of the samples in this SDG on the Sample Log-In Sheet (From DC-1) upon receipt. The chain of custody (COC) records indicate that the samples were preserved properly by the sampler. Additionally, the laboratory's pH/Corrosivity Run Logbook listed the pH as less than two (pH<2) for all samples prior to digestion. No data were qualified based on this finding.

The laboratory failed to include B on Form XIII (Analysis Run Log). The reviewer confirmed using the raw data that the laboratory reported results for B from the analytical run which began 9/30/2009. No data were qualified based on this finding.

Data for Case 38969, SDG MC01G0, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38969.MC01G0IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38969, SDG MC01G0

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Al	All Samples Except MC01G0, MC01G8		UL	Low	CBN (-123.330 J µg/L)
B	All Samples Except MC01G9	K		High	MSH (259%)
Fe	MC01G9		UL	Low	CBN (-48.554 J µg/L)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

CBN = Continuing calibration blank had negative results with absolute values >MDLs [results are in parenthesis]. Quantitation limits may be biased low.

MSH = Matrix spike recovery was high (>125%) [% recovery is in parenthesis]. Positive results may be biased high.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

DATA SUMMARY FORM: INORGANIC

Case #: 38969 SDG : MC01G0 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 10

Lab. : A4

Sample Number :		MC01G0		MC01G1		MC01G2		MC01G3		MC01G4	
Sampling Location :		BG0909-MW-13		BG0909-MW-05A		BG0909-MW-05B		BG0909-MW-11A		BG0909-MW-11B	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/16/2009		9/16/2009		9/16/2009		9/16/2009		9/16/2009	
Time Sampled :		16:29		15:00		15:06		10:15		10:05	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	706			UL		UL		UL		UL
BORON	7	18.5	K	72.0	K	68.9	K	18.4	K	78.3	K
CALCIUM	5000	100000		48500		31300		49800		51900	
IRON	100	39800		7520		623		4200		3430	
MAGNESIUM	5000	25800		16900		9600		20600		19800	
MERCURY	0.2										
POTASSIUM	5000	8600		5380		6420		3190	J	11700	
SODIUM	5000	9930		26000		22700		24100		57200	

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Sample Number :		MC01G5		MC01G6		MC01G7		MC01G8		MC01G9	
Sampling Location :		BG0909-MW-12A		BG0909-MW-12B		BG0909-MW-14		BG0909-MW-15		BG0909-FB03	
Field QC :										Field Blank	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/16/2009		9/16/2009		9/16/2009		9/16/2009		9/15/2009	
Time Sampled :		11:57		11:55		16:17		17:50		12:00	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200		UL		UL		UL	3300			UL
BORON	7	10.6	K	51.4	K	14.9	K	144	K		
CALCIUM	5000	27900		42000		18800		149000			
IRON	100	4570		6130		8050		64100			UL
MAGNESIUM	5000	17000		18900		4280	J	27200			
MERCURY	0.2										
POTASSIUM	5000			4370	J	2550	J	66400			
SODIUM	5000	17200		35100		10400		342000			

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969 **R**
DAS No:

Region:	3	**Date Shipped:**	9/21/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:	CT4682	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:		**Airbill:**	869868645840	1 [signature] 9/21/09 1700	
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:				3	
Site Name/State:	Battlefield Golf Fly Ash/VA			4	
Project Leader:	Donna Davies				
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC01G0	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1412 (HNO3) (1)	BG0909-MW-13	S: 9/16/2009 16:29		--
MC01G1	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1413 (HNO3) (1)	BG0909-MW-05A	S: 9/16/2009 15:00		--
MC01G2	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1414 (HNO3) (1)	BG0909-MW-05B	S: 9/16/2009 15:06		--
MC01G3	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1415 (HNO3) (1)	BG0909-MW-11A	S: 9/16/2009 10:15		--
MC01G4	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1416 (HNO3) (1)	BG0909-MW-11B	S: 9/16/2009 10:05		--
MC01G5	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1417 (HNO3) (1)	BG0909-MW-12A	S: 9/16/2009 11:57		--
MC01G6	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1418 (HNO3) (1)	BG0909-MW-12B	S: 9/16/2009 11:55		--
MC01G7	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1419 (HNO3) (1)	BG0909-MW-14	S: 9/16/2009 16:17		--
MC01G8	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1420 (HNO3) (1)	BG0909-MW-15	S: 9/16/2009 17:50		--
MC01G9	Field QC/ Donna Davies	L/G	ICPAES Sol (14)	1421 (HNO3) (1)	BG0909-FB03	S: 9/15/2009 12:00		Field Blank

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____
ICPAES Sol = CLP TAL ICPAES + Hg + B			

TR Number: 3-222665643-092109-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASQAB USE ONLY		
RAS#	CT4682	Analytical TAT
DAS#		14
NSF#		

38969

Date: 9/2/09	Site Activity: SI			
Site Name: Battlefield Golf Club Site		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DD2C A3LM SI00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP		Date Approved: November 2006	
EPA Project Leader: Donna Santiago	Phone#: 215.814.3222	Cell Phone #:	E-mail: Santiago.donna@epa.gov	
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: DONNA DAVIES	Phone#: 215-669-0069	Cell Phone #: 215-669-0069	E-mail: Donna.davies@ttemi.com	
Contractor: Tetra Tech EM Inc.	EPA CO/PO: Jeff Fang/Karen Wodarczyk			
#Samples 18	Matrix: surface water	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 17	Matrix: sediment	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 5	Matrix: soil	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 20	Matrix: groundwater	Parameter: TAL metals Low	Method: ILM05.4 ICPMS	
#Samples 20	Matrix: groundwater	Parameter: Al, Ca, Fe, K, Mg, Na, + B + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 1	Matrix: blank	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
Ship Date From: 9/9/2009	Ship Date To: 9/11/2009	Org. Validation Level	Inorg. Validation Level IM2	

A4

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) ESAT

Validated Data Package Due: ☐ 42 days ☒ 30 days ☐ 21days ☐ 14 days ☐ Other (Specify) 14/16

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis.

Please emadil results to: Donna Santiago at Santiago.donna@epa.gov and Christine Wagner at Wagner.Christine@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : October 22, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38969; SDG #MC01G2) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 10023

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN
We never forget who we're working for™

DATE: October 15, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38969
SDG: MC01G2
Site: Battlefield Golf Club

FROM: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38969, Sample Delivery Group (SDG) MC01G2, consisted of ten (10) aqueous samples analyzed for total metals by A4 Scientific, Inc. (A4). The sample set included one (1) field blank. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 through the Routine Analytical Services (RAS) program.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Samples in this SDG were analyzed by ICP-MS methodology which does not include analysis for aluminum (Al), calcium (Ca), iron (Fe), magnesium (Mg), mercury (Hg), potassium (K) and sodium (Na).

Data in this case have been impacted by an outlier present in the field blank. Details of this outlier are discussed under "Minor Problem", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MINOR PROBLEM

The field blank (FB) had a reported result greater than the Method Detection Limit (MDL) for zinc (Zn). Positive results for this analyte in affected samples which are less than five times (<5X) the blank concentration may be biased high and have been qualified "B" on the DSFs.

NOTES

Reported results between MDLs and Contract Required Quantitation Limits (CRQLs) were qualified "J" on the DSFs.

The Chain of Custody (COC) Records list that the samples in this SDG should be analyzed for ICP-AES metals, Hg and B. According to the Region III Analytical Request Form and SDG Narrative, the listed analyses should be further clarified in that all samples should be analyzed for selected analytes by both ICP-AES and ICP-MS methodologies.

