

RADFORD ARMY AMMUNITION PLANT, VIRGINIA

SWMU 39 Interim Measures Work Plan



Prepared for:

USACE Baltimore District
10 S. Howard St.
Baltimore, MD 21201



Prepared by:

Shaw Environmental, Inc.
2113 Emmorton Park Rd.
Edgewood, MD 21040

Final Document

July 2008

Leahy, Timothy

From: Geiger.William@epamail.epa.gov
Sent: Wednesday, October 01, 2008 3:07 PM
To: McKenna, Jim J Mr CIV USA AMC
Cc: diane.wisbeck@arcadis-us.com; jim spencer; Parks, Jeffrey; jeremy.flint@atk.com; jerome.redder@atk.com; jlcutler@deq.virginia.gov; Mendoza, Richard R Mr CIV USA IMCOM; Davie, Robert N Mr CIV USA AMC; Leahy, Timothy; Llewellyn, Tim; Tina_Devine@URSCorp.com; Meyer, Tom NAB02
Subject: Re: List of Planned and Submitted Documents (UNCLASSIFIED)
Attachments: List of Planned and Submitted Documents for Regulatory Review 26 Sep 2008 jjm.doc



List of Planned and
Submitted ...

Jim, EPA/VDEQ approve the SWMU 39 Interim Measures Work Plan, and the Final WPA 024 MMRP SSP Work Plan.

Per our previous agreement, hard copy letters from the regulatory agencies are not required for work plans.

William A. Geiger
USEPA Region III
1650 Arch Street
Philadelphia, PA 19103
(215)814-3413

"McKenna, Jim J
Mr CIV USA AMC"
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09/26/2008 11:59
AM

To
William Geiger/R3/USEPA/US@EPA,
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<jeremy.flint@atk.com>,
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Robert N Mr CIV USA AMC"
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Subject

List of Planned and Submitted
Documents (UNCLASSIFIED)



Ammunition Systems Group
Energetic Systems Division
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, VA 24143-0100

www.atk.com

July 23, 2008

Mr. William Geiger
RCRA General Operations Branch, Mail Code: 3WC23
Waste and Chemicals Management Division
U. S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. James L. Cutler, Jr.
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 24143-0100

Subject: With Certification, Radford Army Ammunition Plant,
SWMU 39 Interim Measures Work Plan, Final Document, July 2008
EPA ID# VA1 210020730

Dear Mr. Geiger and Mr. Cutler:

Enclosed is the certification for the subject document that was sent to you on July 18, 2008. Also enclosed is a copy of the transmittal email message.

Please coordinate with and provide any questions or comments to myself at (540) 639-8658, Jerry Redder of my staff (540) 639-7536 or Jim McKenna, ACO Staff (540) 731-5782.

Sincerely,


P.W. Holt, Environmental Manager
Alliant Techsystems Inc.

c: Durwood Willis
Virginia Department of Environmental Quality
P. O. Box 10009
Richmond, VA 23240-0009

E. A. Lohman
Virginia Department of Environmental Quality
West Central Regional Office
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U.S. Army Environmental Command
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Rock Island, Illinois 61299

Tom Meyer
Corps of Engineers, Baltimore District
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10 South Howard Street
Baltimore, MD 21201

bc: Administrative File
J. McKenna, ACO Staff
Rob Davie-ACO Staff
M.A. Miano
P.W. Holt
J. J. Redder
Env. File

Coordination:


J. McKenna

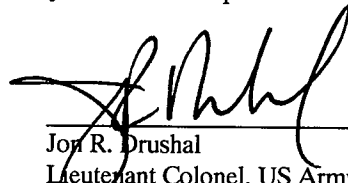

M. A. Miano

Concerning the following:

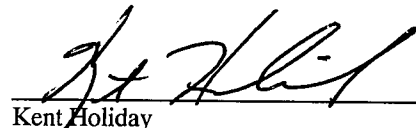
Radford Army Ammunition Plant
SWMU 39 Interim Measures Work Plan
Final Document, July 2008

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SIGNATURE:
PRINTED NAME:
TITLE:


Jon R. Drushal
Lieutenant Colonel, US Army
Commanding

SIGNATURE:
PRINTED NAME:
TITLE:


Kent Holiday
Vice President and General Manager
ATK Energetics Systems

Greene, Anne

From: McKenna, Jim
Sent: Friday, July 18, 2008 1:26 PM
To: Greene, Anne; beth lohman; dennis.druck@us.army.mil; diane.wisbeck@arcadis-us.com; durwood willis2; Geiger.William@epamail.epa.gov; Redder, Jerome; jim spencer; jlcutler@deq.virginia.gov; Llewellyn, Tim; Mendoza, Richard R Mr CIV USA IMCOM; Parks, Jeffrey N; Timothy.Leahy@shawgrp.com; Tina_Devine@URSCorp.com; Tom.Meyer@nab02.usace.army.mil
Subject: Final SWMU 39 Interim Measures Work Plan (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
Caveats: NONE

All:

Note the contractor will ship the subject document with a copy of this email to the POCs and tracking numbers below.

Jim McKenna, RFAAP - 1Z63V8840195219965
Margaret Howard, USAEC - 1Z63V8840197889550 Will Geiger, USEPA - 1Z63V8840197688740 Jim Cutler, VDEQ - 1Z63V8840196041538 Rich Mendoza, USAEC - 1Z63V8840196931924 Tom Meyer, USACE - 1Z63V8840198303911 Dennis Druck, USACHPPM - 1Z63V8840199461507 Beth Lohman, VDEQ - 1Z63V8840199468699

Thank you for your support of the Radford Army Ammunition Plant Installation Restoration Program.

Jim McKenna

Classification: UNCLASSIFIED
Caveats: NONE

**Response to USEPA and VDEQ Comments, Dated 29 May 2008
for
Draft SWMU 39 Interim Measures Work Plan
Dated April 2008**

Comments from Will Geiger, USEPA and Jim Cutler, VDEQ

SPECIFIC COMMENTS

Comment 1

Section 2.2.3 and Figure 2-3 describe and depict the proposed delineation sampling. Based on the historical waste deposition and the limited prior sampling performed to date, the delineation proposed for the southern pond is not sufficient. Several EPA comments on the RFI/CMS dated April 2004 (#3, #29 and #30) indicated that the waste had not been adequately delineated (especially in the southern pond) but concurred with the RFI/CMS with the understanding that proper delineation would take place prior to excavation. On page 9-6 of the final RFI/CMS it is stated (under "Contamination Delineation") that the entire area within both ponds will be delineated to assess the area that needs remediation. The work plan should be revised to address the need for a more complete delineation of the southern pond.

Response

The work plan will be revised to include samples that cover the footprint of the entire southern pond, similar to the current sampling locations in the northern pond. Although the entire pond will be covered, sample density in the southern pond will be higher in the center portion of the pond where a gentle swale appears to be the low point. Coverage will be less dense in the east and west ends of the pond where vegetation, including trees has begun to grow.

Initially, samples from both ponds will be screened with X-Ray Fluorescence (XRF) to assess the extent of lead in the pond sediment. Once the extent of lead has been determined, samples from the perimeter of the area of elevated lead will be sent to a fixed based laboratory for confirmation. These samples will be analyzed for TAL metals and dioxins/furans to encompass the other COIs (arsenic, vanadium and dioxins/furans as TE).

In addition to the perimeter samples, select samples from within the area of elevated lead and from outside the area of elevated lead will be collected and analyzed for TAL metals and dioxins/furans to provide additional samples to calculate a correlation factor between the XRF and laboratory data. These samples will also be used to ensure that other COIs fall within the footprint of the area of elevated lead. Sections 2.2.3 – *Soil Delineation* and 3.3.1 – *Soil Delineation Samples* will be revised to include the use of XRF and the additional samples in the southern pond. **Figure 2-3** has been revised as well and is attached to these comment responses for review.

Comment 2

The RFI/CMS deferred the investigation of groundwater at SWMU 39 to a future base-wide ground water study. The current approach to groundwater at RAAP combines a regional

perspective with the need for site specific data. Although SWMU 39 is somewhat isolated from other SWMUs in the Horseshoe Area, there may be enough site wells to characterize the surrounding groundwater. Please discuss how and when groundwater will be evaluated at this site (separate report?)

Response

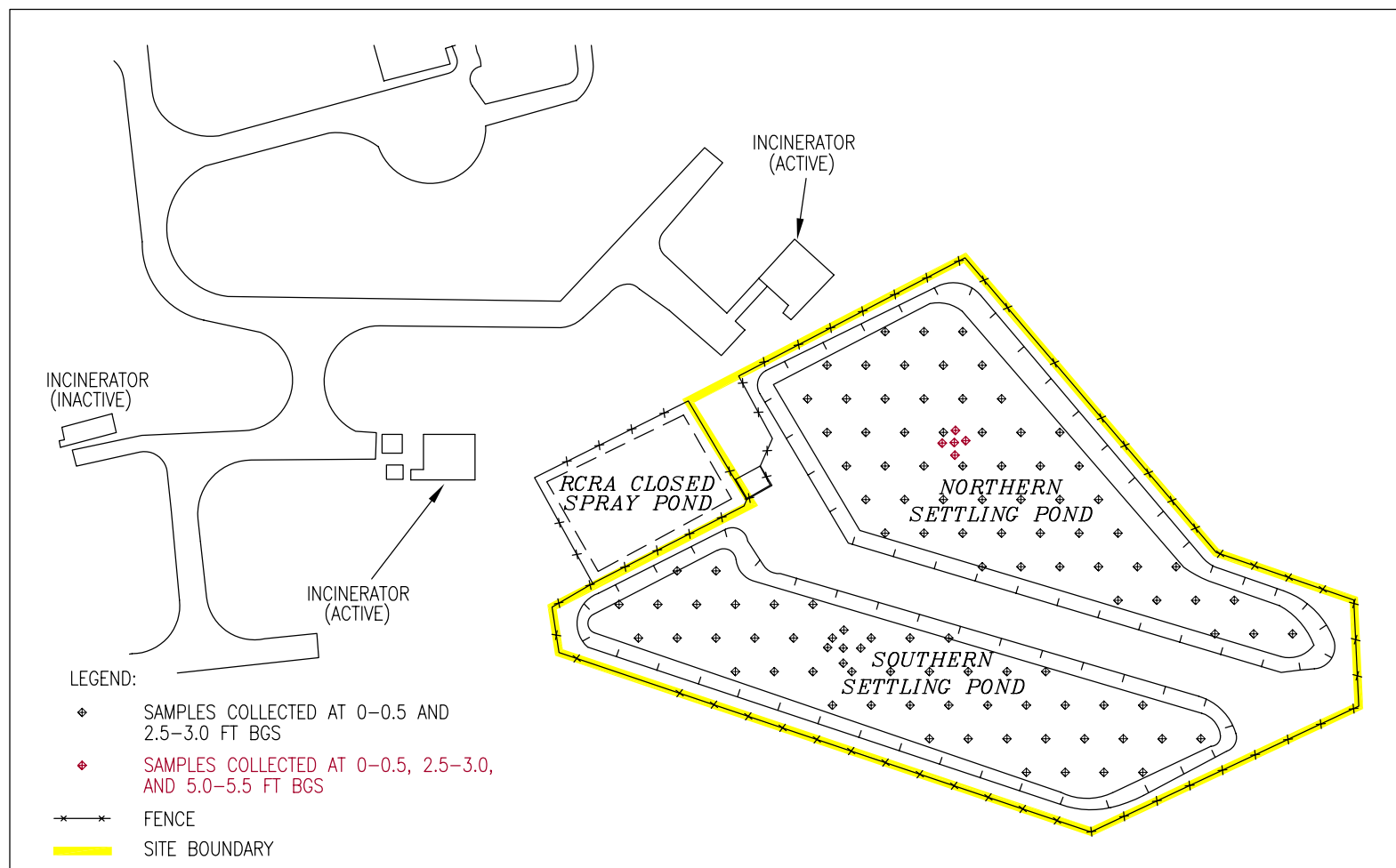
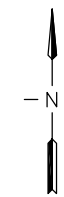
A brief section will be added to the IMWP discussing groundwater and the COIs indentified for SWMU 39.

Samples were collected from four SWMU 39 wells during the 1998 RFI effort and analyzed for TCL SVOCs, PAHs and TAL metals. SVOCs/PAHs were not detected in the samples. Metals results from this sampling effort indicate that arsenic, lead and vanadium were not detected in the samples.

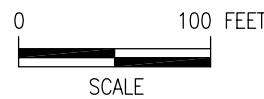
Samples were also collected quarterly from the wells as part of the post-closure permit for HWMU 39. A Closure Evaluation Report was prepared by Alliant Techsystems in 2007 and included the quarterly data collected between 1998 and 2007. This report will be included as an appendix to the IMWP. This sampling program analyzed the groundwater samples for select metals (including lead and arsenic). These samples were not analyzed for vanadium or dioxins/furans. Results for second quarter of 2003 through the second quarter of 2007 are tabulated in **Table 1** (attached) of the Closure Evaluation Report. These results show that lead and arsenic were detected at very low frequencies (arsenic - 3 detections out of 85 GW samples; lead - 4 detections out of 85 GW samples). These low frequencies of detection are not consistent with a continuing source (ie. pond sediments) adding these constituents to the groundwater. Removal of the elevated constituents from the sediment/soil at the floor of the settling ponds will prevent future migration of these constituents to groundwater

Although neither investigation analyzed the samples for dioxins/furans, this group of compounds is highly immobile and is unlikely to be present in aqueous media because it has a very low solubility. Dioxins and furans also have high K_{oc} values, indicating that they have high sorption potentials and will not tend to leach into groundwater or surface water runoff.

The selected remedy for this site is excavation of contaminated soil to residential clean up goals with offsite disposal in an appropriate landfill. Groundwater evidence to date does not show a current impact to groundwater from the settling ponds and removal of the source area will prevent any future impacts to groundwater as well.



FILE: FIG 2-3.dwg PLOT: 3-4-08



RADFORD AAP		FIGURE 2-3
PREPARED BY: SHAW	TASK NO: 82987008200000	SWMU 39 PROPOSED DELINEATION SAMPLE LOCATIONS
CHECKED BY: MT	SHAW DWG NO:	
DATE: REVISED JAN. 2008	FIG 2-3	

TABLES

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Recoverable Phenolics									
CAS # C-020									
Second Quarter 2003	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2003	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2003	U	U	U	U	10.3	5	-	ug/L	9065
First Quarter 2004	10 J	13 J	15 J	13 J	14 J	5	-	ug/L	9065
Second Quarter 2004	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2004	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2004	U	U	U	U	U	5	-	ug/L	9065
First Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
Second Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
First Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
Second Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
First Quarter 2007	U	U	U	U	U	5	-	ug/L	9065
Second Quarter 2007	U	U	U	U	U	5	-	ug/L	9065
Antimony									
CAS # 7440-36-0									
Second Quarter 2003	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	5	6	ug/L	6010B
First Quarter 2004	U	U	U	U	U	5	6	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2004	U	U J	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	6	ug/L	6010B
First Quarter 2005	U J	U J	U J	U J	U J	5	6	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	5	6	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	6	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2006	U J	U J	U J	U J	U J	5	6	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	6	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	6	ug/L	6010B
Arsenic									
CAS # 7440-38-2									
Second Quarter 2003	U	U	U	U	U	5	10	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2003	U	U	U	7.4 J	U	5	10	ug/L	6010B
First Quarter 2004	U	U	U	U	7.8 J	5	10	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	5	10	ug/L	6010B
Third Quarter 2004	U	U J	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	10	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	10	ug/L	6010B
Second Quarter 2005	U	U	U	U	5.8	5	10	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	5	10	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	10	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	10	ug/L	6010B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Barium CAS # 7440-39-3									
Second Quarter 2003	38.6	72.8	97.9	202	68.5	1	2000	ug/L	6010B
Third Quarter 2003	42.6	81.1	99.9	193	323	1	2000	ug/L	6010B
Fourth Quarter 2003	37.4	81.1	117	322	374	1	2000	ug/L	6010B
First Quarter 2004	39.9	84	102	200	342	1	2000	ug/L	6010B
Second Quarter 2004	40.9	77.8	97.1	190	217	1	2000	ug/L	6010B
Third Quarter 2004	34.2	72	104	172	237	1	2000	ug/L	6010B
Fourth Quarter 2004	40.2	81.1	113	224	263	1	2000	ug/L	6010B
First Quarter 2005	28.8	78.9	110	199	342	1	2000	ug/L	6010B
Second Quarter 2005	25.1	77.1	105	209	417	1	2000	ug/L	6010B
Third Quarter 2005	27.6	67.5 J	110	187	294	1	2000	ug/L	6010B
Fourth Quarter 2005	24.1	86.4	137	210	262	1	2000	ug/L	6010B
First Quarter 2006	23.9	74.8	125	201	210	1	2000	ug/L	6010B
Second Quarter 2006	20.7	83	131	205	240	1	2000	ug/L	6010B
Third Quarter 2006	22.8	90	124	197	164	1	2000	ug/L	6010B
Fourth Quarter 2006	31.7	88.7	121	206	207	1	2000	ug/L	6010B
First Quarter 2007	22.7	75.1	129	212	207	1	2000	ug/L	6010B
Second Quarter 2007	30	78.8	114	229	151	1	2000	ug/L	6010B
Beryllium CAS # 7440-41-7									
Second Quarter 2003	U	U	U	U	U	1	4	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2005	U J	U J	U J	U J	U J	1	4	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	1	4	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2006	U J	U J	U J	U J	U J	1	4	ug/L	6010B
Second Quarter 2006	U J	U J	U J	U J	U J	1	4	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2007	U	U	U	U	U	1	4	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	1	4	ug/L	6010B
Cadmium CAS # 7440-43-9									
Second Quarter 2003	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2007	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	1	5	ug/L	6010B

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Chromium									
CAS # 7440-47-3									
Second Quarter 2003	U	U	U	U	U	5	100	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2003	U	U	U	24.5	28.4	5	100	ug/L	6010B
First Quarter 2004	U	U	U	U	29.1	5	100	ug/L	6010B
Second Quarter 2004	U	U	U	U	15.9	5	100	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	100	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	100	ug/L	6010B
Second Quarter 2005	U	U	U	U	30.2	5	100	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2005	U	5.2	7.1	U	U	5	100	ug/L	6010B
First Quarter 2006	U	5.5	U	U	U	5	100	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	100	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	100	ug/L	6010B
First Quarter 2007	U	5.4	U	U	U	5	100	ug/L	6010B
Second Quarter 2007	U	7.1	7.52	U	U	5	100	ug/L	6010B
Iron									
CAS # 7439-89-6									
Second Quarter 2003	57.1	U	66.6	348	543	50	-	ug/L	6010B
Third Quarter 2003	U	U	U	138	1470	50	-	ug/L	6010B
Fourth Quarter 2003	87.7	U	U	19900	15300	50	-	ug/L	6010B
First Quarter 2004	127	U	U	833	15800	50	-	ug/L	6010B
Second Quarter 2004	U	U	U	U	8450	50	-	ug/L	6010B
Third Quarter 2004	U A	U	U	680	2190	50	-	ug/L	6010B
Fourth Quarter 2004	U	U	U	2630	774	50	-	ug/L	6010B
First Quarter 2005	U	U	U	U A	731	50	-	ug/L	6010B
Second Quarter 2005	33.5	U	U	1130	23600	50	-	ug/L	6010B
Third Quarter 2005	152	U	U	161 J	328	100	-	ug/L	6010B
Fourth Quarter 2005	U A	U	4990	161	170	50	-	ug/L	6010B
First Quarter 2006	U	U	1250	149	342	100	-	ug/L	6010B
Second Quarter 2006	U	U	892	350	178	50	-	ug/L	6010B
Third Quarter 2006	U	U	822	104	184	50	-	ug/L	6010B
Fourth Quarter 2006	U	U	350	116	301	50	-	ug/L	6010B
First Quarter 2007	U	U	1340	85.5	232	50	-	ug/L	6010B
Second Quarter 2007	U	857	4640	1200	343	100	-	ug/L	6010B
Lead									
CAS # 7439-92-1									
Second Quarter 2003	U	U	U	U	U	5	15	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2003	U	U	U	19.4	U	5	15	ug/L	6010B
First Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2005	U	U	U	U	5.3	5	15	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2005	U	U	5.9	U	U	5	15	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2007	U	U	10.1	U	U	5	15	ug/L	6010B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Manganese CAS # 7439-96-5									
Second Quarter 2003	U	U	5.3	693	17	2	-	ug/L	6010B
Third Quarter 2003	U	U	2.6	104	54.5	2	-	ug/L	6010B
Fourth Quarter 2003	U	U	8.8	710	241	2	-	ug/L	6010B
First Quarter 2004	U	U	4	56.2	210	2	-	ug/L	6010B
Second Quarter 2004	U	U	U	113	125	2	-	ug/L	6010B
Third Quarter 2004	U	U	10.5	215	76.6	2	-	ug/L	6010B
Fourth Quarter 2004	U	U	6.2	207	52.5	2	-	ug/L	6010B
First Quarter 2005	U	U	U	A 33.6	60.3	2	-	ug/L	6010B
Second Quarter 2005	U	U	6.1	96.8	293	2	-	ug/L	6010B
Third Quarter 2005	U	U	2.2	48.6	57.8	2	-	ug/L	6010B
Fourth Quarter 2005	U	U	359	128	47	2	-	ug/L	6010B
First Quarter 2006	U	U	190	62.8	45.6	2	-	ug/L	6010B
Second Quarter 2006	U	U	149	54	42.5	2	-	ug/L	6010B
Third Quarter 2006	U	U	112	9.1	46.8	2	-	ug/L	6010B
Fourth Quarter 2006	U	U	26.9	19.4	54.5	2	-	ug/L	6010B
First Quarter 2007	U	U	126	6.2	50.8	2	-	ug/L	6010B
Second Quarter 2007	U	23.2	143	30.9	29.5	2	-	ug/L	6010B
Mercury CAS # 7439-97-6									
Second Quarter 2003	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2003	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2003	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2007	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2007	U	U	U	U	U	0.5	2	ug/L	7470A
Nickel CAS # 7440-02-0									
Second Quarter 2003	U	U	U	U	U	5	313	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2003	U	U	U	15.3	17.4	5	313	ug/L	6010B
First Quarter 2004	U	U	U	U	19.8	5	313	ug/L	6010B
Second Quarter 2004	U	U	U	U	10.8	5	313	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	313	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	313	ug/L	6010B
Second Quarter 2005	U	U	U	U	21.8	5	313	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2005	U	U	6.3	U	U	5	313	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	313	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	313	ug/L	6010B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Selenium CAS # 7782-49-2									
Second Quarter 2003	U	U	U	U	U	5	50	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	50	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	5	50	ug/L	6010B
First Quarter 2004	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2004	U J	U J	U J	U J	U J	5	50	ug/L	6010B
Third Quarter 2004	U J	U	U J	U J	U J	5	50	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	50	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	50	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	50	ug/L	6010B
Fourth Quarter 2006	U J	U J	U J	U J	U J	5	50	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	50	ug/L	6010B
Silver CAS # 7440-22-4									
Second Quarter 2003	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	2	78.3	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2004	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2004	U J	U	U J	U J	U J	2	78.3	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2007	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2007	U J	U J	U J	U J	U J	2	78.3	ug/L	6010B
Sodium CAS # 7440-23-5									
Second Quarter 2003	3710	17100	12300	15600	7740	100	-	ug/L	6010B
Third Quarter 2003	3380	22700	10700	15400	8650	100	-	ug/L	6010B
Fourth Quarter 2003	8080	23300	11700	14100	8960	100	-	ug/L	6010B
First Quarter 2004	8130	25900	12100	13800	9180	100	-	ug/L	6010B
Second Quarter 2004	4210	23400	11400	11800	7900	100	-	ug/L	6010B
Third Quarter 2004	9580	23200	11800	11400	7720	100	-	ug/L	6010B
Fourth Quarter 2004	7510	22600	12100	13500	8730	100	-	ug/L	6010B
First Quarter 2005	9630	17400	10700	10500	7240	100	-	ug/L	6010B
Second Quarter 2005	8290	22600	12100	12700	7690	100	-	ug/L	6010B
Third Quarter 2005	10400	24400	12100	11900	8070	500	-	ug/L	6010B
Fourth Quarter 2005	10800	30300	12600	10800	7620	100	-	ug/L	6010B
First Quarter 2006	10400	32400	11300	9650	7250	200	-	ug/L	6010B
Second Quarter 2006	10400	26300	13100	10200	7260	100	-	ug/L	6010B
Third Quarter 2006	15300	45000	16600	13100	9600	200	-	ug/L	6010B
Fourth Quarter 2006	8480	35600	13900	10800	7720	200	-	ug/L	6010B
First Quarter 2007	11300	40000	13500	10800	7860	200	-	ug/L	6010B
Second Quarter 2007	2840	34400	10900	10500	6920	200	-	ug/L	6010B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Thallium CAS # 7440-28-0									
Second Quarter 2003	U	U	U	U	U	2	2	ug/L	7841
Third Quarter 2003	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2003	U	U	U	U	U	2	2	ug/L	7841
First Quarter 2004	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2004	U	U	U	U	U	2	2	ug/L	7841
Third Quarter 2004	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2004	U J	U J	U J	U J	U J	2	2	ug/L	7841
First Quarter 2005	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2005	U	U	U	U	U J	2	2	ug/L	7841
Third Quarter 2005	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2005	U	U	U	U	U	2	2	ug/L	7841
First Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
Third Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
First Quarter 2007	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2007	U	U	U	U	U	2	2	ug/L	7841
Chloride CAS # 16887006									
Second Quarter 2003	2260	3740	2020	9360	4620	100	-	ug/L	300.0
Third Quarter 2003	1830	9130	1570	8600	3630	100	-	ug/L	300.0
Fourth Quarter 2003	7700	8270	1810	7600	3610	100	-	ug/L	300.0
First Quarter 2004	4130	5060	U	4590	2570	1000	-	ug/L	300.0
Second Quarter 2004	2370	5300	2030	8230	4560	1000	-	ug/L	300.0
Third Quarter 2004	8970	6800	2760	7010	3550	1000	-	ug/L	300.0
Fourth Quarter 2004	5990	5430	2530	7450	3510	1000	-	ug/L	300.0
First Quarter 2005	10700 J	6160 J	2550 J	6590 J	2500 J	1000	-	ug/L	300.0
Second Quarter 2005	8220	6020	1920	7420	3080	1000	-	ug/L	300.0
Third Quarter 2005	8920	4980	1590	6800	2340	1000	-	ug/L	300.0
Fourth Quarter 2005	10400	5900	2540	6480	3120	1000	-	ug/L	300.0
First Quarter 2006	11200	6010	2860	5980	3120	1000	-	ug/L	300.0
Second Quarter 2006	12100	13800	5000	8601	5601	1000	-	ug/L	300.0
Third Quarter 2006	10900	17600	2930	6540	3080	1000	-	ug/L	300.0
Fourth Quarter 2006	7620	12800	2470	6500	2800	1000	-	ug/L	300.0
First Quarter 2007	12200	14000	4280	7970	4830	1000	-	ug/L	300.0
Second Quarter 2007	2900	10300	4240	8100	5460	1000	-	ug/L	300.0
Fluoride CAS # 16984-48-8									
Second Quarter 2003	258	299	188	951	416	100	-	ug/L	300.0
Third Quarter 2003	185	254	127	593	251	100	-	ug/L	300.0
Fourth Quarter 2003	253	211	104	704	242	100	-	ug/L	300.0
First Quarter 2004	133	169	U	474	197	100	-	ug/L	300.0
Second Quarter 2004	196	500	135	700	508	100	-	ug/L	300.0
Third Quarter 2004	331	311	183	776	380	100	-	ug/L	300.0
Fourth Quarter 2004	315	317	201	832	380	100	-	ug/L	300.0
First Quarter 2005	325	336	184	865	412	100	-	ug/L	300.0
Second Quarter 2005	321	310	200	1030	457	100	-	ug/L	300.0
Third Quarter 2005	309	363	142	983	388	100	-	ug/L	300.0
Fourth Quarter 2005	302	408	244	880	432	100	-	ug/L	300.0
First Quarter 2006	264	331	257	896	435	100	-	ug/L	300.0
Second Quarter 2006	U	U	U	660	180	100	-	ug/L	300.0
Third Quarter 2006	368	383	270	929	405	100	-	ug/L	300.0
Fourth Quarter 2006	364	402	223	1010	448	100	-	ug/L	300.0
First Quarter 2007	260	297	192	791	381	100	-	ug/L	300.0
Second Quarter 2007	291	283	175	802	343	100	-	ug/L	300.0

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Nitrate (as N) CAS # 14797558									
Second Quarter 2003	1660	1790	592	197	1010	100	10000	ug/L	300.0
Third Quarter 2003	930	1700	282	169	173	100	10000	ug/L	300.0
Fourth Quarter 2003	819	1440	237	U	U	100	10000	ug/L	300.0
First Quarter 2004	610 J	769 J	113 J	550 J	U J	100	10000	ug/L	300.0
Second Quarter 2004	1100	1300	432	361	U	100	10000	ug/L	300.0
Third Quarter 2004	1120	1120	334	169	143	100	10000	ug/L	300.0
Fourth Quarter 2004	1010	699	238	1060	149	100	10000	ug/L	300.0
First Quarter 2005	1290 J	1070 J	222 J	205 J	U J	100	10000	ug/L	300.0
Second Quarter 2005	1090	1190	281	472	162	100	10000	ug/L	300.0
Third Quarter 2005	1110	1430	153	240	U	100	10000	ug/L	300.0
Fourth Quarter 2005	1270	1910	312	116	U	100	10000	ug/L	300.0
First Quarter 2006	1220	3010	321	123	U	100	10000	ug/L	300.0
Second Quarter 2006	1320	4490	209	U	U	100	10000	ug/L	300.0
Third Quarter 2006	1470	5570	312	182	U	100	10000	ug/L	300.0
Fourth Quarter 2006	1240 J	3540 J	240	U	U	100	10000	ug/L	300.0
First Quarter 2007	1310	3990	201	U	U	100	10000	ug/L	300.0
Second Quarter 2007	1270	2670	252	1980	550	100	10000	ug/L	300.0
Sulfate CAS # 14808-79-8									
Second Quarter 2003	22100	76200	98800	43300	58600	5000	-	ug/L	300.0
Third Quarter 2003	18000	71400	71400	41300	25500	5000	-	ug/L	300.0
Fourth Quarter 2003	14400	69200	80500	35700	50700	5000	-	ug/L	300.0
First Quarter 2004	9200	58500	42200	26400	35800	5000	-	ug/L	300.0
Second Quarter 2004	18800	63000	68000	34000	48000	1000	-	ug/L	300.0
Third Quarter 2004	14600 J	76600 J	86700 J	35600 J	37900 J	1000	-	ug/L	300.0
Fourth Quarter 2004	15800	63800	85600	35700	31200	1000	-	ug/L	300.0
First Quarter 2005	13600	64900	81700	37800	39200	1000	-	ug/L	300.0
Second Quarter 2005	14100	72600	89000	38800	35900	1000	-	ug/L	300.0
Third Quarter 2005	12800	69800	87400	34100	32900	1000	-	ug/L	300.0
Fourth Quarter 2005	14600	71000	79700	34500	22100	1000	-	ug/L	300.0
First Quarter 2006	12100	74900	77200	31500	26600	1000	-	ug/L	300.0
Second Quarter 2006	13200	71400	92500	35100	36100	1000	-	ug/L	300.0
Third Quarter 2006	12400	80000	122000	34400	39100	1000	-	ug/L	300.0
Fourth Quarter 2006	15500	73800	82200	33700	22600	1000	-	ug/L	300.0
First Quarter 2007	10700	67600	61800	29000	18400	1000	-	ug/L	300.0
Second Quarter 2007	17300	64900	67100	29200	30800	1000	-	ug/L	300.0
Total Organic Halides (Rep 1) CAS # 59473-04-0									
Second Quarter 2003	12	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	59	U	U	U	U	10	-	ug/L	9020B
First Quarter 2004	38	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	21	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	65	U	15	U	23	10	-	ug/L	9020B
First Quarter 2005	131	56	41	68	246	10	-	ug/L	9020B
Second Quarter 2005	57	31	52	32	U	20	-	ug/L	9020B
Third Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
First Quarter 2006	27	U	U	20	27	20	-	ug/L	9020B
Second Quarter 2006	60	U	U	U	U	20	-	ug/L	9020B
Third Quarter 2006	106	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2006	98	31	35	24	25	20	-	ug/L	9020B
First Quarter 2007	89	25	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	32	U	U	U	U	20	-	ug/L	9020B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Organic Halides (Rep 2)				CAS # 59473-04-0					
Second Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	52	U	U	U	U	10	-	ug/L	9020B
First Quarter 2004	36	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	20	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	66	U	18	U	25	10	-	ug/L	9020B
First Quarter 2005	135	59	107	117	167	10	-	ug/L	9020B
Second Quarter 2005	63	26	55	51	U	20	-	ug/L	9020B
Third Quarter 2005	32	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2005	U	U	U	28	U	20	-	ug/L	9020B
First Quarter 2006	U	U	U	U	U	20	-	ug/L	9020B
Second Quarter 2006	63	22	U	U	U	20	-	ug/L	9020B
Third Quarter 2006	112	22	U	24	U	20	-	ug/L	9020B
Fourth Quarter 2006	111	29	41	24	23	20	-	ug/L	9020B
First Quarter 2007	72	22	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	33	U	U	U	U	20	-	ug/L	9020B
Total Organic Halides (Rep 3)				CAS # 59473-04-0					
Second Quarter 2003	16	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	64	U	U	-	U	10	-	ug/L	9020B
First Quarter 2004	39	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	20	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	63	U	18	U	14	10	-	ug/L	9020B
First Quarter 2005	109	32	92	48	172	10	-	ug/L	9020B
Second Quarter 2005	53	32	29	66	U	20	-	ug/L	9020B
Third Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
First Quarter 2006	22	U	U	28	U	20	-	ug/L	9020B
Second Quarter 2006	70	U	U	24	U	20	-	ug/L	9020B
Third Quarter 2006	98	U	U	26	U	20	-	ug/L	9020B
Fourth Quarter 2006	95	32	40	27	21	20	-	ug/L	9020B
First Quarter 2007	93	U	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	27	U	U	U	U	20	-	ug/L	9020B
Total Organic Halides (Rep 4)				CAS # 59473040					
Second Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	59	U	U	U	U	10	-	ug/L	9020B
First Quarter 2004	42	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	20	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	78	U	19	U	17	10	-	ug/L	9020B
First Quarter 2005	93	64	51	362	230	10	-	ug/L	9020B
Second Quarter 2005	81	44	65	44	U	20	-	ug/L	9020B
Third Quarter 2005	22	U	U	U	20	20	-	ug/L	9020B
Fourth Quarter 2005	U	27	U	U	U	20	-	ug/L	9020B
First Quarter 2006	U	U	U	U	U	20	-	ug/L	9020B
Second Quarter 2006	67	U	U	U	U	20	-	ug/L	9020B
Third Quarter 2006	102	U	U	21	U	20	-	ug/L	9020B
Fourth Quarter 2006	104	29	31	26	U	20	-	ug/L	9020B
First Quarter 2007	95	24	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	29	U	U	U	U	20	-	ug/L	9020B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Organic Carbon (Rep 1)									
				CAS # C-012					
Second Quarter 2003	2070	2400	2950	5300	2330	1000	-	ug/L	9060
Third Quarter 2003	1260	U	2550	3380	6540	1000	-	ug/L	9060
Fourth Quarter 2003	8980	19700 J	8050	10500	19600	1000	-	ug/L	9060
First Quarter 2004	4870	7630	10600	8930	10800	1000	-	ug/L	9060
Second Quarter 2004	U	U	U	1300	1900	1000	-	ug/L	9060
Third Quarter 2004	U	U	1120	U	2050	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1020	1240	2110	1000	-	ug/L	9060
First Quarter 2005	1010	1040	1360	1070	3370	1000	-	ug/L	9060
Second Quarter 2005	1220	U	1020	U	4090	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	1010	2410	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1310	U	2470	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	1800	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1140	U	2140	1000	-	ug/L	9060A
Third Quarter 2006	1110	U	1330	1110	2820	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1340	U	2270	1000	-	ug/L	9060A
First Quarter 2007	U	U	U	U	2120	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1130	1030	2050	1000	-	ug/L	9060A
Total Organic Carbon (Rep 2)									
				CAS # C-012					
Second Quarter 2003	1600	2670	4470	5330	2840	1000	-	ug/L	9060
Third Quarter 2003	1110	1530	2820	3270	5790	1000	-	ug/L	9060
Fourth Quarter 2003	9330	18800 J	7100	13300	27700	1000	-	ug/L	9060
First Quarter 2004	4380	5780	10700	6060	10800	1000	-	ug/L	9060
Second Quarter 2004	U	1120	1220	U	2300	1000	-	ug/L	9060
Third Quarter 2004	U	U	1120	U	1720	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1040	1200	2180	1000	-	ug/L	9060
First Quarter 2005	U	U	1360	1030	3270	1000	-	ug/L	9060
Second Quarter 2005	U	U	1050	U	4387	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	U	2650	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1030	U	2220	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	1920	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1190	U	2140	1000	-	ug/L	9060A
Third Quarter 2006	1110	U	1470	1030	2700	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1210	U	2090	1000	-	ug/L	9060A
First Quarter 2007	U	U	1080	U	2370	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1150	U	1770	1000	-	ug/L	9060A
Total Organic Carbon (Rep 3)									
				CAS # C-012					
Second Quarter 2003	1770	3310	3990	5080	2600	1000	-	ug/L	9060
Third Quarter 2003	U	1520	2060	3000	8290	1000	-	ug/L	9060
Fourth Quarter 2003	8480	27600 J	8280	13200	25700	1000	-	ug/L	9060
First Quarter 2004	4530	8390	9400	5710	8890	1000	-	ug/L	9060
Second Quarter 2004	U	2490	1260	U	1790	1000	-	ug/L	9060
Third Quarter 2004	U	U	1210	1120	1680	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1010	1490	2200	1000	-	ug/L	9060
First Quarter 2005	1070	U	1420	1060	3250	1000	-	ug/L	9060
Second Quarter 2005	U	U	1030	U	3739	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	U	2880	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1120	U	2420	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	2150	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1110	U	2160	1000	-	ug/L	9060A
Third Quarter 2006	1080	U	1460	1020	2740	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1090	U	2140	1000	-	ug/L	9060A
First Quarter 2007	U	U	1050	U	2030	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1210	U	1880	1000	-	ug/L	9060A

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Organic Carbon (Rep 4)									
	CAS # C-012								
Second Quarter 2003	2000	2340	2380	4790	2110	1000	-	ug/L	9060
Third Quarter 2003	1950	1760	1770	3080	6200	1000	-	ug/L	9060
Fourth Quarter 2003	8550	24500 J	6900	7550	19600	1000	-	ug/L	9060
First Quarter 2004	5560	9090	9000	5220	9150	1000	-	ug/L	9060
Second Quarter 2004	U	U	1300	U	1810	1000	-	ug/L	9060
Third Quarter 2004	U	U	1150	U	1710	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1020	1390	2390	1000	-	ug/L	9060
First Quarter 2005	U	U	1330	1150	3480	1000	-	ug/L	9060
Second Quarter 2005	U	U	1030	U	3830	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	U	2680	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1110	U	2520	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	1810	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1120	U	2230	1000	-	ug/L	9060A
Third Quarter 2006	1110	U	1360	1040	2690	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1120	U	2440	1000	-	ug/L	9060A
First Quarter 2007	U	U	1000	U	2100	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1070	1030	2120	1000	-	ug/L	9060A
gamma-BHC									
	CAS # 58-89-9								
Second Quarter 2003	U	U	U	U	U	0.1	0.2	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	0.1	0.2	ug/L	8081A
First Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
First Quarter 2005	U	U	U	U	U	0.1	0.2	ug/L	8081A
Second Quarter 2005	U	U	U	U	U J	0.1	0.2	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	0.1	0.2	ug/L	8081A
First Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	0.1	0.2	ug/L	8081A
Second Quarter 2007	U	U	U	U	U	0.1	0.2	ug/L	8081A
2,4-Dichlorophenoxyacetic acid									
	CAS # 94-75-7								
Second Quarter 2003	U	U	U	U	U	2.5	70	ug/L	8151A
Third Quarter 2003	U	U	U	U J	U	2.5	70	ug/L	8151A
Fourth Quarter 2003	U	U	U	U	U	2.5	70	ug/L	8151A
First Quarter 2004	U	U	U	U	U	2.5	70	ug/L	8151A
Second Quarter 2004	U	U	U	U	U	5	70	ug/L	8151A
Third Quarter 2004	U	U	U	U	U	5	70	ug/L	8151A
Fourth Quarter 2004	U	U	U	U	U	5	70	ug/L	8151A
First Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
Second Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
Third Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
Fourth Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
First Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
Second Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
Third Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
Fourth Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
First Quarter 2007	U	U	U	U	U	5	70	ug/L	8151A
Second Quarter 2007	U	U	U	U	U	5	70	ug/L	8151A

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Di-n-butyl phthalate CAS # 84-74-2									
Second Quarter 2003	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2007	U J	U	U	U	U	10	1565	ug/L	8270C
Diethyl phthalate CAS # 84-66-2									
Second Quarter 2003	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	10	12520	ug/L	8270C
2,4-Dinitrotoluene CAS # 121-14-2									
Second Quarter 2003	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	10	31.3	ug/L	8270C

**Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4**

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
2,6-Dinitrotoluene	CAS # 606-20-2								
Second Quarter 2003	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	10	15.65	ug/L	8270C
Endrin	CAS # 72-20-8								
Second Quarter 2003	U	U	U	U	U	0.4	2	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	0.4	2	ug/L	8081A
First Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
First Quarter 2005	U	U	U	U	U	0.4	2	ug/L	8081A
Second Quarter 2005	U	U	U	U	U J	0.4	2	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	0.4	2	ug/L	8081A
First Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	0.4	2	ug/L	8081A
Second Quarter 2007	U	U	U J	U J	U	0.4	2	ug/L	8081A
Methoxychlor	CAS # 72-43-5								
Second Quarter 2003	U	U	U	U	U	1	40	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	1	40	ug/L	8081A
First Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
First Quarter 2005	U	U	U	U	U	1	40	ug/L	8081A
Second Quarter 2005	U	U	U	U	U J	1	40	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	1	40	ug/L	8081A
First Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	1	40	ug/L	8081A
Second Quarter 2007	U	U	U J	U J	U	1	40	ug/L	8081A

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Resorcinol CAS # 108-46-3									
Second Quarter 2003	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2004	U J	U J	U J	U J	U J	50	-	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2007	U	U	U	U	U	50	-	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	50	-	ug/L	8270C
Silvex CAS # 93-72-1									
Second Quarter 2003	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2003	U	U	U	U J	U	2.5	50	ug/L	8151A
Fourth Quarter 2003	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
Fourth Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
Fourth Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
Fourth Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2007	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2007	U	U	U	U	U	2.5	50	ug/L	8151A
Toxaphene CAS # 8001-35-2									
Second Quarter 2003	U	U	U	U	U	5	3	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	5	3	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	3	3	ug/L	8081A
First Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
First Quarter 2005	U	U	U	U	U	3	3	ug/L	8081A
Second Quarter 2005	U	U	U	U	U J	3	3	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	3	3	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	3	3	ug/L	8081A
First Quarter 2006	U	U	U	U	U	2.5	3	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	3	3	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	3	3	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	3	3	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	3	3	ug/L	8081A
Second Quarter 2007	U	U	U J	U J	U	3	3	ug/L	8081A

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Fecal Coliform									
	CAS #								
Second Quarter 2003	U	U	30	U	U	2	-	MPN	9221
								Index/100 mL	
Third Quarter 2003	30	U	7	U	U	2	-	MPN	9221
								Index/100 mL	
Fourth Quarter 2003	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
First Quarter 2004	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
Second Quarter 2004	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
Third Quarter 2004	U	U	2	U	U	2	-	MPN	9221
								Index/100 mL	
Fourth Quarter 2004	23	U	2	U	U	2	-	MPN	9221
								Index/100 mL	
First Quarter 2005	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
Second Quarter 2005	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Third Quarter 2005	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Fourth Quarter 2005	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
First Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Second Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Third Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Fourth Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
First Quarter 2007	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Second Quarter 2007	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Gross Alpha									
	CAS # 14127-62-9								
Second Quarter 2003	U	U	U	U	U	3	15	pCi/L	9310
Third Quarter 2003	U	U	U	U	U	3	15	pCi/L	9310
Fourth Quarter 2003	U	U	U	U	U	3	15	pCi/L	9310
First Quarter 2004	U	U	U	3.2	15.4	3	15	pCi/L	9310
Second Quarter 2004	U	U	U	U	6.7	3	15	pCi/L	9310
Third Quarter 2004	U	U	U	3.3	10.0	3	15	pCi/L	9310
Fourth Quarter 2004	U	U	U	24.8	7.0	3	15	pCi/L	9310
First Quarter 2005	U	U	U	U	10.9	3	15	pCi/L	9310
Second Quarter 2005	U	U	U	U	11.6	3	15	pCi/L	9310
Third Quarter 2005	U	U	U	U	4.7	3	15	pCi/L	9310
Fourth Quarter 2005	U	U	3.1	4.1	3.2	3	15	pCi/L	9310
First Quarter 2006	U	U	U	6.3	4.6	3	15	pCi/L	9310
Second Quarter 2006	U	U	9.7	11.7	15.6	3	15	pCi/L	9310
Third Quarter 2006	U	U	6.1	6.7	3.1	3	15	pCi/L	9310
Fourth Quarter 2006	U	U	U	6.3	U	3	15	pCi/L	9310
First Quarter 2007	U	U	9.5	5.8	5.7	3	15	pCi/L	9310
Second Quarter 2007	U	3.7	9.6	11.8	8.3	3	15	pCi/L	9310

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Gross Beta									
	CAS # 12587-47-2								
Second Quarter 2003	U	5.5	6.1	7.6	5.1	4	50	pCi/L	9310
Third Quarter 2003	U	11.9	9.0	8.8	U	4	50	pCi/L	9310
Fourth Quarter 2003	U	11.9	9.0	8.8	U	4	50	pCi/L	9310
First Quarter 2004	U	12.5	9.9	6.5	37.5	4	50	pCi/L	9310
Second Quarter 2004	U	4.9	7.3	4.2	19.2	4	50	pCi/L	9310
Third Quarter 2004	U	10.3	9.8	6.1	15.0	4	50	pCi/L	9310
Fourth Quarter 2004	U	12.6	9.5	40.6	21.5	4	50	pCi/L	9310
First Quarter 2005	U	11.5	10.4	5.5	32.8	4	50	pCi/L	9310
Second Quarter 2005	U	12.7	8.9	4.9	37.3 J	4	50	pCi/L	9310
Third Quarter 2005	U	9.7	8.1	5.2	10.9	4	50	pCi/L	9310
Fourth Quarter 2005	U	7.9	14.1	9.6	6.9	4	50	pCi/L	9310
First Quarter 2006	U	9.9	11.8	14.5	6.7	4	50	pCi/L	9310
Second Quarter 2006	U	11.7	28.2	14.8	54.9	4	50	pCi/L	9310
Third Quarter 2006	U	13.8	20.5	10.2	4.7	4	50	pCi/L	9310
Fourth Quarter 2006	U	7.7	11	6.4	U	4	50	pCi/L	9310
First Quarter 2007	U	11.4	37.9	12.1	6.3	4	50	pCi/L	9310
Second Quarter 2007	U	9.9	30	15.6	14.9	4	50	pCi/L	9310
Total Radium									
	CAS # 7440-14-4								
Second Quarter 2003	U	U	U	U	U	1	5	pCi/L	9315
Third Quarter 2003	U	U	U	U	U	1	5	pCi/L	9315
Fourth Quarter 2003	U	U	U	U	U	1	5	pCi/L	9315
First Quarter 2004	U	U	U	1.35	12.1	1	5	pCi/L	9315
Second Quarter 2004	U	U	U	U	U	1	5	pCi/L	9315
Third Quarter 2004	U	U	U	U	1.1	1	5	pCi/L	9315
Fourth Quarter 2004	U	U	U	4.2	1.1	1	5	pCi/L	9315
First Quarter 2005	U	U	U	U	2.2	1	5	pCi/L	9315
Second Quarter 2005	U	U	U	U	7.9 J	1	5	pCi/L	9315
Third Quarter 2005	U	U	U	U	1.1	1	5	pCi/L	9315
Fourth Quarter 2005	U	U	U	U	U	1	5	pCi/L	9315
First Quarter 2006	U	U	U	1.5	U	1	5	pCi/L	9315
Second Quarter 2006	U	U	U	1.7	U	1	5	pCi/L	9315
Third Quarter 2006	U	U	U	U	U	1	5	pCi/L	9315
Fourth Quarter 2006	U	U	U	U	U	1	5	pCi/L	9315
First Quarter 2007	U	U	U	U	U	1	5	pCi/L	9315
Second Quarter 2007	U	U	U	1.8	U	1	5	pCi/L	9315

Definitions: QL Denotes project quantitation limit. Results reported to at or above QL. U Denotes analyte not detected at or above QL. UA Denotes analyte not detected at or above adjusted sample QL. J Denotes analyte reported at or above QL, and associated result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL, and adjusted QL is estimated. "-" Denotes not detected or not available/not sampled. R Denotes result rejected. Q Denotes data validation qualifier. NS Denotes not sampled. DWS Denotes Drinking Water Standard (USEPA MCL dated June 2003 or VDEQ ACL dated Dec. 2006). (The MCL for beta particles is 4 mrem/year. USEPA considers 50 pCi/L to be the level of concern for beta particles.) NA Denotes not analyzed.

Notes:

2,4-D QL increased to 5 µg/l due to new laboratory MDL study (effective 2Q 2003).

No TOX data 3Q 2004 due to instrument breakdown.

The unit of measurement for radiological analyses is pico curries/liter (pCi/l).

Radium 228 via SW846 9320 to be performed when total alpha emitting radium 226 via SW846 9315 exceeds 3 pico curries/liter; not performed in 2Q 2005.

Leahy, Timothy

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Subject: SWMU 39 IM WP Comments

Jim, here are EPA/VDEQ's comments on the SWMU 39 Interim Measures Work Plan. Please call or email me with any questions. Thanks

1. Section 2.2.3 and Figure 2-3 describe and depict the proposed delineation sampling. Based on the historical waste deposition and the limited prior sampling performed to date, the delineation proposed for the southern pond is not sufficient. Several EPA comments on the RFI/CMS dated April 2004 (#3, #29 and #30) indicated that the waste had not been adequately delineated (especially in the southern pond) but concurred with the RFI/CMS with the understanding that proper delineation would take place prior to excavation. On page 9-6 of the final RFI/CMS it is stated (under "Contamination Delineation") that the entire area within both ponds will be delineated to assess the area that needs remediation. The work plan should be revised to address the need for a more complete delineation of the southern pond.

2. The RFI/CMS deferred the investigation of groundwater at SWMU 39 to a future base-wide ground water study. The current approach to groundwater at RAAP combines a regional perspective with the need for site specific data. Although SWMU 39 is somewhat isolated from other SWMUs in the Horseshoe Area, there may be enough site wells to characterize the surrounding groundwater. Please discuss how and when groundwater will be evaluated at this site (separate report?).

William A. Geiger
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April 16, 2008

Mr. William Geiger
RCRA General Operations Branch, Mail Code: 3WC23
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Mr. James L. Cutler, Jr.
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 24143-0100

Subject: With Certification, Radford Army Ammunition Plant,
SWMU 39 Interim Measures Work Plan, Draft Document, April 2008
EPA ID# VA1 210020730

Dear Mr. Geiger and Mr. Cutler:

Enclosed is the certification for the subject document that was sent to you on April 15, 2008. Also enclosed is a copy of the transmittal email message.

Please coordinate with and provide any questions or comments to myself at (540) 639-8658, Jerry Redder of my staff (540) 639-7536 or Jim McKenna, ACO Staff (540) 639-8641.

Sincerely,

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Alliant Techsystems Inc.

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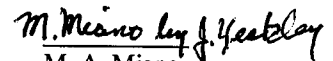
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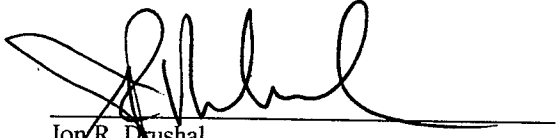

M. A. Miano

Concerning the following:

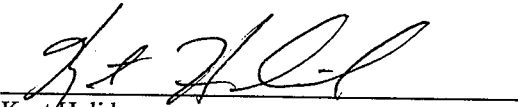
Radford Army Ammunition Plant
SWMU 39 Interim Measures Work Plan
Draft Document, April 2008

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

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PRINTED NAME:
TITLE:


Jon R. Drushal
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Commanding

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Kent Holiday
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Subject: Radford AAP - Draft SWMU 39 Interim Measures Work Plan (UNCLASSIFIED)
Importance: High

Classification: UNCLASSIFIED
Caveats: NONE

All:

Note the contractor will ship the subject document with a copy of this email to the POCs and tracking numbers below.

Certification letter will follow from Radford AAP under separate cover.

Immediately below are the POCs with tracking numbers:

Rich Mendoza, USAEC-RIA, 1 hard copy, 1 CD, 1Z63V8840196252702 William Geiger, US EPA Region III, 3 hard copies, 1Z63V8840196627129 Jim Cutler, VDEQ, 1 hard copy, 1Z63V8840196687118 Elizabeth Lohman, VDEQ, 1 CD, 1Z63V8840196968734 Tom Meyer, USACE-Baltimore, 1 hard copy, 1 CD, 1Z63V8840196187891 Dennis Druck, USACHPPM, 1 CD, 1Z63V8840196967940

Thank you for your support of the Radford AAP Installation Restoration Program.

Jim McKenna
Classification: UNCLASSIFIED
Caveats: NONE

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- B Standard Operating Procedures
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- D Health and Safety Forms
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- G Letter of Authority
- H Quality Control Forms
- I HWMU 39 Closure Evaluation Report

LIST OF ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius	HRGC	High-Resolution Gas Chromatography
°F	degrees Fahrenheit	HRMS	High-Resolution Mass Spectrometry
ACGIH	American Conference of Governmental Industrial Hygienists	HTRW	Hazardous, Toxic, and Radioactive Waste\
ATK	Alliant TechSystems, Inc.	ICP	Inductively Coupled Plasma
bgs	below ground surface	IDLH	Immediately Dangerous to Life or Health
CAR	Corrective Action Request	IDM	Investigation-Derived Material
CFR	Code of Federal Regulations	IM	Interim Measures
CGI/O ₂	Combustible Gas Indicator/Oxygen	IMWP	Interim Measures Work Plan
CMO	Corrective Measures Objective	ISP	Incinerator Spray Pond
CMS	Corrective Measures Study	LMARC	Louisville Multiple Award Remediation Contract
COC	Chain-of-Custody	LQAP	Laboratory Quality Assurance Plan
COD	Chemical Oxygen Demand	M&TE	Measuring and Test Equipment
COI	Contaminants of Interest	MDL	Method Detection Limit
CPR	Cardiopulmonary Resuscitation	MedEvac	Medical Evacuation
CQC	Contractor Quality Control	mg/kg	milligrams per kilogram
CQCP	Contractor Quality Control Plan	mg/m ³	milligrams per cubic meter
CRZ	Contamination Reduction Zone	MRL	Method Reporting Limit
DDT	dichlorodiphenyltrichloroethane	MS	Matrix Spike
DoD	Department of Defense	MSD	Matrix Spike Duplicate
DOT	Department of Transportation	MSDS	Material Safety Data Sheet
DQO	Data Quality Objective	MWP	Master Work Plan
E&SCP	Erosion and Sediment Control Plan	NCR	Nonconformance Report
ENG	Engineering Form	NIOSH	National Institute for Occupational Safety and Health
EZ	Exclusion Zone	OSHA	Occupational Safety and Health Administration
FAR	Federal Acquisition Regulation	OSIC	On-Scene Incident Commander
FSP	Field Sampling Plan	PAH	Polynuclear Aromatic Hydrocarbon
ft msl	feet above mean sea level	PCB	Polychlorinated Biphenyl
ft	feet	PEL	Permissible Exposure Limit
GC/MS	Gas Chromatography/Mass Spectroscopy	PPE	Personal Protective Equipment
H&S	Health and Safety		
HI	Hazard Index		

PRG.....	Preliminary Remedial Goal	USEPA.....	U.S. Environmental
QA.....	Quality Assurance		Protection Agency
QAPP.....	Quality Assurance Project Plan	UTL.....	Upper Tolerance Limit
QC.....	Quality Control	VDEQ.....	Virginia Department of Environment Quality
QIP.....	Quality Improvement Process	VI.....	Verification Investigation
QL.....	Quantitation Limit	VOC.....	Volatile Organic Compound
QSM.....	Quality Systems Manual	WTDP.....	Waste Transportation and Disposal Plan
RBC.....	Risk-Based Concentration		
RCRA.....	Resource Conservation and Recovery Act		
RDW.....	Remediation-Derived Wastes		
RFAAP.....	Radford Army Ammunition Plant		
RFI.....	RCRA Facility Investigation		
RG.....	Remedial Goal		
RMSF.....	Rocky Mountain Spotted Fever		
Shaw.....	Shaw Environmental, Inc.		
SIM.....	Selective Ion Monitoring		
SOP.....	Standard Operating Procedure		
SSHO.....	Site Safety and Health Officer		
SSHP.....	Site Safety and Health Plan		
STEL.....	Short-Term Exposure Limit		
SVOC.....	Semivolatile Organic Compound		
SWMU.....	Solid Waste Management Unit		
SZ.....	Support Zone		
T&D.....	Treatment & Disposal		
TAL.....	Target Analyte List		
TAT.....	Turnaround Time		
TCDD TE.....	tetrachlorodibenzo-p-dioxin toxicity equivalent		
TCL.....	Target Compound List		
TCLP.....	Toxicity Characteristic Leaching Procedure		
TLV.....	Threshold Limit Value		
TSDF.....	Treatment, Storage, and Disposal Facility		
TWA.....	Time-Weighted Average		
USACE.....	U.S. Army Corps of Engineers		

1.0 INTRODUCTION

Shaw Environmental, Inc. (Shaw) has been contracted by the U.S. Army Corps of Engineers (USACE) to perform an Interim Measures (IM) action at Solid Waste Management Unit (SWMU) 39, the Wastewater Ponds from the Propellant Incinerators, at Radford Army Ammunition Plant (RFAAP), Radford, VA. This work plan comprises ten sections, as follows:

- Introduction
- Organization and Technical Approach Plan
- Field Sampling Plan (FSP)
- Quality Assurance Project Plan (QAPP)
- Environmental Protection Plan
- Erosion and Sediment Control Plan (E&SCP)
- Waste Transportation and Disposal Plan (WTDP)
- Site Safety and Health Plan (SSHP)
- Contractor Quality Control Plan (CQCP)
- References

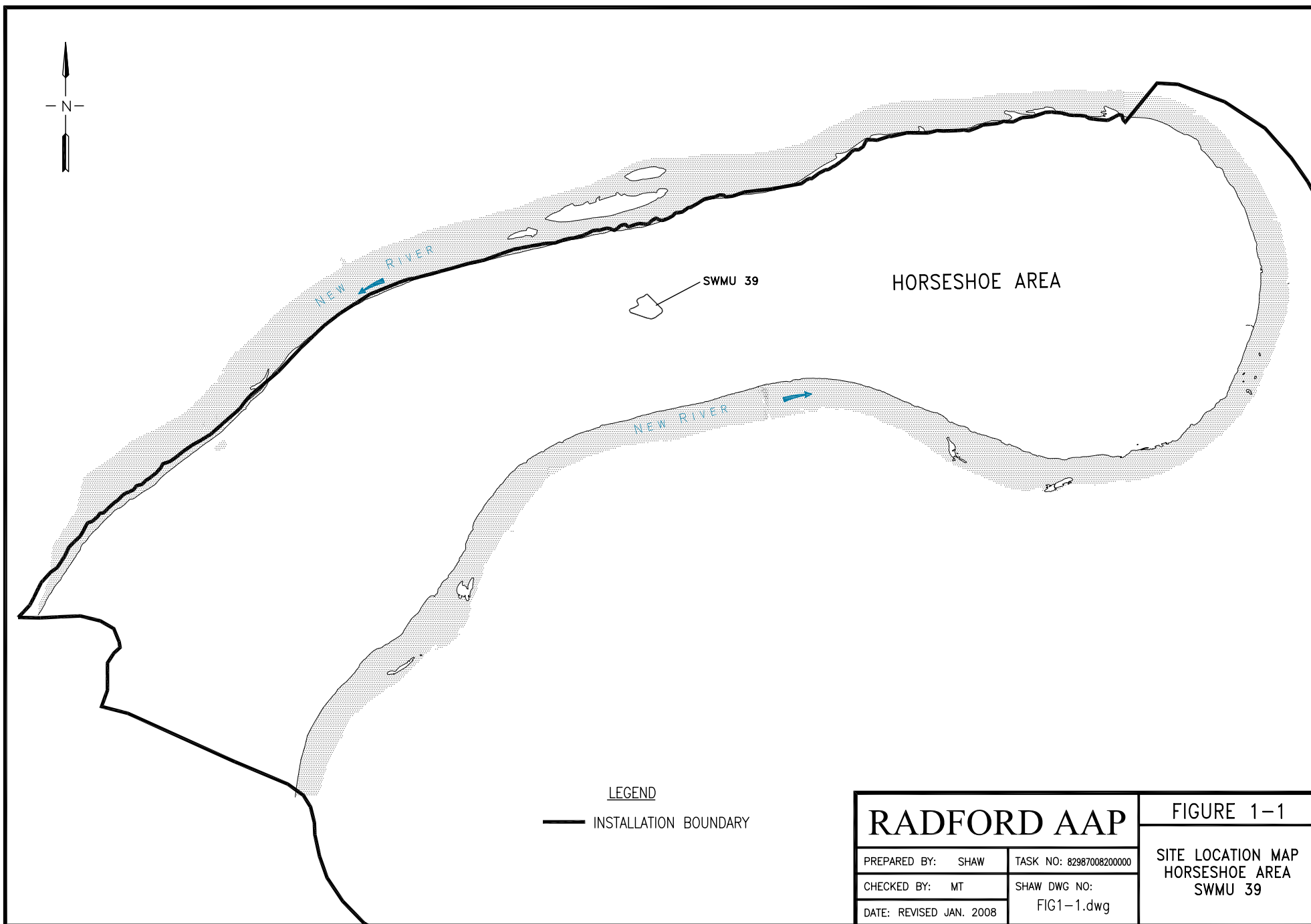
This Interim Measures Work Plan (IMWP) is presented as an addendum to, and incorporates by reference, the elements of the RFAAP Master Work Plan (MWP) (URS, 2003), including Section 8, which discusses entry to the Installation and security concerns and requirements. The IMWP also incorporates details specified in the SWMU 39 RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) Report (Shaw, 2005), which has been approved by the Virginia Department of Environmental Quality (VDEQ) and U.S. Environmental Protection Agency (USEPA).

This IMWP details site-specific procedures for the IM at SWMU 39. Specifically, this IMWP addresses the removal of soil with concentrations of arsenic, lead, vanadium, and dioxins/furans to below the Residential Remedial Goal (RG) of 15.8, 400, 108, and 0.001 milligrams per kilogram (mg/kg), respectively, to facilitate clean closeout in accordance with Part II(D)(11-21) IM of the RFAAP Corrective Action Permit (USEPA, 2000a). This removal action work is being performed under the Louisville Multiple Award Remediation Contract (LMARC), Contract No. W912QR-04-D-0027, Delivery Order DA0101.

1.1 Background

1.1.1 Site Description

SWMU 39 consists of two unlined and bermed earthen ponds (**Photos 1 and 2**) and is located in the north-central section of the Horseshoe Area (**Figure 1-1**), adjacent to and associated with the Hazardous Waste Incinerators. The SWMU is adjacent to a Resource Conservation and Recovery Act (RCRA) closed concrete-lined spray pond (Hazardous Waste Management Unit 39). A site map depicting the locations of the settling ponds, the hazardous waste incinerators, and the former location of the incinerator spray pond (ISP) is presented on **Figure 1-2**.



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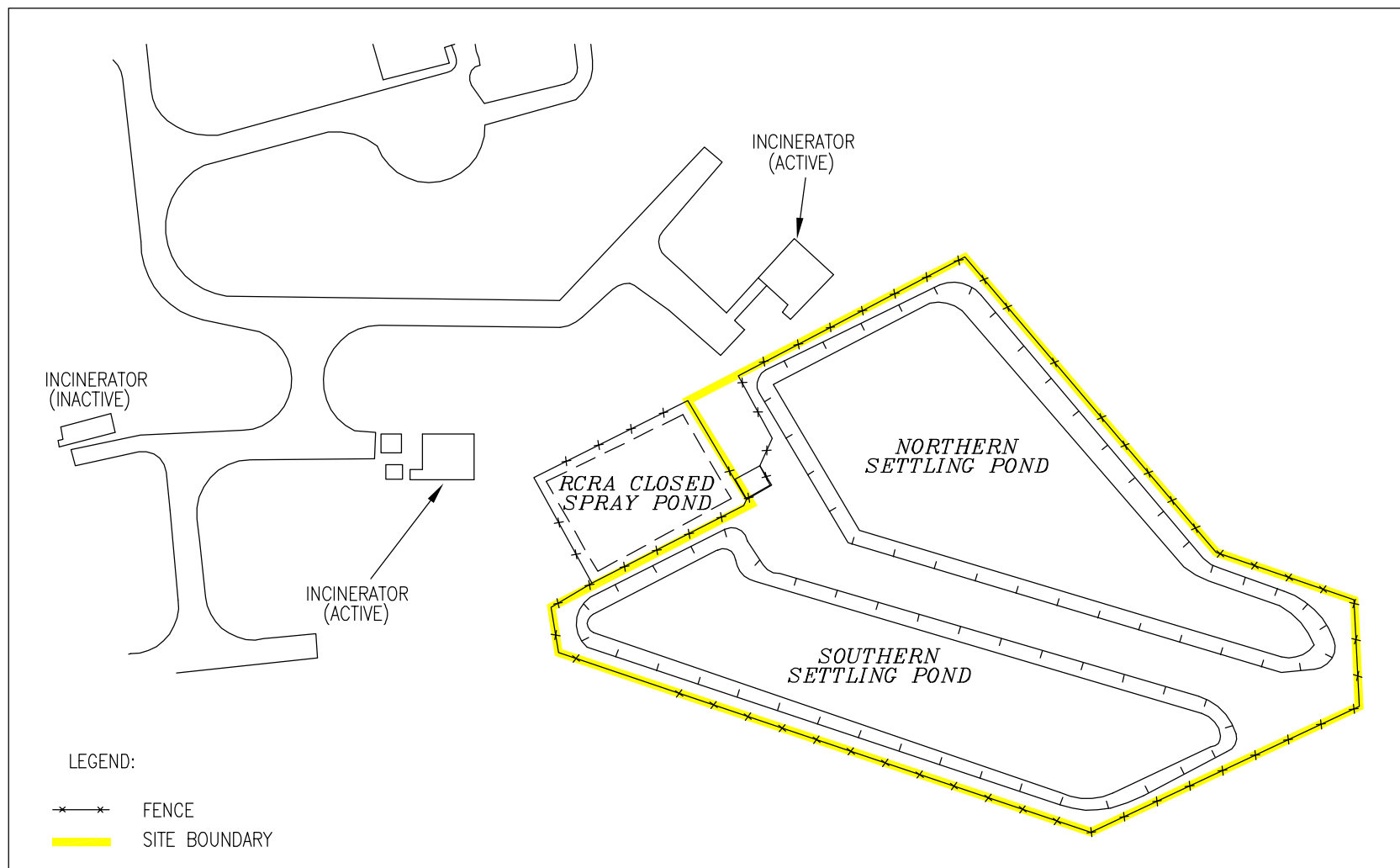
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FIG1-1.dwg

FIGURE 1-1

SITE LOCATION MAP
HORSESHOE AREA
SWMU 39



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RADFORD AAP

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FIGURE 1-2

SWMU 39
SITE MAP



Photo 1. Southeast view of northern settling pond



Photo 2. Southeast view of southern settling pond

The earthen settling ponds received scrubber and precoolер quench water from incinerator exhaust. The settling ponds were excavated approximately 6 to 8 feet (ft) into the natural grade and contain no drainage outlet. The excavated material was used to create a berm that surrounds each pond. A fence surrounds the ponds, and the enclosed area is approximately 450-ft by 300-ft at the widest points. Caustic was reportedly added to neutralize the water received in the two settling ponds. Settled material has not been removed from the ponds [Alliant TechSystems, Inc. (ATK), 1998].

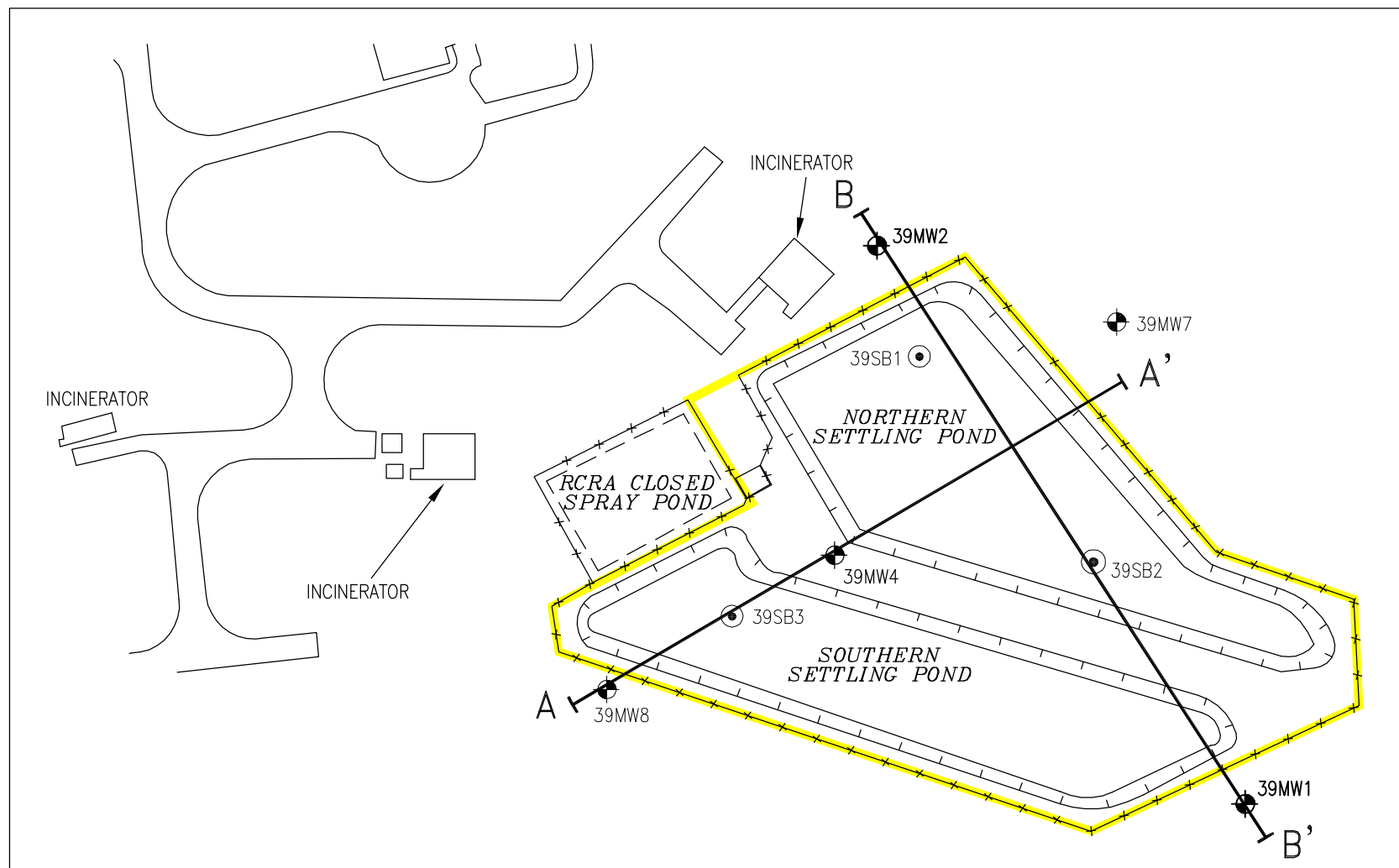
SWMU 39 is a generally flat level area, at an elevation of approximately 1,700 feet above mean sea level (ft msl). A small section of the southern boundary rises to a maximum elevation of approximately 1,720 ft msl. Because the settling ponds are no longer in use, surface water is not present in the ponds except during heavy rain, snow melt, or other precipitation events.