Data for Case 38969, SDG MC01G2, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38969.MC01G2IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38969, SDG MC01G2

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Fe	MC01G1, MC01G3, MC01G4, MC01G6, MC01G7	B		High	FB (0.90 J µg/L)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

FB	=	Field blank had a result >MDL [result is in parenthesis]. Positive results which are <5X the blank concentration may be biased high.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

Case #: 38969 SDG : MC01G2 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 10

Lab. : A4

Sample Number :		MC01G0		MC01G1		MC01G2		MC01G3		MC01G4	
Sampling Location :		BG0909-MW-13		BG0909-MW-05A		BG0909-MW-05B		BG0909-MW-11A		BG0909-MW-11B	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/16/2009		9/16/2009		9/16/2009		9/16/2009		9/16/2009	
Time Sampled :		16:29		15:00		15:06		10:15		10:05	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2										
*ARSENIC	1	1.3		1.8		0.76	J	1.5			
BARIUM	10	33.4		31.4		13.9		10.1		24.8	
BERYLLIUM	1	13.0									
*CADMIUM	1										
*CHROMIUM	2	1.7	J								
COBALT	1	24.7		0.31	J						
COPPER	2										
*LEAD	1										
MANGANESE	1	469		277		49.0		74.2		211	
*NICKEL	1	45.2		0.99	J						
SELENIUM	5										
SILVER	1										
THALLIUM	1										
VANADIUM	5	2.0	J								
ZINC	2	115		4.0	B	203		2.5	B	3.9	B

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38969 SDG : MC01G2

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC01G5		MC01G6		MC01G7		MC01G8		MC01G9	
Sampling Location :		BG0909-MW-12A		BG0909-MW-12B		BG0909-MW-14		BG0909-MW-15		BG0909-FB03	
Field QC :										Field Blank	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/16/2009		9/16/2009		9/16/2009		9/16/2009		9/15/2009	
Time Sampled :		11:57		11:55		16:17		17:50		12:00	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2										
*ARSENIC	1	3.6		0.76	J	2.0		21.5			
BARIUM	10	26.0		20.3		39.1		70.0			
BERYLLIUM	1							1.5			
*CADMIUM	1										
*CHROMIUM	2							2.7			
COBALT	1	1.6						2.1			
COPPER	2							18.5		0.79	J
*LEAD	1					1.6					
MANGANESE	1	97.2		143		203		269		0.32	J
*NICKEL	1	6.7						2.5			
SELENIUM	5							9.0			
SILVER	1										
THALLIUM	1							0.66	J		
VANADIUM	5							17.3			
ZINC	2	21.2		2.2	B	4.1	B	49.5		0.90	J

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969 **R**
DAS No:

Region:	3	**Date Shipped:**	9/21/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:	CT4682	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:		**Airbill:**	869868645840	1 [signature] 9/21/09 1700	
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:				3	
Site Name/State:	Battlefield Golf Fly Ash/VA			4	
Project Leader:	Donna Davies				
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC01G0	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1412 (HNO3) (1)	BG0909-MW-13	S: 9/16/2009 16:29		--
MC01G1	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1413 (HNO3) (1)	BG0909-MW-05A	S: 9/16/2009 15:00		--
MC01G2	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1414 (HNO3) (1)	BG0909-MW-05B	S: 9/16/2009 15:06		--
MC01G3	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1415 (HNO3) (1)	BG0909-MW-11A	S: 9/16/2009 10:15		--
MC01G4	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1416 (HNO3) (1)	BG0909-MW-11B	S: 9/16/2009 10:05		--
MC01G5	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1417 (HNO3) (1)	BG0909-MW-12A	S: 9/16/2009 11:57		--
MC01G6	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1418 (HNO3) (1)	BG0909-MW-12B	S: 9/16/2009 11:55		--
MC01G7	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1419 (HNO3) (1)	BG0909-MW-14	S: 9/16/2009 16:17		--
MC01G8	Ground Water/ Donna Davies	L/G	ICPAES Sol (14)	1420 (HNO3) (1)	BG0909-MW-15	S: 9/16/2009 17:50		--
MC01G9	Field QC/ Donna Davies	L/G	ICPAES Sol (14)	1421 (HNO3) (1)	BG0909-FB03	S: 9/15/2009 12:00		Field Blank

Shipment for Case Complete? Y	**Sample(s) to be used for laboratory QC:**	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____
ICPAES Sol = CLP TAL ICPAES + Hg + B			

TR Number: 3-222665643-092109-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASQAB USE ONLY		
RAS#	CT4682	Analytical TAT
DAS#		14
NSF#		

38969

Date: 9/2/09	Site Activity: SI			
Site Name: Battlefield Golf Club Site		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DD2C A3LM SI00		CERCLIS #: VAN000306614	
Site ID:	Spill ID: A3LM		Operable Unit:	
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP		Date Approved: November 2006	
EPA Project Leader: Donna Santiago	Phone#: 215.814.3222	Cell Phone #:	E-mail: Santiago.donna@epa.gov	
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: DONNA DAVIES	Phone#: 215-669-0069	Cell Phone #: 215-669-0069	E-mail: Donna.davies@ttemi.com	
Contractor: Tetra Tech EM Inc.	EPA CO/PO: Jeff Fang/Karen Wodarczyk			
#Samples 18	Matrix: surface water	Parameter: TAL Metals + Boron + Hg		Method: ILM05.4 ICPAES+Hg&B
#Samples 17	Matrix: sediment	Parameter: TAL Metals + Boron + Hg		Method: ILM05.4 ICPAES+Hg&B
#Samples 5	Matrix: soil	Parameter: TAL Metals + Boron + Hg		Method: ILM05.4 ICPAES+Hg&B
#Samples 20	Matrix: groundwater	Parameter: TAL metals Low *		Method: ILM05.4 ICPMS
#Samples 20	Matrix: groundwater	Parameter: Al, Ca, Fe, K, Mg, Na, + B + Hg		Method: ILM05.4 ICPAES+Hg&B
#Samples 1	Matrix: blank	Parameter: TAL Metals + Boron + Hg		Method: ILM05.4 ICPAES+Hg&B
Ship Date From: 9/9/2009	Ship Date To: 9/11/2009	Org. Validation Level	Inorg. Validation Level IM2	

A4

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) ESAT

Validated Data Package Due: ☐ 42 days ☒ 30 days ☐ 21days ☐ 14 days ☐ Other (Specify) 14/16

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis.

Please emadil results to: Donna Santiago at Santiago.donna@epa.gov and Christine Wagner at Wagner.Christine@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : October 15, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38969; SDG #MC0185) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 10002

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN
We never forget who we're working for™

DATE: October 6, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38969
SDG: MC0185
Site: Battlefield Golf Club

FROM: [redacted]
Inorganic Data Reviewer

[redacted]
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38969, Sample Delivery Group (SDG) MC0185, consisted of fifteen (15) aqueous samples analyzed for total aluminum (Al), boron (B), calcium (Ca), iron (Fe), magnesium (Mg), mercury (Hg), potassium (K) and sodium (Na) by A4 Scientific, Inc. (A4). The sample set included one (1) field blank and one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (with modification 1803.0) through the Routine Analytical Services (RAS) program. Modifications include analysis of B at the Contract Required Quantitation Limit (CRQL) of 7.0 µg/L.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Data in this case have been impacted by outliers present in the laboratory and field blanks as well as the matrix spike analysis. Details of these outliers are discussed under "Minor Problems", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MINOR PROBLEMS

The field blank (FB) had a reported result greater than the Method Detection Limit (MDL) for Fe. The positive result for this analyte in sample MC0191 which is less than five times (<5X) the blank concentration may be biased high and has been qualified "B" on the DSF.

The preparation blank (PB) had negative results greater than the absolute values of the MDLs for Al, Fe and Hg. Positive results for these analytes in affected samples which are less than two times (<2X) the absolute values of the blank concentrations may be biased low. The "L" qualifier for these outliers has been superseded by "J" on the DSFs. Quantitation limits for these analytes in affected samples may be biased low and have been qualified "UL" on the DSFs.

The matrix spike recovery was high (>125%) for B. Positive results for this analyte in affected samples may be biased high and have been qualified "K" on the DSFs unless superseded by "J".

NOTES

Reported results between MDLs and CRQLs were qualified "J" on the DSFs.

The true value CRQL check standard concentration for B was reported incorrectly on Form IIB (CRQL Check Standard). Due to this incorrect value, all %Rs for B were also incorrect. The reviewer used the laboratory's Standards Preparation Logbook to correct the values on this Form.

Reported results for field duplicate pair MC0189/MC0193 were within 20% RPD, ±CRQL for all analytes except Al and Fe.

Data for Case 38969, SDG MC0185, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38969.MC0185IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38969, SDG MC0185

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Al	MC0190, MC0194	J			>MDL<CRQL PBN (-88.473 J µg/L)
	MC01A0, MC0185, MC0187, MC0196, MC0197, MC0198, MC0199		UL	Low	PBN (-88.473 J µg/L)
B	MC0192	J			>MDL<CRQL MSH (168%)
	MC01A0, MC0187, MC0188, MC0189, MC0190, MC0191, MC0193, MC0195, MC0196, MC0197, MC0198, MC0199	K		High	MSH (168%)
Fe	MC0191	B		High	FB (42.9 J µg/L)
	MC0185	J			>MDL<CRQL PBN (-39.084 J µg/L)
Hg	All Samples		UL	Low	PBN (-0.046 J µg/L)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

>MDL = <CRQL		Reported results are greater than MDLs but less than CRQLs and are considered estimated.
PBN	=	Preparation blank had negative results with absolute values >MDLs [results are in parenthesis]. Positive results which are <2X the absolute values of the blank concentrations and quantitation limits may be biased low.
MSH	=	Matrix spike recovery was high (>125%) [% recovery is in parenthesis]. Positive results may be biased high.
FB	=	Field blank had a result >MDL [result is in parenthesis]. The positive result which is <5X the blank concentration may be biased high.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

DATA SUMMARY FORM: INORGANIC

Case #: 38969 SDG : MC0185 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 15

Lab. : A4

Sample Number :		MC01A0		MC0185		MC0187		MC0188		MC0189	
Sampling Location :		BG0909-MW10B		BG0909-FB01		BG0909-MW-01		BG0909-MW-02		BG0909-MW-020	
Field QC :				Field Blank						Dup of MC0193	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/8/2009		9/10/2009		9/10/2009		9/11/2009	
Time Sampled :		19:05		13:10		10:38		12:30		15:13	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200		UL		UL		UL	476		244	
BORON	7	116	K			9.8	K	146	K	15.0	K
CALCIUM	5000	45000				29700		22400		11900	
IRON	100	416		42.9	J	8930		747		4010	
MAGNESIUM	5000	19900				20000		6430		2660	J
MERCURY	0.2		UL		UL		UL		UL		UL
POTASSIUM	5000	13500				1630	J	5220		3960	J
SODIUM	5000	35800				15500		23400		7390	

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Sample Number :		MC0190		MC0191		MC0192		MC0193		MC0194	
Sampling Location :		BG0909-MW-03		BG0909-MW-06A		BG0909-MW-06B		BG0909-MW-07A		BG0909-MW-07B	
Field QC :								Dup of MC0189			
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/11/2009		9/11/2009		9/11/2009		9/11/2009	
Time Sampled :		12:17		08:35		08:41		10:23		10:25	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	101	J	393		327		445		107	J
BORON	7	22.2	K	12.9	K	5.6	J	14.3	K		
CALCIUM	5000	53200		25300		22100		11900		7220	
IRON	100	6800		102	B	3890		5270		6170	
MAGNESIUM	5000	19000		3370	J	3580	J	2720	J	2930	J
MERCURY	0.2		UL		UL		UL		UL		UL
POTASSIUM	5000	2560	J	5200		3090	J	3880	J		
SODIUM	5000	26200		16000		14500		7690		11600	

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38969

SDG : MC0185

Site :

BATTLEFIELD GOLF CLUB

Lab. :

A4

Sample Number :		MC0195		MC0196		MC0197		MC0198		MC0199	
Sampling Location :		BG0909-MW-08A		BG0909-MW-08B		BG0909-MW-09A		BG0909-MW-09B		BG0909-MW-10A	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/10/2009		9/10/2009		9/10/2009		9/10/2009	
Time Sampled :		15:08		15:05		17:20		17:00		19:18	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	584			UL		UL		UL		UL
BORON	7	17.3	K	39.3	K	38.6	K	99.3	K	21.9	K
CALCIUM	5000	15700		26100		45800		29100		59500	
IRON	100	10100		8250		14700		315		9000	
MAGNESIUM	5000	4350	J	8850		15400		13300		13000	
MERCURY	0.2		UL		UL		UL		UL		UL
POTASSIUM	5000	2280	J	3990	J	6320		10400		3450	J
SODIUM	5000	10500		12900		13500		26400		13300	

CRQL = Contract Required Quantitation Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor)

Revised 09/99

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969 **R**
DAS No:

Region:	3	**Date Shipped:**	9/14/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code: / **Account Code:**	CT4682	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
CERCLIS ID:	VAN000306614	**Airbill:**	857499683846	1 [signature] 9/14/09 1700	
Spill ID:		**Shipped to:**	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Site Name/State:	Battlefield Golf Fly Ash/VA			3	
Project Leader:	Donna Davies			4	
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0185	Field QC/ Donna Davies	L/G	ICPMS AES (14)	1333 (HNO3) (1)	BG0909-FB01	S: 9/8/2009	13:10		Field Blank
MC0187	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1335 (HNO3) (1)	BG0909-MW-01	S: 9/10/2009	10:38		--
MC0188	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1336 (HNO3) (1)	BG0909-MW-02	S: 9/10/2009	12:30		--
MC0189	Field QC/ Donna Davies	L/G	ICPMS AES (14)	1337 (HNO3) (1)	BG0909-MW-020	S: 9/11/2009	15:13		Field Duplicate MW07A
MC0190	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1338 (HNO3) (1)	BG0909-MW-03	S: 9/10/2009	12:17		--
MC0191	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1339 (HNO3) (1)	BG0909-MW-06A	S: 9/11/2009	8:35		--
MC0192	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1340 (HNO3) (1)	BG0909-MW-06B	S: 9/11/2009	8:41		--
MC0193	Field QC/ Donna Davies	L/G	ICPMS AES (14)	1341 (HNO3) (1)	BG0909-MW-07A	S: 9/11/2009	10:23		Field Duplicate MW-020
MC0194	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1342 (HNO3) (1)	BG0909-MW-07B	S: 9/11/2009	10:25		--
MC0195	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1343 (HNO3) (1)	BG0909-MW-08A	S: 9/10/2009	15:08		--
MC0196	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1344 (HNO3) (1)	BG0909-MW-08B	S: 9/10/2009	15:05		--

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____
ICPMS AES = CLP TAL ICPMS AES			

TR Number: 3-222665643-091409-0014

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969 **R**
DAS No:

Region:	3	**Date Shipped:**	9/14/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code: / **Account Code:**	CT4682	**Carrier Name:**	FedEx	**Relinquished By** (Date / Time)	**Received By** (Date / Time)
CERCLIS ID:	VAN000306614	**Airbill:**	857499683846	1 [signature] 9/14/09 1205	
Spill ID:		**Shipped to:**	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Site Name/State:	Battlefield Golf Fly Ash/VA			3	
Project Leader:	Donna Davies			4	
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC0197	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1345 (HNO3) (1)	BG0909-MW-09A	S: 9/10/2009 17:20		--
MC0198	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1346 (HNO3) (1)	BG0909-MW-09B	S: 9/10/2009 17:00		--
MC0199	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1347 (HNO3) (1)	BG0909-MW-10A	S: 9/10/2009 19:18		--
MC01A0	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1348 (HNO3) (1)	BG0909-MW10B	S: 9/10/2009 19:05		--

Shipment for Case Complete? N	**Sample(s) to be used for laboratory QC:**	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key:	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____
ICPMS AES = CLP TAL ICPMS AES			

TR Number: 3-222665643-091409-0014

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

REGION COPY

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASQAB USE ONLY		
RAS#	CT4682	Analytical TAT
DAS#		14
NSF#		