1.2 Site Geology

Stratigraphic characterization of the subsurface was performed during the advancement of soil and monitoring well borings at the site. Geologic cross-sections were developed based on the logging descriptions recorded during the advancement of these borings. A plan view of the cross-sectional lines A-A' and B-B' is presented on **Figure 1-3**. The geologic cross sections are presented on **Figures 1-4 and 1-5**.

Borings advanced at the site ranged from 11.5 ft (39SB3) to 50 ft (39MW1) in depth. A layer of unconsolidated sediments ranging from 11.5 to 28 ft thick overlies bedrock at the site. The overburden deposits range from clay to gravel and can be divided into two general units, a finer-grained deposit, consisting primarily of clay, silt, and fine sand, and a coarser-grained unit, consisting of sand and silt with gravel present.

As depicted on **Figures 1-4 and 1-5**, the upper layer [6-10 ft below ground surface (bgs)] consists of fine-grained, yellowish-red to reddish-brown sandy silt, sandy clay, or silty sand. The depositional environment for this unit was likely a flood plain, where flood waters with a high sediment load would deposit silt and clay away from the main river channel. The two settling ponds were excavated into this layer.



LEGEND:

	1994 VI MONITORING WELL (DAMES & MOORE)		FENCE
	1997 RFI MONITORING WELL (ALLIANT TECHSYSTEMS)		SITE BOUNDARY
	1998 RFI MONITORING WELL (ICF KAISER)		
	SOIL BORING		

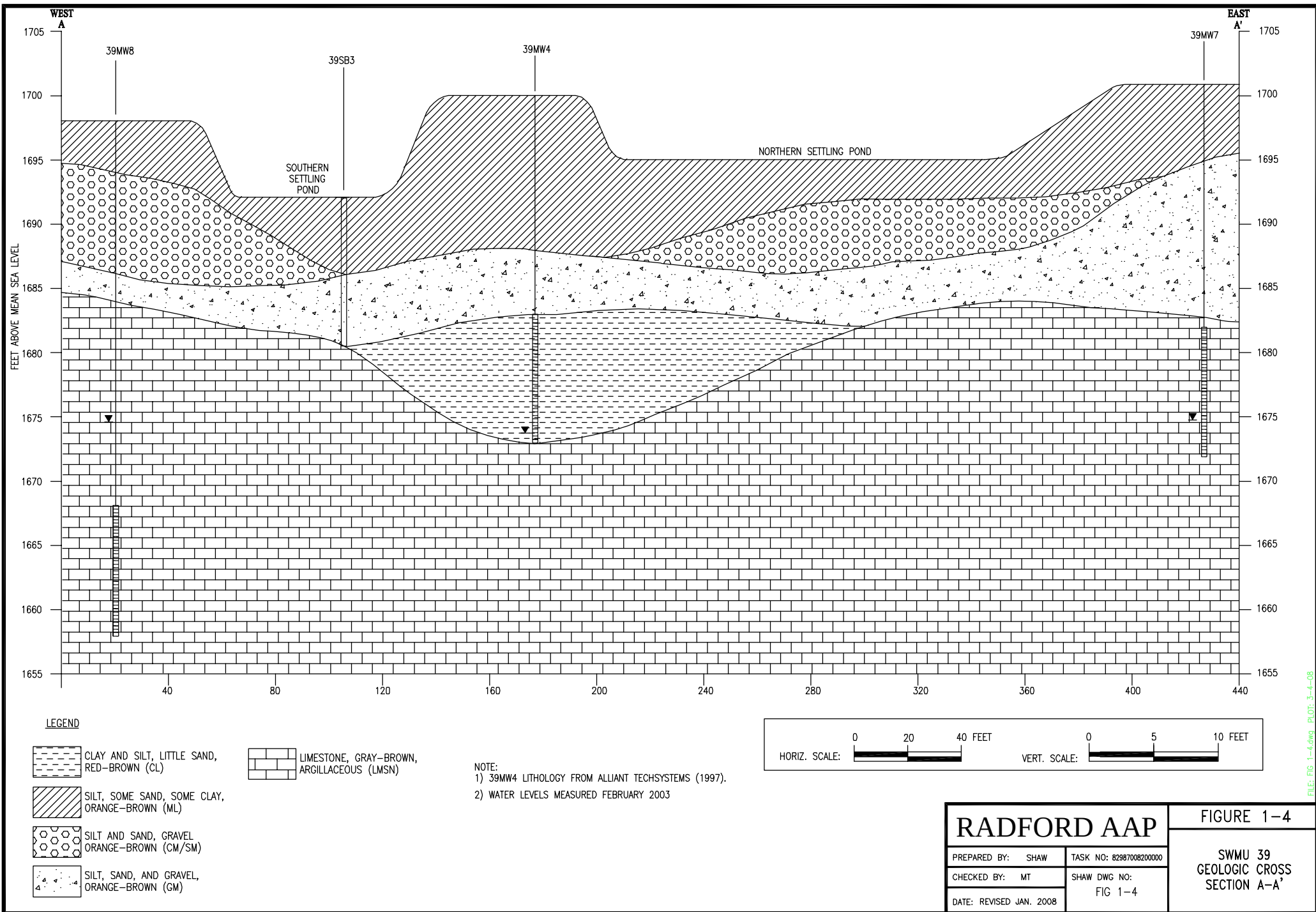
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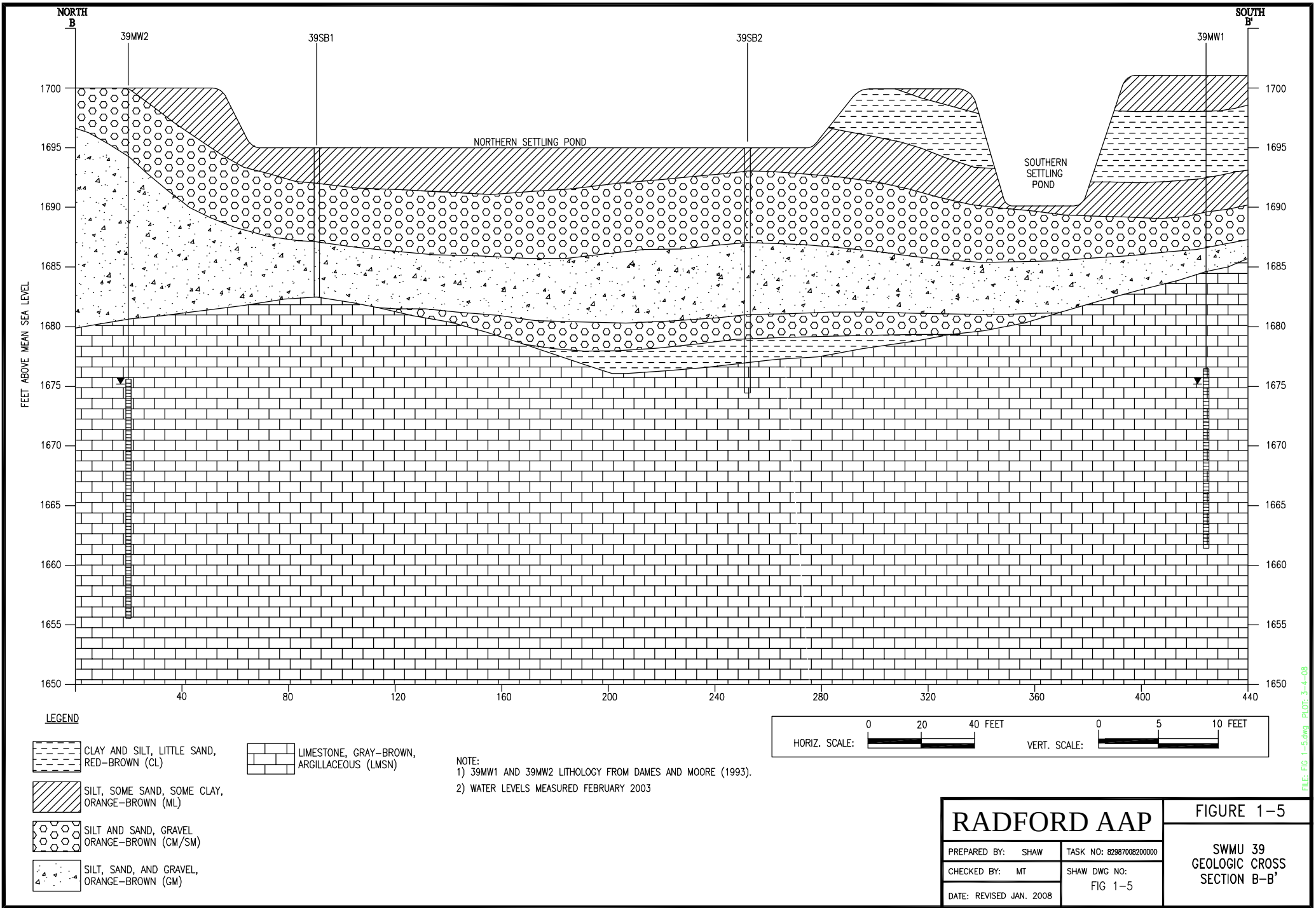
RADFORD AAP

PREPARED BY: SHAW	TASK NO: 82987008200000
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DATE: REVISED JAN. 2008	FIG 1-3

FIGURE 1-3

SWMU 39
GEOLOGIC CROSS SECTION
LINES A-A' AND B-B'





FILE: FIG 1-5.dwg PLOT: 3-4-08

Below this layer, the soil is yellowish-red to brown sand and silty gravel. The amount of fines (clay and silt) in this layer is lower than in the upper layer and coarser sand and gravel begins to appear. This layer consists of fluvial deposits, where larger sand particles and gravel are deposited, but smaller silt and clay grains are carried away by the current. This layer becomes more gravelly with depth. The coarser-grained fluvial deposits are incised into the overbank deposits and, in places, (39SB2 and 39MW4) the finer-grained deposits are still seen in contact with bedrock.

The Elbrook Formation underlying the site consists of argillaceous limestone and dolostone and is generally light gray to bluish-gray. The bedrock exhibits typical karst characteristics with evidence of subsurface solution features. The consistency of bedrock ranges from soft to hard with numerous weathered and fractured zones. Clay and silt-filled voids and solution cavities were encountered in four of the eight borings, at depths of 20 to 37 ft bgs (39MW1: 20-30 ft; 39MW3: 20-35 ft; 39MW7: 21-25 ft; and 39MW8: 33-37 ft).

Groundwater conditions in the SWMU 39 vicinity are controlled by the karstic nature of the Elbrook Formation. Groundwater was encountered during 1998 RFI well installation within fracture and solution zones of the bedrock at depths ranging from 23 to 33 ft. Groundwater flow in the vicinity of SWMU 39 is to the west, northwest at a shallow hydraulic gradient. Observed subsurface conditions indicate that groundwater movement below SWMU 39 would likely be rapid through fractures, voids, and solution cavities with eventual discharge into the New River.

1.3 Site History

SWMU 39 consists of two unlined, earthen ponds that were associated with the Hazardous Waste Incinerators. According to the aerial photographic interpretation contained in the Installation Assessment (USEPA, 1992), construction activity of the ponds was first noted at the site in 1975. Excavation of the ponds appeared to be completed by 1981.

Three incinerators were constructed at the site in 1979 to incinerate slurried waste and off-specification explosives and propellants. The westernmost incinerator was the prototype for the other two incinerators and is inactive. As described in USEPA (1987), the incinerators are equipped with a refractory lined rotary kiln into which the propellant slurry is injected and incinerated. Combustion gasses are passed through an afterburner to effect total combustion. The exhaust gasses then pass through a water quench precoolers to reduce the temperature prior to passing through a wet scrubber to remove noxious gasses and particulates. The gasses are exhausted and the wastewaters from both the quench towers and scrubbers were conveyed to the settling ponds (SWMU 39).

1.3.1 Environmental Investigations

1.3.1.1 Soil

Four previous investigations have been conducted at this site. In 1987, under authority of the 1984 Hazardous and Solid Waste Amendments, USEPA conducted a RCRA Facility Assessment at the site to evaluate releases of hazardous waste or hazardous waste constituents and to implement corrective actions, as necessary. In 1992, in accordance with the 1989 RCRA permit requirements, Dames & Moore performed Verification Investigation (VI) sampling to evaluate potential contamination resulting from site activities. In 1998, ICF Kaiser Engineers (ICF KE, 1999) conducted an RFI to further characterize the nature and extent of contamination at the settling ponds through the investigation of surface and subsurface soil. In 2002, Shaw conducted

an RFI to verify that elevated concentrations of metals are confined to the settling ponds and to further assess the amount of contamination in surface and subsurface soil. These investigations and results of the chemical data are summarized below.

For the contamination assessment of SWMU 39, chemical results from the VI and RFI were compared to adjusted USEPA Region III industrial and residential risk-based concentrations (RBCs) (USEPA, 2007), where non-carcinogenic analytes were adjusted downward to a hazard index (HI) of 0.1, as well as facility-wide background inorganic concentrations (IT, 2001), and other regulatory criteria. Industrial and residential RBCs were adjusted downward to an HI of 0.1 for non-carcinogenic compounds to ensure that chemicals with additive effects were not prematurely eliminated during screening.

The 2002 RFI implemented the sampling strategy developed in MWP Addendum 012 (IT, 2002) to complete the delineation and characterization of the site. Activities included the collection and chemical and physical analysis of eight surface and four subsurface soil samples. The RFI results were presented in the SWMU 39 RFI/CMS. From the analytical results, the contaminants of interest (COIs) and corrective measures for the site were developed. These samples and chemical results from previous investigations were combined for the nature and extent assessment (Shaw, 2005). This assessment indicated lead as the major constituent presenting a concern. Two other metals, iron and thallium, were detected at concentrations greater than their respective industrial screening levels (USEPA, 2007) in soil, and chromium and copper exceeded the residential screening levels (USEPA, 2007) in soil. The sole organic compounds to have a screening level exceedance were dioxins/furans. Although no single dioxin/furan exhibited an exceedance, there was one industrial exceedance of the tetrachlorodibenzo-p-dioxin toxicity equivalent (TCDD TE) for combined dioxins/furans and one residential exceedance of the TCDD TE. Although, there were isolated exceedances of other constituents, the Human Health Risk Assessment identified arsenic, lead, vanadium, and dioxins/furans as TCDD TE as the four COIs for the site under both industrial and residential future land-use conditions. The most elevated concentrations of detected metals in soil were in the northern and southern settling ponds.

Nature and extent analysis indicated that lead is the major constituent presenting a concern, with industrial exceedances in surface soil in both ponds. Lead was also the single constituent to have a screening level exceedance in subsurface soil (at 3-5 ft). The lack of lead exceedances in other subsurface samples indicates limited vertical migration. Lead is the single verified metal that appears to have impacted the surface soil of both settling ponds. Analysis of the results from surface soil samples collected adjacent to the settling ponds indicates that horizontal migration of lead is not occurring. Fate and transport analysis of lead indicates that concentrations in soil decrease rapidly with depth indicating that vertical migration is limited and it is unlikely that groundwater would be impacted at the site.

1.3.1.2 Groundwater

Groundwater was sampled at SWMU 39 during the 1998 RFI and has also been sampled quarterly as part of the post closure permit for adjacent HWMU 39. This section assesses the results of the groundwater sampling as they pertain to the soil COIs identified during the CMS (Shaw, 2005).

Samples were collected from four SWMU 39 wells during the 1998 RFI effort and analyzed for target compound list (TCL) semivolatile organic compounds (SVOCs), polynuclear aromatic

hydrocarbons (PAHs), and target analyte list (TAL) metals. SVOCs/PAHs were not detected in the samples. Metals results from this sampling effort indicate that arsenic, lead, and vanadium were not detected in the samples.

Samples were also collected quarterly from the wells as part of the post-closure permit for HWMU 39. A Closure Evaluation Report was prepared by Alliant Techsystems in 2007 and included the quarterly data collected between 1998 and 2007 (ATK, 2007). This report is included as an appendix to the Work Plan (**Appendix I**). This sampling program analyzed the groundwater samples for select metals (including lead and arsenic). These samples were not analyzed for vanadium or dioxins/furans. Results for the second quarter of 2003 through the second quarter of 2007 are tabulated in **Appendix I, Table 1** of the Closure Evaluation Report. These results show that lead and arsenic were detected at very low frequencies (arsenic - 3 detections out of 85 GW samples; lead - 4 detections out of 85 GW samples). These low frequencies of detection are not consistent with a continuing source (i.e., pond sediments) adding these constituents to the groundwater. Removal of the elevated constituents from the sediment/soil at the floor of the settling ponds will prevent future migration of these constituents to groundwater.

Although neither investigation analyzed the samples for dioxins/furans, this group of compounds is highly immobile and is unlikely to be present in aqueous media because it has a very low solubility. Dioxins and furans also have high K_{oc} values, indicating that they have high sorption potentials and will not tend to leach into groundwater or surface water runoff.

The selected remedy for this site is excavation of contaminated soil to residential cleanup goals with off-site disposal in an appropriate landfill. Groundwater evidence to date does not show a current impact to groundwater from the settling ponds, and removal of the source area will prevent any future impacts to groundwater as well.

1.4 Development of Corrective Measures Objectives

Preliminary remedial goals (PRGs) were obtained from USEPA Office of Solid Waste and Emergency Response Directives, where available. For analytes for which published cleanup levels were not identified, PRGs were calculated such that risks to human health are within the USEPA's acceptable range. USEPA has published recommended residential and industrial cleanup levels for lead (USEPA 1998, 2003) and dioxins/furans (USEPA, 1998) in soil.

- Lead
 - o Industrial: 800 mg/kg
 - o Residential: 400 mg/kg
- Dioxins/Furans as TCDD TE
 - o Industrial: 0.0125 mg/kg
 - o Residential: 0.001 mg/kg

As USEPA cleanup levels were not identified for arsenic and vanadium, RGs for arsenic and vanadium in soil were calculated such that risks to human health were within the USEPA's acceptable range. **Table 1-1** summarizes the residential and industrial risk-based RGs for arsenic and vanadium in soil at SWMU 39. The future land use identified for SWMU 39 is industrial. However, for comparison purposes in the RFI/CMS (Shaw, 2005), RGs for both residential and

industrial exposure scenarios were developed. The residential cleanup scenario was selected as the goal based on long-term cost considerations associated with periodic sampling and reporting under the industrial cleanup scenario. The calculated RGs for the residential and industrial scenarios were then compared to Radford's USEPA and VDEQ approved background 95% Upper Tolerance Limits (UTLs). For the residential scenario, background values for arsenic and vanadium were higher than the calculated RGs and were selected as the residential RGs.

Details on the methodology used to calculate the RGs are presented in **Appendix G** of the RFI/CMS (Shaw, 2005).

Table 1-1
Identification of Remedial Goals for Arsenic and Vanadium in SWMU 39 Soil

Analyte	Medium	Receptor	Calculated RG (lesser of HI=1.0 or 1x10 ⁻⁵ risk)	Background (mg/kg)	Industrial RG (mg/kg)	Residential RG (mg/kg)
Industrial Scenarios						
Arsenic	Surface and Total Soil	Maintenance Worker	39.7	15.8	15.8	---
	Surface and Total Soil	Industrial Worker	8.75	15.8		
	Total Soil	Excavation Worker	65.8	15.8		
Vanadium	Surface and Total Soil	Maintenance Worker	1,440	108	144	---
	Surface and Total Soil	Industrial Worker	321	108		
	Total Soil	Excavation Worker	144	108		
Residential Scenarios						
Arsenic	Total Soil	Adult Resident	5.0	15.8	---	15.8
	Total Soil	Child Resident	2.8	15.8		
Vanadium	Total Soil	Adult Resident	288	108	---	108
	Total Soil	Child Resident	37.7	108		

Ecological Hazard Quotients estimated for metals and dichlorodiphenyltrichloroethane (DDT) in soil were found to be elevated. These estimates are associated with a considerable degree of uncertainty and are, by themselves, not appropriately definitive to recommend ecologically-based Corrective Measures Objectives (CMOs). **Table 1-2** presents estimated residual ecological hazards for chemicals found to be ecological "risk drivers" for at least one of the receptors evaluated for the respective environmental medium. The receptor with the highest (i.e., "critical") environmental effects quotient value from the Screening Level Ecological Risk Assessment is shown in the table. Details on the methodology used to calculate the risk reductions for ecological receptors are presented in Section 8 of the RFI/CMS (Shaw, 2005).

1.5 Removal Action Scope

Based on the *SWMU 39 RFI/CMS Report, Final Document*, June 2005, IM are to be performed at SWMU 39. The IM are being conducted to mitigate the threat of a contaminant release, migration, and/or exposure to the public and the environment, as well as facilitate clean closeout in accordance with Part II(D)(11-21) IM of the RFAAP Corrective Action Permit (USEPA, 2000a). The IM include:

1. **Site Preparation.** Prior to commencement of work, a utility survey will be performed and dig permits will be obtained. In addition, erosion/sediment control measures will be implemented.
2. **Soil Delineation.** Delineation of soil containing arsenic, lead, vanadium, and dioxins/furans above the Residential RG.
3. **Fence Removal.** Removal of chain-link fence surrounding SWMU 39.
4. **Soil Excavation.** Excavation of the delineated area such that the remaining soil is below the Residential RG.
5. **Waste Characterization & Off-site Disposal.** Samples will be collected to assess appropriate disposal options prior to soil excavation. Sample results will determine the appropriate off-site disposal method.
6. **Site Restoration.** Following the removal of soil, the site will be restored and all equipment will be demobilized.

Specific details on the contractor organization and technical approach for the IM listed above are provided in the Organization and Technical Approach Plan, *Section 2.0*.

Table 1-2
Ecological Implications of Human Health Soil RGs on Ecological Receptors

Chemical ^a	Residential Human Health RG (mg/kg)	Expected Residual Conc. ^b (mg/kg)	Critical Ecological LOAEL EEQ (and receptor) ^c	EPC for Critical Ecological Receptor (mg/kg) ^d	Scaled ^e Ecological LOAEL EEQ Using Expected Residual Conc.	Estimated % Reduction in Ecological Hazard ^f
Copper	-	22.5	2.35 earthworm	118	0.4	81%
Copper	-	22.5	6.6 shrew	118	1.3	81%
Chromium	-	31.3	43 robin	46.8	29	33%
Chromium	-	31.3	1.5 earthworm	46.8	1.0	33%
Lead	400	99.2	122 shrew	12,800	0.9	99%
Lead	400	99.2	25.7 earthworm	12,800	0.2	99%
TCDD TE	.001	8.65E-07	474 shrew	2.07E-05	20	96%

^a Chemicals shown are those having the highest ecological EEQ values in the Screening Level Ecological Risk Assessment (SLERA) (*Section 7.0*). Human health COCs are bolded.

^b Residual concentrations in surface soil were estimated by removing the soil samples from the ecological data base that are within the proposed excavation footprint and recalculating the exposure point concentration, based on the resultant nine soil samples, following the methodology used in the SLERA (i.e., use of the 95% UCL EPC). Dilution from clean backfill was not considered in estimating residual concentrations.

^c Value and corresponding receptor shown are for the highest Tier 2 EEQ value among receptors evaluated in the SLERA. For earthworms, trivalent chromium EEQ presented.

^d Value shown is from the SLERA (i.e., the 95% UCL EPC).

^e Estimated using the following scaling relationship: Scaled EEQ = Residual Conc. x (pre-remediation EEQ/pre-remediation EPC).

^f Estimated by subtracting the scaled ecological LOAEL EEQ from the critical ecological LOAEL EEQ, and dividing by the critical LOAEL EEQ.

COC = Chemical of Concern

EEQ = Ecological Effects Quotient from SLERA

EPC = Exposure Point Concentration

(original EPC used in SLERA for surface soil exposure)

LOAEL = Lowest-Observed-Adverse-Effect Level

NA = Not Applicable

RG = Remedial Goal

SLERA = Screening Level Ecological Risk Assessment

1.6 Work Plan Content

This IMWP is composed of an Introduction (*Section 1.0*), eight sub-plans (*Sections 2.0 through 9.0*), and references (*Section 10.0*). The eight sub-plans are as follows:

Section 2 – Organization and Technical Approach Plan

Identifies the Shaw project staff and subcontractors, their roles and responsibilities, and identifies the technical approach to be followed for the IM.

Section 3 – Field Sampling Plan

Describes the sampling rationale and field sampling procedures that will be used to collect field samples.

Section 4 – Quality Assurance Project Plan

Identifies the sample management methods, analytical methods, and quality control (QC) requirements necessary to achieve data quality objectives (DQOs) associated with chemical sampling.

Section 5 – Environmental Protection Plan

Identifies environmental considerations and adequate safeguards to protect the environment during implementation of IM.

Section 6 – Erosion and Sediment Control Plan

Defines the steps that will be taken to minimize and/or eliminate erosion and sedimentation during removal action work.

Section 7 – Waste Transportation and Disposal Plan

Identifies safe handling, transportation, and disposal procedures for waste material resulting from IM.

Section 8 – Site Safety and Health Plan

Provides site-specific safety and health controls to prevent and/or minimize personal injuries, illnesses, and physical damage to equipment and property.

Section 9 – Contractor Quality Control Plan

Defines the contractor QC organization and program for the IM.

1.7 Work Plan Changes

Work outside the scope of this Work Plan is not to be performed without the approval of the USACE Baltimore District. Amendments or supplements to this Work Plan will be submitted in writing to the USACE for approval prior to being implemented by project personnel.

2.0 ORGANIZATION AND TECHNICAL APPROACH PLAN

This section describes the organization and activities to be conducted to accomplish the IM at SWMU 39. Specifically, this section outlines the organization and responsibilities for project personnel as well as presents the step by step approach to be performed for each of the IM tasks.

2.1 Organization and Responsibilities

The organizational structure established for this project is depicted on **Figure 2-1** and includes the Shaw management and field staff, and subcontractors. The lines of authority and the lines of communication for the project can be determined from this organizational structure.

Communication of project objectives will be provided to project staff through meetings.

Statements of qualifications of key Shaw staff are given in **Appendix A**. Names, addresses, and phone numbers of key Shaw individuals are presented in **Table 2-1**. The duties and responsibilities of the key members of this organization are described below.

Program Manager, Mr. Bob Culbertson, has complete management authority and responsibility for all work performed under the LMARC contract. The Program Manager directs the program management organization as a central resource for management, continuity, and control of all LMARC program activities. The centralized program management is organized to facilitate communication with and reporting to USACE and to expedite and support project execution. The Program Manager has total authority, responsibility, and accountability for managing the contract. He will be involved in the decision-making process and oversight of the management of the project.

RFAAP Project Manager, Mr. Jeff Parks, P.G., reports to the LMARC Program Manager. He is responsible for ensuring that all activities are conducted in accordance with contractual specifications and technical requirements. The Project Manager will also coordinate with the USACE RFAAP Project Manager. The Project Manager will monitor the budget and schedule to ensure availability of necessary personnel, equipment, subcontractors, and services.

SWMU 39 IM Task Manager, Mr. Timothy Leahy, reports to the RFAAP Project Manager. He is responsible for ensuring that all activities are conducted in accordance with the IMWP. The IM Task Manager is responsible for management of all operations conducted for this project. He will ensure that all personnel assigned to this project, including subcontractors, have reviewed the technical plans before any task associated with the project is initiated. He will participate in the development of the field program, evaluation of data, and reporting.

SWMU 39 Project Engineer, Ms. Gretchen Tabano, P.E., is responsible for development and/or approval of field procedures and evaluation of applicable or relevant and appropriate requirements for the SWMU 39 remedial activities.

Health and Safety (H&S) Manager, Mr. Doug Russell, East Region H&S Manager, will oversee the development and implementation of the SSHP to ensure that it meets all specific needs of the project and that appropriate H&S requirements are defined.



Figure 2-1
RFAAP SWMU 39 Interim Measures Organizational
Chart

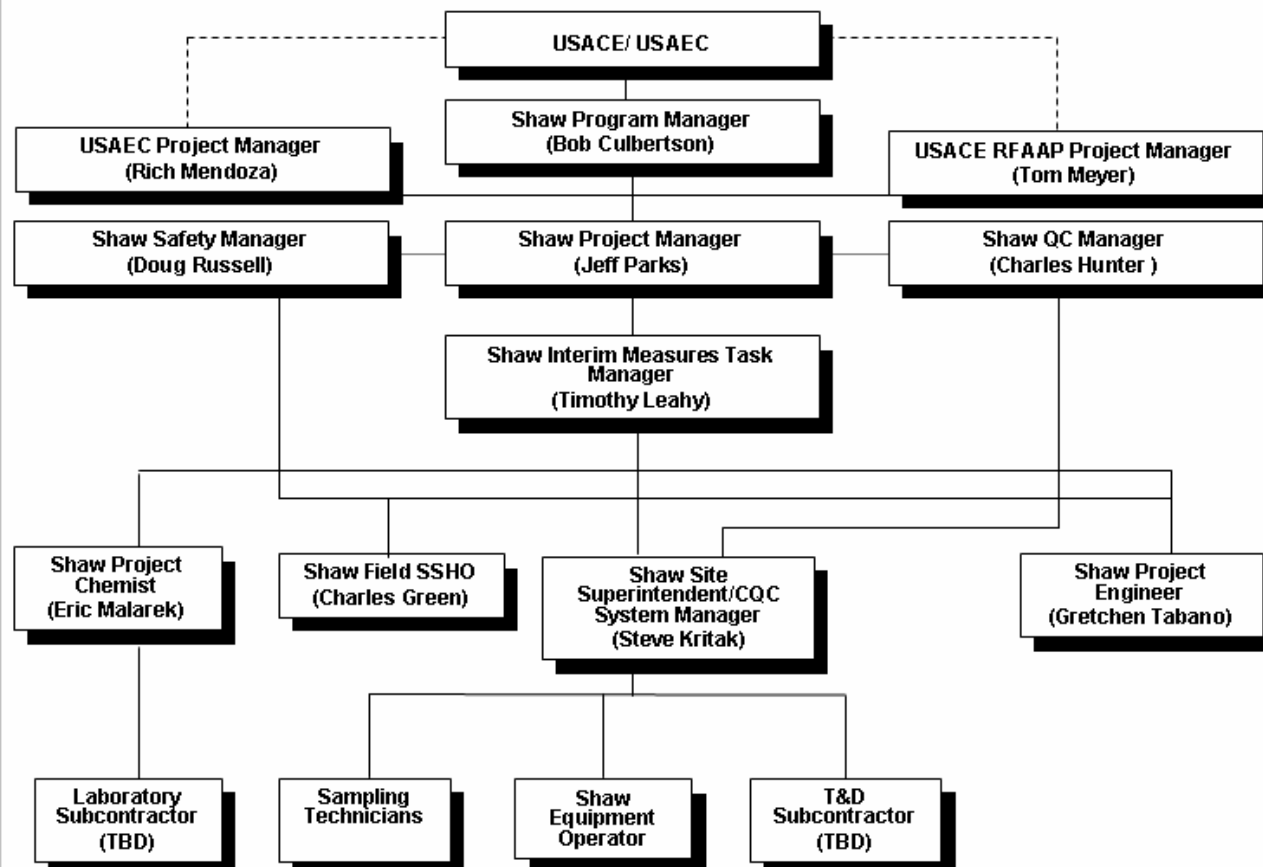


Table 2-1
Shaw Environmental, Inc. and Subcontractor Key Points of Contact

Shaw Environmental, Inc./Subcontractor Personnel	Contact Information
Bob Culbertson Shaw Environmental, Inc. LMARC Program Manager	312 Directors Drive Knoxville, TN 37923 Phone No.: (865) 694-7402 Fax No.: (865) 690-3626 E-Mail: bob.culbertson@shawgrp.com
Jeff Parks, P.G. Shaw Environmental, Inc. RFAAP Project Manager	2113 Emmorton Park Road Edgewood, MD 21040 Phone No.: (410) 612-6326 Fax No.: (410) 612-6351 E-Mail: jeffrey.parks@shawgrp.com
Timothy Leahy Shaw Environmental, Inc. SWMU 39 IM Task Manager	2113 Emmorton Park Road Edgewood, MD 21040 Phone No.: (410) 612-6357 Cellular No.: (410) 404-2299 Fax No.: (410) 612-6351 E-Mail: timothy.leahy@shawgrp.com
Gretchen Tabano, P.E. Shaw Environmental, Inc. SWMU 39 Project Engineer	2113 Emmorton Park Road Edgewood, MD 21040 Phone No.: (410) 612-6308 Cellular No.: (443) 255-6961 Fax No.: (410) 612-6351 E-Mail: gretchen.tabano@shawgrp.com
Doug Russell Shaw Environmental, Inc. East Region H&S Manager	312 Directors Drive Knoxville, TN 37923 Phone No.: (865) 692-3584 Cellular No.: (865) 414-9545 Fax No.: (865) 690-3626 E-Mail: winston.russell@shawgrp.com
Kenneth Martinez Shaw Environmental, Inc. LMARC QC Manager	312 Directors Drive Knoxville, TN 37923 Phone No.: (865) 670-4799 Fax No.: (865) 694-7497 E-Mail: kenneth.martinez@shawgrp.com
Steve Kritak Shaw Environmental, Inc. Site Superintendent/CQC System Manager	101 Fieldcrest Avenue Edison, NJ 08837 Phone No.: (609) 584-8900 Cellular No.: (540) 922-3316 E-Mail: steve.kritak@shawgrp.com
Charles Green Shaw Environmental, Inc. SSHO	250 Cooper Ave, Suite 110 Tonawanda, NY 14150 Phone No.: (607) 343-9267 (cell) E-Mail: charles.green@shawgrp.com
Eric Malarek Shaw Environmental, Inc. Project Chemist	2113 Emmorton Park Road Edgewood, MD 21040 Phone No.: (410) 612-6322 Fax No.: (410) 612-6351 E-Mail: eric.malarek@shawgrp.com

Table 2-1, Continued
Shaw Environmental, Inc. and Subcontractor Key Points of Contact

Shaw Environmental, Inc./Subcontractor Personnel	Contact Information
Analytical Laboratory Subcontractor To Be Determined	
Waste Transportation and Disposal Subcontractor To Be Determined	

QC Manager, Mr. Kenneth Martinez, is responsible for ensuring that quality planning is accomplished, QC procedures are available, and a qualified Contractor Quality Control (CQC) System Manager is assigned to the project. The LMARC QC Manager will review and ensure that the CQCP (*Section 9.0*) addresses all project-specific QC needs and that all appropriate QC requirements are addressed. The LMARC QC Manager will also assess the effective implementation of the CQCP through scheduled audits or assessments.

Site Superintendent/CQC System Manager, Mr. Steve Kritak, will be responsible for dual roles during the removal action work: Site Superintendent and CQC System Manager. As Site Superintendent, he will provide on-site management of field activities during removal actions. The Site Superintendent is responsible for coordinating field team activities and meeting schedule deadlines. The Site Superintendent will ensure that the work is being conducted in accordance with the IMWP. The Site Superintendent will coordinate the initial orientation and safety meeting, as well as the daily safety meeting prior to the start of work each day. As the CQC System Manager, he will be responsible for daily QC oversight of field operations and all aspects of environmental samples. He will be responsible for ensuring that the requirements specified in the CQCP are followed during field activities and will maintain all QC documentation. Additional details on the responsibilities of the CQC System Manager are provided in the CQCP (*Section 9.0*).

Site Safety and Health Officer (SSHO), Mr. Charles Green, will be responsible for implementing and oversight of the on-site H&S program, and maintaining H&S documentation. He will ensure that an adequate level of personal protection is worn by field personnel for anticipated potential hazards and will work in coordination with the IM Task Manager to ensure compliance of project activities with H&S requirements as outlined in the SSHP. Additional details on the responsibilities of the SSHO are provided in the SSHP (*Section 8.0*).

Project Chemist, Mr. Eric Malarek, will be responsible for sample tracking, data management, laboratory coordination, and data validation activities. The Project Chemist will work with field sampling technicians and the contract laboratory to ensure that the work performed is in accordance with the QAPP (*Section 4.0*).

Equipment Operator. An equipment operator will be utilized to perform the IM work in the field. The equipment operator will be experienced and qualified in operating equipment essential to the project. The equipment operator will be a properly trained Occupational Safety and Health Administration (OSHA) qualified worker.

Field Sampling Technicians. Field sampling technicians will be responsible for collecting all samples associated with the removal action work. These technicians will be under the direction of the Site Superintendent. The technicians will coordinate sampling activities with the Project Chemist who in turn coordinates with the contract laboratory.

Subcontractors. Shaw will procure the following subcontractors: waste transportation and disposal, laboratory support and clean fill source and transportation.

2.2 Technical Approach

The following sections describe the background and technical approach to the SWMU 39 IM. The field activities to be performed include: site preparation; final delineation of soil containing arsenic, lead, vanadium, and dioxins/furans above the Residential RG; fence removal; excavation of the delineated area such that the remaining soil is below the Residential RG; waste characterization and off-site disposal; and, site restoration. Detailed safety and health requirements for this scope of work are presented in *Section 8.0*.

2.2.1 Background

RFI activities were conducted at SWMU 39 from 1998 to 2002 (Shaw, 2005). The results from these investigations indicated that elevated levels of arsenic, lead, vanadium, and dioxins/furans were detected in surface soil in the northern and southern pond and lead was detected in the subsurface soil in the northern pond. Analysis of the results from surface soil samples collected adjacent to the settling ponds indicates that horizontal migration of lead is not occurring. Fate and transport analysis of lead indicates that concentrations in soil decrease rapidly with depth indicating that vertical migration is limited and it is unlikely that groundwater would be impacted at the site.

The human health and ecological risk assessments determined that unacceptable risks to potential future residential and industrial receptors were associated with the concentrations of chemicals detected. Because the RFI demonstrated that arsenic, lead, vanadium, and dioxin/furan contamination is present at concentrations associated with unacceptable human health concerns and potential impacts to ecological receptors, a CMS was performed to address elevated arsenic, lead, vanadium, and dioxin/furan concentrations in soil. The alternatives evaluated were as follows:

- Alternative One: No Further Action
- Alternative Two: Institutional Controls (Land Use Controls, Groundwater Monitoring)
- Alternative Three: Excavation of Soil with Waste in Place, Off-site Disposal, and Institutional Controls (Land Use Controls, Groundwater Monitoring)
- Alternative Four: Excavation of Soil for Clean Closeout and Off-site Disposal

These four alternatives were evaluated using the selection criteria: effectiveness, implementability, and cost. The CMO is to reduce contaminant concentrations in soil to levels that are protective of industrial workers at the site. However, the Army also elected to evaluate residential exposure pathways to assess what the increase in remedial effort would be to remediate the site for unrestricted future reuse and facilitate clean closeout. Therefore, Residential RGs were developed and credit was given to those alternatives that met these more stringent criteria. Based on this assessment, Alternative Four was selected as the final alternative for SWMU 39. Because groundwater has not been impacted and the source area is being removed, there is no need for groundwater sampling or remediation with the selected alternative.

The objective of the IM action is to reduce the concentrations of arsenic, lead, vanadium, and dioxins/furans to below the Residential RG of 15.8, 400, 108, and 0.001 mg/kg, respectively, and facilitate clean closeout in accordance with Part II.(D)(11-21) IM of the RFAAP Corrective

Action Permit (USEPA, 2000a). All work performed at SWMU 39 must be completed when the active incinerators are not running. Incinerator schedules will be obtained from ATK and remedial activities will be scheduled accordingly.

2.2.2 Site Preparation

Prior to performing any intrusive activities at SWMU 39, a utility survey to identify underground service lines within or near the excavation site will be performed and dig permits will be obtained from ATK. A hazard analysis has been completed as detailed in *Section 8.0*, and all potential hazards identified will be reviewed prior to commencement of work activities. Erosion and sediment controls will be utilized according to the procedures outlined in *Section 6.0*, as needed. Shaw will spot bathroom facilities on site at SWMU 39, sufficient for the crew size. A nearby water hydrant will be employed to supply water for site activities (decontamination/dust control).

2.2.3 Soil Delineation

Prior to mobilization of excavation personnel, discrete soil delineation samples will be collected from surface and subsurface locations within the settling ponds. In addition to the areas identified during the RFI/CMS (see **Figure 2-2**) with elevated constituents, samples will be collected from uncharacterized portions of the ponds to ensure that all soil with elevated constituents is removed.

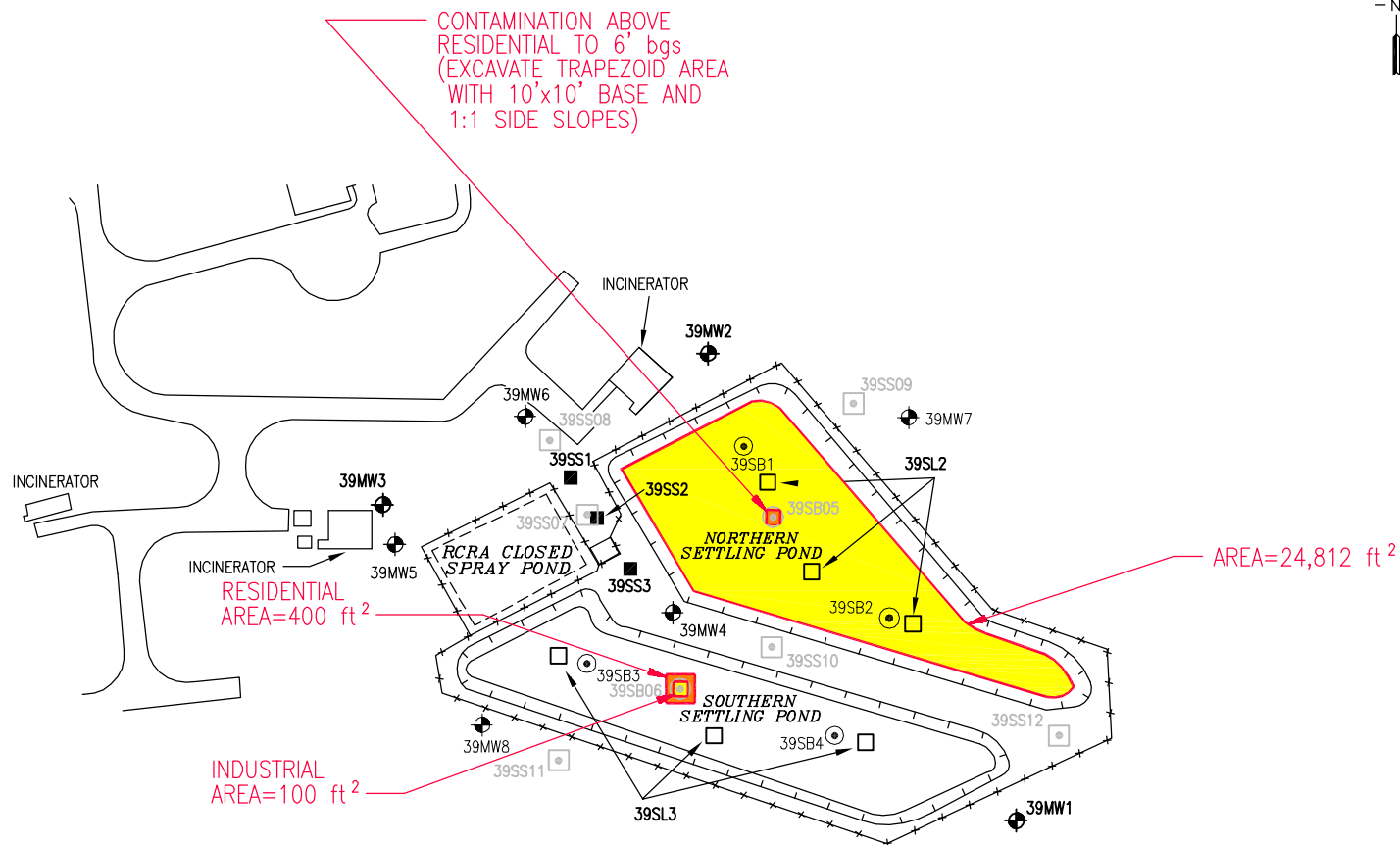
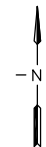
Initially, one surface and one subsurface soil sample (2.5-3 ft bgs) will be collected from a total of approximately 120 locations (240 samples) and analyzed for lead using a portable X-ray fluorescence (XRF) machine (see **Figure 2-3**). An additional five subsurface soil samples will be collected from 5.0-5.5 ft bgs in the areas of the northern and southern settling ponds where highly concentrations were detected during the RFI/CMS to delineate the vertical extent of soil contamination in these areas.

The extent of lead is expected to be the same or greater than the extent of the other COIs, and lead will initially be used to delineate the areas to be excavated. Ten percent of the samples from each side of the delineated areas and at the depth limit, as determined by lead concentrations, will be analyzed at an off-site laboratory for TAL metals and half of these samples (5 percent of the total) will be analyzed for dioxins/furans to ensure that the extent of other COIs (arsenic, vanadium, and dioxins/furans as TE) has also been bound. These samples will also be used to correlate the XRF lead results with the fixed-base laboratory lead results. Select samples (five from within and five from outside the area of elevated lead) will also be analyzed off site for TAL metals and dioxins/furans to:

1. Provide a greater range of concentrations for the lead calibration curve.
2. Ensure that the footprints of elevated arsenic, vanadium, and dioxins/furans are within the footprint of elevated lead.

The limits of the area to be excavated will be bounded by soil characterization samples with concentrations below the chemical-specific RGs. Soil will be excavated to a depth that is 1 foot below where the “hit” was detected.

If the delineation samples collected from the edge of the sampling area contain levels of contaminants above the RG, the sampling area will be expanded outward. If contamination is determined to extend horizontally or vertically farther than anticipated, soil removal will



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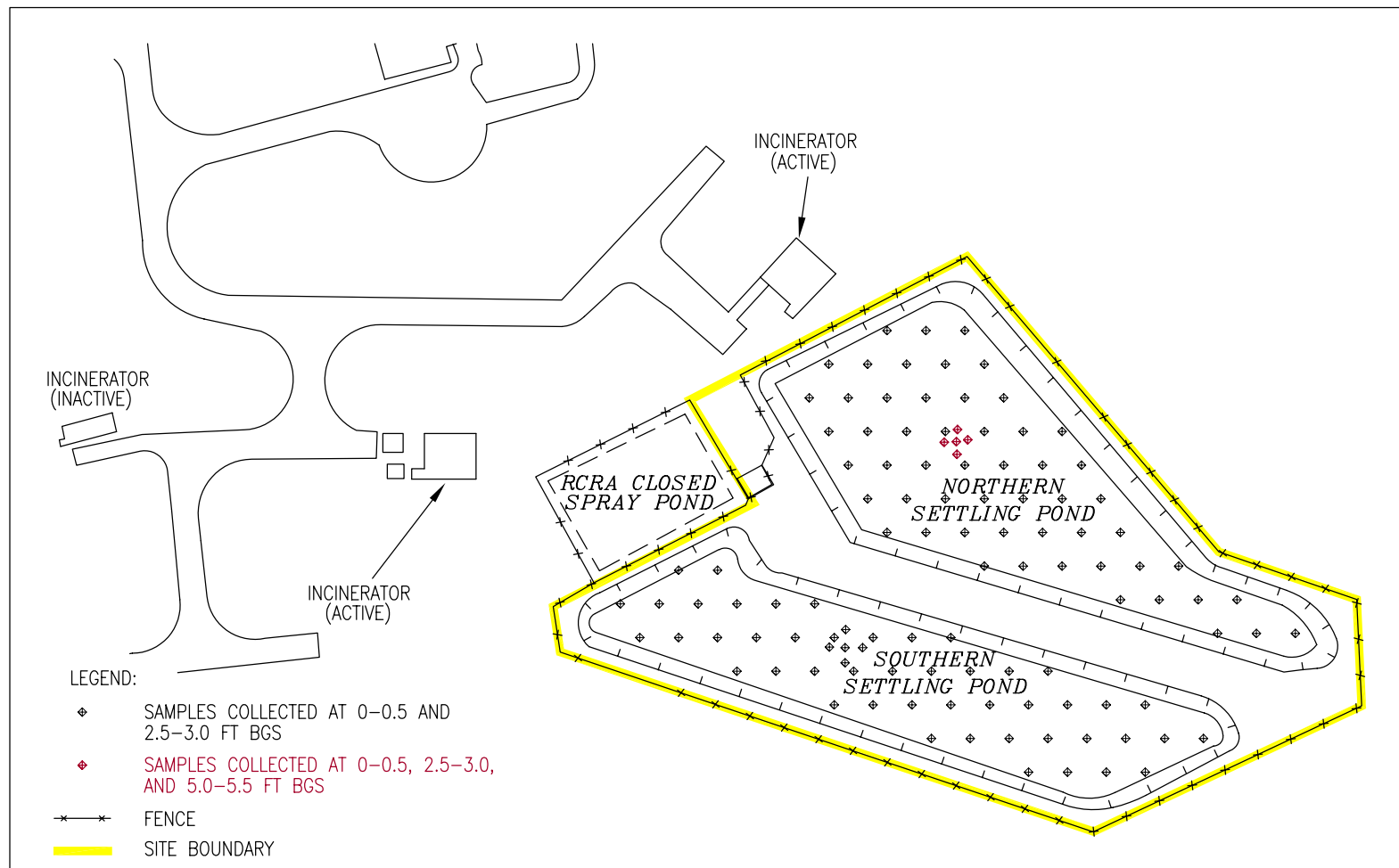
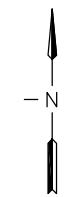
- 1992 VI SOIL SAMPLE (DAMES & MOORE)
- 1992 VI WASTE COMPOSITE SAMPLE (DAMES & MOORE)
- ◆ 1994 VI MONITORING WELL (DAMES & MOORE)
- ◆ 1997 RFI MONITORING WELL (ALLIANT TECHSYSTEMS)
- AREA EXCEEDING RESIDENTIAL REMEDIAL GOALS

- ◆ 1998 RFI MONITORING WELL (BORING) (ICF KAISER)
- 1998 RFI SOIL BORING (ICF KAISER)
- FENCE AROUND SITE BOUNDARY
- 2002 RFI SOIL BORING LOCATION (SHAW)
- 2002 RFI SURFACE SOIL LOCATION (SHAW)
- AREA EXCEEDING INDUSTRIAL REMEDIAL GOALS

0 100 FEET
SCALE

RADFORD AAP		FIGURE 2-2
PREPARED BY: SHAW	TASK NO: 80N070000000	AREA OF CONTAMINATION ABOVE REMEDIAL GOALS
CHECKED BY: GM	SHAW DWG NO:	
DATE: REVISED JAN. 2008	FIG 2-2	

FIG. 2-2-2008 (REV. 3-0-08)



FILE: FIG 2-3.dwg PLOT: 3-4-08



RADFORD AAP

PREPARED BY: SHAW	TASK NO: 82987008200000
CHECKED BY: MT	SHAW DWG NO:
DATE: REVISED JAN. 2008	FIG 2-3

FIGURE 2-3

SWMU 39
PROPOSED DELINEATION
SAMPLE LOCATIONS

continue until the RGs are achieved. All stakeholders will be notified of the changes, and modifications needed to complete the IM action will be documented, as necessary.

In addition, waste characterization samples will be collected during soil delineation to determine the appropriate disposal options for the soil prior to excavation activities. The receiving facility requires that one composite sample be collected from the waste materials per 1,000 cubic yards of material; it is assumed that three soil samples will be collected and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals, corrosivity as pH, reactivity, and ignitability in order to allow direct load-out of soil during excavation activities.

2.2.4 Fence Removal

Prior to excavation, 14,100 linear feet of 4-foot-high chain-link fence must be removed from the site. Removal is necessary in order to allow equipment to enter the site. The fence posts will be cut flush with the ground surface using a powered handheld metal saw and sent to a recycling center.

2.2.5 Soil Excavation

Excavation will be performed using one 20 Ton excavator (trackhoe). Contaminated soils will be excavated and directly loaded into dump trucks and transported off site. The sides of all excavations in which employees are exposed to danger from moving ground shall be guarded by a support system, sloping or benching of the ground, or other equivalent means. Sloping and benching, if required, will be in accordance with EM 385-1-1. There is one location in the northern pond (39SB05C at a depth of 3-5 ft bgs) where lead was detected at depth above the Residential RG, but below the Industrial RG. Therefore, it was assumed that additional excavation at depth was required in the northern pond to reduce contaminant concentrations to Residential RGs. For this area, it was assumed that the contamination would be excavated at a trapezoid with 1:1 side slope for any depth greater than 5 ft bgs. The exact geometry of the excavation at this location will be revised following evaluations of the waste characterization samples. Excavations less than 5 ft in depth and which a “competent person” examines and determines there to be no potential for cave-in do not require protective systems. EM 385-1-1 defines a “competent person” as “one who can identify existing and predictable hazards in the working environment or working conditions that are dangerous to personnel and who has the authority to take prompt corrective measures to eliminate them.” Shaw H&S provides Excavation Competent Person Training, and Shaw will ensure that the Site Superintendent for the project has completed this training. Excavation work will comply with EM 385-1-1 and 29 Code of Federal Regulations (CFR) 1926 Subpart P – *Excavations*. Excavations greater than 4 ft may constitute a confined space. Personnel will not be allowed to enter the excavation if this situation arises. Confirmation sampling will be done from the bucket of the excavator if the excavation is greater than 4 ft.

Geotextile fabric will be used to construct a temporary loading zone on which the trucks will stage while being loaded. The geotextile fabric will extend from the truck to the edge of the excavation zone. The temporary loading zone will be moved as the leading edge of the excavation moves forward. Excavation will start at the top of the drainage ditch and progress down the hillside towards the base of the ditch. Backfilling will commence after the excavation has been completed and analytical results from the confirmation samples have demonstrated that soil above the RGs has been removed from the site.

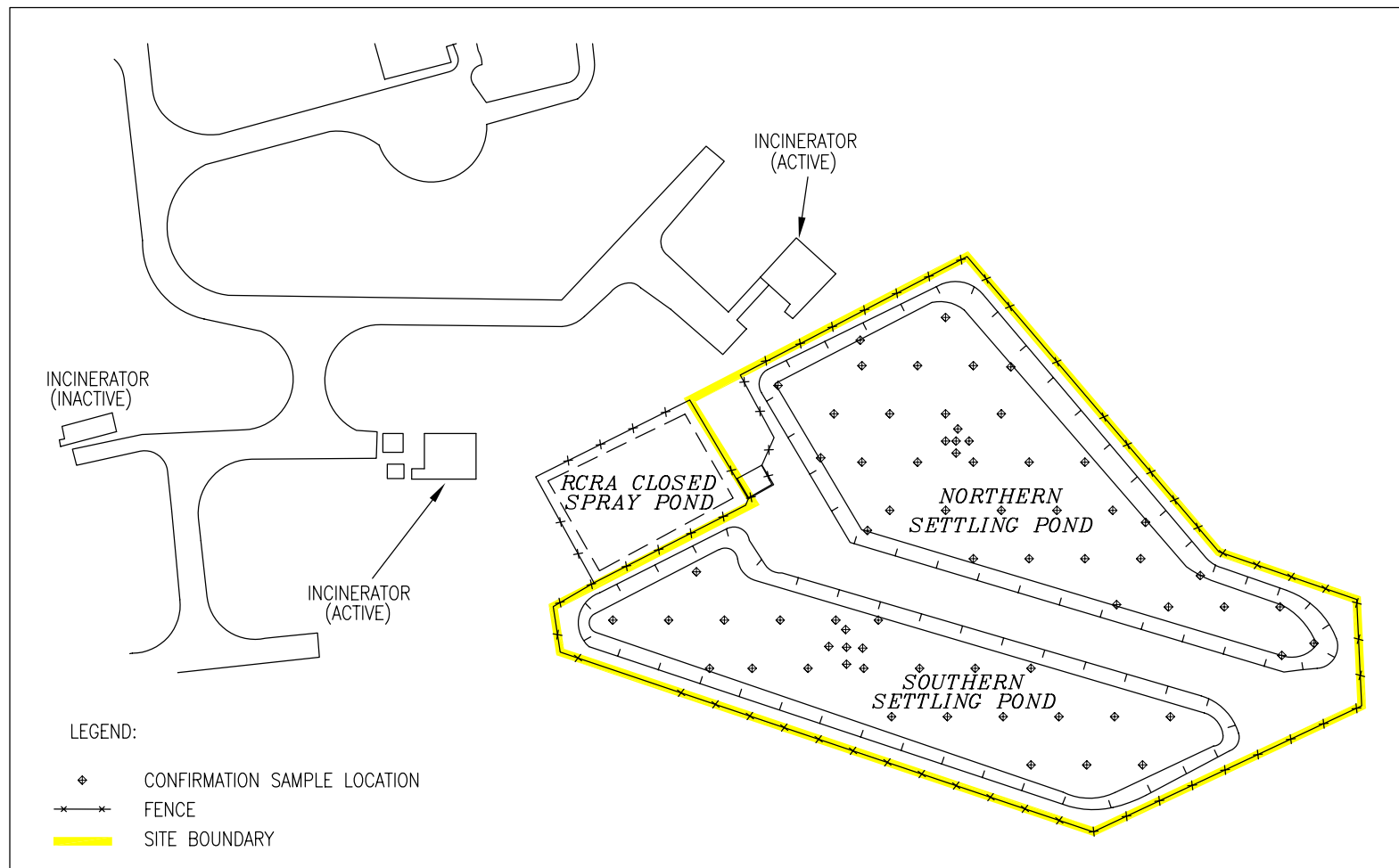
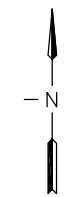
Following soil excavation, confirmation samples will be collected from the excavation bottom and sidewalls to confirm that all contaminated soils have been removed above the RG. Discrete confirmation samples will be collected from the sidewalls adjacent to the boundary of the excavation as determined by the delineation samples during the site delineation sampling event. Locations of the delineation samples will be marked perpendicular to the excavation prior to excavation so that these locations are visible after excavation has commenced. The remaining samples will be located by the site supervisor and project manager based on the final delineation of the area to be excavated. The sampling strategy to be employed is a biased sampling strategy [Standard Operating Procedure (SOP) 30.7] (**Appendix B**), since known sources have been previously identified. Excavation will continue until CMOs have been met. It is estimated that 45 samples (plus QC) will be collected from the bottom and sides of the excavation area and sent to an off-site laboratory for TAL metals analysis. As with the delineation samples, confirmation samples will be initially analyzed for TAL metals. Once results from these samples have demonstrated that metals (arsenic, lead, and vanadium) concentrations are below the RGs, samples will be analyzed for dioxins/furans to ensure that dioxin/furan concentrations are also below RGs. Locations for the confirmation samples are tentative because they will be dependent on the exact area that will be excavated. Minimum spacing of the samples vary depending on the location in the ponds. At a minimum, samples will be collected from the floor of the excavation at a rate of one sample per 25x25 ft area. Additional samples will be collected at corners and the outside edges of the floor of the excavation. Samples from the sidewall will be collected at a rate of one per 20 linear feet of sidewall. Additional samples will be collected at corners and inflection points. **Figure 2-4** shows the preliminary location of 45 of the confirmation samples.

All sampling and excavation equipment will be decontaminated according to the procedures outlined in the SSHP (*Section 8.0*). A decontamination pad will be set up on site for the excavator. The excavator will be decontaminated prior to use, after completion of the excavation phase, and after completion of the project. Decontamination procedures will follow those in SOP 80.1 for a drill rig (**Appendix B**). In addition, a small, temporary decontamination pad will be set up to decontaminate sampling equipment on site. Decontamination water will be pumped out of the pads and containerized in 55-gallon drums.

2.2.6 Waste Characterization and Off-site Disposal

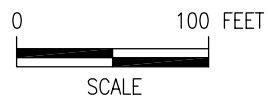
Samples, as described in *Section 2.2.3*, will be collected from the soil and used to assess the appropriate disposal options for the soil prior to excavation. Composite samples will be collected from the soil as specified by the receiving facility. Soil will be collected for geotechnical evaluation for the receiving facility as well. These samples will be collected during the delineation phase, as discussed in *Section 2.2.3*.

The receiving facility requires that all soils at RFAAP be analyzed for explosives (due to the installation mission). Samples were collected for explosives during the RFI. Explosive compounds were detected at SWMU 39, but did not exceed the residential screening levels inside or outside the ponds. One sample (39SS07) from the 2002 RFI detected 2,4-dinitrotoluene and nitroglycerine at 0.2 mg/kg and 0.331 mg/kg, respectively. These detections were well below the Residential RBCs for 2,4-dinitrotoluene (16 mg/kg) and nitroglycerine (46 mg/kg); therefore, these compounds are not a concern at the site and additional sampling of explosives for waste characterization purposes is not warranted. However, samples will be analyzed for explosives if required by the receiving facility.



LEGEND:

- ◆ CONFIRMATION SAMPLE LOCATION
- +—+—+ FENCE
- SITE BOUNDARY



RADFORD AAP

PREPARED BY: SHAW	TASK NO: 82987008200000
CHECKED BY: MT	SHAW DWG NO:
DATE: REVISED JAN. 2008	FIG 2-4

FIGURE 2-4

SWMU 39
PROPOSED CONFIRMATION
SAMPLE LOCATIONS

As discussed in *Section 2.2.3*, direct load-out of the soil will be performed. In addition to the soil generated for this remedial effort, disposal of the chain-link fence will be required.

Each waste type generated during this effort shall require a different disposal method based on its waste characterization results. Excavated soil that is classified as a hazardous waste will be disposed in a RCRA Subtitle C Landfill. Excavated soil that is classified as a non-hazardous waste will be disposed in a RCRA Subtitle D Landfill. Decontamination fluid that is characterized as non-hazardous waste will be disposed in the RFAAP wastewater treatment plant.

Shaw will act as the agent for the Army for treatment and disposal (T&D) of the wastes. Shaw and the Installation shall select the final disposal facility for the waste based on several factors:

1. Treatment, storage, and disposal facility (TSDF) capacity to accommodate incoming waste.
2. Solicitation of bids using applicable Federal Acquisition Regulations (FARs).
3. Verification of permits and insurance (at time of award).
4. The disposal facility must meet the permit compliance requirements.

The selected TSDF will supply the Army with an independent audit performed by an Army approved auditor. Contact information for disposal facilities selected for the SWMU 39 IM will be presented in **Table 2-1** in subsequent versions of this document, once they have been identified.

2.2.7 Site Restoration

Following removal of the soil above RGs, site restoration activities will commence. Off-site borrow material will be placed such that the ponds match the surrounding grade. Six inches of topsoil will then be placed and the area will be graded.

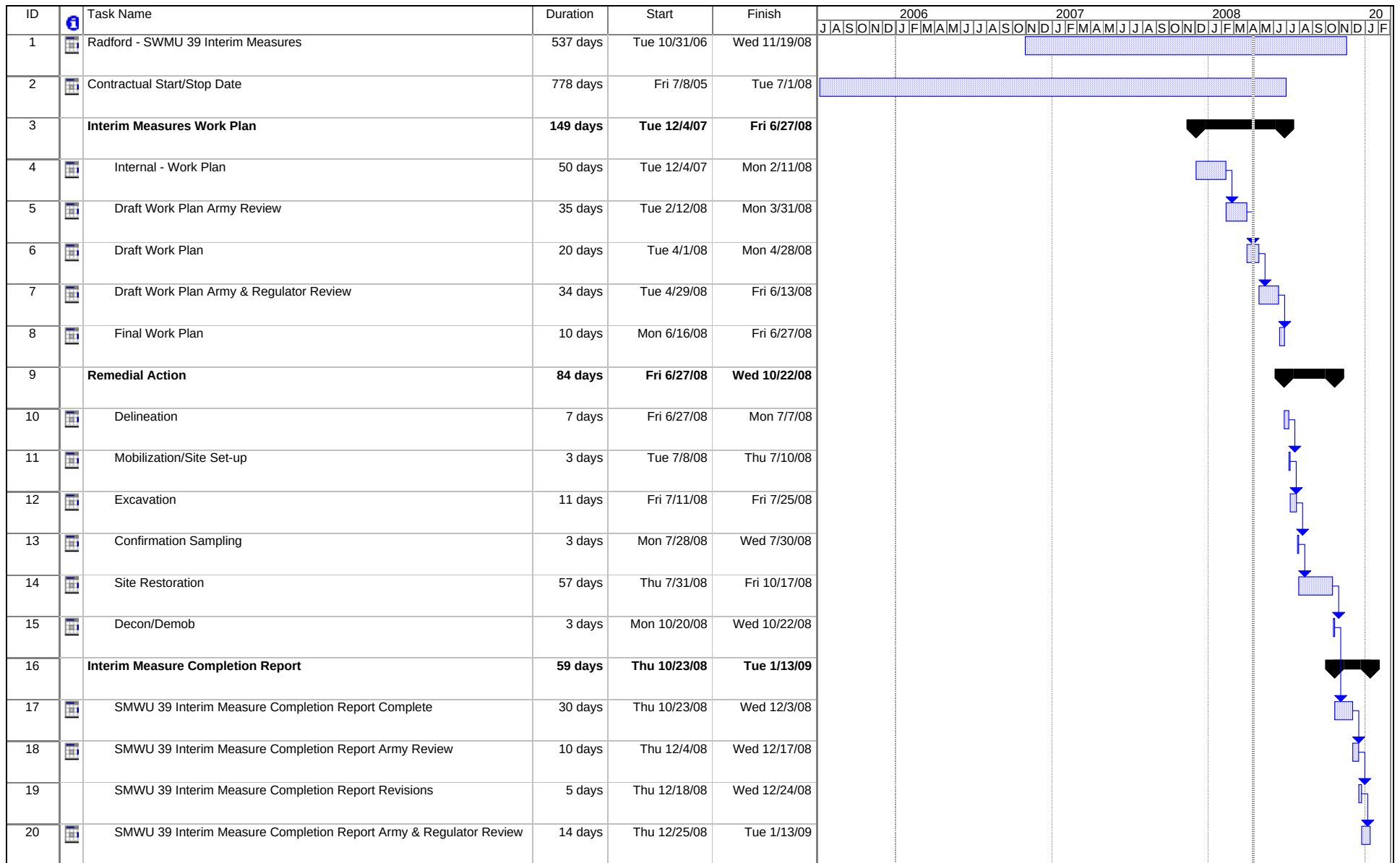
Borrow material will be selected that has physical characteristics consistent with the existing soil at SWMU 39. The borrow material/topsoil will be sampled at a rate of 1 sample/1,000 yards (i.e., estimated as 14 samples from the borrow material, 1 sample from the topsoil) for TAL metals, pesticides/polychlorinated biphenyls (PCBs), PAHs, and pH prior to placement. Erosion control measures will be implemented and excavation areas will be seeded.

After the site restoration activities are completed, Shaw will demobilize all equipment off site.

2.2.8 Project Schedule

The field activities to be performed as part of the SWMU 39 IM are scheduled to commence in June 2008. The proposed schedule of project tasks is provided in **Figure 2-5**.

[NOTE: The project schedule will be updated in each subsequent edition of this Work Plan and will be updated and maintained throughout the project.]



Project: Test2
Date: Mon 4/14/08

Task

Split

Progress

Milestone

Summary

Project Summary

External Tasks

External Milestone

Deadline

SMWU 39 Interim Measure Schedule

Figure 2-5

3.0 FIELD SAMPLING PLAN

This FSP describes the field sampling activities that will be performed and defines the procedures and methods that will be used to collect field samples. Contents included in this FSP include: procedures for collection of soil delineation, confirmation, waste characterization samples; and requirements for sample chain-of-custody (COC), documentation, and shipping. This FSP also addresses investigation-derived material (IDM), contractor chemical QC, corrective action procedures, and the schedule for field activities. This FSP was developed in accordance with USACE EM 200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001), and is to be used in conjunction with the QAPP, *Section 4.0*.

3.1 Project Description

A detailed description of the project history and the planned removal action work has been presented in the Introduction, *Section 1.0*, and the Organization and Technical Approach Plan, *Section 2.0*, of this IMWP, respectively. As part of the planned removal action work, field sampling activities will be conducted. These field sampling activities are discussed below.

3.2 Project Organization and Responsibilities

A detailed discussion of project personnel organization and responsibilities was previously provided in *Section 2.0*. Coordination of sample collection activities will be the responsibility of the Site Superintendent, who is responsible for running site operations. Field sampling technicians will be responsible for collection and delivery of samples to the laboratory. After delivery, the Project Chemist will be responsible for ensuring proper analysis and timely delivery of sample results by the laboratory.

3.3 Scope and Objectives

Samples to be collected during the IM work include soil delineation and confirmation samples and waste characterization samples. QC samples [i.e., field duplicate samples, rinse blanks, matrix spike/matrix spike duplicate (MS/MSD), etc.] will also be collected as described in the QAPP, *Section 4.0*. The following sections describe the function of each type of field sample. Details on the methods used for collection of the samples are presented in **Appendix B**.

3.3.1 Soil Delineation Samples

Soil delineation samples will be used to determine the extent of arsenic, lead, vanadium, and dioxin/furan contamination in surface and subsurface soil at SWMU 39. Soil delineation samples will be collected from the floors of both ponds (see **Figure 2-3**) and analyzed for lead using an XRF. Once the extent of lead has been delineated, selected samples (10% frequency will be analyzed for TAL metals and 5% frequency for dioxins/furans to ensure that concentrations of these compounds at the boundary samples are also below RGs. Analytical methods to be used for sample analysis are detailed in the QAPP (*Section 4.0*). Analytical results will be compared to the RG and will be used as the basis for soil removal.

3.3.2 Soil Confirmation Samples

Soil confirmation samples will be used to determine whether or not all contaminated soil has been completely removed from the excavated area(s). Soil confirmation samples will be collected from the excavated area (as described in *Section 2.0*) and analyzed for TAL metals. Once confirmation samples have demonstrated removal of TAL metal COIs to RGs, selected

samples will be analyzed for dioxins/furans to ensure that these compounds have been removed to concentrations below the RGs. Samples will be submitted to a USACE-approved laboratory for analysis. Analytical methods to be used for sample analysis and additional field QC samples are detailed in the QAPP (*Section 4.0*). Analytical results will be compared to the RG and will be used as the basis for either confirming the completion of the excavation or the requirement for additional soil removal.

3.3.3 Waste and Borrow Characterization Samples

Waste characterization samples will be collected and analyzed to determine the appropriate disposal methods of waste streams resulting from the IM at SWMU 39. Several types of waste streams will be generated during the IM: solid (soil) and liquid (decontamination water). In addition, the provider will demonstrate that the borrow material and top soil is clean, and one sample per 1,000 cubic yards will be collected and analyzed to confirm that the fill and the topsoil is usable at the site.

Soil waste characterization samples will be collected during site delineation to assess the appropriate disposal options. The samples will be submitted to a USACE-approved laboratory and analyzed for TCLP metals and RCRA waste characteristics (corrosivity as pH, reactivity, and ignitability). Liquid waste characterization samples from decontamination procedures will be submitted to a USACE-approved laboratory and analyzed for chemical oxygen demand (COD), TAL metals, and pH. The borrow material and top soil will be analyzed for TAL metals, PAHs, pesticides/PCBs, and pH. Analytical methods to be used for sample analysis are detailed in the QAPP (*Section 4.0*).

3.3.4 Anticipated Sampling Program

The sampling program for SWMU 39 removal action is discussed in detail in *Section 2.2*. Samples anticipated for collection during this scope of work include: Soil Delineation; Soil Confirmation; Waste and Borrow Characterization; and QC. A list of all anticipated analytical samples, QC samples, and analyses associated with the SWMU 39 IM are provided on **Table 3-1**. Analytical methods to be used for sample analysis are detailed in the QAPP (*Section 4.0*). Additional samples and/or analyses may be required depending on site conditions and specific disposal facility requirements. If required, this plan will be modified to include any additional analyses.