38969

Date: 9/2/09	Site Activity: SI			
Site Name: Battlefield Golf Club Site		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DD2C A3LM S100		CERCLIS #: VAN000306614	
Site ID:	Spill ID: A3LM		Operable Unit:	
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP			Date Approved: November 2006
EPA Project Leader: Donna Santiago	Phone#: 215.814.3222	Cell Phone #:		E-mail: Santiago.donna@epa.gov
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114		E-mail: Joshua.cope@ttemi.com
Site Leader: DONNA DAVIES	Phone#: 215-669-0069	Cell Phone #: 215-669-0069		E-mail: Donna.davies@ttemi.com
Contractor: Tetra Tech EM Inc.	EPA CO/PO: Jeff Fang/Karen Wodarczyk			
#Samples 18	Matrix: surface water	Parameter: TAL Metals + Boron + Hg	A4	Method: ILM05.4 ICPAES+Hg&B
#Samples 17	Matrix: sediment	Parameter: TAL Metals + Boron + Hg		Method: ILM05.4 ICPAES+Hg&B
#Samples 5	Matrix: soil	Parameter: TAL Metals + Boron + Hg		Method: ILM05.4 ICPAES+Hg&B
#Samples 20	Matrix: groundwater	Parameter: TAL metals Low		Method: ILM05.4 ICPMS
#Samples 20	Matrix: groundwater	Parameter: Al, Ca, Fe, K, Mg, Na, + B + Hg		Method: ILM05.4 ICPAES+Hg&B
#Samples 1	Matrix: blank	Parameter: TAL Metals + Boron + Hg		Method: ILM05.4 ICPAES+Hg&B
Ship Date From: 9/9/2009	Ship Date To: 9/11/2009	Org. Validation Level		Inorg. Validation Level IM2

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) ESAT

Validated Data Package Due: ☐ 42 days ☒ 30 days ☐ 21days ☐ 14 days ☐ Other (Specify) 14/16

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis.

Please emadil results to: Donna Santiago at Santiago.donna@epa.gov and Christine Wagner at Wagner.Christine@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : October 15, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38969; SDG #MC0186) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 10001

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN
We never forget who we're working for™

DATE: October 6, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38969
SDG: MC0186
Site: Battlefield Golf Club

FROM: (b) (4)(b) (4)(b) (4)
Inorganic Data Reviewer

(b) (4)(b) (4)
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38969, Sample Delivery Group (SDG) MC0186, consisted of nineteen (19) aqueous samples analyzed for total metals and boron (B) by A4 Scientific, Inc. (A4). The sample set included one (1) field blank and one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (with modification 1803.0) through the Routine Analytical Services (RAS) program. Modifications include analysis of B at the Contract Required Quantitation Limit (CRQL) of 7.0 µg/L.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Data in this case have been impacted by outliers present in the laboratory blanks. Details of these outliers are discussed under "Minor Problem", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MINOR PROBLEM

Continuing calibration (CCB) and/or preparation (PB) blanks had negative results greater than the absolute values of the Method Detection Limits (MDLs) regarding the analytes listed below. Positive results for these analytes in affected samples which are less than two times (<2X) the absolute values of the blank concentrations may be biased low and have been qualified "L" on the DSFs unless superseded by "J". Quantitation limits for these analytes in affected samples may be biased low and have been qualified "UL" on the DSFs.

Blank	Affected Analytes
CCB	iron (Fe)
PB	aluminum (Al), B, mercury (Hg)

NOTES

Reported results between MDLs and CRQLs were qualified "J" on the DSFs.

The true concentration for B was reported incorrectly for the continuing calibration verifications (CCVs) on Form IIA (Initial and Continuing Calibration Verification), thus the percent recoveries (%Rs) were outside acceptance criteria for this analyte. The laboratory resubmitted this form with corrected true concentrations for the samples in SDG MC0185. Based on the resubmitted data, the true concentration was corrected for the forms in this SDG. Therefore, %Rs were within control limits, and no data were qualified based on this finding.

The laboratory failed to record the pH values of the samples in this SDG on the Sample Log-In Sheet (From DC-1) upon receipt. The chain of custody (COC) records indicate that the samples were preserved properly by the sampler. Additionally, the laboratory's pH/Corrosivity Run Logbook listed the pH as less than two (<2) for all samples prior to digestion. No data were qualified based on this finding.

The laboratory failed to include B on Form XIII (Analysis Run Log). The reviewer confirmed using the raw data that the laboratory reported results for B from the second analytical run which began 9/26/2009. No data were qualified based on this finding.

Reported results for field duplicate pair MC01D7/MC01D8 were within 20% RPD, ±CRQL for all analytes.

Data for Case 38969, SDG MC0186, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38969.MC0186IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38969, SDG MC0186

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Al	MC01C7, MC01C9, MC01D7, MC01D8	J			>MDL<CRQL PBN (-84.633 J µg/L)
	MC01C3, MC01D5, MC0186		UL	Low	PBN (-84.633 J µg/L)
B	MC01D3, MC0186	L	UL	Low	PBN (-5.053 J µg/L)
Fe	MC0186		UL	Low	CBN (-34.414 J µg/L)
Hg	All Samples		UL	Low	PBN (-0.051 J µg/L)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

>MDL = <CRQL	Reported results are greater than MDLs but less than CRQLs and are considered estimated.
PBN =	Preparation blank had negative results with absolute values >MDLs [results are in parenthesis]. Positive results which are <2X the absolute values of the blank concentrations and quantitation limits may be biased low.
CBN =	Continuing calibration blank had a negative result with an absolute value >MDL [result is in parenthesis]. The quantitation limit may be biased low.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

Case #: 38969 SDG : MC0186 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 19

Lab. : A4

Sample Number :		MC01C3		MC01C4		MC01C5		MC01C6		MC01C7	
Sampling Location :		BG0909-SW-01		BG0909-SW-010		BG0909-SW-011		BG0909-SW-012		BG0909-SW-013	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/9/2009		9/9/2009		9/9/2009		9/9/2009		9/10/2009	
Time Sampled :		13:12		15:31		15:38		15:49		13:35	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200		UL	335		336		234		143	J
ANTIMONY	60										
*ARSENIC	10										
BARIUM	200	63.5	J								
BERYLLIUM	5										
BORON	7	44.0		31.1		43.4		26.8		30.9	
*CADMIUM	5										
CALCIUM	5000	26600		4690	J	3090	J	12100		18800	
*CHROMIUM	10										
COBALT	50										
COPPER	25										
IRON	100	416		326		439		312		1120	
*LEAD	10										
MAGNESIUM	5000	4980	J					2150	J	6700	
MANGANESE	15	52.5		11.8	J	8.0	J	32.7		323	
MERCURY	0.2		UL		UL		UL		UL		UL
*NICKEL	40										
POTASSIUM	5000	10100		4750	J	3840	J	8150		2910	J
SELENIUM	35										
SILVER	10										
SODIUM	5000	50000		2290	J	2270	J	6910		15900	
THALLIUM	25										
VANADIUM	50										
ZINC	60										

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38969 SDG : MC0186

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC01C8		MC01C9		MC01D0		MC01D1		MC01D2	
Sampling Location :		BG0909-SW-014		BG0909-SW-015		BG0909-SW-016		BG0909-SW-017		BG0909-SW-018	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/10/2009		9/10/2009		9/10/2009		9/10/2009	
Time Sampled :		13:50		16:13		17:02		17:30		18:30	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	228		80.2	J	225		204		316	
ANTIMONY	60										
*ARSENIC	10										
BARIUM	200										
BERYLLIUM	5										
BORON	7	28.2		31.1		30.3		29.2		10.5	
*CADMIUM	5										
CALCIUM	5000	18100		17200		20400		20100		6850	
*CHROMIUM	10										
COBALT	50										
COPPER	25										
IRON	100	2030		665		1700		1360		551	
*LEAD	10										
MAGNESIUM	5000	6040		6660		6840		6610		2230	J
MANGANESE	15	234		256		256		250		52.6	
MERCURY	0.2		UL		UL		UL		UL		UL
*NICKEL	40										
POTASSIUM	5000	3340	J	2790	J	3830	J	3750	J	3040	J
SELENIUM	35										
SILVER	10										
SODIUM	5000	16300		15900		19100		19000		16900	
THALLIUM	25										
VANADIUM	50										
ZINC	60										

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38969 SDG : MC0186

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC01D3		MC01D4		MC01D5		MC01D6		MC01D7	
Sampling Location :		BG0909-SW019		BG0909-SW-02		BG0909-SW-03		BG0909-SW-04		BG0909-SW-05	
Field QC :										Dup of MC01D8	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/9/2009		9/9/2009		9/9/2009		9/9/2009	
Time Sampled :		18:34		13:23		13:13		13:43		14:40	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	264		520			UL	898		122	J
ANTIMONY	60										
*ARSENIC	10									3.8	J
BARIUM	200			75.0	J						
BERYLLIUM	5										
BORON	7	9.8	L	38.1		40.4		24.9		45.0	
*CADMIUM	5										
CALCIUM	5000	6840		34400		19200		10600		17300	
*CHROMIUM	10										
COBALT	50										
COPPER	25										
IRON	100	515		1360		284		123		772	
*LEAD	10										
MAGNESIUM	5000	2190	J	7370		4690	J	3580	J	4300	J
MANGANESE	15	38.5		235		16.1		10.9	J	50.4	
MERCURY	0.2		UL		UL		UL		UL		UL
*NICKEL	40										
POTASSIUM	5000	3590	J	17600		6280		4910	J	5600	
SELENIUM	35										
SILVER	10										
SODIUM	5000	18700		85500		18100		5250		11500	
THALLIUM	25										
VANADIUM	50										
ZINC	60										

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38969 SDG : MC0186

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC01D8		MC01E0		MC01E9		MC0186			
Sampling Location :		BG0909-SW-06		BG0909-SW-08		BG0909-SW-07		BG0909-FB-02			
Field QC :		Dup of MC01D7						Field Blank			
Matrix :		Water		Water		Water		Water			
Units :		ug/L		ug/L		ug/L		ug/L			
Date Sampled :		9/9/2009		9/9/2009		9/9/2009		9/8/2009			
Time Sampled :		14:56		15:11		14:55		13:00			
Dilution Factor :		1.0		1.0		1.0		1.0			
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	200	141	J	214		755			UL		
ANTIMONY	60										
*ARSENIC	10										
BARIUM	200										
BERYLLIUM	5										
BORON	7	41.1		35.5		473			UL		
*CADMIUM	5										
CALCIUM	5000	16300		12900		11700					
*CHROMIUM	10										
COBALT	50										
COPPER	25										
IRON	100	663		345		785			UL		
*LEAD	10					4.8	J				
MAGNESIUM	5000	3940	J	4440	J	2020	J				
MANGANESE	15	46.1		21.6		53.5					
MERCURY	0.2		UL		UL		UL		UL		
*NICKEL	40										
POTASSIUM	5000	5210		4930	J	5620					
SELENIUM	35										
SILVER	10										
SODIUM	5000	10700		9080		7440					
THALLIUM	25										
VANADIUM	50										
ZINC	60										

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969
DAS No:
R

Region:	3	Date Shipped:	9/14/2009	Chain of Custody Record	Sampler Signature:
Project Code:	CT4682	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
Account Code:		Airbill:	857499683765	1 9/14/09 1707	
CERCLIS ID:	VAN000306614	Shipped to:	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:				3	
Site Name/State:	Battlefield Golf Fly Ash/VA			4	
Project Leader:	Donna Davies				
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0186	Field QC/ Donna Davies	L/G	ICPAES SW (14)	1334 (HNO3) (1)	BG0909-FB-02	S: 9/8/2009	13:00		Field Blank
MC01C3	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1371 (HNO3) (1)	BG0909-SW-01	S: 9/9/2009	13:12		--
MC01C4	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1372 (HNO3) (1)	BG0909-SW-010	S: 9/9/2009	15:31		--
MC01C5	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1373 (HNO3) (1)	BG0909-SW-011	S: 9/9/2009	15:38		--
MC01C6	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1374 (HNO3) (1)	BG0909-SW-012	S: 9/9/2009	15:49		--
MC01C7	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1375 (HNO3) (1)	BG0909-SW-013	S: 9/10/2009	13:35		--
MC01C8	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1376 (HNO3) (1)	BG0909-SW-014	S: 9/10/2009	13:50		--
MC01C9	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1377 (HNO3) (1)	BG0909-SW-015	S: 9/10/2009	16:13		--
MC01D0	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1378 (HNO3) (1)	BG0909-SW-016	S: 9/10/2009	17:02		--
MC01D1	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1379 (HNO3) (1)	BG0909-SW-017	S: 9/10/2009	17:30		--
MC01D2	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1380 (HNO3) (1)	BG0909-SW-018	S: 9/10/2009	18:30		--

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: MC01E9	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____
ICPAES SW = CLP TAL ICPAES + Hg+ B			

TR Number: 3-222665643-091409-0012

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

REGION COPY

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969
DAS No:
R

Region:	3	Date Shipped:	9/14/2009	Chain of Custody Record	Sampler Signature:
Project Code: / Account Code:	CT4682	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
CERCLIS ID:	VAN000306614	Airbill:	857499683765	1 9/14/09 1700	
Spill ID:		Shipped to:	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Site Name/State:	Battlefield Golf Fly Ash/VA			3	
Project Leader:	Donna Davies			4	
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC01D3	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1381 (HNO3) (1)	BG0909-SW019	S: 9/10/2009 18:34		--
MC01D4	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1382 (HNO3) (1)	BG0909-SW-02	S: 9/9/2009 13:23		--
MC01D5	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1383 (HNO3) (1)	BG0909-SW-03	S: 9/9/2009 13:13		--
MC01D6	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1384 (HNO3) (1)	BG0909-SW-04	S: 9/9/2009 13:43		--
MC01D7	Field QC/ Donna Davies	L/G	ICPAES SW (14)	1385 (HNO3) (1)	BG0909-SW-05	S: 9/9/2009 14:40		Field Duplicate SW-06
MC01D8	Field QC/ Donna Davies	L/G	ICPAES SW (14)	1386 (HNO3) (1)	BG0909-SW-06	S: 9/9/2009 14:56		Field Duplicate -SW-05
MC01E0	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1388 (HNO3) (1)	BG0909-SW-08	S: 9/9/2009 15:11		--
MC01E9	Surface Water/ Donna Davies	L/G	ICPAES SW (14)	1400 (HNO3), 1401 (HNO3) (2)	BG0909-SW-07	S: 9/9/2009 14:55		Lab QC

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: MC01E9	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key: ICPAES SW = CLP TAL ICPAES + Hg+ B	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced?

TR Number: 3-222665643-091409-0012

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

U.S. EPA Region III Analytical Request Form

Revision 10.06

ASQAB USE ONLY		
RAS#	CT4682	Analytical TAT
DAS#		14
NSF#		

38969

Date: 9/2/09	Site Activity: SI			
Site Name: Battlefield Golf Club Site		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DD2C A3LM SI00	CERCLIS #: VAN000306614		
Site ID:	Spill ID: A3LM	Operable Unit:		
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP	Date Approved: November 2006		
EPA Project Leader: Donna Santiago	Phone#: 215.814.3222	Cell Phone #:	E-mail: Santiago.donna@epa.gov	
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: DONNA DAVIES	Phone#: 215-669-0069	Cell Phone #: 215-669-0069	E-mail: Donna.davies@ttemi.com	
Contractor: Tetra Tech EM Inc.	EPA CO/PO: Jeff Fang/Karen Wodarczyk			
#Samples 18	Matrix: surface water	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 17	Matrix: sediment	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 5	Matrix: soil	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 20	Matrix: groundwater	Parameter: TAL metals Low	Method: ILM05.4 ICPMS	
#Samples 20	Matrix: groundwater	Parameter: Al, Ca, Fe, K, Mg, Na, + B + Hg	Method: ILM05.4 ICPAES+Hg&B	
#Samples 1	Matrix: blank	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES+Hg&B	
Ship Date From: 9/9/2009	Ship Date To: 9/11/2009	Org. Validation Level	Inorg. Validation Level IM2	

A4

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) ESAT

Validated Data Package Due: ☐ 42 days ☒ 30 days ☐ 21days ☐ 14 days ☐ Other (Specify) 14/16

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis.