Table 3-1
Anticipated Sampling Program for SWMU 39 Interim Measures

Site ID	Sample ID	TAL Metals	Dioxins/ Furans	TCLP Metals, Corrosivity as pH, Reactivity, & Ignitability	TAL Metals, COD, & pH	TAL Metals, TCL VOCs, TCL SVOCs, PAHs, Pesticides/PCBs, & pH
SWMU 39 IM – Soil Delineation Samples						
39DE01	39DE01A	X	X	---	---	---
39DE01	39DE01B	X	---	---	---	---
39DE01	39DE01C	X	---	---	---	---
39DE02	39DE02A	X	---	---	---	---
39DE02	39DE02B	X	---	---	---	---
39DE02	39DE02C	X	---	---	---	---
39DE03	39DE03A	X	X	---	---	---
39DE03	39DE03B	X	---	---	---	---
39DE03	39DE03C	X	---	---	---	---
39DE04	39DE04A	X	---	---	---	---
39DE04	39DE04B	X	---	---	---	---
39DE04	39DE04C	X	---	---	---	---
39DE05	39DE05A	X	---	---	---	---
39DE05	39DE05B	X	X	---	---	---
39DE05	39DE05C	X	---	---	---	---
39DE06	39DE06A	X	---	---	---	---
39DE06	39DE06B	X	---	---	---	---
39DE07	39DE07A	X	---	---	---	---
39DE07	39DE07B	X	---	---	---	---
39DE08	39DE08A	X	---	---	---	---
39DE08	39DE08B	X	X	---	---	---
39DE09	39DE09A	X	---	---	---	---
39DE09	39DE09B	X	---	---	---	---
39DE10	39DE10A	X	---	---	---	---
39DE10	39DE10B	X	---	---	---	---
39DE11	39DE11A	X	---	---	---	---
39DE11	39DE11B	X	---	---	---	---
39DE12	39DE12A	X	X	---	---	---
39DE12	39DE12B	X	---	---	---	---
39DE13	39DE13A	X	---	---	---	---
39DE13	39DE13B	X	---	---	---	---
39DE14	39DE14A	X	---	---	---	---
39DE14	39DE14B	X	---	---	---	---
39DE15	39DE15A	X	---	---	---	---
39DE15	39DE15B	X	X	---	---	---
39DE16	39DE16A	X	---	---	---	---
39DE16	39DE16B	X	---	---	---	---
39DE17	39DE17A	X	---	---	---	---
39DE17	39DE17B	X	---	---	---	---
39DE18	39DE18A	X	---	---	---	---
39DE18	39DE18B	X	---	---	---	---
39DE19	39DE19A	X	X	---	---	---
39DE19	39DE19B	X	---	---	---	---

Table 3-1, Continued
Anticipated Sampling Program for SWMU 39 Interim Measures

Site ID	Sample ID	TAL Metals	Dioxins/ Furans	TCLP Metals, Corrosivity as pH, Reactivity, & Ignitability	TAL Metals, COD, & pH	TAL Metals, TCL VOCs, TCL SVOCs, PAHs, Pesticides/PCBs, & pH
39DE20	39DE20A	X	---	---	---	---
39DE20	39DE20B	X	---	---	---	---
39DE21	39DE21A	X	---	---	---	---
39DE21	39DE21B	X	---	---	---	---
39DE22	39DE22A	X	---	---	---	---
39DE22	39DE22B	X	X	---	---	---
39DE23	39DE23A	X	---	---	---	---
39DE23	39DE23B	X	---	---	---	---
39DE24	39DE24A	X	---	---	---	---
39DE24	39DE24B	X	---	---	---	---
39DE25	39DE25A	X	---	---	---	---
39DE25	39DE25B	X	---	---	---	---
39DE26	39DE26A	X	X	---	---	---
39DE26	39DE26B	X	---	---	---	---
39DE27	39DE27A	X	---	---	---	---
39DE27	39DE27B	X	---	---	---	---
39DE28	39DE28A	X	---	---	---	---
39DE28	39DE28B	X	---	---	---	---
39DE29	39DE29A	X	---	---	---	---
39DE29	39DE29B	X	X	---	---	---
39DE30	39DE30A	X	---	---	---	---
39DE30	39DE30B	X	---	---	---	---
39DE31	39DE31A	X	---	---	---	---
39DE31	39DE31B	X	---	---	---	---
39DE32	39DE32A	X	---	---	---	---
39DE32	39DE32B	X	---	---	---	---
39DE33	39DE33A	X	---	---	---	---
39DE33	39DE33B	X	---	---	---	---
39DE34	39DE34A	X	X	---	---	---
39DE34	39DE34B	X	---	---	---	---
39DE35	39DE35A	X	---	---	---	---
39DE35	39DE35B	X	---	---	---	---
39DE36	39DE36A	X	---	---	---	---
39DE36	39DE36B	X	---	---	---	---
39DE37	39DE37A	X	---	---	---	---
39DE37	39DE37B	X	---	---	---	---
39DE38	39DE38A	X	---	---	---	---
39DE38	39DE38B	X	X	---	---	---
39DE39	39DE39A	X	---	---	---	---
39DE39	39DE39B	X	---	---	---	---
39DE40	39DE40A	X	---	---	---	---
39DE40	39DE40B	X	---	---	---	---
39DE41	39DE41A	X	---	---	---	---
39DE41	39DE41B	X	X	---	---	---
39DE42	39DE42A	X	---	---	---	---

Table 3-1, Continued
Anticipated Sampling Program for SWMU 39 Interim Measures

Site ID	Sample ID	TAL Metals	Dioxins/ Furans	TCLP Metals, Corrosivity as pH, Reactivity, & Ignitability	TAL Metals, COD, & pH	TAL Metals, TCL VOCs, TCL SVOCs, PAHs, Pesticides/PCBs, & pH
39DE42	39DE42B	X	---	---	---	---
39DE43	39DE43A	X	---	---	---	---
39DE43	39DE43B	X	---	---	---	---
39DE44	39DE44A	X	---	---	---	---
39DE44	39DE44B	X	---	---	---	---
39DE45	39DE45A	X	X	---	---	---
39DE45	39DE45B	X	---	---	---	---
39DE46	39DE46A	X	---	---	---	---
39DE46	39DE46B	X	---	---	---	---
39DE47	39DE47A	X	---	---	---	---
39DE47	39DE47B	X	---	---	---	---
39DE48	39DE48A	X	---	---	---	---
39DE48	39DE48B	X	X	---	---	---
39DE49	39DE49A	X	---	---	---	---
39DE49	39DE49B	X	---	---	---	---
39DE50	39DE50A	X	---	---	---	---
39DE50	39DE50B	X	---	---	---	---
39DE51	39DE51A	X	---	---	---	---
39DE51	39DE51B	X	X	---	---	---
39DE52	39DE52A	X	---	---	---	---
39DE52	39DE52B	X	---	---	---	---
39DE53	39DE53A	X	---	---	---	---
39DE53	39DE53B	X	---	---	---	---
39DE54	39DE54A	X	---	---	---	---
39DE54	39DE54B	X	---	---	---	---
39DE55	39DE55A	X	X	---	---	---
39DE55	39DE55B	X	---	---	---	---
39DE56	39DE56A	X	---	---	---	---
39DE56	39DE56B	X	---	---	---	---
39DE57	39DE57A	X	---	---	---	---
39DE57	39DE57B	X	---	---	---	---
39DE58	39DE58A	X	---	---	---	---
39DE58	39DE58B	X	X	---	---	---
39DE59	39DE59A	X	---	---	---	---
39DE59	39DE59B	X	---	---	---	---
39DE60	39DE60A	X	---	---	---	---
39DE60	39DE60B	X	---	---	---	---
39DE61	39DE61A	X	---	---	---	---
39DE61	39DE61B	X	---	---	---	---
39DE62	39DE62A	X	X	---	---	---
39DE62	39DE62B	X	---	---	---	---
39DE63	39DE63A	X	---	---	---	---
39DE63	39DE63B	X	---	---	---	---
39DE64	39DE64A	X	---	---	---	---
39DE64	39DE64B	X	---	---	---	---

Table 3-1, Continued
Anticipated Sampling Program for SWMU 39 Interim Measures

Site ID	Sample ID	TAL Metals	Dioxins /Furans	TCLP Metals, Corrosivity as pH, Reactivity, & Ignitability	TAL Metals, COD, & pH	TAL Metals, TCL VOCs, TCL SVOCs, PAHs, Pesticides/PCBs, & pH
39DE65	39DE65A	X	X	---	---	---
39DE65	39DE65B	X	---	---	---	---
SWMU 39 IM – Soil Confirmation Samples*						
39SC01	39SC01	X	X	---	---	---
39SC02	39SC02	X	X	---	---	---
39SC03	39SC03	X	X	---	---	---
39SC04	39SC04	X	X	---	---	---
39SC05	39SC05	X	X	---	---	---
39SC06	39SC06	X	X	---	---	---
39SC07	39SC07	X	X	---	---	---
39SC08	39SC08	X	X	---	---	---
39SC09	39SC09	X	X	---	---	---
39SC10	39SC10	X	X	---	---	---
TMSC##	TMSC##	X	X	---	---	---
39SC11	39SC11	X	X	---	---	---
39SC12	39SC12	X	X	---	---	---
39SC13	39SC13	X	X	---	---	---
39SC14	39SC14	X	X	---	---	---
39SC15	39SC15	X	X	---	---	---
39SC16	39SC16	X	X	---	---	---
39SC17	39SC17	X	X	---	---	---
39SC18	39SC18	X	X	---	---	---
39SC19	39SC19	X	X	---	---	---
39SC20	39SC20	X	X	---	---	---
TMSC##	TMSC##	X	X	---	---	---
MMDDYYR1	MMDDYYR1	X	X	---	---	---
39SC21	39SC21	X	---	---	---	---
39SC22	39SC22	X	---	---	---	---
39SC23	39SC23	X	---	---	---	---
39SC24	39SC24	X	---	---	---	---
39SC25	39SC25	X	---	---	---	---
39SC26	39SC26	X	---	---	---	---
39SC27	39SC27	X	---	---	---	---
39SC28	39SC28	X	---	---	---	---
39SC29	39SC29	X	---	---	---	---
39SC30	39SC30	X	---	---	---	---
TMSC##	TMSC##	X	---	---	---	---
39SC31	39SC31	X	---	---	---	---
39SC32	39SC32	X	---	---	---	---
39SC33	39SC33	X	---	---	---	---
39SC34	39SC34	X	---	---	---	---
39SC35	39SC35	X	---	---	---	---
39SC36	39SC36	X	---	---	---	---
39SC37	39SC37	X	---	---	---	---

Table 3-1, Continued
Anticipated Sampling Program for SWMU 39 Interim Measures

Site ID	Sample ID	TAL Metals	Dioxins /Furans	TCLP Metals, Corrosivity as pH, Reactivity, & Ignitability	TAL Metals, COD, & pH	TAL Metals, PAHs, Pesticides/PCBs, & pH
39SC38	39SC38	X	---	---	---	---
39SC39	39SC39	X	---	---	---	---
39SC40	39SC40	X	---	---	---	---
TMSC##	TMSC##	X	---	---	---	---
MMDDYYR2	MMDDYYR2	X	---	---	---	---
39SC41	39SC41	X	---	---	---	---
39SC42	39SC42	X	---	---	---	---
39SC43	39SC43	X	---	---	---	---
39SC44	39SC44	X	---	---	---	---
39SC45	39SC45	X	---	---	---	---
TMSC##	TMSC##	X	---	---	---	---
SWMU 39 IM – Waste and Borrow Characterization Sample						
39DW01	39DW01	---	---	---	X (Aq.)	---
39DW02	39DW02	---	---	X (Soil)	---	---
39DW03	39DW03	---	---	X (Soil)	---	---
39DW04	39DW04	---	---	X (Soil)	---	---
39DW05	39DW05	---	---	X (Soil)	---	---
39DW06	39DW06	---	---	X (Soil)	---	---
39DW07	39DW07	---	---	X (Soil)	---	---
39DW08	39DW08	---	---	X (Soil)	---	---
39DW09	39DW09	---	---	X (Soil)	---	---
39DW10	39DW10	---	---	X (Soil)	---	---
39DW11	39DW11	---	---	X (Soil)	---	---
39DW12	39DW12	---	---	X (Soil)	---	---
39DW13	39DW13	---	---	X (Soil)	---	---
39DW14	39DW14	---	---	---	---	X (Top Soil)
39DW15	39DW15	---	---	---	---	X (Borrow Material)
39DW16	39DW16	---	---	---	---	X (Borrow Material)
39DW17	39DW17	---	---	---	---	X (Borrow Material)
39DW18	39DW18	---	---	---	---	X (Borrow Material)
39DW19	39DW19	---	---	---	---	X (Borrow Material)
39DW20	39DW20	---	---	---	---	X (Borrow Material)
39DW21	39DW21	---	---	---	---	X (Borrow Material)
39DW22	39DW22	---	---	---	---	X (Borrow Material)
39DW23	39DW23	---	---	---	---	X (Borrow Material)
39DW24	39DW24	---	---	---	---	X (Borrow Material)
39DW25	39DW25	---	---	---	---	X (Borrow Material)
39DW26	39DW26	---	---	---	---	X (Borrow Material)
39DW27	39DW27	---	---	---	---	X (Borrow Material)
39DW28	39DW28	---	---	---	---	X (Borrow Material)

Table 3-1, Continued
Anticipated Sampling Program for SWMU 39 Interim Measures

TM: Blind Field Duplicate Sample (## to be assigned in field) will be collected at a frequency of 10% of the total env. sample volume.

A: Sample Collected from 0-0.5 ft bgs

B: Sample Collected from 2.5-3.0 ft bgs

C: Sample Collected from 5.0-5.5 ft bgs

DE: Soil Delineation Sample

SC: Soil Confirmation Sample

DW: Waste and Borrow Characterization Sample

X: Sample group collected

---: Sample type not collected

Note: MS/MSD samples will be collected at a frequency of 5% of the total environmental sample volume.

*: Confirmation sample will be collected from bottom and sides of excavated area as described in *Section 2.0*.

4.0 QUALITY ASSURANCE PROJECT PLAN

This QAPP describes the policy, organization, functional activities, analytical methods, and quality assurance (QA) and QC protocols necessary to achieve the project DQO. This QAPP was developed in accordance with USACE *EM 200-1-3, Requirements for the Preparation of Sampling and Analysis Plans* (USACE, 2001) and is to be used in conjunction with the FSP, *Section 3.0*.

4.1 Project Description

A detailed description of the project history and the planned IM work is presented in the Introduction (*Section 1.0*) and the Organization and Technical Approach Plan (*Section 2.0*) of this IMWP, respectively. As part of the planned IM work, field sampling and analysis activities will be conducted. This QAPP, in conjunction with the FSP (*Section 3.0*), describes the sampling and analysis requirements to ensure DQOs are met.

4.2 Project Organization and Responsibilities

A detailed discussion of project personnel organization and responsibilities has been presented in the Organization and Technical Approach Plan, *Section 2.0*. Coordination of sample collection activities will be the responsibility of the Site Superintendent, who is responsible for running site operations. Field sampling technicians will be responsible for collection and delivery of samples to the laboratory. After delivery, the Project Chemist will be responsible for ensuring proper analytical analysis and timely delivery of sample results by the contract laboratory according to the project Statement of Work and QAPP requirements.

The contract laboratory that will be used to support the IM work at SWMU 39 has yet to be determined. A copy of the subcontractor's Laboratory Quality Assurance Plan (LQAP) will be presented in **Appendix C** upon award.

4.3 Data Quality Objectives

Quality assurance is defined as the overall system of activities for assuring the reliability of data produced. The system integrates the quality planning, assessment, and corrective actions of various groups in the organization to provide the independent QA program necessary to establish and maintain an effective system for collection and analysis of environmental samples and related activities. The program encompasses the generation of complete data with its subsequent review, validation, and documentation.

The overall QA objective is to develop and implement procedures for sample and data collection, evaluation, and reporting that will allow reviewers to determine whether the field and laboratory procedures meet the criteria and endpoints established in the DQOs. DQOs are qualitative and quantitative statements that outline the decision-making process and specify the data required to support corrective actions. DQOs specify the level of uncertainty that will be accepted in results derived from environmental data. *Guidance for the DQO Process* (USEPA, 1994a), *USEPA DQO Process for Hazardous Waste Site Investigations EPA QA/G-4HW* (USEPA, 2000b), and the *Department of Defense (DoD) Quality Systems Manual (QSM), Version 3* (DoD, 2006) formed the basis for the DQO process and development of RFAAP data quality criteria and performance specifications. The DQO process consists of the seven steps specified below. Each phase is broken out in the following DQO elements. DQO elements are included in italics

following each process step. Project-specific DQOs may be found in **Table 4-1** for SWMU 39 IM.

- 1. State the Problem:** Define the problem to focus the study. Specific activities conducted during this process step include 1) the identification of the planning team, 2) primary decision-maker, 3) statement of the problem, and 4) available resources and relevant deadlines.
 - (1) The planning team consists of representatives from the VDEQ, USEPA, USACE, U.S. Army Environmental Command, and RFAAP.*
 - (2) The Army is the primary decision-maker.*
 - (3) Refer to **Table 4-1**.*
 - (4) Resource specifications are contained in the RFAAP SWMU 39 IMWP. The period of performance for this project is approximately 18 months.*
- 2. Identify the Decision:** Define the decision statement that the study will attempt to resolve. Activities conducted during this step of the process involve 1) identification of the principal study question and 2) definition of resultant alternative actions.
 - (1) What is the extent and characteristics of the arsenic, lead, vanadium, and/or dioxin/furan contaminated soil at SWMU 39 and does the soil exceed set RGs? If the areas impacted are above cleanup levels, the soil will be removed and replaced with clean fill.*
 - (2) Resultant alternative actions include:*
 - (2a) Further determine extent of contaminated soil for removal.*
 - (2b) The extent of contamination has been determined.*
- 3. Identify Inputs to the Decision:** Identify information inputs required to resolve the decision statement and which inputs require environmental measurements. This step of the process includes 1) identification of the data that will be required to make the decision, 2) information source determination, 3) identification of data required for study action level goals, and 4) confirmation of appropriate field sampling and analytical methods.
 - (1) Refer to **Table 4-1**.*
 - (2) Samples for the soil delineation, confirmation, and waste and borrow characterization will be analyzed using USEPA SW-846 Update IIIA and USEPA Methods of Chemical Analysis of Water and Wastes methodology. Refer to Section 4.7.*
 - (3) The removal action RGs for SWMU 39 are identified and will be evaluated against unrestricted use criteria (background and/or calculated residential Removal Goals), disposal facility permit levels, and/or USEPA disposal criteria (40 CFR 261.24, 40 CFR 761.50, and USEPA SW-846 Chapter 7).*
 - (4) Field sampling will be performed in accordance with the RFAAP SWMU 39 IMWP. Refer to Section 3.0.*
- 4. Define the Boundaries:** Define decision statement spatial and temporal boundaries. This step specifies 1) the spatial boundary, 2) population characteristics, applicable geographic areas and associated homogeneous characteristics, and 3) constraints on sample collection.
 - (1, 2, 3) Refer to **Table 4-1**.*

Table 4-1
Specific Data Quality Objectives for SWMU 39 Interim Measures

DQO Elements		Pre-Excavation Soil Delineation Sampling and Analysis	Post-Excavation Soil Confirmation Sampling and Analysis	Waste Characterization Sampling and Analysis	Borrow/Top Soil Characterization Sampling and Analysis
PROBLEM STATEMENT	PROBLEM AND OBJECTIVES	Characterize arsenic, lead, vanadium, and/or dioxin/furan contaminated soil, if any, to determine if a soil removal is warranted.	Confirm all arsenic, lead, vanadium, and/or dioxin/furan contaminated soil has been removed.	Waste characterization for disposal.	Confirm borrow soil and top soil is suitable for fill.
DECISION INPUTS	CHEMICAL DATA	Discrete surface and subsurface soil characterization samples will be collected from the area determined during the IM as containing arsenic (As), lead (Pb), vanadium (V), and/or dioxins/furans above remedial goals (RGs) and analyzed off site for As, Pb, V, and dioxins/furans. The field standard operating procedures (SOPs) may be found in Appendix B .	Discrete confirmation soil samples will be collected and analyzed off site for arsenic (As), lead (Pb), vanadium (V), and dioxins/furans at the boundary where found to be fully delineated below RGs. Field SOPs may be found in Appendix B .	Discrete waste characterization samples will be collected and analyzed off site. The soil samples will be analyzed for TCLP metals, Corrosivity as pH, Reactivity, and Ignitability. Decontamination water will be analyzed for chemical oxygen demand (COD), TAL metals, and pH. Field SOPs may be found in Appendix B .	Discrete characterization samples will be collected for borrow material and top soil prior to placement and analyzed off site for TAL metals, PAHs, pesticides/PCBs, and pH. Field SOPs may be found in Appendix B .
	PHYSICAL DATA	NA	Map locations for all sample locations will be generated.	NA	NA
	SAMPLING METHOD	Environmental, biased, grab, and intrusive.	Environmental, biased, grab, and non-intrusive.	Environmental, biased, grab and non-intrusive.	Environmental, grab and non-intrusive.
	DATA USE	Interim Measures	Interim Measures	Waste Characterization	Interim Measures
	VALIDATION DATA LEVEL	Limited Validation	Full Validation (USEPA Region III Validation M3 & IM2)	Limited Validation	Full Validation (USEPA Region III Validation M3 & IM2)
	ANALYTICAL METHOD	<u>Chemical Data</u> (USEPA SW-846): As, Pb, & V: 3050B/6010B Dioxins/Furans: 8290	<u>Off-Site Chemical Data</u> (USEPA SW-846): As, Pb, & V: 3050B/6010B Dioxins/Furans: 8290	<u>Off-Site Chemical Data</u> (USEPA SW-846) TCLP Metals: 1311/3010A/6010B/7470A Corrosivity as pH and pH: 9045D (Soil) & 9040C (Aq.) Ignitability: 1030 (Soil) Reactivity (CN & H2S): Ch. 7.3.3 & 7.3.4 (Soil) TAL Metals: 3010A/6010B/7470A (Aq.) COD: EPA 410.4 (Aq.)	<u>Off-Site Chemical Data</u> (USEPA SW-846) TAL Metals: 3050B/6010B/7471A TCL Pesticides & PCBs: 3540C/8081A/8082 PAHs: 3540C/8270C SIM pH: 9045D
	METHOD QUANTITATION LIMIT	Refer to Table 4-2 .	Refer to Table 4-2 .	Refer to Table 4-2 .	Refer to Table 4-2 .
	FIELD QUALITY CONTROL SAMPLES	NA	Rinse Blank (5% frequency) and Field Duplicate (10% frequency)	NA	NA
STUDY BOUNDARY		1) 25,212 ft ² 2) No public access permitted, no notable geographic characteristics, homogeneous soil types expected in excavation area 3) Access to area is restricted when incinerator is operating	1) 25,212 ft ² 2) No public access permitted, no notable geographic characteristics, homogeneous soil types expected in excavation area 3) Access to area is restricted when incinerator is operating	1) 25,212 ft ² 2) No public access permitted, no notable geographic characteristics, homogeneous soil types expected in excavation area 3) Access to area is restricted when incinerator is operating	1) 25,212 ft ² 2) No public access permitted, no notable geographic characteristics, homogeneous soil types expected in excavation area 3) Access to area is restricted when incinerator is operating

COD = Chemical Oxygen Demand

NA = Not Applicable

PAH = Polynuclear Aromatic Hydrocarbon

PCB = Polychlorinated Biphenyl

RG = Remedial Goal

SOP = Standard Operating Procedure

TAL = Target Analyte List

TCL = Target Compound List

TCLP = Toxicity Characteristic Leaching Procedure

USEPA = U.S. Environmental Protection Agency

5. Develop a Decision Rule: Define the 1) parameters of interest, 2) action levels, and 3) develop a decision rule.

- (1) Parameters of interest are listed in the decision inputs. Refer to **Table 4-1**.*
- (2) The removal action RGs for SWMU 39 are identified as the residential RG, disposal facility permit levels, and/or USEPA disposal criteria (40 CFR 261.24, 40 CFR 761.50, and USEPA SW-846 Chapter 7).*
- (3) If the soil characterization sample exceeds the RG, the soil will be removed. If the confirmation samples exceed RGs, excavation will continue until all soil above RGs has been removed. Waste characterization samples will be compared to disposal facility criteria. If concentrations of chemicals in these samples exceed target levels, the soil will be disposed at an appropriate disposal facility.*

6. Specify Acceptable Limits on Decision Errors: Specify the decision maker's tolerable limits on decision errors. This step of the process includes 1) parameter range of interest, 2) decision errors, 3) potential parameter values, and 4) the probability tolerance for decision errors are identified during this phase.

- (1) Parameter ranges are not defined at this time.*
- (2) Decision errors include:*
 - (2a) Deciding that the soil characteristics exceed cleanup goals (soil removed) when they do not and deciding that the soil characteristics do not exceed cleanup goals (soil not removed) when they actually do. The consequences of deciding that the soil characteristics exceed cleanup goals (soil removed) when they do not will result in unnecessary removal actions. The consequences of deciding that the soil characteristics do not exceed cleanup goals (soil not removed) when they do will result in liabilities associated with future damages and environmental cleanup costs. Additionally, public opinion will be compromised.*
 - (2b) (I) The true state when the most severe decision error occurs [deciding that the soil characteristics exceed cleanup goals (soil removed) when they actually do] is that the soil characteristics exceed cleanup goals and it is removed. (II) The true state when the less severe decision error occurs [deciding the soil characteristics do not exceed cleanup goals (soil not removed) when they do not] is that the soil characteristics do not exceed cleanup goals and no removal occurs.*
 - (2c) The null hypothesis (H_0) is: the soil characteristics exceed cleanup goals (soil removed). The alternative hypothesis (H_a) is the soil characteristics do not exceed cleanup goals (soil not removed).*
 - (2d) The false positive decision error occurs when H_0 is erroneously rejected corresponding to decision error I. The false negative decision error occurs when H_a is erroneously accepted corresponding to decision error II. Project-specific Type I and II error rates are 0.05 and 0.2, respectively.*
- (3, 4) The consequence of decision errors and acceptable probability will be determined as part of the final report.*

- 7. Optimize Data Design:** Identify data collection activities commensurate with data quality specifications. This final step in the process consists of 1) reviewing DQO outputs and existing environmental data, 2) developing data collection design alternatives, 3) formulating mathematical expressions to resolve design problems for each alternative, 4) selecting cost-effective data design capable of achieving DQOs, and 5) documentation of operational details and theoretical assumptions.

- (1) This work plan contains the proposed IM sampling design program for SWMU 39. A phased focus approach has been adopted for site characterization, confirmation, and waste characterization to optimize resource utilization and minimize decision errors. DQO refinement will be an iterative process throughout the project life cycle.*
- (2) Non-statistical sampling procedures are proposed. Biased and judgmental sampling will be performed for the collection of the delineation, characterization, and confirmation samples for the removal action.*
- (3) Mathematical and qualitative assessments will be established during the refinement process.*
- (4) This work plan contains the proposed IM sampling design program based on cost and project DQOs.*

4.3.1 Background

The arsenic, lead, vanadium, and dioxin/furan contaminated soil removal action objective, rationale, and sampling scope for SWMU 39 are presented in **Table 4-1**.

4.3.2 Applicable or Relevant and Appropriate Requirements

Applicable or relevant and appropriate requirements selected for the arsenic, lead, vanadium, and dioxin/furan contaminated soil removal action at SWMU 39 may be found in **Table 4-2** and include:

- Waste Disposal Criteria per USEPA 40 CFR 261.24; USEPA SW-846 Chapter 7 for TCLP analysis.
- Waste Disposal Criteria of 50 mg/kg for total PCBs (USEPA 40 CFR 761.50).

To-Be-Considered Guidance selected for the contaminated soil removal action at SWMU 39 include:

- RG not to exceed 15.8, 400, 108, and 0.001 mg/kg for arsenic, lead, vanadium, and dioxin/furan, respectively, in soil (residential RGs).
- RFAAP Metals Background Concentrations.
- USEPA Region III Industrial and Residential Soil RBCs (USEPA, 2007). [Note: RBCs will be updated as new versions of the RBC table are available.]

Sampling locations and procedures and sampling activities and procedures for the IM at SWMU 39 are presented in the FSP (*Section 3.0*). Parameter, container and preservation requirements, and holding times for analytical samples to be collected as part of the SWMU 39 IM are presented in **Table 4-3**.

Table 4-2
Analyte List and Levels of Concern for SWMU 39 Interim Measures

Parameter	Quantitation Limits		Remedial Goals		Background
	Aqueous (µg/L)	Soil (mg/kg)	Residential (mg/kg)	Industrial (mg/kg)	Soil (mg/kg)
Metals¹					
Arsenic	3	0.5	15.8	15.8	15.8
Lead	2	0.3	400	800	26.8
Vanadium	50	5	108	144	108
Dioxins/Furans²					
2,3,7,8-TCDD	0.010	0.0000010	.001	.0125	NA
1,2,3,7,8-PeCDD	0.025	0.0000025	.001	.0125	NA
1,2,3,4,7,8-HxCDD	0.025	0.0000025	.001	.0125	NA
1,2,3,6,7,8-HxCDD	0.025	0.0000025	.001	.0125	NA
1,2,3,7,8,9-HxCDD	0.025	0.0000025	.001	.0125	NA
1,2,3,4,6,7,8-HpCDD	0.025	0.0000025	.001	.0125	NA
OCDD	0.050	0.0000050	.001	.0125	NA
2,3,7,8-TCDF	0.010	0.0000010	.001	.0125	NA
1,2,3,7,8-PeCDF	0.025	0.0000025	.001	.0125	NA
2,3,4,7,8-PeCDF	0.025	0.0000025	.001	.0125	NA
1,2,3,4,7,8-HxCDF	0.025	0.0000025	.001	.0125	NA
1,2,3,6,7,8-HxCDF	0.025	0.0000025	.001	.0125	NA
2,3,4,6,7,8-HxCDF	0.025	0.0000025	.001	.0125	NA
1,2,3,7,8,9-HxCDF	0.025	0.0000025	.001	.0125	NA
1,2,3,4,6,7,8-HpCDF	0.025	0.0000025	.001	.0125	NA
1,2,3,4,7,8,9-HpCDF	0.025	0.0000025	.001	.0125	NA
OCDF	0.050	0.0000050	.001	.0125	NA
Total TCDD	0.010	0.0000010	.001	.0125	NA
Total PeCDD	0.025	0.0000025	.001	.0125	NA
Total HxCDD	0.025	0.0000025	.001	.0125	NA
Total HpCDD	0.025	0.0000025	.001	.0125	NA
Total TCDF	0.010	0.0000010	.001	.0125	NA
Total PeCDF	0.025	0.0000025	.001	.0125	NA
Total HxCDF	0.025	0.0000025	.001	.0125	NA
Total HpCDF	0.025	0.0000025	.001	.0125	NA

Table 4-2, Continued
Analyte List and Levels of Concern for SWMU 39 Interim Measures

Parameter	Quantitation Limits		UESPA Region III Soil Risk-Based Concentration October 2007		Background
	Aqueous (µg/L)	Soil (mg/kg)	Residential (mg/kg)	Industrial (mg/kg)	Soil (mg/kg)
Aluminum	200	20	78000	1000000	40,041
Antimony	5	0.5	31	410	NA
Barium	20	2.0	16000	200000	209
Beryllium	2	0.2	160	2000	1.02
Cadmium	2	0.1	39	510	0.69
Calcium	100	10	NA	NA	NA
Chromium	10	1.0	230	3100	65.3
Cobalt	50	5.0	NA	NA	72.3
Copper	20	2.0	3100	41000	53.5
Iron	50	5.0	55000	720000	50,962
Magnesium	100	10	NA	NA	NA
Manganese	10	1.0	1600	20000	2,543
Mercury	0.1	0.05	23	310	0.13
Nickel	40	4.0	1600	20000	62.8
Potassium	3,000	300	NA	NA	NA
Selenium	5	1.0	390	5100	NA
Silver	10	1.0	390	5100	NA
Sodium	200	20	NA	NA	NA
Thallium	2	0.3	5.5	72	2.11
Zinc	20	2.0	23000	310000	202
Miscellaneous					
pH	±0.1	±0.1	NA	NA	NA
PAHs					
Acenaphthylene	0.05	0.0017	NA	NA	NA
Acenaphthene	0.05	0.0017	4700	61000	NA
Anthracene	0.05	0.0017	23000	310000	NA
Benz[a]anthracene	0.05	0.0017	0.22	3.9	NA
Benzo[b]fluoranthene	0.05	0.0017	0.22	3.9	NA
Benzo[a]pyrene	0.05	0.0017	.022	.39	NA
Benzo[g,h,i]perylene	0.05	0.0017	NA	NA	NA
Benzo[k]fluoranthene	0.05	0.0017	2.2	39	NA
Chrysene	0.05	0.0017	22	390	NA
Dibenz[a,h]anthracene	0.05	0.0017	.022	.39	NA
Fluoranthene	0.05	0.0017	3100	41000	NA
Fluorene	0.05	0.0017	3100	41000	NA
Indeno[1,2,3-cd]pyrene	0.05	0.0017	.22	3.9	NA
2-Methylnaphthalene	0.05	0.0017	310	4100	NA
Naphthalene	0.05	0.0017	1600	20000	NA
Phenanthrene	0.05	0.0017	NA	NA	NA
Pyrene	0.05	0.0017	2300	31000	NA

Table 4-2, Continued
Analyte List and Levels of Concern for SWMU 39 Interim Measures

Parameter	Quantitation Limits		USEPA Region III Soil Risk-Based Concentration October 2007		Background
	Aqueous (µg/L)	Soil (mg/kg)	Residential (mg/kg)	Industrial (mg/kg)	Soil (mg/kg)
TCL Pesticides & PCBs					
Aldrin	0.050	0.00067	0.038	0.17	NA
Alpha-BHC	0.050	0.00067	0.1	0.45	NA
beta-BHC	0.050	0.00067	0.35	1.6	NA
delta-BHC	0.050	0.00067	NA	NA	NA
Gamma-BHC (Lindane)	0.050	0.00067	0.49	2.2	NA
alpha-Chlordane	0.050	0.00067	NA	NA	NA
gamma-Chlordane	0.050	0.00067	NA	NA	NA
Dieldrin	0.10	0.00067	0.04	0.18	NA
4,4'-DDD	0.10	0.00067	2.7	12	NA
4,4'-DDE	0.10	0.00067	1.9	8.4	NA
4,4'-DDT	0.10	0.00067	1.9	8.4	NA
Endosulfan I	0.050	0.00067	NA	NA	NA
Endosulfan II	0.10	0.00067	NA	NA	NA
Endosulfan sulfate	0.10	0.00067	NA	NA	NA
Endrin	0.10	0.00067	23	31	NA
Endrin aldehyde	0.10	0.00067	NA	NA	NA
Endrin ketone	0.10	0.00067	NA	NA	NA
Heptachlor	0.050	0.00067	0.14	0.64	NA
Heptachlor epoxide	0.050	0.00067	0.07	0.31	NA
Methoxychlor	0.50	0.00067	390	5100	NA
Toxaphene	3.0	0.033	0.58	2.6	NA
Aroclor-1016	1.0	0.033	5.5	41	NA
Aroclor-1221	2.0	0.067	0.32	1.4	NA
Aroclor-1232	1.0	0.033	0.32	1.4	NA
Aroclor-1242	1.0	0.033	0.32	1.4	NA
Aroclor-1248	1.0	0.033	0.16	1.4	NA
Aroclor-1254	1.0	0.033	0.32	1.4	NA
Aroclor-1260	1.0	0.033	0.32	1.4	NA
Miscellaneous					
Ignitability	±1°F	NA	140°F		NA
Corrosivity as pH	±1 Units	NA	<2 or >12 Units		NA
Reactive Cyanide	5 mg/kg	NA	250 mg/kg		NA
Reactive Sulfide	20 mg/kg	NA	500 mg/kg		NA
Chemical Oxygen Demand (COD)	3000	NA	NA		NA

Table 4-2, Continued
Analyte List and Levels of Concern for SWMU 39 Interim Measures

Waste Characterization	Quantitation Limit		RCRA Limits (µg/L)	Background (mg/kg)
	Aqueous (µg/L)	Soil (mg/kg)		
TCLP Metals				
Arsenic	100	NA	5000	NA
Barium	2000	NA	100000	NA
Cadmium	50	NA	1000	NA
Chromium	100	NA	5000	NA
Lead	30	NA	5000	NA
Mercury	2.0	NA	200	NA
Selenium	50	NA	1000	NA
Silver	100	NA	5000	NA

NOTES: (1) Values are the residential and industrial remedial goals, rather than the USEPA Region III risk-based concentrations (USEPA, October 2007).

(2) Values are the residential and industrial remedial goals based off the USEPA published recommended residential and industrial cleanup levels for dioxins/furans (USEPA, 1998) in soil.

µg = microgram

kg = kilogram

L = liter

mg = milligram

NA = Not Applicable or Not Available

Table 4-3. Parameter, Container, Preservation Requirements, and Holding Times for SWMU 39 Interim Measures

Parameter	Sample Container*		Preservation Requirement*	Holding Time
	Solid	Aqueous		
TCL Pesticides/PCBs	1, 8 oz, wide mouth glass with Teflon cap	2, 1-L amber glass with Teflon lined cap	Cool: 4 ± 2°C	Aqueous: Extraction: 7 days Analysis: 40 days Solid: Extraction: 14 days Analysis: 40 days
Polynuclear Aromatic Hydrocarbons	1, 8 oz, wide mouth glass with Teflon cap	2, 1-L amber glass with Teflon lined cap	Cool: 4 ± 2°C	Aqueous: Extraction: 7 days Analysis: 40 days Solid: Extraction: 14 days Analysis: 40 days
Arsenic, Lead, & Vanadium	1, 8 oz, wide mouth glass with Teflon cap	1, 500-mL HDPE	Cool: 4 ± 2°C; HNO ₃ to pH<2 (for aqueous)	ICP Metals: 180 days
Dioxins/Furans	1, 8 oz, wide mouth glass with Teflon cap	2, 1-L amber glass with Teflon lined cap	Cool: 4 ± 2°C	Aqueous: Extraction: 30 days Analysis: 40 days Solid: Extraction: 30 days Analysis: 40 days
TAL Metals	1, 8 oz, wide mouth glass with Teflon cap	1, 1-L HDPE	Cool: 4 ± 2°C solid; Cool: 4 ± 2°C; (HNO ₃ to pH<2 for aqueous)	ICP Metals: 180 days Mercury: 28 days
pH	1, 4 oz, wide mouth glass with Teflon cap	1, 250 mL glass or HDPE	Cool: 4 ± 2°C	ASAP
TCLP Metals	1, 8 oz, wide mouth glass with Teflon cap	1, 1-L glass or HDPE	Cool: 4 ± 2°C	TCLP Extraction: 180 days ICP Mercury: 28 days Sample Analysis: 180 days ICP Mercury: 28 days
Ignitability	1, 8 oz, wide mouth glass with Teflon cap	1, 1-L glass or HDPE	Cool: 4 ± 2°C	28 days
Reactive Sulfide	1, 8 oz, wide mouth glass with Teflon cap	1, 1-L glass or HDPE	Cool: 4 ± 2°C	7 days
Reactive Cyanide	1, 8 oz, wide mouth glass with Teflon cap	1, 1-L glass or HDPE	Cool: 4 ± 2°C	14 days
Corrosivity as pH & pH	1, 8 oz, wide mouth glass with Teflon cap	1, 250 mL glass or HDPE	Cool: 4 ± 2°C	ASAP
Chemical Oxygen Demand	NA	1, 250 mL glass	Cool: 4 ± 2°C, HCl or H ₂ SO ₄ to pH<2 for aqueous	28 days

*Parameters with same preservation requirements may be combined at laboratory's discretion.

Legend

ASAP = As Soon As Possible
HDPE = High Density Polyethylene
ICP = Inductively Coupled Plasma
L = Liter
mL = milliliter
NA = Not Applicable
PCB = Polychlorinated Biphenyl
TAL = Target Analyte List
TCL = Target Compound List
TCLP = Toxicity Characteristic Leachate Procedure
SVOC = Semivolatile Organic Compound
VOC = Volatile Organic Compound

4.4 Number and Type

The anticipated number and type of samples to be collected during the soil removal action at SWMU 39 are presented in **Table 4-4**. **Table 4-4** also presents guidelines for the collection of QC samples that will be taken in conjunction with environmental sampling during the soil removal action at SWMU 39.

Table 4-4
Estimated Number and Type of Samples for SWMU 39 IM

Sample Type	Total Samples
Environmental	
Soil Delineation	240
Soil Confirmation	45
Total Environmental	285
QC (For Soil Confirmation only)	
Rinse Blank (5% frequency)	3
Matrix Spike/Matrix Spike Duplicate (5% frequency)	3
Field Duplicate (10% frequency)	29
Total QC	35
Waste and Borrow Characterization	
Decontamination Rinse Water	1
Soil	12
Topsoil	1
Borrow Material	14
Total Waste and Borrow	28
TOTAL SAMPLES	348

* Total samples assuming areas sampled at SWMU 39 are excavated as described in *Section 2.0*.

4.5 Sample Identification

The sample identification system will be similar with past nomenclature at RFAAP. Samples will be coded in the following order to ensure a unique identification. The sample identification number will consist of an alphanumeric designation related to the sampling location, media type, sequential order sampling location, sample depth, and duplicate. Each sample will be assigned a unique sequential number at the time of sampling on the sample label, which will be permanently affixed to the sample container. **Table 3-1** in the FSP (*Section 3.0*) contains sample identification numbers that will be used for the IM at SWMU 39.

4.5.1 Environmental Samples

The field sample identification number consists of an alphanumeric designation according to the following convention:

- **Site Location Code:** The first two or three characters will be the site location number or code. The identification will include the following:

39	= SWMU 39
TM	= Blind Field Duplicate

- **Sample/Media Type:** The second two characters will be the sample/media type. Sample types will be designated by the following codes:

DE	= Soil Delineation Sample
SC	= Soil Confirmation Sample
DW	= Waste and Borrow Characterization Sample

- **Sampling Location Number:** The next two characters will be the number of the sampling location (e.g., 01, 02, 03,...).
- **Sample Depth:** At sites where there are several samples to be collected at different depths, the sequential collection order will be followed by a letter in alphabetic order indicating shallow to deep depths (e.g., A, B, C,...), where A would be the shallow sample, as follows:

A = Sample Collected from 0-0.5 ft bgs

B = Sample Collected from 2.5-3.0 ft bgs

C = Sample Collected from 5.0-5.5 ft bgs

- **Duplicate:** Field duplicate samples will be identified with a “TM” designation as noted in the “Site Location Code.” A record of the samples that correspond to the duplicates will be kept in the field logbook.

4.5.2 Field QC Blank Samples

All field QC blanks will use the following designation system:

- Date: month, day, year as MMDDYY
- Type: R = Rinse Blank
- Sequential Collection Order (if more than one collected per day): This consists of one digit such as 1, 2, 3 and so on.

Rinse blanks will be designated with the date sampled, followed by “R,” ending with the sequenced number of the rinse blanks (e.g., 062908R2 is the second rinse blank taken on June 29, 2008).

4.5.3 Documentation Requirements

Information pertinent to the sampling effort will be recorded in a field logbook, and a COC form will trace the sample. Field logbook SOPs 10.1 and 10.2 may be found in **Appendix B**. All entries will be made in indelible ink on consecutively numbered pages, and corrections will consist of lineout deletions that are initialed and dated. At a minimum, required field logbook entries include:

- Time and date of sample collection.
- Sampler identification.
- Sample identification number.
- Sample type.

- Analytical request.
- Sampling methodology (grab and composite sample).
- Preservation used, as applicable.
- Associated QA/QC samples.
- Physical field measurements.
- Signature and date of personnel responsible for observations.

Each sample will be assigned a unique sequential number at the time of sampling, which will be permanently affixed to the sample container with polyethylene tape to prevent the loss of the label during shipment. Further discussion as to sample labeling is provided in SOP 50.1 in **Appendix B**. The sample label will be filled out using indelible ink and will include the following information:

- Project name and number.
- Sample location/site ID.
- Sampling date and time.
- Analyses to be performed.
- Preservative, as applicable.
- Sampler name.

4.6 Packaging and COC Requirements

Environmental samples required for shipment must be packaged appropriately in leak-proof coolers to the laboratory. Appropriate custody procedures and documentation must be performed to ensure sample integrity. The following sections discuss sample packaging, shipment, and custody requirements.

4.6.1 Shipping Coolers

Leak proof sample coolers will be shipped to arrive at the laboratory the morning after sampling (priority overnight). The laboratory will be notified of the sample shipment and the estimated date of arrival of the samples being delivered. Shipping coolers are to be clean, leak proof, contamination-free, and in good condition. These containers will be used to transport environmental samples to the laboratory. Suitable sample cooler(s) to handle sample containers packed with bagged ice will be required for sample shipment.

4.6.2 Temperature Blanks

Temperature blanks are to be provided to Shaw and will be included in each environmental sample shipping container requiring wet ice. Temperature blanks are required for each cooler where samples must meet the USEPA storage requirements of 4 degrees Celsius ($^{\circ}\text{C}$) $\pm 2^{\circ}\text{C}$ during shipment. See **Table 4-3** for sample preservation requirements. These blanks will be used by the laboratory to measure the shipping container internal temperatures at receipt. These samples will not be analyzed for any scoped analysis.

4.6.3 Sample Packaging and Shipment

Samples will be transferred to the contract laboratory for analysis via waterproof plastic coolers. Before samples can be put in the cooler, any drains will be sealed with tape to prevent leaking. Each cooler will be packed in the following manner:

1. Ensure sample lids are tight.
2. Wrap environmental samples and associated QC samples in bubble wrap and place in a watertight plastic bag.
3. Fill cooler with enough packing material to prevent breakage of glass bottles.
4. Place sufficient ice in cooler to maintain the internal temperature at $4\pm 2^{\circ}\text{C}$ during transport. The ice will be double-bagged in sealed bags to prevent contact of the melt water with the samples.
5. Place a temperature blank (if applicable) in cooler.
6. Place associated COCs in a waterproof plastic bag, and tape it to the inside lid of the cooler.
7. Seal coolers at a minimum of two locations with signed custody seals or evidence tape before being transferred off site. Attach completed shipping label and Saturday Delivery label (if applicable) to top of the cooler. Cover seals with wide, clear packing tape, and continue around the cooler to seal the lid. If the cooler has a drain spout, it may also be sealed with clear packing tape.

4.6.4 Chain-of-Custody

Sampling will be evidenced through the completion of a COC form, which accompanies the sample containers in the field, during transit to the laboratory, and upon receipt by the laboratory. The COC will be annotated to indicate time and date that samples are relinquished. In addition, shipping containers will be affixed with custody seals. Further discussion of COC may be found in SOP 10.4 of **Appendix B**. The COC will be filled out using indelible ink and will include the following information:

- Project name and number.
- The signatures of the sampling personnel.
- The site code and sample number.
- Sampling dates, locations, and times (military format).
- List of the chemical analysis, volume, and preservatives used.
- Type of sample, whether “grab” or “composite.”
- The total number of containers per location.
- The custody seal number.
- Sample relinquisher, date and time.
- Any special remarks (e.g., MS/MSD this sample).
- Courier, or carrier airbill number, and analytical laboratory.

4.7 Analytical Procedures and Data Validation

4.7.1 Method Selection for Chemical Analyses

Sample collection will be performed in accordance with established Shaw SOPs designed to ensure the collection of representative samples. Shaw SOPs may be found in **Appendix B**. An USACE-approved laboratory (i.e., National Environmental Laboratory Accreditation Conference Accredited) will perform the analytical sample analysis. All laboratory analytical methods will be performed in accordance with USEPA protocols and methods. Shaw will have the laboratory data validated according to the QAPP requirements, DoD QSM requirements, the analytical method, and laboratory SOPs. Data validation qualifiers will be consistent with the *USEPA Region III Modifications to the National Functional Guidelines for Organic Data Review* (USEPA, 1994b), *Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (USEPA, 1993), and *USEPA Region III Dioxin/Furan Data Validation Guidance* (USEPA, 1999). The analysis methods, analytical compound lists, and quantitation limits (QLs) are provided in **Table 4-2**.

Analytical QLs were compared to screening levels to ensure that they do not exceed the screening levels listed in **Table 4-2**. During the planning stage, the QLs are used for comparison rather than method reporting limits (MRLs) or method detection limits (MDLs) because MRLs are sample specific and take into account characteristics such as dilutions, sample volumes, and percent moistures which are unknown prior to sampling and analysis. The laboratory will be required to perform and report MDLs for each sample and analysis. These limits are specific to the laboratory, instrumentation, and methodology and are updated at least annually. The MDLs represent the lowest level the laboratory can detect a constituent at a 99% confidence for a specific compound. If a compound is detected >MDL and <MRL, it will be treated as estimated and flagged with a “J.”

Economical, technical, comparability, and sensitivity factors were considered during the method selection process for this IM. The MRLs and MDLs will be compared to screening levels during the data analysis stage in the IM.

4.7.2 XRF Metals Analysis

Soil samples will be screened for lead using dispersive XRF technology following USEPA SW-846 Method 6200. With this technology, a sealed source of radiation is directed at the sample. The radiation excites the metals atoms in the sample, causing the emission of electrons in the form of photoelectrons. The atoms are thus converted into ions. To restore the atoms to a more stable state, electrons move to fill the empty electron orbitals. This movement causes an energy emission in the form of a secondary x-ray photon, which is referred to as fluorescence. Each element has a characteristic x-ray response, or wavelength, that is recorded by the instrument. The instrument identifies the specific element by the wavelength received. The amount, or concentration, of the element in the sample is determined by the number of the fluorescent x-rays. The instrument is calibrated prior to any measurements following manufacture specified guidelines.

4.7.2.1 Confirmation Metals Analysis

Confirmation samples will be collected for soil matrices and sent to the off-site laboratory following the metals method outlined below in *Section 4.7.3*. They will be collected at a ten percent frequency from representative locations following XRF screening analysis. The

confirmation samples will be analyzed for lead to assess the accuracy of the XRF analysis and for arsenic and vanadium to ensure that these COIs are within the footprint of the elevated lead. Half of the confirmation samples (5% of the total number of samples) will also be analyzed for dioxins/furans to confirm that the extent of dioxins/furans is within the footprint of the lead.

4.7.2.2 XRF Spectrometer Calibration

The XRF Spectrometer is calibrated prior to arrival of the site by the manufacturer. The manufacturer-specified background (scatter) and internal self-calibration checks using the supplied materials are performed. The XRF unit self-calibration will be verified daily prior and end of use with a NIST certified standard as well as with a silicon oxide sand blank. The XRF Calibration Log should be completed daily to record the date, time, sample number, and standardization reading. If the system fails the internal calibration criteria check, clean the window and repeat. Do not use an instrument that fails internal calibration criteria. Contact the manufacturer if the instrument does not pass calibration. Measurements will be documented in the field logbook or on a separate calibration log form by the field personnel performing the calibration. Further details pertaining to the screening for metals via XRF spectrometry may be found in SOP 30.13, Screening for Metals via XRF Spectrometry, contained in **Appendix B** of this IMWP.

4.7.3 Laboratory Procedures for Chemical Analyses

Analytical testing will be performed by the contracted USACE-approved laboratory. The methods listed for the SWMU 39 IM are in accordance with *USEPA Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IIIB* (USEPA, 2004) and *USEPA Methods for Chemical Analysis of Water and Wastes* (USEPA, 1983). The LQAP for the subcontracted analytical laboratory for the SWMU 39 IM is presented as **Appendix C**. Analytical compound lists and minimum QLs to be used are given in **Table 4-2**. The QC requirements may be found in **Tables 4-5 through 4-9**. The delineation and confirmation analysis is being performed for the arsenic, lead, vanadium, and dioxin/furan contamination at SWMU 39. The waste characterization analysis includes the IDM for disposal and the characterization of the borrow material and top soil.

4.7.3.1 Laboratory Calibration

Prior to sample analysis, chemical calibration of each target analyte/compound must be performed to ensure analytical instrumentation is functioning within the established sensitivity range. Laboratory calibration steps include the performing of solution validation, initial calibration, daily calibration, and continuing calibration procedures. Protocols defining the QC procedures, rounding rules, corrective actions, and QC measurements for instrument calibration should be done in accordance with criteria specified in the analytical method, LQAP, and the prime contractor's SOPs. The units and method QLs for the analytical methods to be used are found in **Table 4-2**. The QA/QC method calibration requirements may be found in **Tables 4-5 through 4-9**. Further details as to laboratory calibrations and equipment use may be found in the laboratory's LQAP located in **Appendix C**.

Table 4-5
Quality Control Method Criteria for Polynuclear Aromatic Hydrocarbons by SW-846 8270C SIM

Procedure	Frequency	Acceptance Criteria			Corrective Action
Initial calibration curve (5-pt curve)	Set-up, major maintenance	RRF > 0.05 for every target compound; RSD ≤30% for CCC compounds. RSD ≤15% for the other target compounds. If linear regression is used $r \leq 0.995$; Second Source: ±25%			Must meet criteria prior to sample analysis. Data reviewer should review and judge the target compounds against the acceptance criteria.
Continuing calibration standard	Daily, before analysis & every 12 hours	RRF > 0.05 for every target compound. The percent difference must be ≤20% for response factors from initial calibration.			If criteria are not met, reanalyze the daily standard. If daily standard fails a 2 nd time, cal must be repeated. Reviewer should review and judge the compounds against the acceptance criteria.
Internal standards	Every sample	Retention time ±30 seconds of last CC Area changes by a factor of two (-50% to +100%)			Inspect for malfunction. Demonstrate that system is functioning properly. Reanalyze samples with standards outside criteria.
Tuning DFTPP	12 hours	Must meet tuning criteria.			Re-tune, re-calibrate.
Method blanks	Per extraction batch	<½ MRL; <MRL for common laboratory contaminants.			Document source of contamination.
LCS	Every batch	<u>Standards</u> Every target compound (see Table 4-2 for list)	<u>Aqueous</u> Every target compound (see Table 4-2 for list)	<u>Solids</u> Every target compound (see Table 4-2 for list)	Qualify associated data biased high or biased low as appropriate.
Surrogate spikes	Every sample	<u>Standards</u> nitrobenzene-d5 2-fluorobiphenyl p-terphenyl-d14 phenol-d5 2-fluoropropenol-d6 2,4,6-tribromophenol 2-chlorophenol 1,2-dichlorobenzene	<u>Aqueous</u> (%Rec.) 45–135% 45–135% 45–135% 35–140% 35–140% 35–140% 35–140% 45–135%	<u>Solid</u> (%Rec.) 45–135% 45–135% 45–135% 35–140% 35–140% 35–140% 35–140% 45–135%	If two base/neutral or acid surrogates are out of specification, or if one base/neutral or acid extractable surrogate has a recovery of less than 10%, then there should be a re-analysis to confirm that the non-compliance is due to sample matrix effects rather than laboratory deficiencies.
Matrix spike and duplicate	1 per 20 samples per matrix	<u>Standards</u> Every target compound (see Table 4-2 for list)	<u>Aqueous</u> Every target compound (see Table 4-2 for list)	<u>Solids</u> Every target compound (see Table 4-2 for list)	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to identify whether the problem is specific to the QC samples or systematic.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DOD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DOD, 2006).

DFTPP = Decafluorotriphenylphosphine

LCS = Laboratory Control Sample

MS/MSD = Matrix Spike/ Matrix Spike Duplicate

QC = Quality Control

RRF = Relative Retention Times

RSD = Relative Standard Deviation

Table 4-6
Quality Control Method Criteria for Metals by SW-846 6010B/7470A/7471A

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve (5-pt curve Hg) (1-pt curve low level ICP)	Daily or major maintenance, instrument modification, replacement of the torch, replacement of the mirror	$r > 0.995$ for each element r: linear correlation coefficient Low level check std. $\pm 20\%$ recovery Second Source = ICV = 90-110% recovery If MSA performed, $r > 0.995$	If $r < 0.995$ for an element, the standards for that element must be prepared again and/or the lower/upper range standard must be used.
Continuing calibration verification (CCV)	Every 10 samples or 2 per 8 hr and end of run.	Recovery $\pm 10\%$ of true value for ICP Recovery $\pm 20\%$ of true value for Hg	Reanalyze CCV. If the CCV fails second time, the analysis must be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified prior to continuing sample analyses.
Highest mixed standard	Before sample analysis	Recovery $\pm 5\%$ of true value for ICP Not applicable for Hg	If criteria are not met, reanalyze the daily standards. If the daily standard fails a second time, initial calibration must be repeated.
Interference check standard (ICS)	Beginning and end of each sample analytical run or 2 per 8 hr.	ICS-A: $< 2 \times \text{MDL}$ ICS-AB: Recovery $\pm 20\%$ of true value for ICP Not applicable for Hg	Terminate the analysis, correct the problem, re-calibrate, re-verify the calibration, and reanalyze the samples.
Initial and continuing calibration blank (ICB/CCB)	Every 10 samples, end of analytical run	$< 2 \times \text{MDL}$	If the average is not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze each sample analyzed since the last acceptable CCB.
Serial Dilution (ICP)	1 per 20 samples per matrix for samples $> 10 \times$ Instrument Detection Limit	Difference between diluted and undiluted sample $< 10\%$ for ICP Not applicable for Hg	Chemical or physical interference should be suspected. Investigate to identify cause.
Preparation/method blank	1 per batch per matrix	$< \frac{1}{2} \text{ MRL}$	Documented source of contamination.
Laboratory Control Sample	1 per 20 samples	80-120% (See Table 4-2 for list)	Qualify associated data biased high or biased low as appropriate.
Matrix spike and duplicate and sample duplicate	1 per 20 samples per matrix	$80\% \leq \% \text{Rec.} \leq 120\%$; $\% \text{RPD} < 20\%$; If spike(s) outside of limits, analyze PDS. PDS limits are 75–125% for 6010B $80\% \leq \% \text{Rec.} \leq 120\%$; $\% \text{RPD} < 20\%$ for 7000 methods. PDS limits are 85–115% for 7000 methods. (See Table 4-2 for List)	If matrix spike recovery does not meet criteria (except Ag), a post digestion spike is required for each method except Graphite Furnace Atomic Adsorption. Qualify results in accordance with USEPA criteria.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DOD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DOD, 2006).

CCB = Continuing Calibration Blank
CCV = Continuing Calibration Verification
Hg = Mercury
ICB = Initial Calibration Blank
ICP = Inductively Coupled Plasma
ICS = Interference Check Standard

ICV = Initial Calibration Verification
MDL = Method Detection Limit
MRL = Method Reporting Limit
RPD = Relative Percent Difference
USEPA = U.S. Environmental Protection Agency

Table 4-7
Quality Control Method Criteria for Dioxins/Furans by SW-846 8290

Procedure	Frequency	Acceptance Criteria			Corrective Action
Initial calibration curve (5-pt curve)	Set-up, major maintenance	%RSD $\pm 20\%$ for standard compounds, %RSD $\pm 30\%$ for reference compounds. Isotopic ratio must be within the established control limits. The signal to noise ratio must be ≥ 2.5 for each selected ion current profile. The signal to noise ratio $\geq 10\%$ for all target ions. Ion abundance ratios must be within the specified control limits in Table 8 (SW846 Method 8290).			Must meet criteria prior to sample analysis. Data reviewer should review and judge all of the target compounds against the acceptance criteria.
Continuing calibration standard	12 hours	The signal signal-to-noise ratio (S/N) must be at least 10:1 for each selected ion current profile (SICP) and for each GC signal representing the elution of a target analyte or labeled standard for each analyte. The relative response factor of each analyte for the unlabeled standard must be within $\pm 20\%$ of the average RF obtained from the initial calibration, and the RRF of each labeled standard must be within $\pm 30\%$ of the average RRF established during initial calibration. This is expressed in term of percent difference %D. Ion abundance ratios must be within the specified control limits in Table 8 (SW846 Method 8290).			If criteria are not met, reanalyze the daily standard. If the daily standard fails a second time, calibration must be repeated. Data reviewer should review and judge all of the target compounds against the acceptance criteria.
Internal standards	Every sample	Retention time ± 30 seconds of last CC Area changes by a factor of two (-50% to $+100\%$)			Inspect for malfunction. Demonstrate that system is functioning properly. Reanalyze samples with standards outside criteria.
Tuning PFK	12 hours	Must meet tuning criteria with resolving power of ≥ 10000 .			Re-tune, re-calibrate.
Method blanks	Per extraction batch	$< \frac{1}{2}$ MRL; $<$ MRL for common laboratory contaminants (OCDD, OCDF).			Document source of contamination.
LCS	Every batch	Recoveries of the isotopically-labeled extraction standards to fall within 40-135% control limits for the tetra- through octachlorinated congeners; Recoveries (accuracy) of the unlabeled compounds should be within $+35\%$ when spiked at the method quantitation limit and within $+30\%$ when spiked above 20 times the method quantitation limit; When duplicate OPR are required, the relative percent difference (RPD) of the unlabeled analytes concentrations should be within 30% when spiked at the method quantitation limit and within $+25\%$ when spiked above 20 times the method quantitation limit .See Table 4-2 for list of congeners.			Qualify associated data biased high or biased low as appropriate.
Internal Standards (IS) Recovery Standard Solutions	Every sample	Recoveries of the isotopically-labeled recovery standards: 40-135% or as lab specified QC limits.			Investigate to determine cause and document actions taken; data are acceptable.
Cleanup Standards	Every sample	40-135% or as lab specified QC limits.			Investigate to determine cause and document actions taken; data are acceptable.
Matrix spike and duplicate	1 per 20 samples per matrix	Standards 40-135%; RPD $\leq 20\%$ Every target compound (see Table 4-2 for list)	Aqueous 40-135%; RPD $\leq 20\%$ Every target compound (see Table 4-2 for list)	Solids 40-135%; RPD $\leq 20\%$ Every target compound (see Table 4-2 for list)	If MS/MSD results do not meet criteria, the reviewer should review the data in conjunction with other QC results to determine if the problem is specific to the QC samples or systematic.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DOD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DOD, 2006).

Table 4-7, Continued
Quality Control Method Criteria for Dioxins/Furans by SW-846 8290

GC = Gas Chromatograph
IS = Internal Standards
LCS = Laboratory Control Sample
MRL = Method Reporting Limit
MS/MSD = Matrix Spike/ Matrix Spike Duplicate
QC = Quality Control
RPD = Relative Percent Difference
RRF = Relative Retention Time
RSD = Relative Standard Deviation
S/N = Signal-to-noise ratio
SICP = Selected Ion Current Profile

Table 4-8
Quality Control Method Criteria for Pesticides and PCBs by SW-846 8081A/8082

Procedure	Frequency of QC Procedure	Acceptance Criteria			Corrective Action
Initial calibration curve Single/multi-component (5pt)	Set-up, major maintenance	%RSD < 20% of the response factor from the initial curve. Lab may use first or higher order regression fit ($r \geq 0.995$) if %RSD > 20%. Second Source = $\pm 20\%$ ICV %Rec. = 80-120%			Must meet criteria prior to sample analysis.
Continuing calibration standard	12 hours or every 20 samples	%D recovery $\pm 20\%$ of the response factor from the initial curve for every single peak compound.			If criteria are not met, reanalyze the daily standard. If the daily standard fails a second time, initial calibration must be repeated.
Independent reference standard (LCS)	Per batch	<u>Standards</u> Every target compound (see Table 4-2)	<u>Aqueous</u> Every target compound (see Table 4-2 for list)	<u>Solids</u> Every target compound (see Table 4-2 for list)	Initiate investigation and document actions taken.
Endrin/4,4-DDT Breakdown	Per batch	endrin/4,4-DDT degradation $\leq 15\%$. combined endrin/4,4-DDT degradation $\leq 30\%$.			If criterion is not met, system must be deactivated and the affected sample reanalyzed if endrin or 4,4-DDT or their degradation products are detected in the samples.
Instrument blank	12 hours, after analytical run and highly contaminated samples.	< $\frac{1}{2}$ MRL			Demonstrated "clean." Affected sample will be reanalyzed.
Method blanks	Per extraction batch	< $\frac{1}{2}$ MRL			Document source of contamination.
Surrogate spikes	Every sample	<u>Surrogate</u> Decachlorobiphenyl 2,4,5,6-Tetrachloro m-xylene	<u>Aqueous %Rec.</u> Pests: 30-135 PCBs: 40-135 Pests: 25-140	<u>Solid %Rec.</u> Pests: 55-130 PCBs: 60-125 Pests: 70-125	Investigate to assess cause, correct the problem, and document actions taken; re-extract and re-analyze sample. If still out, qualify.
Matrix spike and duplicate	1 per 20 samples per matrix	<u>Standards</u> Every target compound (see Table 4-2 for list)	<u>Aqueous</u> Every target compound (see Table 4-2 for list)	<u>Solids</u> Every target compound (see Table 4-2 for list)	Data reviewer may use the MS and MSD results in conjunction with other QC sample results to assess the need for some qualification of the data. Specific method cleanups may be used to eliminate or minimize sample matrix effects.
Target Analyte Confirmation	Every detect	RPD $\leq 40\%$			Qualify data as appropriate.

Ref: USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods, Update IIIB (USEPA, 2004) and DOD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DOD, 2006).

LCS = Laboratory Control Sample
MRL = Method Reporting limit
MS = Matrix Spike
MSD = Matrix Spike Duplicate
QC = Quality Control
RPD = Relative Percent Difference
RSD = Relative Standard Deviation

Table 4-9
Quality Control Method Criteria for Chemical Oxygen Demand by USEPA Methods
for Chemical Analysis of Water and Wastes 410.4

Procedure	Frequency of QC Procedure	Acceptance Criteria	Corrective Action
Initial calibration curve 5-pt curve	Major maintenance, instrument modification, per manufacturer's specifications	$r \geq 0.995$ r: linear correlation coefficient Predicted response within $\pm 10\%$	If outside criteria, the standards must be prepared again.
Initial calibration standard (calibration verification)	1 per batch	Recovery $\pm 10\%$ of true value.	If criteria are not met, reanalyze the daily standards. If the daily standard fails a second time, initial calibration must be repeated.
Continuing calibration verification (CCV)	Every 10 samples, end of analytical run	Recovery $\pm 10\%$ of true value.	Reanalyze CCV. If the CCV fails second time, the analysis must be terminated, the problem corrected, the instrument re-calibrated, and the calibration re-verified prior to continuing sample analyses.
Continuing calibration blank (CCB)	Every 10 samples, end of analytical run	$< \frac{1}{2}$ MRL	If not within criteria, terminate the analysis, correct the problem, re-calibrate, and reanalyze each sample analyzed since the last acceptable CCB.
Preparation Reagent blank	1 per 20 samples or batch per matrix	$< \frac{1}{2}$ MRL	Documented source of contamination.
Laboratory Control Sample	1 per 20 samples per matrix	$75\% \leq \% \text{Rec.} \leq 125\%$ or ± 3 standard deviations of the mean from historical data points.	Qualify associated data biased high or biased low as appropriate.
Matrix spike and duplicate	1 per 10 samples per batch, per matrix	$75\% \leq \% \text{Rec.} \leq 125\%$ or ± 3 standard deviations of the mean from historical data points.	If matrix spike recovery does not meet criteria, qualify results in accordance with Regional criteria.

Ref: USEPA Methods for the Chemical Analysis of Water and Wastes (USEPA, 1983) and DOD Quality Systems Manual for Environmental Laboratories, Final Version 3 (DOD, 2006).

CCV = Continuing Calibration Verification

CCB = Continuing Calibration Blank

MRL = Method Reporting Limit

4.7.3.2 Laboratory Calibration

Prior to sample analysis, chemical calibration of each target analyte/compound must be performed to ensure analytical instrumentation is functioning within the established sensitivity range. Laboratory calibration steps include the performing of solution validation, initial calibration, daily calibration, and continuing calibration procedures. Protocols defining the QC procedures, rounding rules, corrective actions, and QC measurements for instrument calibration should be done in accordance with criteria specified in the analytical method, LQAP, and the prime contractor's SOPs. The units and method QLs for the analytical methods to be used are found in **Table 4-2**. The QA/QC method calibration requirements may be found in **Tables 4-5 through 4-9**. Further details as to laboratory calibrations and equipment use may be found in the laboratory's LQAP located in **Appendix C**.

4.7.3.3 Chemical Analyses for Delineation and Confirmation Samples

Arsenic, Lead, and Vanadium. Arsenic, lead, and vanadium will be analyzed using Inductively Coupled Plasma (ICP) techniques using USEPA SW-846 Methods 3010A/6010B for aqueous samples (e.g., rinse blanks) and 3050B/6010B for solid samples. The ICP method involves the simultaneous or sequential multi-element assessment of trace elements in solution. The basis of the method is the measurement of atomic emission by optical spectrometry. Samples are nebulized and the aerosol that was produced was transported to the plasma torch where excitation occurs. Characteristic atomic-line emission spectra are produced by a radio-frequency ICP. A background correction technique is utilized to compensate for variable background contribution for the assessment of trace elements.

Dioxins/Furans. Samples will be analyzed for dioxins/furans using USEPA SW-846 Method 8290 using high-resolution gas chromatography and high-resolution mass spectrometry (HRGC/HRMS) techniques. This method is specific for the analysis of 2,3,7,8-tetrachlorinated dibenzofuran, substituted penta-, hexa-, hepta- and octachlorinated dibenzo-p-dioxins and dibenzofurans in water and soil media. Samples are extracted in organic solvent methylene chloride or toluene. The extracts are injected into a high-resolution gas chromatograph programmed to separate the compounds, which are then detected with a high-resolution mass spectrometer. The HRGC/HRMS instrument is calibrated for a series of target analytes using chemical standards of known concentration and purity. Quantification of these target analytes is performed against specific internal standards as identified in the respective method. Identification of these target analytes is based on a comparison of the analyte to the chemical standards used during calibration based on the analyte's retention time and mass spectra.

4.7.3.4 Chemical Analyses for Waste Characterization Samples

TCLP Metals. Samples for disposal analysis for TCLP metals will undergo a TCLP extraction by USEPA SW-846 Method 1311. Samples are separated by phase, particle size reduced (for solids), and extracted for 18 hours in an extraction fluid. The final liquid extract is separated from the solid material and combined with the initial liquid phase (if applicable). The sample TCLP extract is then treated as an aqueous sample for analysis of metals following the analytical procedures as noted below.

TAL Metals (excluding mercury). TAL metals (excluding mercury) will be analyzed using ICP techniques using USEPA SW-846 Methods 3010A/6010B for aqueous samples (e.g., rinse blanks) and 3050B/6010B for solid samples. The ICP method involves the simultaneous or

sequential multi-element assessment of trace elements in solution. The basis of the method is the measurement of atomic emission by optical spectrometry. Samples are nebulized and the aerosol that is produced is transported to the plasma torch where excitation occurs. Characteristic atomic-line emission spectra are produced by a radio-frequency ICP. A background correction technique is utilized to compensate for variable background contribution for the assessment of trace elements.

Mercury. Mercury will be analyzed using cold vapor atomic absorption technique according to USEPA SW-846 Method 7470A for aqueous samples and Method 7471A for solid samples. A sample aliquot is initially digested with nitric acid to free combined mercury. The mercury is then reduced to its elemental state and aerated from the solution into a closed system. The mercury vapor is passed through a cell positioned in the path of the mercury light source and the measured abundance is proportional to the concentration of mercury in the sample.

Chemical Oxygen Demand. COD will be analyzed using *USEPA Methods for Chemical Analysis of Water and Wastes* Method 410.4 (USEPA, 1983). A sample is heated under acidic conditions at a slow, constant rate in an oven or block digester in the presence of dichromate at 150°C for 2 hours. The COD is measured at 600 nanometers spectrophotometrically.

pH and Corrosivity as pH. pH and corrosivity as pH will be analyzed using USEPA SW-846 Method 9040C for aqueous samples and Method 9045D for solid samples. A sample pH is directly measured electrometrically using either a glass electrode in combination with a reference potential or a combination electrode. For solids, samples are mixed 1:1 with reagent water prior to measurement.

Reactivity. Reactivity comprises of reactive sulfide and reactive cyanide. Reactive sulfide is analyzed in aqueous and solid samples using USEPA SW-846 Method Chapter 7.3.4. This procedure is a colorimetric determination. Sulfide reacts with dimethyl-p-phenylenediamine in the presence of ferric chloride to produce methylene blue. Reactive cyanide is analyzed in aqueous and solid samples using USEPA SW-846 Method Chapter 7.3.3.

Ignitability. Ignitability is analyzed using USEPA SW-846 Method 1010A for aqueous samples and USEPA SW-846 Method 1030 for solid samples. A sample is heated at a slow, constant rate with continual stirring. A small flame is directed into the cup at regular intervals with simultaneous interruption of stirring. The flash point is the lowest temperature at which application of the test flame ignited the vapor above the sample.

PAHs. Samples will be analyzed for PAHs using USEPA SW-846 Method 8270C selective ion monitoring (SIM) procedures. The use of USEPA SW-846 Method 8270C SIM is employed for PAH analysis to achieve lower quantitation and detection limits in order to meet screening criteria. Gas Chromatography/Mass Spectroscopy (GC/MS) methodology also provides a confirmatory MS step. Solid samples will be extracted using soxhlet according to USEPA SW-846 Method 3540C and aqueous samples will be extracted using a continuous liquid-liquid extraction technique according to USEPA SW-846 Method 3520C. The extract is injected into a gas chromatograph programmed to separate the compounds, which are then detected with a mass spectrometer. The GC/MS instrument is calibrated for a series of target analytes using chemical standards of known concentration and purity. Quantification of these target analytes is performed against specific internal standards as identified in the respective method. Identification of these target analytes is based on a comparison of the analyte to the chemical standards used during calibration based on the analyte's retention time and mass spectra.

TCL Pesticides/PCBs. Samples will be analyzed for TCL pesticides and PCBs using USEPA SW-846 Methods 8081A and 8082, respectively. Aqueous and solid samples will be prepared for analysis using extraction techniques. Solid samples will be extracted using soxhlet method USEPA SW-846 Method 3540C for samples. Aqueous samples will be extracted using a continuous liquid-liquid extraction technique by USEPA SW-846 Method 3520C. The extract will be injected into a gas chromatograph programmed to separate the compounds, which are then detected with an electron capture detector. Sulfur cleanups will be employed to aid in the quantification based upon the matrix interferences. Sample concentrations are confirmed on dissimilar columns. Identification of these target analytes is based on a comparison of the analyte to the chemical standards used during calibration based on the analyte's retention time using primary and secondary columns.

4.7.4 Data Validation for Chemical Analyses

Data validation is the process whereby data are determined to be of acceptable or unacceptable quality based on a set of predefined criteria by Shaw. These criteria depend upon the type(s) of data involved and the purpose for which data are collected. Data packages will be validated to ensure project compliance with specified analytical, QA, and data reduction procedures; data reporting requirements; and required accuracy, precision, and completeness criteria. USEPA Level IV Contract Laboratory Program-like raw data will be provided for the full data validation samples. All parameters of interest for the post-excavation soil confirmation samples and borrow-top soil samples will be validated for the IM. Validation for organic data will be performed at USEPA Region III level M3 and for inorganic data will be performed at USEPA Region III level IM2. The waste characterization sample data and delineation soil sample data will not require the full USEPA Region III data validation. The Project Chemist will oversee the performance of data validation functions. Specific validation levels may be found in the DQO tables in *Section 4.3* of this QAPP. Data validation results will be reported with the final findings. Data will be validated using a combination of the following criteria:

- Project-specific Work Plan and/or QAPP criteria.
- Master Quality Assurance Plan (*Section 9.5*) requirements.
- DoD QSM (DoD, 2006).
- Method-specific criteria following *USEPA Office of Solid Waste and Emergency Response Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), Update IIIB* (USEPA, 2004b) and *USEPA Method for Chemical Analysis of Water and Wastes*, March 1983.
- Subcontract Laboratory SOPs.

Table 4-10 presents the laboratory and data validation qualifiers to be used for IM and are applied as appropriate. The laboratory qualifiers are as per DoD QSM and the data validation qualifiers are consistent with the following USEPA guidance:

- *USEPA Region III Modifications to the National Functional Guidelines for Organic Data Review Multi-media, Multi-concentration* (USEPA, 1994b).
- *USEPA Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (USEPA, 1993).
- *USEPA Region III Dioxin/Furan Data Validation Guidance* (USEPA, 1999).

Table 4-10
Laboratory and Data Validation Qualifiers

Qualifier	Definition
Laboratory Qualifiers¹	
U	Undetected at the limit of detection: The associated data value is the limit of detection, adjusted by any dilution factor used in the analysis.
J	Estimated: The analyte was positively identified; the quantitation is an estimation.
B	Blank contamination: The analyte was detected above one-half the reporting limit in an associated blank.
N	Nontarget analyte: The analyte is a tentatively identified compound (using mass spectroscopy).
Q	One or more QC criteria failed.
USEPA Region III Data Validation Qualifiers²	
U	Not detected. The associated number indicates the compound reporting limit for the sample.
B	The analyte has been detected in the sample and the associated laboratory or field blank.
J	Indicates an estimated value for 1) estimated value due to QC non-conformance. Reported value may not be accurate or precise, 2) estimating a concentration as a tentatively identified compound as indicated by the mass spectral and retention time data, or 3) estimating a concentration $\geq$ MDL and $<$ MRL or $<3*$ MDL, whichever is greater.
K	Analyte present. Reported value may be biased high (estimated) due to QC non-conformance.
L	Analyte present. Reported value may be biased low (estimated) due to QC non-conformance.
UL	Value is estimated bias low and not detected due to QC non-conformance. Reporting limit may be inaccurate or imprecise. Quantitation limit is probably higher.
UJ	The analyte was analyzed for, but was not detected above the reported sample quantitation limit. The reported quantitation limit is approximate and may be inaccurate or imprecise.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a “tentative identification.”
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
R	The data are unusable. The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meeting the QC criteria. The analyte may or may not be present in the sample.

¹ The noted laboratory qualifiers are a minimum. If a laboratory has more and they are consistent with DoD and properly defined, the laboratory may use them. Data qualifiers may be combined when appropriate. Ref.: *DoD Quality Systems Manual for Environmental Laboratories, Final Version 3* (DoD, 2006).

² The USEPA data validation qualifiers are referenced from *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA, September 1994), *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (USEPA, April 1993) and *USEPA Region III Dioxin/Furan Data Validation Guidance* (USEPA, March 1999).

Shaw will direct the overall data management. Data activity for the sampling program will be divided between Shaw and the subcontract laboratory. Each firm has the equipment needed to perform the required data management functions. The laboratory will perform data entry and manipulation operations associated with the analysis of raw analytical data and provisions of chemical analysis results by sampling location. These data will be transmitted to Shaw for evaluation and interpretation. Data generated will be assessed for accuracy, precision, comparability, representativeness, completeness, and sensitivity.

5.0 ENVIRONMENTAL PROTECTION PLAN

This section was developed to address environmental considerations during the performance of IM at SWMU 39. The objective of this section is to provide adequate procedures to safeguard the environmental condition of RFAAP property in and around disturbed areas, and to mitigate and/or minimize the environmental impact of IM.

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants.

For the soil removal action at SWMU 39, the Site Superintendent will coordinate all land resource management, waste management, pollution control, and abatement activities, and ensure compliance with the Environmental Protection Plan by all subcontractors.

5.1 Applicable Regulations

Shaw will follow all applicable regulations and obtain all necessary permits concerning environmental protection, pollution control, and abatement necessary for the proposed field operations. Applicable regulations include, but are not limited to:

- Fish and Wildlife Coordination Act (16 USC 661).
- Migratory Bird Treaty Act (16 USC 703).
- Endangered Species Act (16 USC 1531, 50 CFR 402).
- Hazardous Materials Transportation Act (49 USC 1801-1812).
- Noise Pollution and Abatement Act (42 USC 4901).
- Land Disposal Restrictions (40 CFR 268).
- Erosion and Sediment Control (4 VAC 50-30-40).
- Stormwater Management (9 VAC 25-690).
- Visible Emissions and Fugitive Dust/Emissions (9 VAC 5-50).
- Virginia Air Quality Standards (9 VAC 5-50 and 9 VAC 5-30).

5.2 Pre-Construction Survey of Existing Conditions

A survey of environmental conditions will be performed prior to performance of IM actions. This survey will include written records and photographs. Specifically, the status of the trees, roadways, utilities, and other site characteristics will be documented to establish a pre-IM record of initial site conditions. This survey record will be used to restore the site to as close to pre-IM conditions as possible, where applicable, as well as document pre-existing conditions for contractor liability purposes.

5.3 Previously Used Equipment

All previously used equipment shall be cleaned before it is brought into a new work area, ensuring that soil residuals are removed and that egg deposits from pests are not present.

5.4 Protection of Land Resources

Removal activities will be confined to areas defined in the Organization and Technical Approach Plan, *Section 2.0*. Prior to the start of removal activities, Shaw will identify the land resources to be preserved within the work areas. Except for those areas indicated in *Section 2.0*, Shaw will not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission from ATK and the RFAAP Environmental Office. No ropes, cables, or guys will be fastened to or attached to any trees for anchorage unless authorized. When such use is permitted, Shaw will provide protection for land and vegetation resources. Stone, earth, or other material displaced into uncleared areas will be removed.

5.4.1 Work Area Limits/Traffic Control

Prior to start of removal actions, Shaw will mark any areas that need not be disturbed. Isolated areas within the general work area, which are to be saved and protected, shall also be marked or fenced. Shaw personnel and subcontractors will be informed of the purpose for marking and/or protecting particular objects.

Outside of designated work areas, all personnel and subcontractor equipment and vehicles will remain on established or paved roadways in order to prevent damage of manicured lawns and green spaces as well as to limit the amount of mud transported onto base and public roadways.

5.4.2 Landscape

Trees, shrubs, vines, grasses, land forms, and other landscape features to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved technique.

5.4.3 Unprotected Erodible Soils

All earthwork will be completed as planned. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in cases where the constructed feature obscures waste material areas, these areas will not initially be totally cleared. Clearing of such areas will progress in reasonably sized increments, as needed.

5.4.4 Disturbed Areas

Erosion and sedimentation control will be effectively implemented through control of surface runoff and installation of erosion and sedimentation control devices, as needed. Runoff from the removal site or from storms shall be controlled, retarded, and diverted to protected drainage courses by means of diversion ditches, benches, berms, or other structure. Temporary erosion and sedimentation control features will be installed as needed. A detailed E&SCP is provided as *Section 6.0* to this IMWP.

5.4.5 Staging and Work Areas

Staging areas will be located as designated in the Organization and Technical Approach Plan, *Section 2.0*. Relocation of areas will be made with approval from ATK and the RFAAP Environmental Office.

5.5 Water Resources

Removal activities will be managed and controlled to avoid pollution of surface water and groundwater. Toxic or hazardous chemicals will not be applied to soil or vegetation as part of IM actions. The management of erosion and sedimentation is presented in the E&SCP, *Section 6.0*.

5.5.1 Wastewaters

Wastewater will be generated from decontamination operations including general equipment decontamination. Wastewater will be collected in storage tanks or drums. Sampling and analysis will be performed to determine the proper disposal requirements for the wastewater.

5.5.2 Diversion Operations

Removal operations involving dewatering activities will be controlled at all times to limit the impact of water turbidity on the habitat for wildlife and on water quality for downstream use.

5.5.3 Fish and Wildlife

Interferences with, disturbances to, and damage of fish and wildlife will be minimized during removal actions. No federally listed, or proposed endangered, or threatened species are known to exist in this area at RFAAP.

5.6 Air Resources

Dust particles generated from removal activities will be controlled at all times. Excavations, haul roads, work sites, and other areas will be maintained so as not to cause air pollution standards to be exceeded or which would cause a hazard or nuisance. Water sprinkling or other methods will be used to control particulates in the work areas as work proceeds and whenever a hazard or nuisance occurs. The performance of air monitoring during removal action work is described in the SSHP, *Section 8.0*.

Hydrocarbons and carbon monoxide emissions from equipment will be controlled to federal and state allowable limits.

5.7 Noise

Removal actions will be managed and controlled to minimize environment damage by noise.

5.8 Waste Disposal

Waste handling, transportation, and disposal will be performed in accordance with the WTDP, *Section 7.0*, and as specified below.

5.8.1 Solid Wastes

Solid wastes will be direct loaded in dump trucks and transported off site for disposal. Handling and disposal will be conducted to prevent contamination. Segregation measures will be employed so that no hazardous or toxic waste will become co-mingled with solid waste. Solid

waste generated as part of IM actions will be transported off site and disposed in compliance with federal, state, and local requirements.

5.8.2 Chemical Wastes

Chemicals shall be dispensed ensuring no spillage to the ground. Periodic inspections of dispensing areas to identify leakage and initiate corrective action will be performed and documented. Chemical waste will be collected in corrosion resistant, compatible containers. Collection drums shall be monitored and removed to a staging or storage area when contents are within 6 inches of the top. Waste generated as part of removal actions will be transported off site and disposed of in compliance with federal, state, and local requirements.

5.8.3 Hazardous Waste

Sufficient measures will be taken to prevent spillage of hazardous and toxic materials during dispensing and waste will be collected in suitable, compatible containers. Waste generated as part of removal actions will be transported off site and disposed of in compliance with federal, state, and local requirements. Soil containing leachable arsenic or lead at a concentration greater than the TCLP regulatory level of 5 milligrams per liter will be treated as hazardous waste. It should be noted that vanadium does not have a TCLP regulatory level (40 CFR 261.24). Spills of hazardous or toxic materials will be immediately (within 20 minutes) reported using the spill notification procedures presented in *Section 5.13.5*.

5.9 Burning

No burning is allowed, nor will be conducted, during IM actions.

5.10 Historical, Archaeological, and Cultural Resources

There have not been any historical, archaeological, or cultural resources identified in the SWMU 39 area. If during excavation or other IM activity, any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources will be temporarily suspended. These resources include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such a discovery or find, the USACE RFAAP Project Manager will be immediately notified.

5.11 Post-Removal Cleanup

Following IM actions, all areas used as part of IM activities will be cleaned up.

5.12 Restoration of Landscape Damage

Any landscape features damaged or destroyed outside the limits of the approved work areas during IM activities will be restored.

5.13 Maintenance of Control Pollution Facilities

Permanent and/or temporary pollution control facilities and devices will be maintained for the length of time IM activities create the particular pollutant.

5.14 Training of Personnel

Shaw and subcontractor personnel will be instructed on all phases of this Environmental Protection Plan prior to starting removal work to ensure adequate and continuous environmental pollution control.

5.15 Spill Prevention and Response

The following sections describe the type/amount of potential spills that could occur during removal actions, spill prevention and control measures, spill countermeasures, spill response equipment, and spill notification procedures.

5.15.1 Potential Spill Types

Potential spill types that may occur during the SWMU 39 IM actions include waste liquids (decontamination liquids, excavation water, etc.), waste solids (soils, etc.), and materials brought on site for IM work that contain hazardous constituents.

The only hazardous liquids that will be brought and stored on site for IM actions will be small quantities of gasoline and diesel, motor oil, paints, and solvents. Throughout operations, these materials will be stored and transported in approved containers.

5.15.2 Spill Prevention

- Wastes collected from the IM actions will be properly containerized, stored, treated, and disposed in accordance with applicable federal and state regulations.
- Equipment fueling and/or lubrication will be performed utilizing drip pans to contain any spills which may occur.
- Wastes and/or chemicals will be stored in a manner to prevent contact with stormwater including the use of tarpaulins and/or storage under a roofed structure.
- All storage containers for liquid storage will be certified for aboveground use.
- The storage drums/containers will be inventoried periodically to determine if leakage is occurring and the exterior of the tanks will be examined.
- All transport drivers will be trained in Department of Transportation (DOT) and USEPA spill prevention measures.
- The transport driver will be required to remain on duty and with his truck during filling operations to protect against spills.
- The volume of waste material will be calculated prior to filling drums or containers.
- No pump operations are to continue unless attended constantly.
- Personnel training will be conducted on spill prevention, containment, and retrieval methods at the start of IM work.
- Phone numbers will be posted regarding the report of a spill to the response agencies and the state.

5.15.3 Spill Countermeasures

- Any fuel leakage, oil drips, or hydraulic line rupture that may occur during the operation of trucks, heavy equipment, etc., will be immediately cleaned up.

- Any spill of hazardous materials will be reported through the local spill response system and addressed immediately.
- Emergency containment action will consist of placing adsorbent materials around the site of the spill.
- Accidental spills will be cleaned up immediately. The spilled medium (liquid or solid) will be collected and containerized awaiting waste characterization, transportation, and disposal.

5.15.4 Spill Mitigation Equipment

The following spill mitigation equipment will be available on site for use during the removal actions:

- Drip pans.
- Shovels.
- 55-gallon drums (for containerization).
- Absorbents.
- Personal protective equipment (PPE).

5.15.5 Notification Procedures

If a spill occurs on site, the following notification procedure will be initiated immediately (within 20 minutes max):

1. Steve Kritak, Site Superintendent	(540) 922-3316
2. Rob Davie	(540) 239-4475 (cell)
3. Jerry Redder	(540) 659-7536
-or-	(540) 953-8663 (pager)
4. Jim McKenna	(540) 639-8641
5. RFAAP Security Dispatcher	(540) 639-7323
-or-	(540) 639-7324
-or-	(540) 639-7325
6. Brad Jennings	(540) 639-7417
7. Timothy Leahy, Shaw IM Task Manager	(410) 612-6357
8. Doug Russell, Shaw H&S Manager	(865) 692-3584
9. Jeff Parks, Shaw RFAAP Project Manager	(410) 612-6326
10. Tom Meyer, USACE RFAAP Project Manager	(410) 962-7677

6.0 EROSION AND SEDIMENT CONTROL PLAN

The purpose of this E&SCP is to provide a document that defines the steps which will be taken to minimize and/or eliminate erosion and sedimentation during completion of the SWMU 39 IM. This plan has been developed in accordance with the guidelines provided in 4 VAC 50-30-40, the Virginia Erosion and Sediment Control Regulations. The following five basic principles along with environmental concerns should be considered when developing an E&SCP:

- Plan the development to fit the site – areas of high erosion potential should be left undisturbed whenever possible.
- Expose the smallest practical area of land for the shortest possible time – when soil disturbances occur and the natural vegetation is removed, the extent and duration of exposure should be minimized.
- Apply erosion control as a first line of defense against on-site damage – implementing practices that prevent or minimize erosion on a construction site is called “erosion control.”
- Use sediment control practices as perimeter protection to prevent off-site damage – controls placed along the perimeter of a site to collect eroded sediments must be implemented.
- Implement a thorough maintenance and follow-up operation – a site must have thorough periodic maintenance checks of soil erosion and sediment control practices.

6.1 Plan Approval

According to 4 VAC 50-30-40, an E&SCP is required for approval by VDEQ for all land clearing, grading, or other earth disturbances, with the exception of projects involving less than 1 acre of grading. As discussed below, the SWMU 39 IM are not anticipated to involve grading work greater than or equal to 1 acre; therefore, review and approval of this plan by VDEQ is not required.

6.2 Erosion and Sediment Control Plan

The scope of the SWMU 39 IM was previously described in the Organization and Technical Operations Plan (*Section 2.0*) and includes contaminated soil removal activities. The total area to be disturbed may be 25,212 square feet (approximately 0.6 acres). Further, all land-disturbing activities will be planned and conducted to minimize the size of the area to be exposed at any one time and the length of the time of exposure if additional areas are to be impacted.

Surface water runoff originating upgrate of the exposed areas should be controlled to reduce erosion and sediment loss during the time of exposure. If needed, temporary sump pumps will be used in excavations to control accumulation of standing water. All surface water that contacts exposed contaminated areas will be pumped into storage tanks for subsequent characterization and disposal.

SWMU 39 IM will consist of excavating the area to a depth of up to 6 ft bgs. Determination of whether or not removal will occur will be based on soil delineation samples. If contaminant concentrations in soil exceed the residential RGs, soils will be excavated and direct loaded into trucks and disposed off site.

Excavated areas will be immediately backfilled with clean soil following receipt of confirmation samples indicating removal to below the RG has been achieved. A silt fence will not be required for sediment and erosion control at SWMU 39 as all remedial activities will be occurring within a lagoon. Due to the topography of the site, movement of soil/contamination due to rain events or remediation activities from the site is not anticipated.

6.3 Dust Control

Field operations at SWMU 39 will be conducted in a manner that produces minimal dust and/or air pollution. Dust control measures such as water spray will be utilized if dusty conditions exist.

6.4 Installation and Maintenance of Erosion and Sediment Control Structures

Erosion and sediment control structures shall be installed and maintained according to minimum standards and specifications of 4 VAC 50-30-40. As indicated previously, the following erosion and sediment control standards and specifications are anticipated to be used during remedial activities:

- Vegetative Stabilization – Describes vegetative stabilization methods and materials, and temporary and permanent seeding requirements.
- Erosion Control Matting – Describes use and installation of erosion control matting.
- Tree Protection – Describes applicable conditions for and use of tree protection measures.
- Dust Control – Provides temporary and permanent methods of controlling dust blowing and movement.

Erosion control measures will be established at the beginning of removal action work and maintained during the entire period of work. Erosion control measures will be repaired or replaced as needed.

Erosion and sediment control structures, disturbed areas, and areas used for storage of materials exposed to precipitation shall be inspected every 7 days and within 24 hours of the end of a storm event that has rain accumulation of 0.5 inches or greater. Cleanout or replacement of structures will be performed immediately to prevent sediments from entering a live watercourse and discharging off site.

Locations where vehicles enter or exit the sites shall be inspected for evidence of sediment tracking. Construction vehicles and equipment shall be appropriately decontaminated during the course of the IM actions, if necessary.

7.0 WASTE TRANSPORTATION AND DISPOSAL PLAN

The primary objective of this WTDP and the activities mandated by the plan is the safe handling, transportation, and disposal of contaminated materials resulting from IM actions at SWMU 39. This objective will be achieved through compliance with local, state, and federal regulations, and the requirements of this plan. The WTDP details the waste management responsibilities of Shaw and subcontractor personnel and identifies potential waste streams. It also describes the waste management practices that will be implemented for minimizing, segregating, packaging, staging, tracking, and transporting and disposing of the generated wastes.

A secondary objective of the WTDP is the handling of generated waste in a cost-effective manner. This will be accomplished by three activities:

- Waste minimization.
- Waste segregation.
- Waste classification.

These activities begin with the design of the individual removal actions and are integrated into the planning and execution of waste management activities associated with the overall project.

7.1 Regulatory Requirements

Wastes generated during IM actions at SWMU 39 will be handled, staged, labeled, transported, and disposed in full compliance with local, state, and federal regulations. Applicable local, state, and federal regulations governing the treatment, storage, transportation, and disposal of wastes include, but are not necessarily limited to, the following:

- 40 CFR 261: Identification and Listing of Hazardous Waste.
- 40 CFR 262: Standards Applicable to Generators of Hazardous Waste.
- 40 CFR 263: Standards Applicable to Hazardous Waste Transporters.
- 40 CFR 268: Land Disposal Restrictions.
- 40 CFR 270: Regulations controlling the transportation, manifesting, and disposal of hazardous waste.
- 49 CFR 171-179: DOT regulations on the packaging and shipping of hazardous materials and samples.
- 9VAC 20-60-261: Standards Applicable to Generators of Hazardous Waste.
- COMAR 26.13.04: Standards Applicable to Transporters of Hazardous Waste.
- 9 VAC 20-60-268: Land Disposal Restrictions.
- 9 VAC 20-60-263: Regulations Applicable to Transporters of Hazardous Waste.
- 9 VAC 20-110: Transportation of Hazardous Materials.
- 9 VAC 20-60-264 Subparts C, Preparedness and Prevention; and Subpart D, Contingency Plan and Emergency Procedure.
- 9 VAC 20-60-264 Subpart E, Manifest System, Recordkeeping, and Reporting.

7.2 Anticipated Waste Streams

This section presents a brief overview of the anticipated wastes that may be generated during IM actions at SWMU 39. Waste can be divided into two primary categories which include:

- Remediation-derived wastes (RDW).
- Secondary waste.

A summary of anticipated wastes that will be generated from the IM actions are described below.

7.2.1 Remediation-Derived Wastes

RDW are those wastes that are generated through the removal of original, pre-existing contaminated material from the site. Anticipated RDW for each the removal action includes, but, is not limited to contaminated soil.

7.2.2 Secondary Wastes

Secondary wastes will be produced by the contractor during the course of the IM work. Examples of secondary wastes that may be produced are:

- Non-hazardous trash and potentially contaminated materials.
- IDM from sampling activities.
- PPE.
- Temporary facilities (such as decon pads, and erosion and sediment control materials).
- Decontamination water.

Production of secondary wastes will be minimized to the fullest extent possible, typically by the segregation of hazardous and non-hazardous materials. When produced, wastes will typically be co-disposed with the RDW. Where co-disposal results in significant additional costs or is not possible due to incompatibilities with the selected disposal/treatment/recycling method, alternative means of characterization/disposal for secondary wastes will be considered.

7.3 Waste Management Procedures

7.3.1 Waste Minimization

Waste minimization is a primary objective during the design and implementation of the IM actions at SWMU 39. The principal components of this program include:

- Control of waste removal to prevent over-excavation.
- Segregation of waste streams.
- Minimization or elimination of hazardous material that must be used.
- Strict inventory control of hazardous material.

Where a waste stream (such as potentially contaminated soil) has the potential to exhibit differing characteristics, each waste stream will be segregated. Wastes will be segregated into the following groupings:

- Uncontaminated material.
- Potentially contaminated material.
- Contaminated material.

Potentially contaminated and contaminated materials may be further subdivided into different groups by contaminant types such as:

- RCRA waste.
- Non-hazardous solid waste.

Waste characterization for certain waste streams will be attempted prior to or at the beginning of IM activities, in order to minimize waste storage and holding time prior to transportation and disposal.

Generation of secondary waste will typically occur prior to receipt of complete analytical results. Decisions regarding waste segregation will be based on knowledge of the waste and appearance. This segregation will minimize the mixing of contaminated and uncontaminated materials.

Each of the above steps will reduce the amount of contaminated wastes being generated. Audits may be conducted by the CQC Systems Manager to monitor the waste minimization activities.

7.3.2 On-Site Waste Labeling

Following the generation of waste, each container will be clearly labeled with the following information:

- Waste generation activity and location collected.
- Identification numbers.
- Contents of the container (type of material and expected hazard level).
- Accumulation start date.
- Comments/special handling instructions.

This information will be augmented as needed according to applicable requirements during off-site transportation and disposal.

7.3.3 Sampling and Characterization

Each waste stream generated during the IM work will be characterized within 30 days of completion of waste stream generation. Waste characterization sampling and analysis will be performed by Shaw in accordance with the provisions in the FSP (*Section 3.0*) and the QAPP (*Section 4.0*). Based on the analytical results for the waste characterization samples, the wastes will be classified in accordance with Virginia and USEPA waste classification systems. The waste classification will define the waste storage, transportation, and disposal requirements that are applicable. Waste profile sheets for the disposal of each waste will then be prepared in accordance with the requirements of the disposal facility. If required by the disposal facility for acceptance of the waste, additional waste analysis will be conducted beyond that specified in **Table 3-1**.

7.3.4 Recordkeeping

Shaw will maintain an inventory of waste on site. Excavated soil will be direct loaded into dump trucks for transport to the disposal facility and will not be stored on site. An example of the waste inventory form is provided as **Figure 7-1**. This form will be updated daily.

**Figure 7-1 Waste Inventory Form
SWMU 39 IM Action**

Waste Container ID	Container Type	Waste Description	Quantity	Date Packaged	Waste Profile	Date Shipped	Disposal Facility	Disposal Method	Disposal/ Destruction Date

Notes:

7.3.5 Spill Response Materials

Spill response materials including, but not limited to the following, will be kept on site in case of emergencies: drip pans, containers, adsorbents, shovels, and PPE. Spill response materials will be available at all times in which hazardous materials/wastes are being handled or transported, and be compatible with the wastes being handled.

7.4 Off-Site Transportation and Disposal

7.4.1 Identification of Off-Site Disposal Facility

Through a competitive bidding process, one or more waste disposal subcontracts will be awarded. Each subcontract will include several permitted disposal facilities that offer a range of disposal options (e.g., landfilling, incineration) for a variety of waste types (e.g., non-hazardous waste, hazardous waste). Based on the waste characterization results, and subsequent waste classification, an appropriate waste disposal facility will be identified. Shaw will then prepare a two-way memo, including the analytical results, estimated quantity of waste, waste profile sheet(s), and proposed method of disposition and disposal facility, to gain approval from USACE to dispose of the waste. Advanced planning and coordination by Shaw, USACE, and RFAAP/ATK will be necessary to minimize the staging of waste (non-hazardous debris only) on site.

7.4.2 Transportation of the Waste

The transport documentation and transport vehicle will be inspected prior to shipment of hazardous wastes to ensure that the packaging, marking, labeling, handling, and placarding of waste complies with federal, state, and local laws and regulations. Shaw will supervise loading activities, and monitor the stages of waste handling by the disposal subcontractor.

7.5 Documentation and Reporting

7.5.1 Complete Manifest Package

Shaw will prepare manifests for the transportation and disposal of hazardous wastes in accordance with USEPA and DOT requirements. The principal components of the completed manifest package include:

- Waste profile sheets (signed by an ATK representative).
- Waste disposal characterization.
- Hazardous waste manifests.
- Hazardous material shipping papers.
- Land disposal restriction notification and certification form.

Hazardous waste manifests, waste profile sheets, and land disposal restriction notification and certification forms will list RFAAP as the generator and will be signed by an appointed representative of RFAAP. The manifests will include the shipper's license number, address and contact information, and the permit number for the disposal facility. Shaw will provide 3 days notice of shipping to the appointed representative of RFAAP and provide manifest blanks at that time. Final weight for each load will be calculated using an excavator bucket scale during truck loading. Final weights will be filled in on the manifest for signature at that time. Close coordination will be required to minimize demurrage charges.

The supporting information will contain at a minimum the following information:

- Date of initial waste generation.
- Description of process that generated the waste.
- All analytical data and/or process knowledge used to characterize the wastes, including QC data.
- Dates samples were collected.
- Description of the sampling location(s), and sampling methods and equipment utilized.
- Description of sample handling techniques, including containerization, preservation, and COC.
- Any correspondence supporting waste classification determination.
- Specific type of inner and outer packaging.
- Markings, labeling, and placards offered by the transporter.

7.5.2 Transportation and Disposal Reporting Requirements

7.5.2.1 Tabulated Waste Handling Information

Shaw will maintain a list of all waste materials going off site on the Waste Inventory Form (**Figure 7-1**). Where applicable, this list will include the description, quantity, hazardous waste classification, date the waste was shipped, disposal facility, method of disposal, and date of disposal. Copies of the Waste Inventory Form as well as other supporting documentation related to the disposal operation audit trail will be included in the SWMU 39 IM Summary Report following completion of the IM.

7.5.2.2 Transportation and Disposal Procedures

After the waste leaves RFAAP, Shaw will maintain a clear audit trail of the entire disposal operation including, but not limited to, the following:

- Manifest copy(s).
- Driver information and truck numbers.
- Profile sheet(s).
- Certificate of Transfer.
- Certificate of Disposal.

7.5.2.3 Discrepancies

Any discrepancies due to differences between the quantities or types of wastes designated on the manifest or shipping papers and the quantity or type of wastes a facility actually receives must be reported. Shaw will investigate these discrepancies and rectify the identified discrepancy.

7.5.2.4 Exception Reports

The following procedures will be used for determining if an exception report is needed. On or before the 35th day after the transporter signs the manifest, it will be verified that the generator or the generator's representative has received a copy of the signed manifest from the TSDF. If the generator's representative has failed to receive a signed copy of the manifest by the 44th day, an exception report will be prepared and submitted to USACE and RFAAP no later than day 45.

8.0 SITE SAFETY AND HEALTH PLAN

This section discusses safety and health concerns for the SWMU 39 IM actions and serves as the SSHP. The safety and health policies and procedures that will be followed during the removal actions are defined within this section. This SSHP has been prepared by the RFAAP H&S Manager. The SSHP signature approval form is provided in **Appendix D** and documents H&S and project management's acceptance of the plan for the performance of IM at SWMU 39.

This SSHP was prepared for use at SWMU 39 by Shaw personnel and subcontractors performing a specific scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known, or suspected, to be present on the project site. Adherence to the requirements of this Plan will significantly reduce, but not eliminate, the potential for occupational injury or illness at the project site. The guidelines contained in this SSHP were developed specifically for the project site described herein, and should not be used at any other site without the review and approval of a qualified H&S professional.

8.1 Pre-Work Meeting

Due to the potentially dangerous nature of the explosives-related work conducted at RFAAP, a Pre-Work Meeting will be conducted by ATK, the operating contractor at RFAAP. All Shaw employees and subcontractors will attend this meeting prior to initiating work on site. The Propellant Incinerator adjacent to SWMU 39 has strict safety requirements that may differ from the requirements specified in this plan. Where there are differences, ATK's rules will apply. A copy of ATK's *Safety, Security and Environmental Rules for Contractors, Subcontractors, Tenants and Government Employees* (ATK, 2005) will be provided to employees and subcontractors before mobilization onsite.

8.2 Introduction

This SSHP was developed to provide the field team/visitors with safe working conditions during field activities to ensure protection of personnel during the excavation, removal, waste handling, and restoration activities at SWMU 39. In addition, an objective of this SSHP is to provide site-specific safety and health controls that will prevent and minimize personal injuries, illnesses, and physical damage to equipment and property. The plan stresses management responsibilities, pre-planning for new activities, medical surveillance, training, periodic work site evaluations and audits, accident prevention and investigation recordkeeping, PPE, air monitoring requirements, site controls, decontamination procedures, and general safety requirements.

Shaw and subcontractor personnel performing field activities are responsible for the adherence to the SSHP procedures and policies during the performance of all work. Site personnel and visitors will be required to read or be instructed in the content of this SSHP and to sign the acknowledgment form (located in **Appendix D**) to document their understanding of the contents. Shaw will not, however, accept responsibility for the use of the plan by others.

Site personnel will exercise caution at all times and immediately report any site conditions to supervisory personnel which may pose safety or health and environmental hazards to workers or the public.

8.2.1 Soil Removal Activities

Site IM activities to be completed as part of this scope of work at SWMU 39 include excavation and disposal of arsenic, lead, vanadium and dioxin/furan contaminated soil. Background site information and details on the approach and components for each of the removal actions are provided in the Organization and Technical Approach Plan (*Section 2.0*).

8.2.2 Applicable Standards and Regulations

Site activities covered by this SSHP must comply with the requirements of the following regulations and appropriate guidance including, but not limited to:

- 29 CFR Part 1910 (29 CFR 1910) Occupational Safety and Health Standards, General Industry.
- 29 CFR Part 1926 (29 CFR 1926), Safety and Health Regulations, Construction Industry.
- FAR, Clause 52.236-13, Accident Prevention.
- USEPA Office of Solid Waste and Emergency Response Directive 9355.3-01.
- USACE Safety and Health Requirements Manual EM 385-1-1.
- USACE Safety and Occupational Health Document Requirements for Hazardous, Toxic, and Radioactive Waste (HTRW) and Ordnance and Explosives Activities, ER 385-1-92.
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities [National Institute for Occupational Safety and Health (NIOSH) 85-115].
- 40 CFR Parts 260-276 (40 CFR 260-276), Hazardous Waste Management.
- 40 CFR Subchapter C, Air Programs.
- Occupational Safety and Health Guidance for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, October 1985.
- Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists (ACGIH).
- Shaw Safety and Health Requirements Program Manual.
- Alliant TechSystem's *Safety, Security and Environmental Rules for Contractors, Subcontractors, Tenants and Government Employees* (ATK, 2005)

All Shaw and subcontractor field staff will be required to follow these and other applicable federal and/or state safety and health standards, regulations, and guidance manuals.

8.2.3 Site Safety and Health Documentation

Recordkeeping requirements for safety and health are necessary to ensure accurate and complete monitoring of all personnel. Any changes to the approved SSHP will be documented using the Shaw Revision Form presented in **Appendix D**, and reviewed and approved by the USACE prior to implementation. All on-site personnel shall read or be instructed in this SSHP and sign the Acknowledgment Form (located in **Appendix D**) to document their understanding of the contents. The SSHP will keep this form on file.

8.2.4 Safety Statement

It is Shaw's plan to provide a safe work environment for all personnel involved in the IM activities at SWMU 39. Shaw considers no phase of operations or administration to be of greater importance than the prevention of personnel injury and illness at the work site.

Any authorized USACE representative has the right to notify Shaw and/or any subcontractor of any condition that poses a serious or imminent danger to health and safety. Upon such notification, Shaw and/or any subcontractor shall immediately take corrective action. Furthermore, any authorized USACE representative may issue an order stopping all or part of the work until satisfactory corrective action has been taken.

This SSHP prescribes the procedures that must be followed by all site personnel. Operational changes which could affect the health and safety of personnel, the community or the environment will not be made without prior approval of the USACE, Shaw Project Manager, Shaw H&S Manager, and SSHO.

The following is Shaw's corporate policy as it pertains to safety.

The Shaw Group is firmly committed to operating all of its facilities and projects in a safe, efficient manner and in compliance with applicable safety, health and environmental regulations. Its goal is to provide an injury free work environment where facilities and projects are free of recognized hazards; and people, equipment, and the environment are not placed at unreasonable risk of injury or damage.

The most valuable resource Shaw has is its people. While quality and productivity are critical to operations, they will never take precedence over the safety of personnel or protection of the environment.

Accomplishing these goals requires a unified team effort from all levels of the organization. Safety must be planned into all of our activities and receive the same level of attention as quality and productivity.

This project will be conducted under the guidance of applicable federal, state, and local requirements. It is the policy of Shaw to adhere to or exceed the minimum requirements of each governing document (see References, *Section 10.0*). When any conflict exists between referenced documents, the most stringent position of the standard will apply.

The Shaw Group believes in two fundamental principles of safety:

- All accidents, injuries, and occupational illnesses are preventable.
- If an operation cannot be done safely, it will not be done.

To put these principles into practice, all Shaw personnel and subcontractor employees will receive the appropriate training, equipment, and other resources necessary to complete their assigned tasks in a safe and efficient manner. Subcontractors must also be appropriately trained, participate in the necessary medical surveillance programs, and comply with the required policies, procedures, and regulations.

Safety, industrial hygiene, and loss prevention are the direct responsibility of all members of management, who must create an environment in which everyone shares a concern for their own safety and the safety of their associates. Safety will take precedence over expediency. It is a condition of employment that all employees work safely.

8.3 Project Organization and Personnel Qualifications and Responsibilities

The project organization and reporting structure is presented in *Section 2.0* of this Work Plan. Qualifications for key individuals are as follows:

- The H&S Manager must be a Certified Industrial Hygienist or Certified Safety Professional with experience in hazardous waste site operations.
- The SSHO must be fully trained and experienced and able to implement and continually enforce the SSHP.
- At least two site workers will be certified in First Aid/Cardiopulmonary Resuscitation (CPR) by the Red Cross, or equivalent agency.

All personnel are responsible for the adherence to the SSHP procedures and policies during the performance of all work. Site personnel and visitors will be required to read this SSHP and to sign the Acknowledgment Form (located in **Appendix D**) to document their understanding of the contents. Failure to comply with the provisions of this Plan may lead to disciplinary action and/or dismissal from the work site. Ensuring the safe and healthful conduct of site operations is the responsibility of everyone assigned to the site; therefore, all personnel are responsible for the following:

- Complying with the SSHP and all other required safety and health guidelines.
- Taking all necessary precautions to prevent injury to themselves and to their fellow employees.
- Continually being alert to any potentially harmful situation and immediately informing the SSHO of any such conditions.
- Performing only those tasks that they believe they can do safely and have been trained to do.
- Notifying the SSHO of any special medical conditions (i.e., allergies, restrictions, diabetes, etc.) which could affect their ability to safely perform site operations.
- Notifying the SSHO of any prescription and/or over-the-counter medication which they are taking that might cause drowsiness, anxiety, or other unfavorable side effects.
- Preventing spillage and splashing of materials to the greatest extent possible.
- Practicing good housekeeping by keeping the work area neat, clean, and orderly.
- Immediately reporting all injuries, no matter how minor, to the SSHO.
- Maintaining site equipment in good working order, and reporting defective equipment to the SSHO.
- Properly inspecting and using the PPE required by the SSHP or the SSHO.

8.3.1 Subcontractor Responsibilities

In conformance with the Department of Labor, OSHA Hazardous Waste Operations (29 CFR 1910.120), each subcontractor employee proposed for on-site activities must participate in a medical monitoring program, must be certified for hazardous waste field work by a licensed physician, and must have successfully completed the required safety and health training. The

subcontractor shall also be responsible for providing equipment that is safe for operations and free from any hazards.

8.3.2 Visitor Responsibilities

Authorized visitors to IM areas on site will be briefed on the hazards present at that location by the SSHO. Visitors will be responsible for compliance with the requirements specified in this SSHP. Visitors will not be permitted to enter potentially contaminated work zones unless they have completed the appropriate training and medical surveillance requirements, and have the proper PPE. All visitors will be escorted.

8.4 Hazard Analysis

8.4.1 Activity Hazard Analysis

Activity Hazard Analyses define the activities being performed and identify the sequences of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level.

8.4.1.1 Soil Removal

An activity hazard analysis for the SWMU 39 soil removal is included as **Tables 8-1a through 8-1c**. This activity will be performed subject to the safety provisions of 29 CFR Parts 1910 and 1926, and USACE EM 385-1-1.

8.4.2 Physical Hazards

This section discusses specific physical hazards that may be encountered at RFAAP during the removal actions. If additional hazards other than the ones listed in this section are encountered, this SSHP will be revised to address these hazards.

8.4.2.1 Heavy Equipment

Tests shall be made at the beginning of each day during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition and that all required safety devices are in place. Whenever any machinery or equipment is found to be unsafe or a deficiency which affects the safe operation of equipment is observed, the equipment shall be immediately taken out of service and shall not be used until all of the unsafe conditions are corrected. Machinery and mechanized equipment shall be operated by designated qualified personnel. Equipment safety requirements must be in accordance with 29 CFR 1926 and EM 385-1-1, Section 16 and the guidelines listed below:

- Operation of heavy equipment will be limited to properly trained personnel.
- Operator's certifications, qualification letters, and necessary SOPs will be maintained on site.
- Operator shall use the safety devices provided with the equipment (i.e., seatbelts, backup warning indicators and horns).
- Visually inspect equipment daily, prior to operation, and report any deficiencies. Document observations.
- Good housekeeping practices will be maintained in the cab area of heavy equipment.

Table 8-1. Activity Hazard Analysis – Soil Removal

a. Pre-Removal Soil Characterization Sampling

Activity: **Pre-Removal Soil Characterization Sampling**

Analyzed by/date: _____

Reviewed by/date: _____ (/ /)

Approved by/date: _____ (/ /)

PRINCIPLE STEPS	POTENTIAL SAFETY/ HEALTH HAZARDS	RECOMMENDED CONTROLS
Soil Sampling Stop work and notify your supervisor if you are not sure how to perform your task!	Physical Hazards	
	Cold or heat stress	Wear appropriate clothing and follow recommended work schedules and monitoring controls as stated in <i>Sections 8.3.2.6 or 8.3.2.7</i>
	Manual lifting of coolers	Use proper lifting techniques as discussed in <i>See Section 8.3.2.10</i>
	Slip, trip, and fall hazards	- Safety training and personal awareness <i>See Section 8.3.2.11</i> for general slip, trip, and fall controls
	Electrical storm	Shut down operations, <i>see Section 8.3.2.12</i>
	Repetitive Motion	Stretch and flex when using hand auger, alternate auger sampling between coworker
	Utilities	Complete utility mark outs prior to sampling, follow HS308 procedure
	Chemical Hazards	
	Exposure to contaminants in soil, primarily arsenic, lead, vanadium, and dioxins/furans.	- Minimize dust generation, wash hands and face, <i>see Section 8.3.3</i> for chemical hazard controls - Use appropriate PPE
	Biological Hazards	
	Ticks	Tape pant legs to boots, avoid tall grass and bushes if possible, check for ticks frequently, <i>see Section 8.3.4.1</i>
	Stinging insects	Watch out for and avoid stinging insects, <i>see Section 8.3.4.2</i>
	Spiders	Watch out for and avoid black widow and brown recluse spiders, <i>see Section 8.3.4.3</i>
	Poisonous Plants Stop work and notify your supervisor if you are not sure how to perform your task!	Watch out for and avoid poisonous plants likely to grow near sampling locations, avoid contact with plant oils that may be present on clothes or equipment, wash hands to prevent spreading oils, <i>see Section 8.3.4.6</i> Stop work and notify your supervisor if you are not sure how to perform your task!
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Stainless steel trowels, Hand augers	None	- All site workers must have OSHA Training in accordance with 29 CFR 1910.120. - All site workers must attend the Daily Safety Meetings. - Hazard Communication for all site workers.

Table 8-1. Activity Hazard Analysis – Soil Removal
b. Soil and Fence Removal

Activity: **Soil Removal**

Analyzed by/date: _____

Reviewed by/date: _____ (/ /)

Approved by/date: _____ (/ /)

PRINCIPLE STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
- Cut flush the fence posts with the ground surface - Excavate soil and direct load into dump trucks - Collect waste characterization samples Stop work and notify your supervisor if you are not sure how to perform your task!	Physical Hazards	
	General heavy equipment hazards	- Safety training, personal awareness, and safety devices - Maintain a safe equipment distance exclusion zone - Use hand signals - See <i>Section 8.3.2.1</i> for general heavy equipment controls
	Power and hand tools hazard	See <i>Section 8.3.2.2</i> for power and hand tool controls
	Electrical shock	Locate and shut down all utilities in work zone, obtain dig permit, watch out for overhead power lines, use GFCI on all temporary electrical devices
	Noise	Use hearing protection if noise exceeds 85 dBA, see <i>Section 8.3.2.8</i>
	Cold or heat stress	Wear appropriate clothing and follow recommended work schedules and monitoring controls as stated in <i>Sections 8.3.2.6 or 8.3.2.7</i>
	Manual lifting	Use proper lifting techniques as discussed in <i>See Section 8.3.2.10</i>
	Slip, trip, and fall hazards	- Safety training and personal and situational awareness - See <i>Section 8.3.2.11</i> for general slip, trip, and fall controls
	Electrical storm	Shut down operations, follow the 30/30 rule, see <i>Section 8.3.2.12</i>
	Chemical Hazards	
	Exposure to contaminants in soil, primarily arsenic, lead, vanadium, and dioxins/furans.	- Minimize dust generation, wash hands and face, see <i>Section 8.3.3</i> for chemical hazard controls - Use appropriate PPE
	Cross contamination	Avoid spillage from excavator bucket, utilize plastic sheeting where spillage may occur
	Biological Hazards	
	Ticks	Tape pant legs to boots, avoid tall grass and bushes if possible, check for ticks frequently, see <i>Section 8.3.4.1</i>
	Stinging insects	Watch out for and avoid stinging insects, see <i>Section 8.3.4.2</i>
	Spiders	Watch out for and avoid black widow and brown recluse spiders, see <i>Section 8.3.4.3</i>
	Poisonous Plants	Watch out for and avoid poisonous plants, avoid contact with plant oils that may be present on clothes or equipment, wash hands to prevent spreading oils, see <i>Section 8.3.4.6</i>
Stop work and notify your supervisor if you are not sure how to perform your task!		Stop work and notify your supervisor if you are not sure how to perform your task!
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavator, shovels, handheld metal saw	Daily inspection and maintenance of equipment	- All site workers must have OSHA Training in accordance with 29 CFR 1910.120 - All site workers must attend the Daily Safety Meetings - Hazard Communication for all site workers - Appropriate heavy equipment and/or power tools training

Table 8-1. Activity Hazard Analysis – Soil Removal
c. Backfill and Site Restoration

Activity: **Backfill and Site Restoration**
Reviewed by/date: _____ (/ /)

Analyzed by/date: _____
Approved by/date: _____ (/ /)

PRINCIPLE STEPS	POTENTIAL SAFETY/HEALTH HAZARDS	RECOMMENDED CONTROLS
- Backfill excavation - Re-seed Stop work and notify your supervisor if you are not sure how to perform your task!	Physical Hazards	
	General heavy equipment hazards	- Safety training, personal awareness, and safety devices - Maintain a safe exclusion zone - Use hand signals - See <i>Section 8.3.2.1</i> for general heavy equipment controls
	Electrical shock	Watch for overhead power lines
	Cold or heat stress	Wear appropriate clothing and follow recommended work schedules and monitoring controls as stated in <i>Sections 8.3.2.6 or 8.3.2.7</i>
	Manual lifting	Use proper lifting techniques as discussed in <i>Section 8.3.2.10</i>
	Slip, trip, and fall hazards	- Safety training and personal awareness - See <i>Section 8.3.2.11</i> for general slip, trip, and fall controls
	Electrical storm	Shut down operations, see <i>Section 8.3.2.12</i>
	Chemical Hazards – The potential for exposure to chemical hazards will be minimal	
	Biological Hazards	
	Ticks	Tape pant legs to boots, avoid tall grass and bushes if possible, check for ticks frequently, see <i>Section 8.3.4.1</i>
	Stinging insects	Watch out for and avoid stinging insects, see <i>Section 8.3.4.2</i>
	Spiders	Watch out for and avoid black widow and brown recluse spiders, see <i>Section 8.3.4.3</i>
	Poisonous Plants Stop work and notify your supervisor if you are not sure how to perform your task!	Watch out for and avoid poisonous plants, avoid contact with plant oils that may be present on clothes or equipment, wash hands to prevent spreading oils, see <i>Section 8.3.4.6</i> Stop work and notify your supervisor if you are not sure how to perform your task!
EQUIPMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
Excavator, shovels	Daily inspection and maintenance of equipment	- All site workers must have OSHA Training in accordance with 29 CFR 1910.120 - All site workers must attend the Daily Safety Meetings - Hazard Communication for all site workers - Appropriate heavy equipment training

- Additional riders shall not be allowed on equipment, unless it is specifically designed for that purpose.

As presented in **Appendix E**, Shaw procedure HS810, Commercial Motor Vehicle Operation and Maintenance, will be implemented.

8.4.2.2 Power and Hand Tools

By their very nature, power tools have great capability for inflicting serious injury upon site personnel if they are not used and maintained properly. Use of improper or defective tools can contribute significantly to the occurrence of accidents on site. To control the hazards associated with power and hand tool operation, the requirements outlined in EM 385-1-1, and the safe work practices listed below shall be observed when using these tools:

- Operation/use will be conducted by authorized and experienced personnel.
- Tools will be inspected prior to use, and defective equipment will be removed from service until repaired.
- Tools will be selected and used in the manner for which they were designed and in accordance with manufacturers recommendations.
- Be sure of footing and grip before using any tool.
- Power tools designed to accommodate guards will have such guards properly in place prior to use.
- Do not use tools that have split handles, mushroom heads, and worn parts.
- Safety glasses or a face shield will be used if use of tools presents an eye or face hazard.
- Do not use makeshift tools or other improper tools.
- Use non-sparking tools in the presence of explosive vapors, gases, or residue.
- Loose-fitting clothing or long hair will not be permitted around moving parts.
- Hands, feet, etc. will be kept away from moving parts.
- Maintenance and adjustments to equipment will not be made while equipment is in operation. Power will be disconnected prior to maintenance.
- An adequate operating area will be provided, allowing sufficient clearance and access for operation.
- Proper PPE in accordance with equipment operating manual will be used (i.e., chain saw chaps, leather gloves, hard hats, hearing protection, shin guards, face shield, safety glasses, etc.).

8.4.2.3 Fire and Explosion Hazards

SWMU 39 is adjacent to the Propellant Incinerator and Shaw employees and subcontractors MUST strictly follow ATK's protocols to prevent fires and/or explosions in this area.

Although fires and explosions may arise spontaneously, they are more commonly the result of carelessness during the conduct of site activities such as moving drums, mixing/bulking of site chemicals and during refueling of heavy or hand held equipment. Some potential causes of explosions and fires include:

- Mixing of incompatible chemicals, which cause reactions that spontaneously ignite due to the production of both flammable vapors and heat.
- Ignition of explosive or flammable chemical gases or vapors by external ignition sources.
- Ignition of materials due to oxygen enrichment.
- Agitation of shock or friction-sensitive compounds.
- Sudden release of materials under pressure.
- Improper labeling of flammable and combustible material containers.

Explosions and fires not only pose the obvious hazards of intense heat, open flames, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment. Such releases can threaten both personnel on site and members of the general public living or working nearby. Site personnel involved with potentially flammable material or operations will follow the guidelines listed below and EM 385-1-1, Section 9, to prevent fires and explosions:

- Potentially explosive/flammable atmospheres involving gases or vapors will be monitored using a combustible gas indicator/oxygen (CGI/O₂) meter.
- Prior to initiation of site activities involving explosive/flammable materials, all potential ignition sources will be removed or extinguished.
- Non-sparking and explosion-proof equipment will be used whenever the potential for ignition of flammable/explosive gases/vapors/liquids exists.
- Dilution or induced ventilation may be used to decrease the airborne concentration of explosive/flammable atmospheres.
- Smoking is prohibited within the restricted area at Radford. SWMU 39 falls within this area and smoking is therefore prohibited onsite.
- Flammable and/or combustible liquids must be handled only in approved, properly labeled metal safety cans equipped with flash arresters and self-closing lids.
- Transfer of flammable liquids from one metal container to another will be done only when the containers are electrically interconnected (bonded).
- The motors of all equipment being fueled will be shut off during the fueling operations.
- Spark or flame producing operations will require a hot work permit in accordance with ATK requirements and Shaw H&S Procedure HS314.

8.4.2.4 Electrical

While it is anticipated that all electrical hookups at SWMU 39 have been terminated, this section is included as this will be verified prior to the commencement of work at SWMU 39. All electrical work performed shall comply with applicable National Electric Safety Code, National Electronics Council, and National Fire Protection Association requirements. All electrical work shall be performed by qualified personnel familiar with applicable code requirements. All safe guarding of hazardous energy sources will comply with Shaw safety policy HS315.

Above or below ground utilities may pose a hazard to team members during field activities. Below ground utilities will need to be located by Department of Public Works personnel prior to

excavation activities. As presented in **Appendix E**, Shaw safety procedure HS308, Underground and Overhead Utilities will be followed to prevent utility damage. A safe distance between all equipment and overhead power lines must be maintained at all times. Minimum safe clearances are as follows:

<u>Nominal System Voltage</u>	<u>Minimum Rated Clearance</u>
0 to 50 kilovolts (kV)	9.8 ft (3 meters)
51 to 200 kV	14.7 ft (4.5 meters)
201 to 300 kV	19.7 ft (6 meters)
301 to 500 kV	24.6 ft (7.5 meters)
501 to 750 kV	34.4 ft (105 meters)
751 to 1000 kV	44.3 ft (135 meters)

8.4.2.5 Excavations and Trenching

Excavation activities will be conducted in accordance with EM 385-1-1, Section 25 and Subpart P of 29 CFR 1926. As presented in **Appendix E**, Shaw Procedure HS307, Excavation and Trenching, will be implemented during excavation and trenching operations. The guidelines below are intended to reflect minimum requirements to be followed on this site.

- Prior to initiation of any excavation or trenching activity, the location of underground utility installations will be determined in accordance with Shaw safety policy HS308.
- The excavation(s) will be inspected and inspection documented daily by the SSHO or by the Competent Excavation and Trenching person prior to commencement of work activities.
- Evidence of cave-ins, slides, sloughing, or surface cracks will be cause for work to cease until necessary precautions are taken to safeguard workers.
- Excavations 5 ft or deeper, which cannot be sloped will require a registered civil engineer, to design a protective system.
- Protective systems shall be selected from OSHA 29 CFR 1926 Subpart P and/or designed by a registered professional civil engineer.
- Spoils and other materials will be placed 2 ft or more from the edge of the excavation.
- Materials used for sheeting, shoring, or bracing will be in good condition.
- Timbers will be sound, free of large or loose knots, and of appropriate dimensions for the excavation.
- Safe access will be provided into the excavation(s) by means of a gradually sloped personnel access/egress ramp.
- Excavations 4 ft or more in depth will have a means of egress at a frequency such that lateral travel to the egress point does not exceed 25 ft.

8.4.2.6 Heat Stress

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common illnesses at a site, regular monitoring and other preventive measures are vital.

Heat stress manifests itself in progressive stages (listed below), each increasing in severity, and if not remedied, can threaten life or health. Factors which may predispose a worker to heat stress include: lack of physical fitness, lack of acclimatization to hot weather, degree of hydration, current health status, alcohol or drug use, and the worker's age and sex. Therefore, it is important that all workers be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

As with any illness, the best cure for heat stress is avoidance/prevention. Heat stress is most likely to occur early in the summer, prior to acclimatization. Full acclimatization takes 5 to 7 days of consecutive controlled exertion in heat. Individual physical conditioning, pre-existing illnesses and use of alcohol contribute significantly to the potential for heat stress. Avoidance includes drinking plenty of fluids, taking frequent breaks, revise work schedule around hot periods of the day, and assure that worker are acclimated before allowing them to work for extended periods of time. **Table 8-2** shows an example work/rest schedule to be implemented as it relates to the work load and regimen. The SSHO will determine when work/rest schedules will be implemented based on temperature and work load.

As presented in **Appendix E**, Shaw procedure HS400, Working in Hot Environments, will be implemented to control heat-related illness. The SSHO will determine the potential for heat stress based on planned activities and weather forecasts.

Table 8-2
Examples of Permissible Heat Exposure Threshold Limit Values

Work – Rest Regimen	*Work Load		
	Light	Moderate	Heavy
Continuous Work	30.0 (86)	26.7 (80)	25.0 (77)
75% Work - 25% Rest, each hour	30.6 (87)	28.0 (82)	25.9 (78)
50% Work - 50% Rest, each hour	31.4 (89)	29.4 (85)	27.9 (82)
25% Work - 75% Rest, each hour	32.2 (90)	31.1 (88)	30.0 (86)

*Consult the ACGIH TLV booklet for definitions of Light, Moderate and Heavy work loads. Values are given in °C and [degrees Fahrenheit (°F)] WBGT, and are intended for workers wearing single layer summer type clothing. As workload increases, the heat stress impact on an unacclimatized worker is exacerbated. For unacclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5°C.

Heat Rash

Heat rash is caused by continuous exposure to heat and humid air and is aggravated by wet chafing clothes. This condition can decrease a worker's ability to tolerate hot environments.

Symptoms – Symptoms of heat rash include a mild red rash, especially in areas of the body which sweat heavily.

Treatment – Treatment includes decreasing the amount of time in protective gear and providing powder (such as corn starch or baby powder) to help absorb moisture and decrease chafing. Maintain good personal hygiene standards and change into dry clothes if needed.

Heat Fatigue

Heat fatigue is characterized by discomfort and reduced mental awareness, with a greater effect in unacclimated workers. Medical treatment is usually not needed. Heat fatigue usually effect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat fatigue also may result from drinking iced water or other drinks too quickly or in too large a quantity.

Symptoms – Heat fatigue symptoms include muscle cramps in legs and abdomen, pain accompanying the cramps, faintness, and profuse perspiration.

Treatment – Treatment includes removing a victim to a cool area and loosening clothing, stretching and massaging affected muscle, drinking one to two cups of water immediately, and every 20 minutes thereafter.

Heat Exhaustion

Heat exhaustion results from sustained exertion in heat, combined with failure to replace water and salts lost in sweat. Heat syncope results in fainting and can occur when standing immobile in heat. It is caused by the pooling of venous blood in the dilated vessels of the skin and lower body.

Symptoms – Symptoms include weak pulse, rapid and shallow breathing, fatigue, nausea, headache, profuse perspiration, dizziness, unconsciousness, and clammy, moist skin which may be flushed or pale.

Treatment – Replacement of water is required to recover. Electrolyte replacement fluids should be taken until urine volume increases. Recovery is complete and rapid following rest in a recumbent position at a cool location. Treat the person for shock if necessary, and remove him/her to a medical facility if there is any indication of a more serious problem.

Heat Stroke

The most serious heat injury is *heat stroke*. Heat stroke is a medical emergency, treatment must be immediate and professional medical attention must be obtained. Heat stroke is caused by a combination of factors including heavy exertion heat, inadequate replacement of fluids, poor physical condition, and individual susceptibility.

Symptoms – Failure of sweat response occurs, leading to a rapidly accelerated increase in core temperature. The victim usually has hot, dry red skin and if conscious, is confused;

convulsions may be present. Additional symptoms include dilated pupils, and a full and fast pulse.

Treatment – The victim must be cooled immediately; heat stroke is fatal if treatment is incomplete or delayed. Emergency care includes transportation to a medical facility, placing person in a cool environment, assure an open airway, reduce the body temperature (wrap in wet sheet or douse body with water), and if available, place cold packs under arms, around neck, at the ankles, or any place where blood vessel lie close to skin.

8.4.2.7 Cold Stress

As with high temperatures, outdoor work in low temperatures can result in risks to the health of employees exposed without adequate preparation. The combined temperature/wind chill affect is shown in **Table 8-3**. To minimize impacts from cold stress, the information and precautions given below shall be observed.

**Table 8-3
Wind Chill**

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS EQUIVALENT TEMPERATURE													
Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)												
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60	
	Equivalent Chill Temperature (°F)												
	Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
	10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
	15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
	20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
	25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
	30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145	
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148	
(Wind speeds greater than 40 mph have little additional effect)	LITTLE DANGER In<hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of Exposed flesh within One minute.				GREAT DANGER Flesh may freeze within 30 seconds.				
	Trenchfoot and immersion foot may occur at any point on this chart.												

Cold-related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. Most hypothermia cases develop in air temperatures between 30-50°F. The single most important aspect of life-threatening hypothermia is a fall in the deep core temperature of the body. Lower body temperature will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears are the most susceptible.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost Nip or Initial Frostbite: Characterized by sudden blanching or whitening of skin.
- Superficial Frostbite: Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep Frostbite: Tissues are cold, pale, and solid; extremely serious injury.
- Systemic Hypothermia: This condition is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages: 1) shivering; 2) apathy, listlessness, sleepiness, and sometimes rapid cooling of the body to less than 95°F; 3) unconsciousness, glassy stare, slow pulse, and slow respiratory rate; 4) freezing of the extremities; and finally 5) death.

Treatment of cold stress includes bringing the body core temperature back to its normal temperature of 98.6°F. Personnel exhibiting symptoms of cold stress should be brought in to a warm area and allowed to rest and warm up. Warm, non-alcoholic, decaffeinated drinks (not coffee) or soup should be given to increase body temperature, and rewarming should be gradual.

For frostbite emergency treatment, the victim should be sheltered from the wind and cold and given warm drinks. If superficial, the frozen area should be covered with extra clothing or warmed against the body. Do not use direct heat, and do not pour hot water over or rub the effected area. Warming should be gentle and gradual. If the frostbite is deep (area is frozen and hard to the touch), immediate medical attention should be obtained.

For hypothermia emergency treatment, all stages are treated by either passive or active rewarming. This is accomplished by better conservation of the patient's body heat. It is important to note that if a victim is found in a remote area, despite the death-like appearance, the person may be saved. All attempts should be made to revive the victim. Active rewarming means heat is applied to the victim by an external source, either to the skin surface and/or through the core. Treatment includes:

- Preventing further heat loss. Remove the victim to a warm, dry place.
- Remove wet clothing piece-by-piece and dry underlying skin.
- Dress in several layers of warm, dry clothing, giving preference to the central body core rather than the extremities.
- Cover the victims head, then wrap the victim in blankets.
- If the victim is conscious, ask him/her to drink hot fluids.
- Monitor oral body temperature every 15 minutes. If the body temperature falls below 98.6°F, the team member should not be allowed outside until the body temperature returns to normal.

- In more severe cases of hypothermia, implement the above actions, but also institute some type of active rewarming, including:
 - Electric pads or blankets.
 - Hot-air blowers or heaters.
 - Heated blankets or clothes.
 - Use of human body heat.
- It is important to watch for signs of return of the normal thermoregulatory mechanisms (shivering, teeth chattering, etc.) and to monitor mental status.
- The victim should be transferred to a medical facility after the emergency care steps have been initiated and should not be allowed to return to work for at least 48 hours.
- Perform CPR if the victim is pulseless and not breathing.
- Avoidance of cold stress emergencies can be performed by the general practices stated below:
 - Wear layered clothing, including a water-repellent outer layer.
 - Wear gloves, socks, and a hat that are synthetic or wool insulated.
 - Remove outer layers of clothing during breaks to prevent inner layer from getting wet from perspiration.
 - Eat well balance meals and maintain an adequate intake of fluids.
 - Seek shelter in a warm protected area when signs and symptoms of cold stress become evident.

Table 8-4 provides a work/warm-up schedule for a 4-hour shift as it relates to temperature and wind speed. This schedule will be applied during all field work.

Table 8-4
Threshold Limit Values Work/Warm-Up Schedule for 4-Hour Shift*

Air Temperature-Sunny Sky		No Wind		5 MPH Wind		10 MPH Wind		15 MPH Wind		20 MPH Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	Normal	1	Normal	1	75 min.	2	55 min.	3	40 min.	4
-29° to -31°	-20° to -24°	Normal	1	75 min.	2	55 min.	3	40 min.	4	30 min.	5
-32° to -34°	-25° to -29°	75 min.	2	55 min.	3	40 min.	4	30 min.	5		
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5				
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5						
-40° to -42°	-40° to -44°	30 min.	5								
-43° to below	-45° & Below	Non-emergency work should cease									

Notes for Table 8-4:

1. Schedule applies to any 4-hour work period with moderate to heavy work activity, with warm-up periods of 10 minutes in a warm location and with an extended break (e.g., lunch) at the end of the 4-hour work period in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -35°C (-30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
 2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
 3. mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
 4. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be:
 5. Special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m²; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m². In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges because windy conditions rarely prevail at extremely low temperatures.
 6. TLVs apply only for workers in dry clothing.
- * Adapted from the "1995-1996 Threshold Limit Values and Biological Exposure Indices," American Conference of Governmental Industrial Hygienist. Cincinnati, OH.

As presented in **Appendix E**, Shaw procedure HS401, Cold Stress, will be implemented to control cold related illness.

8.4.2.8 Noise

Hearing protection may be required during certain noisy activities. Hearing protection will be required when sound pressure levels in work areas or on equipment exceed 85 dBA, the TLV for noise. Permissible noise exposure levels for different durations are shown in **Table 8-5**. A field guideline for knowing when hearing protection is recommended is if people 3 ft apart must raise their voices to be heard in normal conversation.

Table 8-5
Permissible Noise Exposure

A-Weighted Sound Level (dB)	Permitted Duration Per Workday (Hours)	A-Weighted Sound Level (dB)	Permitted Duration Per Workday (Hours)
80	32.0	106	0.87
81	27.9	107	0.76
82	24.3	108	0.66
83	21.1	109	0.57
84	18.4	110	0.50
85	16.0	111	0.44
86	13.9	112	0.38
87	12.1	113	0.33
88	10.6	114	0.29
89	9.2	115	0.25

Table 8-5, Continued
Permissible Noise Exposure

90	8.0	116	0.22
91	7.0	117	0.19
92	6.2	118	0.16
93	5.3	119	0.14
94	4.6	120	0.125
95	4.0	121	0.11
97	3.0	123	0.082
98	2.6	124	0.072
99	2.3	125	0.063
100	2.0	126	0.054
101	1.7	127	0.047
102	1.5	128	0.041
103	1.3	129	0.038
104	1.1	130	0.031
105	1.0		

Source: Shaw procedure HS402.

As presented in **Appendix E**, Shaw procedure HS402, Hearing Conservation Program, will be implemented when elevated noise levels exist. The SSHO will provide training on the proper use of hearing protection in accordance with 29 CFR 1910.95. The training will be conducted as a part of the pre-work safety and health briefing and documented in the safety files.

8.4.2.9 Dust

It is possible that dust could be generated during soil excavation and load out operations. In such cases, a water spray will be used to minimize dust generation. Real-time dust monitors may be used if necessary to protect site personnel (*Section 8.6*).

8.4.2.10 Manual Lifting

Investigation and IM activities may require personnel to move large, heavy objects by hand. The human body is subject to severe damage in the forms of back injury and hernia if caution is not observed when handling, lifting, or moving these large, heavy objects.

The following fundamentals should be followed while manual lifting objects:

- The size, shape, and weight of the object to be lifted must be considered. Site personnel will not lift more than they can handle comfortably. No individual employee is permitted to lift any object that weighs over 60 pounds. Multiple employees or the use of mechanical lifting devices are required for objects over the 60-pound limit.
- A firm grip on the object is essential; therefore, the hands and objects shall be free of oil, grease, and water.
- The hands and fingers shall be kept away from any points that could cause them to be pinched or crushed, especially when setting the object down.

- The item shall be inspected for metal slivers, jagged edges, burrs, and pinch points, and gloves shall be used to protect the hands.
- The feet will be placed far enough apart for good balance and stability.
- Personnel will ensure that solid footing is available prior to lifting the object.
- To lift the object, the legs are straightened from their bending position.
- Never carry a load that you cannot see around.
- When placing an object down, the stance and position are identical to that for lifting.
- If needed, back support devices will be provided to aid in preventing back injury.

The following steps will be followed during manual lifting:

- Ensure the route you will carry the object is clear and free from trip hazards.
- Get a good footing.
- Place feet about one shoulder width apart.
- Bend at knees to grasp weight.
- Keep the back straight.
- Get a firm hold.
- Lift gradually by straightening the legs.
- If weight is uncomfortable to lift, get help.

8.4.2.11 Slips, Trips, Falls

Field operations may place personnel in situations where they may be exposed to slip, trip, and fall hazards. Slipping hazards will exist when the ground is wet, or on steep slopes. Tripping hazards will exist on rough, uneven terrain, or if the work area is cluttered with tools, equipment, debris, soil piles, etc. Falling hazards will exist as a result of slip or trip hazards, or in elevated work areas with inadequate railing.

The following precautions should be followed by all site personnel:

- Field personnel shall become familiar with the general terrain of the site and potential physical hazards (i.e., rocky conditions, uneven terrain) that would be associated with accidental slips, trips, and falls.
- Be cautious after periods of heavy rainfall, which may cause earth movement and slides.
- Be attentive where you walk since pits, holes, or similar hazards may be partially covered or visually obstructed.
- Be cautious around soil or terrain which recently may have been disturbed, relocated, or otherwise made less stable.
- Avoid the top edges of drop-off areas whether they have been disturbed or not.
- Use the three point rule when getting on and off heavy equipment.

8.4.2.12 Lightning

Electrical storms commonly occur during Spring and Fall. The resulting lightning poses a safety hazard to field personnel. Since the storms are sometimes fast moving, field personnel should watch for indications of electrical storms. The distance to an electrical storm can be estimated by observing the interval between the lightning flash and the sound of thunder. Since sound travels approximately 1,100 feet per second, an interval of 5 seconds corresponds to a storm distance of approximately 1 mile. This is also referred to as the flash/bang process. If lightning is observed and thunder is heard within 30 seconds work shall be suspended. Work will not resume for 30 minutes or until the flash/bang time exceeds 30 seconds (30:30 rule)

If an electrical storm is observed within 6 miles of the site, field personnel shall cease outside activities and proceed to the site office for further instructions and all heavy equipment will be shut down. If caught in the open by an electrical storm, all personnel will immediately seek shelter in their vehicle and proceed as above. In the event that their vehicle is inaccessible, they will move to a topographically low area away from tall objects and conductors (e.g., transformer, power lines, metal sheds) and wait for the storm to leave the area.

8.4.2.13 Drum Handling

Hazardous materials are often shipped, stored, or disposed in 55-gallon drums. If a drum or other container is encountered with unknown contents, caution will be exercised to avoid explosion or chemical hazards. The discovery of unknown drums shall require immediate notification to the H&S Manager. Unknown drums will not be handled until appropriate precautions and PPE are in place.

8.4.3 Chemical Hazards

This section discusses chemical hazards that may be encountered at RFAAP during the IM at SWMU 39. Chemical hazards can be encountered either from chemicals brought on site by the contractor for use during activities, chemicals stored at the site, or chemicals that have been released to the environment and are present in various media such as air, soil, or water.

8.4.3.1 Site-Related Chemicals

Arsenic, lead, vanadium, and dioxins/furans were identified equal to or above the residential RGs of 15.8, 400, 108, and 0.001 mg/kg, respectively, during the RFI investigation at SWMU 39 (Shaw, 2005) as presented on **Figure 2-2**.

8.4.3.2 Exposure Pathways

Chemicals may pose a hazard to humans when inhaled, ingested, or through dermal absorption. Inhalation can occur when chemicals are present as vapors, aerosols, or attached to airborne dust particles. Ingestion usually occurs incidentally, as chemicals present in the air enter the mouth or nose, or from hand to mouth activities such as eating, drinking, and smoking. Dermal absorption occurs when chemicals contact unprotected skin.

8.4.3.3 Exposure Assessment

The toxic hazards to site personnel associated with chemicals can be assessed through comparison of actual exposures with several established occupational exposure limits using quantitative collection and analysis through real-time and/or time-integrated personal air sampling.