Please emadil results to: Donna Santiago at Santiago.donna@epa.gov and Christine Wagner at Wagner.Christine@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : October 6, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Gulf Club site (Case # 38969; SDG #MC0187) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 09098

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

LOCKHEED MARTIN
We never forget who we're working for™

DATE: September 29, 2009

SUBJECT: Inorganic Data Validation (IM2 Level)
Case: 38969
SDG: MC0187
Site: Battlefield Golf Club

FROM: (b) (4)(b) (4)
Inorganic Data Reviewer

(b) (4) (b) (4)
Senior Oversight Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38969, Sample Delivery Group (SDG) MC0187, consisted of fifteen (15) aqueous samples analyzed for total metals by A4 Scientific, Inc. (A4). The sample set included one (1) field blank and one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 through the Routine Analytical Services (RAS) program.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Inorganic Data Review, Level IM2. Areas of concern with respect to data usability are listed below.

Samples in this SDG were analyzed by ICP-MS methodology which does not include analysis for aluminum (Al), calcium (Ca), iron (Fe), magnesium (Mg), mercury (Hg), potassium (K) and sodium (Na).

Data in this case have been impacted by an outlier present in the ICP serial dilution analysis. Details of this outlier are discussed under "Minor Problem", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on the Data Summary Forms (DSFs).

MINOR PROBLEM

The percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) for nickel (Ni). Positive results for this analyte in affected samples are estimated due to possible matrix interferences and have been qualified "J" on the DSFs.

NOTES

Reported results between Method Detection Limits (MDLs) and Contract Required Quantitation Limits (CRQLs) were qualified "J" on the DSFs.

Reported results for field duplicate pair MC0189/MC0193 were within 20% RPD, ±CRQL for all analytes except arsenic (As).

Data for Case 38969, SDG MC0187, were reviewed in accordance with the National Functional Guidelines for Evaluating Inorganic Analyses with Modifications for use within Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Table 1A is a summary of qualifiers applied to the laboratory-generated results during data validation.

TABLE 1A	SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION
TABLE 1B	CODES USED IN COMMENTS COLUMN OF TABLE 1A
APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38969.MC0187IM2.doc

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY FORM AFTER DATA VALIDATION

Case 38969, SDG MC0187

ANALYTE	SAMPLES AFFECTED	POSITIVE VALUES	NON-DETECTED VALUES	BIAS	COMMENTS*
Ni	MC0187, MC0188, MC0189, MC0190, MC0191, MC0192, MC0193, MC0194, MC0195	J			ISD (13%)

* See explanation of comments in Table 1B

TABLE 1B
CODES USED IN COMMENTS COLUMN

ISD	=	Percent difference (%D) in the ICP serial dilution analysis was outside the control limit (>10%) [%D is in parenthesis]. Positive results are estimated.

Appendix A

Glossary of Data Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

Appendix B

Data Summary Forms

Case #: 38969 SDG : MC0187 Number of Soil Samples : 0

Site : BATTLEFIELD GOLF CLUB Number of Water Samples : 15

Lab. : A4

Sample Number :		MC01A0		MC0185		MC0187		MC0188		MC0189	
Sampling Location :		BG0909-MW10B		BG0909-FB01		BG0909-MW-01		BG0909-MW-02		BG0909-MW-020	
Field QC :				Field Blank						Dup of MC0193	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/8/2009		9/10/2009		9/10/2009		9/11/2009	
Time Sampled :		19:05		13:10		10:38		12:30		15:13	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2										
*ARSENIC	1					3.9		2.5		7.1	
BARIUM	10	8.6	J			20.2		48.4		73.1	
BERYLLIUM	1					0.60	J				
*CADMIUM	1										
*CHROMIUM	2							1.0	J		
COBALT	1					14.0		1.6		3.6	
COPPER	2							1.7	J		
*LEAD	1					0.41	J	1.3			
MANGANESE	1	72.0				171		61.3		25.9	
*NICKEL	1					24.0	J	5.7	J	2.8	J
SELENIUM	5										
SILVER	1										
THALLIUM	1										
VANADIUM	5							2.1	J		
ZINC	2	1.3	J			75.9		416		7.6	

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38969 SDG : MC0187

Site : BATTLEFIELD GOLF CLUB

Lab. : A4

Sample Number :		MC0190		MC0191		MC0192		MC0193		MC0194	
Sampling Location :		BG0909-MW-03		BG0909-MW-06A		BG0909-MW-06B		BG0909-MW-07A		BG0909-MW-07B	
Field QC :								Dup of MC0189			
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/11/2009		9/11/2009		9/11/2009		9/11/2009	
Time Sampled :		12:17		08:35		08:41		10:23		10:25	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2			0.77	J						
*ARSENIC	1	0.82	J	2.4		1.4		10.7			
BARIUM	10	15.3		30.5		81.0		77.5		15.8	
BERYLLIUM	1					0.63	J	0.41	J		
*CADMIUM	1										
*CHROMIUM	2			1.1	J			0.80	J		
COBALT	1	0.80	J			5.1		3.9			
COPPER	2			4.7							
*LEAD	1			1.1				0.53	J	0.46	J
MANGANESE	1	151		32.9		119		29.0		146	
*NICKEL	1	1.1	J	0.82	J	6.2	J	3.2	J	0.33	J
SELENIUM	5										
SILVER	1										
THALLIUM	1										
VANADIUM	5			2.5	J	2.4	J	2.9	J		
ZINC	2	19.2		119		21.5		9.1		4.6	

CRQL = Contract Required Quantitation Limit *Action Level Exists SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) Revised 09/99

Case #: 38969

SDG : MC0187

Site :

BATTLEFIELD GOLF CLUB

Lab. :

A4

Sample Number :		MC0195		MC0196		MC0197		MC0198		MC0199	
Sampling Location :		BG0909-MW-08A		BG0909-MW-08B		BG0909-MW-09A		BG0909-MW-09B		BG0909-MW-10A	
Matrix :		Water		Water		Water		Water		Water	
Units :		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :		9/10/2009		9/10/2009		9/10/2009		9/10/2009		9/10/2009	
Time Sampled :		15:08		15:05		17:20		17:00		19:18	
Dilution Factor :		1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ANTIMONY	2										
*ARSENIC	1	1.6				0.68	J				
BARIUM	10	57.6		16.6		55.8		14.4		8.5	J
BERYLLIUM	1	0.76	J								
*CADMIUM	1										
*CHROMIUM	2	0.63	J								
COBALT	1	6.4									
COPPER	2										
*LEAD	1										
MANGANESE	1	280		282		246		69.4		173	
*NICKEL	1	3.8	J								
SELENIUM	5										
SILVER	1										
THALLIUM	1										
VANADIUM	5										
ZINC	2	8.8		30.9		5.8		2.3		6.1	

CRQL = Contract Required Quantitation Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor)

Revised 09/99

Appendix C

Chain-of-Custody Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969
DAS No:
R