Permissible Exposure Limits (PELs) are established by the OSHA. TLVs are established by the ACGIH. Immediately Dangerous to Life or Health (IDLH) values are established by NIOSH. **Table 8-6** presents occupational exposure limits (if available) for potential chemicals, including OSHA PELs, ACGIH TLVs, and NIOSH IDLH values. The table also indicates if there are potential significant contributions to the overall exposure for the chemical of concern through dermal contact, and identifies the acute symptoms resulting from exposure.

Table 8-6
Occupational Health Exposure Guidelines for Potential Contaminants

Contaminant	Acute Symptoms of Exposure	PEL (TWA unless otherwise noted)	TLV-TWA	Skin Notation (Yes/No)	IDLH
Arsenic	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [potential occupational carcinogen]	0.01 mg/m ³	0.01 mg/m ³	Y	5 mg/m ³
Lead	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension	0.05 mg/m ³	0.05 mg/m ³	Y	100 mg/m ³
Vanadium	Irritation eyes, skin, throat; green tongue, metallic taste, eczema; cough; fine rales, wheezing, bronchitis, dyspnea (breathing difficulty)	0.5 mg/m ³	0.05 mg/m ³	Y	35 mg/m ³
Dioxins/ Furans	Cough, dyspnea (breathing difficulty), wheezing; decreased pulmonary function, progressive respiratory symptoms (silicosis); irritation eyes; [potential occupational carcinogen]	NE	NE	N	NE

The occupational exposure limits are described as follows:

PELs may be expressed as an 8-hour Time-Weighted Average (TWA), a Short-Term Exposure Limit (STEL), or a ceiling limit. Ceiling limits may not be exceeded at any time. PELs are enforceable by law. STELs are allowable exposure limits for durations ranging from 5 to 15 minutes, without causing the 8-hour TWA to be exceeded.

The ACGIH TLV is defined as the TWA concentrations for a substance to which nearly all workers (8 hours/day, 40 hours/week) may be repeatedly exposed, day after day, without experiencing adverse health effects. For some substances, the overall exposure to a substance is enhanced by skin, mucous membrane, or eye contact. These substances are identified by “yes” in the skin notation column.

The IDLH values represent the maximum concentrations from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing symptoms or any irreversible health effects.

8.4.3.4 Chemical Hazard Communication

In order to comply with Shaw procedure HS060 and the OSHA Hazard Communication Standard 29 CFR 1910.1200 to ensure that site personnel are informed of the hazards associated with the materials with which they work, the following requirements will apply to all commercial products containing hazardous substances which are brought on site.

- Material Safety Data Sheets (MSDSs) will be maintained for each product containing a hazardous substance that will be used on site. MSDSs for chemicals being used or stored on site during investigation activities are included in **Appendix F**.
- All containers not supplied with adequate hazard labeling will have a hazard communication label affixed to the container providing the health and physical hazards associated with the material.
- All personnel, including subcontractors who work with products containing hazardous substances, will be trained in accordance with the requirements of 29 CFR 1910.1200. This training will be performed and documented by the SSHO and maintained on-site in the safety files.
- An inventory of all products containing hazardous substances used on site will be maintained using a site-specific Chemical Inventory.

8.4.4 Biological Hazards

Biological hazards that may be found at SWMU 39 include ticks, spiders, snakes, and poisonous plants. The following sections discuss the potential biological hazards that may be encountered at SWMU 39 during removal actions.

8.4.4.1 Ticks

From April through October, particular caution will be exercised to prevent site workers from being bitten by deer ticks and potentially contracting Lyme Disease. The Centers for Disease Control has noted an increase of Lyme Disease and Rocky Mountain Spotted Fever (RMSF), which are caused by tick bites. Ticks are small, ranging from the size of a comma up to about 1/4-inch; when embedded in the skin, they may look like a freckle. Ticks live in and near wooded areas, tall grass, and brush.

Lyme Disease – Lyme Disease is caused by deer ticks and lone star ticks that have become infected with spirochetes. Female deer ticks are about 1/4-inch in size, and are black and brick red in color. Male deer ticks are smaller, and completely black. Lone star ticks are larger and chestnut brown in color. The illness typically occurs in the summer and is characterized by a slowly expanding red rash that develops in a few days

to a few weeks after the bite of an infected tick. This may be accompanied by flu-like symptoms along with headache, stiff neck, fever, muscle aches, and/or general malaise. At this stage, treatment by a physician usually is effective. If left alone, these early symptoms may disappear, but more serious problems may follow. The most common late symptom of the untreated disease is arthritis. Other problems which may occur include meningitis, neurological abnormalities, and cardiac abnormalities. It is important to note that some people do not get the characteristic rash and may have diminished progress to the later manifestations. Treatment of later symptoms is more difficult than early symptoms and is not always successful.

Rocky Mountain Spotted Fever – RMSF has occurred in this area of the country. It is caused by Rocky Mountain wood ticks and dog ticks which have become infected with rickettsia. Both are black in color.

RMSF disease is transmitted by the infected dog tick, *Dermacentor variabilis* and is common in the western U.S. It is important to note that the dog tick is significantly larger than the deer tick, previously discussed. Nearly all cases of RMSF occur in the Spring and Summer, generally several days after exposure to infected ticks. The onset of illness is abrupt, often with high fever, headache, chills, and severe weakness. After the fourth day of fever, victims develop a spotted pink rash, which usually starts at the hands and feet and gradually extends to most of the body.

The first symptoms of either disease are flu-like chills, fever, headache, dizziness, fatigue, stiff neck, and bone pain. If immediately treated by a physician, most individuals recover fully in a short period of time. If not treated, more serious symptoms can occur.

If a site employee believes they have been bitten by a tick, or if any of the signs and symptoms noted above appear, the employee will contact the SSHO, who will authorize the employee to visit a physician for an examination and possible treatment.

The following precautions should be taken when working in areas that might be infested with ticks:

- Cover your body as much as possible. Wear long pants and long-sleeved shirts. Light color clothing makes spotting of ticks easier.
- Try to eliminate possible paths by which the deer tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves. (Duct tape may be used to help seal cuffs and ankles.) If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek® coveralls may be used for added protection.
- Conduct periodic and frequent (e.g., hourly) surveys of your clothing for the presence of ticks. Remove any ticks and insects that become attached to clothing.
- Spray outer clothing, particularly your pant legs and socks, but not your skin, with an insect repellent that contains permethrin or permethrin, or use a repellent with DEET, which can be applied to the skin.
- When walking in wooded areas, avoid contact with bushes, tall grass, or brush as much as possible.
- Tuck pant legs into boot tops or tape pants to boot tops to prevent ticks from crawling up the pant leg (this may not be an option at sites where extreme heat stress is anticipated).

- If dressed in Level D or Modified Level D and no other head protection is required, wear a hat to prevent ticks from getting into the hair.

The following actions should be taken if a tick is found:

- If you find a tick, remove it by pulling on it gently with tweezers.
- If the tick resists, cover the tick with salad oil for about 15 minutes to asphyxiate it, then remove it with tweezers.
- Do not use matches, a lit cigarette, nail polish, or any other type of chemical to “coax” the tick out.
- Be sure to remove all parts of the tick’s body and disinfect the area with alcohol or a similar antiseptic after removal.
- For several days to several weeks after removal of the tick, look for the signs of the onset of Lyme disease, such as a rash that looks like a bulls-eye or an expanding red circle surrounding a light area.
- Look for the signs of the onset of RMSF, such as a rash-like inflammation consisting of red spots under the skin that appear 3 to 10 days after the tick bite.

Removal of ticks is best accomplished using small tweezers. Do not squeeze the tick’s body. Grasp it where the mouth parts enter the skin and tug gently, but firmly, until it releases its hold on the skin. Save the tick in a jar labeled with a date, body location of the bite, and place it where it may have been acquired.

Wipe the bite thoroughly with an antiseptic and notify the safety officer as soon as possible. The various stages and symptoms are well recognized and, if detected, can be treated with antibiotics. Early detection and treatment with antibiotics significantly reduces the severity of Lyme disease and RMSF. If necessary, seek medical attention.

8.4.4.2 Ants, Bees, Wasps, Hornets, and Yellow Jackets

Contact with stinging insects like bees, hornets, and wasps may result in site personnel experiencing adverse health affects that range from being mild discomfort to life threatening. Therefore, stinging insects present a serious hazard to site personnel, and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects.

Nests and hives for bees, wasps, hornets, and yellow jackets often occur in ground, trees, and brush. The area will be checked for obvious nests and hives before it is cleared. If a nest or hive is found, the SSHO will be contacted before the nest is disturbed or removed; and, if possible, an alternate sampling location will be selected. Bites and stings can be painful and may elicit an allergic reaction. Medical surveillance will identify any individuals with life threatening allergies. These individuals will not work in areas where there is a great potential for insect stings. If simple first aid measures do not alleviate the symptoms, the victim will be taken to the nearest medical center. An attempt will be made to kill the offending insect and take it to the emergency room with the victim if this can be done quickly and without endangering personnel.

Some of the factors related to stinging insects that increase the degree of risk associated with accidental contact are as follows:

- The nests for these insects are frequently found in remote, wooded, grassy areas.
- The nests can be situated in trees, rocks, bushes, or in the ground, and are usually difficult to see.
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active.
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention.
- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock.
- Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth, and respiratory passages.
- The hypersensitivity needed to cause anaphylactic shock, can in some people, accumulate over time and exposure; therefore, even if someone has been stung previously, and has not experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction upon receipt of another sting.

With these things in mind and with the high probability of contact with stinging insects, all site personnel shall comply with the following safe work practices:

- If a worker knows that he is hypersensitive to bee, wasp, or hornet stings, they must inform the SSHO of this condition prior to participation in site activities. The SSHO will question all site personnel concerning allergies or sensitivities prior to initiating work on site.
- All site personnel will be watchful for the presence of stinging insects and their nests, and shall advise the SSHO if a stinging insect nest is located or suspected in the area.
- Any nests located on site shall be flagged off and site personnel shall be notified of its presence.
- If stung, site personnel shall immediately notify the SSHO to obtain treatment and allow the SSHO to observe them for signs of allergic reaction.
- Site personnel with a known hypersensitivity to stinging insects shall keep required emergency medication on or near their person at all times.

Stings of these insects are responsible for more deaths in the U.S. than bites and stings of all venomous creatures. This is due to the sensitization by the victim to the venom from repeated stings, which can result in anaphylactic reactions. The stinger may remain in the skin and should be removed by teasing or scraping rather than pulling. An ice cube placed over the sting will reduce pain. An analgesic-corticosteroid lotion is often used. People with known hypersensitivity to such stings should carry a kit containing antihistamine and epinephrine.

8.4.4.3 Spiders

The biting insects of greatest concern are spiders, especially the black widow and the brown recluse. These spiders are of special concern due to the significant adverse health effects that can be caused by their bite.

Black Widow – The black widow is a coal-black, bulbous spider 3/4 to 1-1/2 inches in length, with a bright red hourglass on the underside of the abdomen. The black widow is usually found in dark moist locations, especially under rocks and rotting logs and may even be found in outdoor toilets where they inhabit the underside of the seat. Victims of a black widow bite may exhibit the following signs or symptoms:

- Sensation of pinprick or minor burning at the time of the bite.
- Appearance of small punctures (sometimes none are visible).
- After 15 to 60 minutes, intense pain is felt at the site of the bite which spreads quickly and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils, and generalized swelling of face and extremities.

Brown Recluse – The brown recluse is brownish to tan in color, rather flat, 1/2 to 5/8 inches long with a dark brown “violin” shape on the underside. It may be found in trees or in dark locations. Victims of a brown recluse bite may exhibit the following signs or symptoms:

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite.
- Formation of a large, red, swollen, pustulating lesion with a bull’s-eye appearance.
- Systemic effects may include a generalized rash, joint pain, chills, fever, nausea, and vomiting.
- Pain may become severe after 8 hours with the onset of tissue necrosis.

There is no effective first aid treatment for either of these bites. Except for very young, very old, or weak victims, these spider bites are not considered to be life threatening; however, medical treatment must be sought to reduce the extent of damage caused by the injected toxins. If either of these spiders are suspected or known to be on site, the SSHO shall brief the site personnel as to the identification and avoidance of the spiders. Site personnel should notify the SSHO if they locate either of these spiders.

8.4.4.4 Snakes

The possibility for encountering snakes exists. Although rare in the southwestern Virginia area, the species of greatest concern is the copperhead (*Agkistrodon contortix*). Copperheads grow to 36 inches and can be recognized by the copper-color head and a reddish-brown hourglass pattern on the body. Copperheads are normally lethargic; once aroused, however, they strike vigorously and may rapidly vibrate their tails. Rocky hillsides are favorite habitats.

To minimize the threat of snake bites, all personnel walking through the brush will be aware of the potential for encountering snakes and will avoid actions that increase the likelihood of encounters (e.g., turning over logs). Additional caution will be exercised around sawdust or rock

piles, which are known to support copperheads. In the event of a snake bite, the following rules should be followed:

- Do no cut “X’s” over the bite area as this will intensify the effect of the venom.
- Do not apply suction to the wound since this has a minimal effect in removing venom.
- Do not apply a tourniquet since this will concentrate the venom and increase the amount of tissue damage in the immediate area.
- If possible, kill the snake, bag it, and transport it with the victim. Try to identify the snake for proper selection of anti-venom.
- Do not allow the victim to run for help since running increases the heart rate and will increase the spread of the venom throughout the body.
- Keep the victim calm and immobile.
- Have the victim hold the affected extremity lower than the body while waiting for medical assistance.
- Transport the victim to a medical facility immediately.

8.4.4.5 Animals

Normally, wildlife avoid people and areas where activities are ongoing. Small animals such as raccoons infected with rabies or when cornered may become aggressive. When working remain alert for likely locations that animals inhabit. Avoid nests, dens, and holes in the ground that may be the animal’s home.

The only effective measure to preclude animal bites is avoidance. Contact with all wild animals at SWMU 39 will be avoided at all times. Persons bitten by an animal should seek medical assistance immediately, especially if it is suspected that the animal is rabid. Aggressive or disoriented behavior as well as foaming of the mouth can be signs of rabid animals. Until medical assistance can be reached, persons should watch for symptoms of severe swelling, nausea, and shock.

8.4.4.6 Poison Ivy, Poison Oak, Poison Sumac

Poison ivy thrives in all types of light and usually grows in the form of a trailing vine; however, it can also grow as a bush and can attain heights of 10 ft or more. Poison ivy has shiny, pointed leaves that grow in clusters of three. Poison sumac is a tall shrub or slender tree that usually grows along swampy areas or ponds in wooded areas. Each poison sumac leaf stalk has 7 to 13 leaflets which have smooth edges. Poison oak is mostly found in the southeast and west. Poison oak resembles poison ivy, with one important difference. Poison oak leaves are more rounded than jagged like poison ivy, and the underside of poison oak leaves are covered with hair.

All personnel should become familiar with and be able to recognize poison ivy, poison oak, and poison sumac in the field. All personnel that know they are over-sensitive to poison ivy or poison sumac will notify their Site Superintendent or the SSHO. They will not be allowed to work in the area until the poison ivy/sumac has been removed. This information will be noted on their medical data sheet. Reaction to poison ivy can be prevented if the exposed skin is washed with mild soap and water within 10 minutes of contact. Contact can be prevented by site

workers wearing appropriate clothing. Preventive measures which can prove effective for most site personnel are:

- Avoid contact with any poisonous plants on site and keep a steady watch to identify, report, and mark poisonous plants found outside.
- Wash hands, face, or other exposed areas at the beginning of each break period and at the end of each work day.
- Avoid contact with, and wash on a daily basis, contaminated tools, equipment, and clothing.
- Barrier creams, detoxification/wash solutions, and orally administered desensitization may prove effective and should be tried to find the best preventive solution.
- Avoid spreading oils from these plants to hands and other parts of the body.

The skin reaction associated with contacting these plants is caused by the body's allergic reaction to toxins contained in the oils produced by the plant. Contamination from the oils of these plants may occur through contact with leaves, branches, stems or berries, or contact with contaminated items such as tools and clothing. The allergic reaction associated with exposure to these plants will generally cause the following signs and symptoms:

- Blistering at the site of contact, usually occurring within 12 to 48 hours after contact.
- Reddening, swelling, itching, and burning at the site of contact.
- Pain, if the reaction is severe.
- Conjunctivitis, asthma, and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin.

Blisters form during the subsequent 24 to 36 hours. Crusting and scaling occurs within a few days. Signs and symptoms included redness, swelling, and sometimes intense itching. Symptoms usually disappear in 1 to 2 weeks in cases of mild exposure and up to 3 weeks when exposure is severe.

8.4.4.7 Biological Agents

Microbial hazards can potentially occur when workers handle materials with biological contamination. One source of infection for response workers is poor sanitation. Waterborne and foodborne diseases can be a problem if adequate precautions are not taken to keep food and drinking water properly stored and isolated. An example of such a disease is salmonellosis. Workers must also avoid creating any sanitation problems by making sure that properly designed lavatory facilities are available at the work site.

Tetanus is another biological hazard encountered on hazardous materials sites. Workers must avoid puncture hazards, wear appropriate protective clothing, and should be current in Tetanus Inoculations.

8.4.4.8 Bloodborne Pathogens

In July of 1992, OSHA issued a final Standard for Protection of Workers Potentially Exposed to Bloodborne Pathogens (29 CFR 1910.1030). This primarily involves medical and research personnel. Bloodborne pathogens are pathogenic microorganisms which may be present in

human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus and human immunodeficiency virus.

Potential exposure during site activities results from workers who are infected. The OSHA Standard specifically includes first aid providers and is enforceable on site subject to the Hazardous Waste Site Work and Emergency Response Standard (29 CFR 1910.120). The basic concept of this standard is that medical care workers and first aiders must take the “Universal Precaution” of assuming that any blood-containing fluid or person bleeding or contaminated with blood-containing fluid is positive (infected) with both viruses.

Protection involves the use of personal protection such as gloves, eye shields, one-way valve rescue breather devices, and training. In order to effectively protect against any hazards, workers must have a basic understanding of the hazard. This is particularly true of Site Supervisors and SSHOs and others expected to administer first aid if necessary.

8.5 Site Control Procedures

8.5.1 Site Control

To protect the public and maintain security at SWMU 39 during working hours, the site will be controlled as follows:

- Work areas and support areas will be established prior to the start of activities.
- Only authorized workers will be permitted in work areas.
- Work will cease if unauthorized personnel enter work areas.
- Temporary fencing will be utilized around excavations to protect site visitors.

8.5.2 Site Work Zones

If site conditions dictate an upgrade in PPE due to the presence of contaminants at high concentrations, work zones will be established to ensure against the accidental spread of hazardous substances by workers from contaminated areas to clean areas. Zones will be delineated on site where removal activities occur, and the flow of personnel in these zones will be controlled. The establishment of site work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency. The site work zones that will be used during site activities, as deemed necessary by the SSHO, will include:

- Exclusion Zone (EZ) – the contaminated area.
- Contamination Reduction Zone (CRZ) – the area where decontamination of PPE takes place.
- Support Zone (SZ) – the uncontaminated area where workers should not be exposed to hazardous conditions.

A “hotline” where personnel routinely enter or exit the EZ will be located upwind of the work activities. Site work zones, including hotlines, will be established as deemed necessary by the SSHO during field activities. All site work zones will be adequately marked using traffic cones or banner guard.

Access to the EZ and CRZ will be strictly limited to individuals who meet all medical monitoring, training, and PPE requirements of the site. Visitors who have received the appropriate training, are medically qualified, and are wearing the appropriate level of protection must receive a site safety briefing and will be escorted within these zones by the SSHO. Visitors who do not meet the specified requirements will remain in the SZ.

8.5.3 Buddy System

The buddy system will be employed by all personnel entering a hazardous waste operation. This system requires that a partner, or buddy, accompany each worker. The buddy provides the co-worker/partner with assistance, observes the partner for signs of exposure, periodically checks the integrity of the partner's PPE, and notifies the SSHO if help is needed. The buddy must be in a line of sight or hearing of the partner and be prepared to enter any area the partner enters. The buddy must be fully certified to work in the level of protection that the employee is working in, and must have the appropriate PPE available.

8.5.4 Communications

This section describes the on- and off-site communications that are required during operations at SWMU 39. At SWMU 39, at least one cellular telephone will be available at each work site for off-site transmissions and emergency response.

8.6 Personal Protective Equipment

PPE consistent with Shaw procedure HS600 (**Appendix E**) will be required during field work at SWMU 39. **Table 8-7** presents the PPE requirements for the IM actions planned at SWMU 39. The SSHO will review the required level of protection and safety equipment with each work crew. The ultimate decision on which protective level is most appropriate will be made by the SSHO. The level of protection selected will be based on:

- The type and measured concentration of the chemical substance having the lowest PEL, TLV, and/or IDLH concentration in the ambient atmosphere, its range of toxic properties and lower explosive limit, and the evaluated degree of hazard.
- Potential for exposure to substances in the air, liquid splashes, or other direct contact with hazardous materials.

Table 8-7
Personal Protective Equipment Requirements

Activity/Location	PPE Level	Comment
Delineation Sampling and Soil Removal	Level D/ Modified D	Modified Level D for personnel contact with contaminated material. Upgrade to Level C if action levels warrant.
Site Set-up and Restoration	Level D	Level D when no contact with contaminated material exist.

In situations where the chemical identity, concentrations, and possibility of contact are not well-characterized, the appropriate level of protection will be one level higher than the suspected level of protection, based on professional experience and judgment, until the hazards can be better identified.

PPE shields the body against contact with a known or suspected chemical. OSHA specifies four PPE levels: A, B, C, and D. The minimum level of protection for all Shaw sites is Level D. It is not expected that the type and level of contaminant exposure during activities performed under this task will require either Level A or B protection. If unforeseen conditions arise which would require level A or B, work will halt so that the task can be reevaluated and this SSHP can be revised or replaced.

8.6.1 Level D

Level D protection will be worn only as a work uniform and not on any site with respiratory or skin hazards. It provides minimal protection and consists of:

- Coveralls or work clothes (dictated by weather).
- Leather safety boots/shoes with chemical-resistant soles, steel toes, and shanks.
- Surgical gloves: non-latex or non-powdered, low-protein latex gloves (when necessary).
- Work gloves: cotton or leather (when necessary).
- Eye protection (safety glasses or goggles).
- Hearing protection (when necessary).
- Hard hat.

8.6.2 Modified Level D

- Cotton, Saranex, Chemrel (or equivalent), or polycoated Tyvek® or regular Tyvek® coveralls (dependent upon location and splash potential).
- Rain suit or Saranex apron, and face shield (when there is a splash hazard).
- Leather safety boots/shoes with chemical-resistant soles, steel toes, and shanks with chemical resistant (disposable latex) boot covers (outer).
- Inner gloves: non-latex or non-powdered, low-protein latex gloves.
- Outer gloves: chemical-resistant butyl/neoprene or Viton/neoprene gloves.
- Eye protection (safety glasses or goggles).
- Hearing protection (when necessary).
- Hard hat.

8.6.3 Level C

Level C protection will be worn when the criteria for using air-purifying respirators are met. Level C consists of:

- Tyvek® or Saranex coveralls (dependent upon location and splash potential).
- Full-face air-purifying respirator (NIOSH-approved) or Powered air-purifying respirator w/High Efficiency Particulate Air (HEPA) cartridge.

- Prescription insert for workers who require corrective lenses (individuals will not be permitted to wear contact lenses).
- Leather safety boots/shoes with chemical-resistant soles, steel toes, and shanks.
- Latex boot covers or pullover slush boots (dependent upon location and splash potential).
- Inner gloves: chemical-resistant nitrile or non-latex surgical gloves.
- Outer gloves: chemical-resistant butyl or neoprene gloves.
- Other PPE such as hearing protection (dependent upon the activities performed).
- Hard hat.

8.6.4 Respirator Selection and Fit Test

Shaw's Safety and Health Program Requirements Manual requires that all personnel who work on potentially hazardous sites participate in Shaw's Respiratory Protection Program (Shaw procedure HS600 provided in **Appendix E**). A qualitative fit test will be performed on each individual slated for field work at least once per year. Training on use, maintenance and cleaning of respiratory protective equipment is included as part of the employee's 8-hour annual refresher training course. Each person receives documentation of the size, brand, and model number of the air purifying respirator that he or she is approved to use. This information is retained in Shaw's corporate safety and health files and also in the site safety files.

8.7 Air Monitoring Requirements

Environmental monitoring equipment to be used at SWMU 39 is discussed in this section, along with action levels for each monitoring instrument. Based on these action levels, the SSHO, or designated alternate, will authorize downgrades or upgrades in the level of PPE, as appropriate. One or more of the following instruments may be used as directed/needed by task:

- A CGI/O₂ Meter.
- A Real-Time Dust Monitor.

Proposed initial air monitoring instruments for the IM activity are presented in **Table 8-8**.

Air monitoring data from these instruments will be recorded in field logbooks. The use of this equipment is intended to provide warning and allow appropriate action to be taken to prevent exposure to contaminants released into the atmosphere. Instruments are calibrated annually by the manufacturers. In addition, calibration and maintenance checks of monitoring equipment will be performed daily prior to each use according to the manufacturer's specifications.

Table 8-8
Air Monitoring Requirements

Activity/Location	Air Monitoring Instrument Required
Soil Removal	CGI/O ₂ ; Real-Time Dust Monitor

8.7.1 Real-Time Particulate Monitor

A real-time particulate monitoring instrument is used to determine the concentration of total particulate in the breathing zone. Dust monitoring will not initially be required during SWMU 39 IM, as justified in this section. This instrument will be employed during ground intrusive activities where heavy metals and dioxins/furans are the point of contact. A water spray will be used to minimize dust generation during soil removal activities.

The following calculation represents the total particulate in milligrams per cubic meter (mg/m³) which must be detected in the breathing zone of site workers to potentially exceed the PEL for inorganic chemicals:

$$\frac{10^6 \text{ mg/kg} \times \text{PEL in mg/m}^3}{\text{maximum soil concentration (mg/kg)}} = \text{Calculated Action Level}$$

Using this equation and sampling results for soil from SWMU 39, action levels were calculated for arsenic, lead, vanadium, and dioxins/furans. The calculated action levels are as follows:

	<u>PEL</u>	<u>Max. Concentration in Soil</u>	<u>Calculated Action Level</u>
Arsenic	0.01 mg/m ³	9.2 mg/kg	1087 mg/m ³
Lead	0.05 mg/m ³	21000 mg/kg	2.38 mg/m ³
Vanadium	0.5 mg/m ³	92.7 mg/kg	5394 mg/m ³
Dioxins/Furans as TCDD TE	NA	20.67 nanogram/kilogram	NA

In addition to these concentrations, the 15 mg/m³ OSHA PEL for “particulates not otherwise regulated” applies to this site. This action level is shown in **Table 8-9**.

Since the OSHA PEL for the SWMU 39 contaminants is lower than the calculated dust action level, the real-time particulate monitor action level has been based on the sum of the maximum contaminant concentrations in soil. The dust exposure level as a mixture of the compounds is 2.3 mg/m³ or greater for 5 minutes sustained or five separate measurements within a 15-minute period (**Table 8-10**).

Table 8-9
Air Monitoring Action Levels for Particulate Not Otherwise Regulated (PNOR)

Readings	Level of Protection/Action
Real-Time Particulate Monitor	
≤ 15 mg/m ³	Normal Operations
> 15 mg/m ³	Use engineering controls to reduce dust levels.

Table 8-10
Air Monitoring Action Levels for SWMU 39

Readings	Level of Protection/Action
Real-Time Particulate Monitor	
$\leq 2.3 \text{ mg/m}^3$	Normal Operations, Modified Level D PPE
$> 2.3 \text{ mg/m}^3$	Use engineering controls to reduce dust levels. Upgrade to Level C PPE if engineering controls are not effective.

Water spray shall be used for dust control when the real time particulate monitor measures $> 2.3 \text{ mg/m}^3$ for 5 minutes sustained or five separate measurements $> 2.3 \text{ mg/m}^3$ within a 15-minute period.

8.7.2 Time-Integrated Air Sampling

Time-integrated air sampling may be performed during activities when site characterization data and real-time instrumentation indicate that chemical and/or dust exposures to personnel are suspected to be approaching established limits (PEL/TLV) for target compounds such as arsenic, lead, vanadium, or dioxins/furans. Initially, personal air samples will be collected for each craft job classification to determine if an employee may be exposed to these chemicals/materials at or above the action levels. Additional periodic monitoring may be performed based on the results of the initial monitoring. Samples will be collected and analyzed following OSHA or NIOSH methods. All time-integrated, personal air samples for chemical constituents will be analyzed using a laboratory accredited by the American Industrial Hygiene Association. Employees who are subject to time-integrated air sampling will be informed of the results in accordance with Shaw safety procedure (HS104).

8.8 Decontamination Procedures

Decontamination procedures are necessary to protect field personnel and control the spread of contamination by either personnel or equipment. Decontamination procedures to be followed are discussed below, and additional information is provided in Shaw SOP 80.1 (**Appendix B**).

8.8.1 Personnel Decontamination Procedures

During site activities, personnel will attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep “clean” during site activities. Personnel will minimize physical contact with contamination (when possible). This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

A step-by-step description of decontamination procedures for contaminated personnel for Levels C and Modified D is as follows:

- Segregated Equipment Drop – All monitoring instruments, samples, hand tools, and notebooks are dropped in this area to be decontaminated by one of the decontamination team members. To aid in decontamination, instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants.

- Outer Boot Cover and Outer Glove Wash and Rinse – Scrub the outer disposable boot covers and outer gloves with a brush, soap, and water. Rinse the boot covers and glove covers.
- Tape Removal – Remove all sealing tape from around boots, gloves, zippers, etc. Place in the disposable clothing drum.
- Outer Boot Cover and Outer Glove Cover Removal – Remove the outer boots and gloves by pulling down the items and exposing the clean inner lining. Place the boots and gloves in the disposable equipment drum.
- Outer Coverall Removal – Unzip and remove the outer coverall. Remove protective clothing in an “inside out” manner. Do not remove contaminants from clothing by blowing, shaking, or any other means that may disperse material into the air. Secure disposable PPE in plastic bags placed in 55-gallon drums designated for PPE.
- Facepiece Removal – Remove facepiece and place in a designated area for further cleaning.
- Inner Glove Removal – Remove inner gloves and place in the disposable clothing drum. Remove inner coverall, if one is used, and wash hands and face.

The decontamination line will be oriented so that the SZ and CRZ exit is upwind from the EZ and the first stages of decontamination. The decontamination line will be assembled so that it can be easily moved in case of a significant change in wind direction. All receptacles for contaminated protective clothing will be equipped with a lid that can be closed to prevent the release of contaminants.

The SSHO will determine whether conditions warrant wet or dry personnel decontamination procedures based on weather conditions, contaminant risk, and experience.

8.8.1.1 Decontamination During Medical Emergencies

If immediate life-saving first aid or medical treatment is required, decontamination procedures will be omitted. Outer garments can be removed as long as it does not delay giving the proper care or aggravate the condition. Grossly-contaminated clothing should be removed carefully, because clothing can transfer contaminants to people administering first aid. If the outer contaminated garments cannot be safely removed, the individual will be wrapped in plastic, rubber, or blankets to help prevent the spread of contamination to emergency personnel. On-site personnel will accompany contaminated victims to the medical facility to advise on matters involving decontamination.

8.8.2 Equipment Decontamination Procedures

Equipment used to excavate contaminated soil will be decontaminated after use to minimize the spread of contaminants. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SSHO.

8.9 Emergency Response Plan

8.9.1 General

The frequency and severity of emergency situations can be dramatically reduced through proper implementation of the SSHP Emergency Response Plan. If an emergency does occur, quick, decisive action is required since delays in minutes can create or escalate life-threatening situations. In an emergency situation, site personnel involved in emergency response and rescue must be prepared to respond immediately and all required equipment must be on hand, in proper working order, and ready to use. To ensure rapid, effective response to a site emergency, the procedures and contingency plans outlined in this section are implemented prior to and during the conduct of any site activities involving exposure to safety and health hazards.

8.9.2 Pre-Emergency Planning

8.9.2.1 Identification of Local Emergency Services

Prior to the conduct of site operations, Shaw contacted and/or gathered information/phone numbers of the local and site emergency response authorities. The authorities contacted were informed of the nature of the site activities to be performed under this SSHP, and the potential hazards that the conduct of these activities pose to investigation personnel, the environment and the general public. Shaw personnel were informed as to the type of emergency services available through the local authorities and were given the contact phone numbers for these services. In the event that evacuation of the general public is required due to either normal site operations or an emergency event, the SSHO is responsible for contacting the appropriate local authorities who execute and coordinate an evacuation. The phone numbers for local and site emergency services, as well as key personnel involved with the investigation, are listed in **Table 8-11**.

8.9.2.2 Identification of Potential Emergencies

During the development of this SSHP, great attention has been given to identifying potential H&S hazards associated with the conduct of site activities. Once identified, these hazards were assessed to determine the risk that these hazards could result in an emergency situation. Contingency plans for responding to the potential emergency situations have been developed and are included in this section. The potential emergencies which may result during the conduct of site activities are as follows:

- Injury or illness.
- Fire/explosion.
- Adverse weather conditions.

8.9.2.3 Other Hazard Information

In the event that additional site or task hazard information becomes available during the conduct of site investigation activities, this information will be assessed by the SSHO to determine if the contingency plans in this section need to be updated.

Table 8-11
Emergency Assistance Information
RFAAP, Radford, Virginia

Contact	Phone Number
Tom Meyer (USACE)	(410) 962-7677 (office)
Steve Bowers, C.C.M. (USACE ERRO Project Officer)	(410) 671-6003 (office)
Jim McKenna (Environmental Coordinator and Site Contact)	(540) 639-8641 (office)
Jerry Redder, P.E. (ATK Environmental Manager)	(540) 639-7536 (office)
Jeff Parks, P.G. (Shaw RFAAP Project Manager)	(410) 612-6326 (office)
Bob Culbertson, P.E. (Shaw LMARC Program Manager)	(865) 694-7402 (office)
RFAAP Field Office (Site Superintendent/SSHO)	(540) 922-3316 (cellular)
Doug Russell (LMARC Health and Safety Manager)	(865) 692-3584 (office) (865) 414-9545 (cellular)
Shaw Help Desk	(866) 299-3445
Health Resources	800-350-4511
Emergency Response Services	
Installation Fire Department	7457 (On Post)
Installation Security Police	7325 (On Post) (540) 639-7325 (Off Post)
Installation Safety Department	7294 (On Post) (540) 639-7294 (Off Post)
Installation Spill Response	7323, 7324 or 7325 (On Post) (540) 639-7323, 7324, or 7325 (Off Post)
Installation Medical Facility (Occupational Medicine Services)	7123 (On Post) (540) 639-7123 (Off Post)
Installation Ambulatory Services	7323 (On Post) (540) 639-7323 (Off Post)
Local Non-Emergency Clinic (Occupational Medical Services)	540-961-4675
Local Police Department	911
National Poison Control Center	(800) 492-2414
National Response Center	(800) 424-8802
Regional USEPA Emergency Response	(215) 597-9800
Chemical Manufacturers Association Chemical Referral Center	(800) 262-8200
Non-Emergency Services: Occupational Medical Services 3700 South Main Street Blacksburg, VA 24060 Hours of Operation: M-F 8:30-3:30 pm; closed 12-1 pm for lunch Directions to Occupational Medical Services From RFAAP (see Figure 8-1): Turn Left out of RFAAP onto Route 114 (Pepper's Ferry Road), go 6.5 miles Turn Left onto Route 460 Business (Franklin Street), go 1.0 miles Make a U-turn at Yellow Sulphur Rd, Hightop Rd onto S Main St[US-460-Business], go 0.2 mi Arrive at 3700 S Main Street, on the Right Comfort Inn and Cinco de Mayo restaurant will be on the right	

Table 8-11, Continued
Emergency Assistance Information
RFAAP, Radford, Virginia

Emergency Services:

RFAAP Installation Hospital
Alliant Techsystems, Inc.
Rt. 114
PO Box 1
Radford, VA 24141

Directions from the Main Gate to the Radford Army Ammunition Plant Hospital:

Enter through Main Gate
Turn Left at Building 220, Administrative Building
Proceed down hill through gate house at Gate 1
White building on right through gate house (Building 205)

Directions from SWMU 39 to the Radford Army Ammunition Plant Hospital (see Figure 8-2):

Follow Contractor Route back across bridge to Gate No. 1
Hospital is white building on left just inside of the gate (Building 205)

Figure 8-1
Directions to Occupational Medical Services

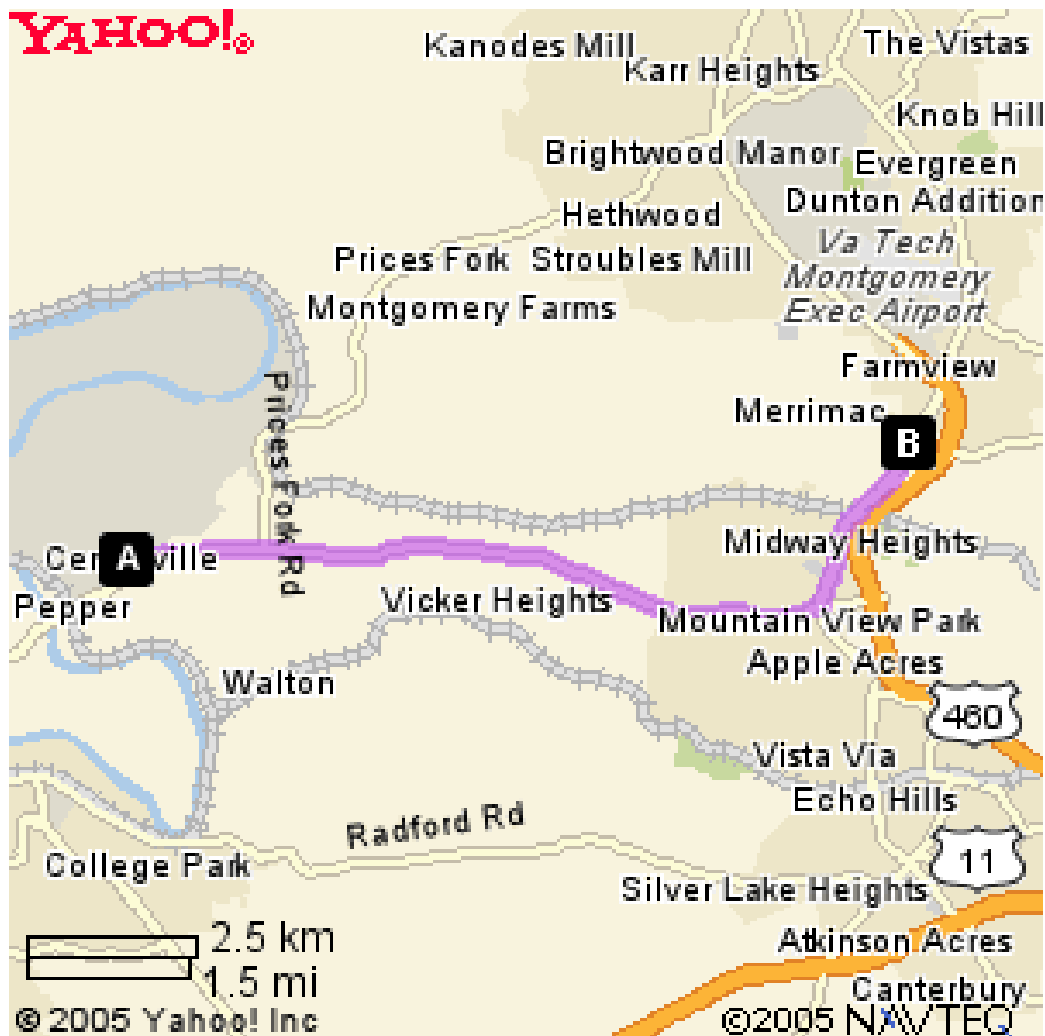
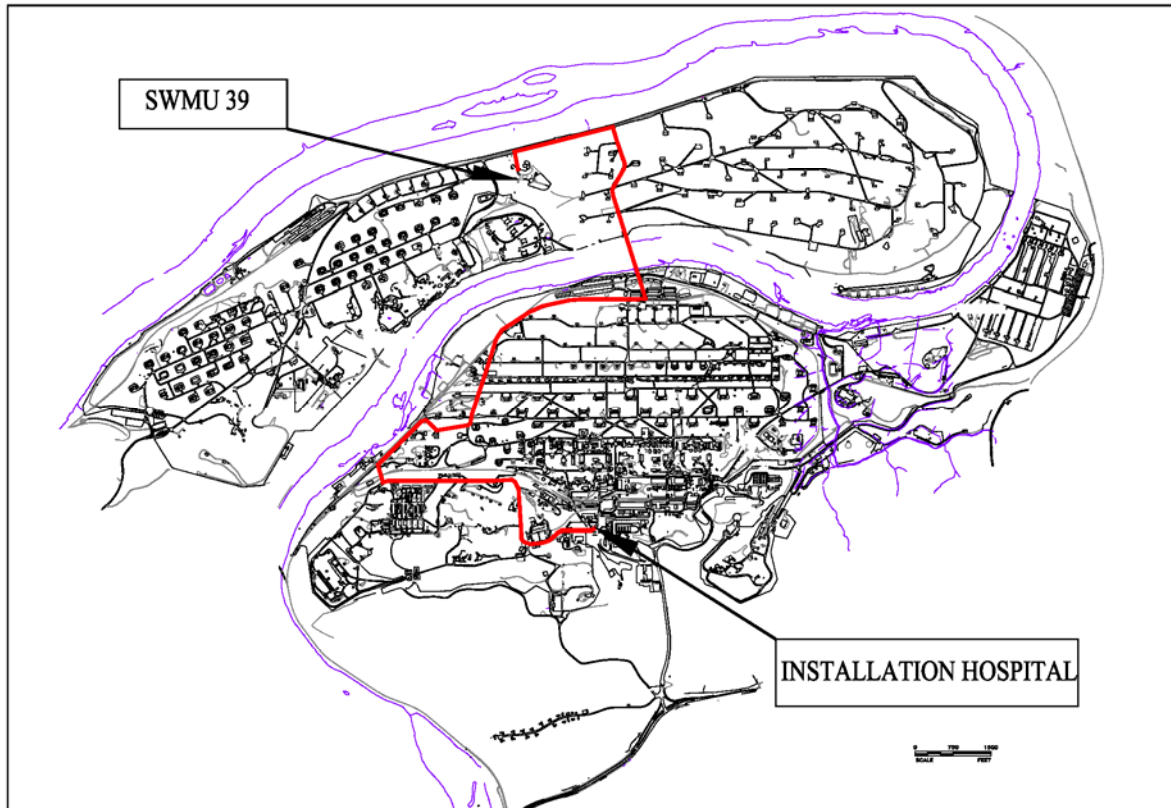


Figure 8-2
Directions to Radford Army Ammunition Plant Hospital



8.9.3 Personnel Responsibilities

8.9.3.1 On-Scene Incident Commander

In the event of an emergency, the SSHO assumes the responsibility of On-Scene Incident Commander (OSIC). The alternate person to assume this role, in the event that the SSHO is unavailable or incapacitated, is the task supervisor. The OSIC has responsibility for directing all on-site and off-site response personnel.

8.9.3.2 On-Site Emergency Response Services

Shaw personnel/subcontractor personnel are trained to provide first aid treatment for minor injuries. At least two persons on site at all times are first aid and CPR certified.

The SSHO will determine if the injury requires further treatment. If emergency response is needed, the SSHO, or other designee, will call emergency response personnel by dialing 911.

8.9.3.3 Off-Site Emergency Response Services

Off-site emergency response services that may be needed in the event of a site emergency, such as fire, medical, and police personnel, are listed in **Table 8-11**.

8.9.3.4 Medical Evacuation

Medical evacuation (MedEvac) requirements are determined by the emergency first responder. Personnel requiring additional treatment are evacuated to the New River Valley Medical Center by ambulance. Helicopter MedEvac will be initiated by the emergency first responder, if necessary.

8.9.4 Emergency Site Control and Security

In an emergency, it is imperative that site control and security be maintained. To control site personnel, the OSIC will utilize the Site Entry/Exit Log to ensure all personnel are present or accounted for at the assembly point(s). Depending upon site size and configuration, weather and wind conditions and the nature of the emergency, the following will, as applicable, be used to maintain site security:

- Close, but do not lock, gates as evacuation occurs.
- Erect flagging or barrier tape to prevent accidental entry.
- Use a megaphone, walkie-talkies, and/or cell phones to alert personnel to stay clear of the site.
- Use vehicles to block access routes to the site, but ensure they can be moved rapidly if emergency vehicles must use the access route.

8.9.5 Medical Facilities

The directions to the Occupational Medical Facilities and RFAAP Hospital are presented on **Figure 8-1** and **Figure 8-2**, respectively. Directions for emergency services at the RFAAP Installation Hospital are presented in **Table 8-11**.

8.9.6 General Emergency Procedures

Emergency response procedures include all steps to be taken for notifying, evaluating, reacting to, documenting, and following-up on a given emergency situation. To ensure all necessary

elements are covered, the procedural steps outlined in this paragraph are implemented for each emergency, regardless of its nature.

8.9.6.1 Notification

Once the OSIC has been informed of the emergency, the OSIC alerts site personnel to the presence of the emergency by radios. This is done to:

- Notify personnel and get their attention.
- Stop all work activity as required.
- Lower noise levels in order to speed and simplify communication.
- Begin emergency and/or evacuation procedures.

If on-site Shaw personnel/subcontractors or off-site emergency personnel are to enter the site in response to the emergency, the OSIC, to the extent possible, will notify response personnel about the nature of the emergency, to include:

- What happened and when it happened.
- Where on site the emergency situation occurred.
- Who is involved and, if possible, the cause of the emergency.
- The extent of damage and what hazards may be involved.
- What actions should be taken.

8.9.6.2 Assessing the Emergency

Available information related to the emergency and the on-site response capabilities should be evaluated and the information listed below obtained to the extent possible:

- What happened.
- Type of incident.
- Casualties involved.
- Victims (number, location, and condition).
- Treatment required.
- Missing personnel.
- Cause of incident.
- Extent of damage to structures, equipment, and terrain.
- What could happen from this point.
- Potential for fire or explosion.
- Location of all personnel in relation to hazardous areas.
- Potential for emergency affecting the general public or the environment.
- What can be done to remediate the situation.
- Equipment and personnel needed for rescue and hazard mitigation.

- Number of uninjured personnel available for response.
- Resources available on site.
- Resources available from off-site response groups and agencies.
- Time needed for off-site response to reach the site.
- Hazards involved in rescue and response.

8.9.6.3 Rescue and Response Actions

Based on the information collected during the emergency assessment, the general actions listed below are taken, with some actions being conducted concurrently. No one is to attempt emergency response/rescue until the situation has been assessed and the appropriate response outlined by the OSIC.

- Enforce the Buddy System.
- Allow no one to enter a hazardous area without a partner.
- Personnel in the EZ should be in line-of-sight or in communication with the OSIC or his designee.
- Survey Casualties.
- Locate all victims and assess their condition.
- Determine resources needed for stabilization and transport.
- Assess Existing and Potential Hazards and Determine.
- Whether and how to respond.
- The need for evacuation of site personnel and off-site population.
- The resources needed for evacuation and response.
- Request Aid.
- Contact the required off-site and on-site personnel or facilities, such as ambulance, fire department, police, etc.
- Allocate Resources.
- Allocate on-site personnel and equipment to rescue and initiate incident response operations.
- Control.
- Assist in bringing the hazardous situation under complete or temporary control and use measures to prevent the spread of the emergency (i.e., control fire, secure site, etc.).
- Extricate.
- Remove or assist victims from the area.
- Stabilize.
- Administer any medical procedures that are necessary before the victims can be moved.
- Stabilize or permanently fix the hazardous condition.

- Attend to what caused the emergency and anything damaged or endangered by the emergency (e.g., drums, tanks, etc.).
- Transport.
- Using either on-site or off-site assets.
- Casualty Logging.
- Record who, time, destination and condition upon transport.
- Evacuate.
- Move site personnel to the rally point, a safe distance upwind of the incident.
- Monitor the incident for significant changes; the hazards may diminish, permitting personnel to re-enter the site, or hazards may increase and require public evacuation.
- Casualty Tracking.
- Record disposition, condition and location.

8.9.6.4 Post Emergency Follow-Up

Immediately following an emergency, it is imperative that all federal, state, and local regulatory agencies be notified of the emergency. The following activities will be conducted:

- Notify all appropriate governmental agencies as required. Accidents will be reported immediately by telephone to USACE and in writing within 2 working days of occurrence. Complete the USACE Accident Investigation Report (Eng Form 3394-see **Appendix D**). Any chemical exposure or occupational injuries and illnesses also will be reported and recorded, if recordable per 29 CFR 1904, on an OSHA Form No. 300 Log (see **Appendix D**). Any incident will be reported to OSHA by Shaw's Health and Safety Manager as soon as possible. Any incident or accident will be reported to the LMARC Safety Manager and the Shaw Corporate Help Desk. If a person is injured, Health Resources need to be notified prior to/during transportation of the injured party to the emergency room or the Health Clinic. Any damage to government or contractor property (which occurs during the performance of the contract at the project site) in excess of \$2,000 will be reported to USACE within 8 hours of occurrence.
- Complete a Shaw Accident Report (see **Appendix D**). Any recommended hazard control will be discussed with the Shaw H&S Manager for approval prior to implementing the control. The SSHO will maintain records of all site accidents and first aid treatments. Accident investigation and injury/illness recordkeeping procedures are outlined in Shaw procedure HS020 (**Appendix E**).
- Conduct an accident investigation and root cause analysis of the emergency and what preventive measures could be taken to ensure the emergency does not occur again.
- Review and revise, as needed, the site operational procedures, and if necessary, update the SSHP to reflect the new procedures.
- Restock and clean all equipment and supplies utilized or damaged in the emergency.

8.9.6.5 Documentation

Documentation related to the emergency will be recorded in an accurate, authentic and complete fashion. Documentation shall be recorded as soon as possible after the emergency to ensure it is recorded while the events are vivid in the minds of the personnel involved. The information recorded will include:

- A chronological record of events.
- A listing of the personnel involved, including personnel on site, site personnel who responded, personnel in charge, and off-site groups or agencies that responded.
- A listing of the actions taken to minimize the effects of or mitigate the emergency.
- An assessment of the potential exposures received by site personnel and the surrounding public.
- A recording of the injuries or illnesses which occurred as a result of the emergency. All information gathered will be forwarded to the LMARC Safety Manager and to the Corporate Safety Group in Louisiana.

8.9.7 On-Site Emergency Equipment

The emergency equipment listed in **Table 8-12** below will be available at each work site. The team support vehicle is designated as an emergency vehicle. All emergency equipment will be maintained in proper working order and inspected by the SSHO to ensure completeness and proper working order. The results of the inspection will be documented in the safety log. In the event that any of the disposable items are utilized, the SSHO will ensure they are replaced immediately. Site operations will not be conducted if the required emergency equipment is not available on site.

Table 8-12
Emergency Response Equipment

Emergency Equipment	Number per Location	Location where Emergency Equipment is Stored
First Aid/Burn Kit	1 each	Team Support Vehicle
Eye Wash	1 each	All First Aid Kits
CPR Pocket Mask	1 each	All First Aid Kits
Disposable Latex Gloves	5 each	All First Aid Kits
Fire Extinguisher 10 BC Rated	1 each	Team Support Vehicle

8.9.8 Contingency Plans

The following paragraphs contain emergency specific contingency plans. These plans outline the procedures for mitigating each of the potential emergency situations that were identified in the pre-emergency planning. These contingency plans specify the minimum emergency procedures and may be subject to alteration by the SSHO, based on actual or changing site conditions.

8.9.9 Contingency Plans

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8.9.9.1 Injury or Illness

In the event of an emergency involving personal injury or illness, immediate response is key in preventing further injury/illness and providing comfort to the affect party. When personnel are injured or overcome by illness, the following procedure is followed:

- Upon notification of the occurrence and nature of the injury/illness, the OSIC, if deemed necessary, summon emergency personnel.
- Administer life support if necessary until emergency response personnel arrive.

8.9.9.2 Fires and Explosions

The occurrence of a fire on site presents a serious threat to all site personnel, the environment, and the general public. Due to the sites proximity to the propellant incinerator, it is imperative that Radford's emergency services be notified immediately [(540) 639-7325 – from cell phone; x7325 from installation phone]. To ensure immediate, aggressive response to emergencies dry-chemical-type fire extinguishers will be available at each individual work site. Dry chemical fire extinguishers are also provided at any other site location where flammable materials may present a fire risk. Additionally, a fire extinguisher rated at least 2A:10B:C will be located with each piece of heavy equipment and in each site vehicle.

Small Fires

A small fire is defined as a fire that can be extinguished with a 4A:20B:C type fire extinguisher. In the event of a small fire, site personnel take the following actions:

- All personnel are evacuated from the site, to an upwind location.
- Extinguish the fire using portable fire extinguishers or by smothering from an upwind location.
- 911 Emergency response services (ambulance, fire, police) will be notified by the OSIC immediately.
- Do not attempt to extinguish a fire, even a small one, involving explosives.
- Notify the SSHO and Site Supervisor.

Large Fires

In the event of a large fire or small fire which cannot be extinguished, the following actions are taken:

- All personnel will be evacuated from the site, to an upwind location.
- The 911 emergency response services (police, ambulance, hospital, etc.) will be notified by the OSIC immediately.

- If it can be conducted safely, the OSIC will direct personnel to move vital equipment/supplies from the fire path.
- Do not attempt to extinguish a fire involving explosives.
- Notify the SSHO and site supervisor.

Explosion

In the event of an explosion, all personnel evacuate, the OSIC requests the required support equipment and personnel, and the USACE and ATK representatives are notified. It is essential that the site be evacuated and no one allowed to re-enter until an ATK representative authorizes re-entry. The OSIC determines what actions are appropriate.

8.9.9.3 Inclement Weather

In the event of inclement weather [i.e., high winds, electrical storms, tornadoes, extremely hot weather (>100°F), or extremely cold weather (<0°F)], it may be necessary to cease operations and evacuate the site.

8.9.9.4 Spill Containment

A spill containment program will be implemented during all site activities that meet drum and container handling requirements in accordance with 29 CFR 1910.120. Hazardous substances and contaminated soils, liquids, and other residues also will be handled, transported, labeled, and disposed of in accordance with this regulation. If a spill occurs, Shaw will follow the *Spill Notification Procedures* in Section 5.15.5 of this Work Plan and, if possible, implement controls to contain and isolate the spilled substance.

8.10 Personnel Training and Medical Surveillance Program

8.10.1 General

Work at RFAAP will be performed in accordance with the RFAAP MWP (URS, 2003). Section 8 of the MWP details the security and entry requirements for the Installation. All Shaw employees, managers, supervisors, consultants, and subcontractors who perform field activities at RFAAP are required to have received the following:

- OSHA 1910.120 initial 40-hour training or OSHA 1910.120 annual 8-hour refresher training within the last year. In addition, 3 days of documented field experience under the direct supervision of a trained, experienced supervisor is required.
- Managers and supervisors directly responsible for site activities must complete an 8-hour supervisor training course in addition to the 40-hour training and 8-hour refresher course. Training certificates for all personnel (including subcontractor personnel) conducting site activities will be maintained in the Project File or Shaw's corporate safety and health file.
- An occupational medical surveillance examination (in compliance with OSHA 1910.120) within the last year, which demonstrates no restrictions for hazardous waste site work, and ability to wear a respirator.
- Site-specific safety and health training that specifically addresses the activities, procedures, monitoring, and equipment applicable to ongoing field activities.

- At least two members of the team are required to have first aid and CPR certification. These personnel will be on site with the team at all times.

8.10.2 Site-Specific Training

To ensure that all personnel understand the hazards associated with this specific project, site workers will attend a pre-work safety meeting conducted by ATK. In addition, the SSHO will conduct initial site-specific training for personnel before participating in the field activities. The SSHO will use the following outline for the initial training of personnel:

- Names of personnel and alternates responsible for site safety and health.
- Safety, health, and hazards present at the site.
- Contingency Plans Training.
- Hazard Communications Training.
- Use of PPE.
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on site.
- Medical surveillance requirements.
- Decontamination procedures.
- Emergency response plan.
- Spill containment.

8.10.2.1 Activity/Hazard Specific Training

Prior to initiating soil remediation activities, all personnel will receive additional training in lead awareness, arsenic awareness, vanadium awareness, and dioxin/furan awareness.

8.10.3 Daily Safety Meetings

Safety meetings/training will be held each morning on site at the daily safety meeting. This meeting will be conducted by the SSHO. Attendance is mandatory for all site personnel and will be documented in a logbook. The safety and health considerations for the day's activities will be reviewed at this meeting. Additional training, Job Safety Analysis creation, and review of safety concerns will be conducted when circumstances dictate. The meeting will re-affirm safety issues, specific hazards, and emergency procedures including:

- Notification procedures and phone numbers.
- Rally points and safe areas.
- Hospital and evacuation routes.
- Emergency equipment.

The SSHO will conduct tailgate safety meetings and new employee orientation at the beginning of each shift, whenever new personnel arrive at the site, as site conditions change, or as needed.

8.10.4 Medical Monitoring Program

Shaw employees who conduct field activities at SWMU 39 must participate in Shaw's medical surveillance program. Personnel performing site work must have received a medical baseline or follow-up examination within the past 12 months. A physician's statement declaring that each Shaw field team member is medically qualified to perform hazardous waste related activities, including medical qualification to wear a respirator, will be maintained on site and in the Shaw corporate safety and health files.

Subcontractor employees must participate in their employer's medical monitoring program consistent with 29 CFR 1910.120. The SSHO must ensure that all subcontractors participate in a medical monitoring program and that subcontractors provide appropriate documentation. Documentation will be maintained on site and should include a statement declaring that each subcontractor employee is medically qualified to perform hazardous waste site work, including medical qualification to wear a respirator.

8.11 General Safety Items

Additional safety items include the following:

- Safety and health audits will be conducted by the SSHO to ensure that all site activities are being performed in accordance with the SSHP, USACE requirements, OSHA regulations, Shaw procedures, and contract requirements.
- The SSHO will ensure that appropriate PPE is available for personnel and is used as directed in this SSHP. The SSHO will be responsible for ensuring that job site hazards are properly controlled to provide safe ingress and egress from the sites. Cones and high-visibility banner guard (when deemed necessary by the SSHO) will be used to control traffic and limit access to hazardous and restricted areas.
- A tailgate safety meeting will be conducted to discuss pertinent site safety topics at the beginning of each shift, whenever new personnel arrive at the job site, as site conditions change, and whenever otherwise deemed necessary. These meetings will be conducted by the SSHO, and all relevant information will be recorded in the site logbooks. Site personnel and visitors are required to attend these meetings. Proof of attendance will be documented. Necessary information from these meetings will be forwarded to the SSHO.
- Shaw and its subcontractors will emphasize compliance with state, local, and Installation motor vehicle laws, regulations, and safety guidelines as part of each daily safety briefing. Special considerations, such as current or anticipated hazardous road conditions, will be addressed at the daily safety briefings.
- Emergency telephone numbers will be posted for the fire department, emergency medical response, and the nearest emergency medical clinic/hospital. These numbers are listed in this SSHP.
- At least one copy of this SSHP shall be available at each work site.
- Horseplay, practical joking, or any other actions that jeopardize safety will not be tolerated.
- Running is not permitted.

- Alcoholic beverages and non-medicinal drugs are not permitted at the project site. Personnel suspected of being under the influence of alcohol or drugs will be removed from the site.
- Radios (excepting two-way radios), tape players, or other forms of entertainment devices are prohibited during work.
- Legible and understandable precautionary labels shall be affixed prominently to containers of contaminated scrap, waste, debris, and clothing.
- Removal of contaminated soil from protective clothing or equipment by blowing, shaking or any other means which disperse contaminants into the air is prohibited.
- Transportation and disposal of contaminated materials shall comply with all applicable local, state, and federal regulations. These items will be addressed by the generator, transporter, and disposer.
- Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.
- Emergency equipment (including first aid equipment, emergency-use respirators, spill control materials, and fire extinguishers) shall be located in readily accessible locations.
- All trenching, shoring, and excavation work must comply with all federal OSHA rules and Shaw safety policy HS307.
- No food or beverages shall be present or consumed in the EZ. No tobacco products shall be present or used and cosmetics shall not be applied in the EZ.
- All personnel shall avoid contact with potentially contaminated substances. Walking through puddles or mud, kneeling on the ground, or leaning against drums shall be avoided.
- Monitoring equipment shall not be placed on potentially contaminated surfaces.

Field personnel must observe each other for signs of toxic exposure. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin discoloration.
- Changes in coordination.
- Changed in demeanor.
- Excessive salivation and papillary response.
- Changes in speech pattern.

Field personnel shall be cautioned to inform each other of non-visual effects of toxic exposure such as:

- Headaches or dizziness.
- Nausea.
- Blurred vision.
- Cramps.
- Irritation of eyes, skin, or respiratory tract.

9.0 CONTRACTOR QUALITY CONTROL PLAN

This CQCP describes the QC organization and program for IM actions at SWMU 39. The requirements and systems herein, are relevant and applicable to project work performed by Shaw and its subcontractors and suppliers. Chemical quality management aspects of this QC program are addressed in the QAPP (*Section 4.0*).

The objective of this CQCP is to establish procedures to verify that the quality of work meets the applicable requirements of the contract, and is suitably well documented. Specifically, this plan:

- Identifies the qualifications, authority, duty and responsibility of the CQC System Manager and staff.
- Establishes QC procedures for inspection and test activities, including the performance of three phase control, deficiency, and daily QC reporting.
- Defines project communication, documentation, and recordkeeping procedures.

References used for the development of this plan include USACE ER 1180-1-6: *Construction Quality Management* (USACE, 1995); USACE ER 1110-1-12: *Engineering and Design Quality Management* (USACE, 1993); and USACE ER 415-1-10: *Contractor Submittal Procedures* (USACE, 1997).

The sponsoring/monitoring agency for this project is the USACE, Baltimore District. Therefore, USACE's acceptance of this CQCP is required prior to the start of on-site operations under definable features of work listed in *Section 9.10* of this CQCP. Work outside these definable features is not to be performed without USACE documented approval.

Once accepted by the USACE, the distribution of plans, drawings, procedures and instructions shall be controlled to ensure that the most recent revision is available for use at all locations where work is to be performed. Within the Shaw's project team, initial distribution will include the Program Manager, Project Manager, SWMU 39 IM Task Manager, QC Manager, CQC System Manager, Site Superintendent, and subcontractors.

The USACE is to be notified by the CQC System Manager in writing a minimum of seven calendar days prior to any proposed changes to a USACE-accepted CQCP. Any revisions or changes to the accepted CQCP, CQC staff, or their responsibilities must be approved by the USACE prior to being implemented by the CQC System Manager or other project personnel.

Revisions to this plan will require the same level of review and approval as the original document.

9.1 Project Background

A detailed discussion of the project background was presented in the Organization and Technical Approach Plan (*Section 2.0*).

9.1.1 Project Scope of Work

The project scope of work and detailed approach for completion of the SWMU 39 IM is provided in the Organization and Technical Approach Plan (*Section 2.0*).

9.2 Project Organization

The quality related responsibilities and authority of the key members of the organization are outlined below. Additional QC staff may be added as necessary to meet QC requirements to complete the definable features of work. Changes in project management and QC personnel require USACE approval.

9.2.1 Project Manager

Mr. Jeff Parks, P.G., the Project Manager, reports to the Program Manager, Mr. Bob Culbertson. Mr. Parks is responsible for coordinating all activities performed by Shaw at RFAAP and for communicating with the USACE.

9.2.2 SWMU 39 IM Task Manager

Mr. Timothy Leahy, the SWMU 39 IM Task Manager, reports to the RFAAP Project Manager, Mr. Jeff Parks. Mr. Leahy is responsible for the quality and timeliness of all project activities, including those performed by subcontractors. Essentially, the Task Manager is responsible for task accomplishment, administration of all instructions, and on-site customer interface.

9.2.3 Site Superintendent/CQC System Manager

Mr. Steve Kritak is the designated Site Superintendent and CQC System Manager for this project. As Site Superintendent, Mr. Kritak reports to the SWMU 39 IM Task Manager regarding daily site operations. The Site Superintendent is responsible for supporting the implementation of the CQCP and efforts of the CQC Manager and his staff.

As CQC System Manager, Mr. Kritak will report to Mr. Kenneth Martinez, QC Manager, and will coordinate activities with the SWMU 39 IM Task Manager. As CQC System Manager, Mr. Kritak has authority to enforce the procedures defined in this CQCP. In alignment with this authority, Mr. Kritak has the authority to stop work, if necessary to ensure that project activities comply with the requirements of this CQCP, the contract, and the Task Order. This authority applies equally to all project activities, whether performed by Shaw or its subcontractors and suppliers.

The CQC System Manager is responsible for planning and executing QC monitoring, inspection, and oversight of project operations to verify compliance with applicable requirements.

Specifically, the CQC System Manager is responsible for: 1) developing, implementing, and maintaining this CQCP and its related procedures; 2) planning and conducting preparatory, initial, follow-up, and final/completion inspections for each definable feature of work; 3) identifying quality deficiencies and verifying that appropriate corrective actions are implemented; 4) verifying that the requisite QC records including submittals are generated and retained as prescribed in this CQCP ; and 5) verifying that subcontracted laboratories have appropriate USACE certifications and a documented QC program that complies with the applicable requirements of the contract and Task Order.

The CQC System Manager is to be physically on site whenever project-related fieldwork is in progress. If the CQC System Manager is to be absent from the site, with USACE approval, an alternately qualified CQC System Manager will be provided for USACE acceptance and assigned during the absence.

Mr. Kritak has successfully completed the USACE Quality Management Training Course for Contractors. Any alternate CQC System Manager must also complete this training prior to assignment.

9.2.4 Project Chemist

Mr. Eric Malarek, the Project Chemist, will be responsible for analytical sampling, reviewing results for acceptance and ensuring analytical data is validated at the level required by the DQOs. The Project Chemist will be responsible for coordinating analysis and data package production with the laboratory. The Project Chemist will report to the SWMU 39 IM Task Manager and assist the CQC System Manager, as needed.

9.2.5 Subcontractors

Shaw will procure subcontractors for waste transportation and disposal and laboratory services from USACE certified laboratories.

9.3 Personnel Qualification and Training

Project staff shall be qualified to perform their assigned jobs in accordance with terms outlined by the LMARC contract. This will be accomplished by establishing and enforcing minimum qualification requirements for key positions, verifying initial and continued personnel proficiency, and implementing on-the-job training, as necessary.

9.3.1 Project Personnel

Shaw has established minimum qualification requirements for key positions on this project through review of contractual and other project-related requirements. The SWMU 39 IM Task Manager is responsible for reviewing personnel qualifications, and providing for any additional training required for this site. In the event that additional assignments are made for this project, the qualifications of assigned personnel are to be evaluated and documented. Project personnel are not to be assigned a position or job for which they do not meet the minimum qualifications.

Senior technical staff shall provide on-the-job training to newly-assigned technical staff related to their job requirements and techniques and with particular emphasis on problem prevention. Work performed by newly assigned staff is to be monitored by senior staff. When newly assigned personnel arrive, the individual's demonstrated proficiency to perform his or her assigned duties must be thoroughly documented prior to his or her release from senior staff monitoring. Training will be documented with training records maintained on file.

9.3.2 QC Personnel

QC personnel will be qualified to perform their assigned jobs. Minimum education and experience standards shall be in compliance with Shaw policies and procedures. Qualifications for key technical, management, and additional QC staff (if required) will be documented as outlined in the LMARC contract vehicle.

9.3.3 Subcontractors

As described in *Section 9.2.5*, Shaw will procure the necessary subcontractors for the SWMU 39 IM. Anticipated subcontractor organizations are identified in *Section 9.2.5* of this CQCP. The Project Manager is responsible for ensuring that subcontractors possess the requisite qualifications prior to procurement. Subcontractors to Shaw shall not subcontract their responsibilities on this project to a third party or organization without prior and written approval

of the Shaw Project Manager. The Shaw Project Manager will ensure that each subcontractor agrees to comply with this CQCP or develops and implements a QC program that meets all contract requirements and is reviewed and accepted by Shaw and the USACE, prior to performing work.

9.3.4 Health and Safety Training

Health and Safety training requirements for on-site project personnel have been established in accordance with OSHA requirements for hazardous site workers (29 CFR 1910.120) and Shaw policies and procedures. These training requirements are specified in the SSHP and are to be met before project personnel can begin site work. As a minimum, site workers and visitors who may encounter hazardous substances are to have completed the OSHA Hazardous Material Site Worker Training (40-hour initial training and 8-hour annual refreshers). Site managers are to have completed the 8-hour Supervisor Training also.

9.4 Letter of Authority

The letter of authority describes responsibilities and delegates the authority of the CQC System Manager. A copy of this letter will be furnished to the USACE and provided in **Appendix G**.

A letter of authority has been signed by the Shaw LMARC QC Manager and acknowledged by the designated CQC System Manager for this project. This letter describes the responsibilities of, and delegates authority to, this function, including the authority to stop work that is not in compliance with project requirements.

9.5 Submittal Management

The Project Manager has the sole responsibility for ensuring submittals fully comply with project requirements and shall establish and designate an individual to maintain the project Submittal Register. Submittal control is required to regulate the timely flow of materials and work, to ensure problem prevention, and to demonstrate that materials and work are in compliance with applicable requirements. Project submittal procedures are to be implemented as prescribed herein and in accordance with the project Submittal Register.

9.5.1 General Requirements

The Site Superintendent is responsible for submittal scheduling and tracking. The CQC System Manager is responsible for ensuring, through detailed review, that submittals, as well as the materials and the work they represent, are verified in full compliance with applicable requirements.

9.5.1.1 Project Submittals

Submittals are to be listed and tracked using USACE Engineering Form (ENG) 4288, Submittal Register. Submittals include deliverables generated on site or off site by Shaw, subcontractors, fabricators, manufacturers, suppliers, or purchasing agents. Procurement documents for subcontracted services and materials are to list the submittals required of the subcontractor. The CQC System Manager is to review the list to verify its completeness. The approved ENG 4288 becomes the scheduling document used to track and control submittals throughout the project. Submittals will be transmitted using form ENG 4025 with a unique tracking number assigned from the Submittal Register.

9.5.1.2 Project Records

The CQC System Manager is to establish and maintain an on-site project file in accordance with contract requirements. The purpose of this file is to maintain a complete set of all documents, reports, certifications, and other records that provide information on project plans, contract agreements, and project activities. The initial file will be structured to include a record copy of the following documents:

- Construction schedule and progress reports.
- Technical specifications, including addenda and modifications thereof.
- Change orders and other contract modifications.
- Engineer Field Orders.
- Manufacturer's certificates.
- Daily work activity summary reports, including:
 - Daily QC report (including QC log).
 - Daily H&S Report.
 - Daily Superintendent Report (including activity log).
 - Reports on any emergency response actions.
 - Test records.
 - Records of site work.
 - Chain-of-custody records.
 - Reports on any spill incidents.
 - Truck load tickets and shipping papers.
 - Laboratory results.
 - Records on quantities of soil treated.
 - Other items as required by the Contracting Officer's Representative.
- Conversation logs.
- Meeting minutes and agenda.
- Inspection logs and schedules.
- Photo documentation.
- Site maps.
- As-built drawings.

9.5.2 Submittal Scheduling

The Site Superintendent is to establish and maintain a project submittal schedule that reflects the status on ENG 4288. Submittal activities are to be incorporated into the construction schedule so that submittal progress can be tracked in conjunction with overall progress. Submittal schedules are to allow for evaluation, approval, procurement, and delivery prior to the preparatory phase

and before the item is needed. The Site Superintendent is responsible for monitoring the progress of project submittals and keeping the Project Manager apprised. The submittal schedule is to be updated by the Site Superintendent on a weekly basis. Submittals covering component items that form a system or items that are interrelated are to be scheduled and submitted concurrently. Adequate time is to be allowed for required reviews and approvals.

9.5.3 Review of Plans and Specifications

During the preparatory phase for a construction feature of work, the Project Manager or his designee is responsible for reviewing the construction drawings and specifications and requesting clarification from USACE, where necessary. The primary purposes of this review are to identify and resolve potential conflicts prior to initiating work operations. In the interest of minimizing adverse impacts on project schedules this review is to be performed as early in the process as practical to allow sufficient time for evaluation and response. The Project Manager is responsible for ensuring that construction plans, drawings, and specifications 1) have been approved by USACE for implementation on the particular feature of work; 2) are clear and complete; and 3) are executable, cost-effective, and practical. The review should include items such as identifying discrepancies between plans and specifications, assessing and verifying site conditions and restraints, verifying that proper allowances are made for maintenance space and access, etc.

9.5.4 Review and Approval of Submittals

Prior to client delivery or use, project submittals are to be reviewed and accepted by Shaw. The CQC System Manager certification and signature are required on each submittal. He is to review submittals prepared by Shaw, subcontractors, and suppliers for completeness and compliance with the specifications of the Task Order and contract. Submittals related to construction equipment or materials are to be reviewed for contractual compliance, including compliance with the *Buy American Act* (FAR 52.225-0005 and 52.225-15). Noncompliant submittals are to be returned to the originator for corrective action and re-submittal to the CQC System Manager.

Prior to submittal to the CQC System Manager for certification, technical documents (e.g., reports, plans, and engineering drawings) are to be reviewed by qualified staff. Although part of the QC process, technical reviewers may include but are not limited to the QC staff.

9.5.5 Documentation

In addition to the documentation requirements specified above, the following requirements apply to this project. The QC file is to be maintained by the CQC System Manager and is to be controlled as an integral component of the project files. Shop drawings, work orders, and change orders issued for remedial actions are to be provided to the CQC System Manager. It is the responsibility of the CQC System Manager to maintain this technical information and keep it current and recorded as it is revised. Technical information is not to be replaced or revised without receipt of a properly authorized change order or revision. Copies of purchase orders or subcontracts requiring inspection are to be provided to the CQC System Manager for receiving and recording purposes. Copies of required certifications received are to be maintained in the QC file and are to be submitted to the client in accordance with agreements made at the coordination meeting. Changes in submittal progress and QC activities related to submittals are to be summarized in the Daily QC Report.

9.6 Inspection Phases

The CQC System Manager is responsible for verifying compliance with this CQCP through implementation of the 3-phase control process. This process ensures that project activities comply with the approved plans and procedures. The specific QC monitoring requirements for the definable features of work for the SWMU 39 IM actions are discussed below. This section specifies the minimum requirements that must be met and to what extent QC monitoring must be conducted by the CQC System Manager.

9.6.1 Implementation of the 3-Phase Inspection Process

The CQC System Manager is to ensure that the 3-phase control process is implemented for each definable feature of work listed in *Section 9.10* of this CQCP, regardless of whether they are performed by Shaw or its subcontractors. Each control phase is important for obtaining a quality product. However, the preparatory and initial inspections are particularly invaluable in preventing problems. Production work is not to be performed on a definable feature of work until a successful preparatory and initial phase inspection have been completed.

9.6.1.1 Preparatory Phase Inspection

The CQC System Manager or designee will perform a Preparatory Phase Inspection prior to beginning each definable feature of work. The purposes of this inspection are to review applicable specifications and verify that the necessary resources, conditions, and controls are in place and compliant before the start of work activities. To conduct and document the inspection, the CQC System Manager shall use the Preparatory Inspection Checklist provided in **Appendix H**.

The CQC System Manager or designee will review work plans and operating procedures to ensure that they describe pre-qualifying requirements or conditions, equipment and materials, appropriate sequence, methodology, hold/witness points, and QC provisions. He is to verify that the required plans and procedures have been prepared and approved and are available to the field staff; field equipment is appropriate for its intended use, available, functional, and properly calibrated; staff responsibilities have been assigned and communicated; staff have the necessary knowledge, expertise, and information to perform their jobs; arrangements for support services (such as test laboratories) have been made; and prerequisite site work has been completed. As part of the Preparatory Phase Inspection, the CQC System Manager is to verify that lessons learned during previous similar work have been incorporated as appropriate into the project procedures to prevent recurrence of past problems.

Project staff must correct or resolve discrepancies between existing conditions and the approved plans/procedures identified by the CQC System Manager during a Preparatory Inspection. The CQC System Manager or designee must then verify that unsatisfactory and nonconforming conditions have been corrected prior to granting approval to begin work. Client notification is required at least 24 hours in advance. Results are to be documented in the preparatory inspection checklist and summarized in the Daily QC Report, which is provided in **Appendix H**.

9.6.1.2 Initial Phase Inspection

The CQC System Manager is to perform an Initial Phase Inspection the first time a definable feature of work is performed. To conduct and document the inspection, the CQC System Manager shall use the Initial Phase Inspection Checklist provided in **Appendix H**. The purposes of this inspection is to check preliminary work for compliance with procedures and

specifications, establish the acceptable level of workmanship, and check for omissions and resolve differences of interpretation. The CQC System Manager, or his designee, is responsible for ensuring that discrepancies between site practices and approved specifications are identified and resolved. Initial inspection results are to be documented by the CQC System Manager and summarized in the Daily QC Report. Discrepancies between site practices and approved plans/procedures are to be resolved and corrective actions for unsatisfactory and nonconforming conditions or practices are to be verified by the CQC System Manager or his designee, prior to granting approval to proceed. Client notification is required at least 24 hours in advance.

9.6.1.3 Follow-up Phase Inspection

The CQC System Manager or designee will perform a Follow-up Phase Inspection each day a definable feature of work is performed. The purpose is to ensure continuous compliance and the level of workmanship. To conduct and document these inspections, the CQC System Manager shall develop inspection checklists to accommodate the inspection of both routine and complex inspection activities. The CQC System Manager is responsible for on-site monitoring of the practices and operations taking place and verifying continued compliance with the specifications and requirements of the contract, Task Order, and approved project plans and procedures. He is also responsible for verifying that a daily health and safety inspection is performed and documented as prescribed in the project SSHP. Discrepancies between site practices and approved plans/procedures are to be reported, and corrective actions for unsatisfactory and nonconforming conditions or practices are to be verified by the CQC System Manager or his designee prior to granting approval to continue work. Follow-up inspection results are to be documented using a suitable checklist, as necessary, and summarized in the Daily QC Report.

9.6.1.4 Additional Inspections

Additional inspections performed on the same definable feature of work may be required at the discretion of the client or the CQC System Manager with approval by the client. Additional preparatory and initial inspections are generally warranted under any of the following conditions: unsatisfactory work, as determined by Shaw or the client; changes in key personnel; resumption of work after a substantial period of inactivity (e.g., 2 weeks or more); or changes to the project scope of work/specifications.

9.6.1.5 Completion/Acceptance Inspection

A Completion/Acceptance Inspection shall be performed, upon conclusion of the feature of work and prior to closeout, to verify that project requirements relevant to the particular feature of work are satisfied. Outstanding and nonconforming items are to be identified and documented on a punch list. As each item is resolved, it is to be so noted on the punch list. Client acceptance and closeout of each definable feature of work is a prerequisite to project closeout.

9.6.2 Inspection Procedures

9.6.2.1 Receiving and Storage

The CQC System Manager or designee is to inspect construction materials upon receipt and prior to use. Visual inspection criteria include identification, signs of damage or distortion, completeness, evidence of compliance with specifications, and associated documentation. Results of receiving inspections are to be documented and summarized in the Daily QC Report.

9.6.2.2 Off-Site Control

Source inspections at supplier facilities, if necessary, shall be performed to verify compliance with contract and Task Order requirements.

9.6.2.3 Material Certification

Copies of purchase orders or subcontracts requiring receiving inspection are to be provided to the CQC System Manager for scheduling inspection and recordkeeping purposes. Copies of supplier certifications are to be maintained in the project QC file and made available to the USACE upon request or submitted in accordance with contract requirements.

9.6.2.4 Inspection of Workmanship

Standards for good workmanship shall be established and documented. The CQC System Manager shall discuss these standards during the preparatory phase meeting for each definable feature of work and verify the presence of good workmanship during each initial phase inspection, and follow-up phase inspection thereafter. Identified deficiencies are to be reported to the responsible organization and documented. Corrective actions are to be verified by the CQC System Manager and documented.

9.6.2.5 Surveillance of Subcontractor Operations

The CQC System Manager is responsible for performing monitoring, inspection and oversight of project activities conducted by Shaw and its subcontractors. Deficiencies associated with subcontractor work are to be reported to the appropriate level of management for resolution.

9.6.3 Documentation of Inspections

The Shaw Inspection Schedule & Tracking Form (**Appendix H**) is to be used by the CQC System Manager for planning, scheduling, and tracking the progress of inspections for this project. The information on the form is to be kept up to date.

9.7 Testing

Testing will be performed as required to confirm that specifications are met. Testing in support of remediation activities generally includes on-site tests of items and materials, and off-site testing by laboratories, manufacturers and suppliers.

9.7.1 Test Plan Application

Testing will be conducted and reported in accordance with project specifications, drawings, codes, standards, and procedures. The CQC System Manager and the subcontract laboratory will use this plan as a guide and checklist throughout the project. A preparatory meeting will be held for each definable feature of work where the testing and frequency of tests are to be reviewed. The QC staff is responsible for verifying that the tests are performed and that the results are summarized in and provided with the Daily QC report. Test failures will be documented on a nonconformance report and tracked until such time as rework and re-testing can be performed and corrective action is verified.

9.7.2 Testing Procedures

The QC staff shall verify the proper selection of measuring and test equipment (M&TE) and verify that approved procedures and protocols are identified and available for use. QC shall also confirm that test personnel have a working knowledge of the test and instruments to be used.

Upon satisfactory verification of the stated requirements, the test may proceed. Each reading is to be verified and documented by a member of the QC staff. As a minimum, test reports will reflect the date of performance, type of test conducted, the item tested, the procedure/protocol used (including revision), actual test results, identification of any measuring and test equipment used (including calibration status), identification and signature of the individual performing the test. Copies of test reports will be maintained in the project files and submitted to the USACE, as required.

9.7.3 Test Organizations

The CQC System Manager will verify the performance of sampling, sample handling and shipping in accordance with the applicable sections of this plan. The sampling technicians will perform the required sampling. The Project Chemist will be responsible for ensuring analytical data is validated at the level required by the DQOs.

Data reports are to include sufficient information to verify the effectiveness and implementation of laboratory QC systems. Requisite information includes raw data, instrument printouts, preparation logs, calibration records, test results for associated QC samples, dilution factors, instrument settings, equations used in data reduction, and any observed deviations or problems.

9.7.4 M&TE Calibration and Maintenance

The selection, control and use of M&TE shall be as specified within procedures and specifications. M&TE shall be calibrated or verified at specific intervals or prior to use, against measurement standards traceable to nationally recognized standards. M&TE shall be stored, handled and maintained in accordance with the manufacturer's instructions. Records of these activities are to be generated by the individual performing the activity with copies provided to the CQC System Manager for retention in the project QC file. The Work Plan lists the M&TE for this project and provides calibration and maintenance responsibilities, schedules, and procedures.

9.7.5 Validation of Test Results

Prior to their use in decision-making, test data are to be reviewed and validated by the Project Chemist or his designee. Validation is to include:

- Verification that all required documentation was submitted.
- Verification that specified test procedures and conditions were followed.
- Review of QC data and comparison of achieved results against specified limits of acceptability.

9.7.6 Documentation of Testing

Test results are to be documented by the individual performing the test. Calibration and maintenance records associated with the M&TE are to be generated by the individual performing the activity. Documentation for calibration and maintenance of M&TE is to be made available to the USACE upon request.

Test results are to be retained in the project file and summarized in the Daily QC Report. These results will additionally be compiled into a report to the CQC System Manager that includes the name of the test, the items tested, test conditions and procedures, units of measurement, the resulting test data for all submitted samples (both passing and failing), and associated QC

information (e.g., equipment calibration and maintenance, duplicate measurements, and use of certified reference standards). A copy of each test report is to be attached to the Daily QC Report.

9.8 Nonconformance Reporting & Corrective Action

The Shaw system for reporting deficiencies and implementing effective corrective action provides for two distinct reporting mechanisms which are procedurally addressed. The Nonconformance Report (NCR) shall be used for reporting and correcting deficient items and materials, and the Corrective Action Request (CAR) shall be used to report and correct programmatic deficiencies, negative quality trends, breakdowns in the quality program, and/or the more serious or significant deficiencies requiring management attention and action.

9.8.1 Identification and Control of Nonconforming Conditions

Any deficiency in characteristic, documentation, or procedure, which renders an item or material unsatisfactory or unacceptable, is required to be identified, reported, and corrected. The CQC System Manager will document item and material deficiencies using an NCR, following form instructions and those instructions delineated within Shaw SOP-EI-Q-007; Nonconformance Reporting. The NCR form is provided in **Appendix H**. Each NCR will be logged within the NCR Tracking Log (**Appendix H**), and issued to the responsible organization for timely disposition and corrective action. Each NCR response shall identify one of the following four categories for disposition:

- Rework – The act of bringing the item into compliance with the original requirements.
- Repair – The act of making the item perform to its original requirements and function.
- Scrap – Removing the item from the project site for disposal.
- Use-As-Is – Permits the item to be utilized based on a documented and acceptable technical justification.

When possible, each NCR disposition will include the following within its corrective action:

- Identification of the cause.
- Steps taken to preclude recurrence.
- Date of disposition performance and corrective action completion.

Each NCR disposition and its corrective action will be verified by the CQC System Manager and documented by signature and date. This will include all re-inspection and re-testing, as appropriate.

NCR forms may be supplemented by completed checklists, photographs, sketches, drawings or other renderings to assist in identifying the deficiency. All such data will become a part of the NCR and shall be maintained with the NCR on file.

9.8.2 Corrective Action Requests

In the case of a programmatic deficiency, or recurrence of a nonconforming condition (attributed to ineffective corrective action), the CQC System Manager will issue a CAR to the responsible organization. A CAR form is provided in **Appendix H**. The CAR will be processed in accordance with Shaw SOP-EI-Q-008; Corrective Action Requests. The CAR is a document used to report deficiencies of a significant nature and shall be distributed to upper management

for their attention and any subsequent action. The CAR is generally reserved for serious or major deficiencies and requires the responsible organization to:

- Take immediate corrective action to remedy the condition.
- Investigate and identify the root cause through analysis.
- Identify steps taken to preclude recurrence.
- Implement effective corrective action in a timely manner.

For each CAR, the responsible organization shall prepare and submit a formal response to the CQC System Manager for evaluation and acceptance, prior to the established due date. Failure to respond and/or provide effective corrective action will generally result in the issuance of a stop work order.

Each CAR corrective action will be verified by the CQC System Manager and documented. The completed CAR and any related documentation will be maintained in the project quality files.

9.9 Reports

The CQC System Manager is responsible for the preparing and submitting the Daily QC Report to the USACE, the Site Superintendent for the project file, and providing concurrent courtesy copies to the Project Manager. The original and one copy of the Daily QC Report with attachments are to be submitted to the USACE on the first work day following the date covered by the report. All calendar days, including weekends and holidays, are to be accounted for throughout this project. As a minimum, one report is to be prepared and submitted for every continuous seven days of no work.

As a primary component of the Daily Activity Summary Report, the Daily QC Report is to provide an overview of QC activities performed each day, including those performed for subcontractor and supplier activities. The QC reports are to present an accurate and complete picture of QC activities. They are to report both conforming and deficient conditions, and should be precise, factual, legible, and objective. Copies of supporting documentation, such as checklists and surveillance reports are to be attached. The format to be used is provided in **Appendix H**.

A field QC log is to be maintained by the CQC System Manager and assigned to each member of the QC staff for use in documenting details of field activities during QC monitoring activities. At the end of each day, a copy of the log entries is to be attached to the Daily QC Report. The information in the QC log provides backup information and is intended to serve as a phone log and memory aide in the preparation of the Daily QC Report and in addressing follow-up questions that may arise.

QC and Health and Safety (H&S) staff input for the Daily QC Report is to be provided in writing to the CQC System Manager at a previously agreed upon time and place, generally no later than about 1 hour before normal close of business. For the sake of simplicity and completeness, the format for QC staff input should follow the same as for the Daily QC report with only the relevant sections completed.

Each Daily QC Report is to be assigned and tracked by a unique number comprised of the Delivery Order number followed by the date expressed as DDMMYY. In the case of “no work day” reports, the report number is to comprise the Delivery Order, the last date covered, the

number of days covered, and the initials “NW.” For example, DO #0025-110908 is the report for this delivery order related to site work performed on 11 September 2008, and DO #0025-291008-3NW is the report for this delivery order related to three no work days from 27 October 2008 through 29 October 2008. Copies of Daily QC Reports with attachments and QC logs no longer in use are to be maintained in the project QC file. Upon project closeout, all QC logs are to be included in the project QC file.

9.10 Definable Features of Work

Below, the definable features of work are identified and briefly described for the SWMU 39 IM action.

9.10.1 Mobilization

This definable feature of work includes all pre-mobilization activities such as notifications and preparation of manifests; mobilization activities, mobilization of personnel, and mobilization of materials and equipment; and a kick-off/safety meeting to include a walk-through orientation of the removal action site, review of the work plan and removal action tasks, and review and acknowledgement of the SSHP (*Section 8.0*) by all site personnel.

9.10.2 Site Preparation

This definable feature of work includes all required activities associated with preparing the site for contaminated soil removal activities. This includes delineation of work and support zones, and installation of sediment and erosion control measures, if necessary.

9.10.3 Delineation and Soil Characterization Sampling

This definable feature of work includes all required activities associated with establishing excavation area boundaries at SWMU 39, and collecting discrete soil samples to determine the area where elevated levels of arsenic, lead, vanadium, or dioxins/furans is present.

9.10.4 Soil and Fence Removal and Confirmation Sampling

This definable feature of work includes all required activities associated with: 1) removal and disposal of fence around SWMU 39; 2) the collection of confirmation soil samples to ensure all contaminated soil has been removed; and 3) the excavation, transport, and disposal of contaminated soil from SWMU 39.

9.10.5 Backfill and Site Restoration

This definable feature of work includes all required activities associated with backfilling the site and restoring vegetation at SWMU 39.

9.10.6 Demobilization

This definable feature of work includes the removal of all equipment and materials from the jobsite and staging areas that were utilized during, or generated as a result of the soil removal activities at SWMU 39.

10.0 REFERENCES

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Appendix A

Statement of Qualifications

STATEMENT OF QUALIFICATIONS

Mr. Bob Culbertson has over 30 years of experience as a professional in environmental remediation, construction, and mining industry operations. He has 17 years of experience managing large, multi-task programs on Hazardous, Toxic, and Radioactive Waste (HTRW) cost-reimbursable and fixed price contracts involving site characterization, Remedial Investigation/Feasibility Study (RI/FS), remedial design and engineering, and remedial construction actions. In addition, he has over 13 years of experience managing large-scale industrial projects from the conceptual evaluation and process design stage through construction, startup, and operations management. He has also managed engineering organizations responsible for new project development, providing operations support, obtaining environmental permits, and managing operations for regulatory compliance.

Mr. Culbertson's program management experience has encompassed the full range of HTRW remediation services; having been responsible and accountable for Indefinite Delivery/Indefinite Quantity (ID/IQ) contracts valued in excess of \$689 million on 8 programs. These programs consisted of 5 A/Es, 1 RAC, and 2 TERCs performing work for the Army, Navy, Air Force, and EPA. He has directed the activities of large field and office staffs, comprised of more than 15 project managers and up to 250 professional personnel working on more than 55 simultaneous task orders at 30 installations, including installations outside the continental United States (OCONUS).

Mr. Jeffrey Parks is a registered, professional geologist with 20 years of personnel and project management, geologic, hydrogeologic, and hazardous waste management experience. Mr. Parks' expertise is in HTRW projects, RI/FSs, RFIs, RCRA permitting and remedial actions. He is currently responsible for senior management of USACE groundwater study, remedial investigation, and remediation projects, including projects at Radford Army Ammunition Plant, VA. He has been the senior hydrogeologist and project manager for USEPA-funded investigations of uncontrolled hazardous waste sites and a technical lead for the Federal Aviation Authority-expedited response action group. Mr. Parks is also the Edgewood Office Technical Services Manager Northern Division. Responsibilities in this role include guidance for scientists in addition to project staffing, mentoring, and yearly progress evaluations.

As a Project Manager for Radford Army Ammunition Plant, Radford, VA. Mr. Parks is responsible for budgetary and technical management of a variety of tasks including RCRA Facility Investigations and Corrective Measures Studies in support of Radford's RCRA Permit, contract compliance and administration, preparation and review of daily production and usage rates, tracking and reviewing project finances, and client and regulatory interface. Also conducting Remedial Investigations/Feasibility Studies, expedited removal actions, and a facility-wide groundwater study in karst terrain.

Mr. Timothy Leahy has 13 years of experience managing environmental investigation and remediation projects. He is currently project manager for several tasks at Radford Army Ammunition Plant, including the recently completed removal action at Building 4343. His field experience includes field management of multiple crews of co-workers and subcontractors on large CERCLA field investigations. His experience also includes groundwater monitoring and extraction well design, site selection, installation, and sampling; geologic sample logging; and drilling supervision for CERCLA and RCRA sites. His experience includes project

management; technical analysis and writing; computer programming; and, design and implementation of field investigation programs.

Ms. Gretchen Tabano, P.E. has over ten years of experience as a task manager/project engineer involved in HTRW investigations and cleanup of a wide variety of DoD sites. Her experience includes the completion of site investigations, EE/CA preparation involving the removal and/or avoidance of ordnance as part of the process, the excavation and disposal of lead-contaminated range soils, pits of unknown chemical/biological wastes, and landfills including municipal, industrial, medical, and UXO wastes and RI/FS for VOC, TPH, and explosive contamination in soil and groundwater and pits of UXO/CWM. Ms. Tabano is knowledgeable in Base Realignment and Closure (BRAC) site investigation and remediation. Ms. Tabano has worked at DOD sites located in Virginia, New Jersey, New Hampshire, Colorado, Alaska, Florida, Maryland, Alabama, Tennessee, California, and Nebraska.

Mr. Doug Russell has more than 24 years of experience with Shaw Environmental & Infrastructure, Inc. (Shaw E&I) and has experience in the supervision of personnel, safety and health programs, quality control (QC), analytical sampling programs, and environmental remediation/construction and restoration projects. Many of the projects have involved sampling and treatment of hazardous and industrial waste, stabilization and solidification, construction, incineration, investigation, containment, vapor extraction and environmental monitoring. Mr. Russell is also experienced in the operation of heavy equipment typical of construction sites. He has worked as a health and safety (H&S) professional for the last 15 years and managed construction QC programs on large projects throughout the United States. As an H&S Manager, he managed subcontractor, client and Shaw associates in compliance with 29 CFR 1910.120, and 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response. Mr. Russell implemented employee exposure monitoring programs, tracked training and medical records, initiated safety councils, and performed hazard communication training and site compliance audits. As a construction QC systems manager, he developed project specifications, work plans, and implemented the quality management processes for Commercial, U.S. Department of Energy (DOE), and U.S. Department of Defense (DoD) projects. Mr. Russell also has experience with public meetings, fire and rescue services, client/regulator negotiations and emergency response services. In the analytical field, he has extensive environmental field sampling experience from sample collection to laboratory analysis procedures. Currently, Mr. Russell is responsible for EH&S program management for multiple federal programs and projects as well as regional responsibility for the east Federal Business Line, Army, Environmental Operations, and Civilian Agencies. The east region encompasses all projects east of the Mississippi River. Mr. Russell also manages the EH&S aspects of Shaw's Military Munition Response Programs which involve munitions of explosive concern and nonstockpile chemical warfare agent.

Mr. Charles Pete Hunter has successfully served the energy and environment industries for thirty years. During his career he has held responsible positions in quality management supporting the U.S. Department of Energy, as well as major architectural engineering, construction, and environmental management firms. His experience in quality systems, management of personnel, business development, and program assessment has encompassed commercial nuclear power plant construction, startup, and operations; defense reactor program support; environmental restoration; hazardous waste management and remedial construction projects. As a quality assurance professional he has extensive experience in quality programs

meeting the requirements of 10CFR-830.120, DOE/RW-0333P, 10CFR-50, Appendix B, ANSI/ASME NQA-1, ANSI/ASQC-E4, ISO-9000 and other quality standards. He is a committee member of the U.S. Sub TAG to ISO/TC207 for the development of ISO 14000 Environmental Management Standards, and member of the ANSI ASQ Z1 Environmental Management Subcommittee to the U.S. Technical Advisory Group to ISO.

Mr. Steve Kritak has gained over 14 years of experience managing multi-disciplinary project personnel on both emergency response and planned remediation projects for a wide variety of government (e.g., USACE and USEPA) and commercial clients. He has managed field crews ranging in size from a few cleanup technicians to over 50 equipment operators, sample technicians, cleanup technicians, and laborers, as well as subcontractor personnel (e.g., asbestos and lead-based paint abatement, demolition, and T&D subcontractors). Types of projects he has successfully managed include landfill capping, soil and sediment excavation, facility decontamination and demolition, stabilization/solidification, UST/AST cleaning/removal, drum handling, slurry wall construction and Transportation and disposal coordination. Mr. Kritak has worked on RFAAP previously and is well aware of the intricacies with the project.

Mr. Charles Green is a Health and Safety Coordinator. In this position he is responsible for field coordination of the project health and safety program. He plays a key role as advisor to the Project Manager, Site Superintendent, and client representative on all matters relating to project health and safety. His specific on-site duties include health and safety plan development and implementation; direct reading an integrated air monitoring; establishing site work zone and decontamination stations; conducting periodic safety inspections; establishing emergency egress points, assembly areas, and first aid stations; implementing a site emergency warning communication system; maintaining the local medical surveillance and emergency medical treatment programs; conducting site-specific employee training and information sessions; and assigning appropriate personal protection levels.

Mr. Green has served as the Site Health and Safety Officer, Radford AAP – Building 4343 Interim Measures, Radford, Virginia. July 2006 – October 2006. As the Site Health and Safety Officer during excavation and demolition activities for the Building 4343 Interim Measures, Mr. Green has direct experience at Radford AAP and is familiar with the Installation's H&S policies and procedures.

Mr. Eric Malarek is a chemist with 19 years hands-on experience overseeing and providing broad range of environmental project consulting, quality assurance oversight and training, data validation and management, field sampling, and technical support. Overall experience with public and commercial accounts with special strengths gleaned from key project positions on large federal site/remedial investigations, feasibility studies, corrective actions, and long-term monitoring programs. Strong familiarity with relevant laboratory operations, procedures, regulatory requirements, QA/QC protocols, scheduling, data packages and other factors critical to meeting external (and internal) client needs. Practical foundation rooted in commercial and USEPA laboratory positions complimented by business, technical and project management skills enhanced in the consulting industry.

Appendix B

Standard Operating Procedures

Standard Operating Procedures

SOP SERIES	TITLE
10.0	DOCUMENTATION
10.1	Field Logbook
10.2	Surface Water, Groundwater, and Soil/Sediment Field Logbooks
10.3	Boring Logs
10.4	Chain-of-Custody Forms
30.0	SAMPLING
30.1	Soil Sampling
30.6	Containerized Material
30.7	Sampling Strategies
30.13	Screening for Metals via X-ray Fluorescence (XRF) Spectrometry
50.0	SAMPLE MANAGEMENT
50.1	Sample Labels
50.2	Sample Packaging
70.0	INVESTIGATION-DERIVED MATERIAL
70.1	Investigation-Derived Material
80.0	DECONTAMINATION
80.1	Decontamination

STANDARD OPERATING PROCEDURE 10.1 FIELD LOGBOOK

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for recording daily site investigation activities.

Records should contain sufficient information so that anyone can reconstruct the sampling activity without relying on the collector's memory.

2.0 MATERIALS

- Field Logbook.
- Indelible ink pen.
- Clear tape.

3.0 PROCEDURE

Information pertinent to site investigations will be recorded in a bound logbook. Each page/form will be consecutively numbered, dated, and signed. All entries will be made in indelible ink, and all corrections will consist of line out deletions that are initialed and dated. If only part of a page is used, the remainder of the page should have an "X" drawn across it. At a minimum, entries in the logbook will include but not be limited to the following:

- Project name (cover).
- Name and affiliation of personnel on site.
- Weather conditions.
- General description of the field activity.
- Sample location.
- Sample identification number.
- Time and date of sample collection.
- Specific sample attributes (e.g., sample collection depth flow conditions or matrix).
- Sampling methodology (grab or composite sample).
- Sample preservation, as applicable.
- Analytical request/methods.
- Associated quality assurance/quality control (QA/QC) samples.
- Field measurements/observations, as applicable.
- Signature and date of personnel responsible for documentation.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCES

- USEPA, 1990. *Sampler's Guide to the Contract Laboratory Program*. EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, D.C.
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STANDARD OPERATING PROCEDURE 10.2 SURFACE WATER, GROUNDWATER, AND SOIL/SEDIMENT FIELD LOGBOOKS

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for recording surface water, groundwater, and soil/sediment sampling information, as well as instrument calibration data in field logbooks.

2.0 MATERIAL

- Applicable field logbook (see attached forms).
- Indelible ink pen.

3.0 PROCEDURE

All information pertinent to surface water, groundwater, or soil/sediment sampling will be recorded in the appropriate logbook. Each page/form of the logbook will be consecutively numbered. All entries will be made with an indelible ink pen. All corrections will consist of line out deletions that are initialed and dated.

3.1 SOIL/SEDIMENT

3.1.1. Field Parameters/Logbook (Form 10.2-a)

HIGH CONCENTRATION EXPECTED?: Answer “Yes” or “No.”

HIGH HAZARD?: Answer “Yes” or “No.”

INSTALLATION/SITE: Record the complete name of the Installation or site.

AREA: Record the area designation of the sample site.

INST. NAME: Record the two-letter installation name for Radford Army Ammunition Plant – “RD.”

SAMPLE MATRIX CODE: Record the appropriate sample matrix code. Common codes are “SD” for solid - sediment, “SI” for soil - gas, “SL” for solid sludge, “SO” for surface other, “SS” for solid – soil, “SW” for surface wipe, “WD” for water – potable, “WG” for water – ground, “WS” water – surface, “WT” – water treated and “WW” water – waste.

SITE ID: Record a code up to 20 characters or numbers that is unique to the site.

ENV. FIELD SAMPLE IDENTIFIER: Record a code up to 20 characters specific for the sample.

DATE: Enter the date the sample was taken.

TIME: Enter the time (12-hour or 24-hour clock acceptable as long as internally consistent) the sample was taken.

AM PM: Circle “AM” or “PM” to designate morning or afternoon (12-hour clock).

SAMPLE PROG: Record “RFI” (RCRA Facility Investigation) or other appropriate sample program.

DEPTH (TOP): Record the total depth sampled.

DEPTH INTERVAL: Record the intervals at which the plug will be sampled.

UNITS: Record the units of depth (feet, meters).

SAMPLE MEASUREMENTS: Check the appropriate sampling method.

CHK: Check off each container released to a laboratory.

ANALYSIS: Record the type of analysis to be performed on each sample container.

SAMPLE CONTAINER: Record the sample container type and size.

NO.: Record the number of containers.

REMARKS: Record any remarks about the sample.

TOTAL NUMBER OF CONTAINERS FOR SAMPLE: Record the total number of containers.

SITE DESCRIPTION: Describe the location where the sample was collected.

SAMPLE FORM: Record the form of the sample (i.e., clay, loam, etc.) using The Unified Soil Classification System (USCS).

COLOR: Record the color of the sample as determined from standard Munsell Color Charts.

ODOR: Record the odor of the sample or “none.”

PID: Record the measured PID values or other similar measurement instrument value.

UNUSUAL FEATURES: Record anything unusual about the site or sample.

WEATHER/TEMPERATURE: Record the weather and temperature.

SAMPLER: Record your name.

3.1.2 Map File Form (refer to form 10.2-c)

- SITE ID: Record the Site ID from the field parameter form.
- POINTER: Record the field sample number for the sample being pointed to.
- DESCRIPTION/MEASUREMENTS: Describe the location where the sample was taken, along with distances to landmarks.
- SKETCH/DIMENSIONS: Diagram the surroundings and record the distances to landmarks.
- MAP REFERENCE: Record which U.S.G.S. Quad Map references the site.
- COORDINATE DEFINITION: Write the compass directions and the X- and Y-coordinates of the map run.
- COORDINATE SYSTEM: Write “UTM” (Universal Transverse Mercator).
- SOURCE: Record the 1-digit code representing the Map Reference.
- ACCURACY: Give units (e.g., write “1-M” for 1 meter).
- X-COORDINATE: Record the X-coordinate of the sample site location.

- Y-COORDINATE: Record the Y-coordinate of the sample site location.
- UNITS: Record the units used to measure the map sections.
- ELEVATION REFERENCE: Record whether topography was determined from a map or a topographical survey.
- ELEVATION SOURCE: Record the 1-digit code representing the elevation reference.
- ACCURACY: Record the accuracy of the map or survey providing the topographical information.
- ELEVATION: Record the elevation of the sampling site.
- UNITS: Write the units in which the elevation is recorded.
- SAMPLER: Write your name.

4.2 SURFACE WATER

4.2.1 Field Parameter Logbook (Forms 10.2-b and 10.2-c)

- CAL REF: Record the calibration reference for the pH meter.
- pH: Record the pH of the sample.
- TEMP: Record the temperature of the sample in degrees Celsius.
- COND: Record the conductivity of the water.
- Description of site and sample conditions (refer to 10.2-b).
- Map File Form (refer to Section 3.1.2).

4.3 GROUNDWATER (FORMS 10.2- D)

4.3.1 Field Parameter Logbook (Forms 10.2-b)

Refer to Section 3.2.1.

4.3.1 Map File and Purging Forms

- WELL NO. OR ID: Record the abbreviation appropriate for where the sample was taken. Correct abbreviations can be found on pages 18-21 of the IRDMIS User's Guide for chemical data entry.
- SAMPLE NO.: Record the reference number of the sample.
- WELL/SITE DESCRIPTION: Describe the location where the sample was taken, along with distances to landmarks.
- X-COORD AND Y-COORD: Record the survey coordinates for the sampling site.
- ELEV: Record the elevation where the sample was taken.
- UNITS: Record the units the elevation was recorded in.
- DATE: Record the date in the form MM/DD/YY.
- TIME: Record the time, including a designation of AM or PM.

- AIR TEMP.: Record the air temperature, including a designation of C or F (Celsius or Fahrenheit).
- WELL DEPTH: Record the depth of the well in feet and inches.
- CASING HEIGHT: Record the height of the casing in feet and inches.
- WATER DEPTH: Record the depth (underground) of the water in feet and inches.
- WELL DIAMETER: Record the diameter of the well in inches.
- WATER COLUMN HEIGHT: Record the height of the water column in feet and inches.
- SANDPACK DIAM.: Record the diameter of the sandpack. Generally, this will be the same as the bore diameter.
- EQUIVALENT VOLUME OF STANDING WATER: Use one of the following equations to determine one equivalent volume (EV).

1 EV = volume in casing + volume in saturated sandpack. Or:

$$1 \text{ EV} = [\pi R_w^2 h_w + 0.30p(R_s^2 - R_w^2)h_s] * (0.0043)$$

Where:

R_s = radius of sandpack in inches
 R_w = radius of well casing in inches
 h_s = height of sandpack in inches
 h_w = water depth in inches

$$0.0043 = \text{gal/in}^3$$

and filter pack porosity is assumed as 30%, or

$$\text{Volume in casing} = (0.0043 \text{ gal/in}^3)(p)(12 \text{ in/ft})(R_c^2)(W_h)$$

Where:

R_c = radius of casing in inches, and
 W_h = water column height in feet

$$\text{Vol. in sandpack} = (0.0043 \text{ gal/in}^3)(p)(12 \text{ in/ft})(R_b^2 - R_c^2)(W_h)(0.30)$$

(if W_h is less than the length of the sandpack), or

$$\text{Vol. in sandpack} = (0.0043 \text{ gal/in}^3)(p)(12 \text{ in/ft})(R_b^2 - R_c^2)(S_h)(0.30)$$

(if W_h is greater than the length of the sandpack).

Where:

R_b = radius of the borehole, and

Sh = length of the sandpack.

Show this calculation in the comments section.

- PUMP RATE: Record pump rate.
- TOTAL PUMP TIME: Record total purge time and volume.
- WELL WENT DRY? Write “YES” or “NO.”
- PUMP TIME: Record pump time that made the well go dry.
- VOLUME REMOVED: Record the volume of water (gal) removed before the well went dry.
- RECOVERY TIME: Record the time required for the well to refill.
- PURGE AGAIN?: Answer “YES” or “NO.”
- TOTAL VOL. REMOVED: Record the total volume of water (in gallons) removed from the well.
- CAL REF.: Record the calibration reference for the pH meter.
- TIME: Record time started (INITIAL T(0)), 2 times DURING the sampling and the time sampling ended (FINAL).
- pH: Record the pH at start of sampling (INITIAL), twice DURING the sampling, and at the end of sampling (FINAL).
- TEMP: Record the water temperature (Celsius) at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL).
- COND: Record the conductivity of the water at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL).
- D.O.: Record the dissolved oxygen level in the water at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL).
- TURBIDITY: Record the readings from the turbidity meter (nephelometer) and units at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL).
- ORD: Record the oxidation/reduction (RedOx) potential of the water sample at the start of sampling, twice DURING the sampling, and at the end of sampling (FINAL).
- HEAD SPACE: Record any positive readings from organic vapor meter reading taken in well headspace before sampling.
- NAPL: Record the presence and thickness of any non-aqueous phase liquids (LNAPL and DNAPL).
- COMMENTS: Record any pertinent information not already covered in the form.
- SIGNATURE: Sign the form.

4.3 FIELD CALIBRATION FORMS (REFER TO FORM 10.2-E)

- Record time and date of calibration.
- Record calibration standard reference number.

- Record meter ID number.
- Record initial instrument reading, recalibration reading (if necessary), and final calibration reading on appropriate line.
- Record value of reference standard (as required).
- COMMENTS: Record any pertinent information not already covered on form.
- SIGNATURE: Sign form.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCE

USEPA, 1991. *User's Guide to the Contract Laboratory Program*. EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response, January.

FIELD PARAMETER/LOGBOOK FORM 10.2-a
SOIL AND SEDIMENT SAMPLES

HIGH CONCENTRATION EXPECTED? _____ HIGH HAZARD? _____

INSTALLATION/SITE _____ AREA _____

INST NAME _____ FILE NAME _____

SAMPLE MATRIX CODE _____ SITE ID _____

ENV. FIELD SAMPLE IDENTIFIER _____

DATE (MM/DD/YY) __/__/__ TIME _____ AM PM SAMPLE PROGRAM _____

DEPTH (TOP) _____ DEPTH INTERVAL _____ UNIT _____

SAMPLING METHOD:

SPLIT SPOON ___ AUGER ___ SHELBY TUBE ___ SCOOP ___ OTHER _____

CHK	ANALYSIS	SAMPLE CONTAINER	NO.	REMARKS

TOTAL NUMBER OF CONTAINERS FOR SAMPLE _____

DESCRIPTION OF SITE AND SAMPLE CONDITIONS

SITE DESCRIPTION: _____

SAMPLE FORM _____ COLOR _____ ODOR _____

PID (HNu) _____ UNUSUAL FEATURES _____

WEATHER/TEMPERATURE _____

SAMPLER _____

FIELD PARAMETER/LOGBOOK FORM 10.2-b
GROUNDWATER AND SURFACE WATER SAMPLES

HIGH CONCENTRATION EXPECTED? _____ HIGH HAZARD? _____

INSTALLATION/SITE _____ AREA _____

INST CODE _____ FILE NAME _____ SITE TYPE _____

SITE ID _____ FIELD SAMPLE NUMBER _____

DATE (MM/DD/YY) __/__/__ TIME _____ AM PM SAMPLE PROG. _____

DEPTH (TOP) _____ DEPTH INTERVAL _____ UNITS _____

SAMPLING MEASUREMENTS

CAL REF. _____ pH _____ TEMPERATURE °C _____ CONDUCTIVITY _____ REDOX _____

DISSOLVED OXYGEN _____ TURBIDITY _____ OTHER _____

CHK	ANALYSIS	SAMPLE CONTAINER	NO.	REMARKS

TOTAL NUMBER OF CONTAINERS FOR SAMPLE _____

DESCRIPTION OF SITE AND SAMPLE CONDITIONS

SITE DESCRIPTION _____

SAMPLING METHOD _____

SAMPLE FORM _____ COLOR _____ ODOR _____

PID (HNu) _____

UNUSUAL FEATURES _____

WEATHER/TEMPERATURE _____ SAMPLER _____

EXAMPLE MAP FILE LOGBOOK FORM 10.2-c
SURFACE WATER, SOIL, AND SEDIMENT SAMPLES

SITE ID _____ POINTER _____

DESCRIPTION/MEASUREMENTS _____

SKETCH/DIMENSIONS :

MAP REFERENCE _____

COORDINATE DEFINITION (X is _____ Y is _____)

COORDINATE SYSTEM _____ SOURCE _____ ACCURACY _____

X-COORDINATE _____ Y-COORDINATE _____ UNITS _____

ELEVATION REFERENCE _____

ELEVATION SOURCE _____ ACCURACY _____ ELEVATION _____

UNITS _____

SAMPLER _____

**EXAMPLE MAP FILE AND PURGING LOGBOOK FORM 10.2-d
GROUNDWATER SAMPLES**

WELL COORD. OR ID _____ SAMPLE NO. _____

WELL/SITE DESCRIPTION _____

X-COORD. _____ Y-COORD. _____ ELEV. _____ UNITS

DATE ____/____/____ TIME _____ AIR TEMP. _____

WELL DEPTH _____ FT. _____ IN. CASING HT. _____ FT. _____ IN.

WATER DEPTH _____ FT. _____ IN. WELL DIAMETER _____ IN.

WATER COLUMN HEIGHT _____ FT. _____ IN. SANDPACK DIAM. _____ IN.

EQUIVALENT VOLUME OF STANDING WATER _____ (GAL) (L)

VOLUME OF BAILER _____ (GAL) (L) or PUMP RATE _____ (GPM) (LPM)

TOTAL NO. OF BAILERS (5 EV) _____ or PUMP TIME _____ MIN.

WELL WENT DRY? [Yes] [No] NUM. OF BAILERS _____ or PUMP TIME

VOL. REMOVED _____ (GAL) (L) RECOVERY TIME

PURGE AGAIN? [Yes] [No] TOTAL VOL. REMOVED _____ (GAL) (L)

DATE & TIME	QUANTITY REMOVED	TIME REQ'D	pH	Cond	Temp	ORD	Turb	DO	Character of water (color / clarity / odor / partic.)
(before)									
(during)									
(during)									
(during)									
(after)									

COMMENTS _____

SIGNATURE _____

INITIAL CALIBRATION	FINAL CALIBRATION
DATE:	DATE:
TIME:	TIME:

pH METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

pH STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
7.0			
10.0			
4.0			

CONDUCTIVITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

COND. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

TEMPERATURE METER CALIBRATION

METER ID_____

TEMP. STANDARD	INITIAL READING	RECALIB. READING	FINAL READING
ICE WATER			
BOILING WATER			
OTHER _____			

TURBIDITY METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

ORD METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

DISSOLVED OXYGEN METER CALIBRATION

CALIBRATION STANDARD REFERENCE NO:_____

METER ID_____

STANDARD	INITIAL READING	RECALIB. READING	FINAL READING

COMMENTS_____

SIGNATURE_____

STANDARD OPERATING PROCEDURE 10.3 BORING LOGS

1.0 INTRODUCTION

The purpose of this standard operating procedure (SOP) is to describe the methods to be followed for classifying soil and rock, as well as preparing borehole logs and other types of soil reports.

2.0 MATERIALS

The following equipment is required for borehole logging:

- HTRW ENG Form 5056-R and 5056A-R boring log forms.
- Daily inspection report forms.
- Chain-of-custody forms.
- Request for analysis forms.
- ASTM D 2488 classification flow chart.
- Soil and/or Rock color chart (i.e., Munsell®).
- Grain size and roundness chart.
- Graph paper.
- Engineer's scale.
- Previous reports and boring logs.
- Pocketknife or putty knife.
- Hand lens.
- Dilute hydrochloric acid (10% volume).
- Gloves.
- Personal protective clothing and equipment, as described in work plan addenda health and safety plan.
- Photoionization detector or other appropriate monitoring equipment per site-specific health and safety plan.
- Decontamination supplies (SOP 80.1).

3.0 PROCEDURE

Each boring log should fully describe the subsurface environment and the procedures used to obtain this description.

Boring logs should be prepared in the field on USACE Engineer Form 5056-R and 5056-R. Logs should be recorded in the field directly on the boring log form and not transcribed from a field book.

A “site geologist” should conduct borehole logging and soil/rock identification and description or other professional trained in the identification and description of soil/rock.

3.1 BORING LOG INFORMATION

As appropriate, the following information should be recorded on the boring log during the course of drilling and sampling activities:

- Project information including name, location, and project number.
- Each boring and well should be uniquely numbered and located on a sketch map as part of the log.
- Type of exploration.
- Weather conditions including events that could affect subsurface conditions.
- Dates and times for the start and completion of borings, with notations by depth for crew shifts and individual days.
- Depths/heights in feet and in decimal fractions of feet.
- Descriptions of the drilling equipment including rod size, bit type, pump type, rig manufacturer and model, and drilling personnel.
- Drilling sequence and descriptions of casing and method of installation.
- Description and identification of soils in accordance with ASTM Standard D 2488.
- Descriptions of each intact soil sample for the parameters identified in Section 3.2.
- Descriptions and classification of each non-intact sample (e.g., wash samples, cuttings, auger flight samples) to the extent practicable.
- Description and identification of rock.
- Description of rock (core(s)) for the parameters identified in Section 3.7.
- Scaled graphic sketch of the rock core (included or attached to log) according to the requirements identified in Section 3.7.
- Lithologic boundaries, with notations for estimated boundaries.
- Depth of water first encountered in drilling, with the method of first determination (any distinct water level(s) below the first zone will also be noted).
- Interval by depth for each sample taken, classified, and/or retained, with length of sample recovery and sample type and size (diameter and length).
- Blow counts, hammer weight, and length of fall for driven samplers.
- Rate of rock coring and associated rock quality designation (RQD) for intervals cored.
- Drilling fluid pressures, with driller’s comments.
- Total depth of drilling and sampling.

- Drilling fluid losses and gains should be recorded.
- Significant color changes in the drilling fluid returned.
- Soil gas or vapor readings with the interval sampled, with information on instrument used and calibration.
- Depth and description of any in-situ test performed.
- Description of other field tests conducted on soil and rock samples.

3.2 SOIL PARAMETERS FOR LOGGING

In general, the following soil parameters should be included on the boring log when appropriate:

- Identification per ASTM D 2488 with group symbol.
- Secondary components with estimated percentages per ASTM D 2488.
- Color.
- Plasticity per ASTM D 2488.
- Density of non-cohesive soil or consistency of cohesive soil.
- Moisture condition per ASTM D 2488 (dry, moist, or wet).
- Presence of organic material.
- Cementation and HCL reaction testing per ASTM D 2488.
- Coarse-grained particle description per ASTM D 2488 including angularity, shapes, and color.
- Structure per ASTM D 2488 and orientation.
- Odor.
- Depositional environment and formation, if known.

ASTM D 2488 categorizes soils into 13 basic groups with distinct geologic and engineering properties based on visual-manual identification procedures. The following steps are required to classify a soil sample:

- Observe basic properties and characteristics of the soil. These include grain size grading and distribution, and influence of moisture on fine-grained soil.
- Assign the soil an ASTM D 2488 classification and denote it by the standard group name and symbol.
- Provide a written description to differentiate between soils in the same group, if necessary.

Many soils have characteristics that are not clearly associated with a specific soil group. These soils might be near the borderline between groups, based on particle distribution or plasticity characteristics. In such a case, assigning dual group names and symbols (e.g., GW/GC or ML/CL) might be an appropriate method of describing the soil. The two general types of soils, for which classification is performed, coarse- and fine-grained soils, are discussed in the following sections.

3.3 COURSE-GRAINED SOIL IDENTIFICATION

For soils in the coarse-grained soils group, more than half of the material in the soil matrix will be retained by a No. 200 sieve (75- μ m).

- Coarse-grained soils are identified on the basis of the following:
- Grain size and distribution.
- Quantity of fine-grained material (i.e., silt and clay as a percentage).
- Character of fine-grained material.

2. The following symbols are used for classification:

Basic Symbols

G = gravel
S = sand

Modifying Symbols

W = well graded
P = poorly graded
M = with silty fines
C = with clayey fines

3. The following basic facts apply to coarse-grained soil classification.
- The basic symbol G is used if the estimated percentage of gravel is greater than that for sand. In contrast, the symbol S is used when the estimated percentage of sand is greater than the percentage of gravel.
 - Gravel ranges in size from 3-inch to 1/4-inch (No. 4 sieve) diameter. Sand ranges in size from the No. 4 sieve to No. 200 sieve. The Grain Size Scale used by Engineers (ASTM Standards D 422-63 and D 643-78) is the appropriate method to further classify grain size as specified by ASTM D 2488.
 - Modifying symbol W indicates good representation of all particle sizes.
 - Modifying symbol P indicates that there is an excess or absence of particular sizes.
 - The symbol W or P is used only when there are less than 15% fines in a sample.
 - Modifying symbol M is used if fines have little or no plasticity (silty).
 - Modifying symbol C is used if fines have low to high plasticity (clayey).
 - Figure 10.03a is a flowchart for identifying coarse-grained soils by ASTM D 2488.

3.4 FINE-GRAINED SOIL IDENTIFICATION

If one-half or more of the material will pass a No. 200 sieve (75 μ m), the soil is identified as fine-grained.

- Fine-grained soils are classified based on dry strength, dilatancy, toughness, and plasticity.
- Classification of fine-grained soils uses the following symbols:

Basic Symbols

M = silt (non plastic)
C = clay (plastic)
O = organic
Pt = peat

Modifying Symbols

L = low liquid limit (lean)
H = high liquid limit (fat)

3. The following basic facts apply to fine-grained soil classification:

- The basic symbol M is used if the soil is mostly silt, while the symbol C applies if it consists mostly of clay.
- Use of symbol O (group name OL/OH) indicates that organic matter is present in an amount sufficient to influence soil properties. The symbol Pt indicates soil that consists mostly of organic material.
- Modifying symbols (L and H) are based on the following hand tests conducted on a soil sample:
 - Dry strength (crushing resistance).
 - Dilatancy (reaction to shaking).
 - Toughness (consistency near plastic limit).
- Soil designated ML has little or no plasticity and can be recognized by slight dry strength, quick dilatancy, and slight toughness.
- CL indicates soil with slight to medium plasticity, which can be recognized by medium to high dry strength, very slow dilatancy, and medium toughness.
- Criteria for describing dry strength per ASTM D 2488 are as follows:

Description	Criteria

 - None: Dry sample crumbles into powder with pressure of handling
 - Low: Dry specimen crumbles into powder with some finger pressure
 - Medium: Dry specimen breaks into pieces or crumbles with considerable finger pressure
 - High: Dry specimen cannot be broken with finger pressure but will break into pieces between thumb and a hard surface
 - Very high: Dry specimen cannot be broken between the thumb and a hard surface stiffness
- Criteria for describing dilatancy per ASTM D 2488 are as follows:
 - None: No visible change in the sample
 - Slow: Water appears slow on the surface of the sample during shaking and does not disappear or disappears slowly upon squeezing
 - Rapid: Water appears quickly on the surface of the sample during shaking and disappears quickly upon squeezing
- Criteria for describing toughness per ASTM D 2488 are as follows:

- Description Criteria
- Low: Only slight pressure is required to roll the thread near the plastic limit and the thread and lump are weak and soft
- Medium: Medium pressure is required to roll the thread to near the plastic limit and the thread and lump have medium stiffness
- High: Considerable pressure is required to roll the thread to near the plastic limit and the thread and lump have very high stiffness
- Figure 10.03b is a flowchart for identifying fine-grained soils by ASTM D 2488.

3.5 DENSITY AND CONSISTENCY

Relative density for coarse-grained soils and consistency for fine-grained soils can be estimated using standard penetration test blow count data (ASTM D 1586). The number of blows required for each 6 inches of penetration or fraction thereof is recorded. If the sampler is driven less than 18 inches, the number of blows per each complete 6-inch interval and per partial interval is recorded.

For partial increments, the depth of penetration should be recorded to the nearest 1 inch. If the sampler advances below the bottom of the boring under the weight of rods (static) and/or hammer, then this information should be recorded on the log.

The following are some “rule-of-thumb” guidelines for describing the relative density of coarse-grained soils:

<u>Blow Count</u>	<u>Relative Density for Sand</u>
0–4	Very loose
4–10	Loose
10–30	Medium dense
30–50	Dense
>50	Very Dense

The following are some “rule-of-thumb” guidelines for describing the consistency of fine-grained soils:

<u>Blow Count</u>	<u>Consistency for Clays</u>	<u>Description</u>
0–2	Very Soft	Sample sags or slumps under its own weight
2–4	Soft	Sample can be pinched in two between the thumb and forefinger
4–8	Medium Stiff	Sample can be easily imprinted with fingers
8–16	Stiff	Sample can be imprinted only with considerable pressure of fingers
16–32	Very Stiff	Sample can be imprinted very slightly with fingers
>32	Hard	Sample cannot be imprinted with fingers; can be pierced with pencil

3.6 OTHER DESCRIPTIVE INFORMATION

The approximate percentage of gravel, sand, and fines (use a percentage estimation chart) should be recorded per ASTM D 2488 as follows:

<u>Modifiers</u>	<u>Descriptions</u>
Trace	Less than 5%
Few	5%–10%
Little	15%–25%
Some	30%–45%
Mostly	50%–100%

Color/discoloration should be recorded and described using a soil color chart, such as the Munsell® Soil Color Charts. A narrative and numerical description should be given from the color chart, such as Brown 10 YR, 5/3 (Munsell®). Odor should be described if organic or unusual.

Plasticity should be described as follows:

<u>Description</u>	<u>Criteria</u>
Non-plastic	A 1/8-inch thread cannot be rolled at any water content
Low	Thread can barely be rolled and lump cannot be formed when drier than plastic limit.
Medium	Thread is easy to roll; plastic limit can be reached with little effort and lump crumbles when drier than plastic limit.
High	Considerable time is required to reach the plastic limit and lump can be formed without crumbling when drier than plastic limit

Moisture condition should be recorded as dry (absence of moisture), moist (damp but no visible water) or wet (visible free water).

Cementation should be recorded (carbonates or silicates) along with the results of HCL reaction testing. The reaction with HCL should be described as none (no visible reaction), weak (some reaction with slowly forming bubbles) or strong (violent reaction with bubbles forming immediately).

Particle description information for coarse-grained soil should be recorded where appropriate per ASTM D 2488 including maximum particle size, angularity (angular, subangular, subrounded, or rounded), shape (flat, elongated or flat and elongated), and color.

Structure (along with orientation) should be reported using the following ASTM D 2488 descriptions:

<u>Description</u>	<u>Criteria</u>
Stratified	Alternating layers of varying material or color with layers greater than 6 millimeters thick
Laminated	Alternating layers of varying material or color with layers less than 6 millimeters thick
Fissured	Breaks along definite planes of fracture with little resistance
Slickensided	Fracture planes that appear polished or glossy, can be striated
Blocky	Inclusion of small pockets of different soils
Homogeneous	Same color and appearance throughout

3.7 ROCK CORE PARAMETERS FOR LOGGING

In general, the following parameters should be included on the boring log when rock coring is conducted:

- Rock type.
- Formation.
- Modifier denoting variety.
- Bedding/banding characteristics.
- Color.
- Hardness.
- Degree of cementation.
- Texture.
- Structure and orientation.
- Degree of weathering.
- Solution or void conditions.
- Primary and secondary permeability including estimates and rationale.
- Lost core interval and reason for loss.

A scaled graphic sketch of the core should be provided on or attached to the log, denoting by depth, location, orientation, and nature (natural, coring-induced, or for fitting into core box) of all core breaks. Where fractures are too numerous to be shown individually, their location may be drawn as a zone.

The RQD values for each core interval (run) should be calculated and included on the boring log. The method of calculating the RQD is as follows per ASTM D 6032:

$$RQD = [\sum \text{length of intact core pieces} > 100 \text{ mm (4-inches)}] \times 100\% / \text{total core length}.$$

3.8 PROCEDURES FOR ROCK CLASSIFICATION

For rock classification record mineralogy, texture, and structural features (e.g., biotite and quartz fine grains, foliated parallel to relict bedding oriented 15 to 20 degrees to core axis, joints coated with iron oxide). Describe the physical characteristics of the rock that are important for engineering considerations such as fracturing (including minimum, maximum, and most common and degree of spacing), hardness, and weathering.

- The following is to be used as a guide for assessing fracturing:

<u>AEG Fracturing</u>	<u>Spacing</u>
Crushed	up to 0.1 foot
Intense	0.1–0.5 foot
Moderate	0.5 foot–10 feet
Slight	1.0 foot–3.0 feet
Massive	>3.0 feet

- Record hardness using the following guidelines:

<u>Hardness</u>	<u>Criteria</u>
Soft	Reserved for plastic material
Friable	Easily crumbled by finger pressure
Low	Deeply gouged or carved with pocketknife
Moderate	Readily scratched with knife; scratch leaves heavy trace of dust
Hard	Difficult to scratch with knife; scratch produces little powder and is often faintly visible
Very Hard	Cannot be scratched with knife

- Describe weathering using the following guidelines:

Weathering	Decomposition	Discoloration	Fracture Condition
Deep	Moderate to complete alteration of minerals feldspars altered to clay, etc.	Deep and thorough	All fractures extensively coated with oxides, carbonates, or clay
Moderate	Slight alteration of minerals, cleavage surface lusterless and stained	Moderate or localized and intense	Thin coatings or stains
Weak	No megascopic alteration of minerals	Slight and intermittent and localized	Few strains on fracture surfaces
Fresh	Unaltered, cleavage, surface glistening		

3.9 PROCEDURE FOR LOGGING REFUSE

The following procedure applies to the logging of subsurface samples composed of various materials in addition to soil as may be collected from a landfill or other waste disposal site.

- Observe refuse as it is brought up by the hollow stem auger, bucket auger, or backhoe.
- If necessary, place the refuse in a plastic bag to examine the sample.
- Record observations according to the following criteria:
 - Composition (by relative volume), e.g., paper, wood, plastic, cloth, cement, or construction debris. Use such terms as “mostly” or “at least half.” Do not use percentages.
 - Moisture condition: dry, moist, or wet.
 - State of decomposition: highly decomposed, moderately decomposed, slightly decomposed, etc.

- Color: obvious mottling and/or degree of mottling.
- Texture: spongy, plastic (cohesive), friable.
- Odor.
- Combustible gas readings (measure down hole and at surface).
- Miscellaneous: dates of periodicals and newspapers, ability to read printed materials, degree of drilling effort (easy, difficult, and very difficult).

3.10 SUBMITTAL REQUIREMENTS

Each original boring log should be submitted to the Contracting Officer Representative (CRO) after completion of the boring. When a monitoring well will be installed in a boring, the boring log and well installation diagram should be submitted together.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Not applicable.

6.0 REFERENCES

- ASTM Standard D 1586-84 (1992), 1992. *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils.*
- ASTM Standard D 2488-93, 1993. *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).*
- ASTM Standard D 5434-93, 1993. *Guide for Field Logging of Subsurface Explorations of Soil and Rock.*
- ASTM Standard D 6032-96, 1996. *Standard Test Method for Determining Rock Quality Designation (RQD) of Rock Core.*
- Compton, R.R., 1962. *Manual of Field Geology.* John Wiley & Sons, Inc., New York.
- USACE, 1998. *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* EM 1110-1-4000, 1, November.
- U.S. Department of the Interior, 1989. *Earth Manual.* Water and Power Resources Service, Washington, D.C.

STANDARD OPERATING PROCEDURE 10.4

CHAIN-OF-CUSTODY FORM

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for use of the chain-of-custody form. An example is provided as part of this SOP. Other formats with similar levels of detail are acceptable.

2.0 MATERIALS

- Chain-of-custody form.
- Indelible ink pen.

3.0 PROCEDURE

- Record the project name and number.
- Record the project contact's name and phone number.
- Print sampler's names in "Samplers" block.
- Enter the Field Sample No.
- Record the sampling dates for all samples.
- List the sampling times (military format) for all samples.
- Indicate, "grab" or "composite" sample with an "X."
- Record matrix (e.g., aqueous, soil).
- List the analyses/container volume across top.
- Enter the total number of containers per Field Sample No. in the "Subtotal" column.
- Enter total number of containers submitted per analysis requested.
- State the carrier service and airbill number, analytical laboratory, and custody seal numbers.
- List any comments or special requests in the "Remarks" section.
- Sign, date, and time the "Relinquished By" section when the cooler is relinquished to the next party.
- Upon completion of the form, retain the shipper copy and place the forms and the other copies in a zip seal bag to protect from moisture. Affix the zip seal bag to the inside lid of the sample cooler to be sent to the designated laboratory.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Not applicable.

6.0 REFERENCES

USEPA, 1990. *Sampler's Guide to the Contract Laboratory Program*. EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, DC, December 1990.

USEPA, 1991. *User's Guide to the Contract Laboratory Program*. EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response, January 1991.

USEPA, 1998. *EPA Requirements for Quality Assurance Project Plans*. EPA/600/R-98/018, QA/R5, Final, Office of Research and Development, Washington, D.C.

FIGURE 10.4-a
EXAMPLE CHAIN-OF-CUSTODY FORM

Project Number		Project Name			Matrix	A N A L Y S E S								S u b t o t a l	LAB :	
Project Contact (Name and Phone Number)															AIRBILL No:	
Samplers:															Courier:	
Field Sample No.	Date (MM-DD-YY)	Time	C o m p	G r a b											REMARKS	
TOTAL																
Relinquished by:		Date/time		Received by:		Relinquished by:			Date/Time			Received by:				
Relinquished by:		Date/time		Received by: (for lab)		Date/Time			Remarks							

STANDARD OPERATING PROCEDURE 30.1 SOIL SAMPLING

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for sampling surface and subsurface soils.

2.0 MATERIALS

- Stainless steel scoop, spoon, trowel, knife, spatula, (as needed).
- Split-spoon, Shelby tube, or core barrel sampler.
- Hand auger or push tube sampler.
- Drill rig and associated equipment (subsurface soil).
- Stainless steel bowls.
- Photoionization detector or other appropriate instrument as specified in site-specific health and safety plan.
- Sampling equipment for collection of volatile organic samples.
- Appropriate sample containers.
- Appropriate sample labels and packaging material.
- Personal protective equipment and clothing (PPE) per site-specific health and safety plan.
- Decontamination equipment and supplies (SOP 80.1).

3.0 PROCEDURE

3.1 DOCUMENTATION

- Soil sampling information should be recorded in the field logbooks as described in SOPs 10.1 and 10.2.

3.1 SURFICIAL SOIL SAMPLES

The targeted depths for surficial soil samples (surface and near surface) will be specified in the work plan addenda developed for site-specific investigations.

- All monitoring equipment should be appropriately calibrated before beginning sampling according to the requirements of the work plan addenda and SOP 90.1 or 90.2.
- All sampling equipment should be appropriately decontaminated before and after use according to the requirements of the work plan addendum and SOP 80.1.
- Use a spade, shovel, or trowel or other equipment (manufactured from material, which is compatible with the soil to be sampled) to remove any overburden material present (including vegetative mat) to the level specified for sampling.

- Measure and record the depth at which the sample will be collected with an engineers scale or tape.
- Remove the thin layer that was in contact with the overburden removal equipment using a clean stainless steel scoop or equivalent and discard it.
- Begin sampling with the acquisition of any discrete sample(s) for analysis of VOCs, with as little disturbance as possible. VOC samples will not be composited or homogenized.
- When a sample will not be collected with a core type of sampler (push tube, split spoon, etc.), the sample for VOC analysis will be collected from freshly exposed soil. The method of collection will follow the procedures specified in SOP 30.8 (Methanol Preservation Method) or 30.9 (En Core® Method) based on the requirements of the work plan addenda.
- Field screen the sample with properly calibrated photoionization detector (PID) or other appropriate instrument. Cut a cross-sectional slice from the core or center of the sample and insert the monitoring instrument(s). Based on the screening results, collect the VOC fraction, as applicable.
- Collect a suitable volume of sample from the targeted depth with a clean stainless steel scoop (or similar equipment), push tube sampler, or bucket auger
- For core type of samplers, rough trimming of the sampling location surface should be considered if the sampling surface is not fresh or other waste, different soil strata, or vegetation may contaminate it. Surface layers can be removed using a clean stainless steel, spatula, scoop, or knife. Samples collected with a bucket auger or core type of sampler should be logged per the requirements of SOP 10.3.
- If homogenization or compositing of the sampling location is not appropriate for the remaining parameters, the sample should be directly placed into appropriate sample containers with a stainless steel spoon or equivalent.
- If homogenization of the sample location is appropriate or compositing of different locations is desired, transfer the sample to a stainless steel bowl for mixing. The sample should be thoroughly mixed with a clean stainless steel spoon, scoop, trowel, or spatula and then placed in appropriate sample containers per the requirements for containers and preservation specified in work plan addenda. Secure the cap of each container tightly.
- Appropriately, label the samples (SOP 50.1), complete the chain-of-custody (SOP 10.4), and package the samples for shipping (SOP 50.2).
- Return any remaining unused soil to the original sample location. If necessary, add clean sand to bring the subsampling areas back to original grade. Replace the vegetative mat over the disturbed areas.

3.1 SUBSURFACE SAMPLES

- All sampling equipment should be appropriately decontaminated before and after use according to the requirements of the work plan addendum and SOP 80.1.
- All monitoring equipment should be appropriately calibrated before sampling according to the requirement of the work plan addendum and SOP 90.1 or SOP 90.2.

- All sampling equipment should be appropriately decontaminated before and after use according to the requirements of the work plan addendum and SOP 80.1.
- Collect split-spoon; core barrel, Shelby tube, sonic core or other similar samples during drilling.
- Upon opening sampler or extruding sample, immediately screen soil for VOCs using a PID or appropriate instrument. If sampling for VOCs, determine the area of highest concentration; use a stainless steel knife, trowel, or lab spatula to cut the sample; and screen for VOCs with monitoring instrument(s).
- Log the sample on the boring log before extracting from the sampler per the requirements of SOP 10.3.
- Any required VOC samples will be collected first followed by the other parameters. VOC samples will not be composited or homogenized and will be collected from the area exhibiting the highest screening level. The method of VOC sample collection will follow the procedures specified in SOP 30.8 (Methanol Preservation Method) or 30.9 (En Core® Method) based on the requirements of the work plan addenda.
- Field screen the sample with properly calibrated photoionization detector (PID) or other appropriate instrument. Cut a cross-sectional slice from the core or center of the sample and insert the monitoring instrument(s). Based on the screening results, collect the VOC fraction, as applicable.
- Rough trimming of the sampling location surface should be considered if the sampling surface is not fresh or other waste, different soil strata, or vegetation may contaminate it. Surface layers can be removed using a clean stainless steel, spatula, scoop, or knife.
- If homogenization or compositing of the sampling location is not appropriate for other parameters, the sample should be directly placed into appropriate sample containers with a stainless steel spoon or equivalent.
- If homogenization of the sample location is appropriate or compositing of different locations is desired, transfer the sample to a stainless steel bowl for mixing. The sample should be thoroughly mixed with a clean stainless steel spoon, scoop, trowel, or spatula and placed in appropriate sample containers per the requirements for containers and preservation specified in work plan addenda. Secure the cap of each container tightly.
- Appropriately, label the samples (SOP 50.1), complete the chain-of-custody (SOP 10.4), and package the samples for shipping (SOP 50.2).
- Discard any remaining sample into the drums used for collection of cuttings.
- Abandon borings according to procedures outlined in SOP 20.2.

3.1 INVESTIGATION DERIVED MATERIALS

Investigation-derived material will be managed in accordance with procedures defined in the work plan addenda for the site being investigated and SOP 70.1.

NOTES: If sample recoveries are poor, it may be necessary to composite samples before placing them in jars. In this case, the procedure will be the same except that two split-spoon samples (or other types of samples) will be mixed together. The boring log should clearly state

that the samples have been composited, which samples were composited, and why the compositing was done. In addition, VOC fraction should be collected from the first sampling device.

When specified, samples taken for geotechnical analysis (e.g., percent moisture, density, porosity, and grain size) will be undisturbed samples, such as those collected using a thin-walled (Shelby tube) sampler, sonic core sampler, etc.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

Refer to the site-specific health and safety plan.

Soil samples will not include vegetative matter, rocks, or pebbles unless the latter are part of the overall soil matrix.

6.0 REFERENCES

ASTM Standard D 1586-84, 1984. *Penetration Test and Split-Barrel Sampling of Soils.*

ASTM Standard D 1587-83, 1983. *Thin Walled Sampling of Soils.*

ASTM Standard D 5633-94, 1994. *Standard Practice for Sampling with a Scoop.*

USACE, 2001. *Requirements for the Preparation of Sampling and Analysis Plans.* EM 200-1-3.
1 February.

STANDARD OPERATING PROCEDURE 30.6 CONTAINERIZED MATERIAL

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the opening and sampling of containerized liquids of potentially unknown substances.

2.0 MATERIALS

- Work Plans.
- Field logbooks.
- Personal protective equipment and clothing per the site-specific health and safety plan.
- Monitoring instruments per the site-specific health and safety plan.
- Decontamination equipment and supplies (SOP 80.1).
- Tools.
- Historical data, if available.
- Sampling tube.
- Remote samplers, as required.

3.0 PROCEDURE

Sealed containers with unknown contents represent potential severely hazardous situations for sampling teams. Even when the original identity of the contents is reasonably certain, contents may be under pressure or in a decomposed state and may readily react (sometimes violently) with air or water vapor in the atmosphere.

Only hazardous material specialists that have appropriate training and experience will inspect and sample unidentifiable drums or containers. Specialist team members will use extreme caution and care when opening sealed drums or cans of unknown content for purposes of inspection and sampling.

Efforts will be made to determine the identity of the contents, through markings, history of activities at the site, and similarity and proximity to containers of known contents. The range of possible hazards will dictate which specific procedure will be followed, and specific procedures will be identified in work plan addenda. All predetermined procedures will be strictly followed as designated by the site-specific conditions.

Using this SOP and appropriate health and safety protocols, field personnel will use extreme caution and care in opening sealed drums or cans of unknown contents for purposes of inspection and sampling. Specific activities include the following:

- Determine the identity of the contents through markings, history of activities at the site, and similarity and proximity to containers of known contents. The range of possible hazards will dictate which specific procedure should be followed.

- Handle containers as little as possible; however, if it is necessary to reorient a drum to allow access to a bung or cap, perform this activity using remote-handling forklift equipment with special drum-holding attachments.
- If contents are deemed to be under pressure, highly reactive, or highly toxic (or if these possibilities cannot be disproven), perform initial opening of the container remotely.
- Air monitoring stations will be established as necessary, using the following procedures:
- Affix a remote bung opener to the drum.
- Evacuate personnel to a safe distance or station them behind a barricade.
- Activate the non-sparking motor of the opener.
- After the bung is removed, monitor the drum for potential activity of the contents, such as vapor emission, smoking, or audible reaction.
- Approach cautiously while monitoring for toxic levels of airborne contaminants.
- If the contents of the drum pose acceptable hazards, accomplish opening (or inspection if previously opened remotely) and sampling with one of three approved devices. The preferred method is to use a clean glass tube, with or without bottom stopper, which can be placed in the drum (breaking it if necessary) after sampling is complete. Alternately (if a bung has been removed), a well sampler such as a Kemmererbailer can be used (but would require removal and cleaning or disposal according to the nature of the waste). By opening either of these devices at a desirable depth, stratified sampling can be performed. Also, the sampling tubes can be made with a plunger rod and O-ring seals at selected intervals, allowing simultaneous collection of multiple samples in a stratified medium.
- Following sampling, the drum will be resealed and/or overpacked to prevent any possibility of leakage while analysis determines the identity of the contents.
- Drums that do not have removable bungs may be opened remotely with a solenoid-activated punch (this requires that the drum be recontainerized or overpacked after sampling is complete).

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCE

USEPA, 1989. A Compendium of Superfund Field Operation Methods. EPA/540/P-87/001. December.

STANDARD OPERATING PROCEDURE 30.7 SAMPLING STRATEGIES

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate sampling strategies for sampling various media.

2.0 MATERIALS

- Historical site data.
- Site topography.
- Soil types.
- Sampled media.

3.0 PROCEDURE

The primary goal of any investigation is to collect samples representative of existing site conditions. Statistics are generally used to ensure samples are as representative as possible. Sampling plans may employ more than one approach to ensure project data quality objectives are adequately addressed. A comparison of sampling strategies is presented in Table 1.