Region:	3	Date Shipped:	9/14/2009	Chain of Custody Record	Sampler Signature:
Project Code: / Account Code:	CT4682	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
CERCLIS ID:	VAN000306614	Airbill:	857499683846	1 9/14/09 17:27	
Spill ID:		Shipped to:	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Site Name/State:	Battlefield Golf Fly Ash/VA			3	
Project Leader:	Donna Davies			4	
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC0185	Field QC/ Donna Davies	L/G	ICPMS AES (14)	1333 (HNO3) (1)	BG0909-FB01	S: 9/8/2009	13:10		Field Blank
MC0187	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1335 (HNO3) (1)	BG0909-MW-01	S: 9/10/2009	10:38		--
MC0188	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1336 (HNO3) (1)	BG0909-MW-02	S: 9/10/2009	12:30		--
MC0189	Field QC/ Donna Davies	L/G	ICPMS AES (14)	1337 (HNO3) (1)	BG0909-MW-020	S: 9/11/2009	15:13		Field Duplicate MW07A
MC0190	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1338 (HNO3) (1)	BG0909-MW-03	S: 9/10/2009	12:17		--
MC0191	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1339 (HNO3) (1)	BG0909-MW-06A	S: 9/11/2009	8:35		--
MC0192	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1340 (HNO3) (1)	BG0909-MW-06B	S: 9/11/2009	8:41		--
MC0193	Field QC/ Donna Davies	L/G	ICPMS AES (14)	1341 (HNO3) (1)	BG0909-MW-07A	S: 9/11/2009	10:23		Field Duplicate MW-020
MC0194	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1342 (HNO3) (1)	BG0909-MW-07B	S: 9/11/2009	10:25		--
MC0195	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1343 (HNO3) (1)	BG0909-MW-08A	S: 9/10/2009	15:08		--
MC0196	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1344 (HNO3) (1)	BG0909-MW-08B	S: 9/10/2009	15:05		--

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____
ICPMS AES = CLP TAL ICPMS AES			

TR Number: 3-222665643-091409-0014

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

EPA USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38969 **R**
DAS No:

Region:	3	Date Shipped:	9/14/2009	Chain of Custody Record	Sampler Signature:
Project Code: / Account Code:	CT4682	Carrier Name:	FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
CERCLIS ID:	VAN000306614	Airbill:	857499683846	1 9/14/09 1705	
Spill ID:		Shipped to:	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Site Name/State:	Battlefield Golf Fly Ash/VA			3	
Project Leader:	Donna Davies			4	
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC0197	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1345 (HNO3) (1)	BG0909-MW-09A	S: 9/10/2009 17:20		–
MC0198	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1346 (HNO3) (1)	BG0909-MW-09B	S: 9/10/2009 17:00		–
MC0199	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1347 (HNO3) (1)	BG0909-MW-10A	S: 9/10/2009 19:18		–
MC01A0	Ground Water/ Donna Davies	L/G	ICPMS AES (14)	1348 (HNO3) (1)	BG0909-MW10B	S: 9/10/2009 19:05		–

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____
ICPMS AES = CLP TAL ICPMS AES			

TR Number: 3-222665643-091409-0014

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

REGION COPY

U.S. EPA Region III Analytical Request Form

Revision 10.06

JTS 9-4-09

ASQAB USE ONLY		
RAS#	CT4682	Analytical TAT
DAS#		14
NSF#		

38969

Date: 9/2/09	Site Activity: SI			
Site Name: Battlefield Golf Club Site		Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790	
Program: Superfund	Acct. #: 2009 T03 N 302DD2C A3LM SI00		CERCLIS #: VAN000306614	
Site ID:	Spill ID: A3LM		Operable Unit:	
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START 3 QAPP		Date Approved: November 2006	
EPA Project Leader: Donna Santiago	Phone#: 215.814.3222	Cell Phone #:	E-mail: Santiago.donna@epa.gov	
Request Preparer: JOSHUA COPE	Phone#:	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com	
Site Leader: DONNA DAVIES	Phone#: 215-669-0069	Cell Phone #: 215-669-0069	E-mail: Donna.davies@ttemi.com	
Contractor: Tetra Tech EM Inc.	EPA CO/PO: Jeff Fang/Karen Wodarczyk			
#Samples 15	Matrix: surface water	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES	31173
#Samples 15	Matrix: sediment	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES	31176
#Samples 5	Matrix: soil	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES	
#Samples 19	Matrix: groundwater	Parameter: TAL metals Low + Hg	Method: ILM05.4 ICPMS	31174
#Samples 19	Matrix: groundwater	Parameter: Al, Ca, Fe, K, Mg, Na, B, Hg	Method: ILM05.4 ICPAES	31175
#Samples 1	Matrix: rinseate blank	Parameter: TAL Metals + Boron + Hg	Method: ILM05.4 ICPAES	31173
Ship Date From: 9/9/2009	Ship Date To: 9/11/2009	Org. Validation Level	Inorg. Validation Level IM2	

A4

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: ☒ 14days ☐ 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☐ Other (Specify) 14day PR's ESAT

Validated Data Package Due: ☐ 42 days ☒ 30 days ☐ 21days ☐ 14 days ☐ Other (Specify) 14/16

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached. Please note addition of Boron analysis.

Please email results to: Donna Santiago at Santiago.donna@epa.gov and Christine Wagner at Wagner.Christine@epa.gov

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : September 15, 2009

SUBJECT: Region III Data QA Review

FROM : Colleen Walling
Region III ESAT RPO (3EA20)

TO : Donna Santiago
Regional Project Manager

Attached is the inorganic data validation report for the Battlefield Golf Club site (Case # 38843; SDG #MC00S8) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2763.

Attachment

cc: Joshua Cope (TTEMI)

TO File #: 0021 TDF#: 08107

LOCKHEED MARTIN
We never forget who we're working for™

Lockheed Martin Enterprise Solutions & Services
ESAT Region 3
US EPA Environmental Science Center
701 Mapes Road Ft. Meade, MD 20755-5350
Telephone 410-305-3037 Facsimile 410-305-3597

DATE: September 02, 2009

SUBJECT: Level IM2 Inorganic Data Validation for Case 38843
SDG: MC00S8
Site: Battlefield Golf Club

FROM: (b) (4) (b) (4)
Inorganic Data Reviewer

Through: (b) (4) (b) (4)
Senior Data Review Chemist

TO: Colleen Walling
ESAT Region 3 Project Officer

OVERVIEW

Case 38843, Sample Delivery Group (SDG) MC00S8, consisted of five (4) waste samples submitted to A4 Scientific, Inc. (A4) for total metals analyses. The sample set included one (1) field duplicate pair. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.4 (Modified) through the Routine Analytical Services (RAS) program. Modifications included analysis of boron (B) at a Contract Required Quantitation Limit (CRQL) of 5.0 ug/L.

SUMMARY

Data were validated according to the Region III Modifications to the National Functional Guidelines for Inorganic Data Review, level IM2. No problems regarding data usability were noted during the review of this data set. The analytical results for this sample set are summarized on a single Data Summary Form (DSF) in Appendix B.

NOTES

The Laboratory Control Sample (LCS) reported results below Method Detection Limits (MDLs) for barium (Ba), boron (B), and potassium (K). Therefore, the LCS results for these analytes were reported as non-detects on Form 7. The lower acceptance limits for these analytes were also below the laboratory MDLs which make the recoveries of these analytes within the control limits. No data were qualified based on LCS recoveries.

Reported results for the field duplicate pair MC00S8/MC00S9 were within the control limits of 35% RPD, ±2XCRQL for all analytes.

The positive result for cadmium (Cd) in sample MC00T2 was less than the Contract Required Quantitation Limit (CRQL) but greater than the MDL and was qualified "J" on the DSF.

Data for Case 38843, SDG MC00S8, were reviewed in accordance with Region III Modifications to the National Functional Guidelines for Evaluating Inorganic Analyses, April 1993.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

APPENDIX A	GLOSSARY OF DATA QUALIFIER CODES
APPENDIX B	DATA SUMMARY FORMS
APPENDIX C	CHAIN OF CUSTODY RECORDS
APPENDIX D	LABORATORY CASE NARRATIVE

DCN: 38843_ MC00S8. IM2

APPENDIX A

Glossary of Qualifier Codes

GLOSSARY OF DATA QUALIFIER CODES (INORGANIC)

CODES RELATED TO IDENTIFICATION
(confidence concerning presence or absence of analytes):

U = Not detected. The associated number indicates approximate sample concentration necessary to be detected.