3.1 CLASSICAL STATISTICAL SAMPLING

- Classical statistical sampling strategies are appropriately applied to either sites where the source of contamination is known or small sites where the entire area is remediated as one unit. Primary limitations of this sampling approach include 1) inability to address media variability; 2) inadequate characterization of heterogeneous sites; and 3) inadequate characterization of sites with unknown contamination characteristics.

3.1.1 Simple Random Sampling

Simple random sampling is generally more costly than other approaches because of the number of samples required for site characterization. This approach is generally used when minimal site information is available and visible signs of contamination are not evident and includes the following features:

- Sampling locations are chosen using random chance probabilities.
- This strategy is most effective when the number of sampling points is large.

3.1.2 Stratified Random Sampling

This sampling approach is a modification to simple random sampling. This approach is suited for large site investigations that encompass a variety of soil types, topographic features, and/or land uses. By dividing the site into homogenous sampling strata based on background and historical data, individual random sampling techniques are applied across the site. Data acquired from each stratum can be used to determine the mean or total contaminant levels and provide these advantages:

- Increased sampling precision results due to sample point grouping and application of random sampling approach.
- Control of variances associated with contamination, location, and topography.

3.1.3 Systematic Grid

The most common statistical sampling strategy is termed either systematic grid or systematic random sampling. This approach is used when a large site must be sampled to characterize the nature and extent of contamination.

Samples are collected at predetermined intervals within a grid pattern according to the following approach:

- Select the first sampling point randomly; remaining sampling points are positioned systematically from the first point.
- Determine the grid design: one or two-dimensional. One-dimensional sample grids may be used for sampling along simple man-made features. Two-dimensional grid systems are ideal for most soil applications.
- Determine the grid type: square or triangular. Sampling is usually performed at each grid-line intersection. Other strategies include sampling within a grid center or obtaining composite samples within a grid.
- Each stratum is sampled based on using the simple random sampling approach but determined using a systematic approach.

3.1.4 Hot-Spot Sampling

Hot spots are small, localized areas of media characterized by high contaminant concentrations. Hot-spot detection is generally performed using a statistical sampling grid. The following factors should be addressed:

- Grid spacing and geometry. The efficiency of hot-spot searches is improved by using a triangular grid. An inverse relationship exists between detection and grid point spacing, e.g., the probability of hot-spot detection is increased as the spacing between grid points is decreased.
- Hot-spot shape/size. The larger the hot spot, the higher the probability of detection. Narrow or semi-circular patterns located between grid sampling locations may not be detected.
- False-negative probability. Estimate the false negative (β -error) associated with hot-spot analysis.

3.1.5 Geostatistical Approach

Geostatistics describe regional variability in sampling and analysis by identifying ranges of correlation or zones of influence. The general two-stage approach includes the following:

- Conducting a sampling survey to collect data defining representative sampling areas.
- Defining the shape, size, and orientation of the systematic grid used in the final sampling event.

3.2 NON-STATISTICAL SAMPLING

3.2.1 Biased Sampling

Specific, known sources of site contamination may be evaluated using biased sampling. Locations are chosen based on existing information.

3.2.2 Judgmental Sampling Grid

This sampling approach entails the subjective selection of sampling locations that appear to be representative of average conditions. Because this method is highly biased, it is suggested that a measure of precision be included through the collection of multiple samples.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCE

USACE, 2001. *Requirements for the Preparation of Sampling and Analysis Plans*. EM200-1-3. 1 February.

TABLE 1
SAMPLING STRATEGIES

SAMPLING STRATEGY	DESCRIPTION	APPLICATION	LIMITATIONS
Classical Statistical Sampling Strategies			
Simple Random Sampling	Representative sampling locations are chosen using the theory of random chance probabilities.	Sites where background information is not available and no visible signs of contamination are present.	May not be cost-effective because samples may be located too close together. Does not take into account spatial variability of media.
Stratified Random Sampling	Site is divided into several sampling areas (strata) based on background or site survey information.	Large sites characterized by a number of soil types, topographic features, past/present uses, or manufacturing storage areas.	Often more cost-effective than random sampling. More difficult to implement in the field and analyze results. Does not take into account spatial variability of media.
Systematic Grid Sampling	Most common statistical strategy; involves collecting samples at predetermined, regular intervals within a grid pattern.	Best strategy for minimizing bias and providing complete site coverage. Can be used effectively at sites where no background information exists. Ensures that samples will not be taken too close together.	Does not take into account spatial variability of media.
Hot-Spot Sampling	Systematic grid sampling strategy tailored to search for hot spots.	Sites where background information or site survey data indicate that hot spots may exist.	Does not take into account spatial variability of media. Tradeoffs between number of samples, chance of missing a hot spot, and hot spot size/shape must be weighed carefully.
Geostatistical Approach	Representative sampling locations are chosen based on spatial variability of media. Resulting data are analyzed using kriging, which creates contour maps of the contaminant concentrations and the precision of concentration estimates.	More appropriate than other statistical sampling strategies because it takes into account spatial variability of media. Especially applicable to sites where presence of contamination is unknown.	Previous investigation data must be available and such data must be shown to have a spatial relationship.
Non-Statistical Sampling Strategies			
Biased Sampling	Sampling locations are chosen based on available information.	Sites with known contamination sources.	Contaminated areas can be overlooked if background information or visual signs of contamination do not indicate them. Best used if combined with a statistical approach, depending on the project objectives.
Judgmental Sampling	An individual subjectively selects sampling locations that appear to be representative of average conditions.	Homogenous, well-defined sites.	Not usually recommended due to bias imposed by individual, especially for final investigations.

STANDARD OPERATING PROCEDURE 30.13

SCREENING FOR METALS VIA X-RAY FLUORESCENCE (XRF) SPECTROMETRY

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to provide general guidance for the analysis of samples using X-Ray Fluorescence (XRF) methods. XRF can be used to screen for a variety of metals (**Attachment 1**) in environmental sample matrices that include soil, air filters, solid surfaces, materials including dried filter papers, and to screen for lead-based paint. The XRF technique has been accepted by the U.S. Environmental Protection Agency (EPA) for screening of samples during investigative and remediation actions and is published in USEPA SW-846 as Method 6200.

This procedure is applicable to efforts where metals are to be assessed using XRF methods. It is intended to act primarily as a guideline for the use and applicable Quality Control (QC) requirements of this technique. This procedure is not intended to replace the applicable manufacturer's information/procedures or those in SW-846, and it also does not present expanded detail on sample preparation. XRF is a surface analysis technique and as such, higher confidence data is achieved when solid samples, especially soil samples, are homogenized and reduced to consistent particle-size mixtures by drying, grinding, and sieving.

2.0 MATERIALS

- NITON Model XL-703 XRF system.
- Applicable source (Cd-109, Am-241).
- Filter holder assembly.
- System blank.
- Energy blank.
- System reference material (SRM).
- Sample cup.
- Field logbook and log sheets.

3.0 PRECAUTIONS

- XRF instruments contain radioactive source(s), and the electron beam is hazardous. Do not remove shielding or disassemble instruments beyond the user maintenance dictated in the instrument manual.
- Never place a hand or other body part in the path of the detector, and always operate it either with its shield closed or with the sensor window held tight against a surface; do not look directly at the beam.
- Some systems utilize cryogenic cooling systems, and appropriate precautions should be taken during operation.

- These instruments are regulated radioactive sources and require licensing and specific radioactive licensee procedures for use. In several states, some units, especially those containing Cd109 sources, are considered controlled sources and subject to state radioactive regulations including specific training for persons using the instrument, posting of radioactive safety procedures, isolation of work areas, and issuance of state radioactive licenses and permits. The Commonwealth of Virginia allows the use of Niton Corporation's Radioactive Materials License. The Virginia State Department of Health must be informed (804-786-5932) that a "generally licensed source" is being used. Personnel using this type of instrument for the first time must attend the manufacturer's Safety Training course or be trained by a certified representative. Manufacturers will not send instruments containing radioactive sources to a project site without a competent person as required by their Specific License and General License with an Agreement State where analysis will be performed. The Commonwealth of Virginia requires the instrument to be shipped to the site directly. For additional information or assistance in dealing with licensing and/or shipment issues, contact the manufacturer, or leasing agent.

4.0 PROCEDURE

4.1 GENERAL INFORMATION

Method sensitivity is a function of the count time. Consult the manufacturer's manual to establish a count time that provides the needed sensitivity while allowing for sample throughput efficiency. Typical count times are 60 to 180 seconds.

Soil samples will be analyzed by using *ex situ* methods. *Ex situ* analysis involves thorough drying, grinding, mixing, and sieving of the sample, placing it into a sample cup for introduction to the instrument, and collecting data. Soil samples are analyzed by placing the sample cup into the manufacturer's holder and read by the instrument. The average of two readings should be calculated for each result.

XRF instruments are essentially semi-quantitative screening instruments and in most instances provide non-definitive screening data that must be confirmed by definitive methods. In well defined remedial actions governed by detailed approved plans, XRF has been used as a confirmatory tool. Use of the method for confirmatory purposes requires site-specific calibration over multiple points, regular QC checks, adjustments of the site-specific curve/Definitive method relationship via split sample analysis, and defined confidence windows for grey-area data.

4.2 GENERAL OPERATION

4.2.1 **Record** data onto a log sheet using the XRF Calibration Log (**Attachment 2**) and XRF Sample Collection Log (**Attachment 3**).

4.2.2 Allow the instrument to warm-up for 15 to 30 minutes before use.

4.2.3 **Perform** manufacturer-specified background (scatter) and internal self-calibration checks using the supplied materials. The XRF Calibration Log should be **completed daily** to record the date, time, sample no., leakage current (Pa), and resolution (eV). If the resolution reads above 900 eV or the leakage current is above 160 milliamps, the detector is not performing adequately. If the system fails the background check, **clean** the window and repeat. Do not use an instrument that fails either the background check or internal calibration criteria. **Contact** the manufacturer if the instrument does not pass calibration.

4.2.4 Prior to analyzing samples, **analyze** each of the required QC samples to include SRM and blanks and **compare** to the project criteria. Do not proceed to project samples until QC meets criteria. QC samples in sample cups should be **tilted** to **remix** the contents before analysis.

4.2.5 For *ex situ* samples, **place** approximately 5-10 grams of soil on a drying pan or tin and **place** in 103°C oven for 2-4 hours.

4.2.6 Using a 60 mesh sieve, **sift** out any coarse material. **Mix and grind** the sample using a mortar and pestle until a fine consistency is reached.

4.2.7 **Fill** each sample cup with the soil matrix. **Analyze** in duplicate and **average** the results. Higher confidence data from soils in sample cups is achieved if each cup is analyzed in duplicate.

4.2.8 **Tilt** the cup to **remix** the material between each analysis. **Report** the result as the average of the two values, provided they differ by less than 20%. If they differ by more than 20%, sample preparation methods should be reviewed.

4.2.9 **Analyze** a calibration check standard (SRM) and instrument blank after every ten sample analyses, following an extended down period, and at the end of the analysis day/shift.

4.3 QUALITY CONTROL

QC requirements include analysis of blanks (instrument, method), calibration checks (SRMs or known value samples), and replicate samples. Blanks should be less than the instrument detection limits in **Attachment 1**. Instrument blank is clean sand or lithium carbonate. The SRM and continuing calibration should be $\pm 20\%$ D of certified value.

Confirmatory use requires more extensive QC efforts. A site-specific calibration should be performed by split analyzing prepared samples in duplicate by XRF and off-site definitive methods. The results are used to develop a site-specific XRF/Definitive method correlation and calibration curve. Daily QC should include the analysis of blanks, at least three of the site-specific calibration standards bracketing the expected concentration ranges, replicates, and a check sample or SRM. The correlation should be verified and if necessary adjusted on a defined sample analysis or time frequency.

5.0 REFERENCES

Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment, Method 6200, Revision 0, 1998, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, Third Edition, January.

Instrument Manual for Spectrace Model 9000 XRF, TN Technologies.

Instrument Manual for Niton 700 Series Systems, Niton Inc.

Attachment 1
List of XRF Analytes and Instrument Detection Limits^a

Element	Typical Reporting Limits for Each Radioactive Source (mg/kg)	
	Cd-109	Am-241
Sulfur		
Chlorine		
Potassium		
Calcium		
Titanium		
Chromium	260	
Manganese	205	
Iron	110	
Cobalt	100	
Nickel	65	
Copper	45	
Zinc	35	
Mercury	30	
Arsenic	25	
Selenium	15	
Lead	15	
Rubidium	5	
Strontium	4	
Zirconium	3	
Molybdenum	4	
Cadmium		50
Tin		85
Antimony		45
Barium		30
Silver		9

^a Typically achievable in a clean, silica sand matrix. Actual sample detection limits will be higher due to the sample matrix interferences.

Attachment 2 XRF Calibration Log

XRF Model Number:		XRF Serial Number:		
Date	Time	Sample No.	Instrument Self-Calibration	
			Leakage Current (Pa)	Resolution (eV)

Notes: If the Resolution reads above 900 eV, contact Niton Corporation.
 If leakage current is above 160 milliamps, the detector is not performing adequately.

**Attachment 3
XRF Sample Collection Log**

Client:		XRF Model:		XRF Serial Number:					
Site:		Samplers:		Parameters/Readings (ppm)					
Date	Time	Sample No.	Media	Arsenic	Chromium	Copper	Iron	Lead	Remarks

STANDARD OPERATING PROCEDURE 50.1

SAMPLE LABELS

1.0 SCOPE AND APPLICATION

Every sample will have a sample label uniquely identifying the sampling point and analysis parameters. The purpose of this standard operating procedure (SOP) is to delineate protocols for the use of sample labels. An example label is included as Figure 50.1-A. Other formats with similar levels of detail are acceptable.

2.0 MATERIALS

- Sample label.
- Indelible marker.

3.0 PROCEDURE

The use of preprinted sample labels is encouraged and should be requested from the analytical support laboratory during planning activities.

- As each sample is collected, fill out a sample label ensuring the following information has been collected:
- Project name.
- Sample ID: enter the SWMU number and other pertinent information concerning where the sample was taken. This information should be included in site-specific work plan addenda.
- Date of sample collection.
- Time of sample collection.
- Initials of sampler(s).
- Analyses to be performed (NOTE: Due to number of analytes, details of analysis should be arranged with lab *a priori*).
- Preservatives (water samples only).

Double-check the label information to make sure it is correct. Detach the label, remove the backing and apply the label to the sample container. Cover the label with clear tape, ensuring that the tape completely encircles the container.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

None.

6.0 REFERENCE

USEPA, 1998. *EPA Requirements for Quality Assurance Project Plans*. EPA/600/R-98/018, QA/R5, Final, Office of Research and Development, Washington, D.C.

FIGURE 50.1-A
SAMPLE LABEL

PROJECT NAME _____

SAMPLE ID _____

DATE: ____/____/____ TIME: ____:____

ANALYTES: VOC SVOC P/P METALS CN
 PAH D/F HERBs ANIONS TPH
 ALK TSS

PRESERVATIVE: [HCl] [HNO₃] [NaOH] [H₂SO₄]

SAMPLER: _____

STANDARD OPERATING PROCEDURE 50.2

SAMPLE PACKAGING

1.0 SCOPE AND APPLICATION

The purpose of this standard operating procedure (SOP) is to delineate protocols for the packing and shipping of samples to the laboratory for analysis.

2.0 MATERIALS

- Waterproof coolers (hard plastic or metal).
- Metal cans with friction-seal lids (e.g., paint cans).
- Chain-of-custody forms.
- Chain-of-custody seals (optional).
- Packing material.
- Sample documentation.
- Ice.
- Plastic garbage bags.
- Clear Tape.
- Zip-top plastic bags.
- Temperature blanks provided by laboratory for each shipment.

3.0 PROCEDURE

- Check cap tightness and verify that clear tape covers label and encircles container.
- Wrap sample container in bubble wrap or closed cell foam sheets. Samples may be enclosed in a secondary container consisting of a clear zip-top plastic bag. Sample containers must be positioned upright and in such a manner that they will not touch during shipment.
- Place several layers of bubble wrap, or at least 1 in. of vermiculite on the bottom of the cooler. Line cooler with open garbage bag, place all the samples upright inside the garbage bag and tie.
- Double bag and seal loose ice to prevent melting ice from soaking the packing material. Place the ice outside the garbage bags containing the samples.
- Pack shipping containers with packing material (closed-cell foam, vermiculite, or bubble wrap). Place this packing material around the sample bottles or metal cans to avoid breakage during shipment.
- A temperature blank (provided by laboratory) will be included in each shipping container to monitor the internal temperature. Samples should be cooled to 4 degrees C on ice immediately after sampling.

- Enclose all sample documentation (i.e., Field Parameter Forms, Chain-of-Custody forms) in a waterproof plastic bag and tape the bag to the underside of the cooler lid. If more than one cooler is being used, each cooler will have its own documentation. Add the total number of shipping containers included in each shipment on the chain-of-custody form.
- Seal the coolers with signed and dated custody seals so that if the cooler were opened, the custody seal would be broken. Place clear tape over the custody seal to prevent damage to the seal.
- Tape the cooler shut with packing tape over the hinges and place tape over the cooler drain.
- Ship all samples via overnight delivery on the same day they are collected if possible.

4.0 MAINTENANCE

Not applicable.

5.0 PRECAUTIONS

5.1 PERMISSIBLE PACKAGING MATERIALS

- Non-absorbent.
- Bubble wrap.
- Closed cell foam packing sheets.
- Absorbent.
- Vermiculite.

5.2 NON-PERMISSIBLE PACKAGING MATERIALS

- Paper.
- Wood shavings (excelsior).
- Cornstarch “peanuts”.

6.0 REFERENCES

USEPA, 1990. *Sampler's Guide to the Contract Laboratory Program*. EPA/540/P-90/006, Directive 9240.0-06, Office of Emergency and Remedial Response, Washington, D.C., December 1990.

USEPA, 1991. *User's Guide to the Contract Laboratory Program*. EPA/540/O-91/002, Directive 9240.0-01D, Office of Emergency and Remedial Response. January 1991.

USEPA, 1998. *EPA Requirements for Quality Assurance Project Plans*. EPA/600/R-98/018, QA/R5, Final, Office of Research and Development, Washington, D.C.

STANDARD OPERATING PROCEDURE 70.1

INVESTIGATION-DERIVED MATERIAL

1.0 SCOPE AND APPLICATION

Management of investigation-derived material (IDM) minimizes the potential for the spread of waste material on site or off site through investigation activities. The purpose of this standard operating procedure (SOP) is to provide general guidelines for appropriate management of potentially contaminated materials derived from the field investigations. Specific procedures related to the transportation and disposal of hazardous waste are beyond the scope of this SOP.

2.0 INTRODUCTION

IDM consists of waste materials that are known or suspected to be contaminated with waste substances through the actions of sample collection or personnel and equipment decontamination. These materials include decontamination solutions, disposable equipment, drill cuttings and fluids, and water from groundwater monitoring well development and purging. To the extent possible, the site manager will attempt to minimize the generation of these materials through careful design of decontamination schemes and groundwater sampling programs. Testing conducted on soil and water IDM will show if they are also hazardous wastes as defined by RCRA. This will determine the proper handling and ultimate disposal requirements.

The criteria for designating a substance as hazardous waste according to RCRA is provided in 40 CFR 261.3. If IDM meet these criteria, RCRA requirements will be followed for packaging, labeling, transporting, storing, and record keeping as described in 40 CFR 262.34. Those materials that are judged potentially to meet the criteria for a regulated solid or hazardous waste will be placed in DOT-approved 55-gallon steel drums or another type of DOT approved container; based on waste characteristics and volume.

Investigation-derived material will be appropriately placed in containers, labeled, and tested to determine disposal options in accordance with RCRA regulations and Virginia Hazardous Waste Management Regulations.

3.0 INVESTIGATION-DERIVED MATERIAL MANAGEMENT

Procedures that minimize potential for the spread of waste material include minimizing the volume of material generated, material segregation, appropriate storage, and disposal according to RCRA requirements.

3.1 WASTE MINIMIZATION

In the development of work plan addenda, each aspect of the investigation will be reviewed to identify areas where excess waste generation can be eliminated. General procedures that will eliminate waste include avoidance of unnecessary exposure of materials to hazardous material and coordination of sampling schedules to avoid repetitious purging of wells and use of sampling equipment.

3.2 WASTE SEGREGATION

Waste accumulation and management procedures to be used depend upon the type of material generated. For this reason, IDM described below are segregated into separate 55-gallon storage drums or other appropriate DOT containers. Waste materials that are known to be free of potential hazardous waste contamination (such as broken sample bottles or equipment containers and wrappings) must be collected separately for disposal to municipal systems. Large plastic garbage or “lawn and leaf” bags are useful for collecting this trash. Even “clean” sample bottles or Tyvek should be disposed of with care. Although they are not legally a problem, if they are discovered by the public they may cause concern. Therefore, items that are known to be free from contamination but are also known to represent “hazardous or toxic waste” to the public must not be disposed of in any public trash receptacle, such as found at your hotel or park.

3.2.1 Decontamination Solutions

Solutions considered IDM range from detergents, organic solvents, and acids used to decontaminate small hand samplers to steam-cleaning rinsate used to wash drill rigs and other large equipment. These solutions are to be placed in 55-gallon drums with bolt-sealed lids or other appropriate DOT approved containers. Residual liquid IDM from decontamination pads will be removed and appropriately placed in container(s) at the end of each field day.

3.2.2 Soil Cuttings and Drilling Muds

Soil cuttings are solid to semi-solid soils generated during trenching activities or drilling for the collection of subsurface soil samples or the installation of monitoring wells. Depending on the type of drilling, drilling fluids known as “muds” may be used to remove soil cuttings. Drilling fluids flushed from the borehole must be directed into a settling section of a mud pit. This allows reuse of the decanted fluids after removal of the settled sediments. Drill cuttings, whether generated with or without drilling fluids, are to be removed with a flat-bottomed shovel and placed in 55-gallon drums with bolt-sealed lids or other appropriate DOT containers, as conditions or volume of IDM dictate.

3.2.3 Well Development and Purge Water

Well development and purge water is removed from monitoring wells to repair damage to the aquifer following well installation, obtain characteristic aquifer groundwater samples, or measure aquifer hydraulic properties. The volume of groundwater to be generated will determine the appropriate container to be used for accumulation of IDM.

For well development and purging, 55-gallon drums are typically an efficient container for accumulation. When larger volumes of water are removed from wells, such as when pumping tests are conducted, the use of large-volume portable tanks such as “Baker Tanks” should be considered for IDM accumulation.

Analytical data for groundwater samples associated with the well development and purge water will be used to assist in characterizing IDM and evaluating disposal options.

3.2.4 Personal Protective Equipment and Disposable Sampling Equipment

Personal protective equipment and clothing (PPE) may include such items as Tyvek coveralls, gloves, booties, and APR cartridges. Disposable sampling equipment may include such items as plastic sheeting, bailers, disposable filters, disposable tubing and paper towels. PPE and disposable sampling equipment that have or may have contacted contaminated media (soil, water, etc.) will be segregated and placed in 55-gallon drums separate from soil and water IDM.

Disposition of this type of IDM will be determined by the results of IDM testing of the media in which the PPE and sampling equipment contacted.

3.3 MATERIAL ACCUMULATION

The IDM in containers must be placed in an appropriate designated RCRA container accumulation area at RFAAP, where it is permissible to accumulate such waste. IDM placed into a designated 90-day accumulation area will be properly sealed, labeled and covered. All drums will be placed on pallets.

A secure and controlled waste staging area will be designated by the installation prior the commencement of field sampling activities. Per the facility's requirements as a RCRA large quantity generator, waste accumulation cannot exceed 90 days for materials presumed or shown to be RCRA-designated hazardous wastes; waste which is known not to be RCRA-designated waste should be promptly disposed to municipal waste systems or appropriate facility.

3.3.1 IDM Accumulation Containers

Containers will be DOT-approved (DOT 17H 18/16GA OH unlined) open-head steel drums or other DOT approved container, as appropriate.

Container lids should lift completely off be secured by a bolt ring (for drum). Order enough containers to accumulate all streams of expected IDM including soil, PPE and disposable sampling equipment, decontamination water, purge water, etc.

Solid and liquid waste streams will not be mixed in a container. PPE and expendable sampling equipment will be segregated from other IDM and placed in different containers than soil. Containers inside containers are not permitted. PPE must be placed directly in a drum not in a plastic bag.

Pallets are often required to allow transport of filled drums to the staging area with a forklift. Normal pallets are 3×4 ft and will hold two to three 55-gallon drums depending on the filled weight. If pallets are required for drum transport or storage, field personnel are responsible for ensuring that the empty drums are placed on pallets before they are filled and that the lids are sealed on with the bolt-tighten ring after the drums are filled. Because the weight of one drum can exceed 500 lbs, under no circumstances should personnel attempt to move the drums by hand.

3.3.2 Containers Labeling

Each container that is used to accumulate IDM will be appropriately labeled at the time of accumulation and assigned a unique identification number for tracking purposes. The following information will be written in permanent marker on a drum label affixed on the exterior side at a location at least two-thirds of the way up from the bottom of the drum.

- Facility name.
- Accumulation start date and completion date.
- Site identifier information (SWMU, boring, well, etc.).
- Description of IDM.
- Drum ID No.

4.0 MATERIAL CHARACTERIZATION AND DISPOSAL

IDM will be characterized and tested to determine whether it is a hazardous waste as defined by 40 CFR Part 261 and to determine what disposal options exist in accordance with RCRA regulations and the Virginia Hazardous Waste Management Regulations (VHWMR).

In general, IDM will be considered a hazardous waste if it contains a listed hazardous waste or if the IDM exhibits a characteristic of hazardous waste.

Work plan addenda will identify the appropriate characterization and testing program for IDM based on the following:

- Site-specific conditions related to chemicals of concern, etc.
- The nature and quantity of expected IDM to be generated during site-specific investigations.
- Applicable federal, state, and local regulations, such as RCRA, VHWMR regulations and policies and procedures, and Army Regulation 200-1.
- RFAAP specific requirements and policies for IDM characterization and disposal at the time of the investigation.

In general, appropriate USEPA SW 846 Test Methods for Evaluating Solid Waste will be used for testing IDM and will be specified in work plan addenda. Other appropriate test methods may be specified by RFAAP in addition to SW 846 Methods that are specific to installation operations, the site of interest (percent explosive content, reactivity, etc.), or requirements for disposal at RFAAP water treatment facilities or publicly owned treatment works.

Responsibility for the final disposal of IDM will be determined before field activities are begun and will be described in work plan addenda. Off-site disposal of IDM will be coordinated with RFAAP (generator) to ensure appropriate disposition. The contractor will coordinate IDM transportation and disposal activities for RFAAP (generator).

At the direction of RFAAP, appropriate waste manifests will be prepared by the USACE contractor or Alliant Techsystems subcontractor for transportation and disposal. Alliant Techsystems or other appropriate RFAAP entity will be listed as the generator and an appointed representative from RFAAP will review and sign the manifest for off-site disposal.

RFAAP will make the final decision on the selection of the transporter, storage, and disposal facility (TSDFs) or recycling facility. RFAAP will provide the contractor a listing of previously used TSDFs for priority consideration. Proposed facilities that are not included on the listing are required to provide a copy of the TSDFs most recent state or federal inspection to the installation. Waste characterization and testing results will be submitted to RFAAP (generator) for review and approval before final disposition of the material.

Hazardous waste: Prior to final disposition, a hazardous waste manifest will be furnished by the TSDF to accompany transport to the disposal facility. Following final disposition, a certificate of disposal will be furnished by the disposal facility. Copies of the manifests and certificates of disposal are to be provided to RFAAP and retained on file by the contractor or subcontractor.

5.0 PRECAUTIONS

- Because the weight of one drum can exceed 500 lbs, under no circumstances should personnel attempt to move drums by hand.

- Refer to the site-specific health and safety plan when managing IDM.

6.0 REFERENCE

Safety Rules for Contractors and Subcontractors, 1995. Alliant Techsystems, Incorporated,
Radford Army Ammunition Plant.

STANDARD OPERATING PROCEDURE 80.1 DECONTAMINATION

1.0 SCOPE AND APPLICATION

Before leaving the site, all personnel or equipment involved in intrusive sampling or having entered a hazardous waste site during intrusive sampling must be thoroughly decontaminated to prevent adverse health effects and minimize the spread of contamination. Equipment must be decontaminated between sites to preclude cross-contamination. Decontamination water will be free of contaminants as evidenced through either chemical analyses or certificates of analysis. This standard operating procedure (SOP) describes general decontamination requirements for site personnel and sampling equipment. Decontamination procedures for contaminants requiring a more stringent procedure, e.g., dioxins/furans, will be included in site-specific addenda.

2.0 MATERIALS

- Plastic sheeting, buckets or tubs, pressure sprayer, rinse bottles, and brushes.
- U.S. Army Corps of Engineers or installation approved decontamination water source.
- Deionized ultra-filtered, HPLC-grade organic free water (DIUF).
- Non-phosphate laboratory detergent.
- Nitric Acid, 0.1 Normal (N) solution.
- Pesticide-grade solvent, Methanol.
- Aluminum foil.
- Paper towels.
- Plastic garbage bags.
- Appropriate containers for management of investigation-derived material (IDM).

3.0 PROCEDURE

3.1 SAMPLE BOTTLES

At the completion of each sampling activity the exterior surfaces of the sample bottles must be decontaminated as follows:

- Be sure that the bottle lids are on tight.
- Wipe the outside of the bottle with a paper towel to remove gross contamination.

3.2 PERSONNEL DECONTAMINATION

Review the site-specific health and safety plan for the appropriate decontamination procedures.

3.3 EQUIPMENT DECONTAMINATION

3.3.1 Drilling Rigs

Drilling rigs and associated equipment, such as augers, drill casing, rods, samplers, tools, recirculation tank, and water tank (inside and out), will be decontaminated before site entry, after

over-the-road mobilization and immediately upon departure from a site after drilling a hole. Supplementary cleaning will be performed before site entry. There is a likelihood that contamination has accumulated on tires and as spatter or dust en route from one site to the next.

- Place contaminated equipment in an enclosure designed to contain all decontamination residues (water, sludge, etc.).
- Steam-clean equipment until all dirt, mud, grease, asphaltic, bituminous, or other encrusting coating materials (with the exception of manufacturer-applied paint) has been removed.
- Water used will be taken from an approved source.
- When cross-contamination from metals is a concern, rinse sampling components such as split spoons, geo-punch stems, and augers with nitric acid, 0.1N.
- Rinse with DIUF water.
- When semi-volatile and non-volatile organics may be present, rinse the sampling components with pesticide-grade solvent methanol.
- Double rinse the sampling components with DIUF water.
- Decontamination residues and fluids will be appropriately managed as IDM per work plan addenda and SOP 80.1.

3.3.2 Well Casing and Screen

Prior to use, well casing and screen materials will be decontaminated. This activity will be performed in the leak proof, decontamination pad, which will be constructed prior to commencement of the field investigation. The decontamination process will include:

- Steam cleaning with approved source water.
- Rinse with DIUF water.
- Air-dry on plastic sheeting.
- Wrap in plastic sheeting to prevent contamination during storage/transit.

3.3.3 Non Dedicated Submersible Pumps Used for Purging and Sampling

- Scrub the exterior of the pump to remove gross (visible) contamination using appropriate brushes, approved water, and non-phosphate detergent (steam cleaning may be substituted for detergent scrub).
- Pump an appropriate amount of laboratory detergent solution (minimum 10 gallons) to purge and clean the interior of the pump.
- Rinse by pumping no less than 10 gallons of approved water to rinse.
- Rinse the pump exterior with approved decontamination water.
- When cross-contamination from metals is a concern, rinse the pump exterior with approved nitric acid 0.1N solution.
- Rinse the pump exterior with DIUF water.
- When semi-volatile and non-volatile organics may be present, rinse the pump exterior with pesticide-grade solvent methanol.
- Double rinse the pump exterior with DIUF water.

- Air-dry on aluminum foil or clean plastic sheeting.
- Wrap pump in aluminum foil or clean plastic sheeting, or store in a clean, dedicated PVC or PTFE storage container.
- Solutions and residuals generated from decontamination activities will be managed appropriately as IDM per work plan addenda and SOP 80.1.

3.3.4 Sample Equipment and Measuring Water Level Devices

- Scrub the equipment to remove gross (visible) contamination using appropriate brush (es), approved water, and non-phosphate detergent.
- Rinse with approved source water.
- When cross-contamination from metals is a concern, rinse the sampling equipment with approved nitric acid 0.1N solution.
- Rinse equipment with DIUF water.
- When semi-volatile and non-volatile organics may be present, rinse the sampling equipment with pesticide-grade solvent methanol.
- Double rinse the sampling equipment with DIUF water.
- Air-dry on aluminum foil or clean plastic sheeting.
- Wrap in aluminum foil, clean plastic sheeting, or zip top bag or store in a clean, dedicated PVC or PTFE storage container.
- Solutions and residuals generated from decontamination activities will be managed appropriately as IDM per work plan addenda and SOP 80.1.

3.3.5 Other Sampling and Measurement Probes

Temperature, pH, conductivity, Redox, and dissolved oxygen probes will be decontaminated according to manufacturer's specifications. If no such specifications exist, remove gross contamination and triple-rinse probe with DIUF water.

5.0 PRECAUTIONS

- Manage IDM appropriately according to the requirements specified in work plan addenda.
- Follow appropriate procedures as specified in the site-specific health and safety plan.

6.0 REFERENCE

USACE, 2001. Requirements for the Preparation of Sampling and Analysis Plans. EM 200-1-3. 1 February.

Appendix C
Laboratory Quality Assurance Plan TBD LAB

Appendix D

Health and Safety Forms

Form D-1
Worker Acknowledgment Form

SITE SAFETY AND HEALTH PLAN
FOR
INTERIM MEASURES REMEDIAL ACTIONS
AT
RADFORD ARMY AMMUNITION PLANT
RADFORD, VA

I have read and approve this Site Safety and Health Plan for activities associated with the Interim Measures at SWMU 39, Radford Army Ammunition Plant, Radford, VA with respect to project hazards, regulatory requirements, and Shaw Environmental, Inc. procedures.

Winston D. Russell
Health and Safety Manager

Jeff Parks P.G.
Project Manager

Prepared by:
Shaw Environmental and Infrastructure, Inc.
312 Directors Drive
Knoxville, TN 37923

February 1, 2008

Form D-2
Revision Form
SWMU 39 Interim Measures Work Plan

SITE DESIGNATION/

LOCATION

Radford Army Ammunition Plant
Radford, VA

SUBJECT:

Section: _____

Addendum: _____

Version: _____

Effective Date: _____

Approved By:

Field Operations Leader

Date: _____

Concurrence:

Project Manager

Date: _____

Sheet ____ of ____

Document: SWMU 39 Interim Measures Work Plan

Version: Final

Project: Radford Army Ammunition Plant

Location: Wastewater Ponds from the Propellant Incinerators, SWMU 39

Site Personnel:

Date

This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Appendix E

Shaw Health and Safety Procedures



PROCEDURE

Subject: ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the requirements for incident reporting, investigation, and review. This procedure is an integral part of the company's overall accident prevention program and aids in the identification of potential causal factors and corrective actions. Key elements of this procedure include:

- **All occupational injuries/illnesses, vehicle accidents, and near miss incidents must be promptly reported and investigated.**
- All Occupational Safety and Health Administration (OSHA) recordable injuries/illnesses and chargeable vehicle accidents must be reviewed by an Accident Review Board. The Accident Review Board report is submitted to the Baton Rouge Corporate Safety Department, for production to and retention on behalf of the Legal Department.
- All incidents involving a fatality, major injury/illness, or resulting in significant property damage will be immediately reported to: the business line Health & Safety Manager; the Corporate Health and Safety Department; Business Line Vice President and the Legal Department.
- All investigations and associated materials obtained and/or produced, in association with OSHA recordable injuries/illnesses, chargeable vehicle accidents, fatalities, major injury/illness, or incidents resulting in significant property damage, are to be performed for & on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product.
- All business line Health & Safety Managers are required to prepare a Monthly Loss Report summarizing all current month, and year-to date, chargeable vehicle accidents, injury/illness cases (requiring outside medical care), lost work day totals and restricted work day totals. This report shall then be forwarded, by the 10th day of the following month, to the Baton Rouge Corporate Safety Office.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
 - 3.2 Action/Approval Responsibilities
- 4.0 Definitions
- 5.0 Text



- 5.1 Incident Reporting Process
- 5.2 Supervisor's Employee Injury Report
- 5.3 Vehicle Accident Report
- 5.4 Equipment, General Liability, Property Damage, and Loss Report
- 5.5 Incident Investigation Report
- 5.6 Witness Statement Form
- 5.7 Accident Review Board
- 5.8 Monthly Loss Report
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Corporate Health & Safety Department is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any **at-fault** vehicle accident meeting any **one** of the following criteria:

- An individual other than an employee of the company is a party in the accident
- Property owned by a person or entity other than the company is damaged
- When company owned, leased or rented vehicles are involved and damage exceeds \$2,500.00.
- When an employee is driving a personal vehicle while on company business and damage exceeds \$2,500.00.

Company - All affiliates, indirect and wholly owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Days Away From Work - Days away from work are the number of **calendar** days following the injury or illness, excluding the date of the injury.

Job Safety Analysis (JSA) – The JSA is an effective management technique for identifying hazardous conditions and unsafe acts in the workplace. A JSA is intended to analyze the individual steps or activities, which together create a job or specific work duty, and to detect any actual or potential hazards that may be present. (See HS045: Job Safety Analysis)



Restricted Work – Occurs when, as the result of a work-related injury or illness:

- A physician or other licensed health care professional recommends that the employee not perform one or more of the routine functions of his or her job, or not work the full workday that he or she would otherwise have been scheduled to work

Near Miss Incident - Any incident where no injury occurred, but where the potential for injury existed.

OSHA Recordable Case – See Attachment 8

Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. For the purpose of this procedure, off-road vehicles such as earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. (See HS800 Motor Vehicle Operation: General Requirements)

5.0 TEXT

5.1 Incident Reporting Process

Employees are required to immediately report to their direct supervisor all occupational injuries, illnesses, accidents and near miss incidents having the potential for injury. Site Business Line Managers or Supervisors (supervisor directly responsible for the employee involved in the incident) with first-hand knowledge of an incident is required to:

- Immediately arrange for appropriate medical attention and notify the responsible health and safety representative.
- **As soon as practical, but not longer than one hour after gaining knowledge of the occurrence**, notify the Shaw Notification Hotline/Helpdesk by calling 1-866-299-3445 (Attachment 10) of any injury requiring off-site medical treatment, any chargeable vehicle accident or equipment incident involving property damage exceeding \$2,500 in value (Shaw or third party).
- Inform Health Resources of all incidents requiring off-site medical attention by calling 1-800-350-4511. This call should be made **prior** to transporting the employee such that they can coordinate physicians services prior to arrival of the employee to the clinic, and provide the following information:
 - Company Name (Shaw E&I) & Business Line (e.g. DOD, Commercial)
 - Employee Name
 - Name of anticipated, treating medical facility and phone number
 - Brief description of incident.

Health Resource's role is to interface with the treating physician, to ensure that appropriate care is provided to the injured employee.



- Complete the *Authorization for Treatment, Release of Medical Information, and Return to Work* (Attachment 9A, 9B, 9C) and the *Supervisor's Employee Injury Report* (Attachment 2) for all cases requiring off-site medical attention. The Site Safety and Health Representative or responsible supervisor shall ensure that the forms are completed and faxed to Health Resources at (800) 853-2641 prior to leaving the medical facility or as soon as reasonably possible.
- Post accident drug and alcohol testing shall occur in accordance with HS101 Drug and Alcohol Testing, immediately following an incident.

NOTE: Prior to performing non-DOT post accident testing, it is the responsibility of the employee's supervisor to ensure that Health Resources has verified that this testing is not prohibited or restricted by state or local regulations.

- Prior to an injured employee returning to his/her job duties, a follow-up call by Health Resources will be made to the project site. The purpose of this call is to ensure work restrictions are clarified and planned work activities are consistent with medical recommendations.
- The Supervisor shall initiate/complete the appropriate company documentation in accordance with the following incident classifications: (note: if a Site Safety and Health Representative is on site, he should work in concert with the supervisor)

- OSHA Recordable Cases

- a. Supervisor's Employee Injury/Illness Report (Attachment 2)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement Form (Attachment 6)
- d. Accident Review Board (Attachment 7)

- First Aid Cases

- a. Supervisor's Employee Injury/Illness Report (Attachment 2)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement Form (Attachment 6)

- Chargeable Vehicle Accidents

- a. Vehicle Accident Report (Attachment 3)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement (Attachment 6)
- d. Accident Review Board (Attachment 7)
- e. Driving Record Certification (Procedure HS800)

- Non-Chargeable Vehicle Accidents

- a. Vehicle Accident Report (Attachment 3)
- b. Incident Investigation Report (Attachment 5)
- c. Witness Statement (Attachment 6)



- Equipment, Property Damage and General Liability Incidents
 - a. Incident Investigation Report (Attachment 5)
 - b. Witness Statement Form (Attachment 6)
 - c. Equipment, Property Damage and General Liability Loss Report (Attachment 4).
- Near Miss
 - a. Incident Investigation Report (Attachment 5)

5.2 Supervisor's Employee Injury/Illness Report (Attachment 2)

The Supervisor's Employee Injury Report is to be completed for all incidents that result in an employee occupational injury or illness requiring off-site medical attention. It is to be initiated by the supervisor of the injured employee and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded, **within 24 Hours**, to the Shaw Corporate Claims department in Baton Rouge, via the corporate claims fax number (225.932.2636).

5.3 Vehicle Accident Report (Attachment 3)

The Vehicle Accident Report must be completed for any vehicle accident in which a company vehicle is involved. This includes company-owned or leased vehicles, rental vehicles, and personal vehicles being used for company business. This report is to be initiated by both the employee involved in the accident and his/her direct supervisor and forwarded to the respective Business Line Safety Manager for review / comments. Upon completion of review and comments the report should be forwarded to the Shaw Corporate Claims department in Baton Rouge (fax number 225.932.2636).

5.4 Equipment, General Liability, Property Damage, and Loss Report (Attachment 4)

The General Liability, Property Damage, and Loss Report is to be used for all losses or damage to company property in excess of \$2,500.00. This form must be completed for all third party property, regardless of value, damaged as a result of company activities.

The employee most familiar with the events that contributed to the loss or damage will complete the form, and then forward it to the project/location manager. The Corporate Claims Department and the respective Business Line Safety Manager must receive a copy of the report within one business day of the incident.

5.5 Incident Investigation Report (Attachment 5)

All injuries, illnesses, accidents, and near miss incidents will be investigated. Once arrangements for immediate medical care have been made, the employee's direct supervisor, with assistance from the health and safety representative and Business Line Health and Safety Manager, will:

- Collect the facts;
- Describe and document (include sketch, photos, etc.) how the incident occurred;



- Collect support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.);
- List witnesses and collect written statements;
- If applicable, contact the employee's Functional Manager in an effort to gain relevant information
- Identify the causative factors;
- Identify potentially unsafe acts or unsafe conditions that may have contributed to the incident;
- Identify potential curative action; and
- List the corrective actions which are to be executed, appropriate curative action, the person(s) responsible for the corrective action, and the date by which action is to be completed.

The investigation will be started as soon as possible following the incident and the relevant reports and support documentation (JSA's, AHA's, Tailgate Safety Meetings, Work Orders, etc.) shall be submitted to the appropriate Business Line Health and Safety Manager within 72 hours. In addition to the previous information, reports from external sources (police, insurance carriers, testing laboratories, etc.) are to be obtained as soon as they become available and forwarded by the Business Line Safety Manager to the Corporate Claims department in Baton Rouge.

5.6 Injured Employee Statement & Witness Statement Forms (Attachment 6a & 6b)

The Injured Employee and Witness Statement Forms allow for consistency in the development of the investigation process. The Injured Employee Statement must be completed in all cases where an employee injury results in off site medical treatment. If there are witnesses to the accident/incident, the Witness Statement form should be completed and signed by the subject witness. Both of these forms should be attached to the incident investigation report. It is essential that these statements are executed immediately following the incident to ensure an accurate account of the events.

5.7 Accident Review Board (ARB) (Attachment 7)

The purpose of the Accident Review Board is to collect and review the information gathered for each incident, report that information to the Legal Department and take appropriate curative action. In all cases, the purpose of the entire investigative process, inclusive of conducting an ARB, is to identify curative actions as it relates to the incident / injury. Accordingly, a diligent and concerted effort to accomplish these tasks must be established at the onset of all of the subject incidents.

In order to assist the Legal Department in evaluating the risk to, or liability of, the company, associated with OSHA recordable injuries, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, the responsible Project / Location Manager is required to coordinate with all parties and set up the ARB such



that it occurs **within 10 days of the accident**. The respective Business Line Health and Safety Manager, whose project/location experiences accident is then required to conduct the subject ARB.

The Accident Review Board shall be composed of the project/location manager, the employee's direct supervisor (at time of incident), a health and safety representative, and the employee(s) involved in the incident.

Additionally, there may be cases that involve an employee that has been assigned to a project and the Functional Manager of that employee may not have direct knowledge of an incident. In cases such as these, the Functional Manager shall be notified of the incident and requested to participate in the ARB. Also, as determined by the Business Line Health and Safety Manager, a representative of other internal sources of expertise should be involved where applicable.

All investigations and associated materials obtained and/or produced, in association with injuries/illnesses resulting in OSHA recordable classification, chargeable vehicle accidents, fatalities or incidents resulting in significant property damage, are to be performed for and on behalf of the legal department and will be subject to being classified as Confidential Attorney-Client / Attorney Work Product. If the ARB is initiated under a Confidential Attorney-Client / Attorney Work Product status, all documents and other work product arising out of, or associated with, the investigation process, including the ARB, shall be prepared in anticipation of litigation. The Accident Review Board report, and associated documents, is submitted to the Corporate Safety Department, for production to and retention on behalf of the Legal Department.

The ARB report, and all associated documents, shall be completed as soon as practicable, but not more than 5 business days following the ARB meeting, and forwarded by the Business Line Safety Manager to the Corporate Safety Department, via the Corporate Claims fax number. The original documents shall then be mailed to the Corporate Safety Department. These documents shall then be filed in a lockable cabinet, separate from files not meeting the subject criteria, by the Corporate Safety Department, for production to and retention on behalf of the Legal Department. In the event that copies of these files are maintained by Business Line Safety Managers and / or the respective location in which the injury occurred, the same filing criteria shall be followed. The criteria shall be that these documents are filed in lockable cabinets, separate from files not meeting the subject Attorney-Client / Attorney Work Product criteria.

It is generally not acceptable to discipline an employee for having an accident. However, if in the opinion of the Accident Review Board, it is determined that the accident resulted from an intentional unsafe act or intentional violation of company procedure on the employee's part, the employee may be subject to disciplinary action in accordance with the company's progressive disciplinary action system (see Human Resources Procedure HR207).



5.8 Monthly Loss Report

Each business line Health and Safety Manager is responsible to submit a Monthly Loss Report summarizing incidents that took place within their business line during the previous month. The business line Health and Safety Manager is responsible for submitting a consolidated package for the entire business line to the corporate health and safety office for **receipt no later than the 10th working day of the following month.**

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HR207 Disciplinary Action
HS013 Health and Safety Procedure Variances
HS101 Drug and Alcohol Testing
HS800 Motor Vehicle Operations - General Requirements
HS810 Commercial Motor Vehicles

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Supervisor's Employee Injury/Illness Report
3. Vehicle Accident Report
4. Equipment, Property Damage and General Liability Loss Report
5. Incident Investigation Report
6.
 - a. Injured Employee Statement
 - b. Witness Statement
7. Accident Review Board Report
8. Injury/Illness Classification Guidelines
9. Medical Forms
 - a. Authorization for Treatment of Occupational Injury/Illness
 - b. Authorization for Release of Medical Information
 - c. Return to Work Examination Form.
10. Help Desk / Hotline Notification Guidelines



ATTACHMENT 1

ACCIDENT PREVENTION PROGRAM: REPORTING, INVESTIGATION, AND REVIEW RESPONSIBILITY MATRIX

Action	Procedure Section	Responsible Party					
		Employee	Supervisor	Project/ Location Manager	Site Health and Safety Rep. / Officer	Business Line Health and Safety Manager	Corporate Health & Safety Manager
Issue, Revise, and Maintain Procedure	3.1						X
Report All Incidents to Supervisor	5.1	X					
Notify Health and Safety Representative	5.1		X				
Arrange Medical Care	5.1		X		X		
Notify Health Resources or Gates McDonald of Incident	5.1		X		X		
Initiate/Complete Company Forms	5.1		X		X		
Complete Investigation of incident	5.5		X	X	X	X	
Complete Equipment, Property Damage and General Liability Loss Report Incident	5.4	X					
Coordinate and Set up Accident Review Board	5.7			X			
Conduct Accident Review Board	5.7					X	
Participate in Accident Review Board	5.7	X	X	X	X	X	
Complete Monthly Loss Report	5.8					X	



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Attachment 2

REPORT ALL WORKER'S COMPENSATION INJURIES TO SHAW CLAIMS DEPARTMENT

FAX REPORT WITHIN 24 HOURS OF INCIDENT TO 225-932-2636.

Phone all injuries/ illnesses to Shaw Notification Hotline/Helpdesk

1-866-299-3445

Supervisor's Employee Injury/Illness Report Form

EMPLOYEE INFORMATION

Employee's Social Security Number:		Claim Number:	
Employee's Name:		Home Phone Number:	
Home Address:		Business Line Code:	
Male	Female	Date of Birth:	Hire Date:
Dependents:		Dependents Under 18:	Marital Status:
Occupation:		Department Name:	
State Hired:	Currently Weekly Wage:	Hourly Wage:	
Hours/Days Worked Per Week:	Days Per Week	Hours Worked Per Day:	
Employment Status:	Employee Report No.: N/A	Employee ID No.:	N/A
Salaried Continued:	Paid For Date of Injury:	Education No. of Years:	
Ever Injured on the Job:	Supervisor Name & Phone:		

EMPLOYER INFORMATION

Employer Name:	The Shaw Group, Inc.		
Work Location:			
Contact Name:	John Mollere	Telephone Number:	(800)747-3322, Ext. 572
Employer SIC:	Employer Location Code:		
Employer FED ID:	Employer Code: N/A		
Nature of Business:			
Policy Number:			

ACCIDENT INFORMATION

Date and Time of Injury:	
Did the Accident Occur at the Work Location:	If no, where did the accident occur? N/A
Accident Address:	
Nature of Accident:	
Give a Full Description of the Accident: (Be as Factually Complete As Possible)	
Are Other WC Claims Involved?	No
Date and Time Reported to Employer:	
Person Reported To:	



WITNESS INFORMATION

Were There Any Witnesses?

If Yes, List Names and How to Contact Them:

INJURY INFORMATION

Which Part of the Body Was Injured? (e.g. Head, Neck, Arm Leg)

What Was the Nature of Injury? (e.g. Fracture, Sprain, Laceration)

Part of Body Location: (e.g. Left, Right, Upper, Lower)

Injury Description:

Source of Injury:

Is Employee Hospitalized?

Lost Time:

If Yes, What was First Full Day Out:

Date Last Day Worked:

Date Disability Began:

N/A

Date Returned to Work:

Estimated Return Date:

N/A

MEDICAL INFORMATION

ER Treated & Released:

Hospitalized:

Phy./Clinic:

Hospital - Name, Address, Phone Number:

Was Employee Transported via Ambulance:

Yes No

N/A

Clinic - Name, Address, Phone Number:

ADDITIONAL COMMENTS & INFORMATION

REPORT PREPARED BY

Name:

Title:

Signature:

Phone:



ATTACHMENT 3
VEHICLE ACCIDENT REPORT
Page 1 of 2

ACCIDENT DESCRIPTION

This report is to be initiated by the employee involved in the accident or his/her direct supervisor. Please answer all questions completely. This report must be forwarded to the appropriate health and safety representative within 24 HOURS of the accident. Attach police report.

ACCIDENT DATE _____ TIME _____ ☐ A.M. or ☐ P.M.
LOCATION OF ACCIDENT (CITY, STATE) _____
DESCRIPTION OF ACCIDENT _____

WITNESS _____ PHONE NO. _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
POLICE OFFICER'S NAME AND BADGE # _____ DEPARTMENT _____

COMPANY VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
WORK PHONE NO. (_____) _____ S.S. NO. _____ PROJECT NAME/NO. _____
VEHICLE NO. _____ YEAR _____ MAKE _____ MODEL _____ LICENSE PLATE NO. _____
STATE _____ VEHICLE OWNER: ☐ COMPANY ☐ LEASED/RENTED ☐ PRIVATE VEHICLE
VEHICLE TYPE: ☐ COMMERCIAL MOTOR VEHICLE ☐ NON-COMMERCIAL
IF NOT COMPANY-OWNED: OWNER _____ PHONE NO. (_____) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE DAMAGE _____
NO. OF VEHICLES TOWED FROM SCENE _____ NUMBER OF INJURIES _____ NUMBER OF FATALITIES _____
WERE HAZARDOUS MATERIALS RELEASED? ☐ NO ☐ YES IF YES, DESCRIBE MATERIALS _____

OTHER VEHICLE

DRIVER _____ DRIVERS LICENSE NO. _____ STATE _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
PHONE NO. (_____) _____ S.S. NO. _____
OWNER'S NAME (☐ CHECK IF SAME AS DRIVER) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
INSURANCE COMPANY _____ POLICY NO. _____
AGENT'S NAME _____ PHONE NO. (_____) _____
ADDRESS _____ CITY _____ STATE _____ ZIP _____
VEHICLE YEAR _____ MAKE _____ MODEL _____ PLATE NO. _____ STATE _____
VEHICLE I.D. NO. _____
VEHICLE DAMAGE _____
PASSENGERS: ☐ NO ☐ YES INJURIES: ☐ NO ☐ YES (If Yes, list names and telephone numbers below)



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VEHICLE ACCIDENT REPORT

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WEATHER: ☐ Clear ☐ Cloudy ☐ Fog ☐ Rain ☐ Sleet ☐ Snow Other _____
PAVEMENT: ☐ Asphalt ☐ Steel ☐ Concrete ☐ Wood ☐ Gravel/Dirt
☐ Brick/Stone Other _____
CONDITION: ☐ Dry ☐ Wet ☐ Icy ☐ Pot Holes Other _____
TRAFFIC CONTROL: ☐ Traffic Light ☐ Stop Sign ☐ Railroad ☐ No Intersection ☐ No Control
ROADWAY: Number of Lanes Each Direction: _____ ☐ Residential ☐ Divided Highway ☐ Undivided Highway

Draw and name roadways showing each vehicle, direction of travel, and point of impact. Indicate travel before the accident with a solid line, and post-accident movement with a broken line.

SYMBOLS:

Your Vehicle



Other Vehicle(s)



Pedestrian



Stop Sign



Yield



Railroad



ADDITIONAL
INFORMATION:

EMPLOYEE _____

(Print)

(Signature)

(Date)

SUPERVISOR _____

(Print)

(Signature)

(Date)

HEALTH & SAFETY REP. _____

(Print)

(Signature)

(Date)

ATTACH POLICE REPORT TO VEHICLE ACCIDENT REPORT

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY.

**REPORT ALL CHARGEABLE VEHICLE ACCIDENTS TO SHAW NOTIFICATION HOTLINE/HELPDESK
(PHONE: 1-866-299-3445)**



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ATTACHMENT 4

EQUIPMENT, PROPERTY DAMAGE AND GENERAL LIABILITY LOSS REPORT

This report is to be completed for all losses or damage to company property in excess of \$2,500.00 and all third party damage, regardless of value, resulting from company activities.

PROJECT/LOCATION _____ PROJECT NO. _____ DATE _____

ADDRESS _____

HOW DID DAMAGE OR LOSS OCCUR: _____

DESCRIPTION AND VALUE (\$) OF DAMAGED/LOST/STOLEN PROPERTY: _____

LOCATION OF DAMAGED/LOST/STOLEN PROPERTY (Before Loss): _____

DATE AND TIME OF DAMAGE, LOSS, OR THEFT: Date: _____ Time: _____ a.m./p.m.

OWNER OF DAMAGED/LOST/STOLEN PROPERTY:

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

INJURED PARTIES (Also complete a Supervisor's Employee Injury Report if a Company Employee):

Name _____ Phone No. (____) _____

Address _____ City _____

Employer and Address _____

Description of Injury _____

WITNESSES:

1. Name _____ Home Phone (____) _____

Home Address _____ City _____

Employer and Address _____

2. Name _____ Home Phone (____) _____

Home Address _____ City _____

Employer and Address _____

WERE PICTURES TAKEN? ☐ YES ☐ NO

WERE POLICE NOTIFIED? ☐ YES ☐ NO DEPT. _____ REPORT NO. _____

COMPLETED BY: _____
(Print) (Signature) (Date)

PROJECT/LOCATION MANAGER: : _____
(Print) (Signature) (Date)

REPORT MUST BE FAXED TO:
CORPORATE CLAIMS DEPARTMENT (FAX: 225-932-2636)
WITHIN 24 HOURS, OR NOT LATER THAN NEXT BUSINESS DAY



ATTACHMENT 5 INCIDENT INVESTIGATION REPORT

*** Must Be Completed Within 72 HOURS & Relevant Support Documentation Must Be Attached / Submitted***

Investigation Date _____ Date of Incident _____

Employee Name _____

Supervisor Name _____

Project Number/Name _____ / _____

Location of Incident _____

· Incident Classification

<u>Injury</u>	☐ First Aid	<u>Vehicle</u>	☐ Chargeable	<u>DOT</u>	☐ DOT Vehicle
	☐ OSHA Recordable		☐ Non-chargeable		☐ DOT Reportable
	☐ Lost Workday				
	☐ Restricted Workday	<u>Near Miss</u>	☐	<u>General Liability</u>	☐

· Description (Provide facts, describe how incident occurred, provide diagram [on back] or photos)

· Analysis (What unsafe acts or conditions contributed to the incident?)

· Corrective Action(s) (List corrective action items, responsible person, scheduled completion date)

· Witness Names (Complete Attachment 6 – Employee Witness Statement)

Investigated By _____
Print Name Signature Date

Project/Location Mgr. _____
Print Name Signature Date



ATTACHMENT 6a
Injured Employee Statement
MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by the injured employee involved in the incident. Describe only the facts for which you have personal knowledge. If you have no knowledge of a particular question, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am _____ pm

Date of this Statement _____ Time _____ am _____ pm

Time your shift begins? Time _____ am _____ pm Time your shift ends? Time _____ am _____ pm

Name of Known Witnesses:

Name _____

Name _____

Name _____

Name _____

Your Immediate Supervisors Name _____

If not employed by Shaw E&I, enter name of company and phone number _____

Have you had a prior injury similar to this injury? _____

Was it while you were at work? _____

What date did the prior injury occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Signature/Date

Print Name



ATTACHMENT 6b
Employee Witness Statement

MUST BE COMPLETED WITHIN 24 HOURS OF THE INCIDENT

This form should be completed by every employee working in the crew of the injured employee and by every other employee with knowledge of events or circumstances involved in the incident. This information is being solicited from you so that the company can accurately assess the reported incident to avoid similar occurrences in the future. Describe only the facts for which you have personal knowledge. If you have no knowledge of the incident, write "no knowledge".

Company _____

Exact Location of Incident/Accident _____

Name of Injured Employee _____

Date of Incident/Accident _____ Time _____ am pm

Date of this Statement _____ Time _____ am pm

Time your shift begins? Time _____ am pm Ends _____ am pm

Witness Information:

Name _____

Home Phone No. _____

Home Address _____

County _____ Zip _____

Witness' Supervisor Name _____

If not employed by Shaw E&I, enter name of company _____

Company Phone Number _____

Did You See the Incident/Accident? _____

How Far From You (approx., in feet) Did the Incident/Accident Occur? _____

Stating Only Factual Information, Describe in Detail What Happened and Include Any Applicable Events Leading to the Incident/Accident.

I certify that, to the best of my knowledge, all of the above information is complete, accurate and factual. I acknowledge that the intentional falsification or altering of facts or making misleading statements may be grounds for disciplinary action.

Witness Signature/Date

Print Name



ATTACHMENT 7

ACCIDENT REVIEW BOARD

DATE:		LOCATION:	
BOARD MEMBERS:			
ACCIDENT DATE:		EMPLOYEE(S) INVOLVED IN INCIDENT:	
INVESTIGATION COMPLETE: YES ☐ NO ☐		ACCIDENT CLASSIFICATION:	
THE FOLLOWING INFORMATION <u>MUST</u> BE PROVIDED BY THE REVIEW BOARD FOR THIS INCIDENT (PRINT):			
SUPERVISOR: _____		PROJECT/LOCATION MGR.: _____	
POTENTIAL CAUSE OF ACCIDENT:			
ACTION BY BOARD*:			
* ALL ACTIONS BY THE ACCIDENT REVIEW BOARD ARE SUBJECT TO FINAL REVIEW BY THE HUMAN RESOURCES AND LEGAL DEPARTMENTS.			
ACCEPTED:			
_____ (Employee Signature)		_____ (Supervisor Signature)	
APPROVED:		REJECTED FOR:	
_____ (Project/Location Manager)		_____ _____ _____	
APPROVED:		REJECTED FOR:	
_____ (Business Line Health and Safety Manager or Designee)		_____ _____ _____	
APPROVED:		REJECTED FOR:	
_____ (Business Line Vice President)		_____ _____ _____	



ATTACHMENT 8

INJURY/ILLNESS CLASSIFICATION GUIDELINES

First Aid Treatment – If the incident requires only the following types of treatment, consider it first aid. **Do Not** record the case if it involves only:

- Using non-prescription medications at non-prescription strength
- Administering tetanus immunizations
- Cleaning, flushing, or soaking wounds on the skin surface
- Using wound coverings such as bandages, Band-Aids™, gauze pads, etc., or using SteriStrips™ or butterfly bandages
- Using hot or cold therapy
- Using any totally non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.
- Using temporary immobilization devices while transporting an accident victim (slings, neck collars, or back boards)
- Drilling a fingernail or toenail to relieve pressure, or draining fluids from blisters
- Using eye patches
- Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
- Using irrigation, tweezers, cotton swab or other simple means to remove splinters or foreign material from areas other than the eye
- Using finger guards
- Using massages
- Drinking fluids to relieve heat stress

Medical Treatment – Includes managing and caring for a patient for the purpose of combating disease or disorder. The following are **not** considered medical treatments and are not recordable:

- Visits to a doctor or Licensed Health Care Professional (LHCP) solely for the purpose of observation or counseling
- Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
- Any procedure that can be labeled first aid (see above descriptions)

OSHA Recordable Injuries and Illnesses

Work related injuries and illnesses that result in the following should be recorded on the OSHA 300 Log:

- Death
- Loss of consciousness
- Days away from work
- Restricted work activity or job transfer
- Medical treatment beyond first aid.



You must also record any **work related** injury or illness that involves cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum.

Additional Recordable Criteria

You must also record the following conditions when they are work related:

- Any needle stick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material
- Any case requiring an employee to be medically removed from a site under the requirements of an OSHA health standard
- Any Standard Threshold Shift (STS) in hearing (i.e., cases involving an average hearing loss of 10dB or more in either ear)
- Tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed health care professional after exposure to a known case of active tuberculosis.



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**ATTACHMENT 9B
MEDICAL FORMS**

AUTHORIZATION FOR TREATMENT OF OCCUPATIONAL INJURY/ILLNESS

Employee Name: _____
Social Security #: _____
Job Title: _____
Project/Location: _____
Telephone #: _____
H&S Representative: _____
Body Part(s) Injured: _____
Describe in detail how incident occurred: _____

Injury: ☐ Illness: ☐
Incident Date: _____
Location of Accident/Exposure: _____

TO TREATING PHYSICIAN:

In the case of occupational injury/illness, please examine the employee and render necessary conservative treatment directly related to the occupational injury/illness.

Light Duty Work:

It is the policy of our company to provide work assignments, whenever possible, for employees with physical activity restrictions resulting from an occupational injury/illness. If the employee will be subject to a restriction, please contact **Health Resources** before releasing the employee, so that a light duty assignment may be arranged.

Medically Unfit to Return to Work:

It is the policy of our company to assist employees unable to return to work, due to an injury/illness, in obtaining needed medical care and other available benefits. Medical findings are also used to help evaluate unsafe conditions that may have led to the incident. Please help us assist our employees by contacting **Health Resources** with your findings as soon as possible, preferably before the employee leaves your office, but not later than the close of business on the day of initial treatment.

Health Resources: Telephone: 1-800-350-4511 Fax: (800) 853-2641

Please Send Reports To **Health Resources** **AND** **The Shaw Group, Inc. Corporate Claims Department**
Both of the Following: 600 West Cummings Park, Suite 3400 4171 Essen Lane
Woburn, Massachusetts 01801 Baton Rouge, LA 70809

Please Send Bills To: **The Shaw Group, Inc. Corporate Claims Department**
4171 Essen Lane
Baton Rouge, LA 70809

DOCTOR, Please provide:

Medical Diagnosis: _____
Treatment Provided: _____

Recommended Work Limitation/Restriction: _____
Return Visit Needed: No ☐ Yes ☐ Date if Yes _____ First Aid Only ☐
Physician Name: _____ Physician Telephone: _____
Physician Signature: _____ Date: _____

**YOU MUST CALL HEALTH RESOURCES FOR ALL OCCUPATIONAL INJURIES/ILLNESSES
REQUIRING OUTSIDE MEDICAL TREATMENT: 1-800-350-4511.**

FAX COMPLETED FORM TO HEALTH RESOURCES (800) 853-2641.

Send Bills to Shaw Corporate Claims Department



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**ATTACHMENT 9B
MEDICAL FORMS
AUTHORIZATION FOR RELEASE OF PROTECTED MEDICAL INFORMATION**

Printed Name: _____ Date of Birth: _____

Address: _____

Social Security #: _____ Home Telephone: _____

Authority to Release Protected Health Information

I hereby authorize the release of medical information, identified in this authorization form, and provide such information to:

HEALTH RESOURCES

600 West Cummings Park, Suite 3400
Woburn, Massachusetts 01801
Phone: (800) 350-4511
Fax: (800) 853-2641

AND

The Shaw Group Inc.

4171 Essen Lane
Baton Rouge, Louisiana 70809
Phone: 225-932-2500
Fax: 225-932-2636

The Information To Be Released includes the following:

Complete health record	Discharge summary	Progress notes
History and physical exam	Consultation reports	X-ray films / images
Laboratory test results	X-ray & Image reports	Itemized bill
Diagnosis & treatment codes	Complete billing record	

Other, (specify) _____

Purpose of the Requested Disclosure of Protected Health Information

I am authorizing the release of my Protected Health Information.

Drug and/or Alcohol Abuse, and/or Psychiatric, and/or HIV/AIDS Records Release

I understand if my medical or billing record contains information in reference to, psychiatric care, sexually transmitted disease, hepatitis B or C testing, previous drug and/or alcohol abuse and/or other sensitive information, I agree to its release. **Check One:** ☐ **Yes** ☐ **No**

I understand if my medical or billing record contains information in reference to HIV/AIDS (Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome) testing and/or treatment I agree to its release. **Check One:** ☐ **Yes** ☐ **No**

Right to Revoke Authorization

Except to the extent that action has already been taken in reliance on this authorization, the authorization may be revoked at any time by submitting a written notice to **The Corporate Claims Dept. at The Shaw Group Inc., 4171 Essen Lane, Baton Rouge, Louisiana 70809.** Unless revoked, this authorization will expire at which time completion of treatment for the injury or illness has been accomplished.

Re-disclosure

I understand the information disclosed by this authorization may be subject to re-disclosure by the recipient and no longer be protected by the Health Insurance Portability and Accountability Act of 1996.

Signature of Patient or Personal Representative Who May Request Disclosure

I understand that I do not have to sign this authorization. However, if health care services are being provided to me for the purpose of providing information to a third-party (e.g. fitness-for-work test), I understand that services may be denied if I do not authorize the release of information related to such health care services to the third-party. I can inspect or copy the protected health information to be used or disclosed. **I hereby release and discharge The Shaw Group Inc of any liability and the undersigned will hold The Shaw Group Inc harmless for complying with this Authorization.**

Signature: _____ Date: _____

Description of relationship if not patient: _____



**ATTACHMENT 9C
MEDICAL FORMS**

RETURN-TO-WORK EXAMINATION FORM

Exam Date: ____/____/____ Employee Name: _____
Birth Date: ____/____/____ Social Security #: ____ - ____ - ____
Job Title: _____ Sex: ☐ Male ☐ Female

Examining Provider: Please complete this form and fax to Health Resources at (800) 853-2641. Please contact Health Resources at (800) 350-4511 to report status of employee post-treatment.

DIAGNOSIS: _____

TREATMENT PLAN: _____

MEDICATIONS: _____

PHYSICAL THERAPY: _____

OTHER: _____

- ☐ May return to full duty work effective ____/____/____
☐ May return to limited duty from ____/____/____ to ____/____/____
☐ Unable to return to work from ____/____/____ to ____/____/____

WORK LIMITATIONS:

- ☐ Restricted lifting/pushing/pulling: maximum weight in lbs: _____ (company limits all lifting to ≤ 60 lbs).
☐ Work only with right/left hand. ☐ Restricted repetitive motion right/left hand.
☐ Sitting job only. ☐ Restricted operation of moving equipment.
☐ Other: _____

FOLLOW-UP PLAN:

- ☐ Release from care.
☐ Schedule for follow-up appointment on ____/____/____.
Time _____ AM/PM
☐ Referral to _____
Appointment date ____/____/____ Time _____ AM/PM

Comments: _____

Examiner's Name (*print*)

Examiner's Signature

Date



ATTACHMENT 10

HELP DESK / HOTLINE NOTIFICATION GUIDELINES

Any incident, as defined in the bulleted items below, requires corporate notification **as soon as practical but not longer than one hour after occurrence**, via the Health and Safety Help Desk / Hotline. This requirement is a corporate wide directive and applies to all Shaw Group companies, not just Shaw E&I. As such, the responsibility for whom makes this notification has purposefully not been defined. This is due to the various types of projects in which The Shaw Group performs activities. Some projects may only consist of three technicians at a site; others may involve multiple levels of site management and consist of 200+ employees. Therefore, the intent is for the supervisory/management person to communicate the notification requirements to his/her employees and make the appropriate determination as to how the notification takes place.

Immediate Corporate Notification via Help Desk: **1-866-299-3445**

- Illness and/or injury (doctors cases and above);
- Property damage (dollar amount greater than \$2,500);
- Automobile accidents (All);
- Criminal activity (i.e. bomb threat, theft);
- Natural disaster (i.e. earthquakes, flood, storm damage, hurricanes);
- Explosion and/or fires (that results in property damage greater then \$2,500 or result in injury);
- Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact);
- Regulatory visit (i.e. OSHA, EPA, DEQ, MSHA, etc.);
- Fatalities

Note:

- Help Desk / Hotline notification is in addition to the requirement to inform Health Resources of all incidents requiring off-site medical attention by calling **1-800-350-4511**. This call should be made **prior** to transporting the employee such that they can coordinate physicians' services prior to arrival of the employee to the medical facility.
- As stated above, the notification requirements are a corporate directive and apply to the entire Shaw Group. . Accordingly, Shaw E&I managers/supervisors should use sound judgment as it pertains to the two bulleted items that have been highlighted above. Although they may not be desired events, some Environmental spills/releases that occur may not be an uncommon situation at a particular site. In addition, there may be projects in which the EPA or some other regulatory agency visits on some normal frequency. Events such as these, which would typically be unusual at a construction or fabrication site, are not so unusual to some of our environmental projects. As such, a notification to the helpdesk would not be required.



PROCEDURE

Subject: TAILGATE SAFETY MEETINGS

1.0 PURPOSE AND SUMMARY

This procedure establishes the requirement for the conductance of tailgate safety meetings. These meetings are to be conducted at each company project site, on a daily basis, prior to the start of any work activities.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
 - 3.2 Action/Approval Responsibilities
- 4.0 Definitions
- 5.0 Text
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Tailgate Safety Meeting - A short training or informative session that provides safety guidelines for the planned work activities for the day or shift.



5.0 TEXT

The project supervisor or his/her designee conducts a tailgate safety meeting at the beginning of each shift or whenever new employees arrive at the work site. The topics discussed at the tailgate safety meeting should cover the work assignments for the day, the expected hazard(s) presented by the work, and an explanation on how employees will protect themselves from those hazards.