(NO CODE) = Confirmed identification.

B = Not detected substantially above the level reported in laboratory or field blanks.

R = Unusable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result.

N = Tentative identification. Consider present.
Special methods may be needed to confirm its presence or absence in future sampling efforts.

CODES RELATED TO QUANTITATION
(can be used for both positive results and sample quantitation limits):

J = Analyte Present. Reported value may not be accurate or precise.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

L = Analyte present. Reported value may be biased low.
Actual value is expected to be higher.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

UL = Not detected, quantitation limit is probably higher.

OTHER CODES

Q = No analytical result.

APPENDIX B

Data Summary Forms

Case #: 38843 SDG : MC00S8 Number of Soil Samples : 0
Site : Battlefield Golf Club Number of Water Samples : 5
Lab. : A4

Sample Number :	MC00S8		MC00S9		MC00T0		MC00T1		MC00T2	
Sampling Location :	Ash-01		Ash-02		Ash-03		Ash-04		Ash-05	
Field QC :	Dup. of MC00S9		Dup. of MC00S8							
Matrix :	Waste		Waste		Waste		Waste		Waste	
Units :	mg/Kg		mg/Kg		mg/Kg		mg/Kg		mg/Kg	
Date Sampled :	8/11/2009		8/11/2009		8/11/2009		8/11/2009		8/11/2009	
Time Sampled :	14:57		16:00		15:10		17:21		17:01	
%Solids :	74.4		73.1		73.1		68.7		70.0	
Dilution Factor :	1.0		1.0		1.0		1.0		1.0	
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	13300		13200		12600		11400		8520	
ANTIMONY	6										
ARSENIC	1	80.9		77.9		81.0		76.6		33.5	
BARIUM	20	565		561		684		448		346	
BERYLLIUM	0.5	4.1		4.1		3.9		3.2		2.2	
BORON	5	40.2		39.5		33.3		35.3		26.2	
CADMIUM	0.5	1.2		1.2		1.2		1.1		0.55	J
CALCIUM	500	14800		14800		13800		10100		14100	
CHROMIUM	1	29.4		27.3		25.4		16.4		13.0	
COBALT	5	17.2		17.1		16.3		11.3		8.9	
COPPER	2.5	48.2		47.8		45.9		37.0		27.4	
IRON	10	9730		9630		9470		8690		6480	
*LEAD	1	23.4		23.0		22.2		15.8		12.0	
MAGNESIUM	500	1640		1630		1550		1330		1310	
MANGANESE	1.5	91.1		89.4		89.2		65.8		52.1	
MERCURY	0.1	0.26		0.27		0.27		0.32		0.24	
NICKEL	4	25.1		24.7		24.0		18.2		14.0	
POTASSIUM	500	2130		2140		2300		1930		1250	
SELENIUM	3.5	13.2		13.1		12.3		9.3		9.0	
SILVER	1										
SODIUM	500	1050		1060		1400		1540		1730	
THALLIUM	2.5										
VANADIUM	5	69.5		68.0		66.2		57.2		37.5	
ZINC	6	35.2		34.7		34.0		27.4		20.2	

CRQL = Contract Required Quantitation Limit SEE NARRATIVE FOR CODE DEFINITIONS
To calculate sample quantitation limits: (CRQL * Dilution Factor) / (%Solids/ 100) Revised 09/99

APPENDIX C

Chain of Custody (COC) Records

USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 38843 **R**
DAS No:

Region:	3	**Date Shipped:**	8/12/2009	**Chain of Custody Record**	**Sampler Signature:**
Project Code:	CT4645	**Carrier Name:**	FedEx	**Relinquished By (Date / Time)**	**Received By (Date / Time)**
Account Code:		**Airbill:**	869868645862	1	
CERCLIS ID:	VAN000306614	**Shipped to:**	A4 Scientific 1544 Sawdust Road Suite 505 The Woodlands TX 77380 (281) 292-5277	2	
Spill ID:				3	
Site Name/State:	Battlefield Golf Fly Ash/VA			4	
Project Leader:	Donna Davies				
Action:	Screening Site Investigation				
Sampling Co:	Tetra Tech EM Inc.				

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC00S8	Waste/ Donna Davies	L/C	TAL metals (14)	1191 (Ice Only) (1)	Ash-01	S: 8/11/2009 14:57		Field Duplicate of Ash-02
MC00S9	Waste/ Donna Davies	L/C	TAL metals (14)	1192 (Ice Only) (1)	Ash-02	S: 8/11/2009 16:00		Field Duplicate of Ash-01
MC00T0	Waste/ Donna Davies	L/C	TAL metals (14)	1193 (Ice Only) (1)	Ash-03	S: 8/11/2009 15:10		–
MC00T1	Waste/ Donna Davies	L/C	TAL metals (14)	1194 (Ice Only) (1)	Ash-04	S: 8/11/2009 17:21		Lab QC
MC00T2	Waste/ Donna Davies	L/C	TAL metals (14)	1195 (Ice Only) (1)	Ash-05	S: 8/11/2009 17:01		–

Shipment for Case Complete? Y	**Sample(s) to be used for laboratory QC:** MC00T2	**Additional Sampler Signature(s):**	**Chain of Custody Seal Number:**
Analysis Key: TAL metals = Total metals + Boron	**Concentration:** L = Low, M = Low/Medium, H = High	**Type/Designate:** Composite = C, Grab = G	**Shipment Iced?** _____

TR Number: 3-222665643-081209-0001

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: (b) (4)(b) (4)(b) (4)(b) (4) (b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)(b) (4)

U.S. EPA Region III Analytical Request Form

Revision 10.06

9TS

ASQAB USE ONLY		
RAS#	CT4645	Analytical TAT
DAS#		14
NSF#		

38843

Date: 7/28/09	Site Activity: SI – Site Inspections		
Site Name: Battlefield Golf Club ~~Fly Ash Assessment~~	Street Address: 1001 South Centerville Turnpike		
City: Chesapeake	State: VA	Latitude: 36.68982	Longitude: 76.17790
Program: Superfund	Acct. #: 2009 T03 N 302DD2C A3LM SI00	CERCLIS #: VAN000306614	
Site ID:	Spill ID: A3LM	Operable Unit:	
Site Specific QA Plan Submitted: ☒ No ☐ Yes	Title: START3 QAPP	Date Approved: November 2006	
EPA Project Leader: Donna Santiago	Phone#: 215-814-3222	Cell Phone #:	E-mail: Santiago.donna@epa.gov
Request Preparer: JOSHUA COPE	Phone#: 610-364-2130	Cell Phone #: 215-768-8114	E-mail: Joshua.cope@ttemi.com
Site Leader: Donna Davies	Phone#: 610-364-2125	Cell Phone #: 215 669-0069	E-mail: davies.donna@ttemi.com
Contractor: Tetra Tech EM Inc	EPA CO/PO: Jeff Fang/Karen Wodarczyk		
#Samples 7*	Matrix: fly ash	Parameter: TAL Metals + Boron + Hg A4	Method: ILM05.4 ICPAES+Hg+B 3/005
Ship Date From: 8/3/09	Ship Date To: 8/14/09	Org. Validation Level	Inorg. Validation Level IM2

Unvalidated Data Requested: ☐ No ☒ Yes If Yes, TAT Needed: 7days ☐ 72hrs ☐ 48hrs ☐ 24hrs ☒ Other (Specify)14 Days PR's by tech ESAT

Validated Data Package Due: ☐ 42 days ☐ 30 days ☒ 21days ☐ 14 days ☐ Other (Specify) 14/7

Electronic Data Deliverables Required: ☐ No ☒ Yes (EDDs will be provided in Region 3 EDD Format)

Special Instructions: Detection limits are attached please note addition of Boron analysis. *Actual number of samples will range from 3 to 7 samples depending on site conditions.

FORM ARF- 10/06