The meetings are to be documented by the completion of a Tailgate Safety Meeting Form. The project supervisor will assure that the form is properly completed and signed by all attendees. Completed forms will be maintained in the project files.

The following sections provide guidance for the completion of the form:

- A. **Project Name/Number** - Specific project name and number assigned to the project.
- B. **Date** - Date of meeting.
- C. **Time** - Time at which meeting is held.
- D. **Client** - Identification, name, etc. of entity for whom work is to be performed.
- E. **Work Activities** - Detailed description of the work activities to be performed that day.
- F. **Hospital Name/Address** - Hospital name and address designated to be used for the project.
- G. **Phone Number** - Designated hospital non-emergency phone number.
- H. **Ambulance** - Phone number for medical emergency transportation.
- I. **Safety Topics Presented:**
 - 1. **Chemical Hazards** - Specific chemical name and adverse properties of all chemicals to be encountered on the job that day. A Material Safety Data Sheet (MSDS) for each should be available and discussed in accordance with Procedure HS060.
 - 2. **Physical Hazards** - Address physical hazards associated with the work site, such as slipping/tripping/falling hazards, pinch points, overhead hazards, and nearby operations that could pose a hazard.
 - 3. **Personal Protective Equipment** - Specify levels of protective clothing and protective devices to be used by employees for each of the day's activities.
 - 4. **New Equipment** - Indicate proper work techniques and any hazards associated with new or unfamiliar equipment.



5. **Other Safety Topic(s)** - List any remaining safety topics pertinent to the potential hazards of the job for that day. This is an area where different, unique subjects can be introduced to make the tailgate safety meeting more interesting.

J. **Attendees** - Printed name and signature of all persons in attendance. (Also, list affiliation if not employed by the company.)

K. **Meeting Conducted By** - Printed name and signature of individual conducting the tailgate safety meeting.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS060 Hazard Communication Program

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Tailgate Safety Meeting Form



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ATTACHMENT 1 TAILGATE SAFETY MEETINGS

Responsibility Matrix

Action	Procedure Section	Responsible Party	
		Vice President of Health and Safety	Project Supervisor
Issuance, Revision, and Maintenance of Procedure	3.1	X	
Conduct Meeting	5.0		X



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ATTACHMENT 2

TAILGATE SAFETY MEETING FORM

Project Name/Number: _____ Date: _____ Time: _____

Client: _____

Work Activities: _____

Hospital Name/Address: _____

Hospital Phone No.: _____ Ambulance Phone No.: _____

Safety Topics Presented

Chemical Hazards: _____

Physical Hazards: _____

Personal Protective Equipment:

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

Activity: _____ PPE Level: _____

New Equipment: _____

Other Safety Topic(s): _____

Attendees

NAME PRINTED

SIGNATURE

Meeting conducted by:



PROCEDURE

Subject: EXCAVATION AND TRENCHING

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to describe the company requirements for excavation and trenching safety. These requirements are based on the federal Occupational Safety and Health Administration (OSHA) excavation standard found in 29 Code of Federal Regulations (CFR) 1926, Subpart P.

Some company activities are likely to occur in states or localities that either currently have or will have requirements that differ from those contained within the federal standard. In such circumstances, the local health and safety representative will be responsible for ensuring that these requirements are included in either a site health and safety plan or a similar document and conveyed to all affected employees. If federal, state, or local regulations vary or conflict, the more protective requirements and practices will be followed.

2.0 TABLE OF CONTENTS

1.0	Purpose and Summary
2.0	Table of Contents
3.0	Responsibility Matrix
3.1	Procedure Responsibility
3.2	Action/Approval Responsibilities
4.0	Definitions
5.0	Text
5.1	Pre-Excavation Requirements
5.1.1	Underground Utilities
5.1.2	Surface Encumbrances
5.1.3	Vehicular Traffic
5.1.4	Training
5.2	Excavation Work Practices
5.2.1	General
5.2.2	Supervision
5.2.3	Soil Classification
5.2.4	Access and Egress
5.2.5	Protective Systems
5.2.6	Exposure to Falling Loads
5.2.7	Warning System for Mobil Equipment
5.2.8	Hazardous Atmospheres
5.2.9	Water Accumulation Hazards
5.2.10	Stability of Adjacent Structures
5.2.11	Protection from Loose Rock or Soil
5.2.12	Inspections



5.2.13 Fall Protection

- 6.0 Exception Provisions
- 7.0 Cross Reference
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President of Health & Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Accepted Engineering Practices

Those requirements or practices which are compatible with standards required by a registered professional engineer.

Angle of Repose

The greatest angle above the horizontal plane at which a material will lie without sliding.

Benching

A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels of steps, usually with vertical or near-vertical surfaces between levels.

Competent Person

An employee who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has the authority to take prompt corrective measures to eliminate them.

Company

All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Excavation

Any man-made cut, cavity, trench or depression in an earth surface, including its sides, walls, or faces, formed by earth removal.



Registered Professional Engineer

An individual currently registered as a professional engineer (preferably civil) in the state where work is to be performed.

Sheeting

Members of a shoring system that retain the earth in position and in turn are supported by other members of the shoring system.

Shield

A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Shields may be pre-manufactured or job-built in accordance with 1926.652(c)(3) or (c)(4). Shields used in trenches are usually referred to as "trench boxes" or "trench shields".

Shoring

Structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.

Sloping

A method of protecting employees from cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of incline required to prevent a cave-in varies with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

Support System

A structure such as underpinning, bracing, or shoring, which provides support to an adjacent structure, underground installation, or the sides of an excavation.

Tabulated Data

Tables and charts approved by a registered professional engineer and used to design and construct a protective system.

Trench

A narrow (in relation to its length) excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Type A Soil

Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, soil is NOT Type A if:

- The soil is fissured;
- The soil is subject to vibration from heavy traffic, pile driving, or similar effects;



- The soil has been previously disturbed;
- The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- The material is subjected to other factors that would require it to be classified as a less stable material.

Type B Soil

This classification refers to:

- Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa)
- Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam, and, in some cases, silty clay loam and sandy clay loam.
- Previously disturbed soils except those which would otherwise be classified Type C soil;
- Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration;
- Dry rock that is not stable; or
- Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C Soil

This classification refers to:

- Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less;
- Granular soils including gravel, sand, and loamy sand;
- Submerged soil or soil from which water is freely seeping;
- Submerged rock that is not stable; or
- Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.

5.0 TEXT

5.1 Pre-Excavation Requirements

5.1.1 Underground Utilities. Prior to opening an excavation, the estimated location of underground utilities such as sewer, telephone, fuel, electric, water, or any other underground installation that may be reasonably expected to be encountered during the excavation work shall be determined.



Utility companies or a utility location service shall be contacted within the established pre-notification time, advised of the proposed work, and asked to delineate the location of all underground utilities. Employees should be careful to protect and preserve the utility markings until they are no longer required for safe excavation. At least 3 feet of clearance between any underground utility and the cutting edge or point of powered excavation equipment will be maintained until the precise location of the utility is determined. Initial excavation within this 3 foot area will be conducted manually.

5.1.2 Surface Encumbrances. All surface encumbrances (trees, poles, boulders, etc.) that may create a hazard to employees shall be removed or supported.

5.1.3 Vehicular Traffic. Employees exposed to vehicular traffic shall be provided with, and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material. Traffic control devices (i.e., barricades, signs, cones, flagpersons, etc.) shall be specified and used in accordance with regulations applicable to the roadway or area in which excavation activities are occurring.

5.1.4 Training. Those who supervise the entry of personnel into an excavation must have completed a training course that included instruction in:

- Types of hazards associated with excavation operations;
- Safe work practices and techniques;
- A review of applicable Federal, state and local regulations; and
- A review of this procedure.

Employees who enter excavations are required to complete a site-specific training session to enable them to recognize unsafe conditions in and around the excavation. This training can be conducted during a tailgate safety meeting that emphasizes the specific excavation hazards that may be encountered.

Training documentation shall be maintained in the project file with a copy forwarded to the Knoxville Training Department.

As part of standard employee supervision process, training shall be complemented with on-the-job instruction and reinforcement of accepted practices to the extent necessary to assure compliance with this procedure and all other applicable regulations.



5.2 Excavation Work Practices

5.2.1 General. Each employee working within an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR 1926 Subpart P, except when the excavation is made entirely in stable rock or when the excavation is less than 5 feet deep and examination of the ground by a competent person provides no indication of a potential cave-in. A competent person shall ensure that protective systems, when required, are installed and maintained per the design specifications.

No employees shall be permitted to enter an excavation unless it is absolutely essential to do so and all requirements of this procedure are met.

5.2.2 Supervision. Work in an excavation shall at all times be supervised by a competent person. This individual will remain outside of the excavation at all times, and will be responsible for identifying any unusual developments above ground which may warn of impending earth movement.

5.2.3 Soil Classification. Based on the results of tests described in Attachment 3, the competent person will classify each soil/rock deposit as stable rock, Type A, Type B, or Type C. When layers of soil/rock exist, the weakest layer will be classified; however, each layer may be classified individually when a more stable layer lies under a less stable layer. If the properties or conditions of a soil/rock deposit change in any way, re-evaluation will be required.

5.2.4 Access and Egress. Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 or more feet in depth so as to require no more than 25 feet of lateral travel for employees.

5.2.5 Protective Systems. Protective systems shall be designed in accordance with 29 CFR 1926.652(b) or (c) and shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

5.2.6 Exposure to Falling Loads. No employees shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by spillage or falling materials. Operators may remain in the cabs of vehicles being



loaded or unloaded provided the vehicles are equipped with a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.

5.2.7 Warning System for Mobil Equipment. When mobile equipment is operated adjacent to an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals, or stop logs.

5.2.8 Hazardous Atmospheres. Where an oxygen deficient (less than 19.5% O₂) or hazardous atmosphere exists, or could reasonably be expected to exist, the excavation shall be tested before employees enter. Testing shall be conducted as often as necessary to ensure that the atmosphere remains safe. Some excavations may be considered confined spaces which require compliance with Shaw E & I Procedure HS300.

Adequate precautions shall be taken to prevent employee exposure to oxygen deficient or hazardous atmospheres. As appropriate, ventilation and/or respiratory protective devices shall be used.

5.2.9 Water Accumulation Hazards. Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water is controlled or prevented from accumulating by the use of water removal equipment, the process shall be monitored by a competent person to ensure proper operation.

If the excavation work interrupts the natural drainage of surface water (streams, run-off channels), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains shall be regularly inspected by a competent person.

5.2.10 Stability of Adjacent Structures. Structures adjoining an excavation shall be evaluated to assess their stability. Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall only be permitted when:

- A support system (underpinning) is provided to ensure the safety of employees and the stability of the structure;
- The excavation is in stable rock;
- A registered professional engineer has determined that the structure will be unaffected by the excavation; or
- A registered professional engineer has determined that such excavation will not pose a hazard to employees.



Sidewalks, pavements and other surface structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

5.2.11 Protection from Loose Rock or Soil. Employees shall be protected from loose rock or soil which could fall or roll from the excavation face or edge. Such protection could consist of scaling to remove loose materials, or the installation of protective barriers. All spoil shall be placed at least 2 feet from the edge of the excavation. It is strongly recommended that spoil be placed 4 or more feet from the excavation edge so as not to cover surface indicators of subsidence (such as fissures or cracks).

5.2.12 Inspections. The competent person shall make daily inspections of excavations, adjacent areas, and protective systems for evidence of conditions that could result in a cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. The inspection shall be made prior to start of work, and as needed throughout the shift. Inspections shall be made after each rainstorm or other hazard-increasing event and will be documented using Attachment (2).

Where the inspection finds evidence of any hazardous condition, exposed employees shall be immediately removed from the hazardous area until necessary precautions have been taken.

5.2.13 Fall Protection. Where employees or equipment are permitted to cross over excavations, walkways or bridges shall be provided. Standard guardrails shall be provided where walkways are 6 feet or more above lower levels.

Adequate barriers or other types of physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc., shall be barricaded or covered and shall be backfilled as soon as possible.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of procedure HS013, Health and Safety Procedure Variances.



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7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS050 Training Requirements
HS051 Tailgate Safety Meetings
HS300 Confined Spaces
29 CFR 1926 Subpart P - Excavations

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Excavation Inspection
3. Soil Classification Worksheet
4. Selection of Protective Systems for Excavations 20 Feet or Less in Depth
5. Sloping Options
6. Shoring or Shielding Options



ATTACHMENT 1 EXCAVATION AND TRENCHING

Responsibility Matrix

Action	Procedure Section	Responsible Party					
		Employee	Supervisor	Registered Professional Engineer	VP Health and Safety	Local H&S Representative	Competent Person
Incorporate state, local, or client-specific excavation requirements into project plans.	1.0					X	
Issue, revise, and maintain procedure	3.1				X		
Coordinate identification of underground utilities.	5.1.1		X				
Determine need for traffic control devices.	5.1.3		X				
Participate in excavation training.	5.1.4	X	X			X	X
Ensure that protective systems are installed and maintained.	5.2.1						X
Classify Soil Type	5.2.3						X
Design Structural Ramps	5.2.4						X
Selection and design of protective system(s)	5.2.5			X			
Determine stability of adjacent structures.	5.2.10			X			
Inspecting excavation for hazardous conditions	5.2.12	X	X				X



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ATTACHMENT 2
EXCAVATION INSPECTION

THIS INSPECTION IS TO BE COMPLETED BY THE COMPETENT PERSON
EACH DAY THAT EMPLOYEES WILL BE ENTERING AN EXCAVATION.

Project Name: _____ Project No.: _____

Date: _____ Time: _____ Competent Person: _____

Soil Classification (see Soil Classification Worksheet): _____

Excavation Depth: _____ Excavation Width: _____

Type of Protective System Used: _____

		☒		
		YES	NO	N/A
1 GENERAL				
Surface encumbrances removed or supported				
Employees protected from loose rock or soil that could pose a hazard by falling or rolling into the				
Hard hats, steel-toed boots, and safety glasses worn by all employees.				
Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation.				
Walkways over excavations 6 feet or more above lower levels are equipped with standard guardrails.				
Warning vest or other highly visible clothing provided and worn by all employees exposed to public				
Employees required to stand away from vehicles being loaded or unloaded.				
Warning system established and utilized when mobile equipment is operating near excavation edge.				
Employees prohibited from going under suspended loads.				
2 UTILITIES				
Utility companies contacted and/or utility locations delineated.				
Underground installations protected, supported, or removed while excavation is open.				
3. MEANS OF ACCESS AND EGRESS:				
Lateral travel to means of egress no greater than 25 feet in trench excavations 4 feet or more in depth.				
Ladders used in excavations secured and extended 3 feet above the edge of the trench.				
Structural ramps used by employees designed by a competent person.				
Structural ramps used for equipment designed by a registered professional engineer.				
4. WET CONDITIONS:				
Precautions taken to protect from the accumulation of water.				



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Water removal equipment monitored by a competent person.			
Surface water or runoff diverted or controlled to prevent accumulation in the excavation.			
Inspections made after every rainstorm or other hazard-increasing occurrence.			
5. HAZARDOUS ATMOSPHERE:			
Atmosphere within the excavation tested where there is a reasonable possibility of an oxygen deficient, combustible, or otherwise hazardous atmosphere.			
Adequate precautions taken to protect employee from exposure to a hazardous atmosphere.			
Testing conducted to ensure that the atmosphere remains safe.			
Emergency equipment, such as breathing apparatus, safety harness and line, and basket stretcher readily available where hazardous atmosphere does exist.			
6. SUPPORT SYSTEMS:			
Materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads.			
Materials and equipment used for protective systems inspected and in good condition.			
Damaged materials and equipment used for protective systems inspected by a Registered Professional Engineer after repairs and before being placed back into service.			
Protective systems installed without exposing employees to the hazards of cave-ins, collapses, or from being struck by materials or equipment.			
Members of support systems securely fastened to prevent failure.			
Support systems provided to insure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
Excavations below the level of the base or footings approved by a registered professional engineer.			
Removal of support systems progresses from the bottom, and members are released slowly as to note any indication of possible failure.			
Excavation of material to a level of greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
Shield system placed to prevent lateral movement.			
Employees are prohibited from remaining in shield system during vertical movement.			
7. REMARKS:			



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ATTACHMENT 3 SOILS CLASSIFICATION WORKSHEET

The following worksheet outlines the visual and manual tests that the competent person must perform at least once, and each time soil conditions change. At least one visual and one manual test must be performed; however, performing several tests is recommended so that the condition of the excavation is thoroughly examined.

Project Name: _____ Project Number: _____

Date: _____ Time: _____

Where was the sample taken from? _____

I. VISUAL TESTS: One or more visual tests are required for each classification and each time conditions change.

1. Estimate range of particle sizes:	a. primarily fine-grained = cohesive material b. primarily coarse-grained = granular material	
2. Observe excavated soil:	a. clumps = cohesive material b. breaks up easily = granular material	
3. Observe sides and adjacent surface area of opened excavation:	a. crack like openings = fissured material b. soil spalls off vertical sides = possible fissured material	
4. Previous excavation activities:	a. previously disturbed soil	b. not previously disturbed soil
5. Observe opened side of excavation:	a. layered systems c. estimate degree of slope of layers:	b. layers sloped towards excavation _____
6. Water condition:	a. evidence of surface water c. depth of water table :	b. water seeping from sides _____
7. Vibration present:	a. area adjacent to excavation	b. area within excavation

II. MANUAL TESTS- One or more manual tests are required for classification and each time soil conditions change.

1. Plastically- soil is cohesive if following is true:	a. mold soil samples into a small ball b. roll ball into thread ~~20~~ diameter c. pick up 2" length of ~~20~~ thread by one end without breaking
2. Dry Soil Strength:	a. crumbles on its own or with moderate pressure = granular b. falls into clumps which break into smaller clumps that are only broken with difficulty = clay with gravel, sand, or silt. c. breaks into clumps which do not break into smaller clumps and can only be broken with difficulty with no visual indication of fissures = unfissured.
3. Thumb penetration test: (These tests are to be run on a large clump of material as soon as it is excavated.)	a. can be easily indented by the thumb but penetrated by thumb only with great effort Type A b. easily penetrated several inches by thumb and molded by light finger pressure = Type C
4. Unconfined Compressive Strength: (Saturated Soil Needed)	a. Pocket Penetrometer reading (take 10 readings and average) 0 - 0.5 = Type C, 0.5 - 1.5 = Type B, 1.5 - 2.0 = Type A b. Shear Vane reading X2: 0 - 0.5 = Type C, 0.5 - 1.5 = Type B, 1.5 - 2.0 = Type A
5. Drying Test: (A dry soil sample 1" thick X 6' diameter is needed)	a. develops cracks = fissured material b. dries without cracks and breaks by hand with considerable force significant cohesive content = unfissured cohesive material. c. sample breaks easily by hand = fissured cohesive or granular material d. easily pulverize dry clumps by hand or by stepping on them = granular e. don't pulverize easily = fissured cohesive.

SOIL CLASSIFICATION: Type A Type B Type C Stable Rock Other _____

COMPETENT PERSON: _____
Print Name Signature Date

ATTACHMENT 4



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SELECTION OF PROTECTIVE SYSTEMS FOR EXCAVATIONS 20 FEET OR LESS IN DEPTH

Is the excavation more than 5 feet in depth?	
NO	YES
Is there potential for cave-in?	Is the excavation entirely in stable rock?
NO	YES
Excavation may be made with vertical sides	
YES	NO
Excavation must be sloped, shored, or shielded.	
<i>Sloping</i>	<i>Shoring or Shielding</i>
Go to Attachment 5	Go to Attachment 6

For excavations greater than 20 feet in depth, design by a registered professional engineer in compliance with 1926.652 (b) and (c) is required.



ATTACHMENT 5 OPTIONS

SLOPING

YES

NO

Sloping selected as the
method of protection

Excavation must comply
with one of the following
three options:

EITHER

Option 1:
1926.652(b)(2) which
requires following
Appendices A or B.

OR

Option 2:
1926.652(b)(3) which
requires other tabulated
data (see Def.) to be
followed.

OR

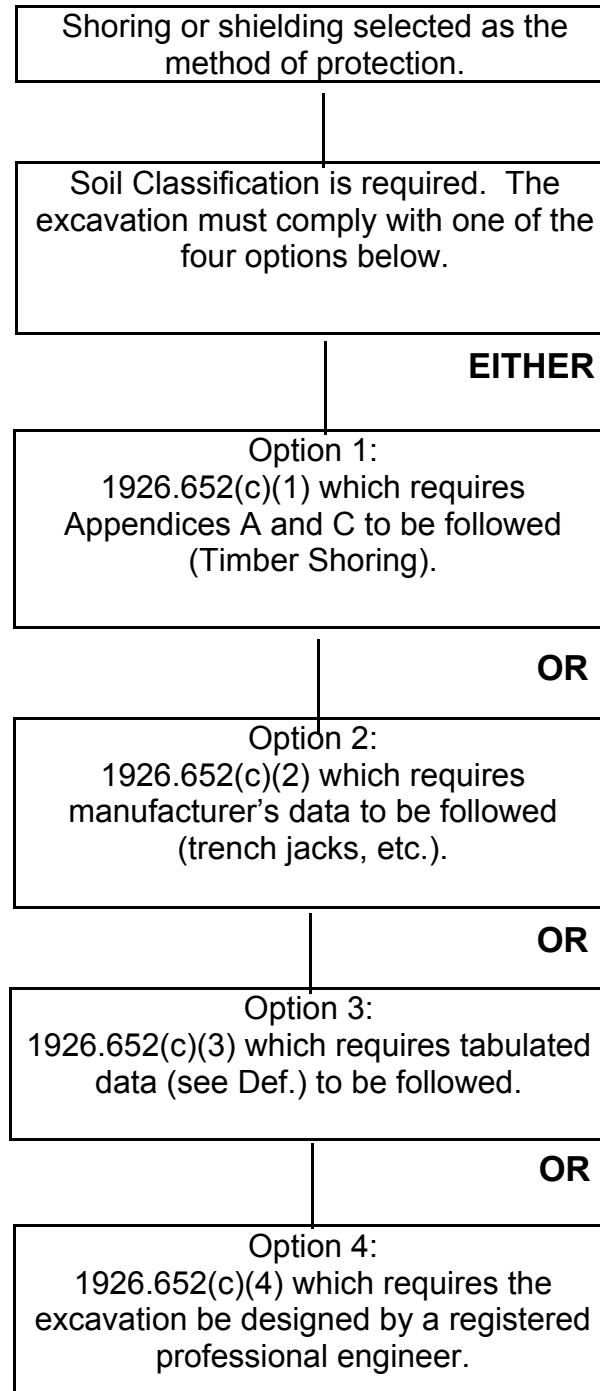
Option 3:
1926.652(b)(4) which
requires the excavation
be designed by a
registered professional
engineer.

Will soil classification be
made in accordance with
1926.652(b)?

Excavation must comply with
1926.652(b)(1) which requires
a slope of 1.5H:1V (34°)



ATTACHMENT 6 SHORING OR SHIELDING OPTIONS





PROCEDURE

Subject: UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION

1.0 PURPOSE AND SUMMARY

This procedure prescribes the steps to be followed in order to prevent accidents involving the contact with or damage of underground/overhead utilities. The company provides the operational and training practices required to safely execute work where underground/overhead utility hazards may exist.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
 - 3.1 Procedure Responsibility
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- 5.0 Text
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 - 5.2.2 Overhead Utilities Requirements
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 - 5.5 Local Jurisdiction Requirements
- 6.0 Exception Provisions
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3.0 RESPONSIBILITY MATRIX

- 3.1 **Procedure Responsibility**

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure. Also, see Attachment 1 for matrix of responsibilities.
- 3.2 **Action/Approval Responsibilities**

The Responsibility Matrix is Attachment 1.



4.0 DEFINITIONS

Company

All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Competent Person – Drilling Oversight (CPDO) Training

When drilling activity is to take place the Shaw's Field Team Leader (FTL) must have successfully completed Shaw's in-house training pertinent to competent person drilling oversight (CPDO Training). The FTL is required not only to have successfully completed CPDO training but to have an appropriate educational background, coupled with field experience and, the authority to make changes to correct deficiencies, or to stop the job if need be.

NOTE: The CPDO training requirement will become effective September 1st 2006.

This means that every FTL will have successfully completed CPDO Training prior to August 31, 2006.

Competent Person - Excavation and Trenching

A person who is capable of identifying existing and predictable hazards in the excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. NOTE: Excavation/Trenching training is required when trenching/excavation hazards are present/anticipated (i.e. spoil piles, use of three foot (3') or larger diameter augers, or other circumstances) but only recommended when trenching/excavation hazards are not present/anticipated.

Excavation

Any manmade cut, cavity, trench or depression in an earth surface formed by earth removal.

Underground Utility

Any active or inactive subsurface or buried structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Electric power lines
- Natural gas lines
- Telephone lines
- Telephone cables and fiber optic lines
- Water lines
- Steam and pneumatic lines
- Sewer lines
- Drain lines
- Underground storage tanks
- Septic tanks
- Process or product lines



Overhead Utility

Any active or inactive overhead structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:

- Overhead power lines
- Overhead telephone lines
- Overhead fiber optic lines
- Overhead cables
- Overhead supports
- Overhead piping
- Traffic lights
- Utility Bridges

One Call Center

Each state has a One Call, Dig Safe, Miss Dig, etc. dial-in number for requesting mark-out of buried public utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines. This number is typically called a minimum of 72 hours prior to subsurface activities depending on the particular state the work will be conducted. The One Call Center will notify the local public utilities for a line location mark-out for the particular location. The individual public utilities must locate and mark-out the utilities upon request. In most cases, the markouts will not be performed on private property. A confirmation number is established and confirmation report generated and submitted to the requester.

As-Built Drawings

As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications which have been made.

Private Utility Locating Service

A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.

Fiber Optic Service Lines

Fiber optic service lines are communication lines that are buried underground. When damaged, these lines are very expensive to replace. Fiber optic companies routinely provide on-site supervision, if requested. The company encourages this practice.

Field Team Leader (FTL)

The FTL is the person with whom the responsibility of the execution of the field work resides. This person may be the project manager, senior geologist, staff geologist, etc. This individual must have the sufficient experience, training and, field knowledge to ensure all site configuration information is collected and analyzed.



Site Survey

A site survey is an inspection of the work site to look for signs of other buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, inspection of basements, utility rooms, garages, etc., for signs of old electrical conduits or fuel/water/septic lines. The FTL must contact the appropriate site representative to provide any additional information that may be marked on the as-builts.

5.0 TEXT

Underground/overhead utilities may be encountered at any job site. The guidelines established in this procedure were developed to help identify and mitigate the potential hazards associated with this type of work.

Any subsurface activity is subject to the underground utility locating regulations for the state where the work will be conducted. This procedure authorizes the use of state, local or other required practices, but requires that the practice which most limits the liability to Shaw for damaged utilities is utilized. No variance is required under these circumstances, but the project-specific Health and Safety Plan (HASP) or work plan shall fully document these more protective procedures.

5.1 Preliminary Requirements

The Project Manager or designee must visit the site to mark the boring/excavation locations so they can be clearly identified and then contact the One Call Center for the state in which the work is to be performed in to formally request a utility mark out at the particular work location(s).

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

5.2 Operating Requirements

5.2.1 Underground Utilities Requirements

Prior to conducting any project site activities, the FTL must ensure that all existing underground/overhead utilities in the work area are located per the state or local mark-out protocols. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (Attachment 3). No boring/excavation work is to be performed until all utility mark-outs are verified.



While on-site, the FTL must conduct a site survey to search for signs of other buried or overhead utilities. This will include areas such as garages, basements, etc. The results of such surveys must be documented on the Utility Markout Documentation form (Attachment 3). The property owner, client, or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work..

After all mark outs have been completed, and the boring locations have been accepted by the FTL prior to drilling, each borehole location must be hand dug to a minimum of five feet bgs.

If the investigation requires boreholes in an area not covered by a municipal one call system (on private property), then the FTL must utilize appropriate geophysical techniques, hand held utility locating devices, a private utility locating firm, or other approved method to determine the locations of underground utilities. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. The geophysical methods can be very useful for locating buried utility lines in areas where hand digging is not possible or practical. However, it must be noted that these methods do have limitations that are a function of soil conditions, depth of investigation, imaging resolution, or other factors.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group, and a variance request must be submitted and approved prior to the inception of intrusive field activity.

Should the local geology be prone to refusal or should there be any other reason the boring location cannot be cleared to a minimum of 5' bgs then the appropriate aforementioned alternative methods should be utilized to ensure the boring location is clear of utilities 5' bgs, and a variance request must be submitted for review.

5.2.2 Overhead Utilities Requirements

Overhead utility locations must be marked (warning tape, flags, etc.) where heavy equipment, or other equipment, has the potential for contacting overhead utilities. Conduct a site inspection on a daily basis to determine where activities will take place and the location of overhead utilities and overhead obstructions. Once they have been identified, place warning tape on poles and/or guy wires and attempt to plan the work so that no contact will be made with the overhead utilities or obstructions. Share the information with all site personnel during the tailgate safety meeting.



Maintain at least 10 feet from overhead power lines, up to 50 kV. For voltages over 50 kV, add 0.4 inches per kV to obtain the safe distance between equipment and power lines. If voltage is unknown, remain at least 20 feet from overhead power lines.

As a precaution, a spotter must be used at all times when it is possible to violate the minimum distance requirements for overhead utilities. If contact is deemed unavoidable, consult with the client and the respective health and safety representative to evaluate the area to determine if the particular overhead utility can be removed prior to engaging in the activity.

5.2.3 Other Requirements

Only hand digging is permitted within 3 feet of underground high voltage, product or gas lines. Once the line is exposed heavy equipment can be used but must remain at least 3 feet from the exposed line.

Only experienced, demonstrably proficient equipment operators will be used to operate such heavy equipment as drill rigs, backhoes, front-end loaders, cranes, etc.

Due the sensitivity and costs associated with damage to fiber optic cables the FTL must have documented verbal contact and an agreement with the fiber optic company for all work within 50' of the fiber optic cables. Subsurface investigations near fiber optic cables are more fully discussed in site specific HASP's. Contact your division Health and Safety Professional for specific information on this subject.

5.3 Training Requirements

Competent Person Drilling Oversight (CPDO) Training

The FTL (at least one onsite Shaw person will be performing the drilling oversight) will be required to have successfully completed the approved internal Competent Person Drilling Oversight (CPDO) training.

Prior to assignment of work the Field Team Leader (FTL) will assure that all affected employees receive an overview of the hazards of encountering underground/overhead utilities. The FTL is responsible to review this procedure, the work practices to control these hazards, and the roles and responsibilities of each worker with the work crew. This procedure and other requirements that may be contained in the site specific HASP shall be reinforced during daily tailgate safety meetings.

Trenching/Excavation Training

The Field Team Leader or at least one onsite Shaw employee will be required to have successfully completed Trenching/Excavation training prior to the inception of site work activity when trenching excavation hazards (i.e. spoil piles, use of 3' diameter augers, or anytime similar hazards are present) are present/anticipated. NOTE: This training is now recommended rather than required when trenching/excavation hazards are NOT anticipated/required



5.4 Incident Reporting Requirements

Employees are required to immediately report to their direct supervisor any overhead or underground utility contact incident, or near miss incidents. Any supervisor (but preferably the supervisor directly responsible for the involved employees) with first-hand knowledge of an incident is required to investigate the incident. The Project Manager and respective Health and Safety Manager or Representative shall be informed of the incident immediately.

At a minimum, the incident investigation will require completion of the incident investigation report and General Liability Property Damage and Loss Report form found in H&S Procedure HS020.

In addition, Attachment 5 provides a “Tip Sheet” to help properly assess and investigate the incident causes and recommendations or requirements.

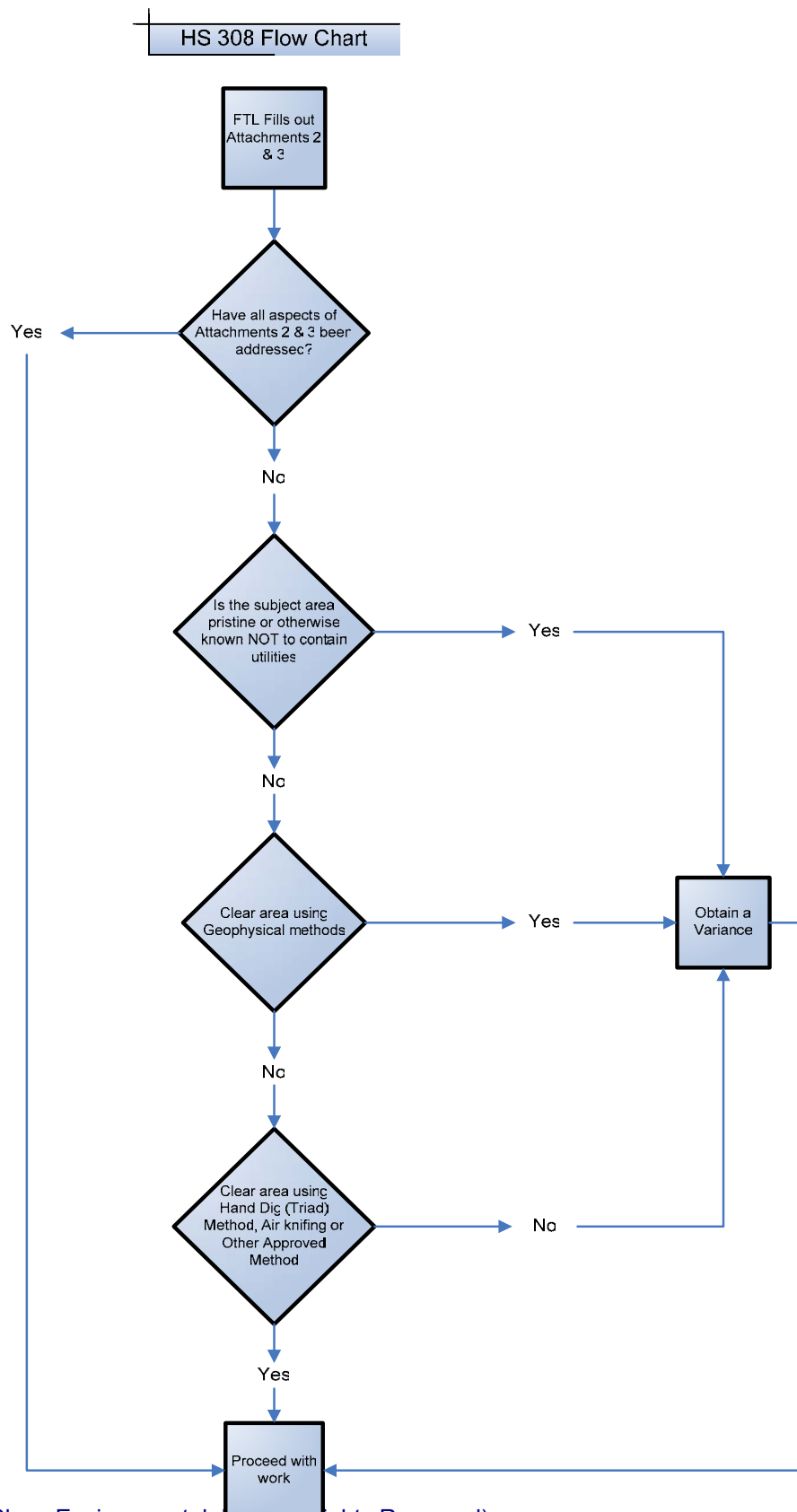
5.5 Local Jurisdiction Requirements

Where local jurisdictions or clients have established requirements different from those in this procedure, the practice which most limits the liability to Shaw for damaged utilities shall be utilized. No variance is required under these circumstances but the project-specific Health and Safety Plan or work plan shall fully document the alternate procedures.

6.0 EXCEPTION PROVISIONS

Anytime a minimum of a 5’ clearance cannot be obtained by either hand digging or by using geophysical means, the FTL must obtain a variance from the Regional VP (or equivalent level such as Operations Director for Federal Business Line) or designee to proceed with drilling operations in that area. This would include an initial verbal variance documented in the field log followed up by a written (email) approval from either the Regional VP (or equivalent level or title) or designee. The record of communication will be noted in the field log for the project and, a record of the approval or denial will be placed in the project file.

A variance form can be obtained in HS 013. A flowchart to assist one in determining how and when a variance should be obtained can be found immediately following this section.





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7.0 CROSS REFERENCES

HS013	Health and Safety Procedure Variances
HS020	Accident Prevention Program: Reporting, Investigation, and Review
HS050	Training Requirements
HS307	Excavation and Trenching

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Pre Drilling Checklist
3. Utility Markout Documentation
4. Underground Utility Hits – Tip Sheet for Incident Investigations
5. Frequently Asked Questions



ATTACHMENT 1 - UNDERGROUND/OVERHEAD UTILITY CONTACT PREVENTION
Responsibility Matrix

Action	Procedure Section	Vice President	Project Manager	Field Team Leader	HS Representative
Project-specific HASP or Work Plan shall document the practices to be used at a particular site.	1.0		X	X	X
Contact the One Call Center for mark out of utilities at the site	5.1		X		
Complete Utility Markout Documentation Form	5.2		X	X	
As-built drawings shall be reviewed	5.2			X	
Only experienced demonstrably proficient equipment operators will be used to operate such heavy equipment as backhoes, front-end loaders, cranes, etc.	5.3			X	
Provide training*	5.3				
Incident Investigation and Reporting	5.4		X	X	X
Exceptions to Procedure	6.0	X	X	X	X

*Provided by Shaw's Training Department



ATTACHMENT 2 - PRE - DRILLING/BORING/GEOPROBE Checklist

Purpose: This form is designed to help the FTL make decisions drilling/boreholing/geoprobng around underground/overhead utilities.

DATE _____ PROJECT NAME/NUMBER _____

Field Team Leader Name: _____

DURATION/SUMMARY OF WORK TO BE PERFORMED: _____

Consideration	Check	Check	Explanation	Initial
Has the state one-call been contacted?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
If one-call not available has a private locating service or Shaw S&T group been contacted?	☐ Yes	☐ No		
Were any utilities identified through private locating service? If so, indicate on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables within 50 feet of hole locations?	☐ Yes	☐ No		
If fiber optic cables are within 50 feet has an agreement with the fiber optic company been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post hole digging, and/or air knifed to 5 feet bgs?	☐ Yes	☐ No		
If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Are you comfortable with approving this authorization?	☐ Yes	☐ No		
Other considerations:				



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ATTACHMENT 3 - UTILITY MARK-OUT DOCUMENTATION

Project Name: _____
FTL Name: _____
Utility Called: _____
Subcontractor: _____
County of work: _____

Location: _____
Date: _____
Confirmation #: _____
Task/Activity: _____
Municipality of work: _____

Before work is done on any site, contact the appropriate local utility locating service (One Call, Miss Dig, Uloco, etc.) or a local utility contractor to have sub grade utilities marked. NOTE: Boring locations to be placed not in the public right of way are typically not marked out by the public utility mark out, and a private utility locate service must be engaged. Indicate to the utility locator the nearest intersecting street for the site: _____ Confirmation No: _____.

List utility firms (public and private) and the utility they will mark.

Utility Marker Emergency Telephone Numbers			
Major Utilities Marked by Color Code			
Name of Utility Company	Utility	Color Code	Emergency Telephone Number
	Water	Blue	
	Gas	Yellow	
	Electric	Red	
	Telephone/ Cable/ Communication	Orange	
	Sewer	Green	

“ALL UNDERGROUND UTILITIES MAY NOT BE LOCATED BY THE LOCAL UTILITY SERVICE”. Accordingly, you must list other known utilities in the area that the “One Call” service will not contact:

Attach photos of the area prior to placing boreholes.

Take photos of the area indicating minimum 5' hand dig, post hole dig, probe, GPR or other:

NOTE: For any borehole, should 5' minimum clearance not be obtained, you must contact Business Line VP or equivalent (Operations Director or other on the Federal Business Line) and obtain a variance.



Completed by: _____
Name

Signature

Date

ATTACHMENT 3 – UNDERGROUND UTILITY HITS TIP SHEET FOR INCIDENT INVESTIGATIONS

1. Location of the incident.
2. The time of day the incident occurred.
3. What type of utility was hit?
4. How deep was the line hit (in feet)?
5. Who called Designated Locator Service?
6. Note the “One Call” number on the Incident Investigation Follow-up report.
7. Attach the “One Call” record keeping documentation.
8. Were mark-outs completed by the utilities? If so, please identify.
9. Were mark-outs legible at the site?
10. Was the mark-out of the line that was hit accurate?
11. Was the mark-out misinterpreted?
12. Is there a utility damage sheet attached to the Incident Investigation Follow-up Report?
13. Have there been any faults or oversights by any 3rd party? If so, is it documented on the Incident Investigation Follow-up Report?
14. Did the FTL interview the property owner/manager prior to the incident?
15. Was pre-screened by hand digging 5 feet?
16. Were any supplemental utility locator devices used? If so, did we obtain them? If so, were they used on site?
17. Were there blueprints/as built plans available? If so, did we obtain them? If so, were they used on site?
18. Who is paying for the repairs?
19. Please define the total hours and cost estimate/impact to address the utility damage incident:

_____	Site time in hours (not billed to the job)
_____	PM time hours (not billed to the job)
_____	H&S time in hours (not billed to the job)
_____	BLM Time in hours (not billed to the job)
_____	Rework/non-billable time (estimate)
_____	Subcontractor rework/non-billable costs (estimate)
_____	Repair costs to company (estimate)
_____	Repair cost to customer (estimate)

20. Has the FTL completed Shaw’s in-house CPDO training?
21. Has the FTL completed trenching/excavation training?
22. Is he/she current with the OSHA 40 hour and 8 hour refresher? If so, what are the dates of the training?
23. Who was the Site Safety Officer on the job site?
24. Does he/she have OSHA 8 hour supervisor training? If so, what are the dates of the training?
25. What was the name of the drilling subcontractor that was on site?
26. Have we researched the training background for this vendor?
27. Was a JSA performed at least once during the day that covered utility contacts and associated hazards?
28. Does this vendor have approved status?
29. Was there a tailgate safety meeting that took place?
30. Were utility mark-outs addressed at the tailgate safety meeting?
31. Were there any markings nearby the “hit” area?



ATTACHMENT 5 – Frequently Asked Questions (FAQs)

During the roll-out of this revision of HS 308 a variety of questions/comments/concerns arose. These concerns have been put in the form of most frequently asked questions (FAQs) and their respective responses. These FAQs will clear up misunderstanding pertaining to this procedure, and provide valuable information that will help our workforce have a better understanding of how this procedure should be implemented. Please review the FAQs below:

- 1. No other competitor of Shaw has felt the need to do anything as extreme as this procedure to ensure minimization of utility hits. Instituting this procedure will put us out of business.*

Response: After thorough review of claims and incidents involving drilling activities and underground utilities, the committee believes that our business/client needs are best served by adopting this policy. And that the likelihood of being put out of business is much greater from continuing to do business the way we currently do it than by adopting this improved policy. The committee realized that 100% adherence to this procedure at all work sites is likely not possible. For those cases where legitimate reasons exist for non-compliance, the committee realized that an effective responsive (variance) system must be in place. The committee believes that the variance procedure, as stated in the policy, should address the exceptions as they occur.

The Committee is not aware of any specific ASTM or true “industry standard”. However, the committee is aware that best practices can vary tremendously and many times are client dependent. For example one extremely large Shaw client requires that we continuously probe. On the other end of the spectrum some clients look completely to Shaw for guidance in these matters.

- 2. Our clients want us to do the work but do not wish to pay the additional fees involved with this new procedure. Could we offer them a two tiered pricing, one to do it the old way, and one to do it the new way?*

Response: The committee believes that contacting an underground utility of any type, no matter who is at fault or who ultimately pays for fixing, the outcome is a “black eye” for all involved. When these events occur, even if Shaw is not at fault, the committee believes that continued good client relations, and the potential for obtaining future business lessens as utility hits/incidents occur. This procedure is designed to minimize health and safety risks to our workers AND to mitigate liability to Shaw. Receiving the necessary compensation for the precautionary measures outlined in the procedure would be expected, and should be itemized in the initial proposal including a statement as to what will specifically be done in the field to mitigate risks relative to underground utilities and WHY Shaw believes these steps are necessary. However, if the client is willing to assume the entire liability resulting from “hitting” an underground utility, the contract should be written to reflect this

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and a variance would be in order. Keep in mind that Shaw cannot allow a client's desires to take on liability to affect the health and safety of workers. No matter what the client desires might be, Shaw would still expect the basic procedures to be followed for health and safety purposes. The training though yet to be finalized will provide project manager's examples of wording to be used in proposals and contracts.

3. *Hand digging to 5' is impossible during frost conditions in Minnesota, Wisconsin and many northern areas. How should this be addressed?*

Response: When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and a variance must be obtained. The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. These non-invasive geophysical methods are suggested and mentioned in the procedure.

4. *What if the field crew runs into refusal during hand dig clearance?*

Response: If refusal occurs and moving to an alternate spot presents the same problem, hand digging may not be possible as mentioned in #2 above. When conditions present themselves that do not allow for hand digging each borehole, other methods must be used for clearance and/or a variance must be obtained. Of course, we expect that the dig safe folks to be contacted, and that a private locating service be utilized if available. Should a private locating service not be available, we can use trained internal sources.

The alternative methods include a range of non-invasive geophysical survey techniques designed specifically for locating buried utilities, pipelines, tank (UST), and other buried objects that can interfere with drilling. The current accepted geophysical methods for the investigation and location of buried utilities include: Ground Penetrating Radar (GPR), Time Domain and/or Frequency Domain Electromagnetic methods, Magnetometer, and Inductive/Conductive Radio-Magnetic methods. These non-invasive geophysical methods are suggested and discussed in the procedures. The geophysical methods can be very useful for locating buried utility lines in areas where drilling and digging are not possible or practical, but these methods do have some limitations that are a function of soil conditions, depth of investigation, and imaging resolution.

If it is determined that a non-invasive geophysical investigation may be needed, assistance with selecting the appropriate method(s) can be obtained from the Shaw E & I Science and Technology Division, Geophysics & Mapping Group. Of course, it is expected that the "dig safe" folks will be contacted, and that a private utility locating service be utilized when appropriate (utility location method is known to be feasible), and if available. Should a private locating service not be available, we can use trained internal Shaw E & I personnel resources to perform utility line location work. Finally, if the Project Manager has determined that a variance to the procedure is justified, a variance request should be submitted for review.



5. *Why is trenching/excavation training required for putting in Geoprobe® boreholes? This seems like tremendous overkill.*

Response: The committee believes that, in general, trenching/excavation training is a good educational tool that promotes overall health and safety awareness and provides important information/techniques for our field staff. Trenching/excavation training provides insights into fall hazards, spoil pile placement, and many other related safety issues. Many of our drilling jobs have involved oversized auger bits (3' in diameter) where a large deep borehole is created. The committee agrees that when the diameter of the borehole lessens (i.e. use of a Geoprobe®), the impact of trenching/excavation training decreases. Trenching excavation training is now a requirement only when large boreholes are created or other hazards as mentioned above are present, but only recommended training when Geoprobe® or similar equipment is being used and the result is trenching excavation type hazards do NOT exist. NOTE: Specific training pertinent to drilling/Geoprobe®/boring (CPDO training) will be provided and will be mandatory. Additionally, CPDO and trenching / excavation training are both required on projects where 3' or larger diameter boreholes are to be drilled.

6. *Are there any training requirements besides trenching/excavation training?*

Response: The committee evaluated a need for training specific to the HS 308 policy (drilling) and solicited the assistance of the training department and certain operations employees to develop CPDO training. This CPDO training includes basic steps needed to be taken from call the dig-safe number, private utility searches, geo-physical capabilities, probing, hand augering, air knifing, water pumping/knifing, hand digging and others.

7. *Hand diggings creates heat stress, tripping hazards, back injuries, and other hazards and is unnecessary.*

Response: The committee did not envision using a spade and a strong back to dig various 5' holes at the field site. The committee does envision using an air knife, water knife, probe, or other method rather than a hand shovel. The committee understands that not all methods may be acceptable in all states, municipalities or to all clients. The committee was also aware that when all else fails one could consider using a 1" diameter stainless steel auger placing 5' bgs hand borings in a triangular pattern where the auger bit could be placed in between these small hand borings. The committee envisions this theme and methodology to be expanded within the upcoming training. Additional information on augering techniques will be provided in the specific training (CPDO) mentioned above.

8. *I need to put borings in pristine farmland next door to a contamination zone. There are no and have never been any utilities in this area. What should I do?*

Response: Once you go through the proper utility locate procedure and are confident that no utilities



exist in the subject area, you need to obtain a variance. This would also hold true for pristine forest preserves, wildlife refuges, or other areas not affected by utilities.

9. Who needs to sign off on a variance?

Response: Variances are signed by the Area Vice President (or designee, which may be delegated to the BLM for each office) along with the Project/Program Manager/Director. When we know in advance that HS308 cannot be adhered to, one should make plans to get a formal variance approval and appropriate paperwork developed two weeks prior to field activity. Variances can also be obtained when field conditions arise that make adherence to HS308 impossible. The variance can be obtained via cell phone in the field with the PM and appropriate management with the outcome noted in the field logbook followed up by an appropriate e-mail. This e-mail should be kept in the project file as proof of variance approval. It is recommended that variances be obtained as soon as it is known that they will be required.

10. What constitutes a “probe”? I assume a Geoprobe® is not valid?

Response: A Geoprobe® is NOT a valid probe in that Geoprobess® have caused damage to sewer lines and other utilities. Probes are typically made of a fiberglass-like material that have a pointed end but will not damage subsurface utilities and allows for the field staff to sense if underground items are encountered.

11. Under 5.1, is a subcontractor a designee?

Response: Although a subcontractor can make arrangements to contact dig safe and more, Shaw must ensure that the sub has, in fact, done what they had agreed to do. It should be remembered that typically on drilling projects, from many of our customer’s perspective, the liability remains with Shaw, and they will look to Shaw, not our subs, for resolution of any events that occur. Hence, it is incumbent on Shaw to insure that our procedures are followed by Shaw and Shaw subs.

12. Does ground surface include concrete, asphalt or other man-made coverings?

Response: A simple NO. Some of our projects include drilling through airport runways or tarmacs which can be up to 15” in depth. Manmade surfaces do NOT count in the 5’ hand dig clearance specification. If we are attempting to advance boreholes below existing concrete surfaces, the geology below the concrete will be exposed by cutting the concrete and removal of the concrete. After the concrete is removed and the geology is exposed, a hand auger can then be used. Hopefully, the twelve concerns above and the responses to these comments will have helped users understand the implementation of this HS 308 policy. More importantly the committee realizes that information on this subject will be provided during the training mentioned above. It is the committee’s belief that once this program has been completely rolled out the need for variances will be minimal and the interactions of the safety department with operations management with this entire process will make ensure success.



PROCEDURE

Subject: CONTROL OF HAZARDOUS ENERGY AND HAZARDOUS MATERIAL SOURCES (LOCKOUT/TAGOUT)

1.0 PURPOSE AND SUMMARY

This procedure establishes the minimum requirements for the lockout and tagout of energy and hazardous material sources and must be used to:

- Ensure that all machinery, equipment, or confined spaces are isolated from all potential hazard sources (mechanical, electric, chemical hazards, etc.) and are locked out and tagged out prior to employees performing any servicing, maintenance, or entry activities.
- Ensure that field projects where hazardous energy/material sources are present develop a site-specific Lockout/Tagout procedure.
- Ensure that equipment can accommodate locks. Additional means such as a tagout program may be used to ensure safety when locks are not used.
- Establish procedures for release of the Lockout/Tagout that include machine inspections, notification and safe positioning of workers, and removal of the Lock/Tag.
- Ensure the use of standardized locks and tags that identify the worker using them, making sure that locks and tags are of sufficient quality and durability to ensure their effectiveness.
- Provide the necessary employee training.

For a basic overview of the Lockout/Tagout System refer to the "Flow Diagram - Overview: Lockout/Tagout System" (Attachment 2).

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3.0 RESPONSIBILITY MATRIX

3.1 Procedures Responsibility

The Corporate Director of Health & Safety is responsible for the issuance, revision and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Affected Employee - An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout and tagout, or whose job requires the employee to work in an area in which isolation of hazards is necessary to provide a safe workplace.

Authorized Employee - A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance.

Blanking or Blinding - The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or skillet blind) that completely covers the bore, and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.



Capable of Being Locked Out - An energy/hazard isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy/hazard isolating device or permanently alter its energy control capability.

Double Valve and Vent - A valve arrangement in a piping system in which three valves are arranged in conjunction with a vent line. One valve is upstream of the vent, another downstream, and one is on the vent itself. To isolate the downstream system, the vent valve is opened, the other two are closed, and all three valves are locked in this position.

Energized - Connected to an energy source or containing residual or stored energy.

Energy Isolating Device - A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices.

Energy Source - Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Group Lock Box - A device capable of holding and securing the key or other release mechanism for a group lock, which can accommodate the individual locks from all members of the work crew.

Hot Tap - A procedure used in repair, maintenance, and service activities which involves welding on a piece of equipment (pipeline, vessel or tank) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout - The placement of an energy/hazard isolating device, in accordance with an established procedure, which ensures that the equipment being controlled cannot be operated until the device is removed.

Lockout Device - A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy/hazard isolating device in the safe position and prevent the energization of a machine or equipment. This includes blank flanges and bolted slip blinds.

Normal Production Operations - The utilization of a machine or equipment to perform its intended production function.



Qualified Employee - An employee whose skills and training meet or exceed 29 CFR 1910.332(b)(3) for work on or near exposed energized parts must, at a minimum, be trained in and familiar with the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment; to determine the nominal voltage of exposed lines; and the clearance distances to which the qualified persons will be exposed.

Servicing and/or Maintenance - Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming machines or equipment, making adjustments or tool changes, where the employee may be exposed to an unexpected energization or start-up of the equipment, or release of hazardous energy/or material.

Setting-up - Any work performed to prepare a machine or equipment to perform its normal production operation.

Tagout - The placement of a tagout device on an energy/hazard isolation device, in accordance with an established procedure, to indicate that the device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device - A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolation device in accordance with an established procedure, that indicates that the device and the equipment being controlled may not be operated until the tagout device is removed.

5.0 TEXT

5.1 Scope/Application

This procedure covers any activity which requires isolation of a source of energy or hazardous material, such as, the servicing and maintenance of equipment and confined space entry. It outlines methods to prevent the unexpected energization or start-up of the equipment, or release of stored energy or material that could cause injury to employees. For any projects planned for more than 30 days with lockout/tagout planned for more than seven calendar days or when locking/tagging out specialized equipment having its own lockout requirements, a site-specific/equipment specific plan must be developed and incorporated as part of the Site-Specific Health and Safety Plan. Otherwise Attachments 4-7 (discussed later in text) must be utilized to document lockout/tagout.

In situations where our client has specific lockout/tagout requirements, Shaw Environmental & Infrastructure, Inc. (Shaw E & I) personnel can follow client procedures after an Shaw E & I health and safety professional has approved them as being at least as protective as Shaw E & I procedures. In such cases, the client procedures shall be incorporated into the Shaw E & I health and safety plan and all affected employees trained on these procedures.



- 5.1.1 Exclusions.** Normal operations including repetitive, routine minor adjustments that do not require removal of equipment guarding.

When work is conducted on equipment where an employee has direct control over the cord(s) or plug(s) connected to the associated equipment.

- 5.1.2 References.** OSHA General Industry Standard, 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout), 29 CFR 1910.146, Permit-Required Confined Spaces, and 29 CFR 1910.331-335, Safety-Related Work Practices.

5.2 Responsibility

Each new, transferred, authorized or affected employee and other employees whose work operations are or may be in an area where lockout/tagout procedures are utilized must be instructed in the purpose and use of this lockout/tagout procedure.

■ **All Personnel**

All site personnel will be responsible for continuous adherence to the health and safety procedures during the performance of assigned work. In no case may work be performed in a manner that conflicts with the intent of this procedure.

■ **Authorized Employee**

The authorized employee, or his/her designee, is responsible for reviewing the planned activities prior to commencement of work and confirming that the maintenance manager or his designee of the particular facility where the work is to be accomplished is made aware of the nature and extent of the work and when it is to commence.

■ **Site Supervisor**

The site supervisor is responsible for verifying that all proper lockout/tagout procedures have been followed. The site supervisor must ensure that the power disconnects, appropriate attachment of locks and tags, and proper documentation of the procedure are implemented. He/she is also the designated custodian and controller for all locks, tags, and group lock boxes issued to authorized employees.

■ **Subcontractors, Visitors and Other On-Site Personnel**

Subcontractors are responsible for the health and safety of their employees and for complying with the requirements established by the site Health & Safety Plan. All Shaw E & I subcontractors and visitors are responsible to the Shaw E & I site supervisor.



- **Site Health and Safety Coordinator**

The health and safety coordinator will assist in compliance with the other applicable company policies and procedures, and the Health and Safety Plan.

5.3 Procedures for Lockout/Tagout

Lockout and tagout devices must be capable of withstanding the environment to which they are exposed for the maximum period of time that exposure is expected.

Locks are to be used when a machine, equipment, or piping system is capable of being locked out. All locks must be accompanied by a tag to indicate the name of the employee applying the lockout device and warn against the hazard if the valve is opened, or the machine/equipment is energized. A legend such as "This lock and tag to be removed only by authorized personnel" with an additional message: "Do Not Start," "Do Not Open," "Do Not Close," "Do Not Energize," or "Do Not Operate" must be utilized.

All tags and their means of attachment must be sturdy enough to prevent inadvertent removal. The tag attachment will be attachable by hand, self-locking, non-releasable, and non-reusable, with a minimum unlocking strength of not less than 50 pounds. Tags must be durable and not deteriorate from exposure to weather conditions and corrosive environments or cause the message on the tag (hand-written or pre-existing) to become illegible. Lockout and tagout devices must be singularly identified; must be the only device(s) used for controlling energy; and must not be used for other purposes.

All equipment must be designed with a hazardous energy/material isolating device as a means of protection for the employee against injury during repairs. **All new equipment installed must be designed to accept a lockout device.**

Authorized padlocks will be assigned to each authorized employee. Each group's lock will be individually keyed and the supervisor on each shift will maintain possession of the master key for these padlocks. The specific project must provide a sufficient number of locks for each employee on site.

All tags must contain the authorized employee name, date of application of the lock, equipment name or number and the reason for lockout. The tag must be attached to the lockout device.

On any equipment that can start automatically, the main disconnect must be switched to the "off" position, locked, and tagged by the authorized employee. This switch must be turned off before opening the main power disconnect and remain off until the disconnect is closed. Locking out 220v, 440v and other equipment must always be done at the main feed or starter panel.

All hazardous material lines must be blanked, blinded, or double valve and vent locked to prevent release of hazardous material.



Blanking or blinding of hazardous material lines are preferable to the double valve and vent technique. All blanks and blinds must be identified with tags in the same manner as locks.

A "Lockout Log" (Attachment 3) must be maintained by the site supervisor. This log must be included in the Health and Safety Plan.

5.3.1 Lockout/Tagout Overview

- Check equipment file for specific lockout/tagout procedures.
- Determine the requirements for lockout. If there is more than one energy source to the equipment, document each source.
- Conduct a survey to locate and identify all energy isolation devices that apply to the equipment.
- Use the equipment type-specific procedures as outlined in Attachments 4-7, if applicable. Complete the "Lockout/Tagout Procedure for Specific Equipment" form (Attachment 8) logging all data and return to the site-supervisor.
- Shut off energy source(s) to affected equipment.
- Affix lock(s) and tag(s) to each energy source controlling device.
- Identify work on process lines or vessels and determine isolation requirements.
- Blind, blank, disconnect, or double valve and vent all hazardous material lines, including steam, and identify the isolation points with tags.
- When only tag is used because machine or equipment can't be locked out, the following steps must be taken: Remove fuses, block machine, etc. and complete the "Lockout/Tagout Procedure for Specific Equipment" form (Attachment 8) and give to the site supervisor for the record.
- Stored energy - Relieve all stored energy from capacitor banks, springs, compressed air, hydraulic, steam, etc.
- Verify isolation of energy has occurred by attempting to activate equipment by using the on/off switch.
- Return control switch to "off" position before proceeding with work.

5.3.2 Removal of Lockout/Tagout



- Ensure that nonessential items, such as tools, etc., are removed from equipment.
- Ensure that equipment components are intact.
- Check work area to ensure that all employees are safely positioned or removed from the area.
- Notify all affected employees and site supervisor before re-energizing the equipment.
- Remove lockout/tagout device.
- Re-energize equipment or open valves and restore flow in process line, place back in into service.

5.3.3 Preparation for Confined Space Entry

1. Refer to Shaw E & I Procedures HS300, HS301, or HS302 for Confined Space Entry.
2. Blank or blind piping, identify with tags.
3. Misalign or remove sections of lines, pipes, or ducts, identify with tags.
4. Double valve and vent system, identify with tags.
5. Lockout or tagout all sources of energy.
6. Block or disconnect all mechanical linkages.

If it is impossible or impractical to lockout a piece of equipment, the site supervisor, H&S Professional, and the Maintenance Engineer of the facility must approve a method to make the equipment safe before any activities beyond normal operations of the equipment are performed. This can be done by disconnecting wiring, removing fuses, disconnecting or blanking supply lines, etc. "Danger - Do Not Operate" tags must be used to describe the condition.

The practice of permitting a person to place or remove a lock for someone else is prohibited. No employee can be sure he/she is safe until he/she places their own lock correctly.

5.4 Safety Audit

5.4.1 Verification Audit. A periodic audit of the lockout/tagout system must be performed to ensure that the requirements of this procedure are being implemented. The audit will be conducted by authorized and qualified employees other than the ones(s) utilizing the procedure being inspected. Any deficiencies that are observed must be corrected immediately. For each project, the site-supervisor will be responsible for daily audits of lockout/tagout systems to



ensure proper installation of locks and tags to the equipment and adherence to the appropriate procedures.

Where lockout or tagout is used for energy control, the periodic inspection must include a review, between the inspector and each authorized employee, of that employee's responsibilities under the energy control procedure being inspected.

5.4.2 Follow-up Audit. A follow-up audit must be conducted to ensure that all deficiencies noted have been corrected.

5.4.3 Documentation. Audit documentation must identify the machine or equipment on which the lockout procedure is being utilized, the date of the inspection, employees interviewed and employee(s) performing the inspection. The audit results must be provided to the Health & Safety Department to be documented as being performed.

5.5 Training

Training must be provided to ensure that the purpose and function of the energy control program are understood by employees, and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees.

- Each authorized employee must receive training in the recognition of applicable hazardous energy/material sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for isolation and control.
- All affected employees must be instructed in the purpose and use of the lock and tag system.
- All other employees (including new hires) whose work operations are or may be in an area where lockout/tagout may be utilized, must be instructed about the procedure, and the prohibition relating to attempts to restart or re-energize machines or equipment that are locked out or tagged out.
- Retraining must be conducted for all authorized and affected employees whenever there is a change in job assignment, change in equipment, changes in a process that presents a new hazard or there is a change in the lockout/tagout procedure. Retraining must also be conducted whenever there is significant evidence, based on the periodic audits, indicating employee deviation from, or lack of understanding of, the lockout/tagout procedure.



- Employee site-specific training must be documented to ensure that it has been accomplished and is being kept up to date. The documentation must contain each employee's name and dates of training.

Documentation of employee training and retraining must be maintained and kept up to date by the Shaw E & I H&S representative and forwarded to the Shaw E & I Training Department.

5.6 Shift or Personnel Changes

Specific procedures must be utilized during shift or personnel changes to ensure the continuity of lockout or tagout protection. These must include provision for the orderly transfer of lockout or tagout device protection between off-going and oncoming employees to minimize exposure to hazards from the unexpected energization or start-up of the machine or equipment or the release of stored energy. All site-specific locks in place must be covered in the tailgate safety meetings on each shift.

All individual lock(s) of the outgoing shift working on equipment will be removed and replaced by the on-coming shift's individual lock(s). The authorized employees of the on-coming shift must inspect and "try" the system to ensure de-energization.

The site supervisor must re-audit the system as necessary.

5.7 Troubleshooting

Special precautions must be observed when the authorized employee must perform maintenance troubleshooting tasks with energized equipment. This function requires added caution and communications between all other affected employees to ensure employee protection.

An authorized employee must identify all start-stop locations and circuit breakers for disconnecting equipment. All other affected employees must be kept informed throughout the testing and troubleshooting. If the job is left incomplete, the authorized employee must install his/her individual lock and tag before leaving the job.

The following sequence must be followed when troubleshooting any equipment:

1. Written approval including detailed work plan, must be obtained from the site supervisor and H&S Professional to ensure that troubleshooting can be performed safely.
2. Inspect and clear machine or equipment of all tools and unnecessary materials.
3. Ensure that all affected employees are positioned out of the way of machine activation. Instruct all affected employees in the procedures that must be followed, the potential hazards that may exist, and the safety precautions that have been taken. Document this training on the Tailgate Safety meeting form.
4. Remove the lockout and tagout devices.



5. Energize and proceed with the troubleshooting, testing or positioning of the machine or equipment.
6. De-energize, reapply all lockout and tagout devices and "try" the system to ensure de-energization or place machine back into service.

5.8 Group Lockout/Tagout

When servicing and/or maintenance is performed by a crew, craft, department or other group, the work crew must use a procedure which affords the employees a level of protection equivalent to that provided by the implementation of a personal lockout or tagout device.

- Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device.
- Provision for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machine or equipment; and
- When more than one crew, craft, department, etc. is involved, assignment of overall job-associated lockout or tagout control responsibility to an authorized employee to coordinate affected work forces and ensure continuity of protection; and
- Each authorized employee must affix a personal lockout or tagout device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and must remove those devices when he or she stops working on the machine or equipment being serviced or maintained.

The following procedure applies to distribution and utilities systems. The employee authorized to "Group Lockout" will lock and tag out the system. Using the "group lockout" locks and tags. The "Group Lockout" must be signed by the authorized employee.

1. Use of personal tags and locks on the "Group Lock Box" must follow the normal lockout/tagout procedure.
2. The authorized employee must verify that all energy sources are in a neutral state.
3. The authorized employee places the group lock and tags on the hazard isolation device.



4. The authorized employee then places the "Group Lock Key" in the "Group Lock Box", and tag the box with a "DANGER DO NOT OPERATE" tag stating which system is locked out and why.
5. Each employee, prior to working on the "Group Lockout" system, must attach his/her personal tag and lock to the "Group Lockout Box."
6. Upon completion of work, all employees must remove their personal lock and tag.
7. The authorized employee must then remove the "Group Lock" locks and tags and follow normal procedures for restoring energy.
8. If repairs take more than the initiating shift, and the authorized employee is not remaining on the job for the completion, he/she may transfer "Authorization" to another employee by stating so on the "DANGER DO NOT OPERATE" tag. The employee identified then becomes the authorized employee. He/she is now authorized to remove the "Group Lockout" locks and tags installed by the original authorized employee if the work is completed on that shift. The follow-up shift must then follow normal procedures for "Group Lock/Tagout."

5.9 Outside Personnel (Contractors, etc.)

Whenever outside servicing personnel are to be engaged in activities covered by the scope and application of this standard, the on-site employer and the outside employer must inform each other of their respective lockout or tagout procedures.

All subcontractor's lockout/tagout procedures must be reviewed and approved by Shaw E & I prior to the project.

5.10 Special Situations

If lockout/tagout lasts for more than one shift, the appropriate protection must not be interrupted. No lock is to be removed until the next shift is ready to lockout the equipment.

When the employee(s) who originally applied a lock(s) is not at the site to remove it, the lock can be removed only in an emergency and only under the direction of an authorized employee, the site-supervisor, and if applicable the site-safety and health coordinator. Such actions and associated personnel safeguards shall be documented on the Field Activity Daily Log and the Lockout Log.



6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health and Safety Procedure Variances.

7.0 CROSS REFERENCE

HS050 Training Requirements
HS052 Health and Safety Plans
HS300 Confined Spaces
HS301 Confined Spaces, Marine
HS302 Confined Spaces, Leaded Product
HS310 Hazardous Waste Operations
HS311 Emergency Response Operations
HS312 Hazardous Waste Operations at TSD Facilities

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Flow Diagram - Overview: Lockout/Tagout System
3. Lockout Log
4. Lockout/Tagout for Electrical Equipment
5. Lockout/Tagout for Compressed Air and Gases
6. Lockout/Tagout for Steam, Water, and Fluid Lines
7. Lockout/Tagout for Hydraulic Equipment
8. Lockout/Tagout Procedure for Specific Equipment



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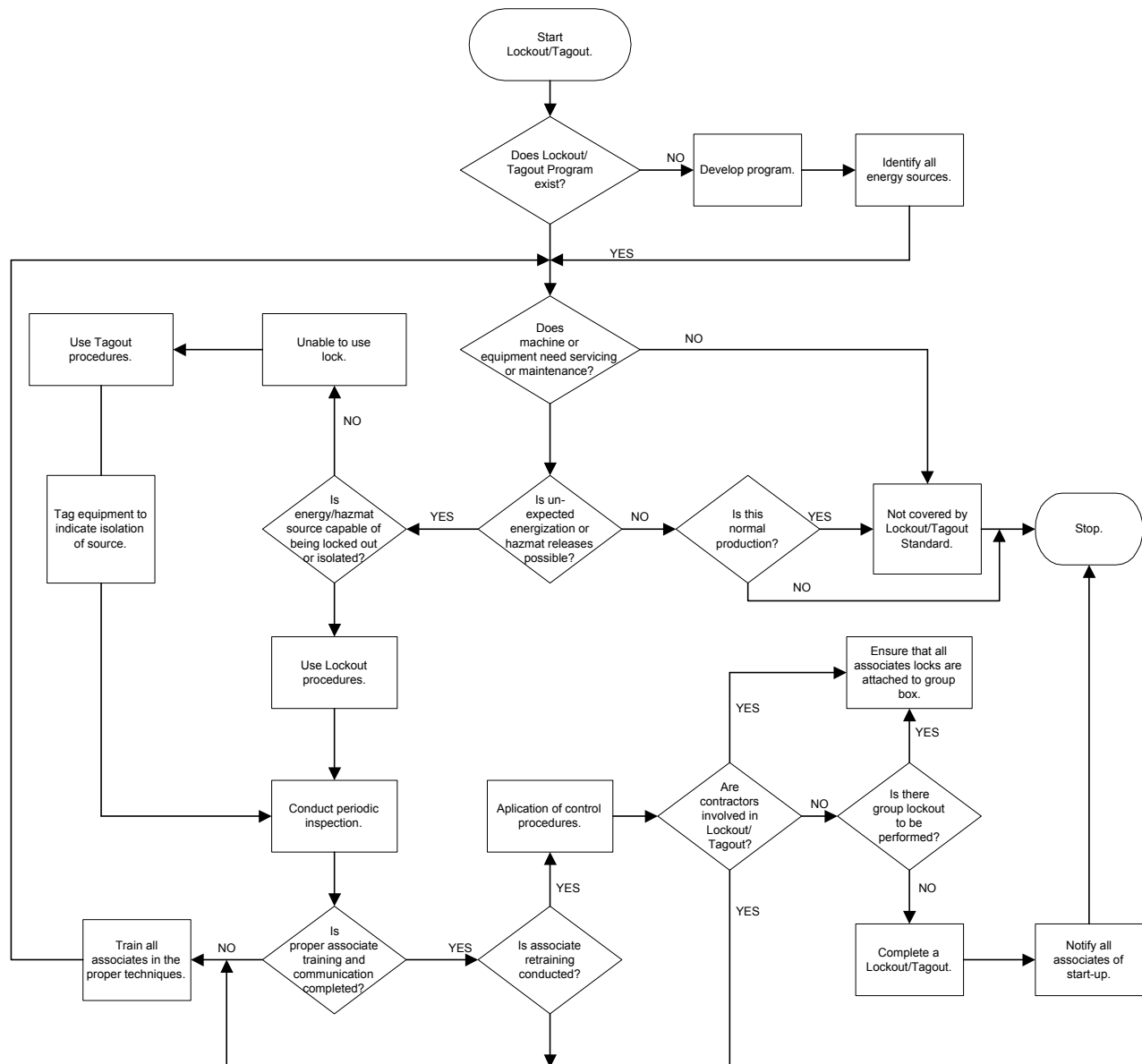
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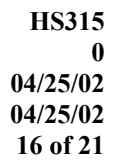
Responsibility Matrix

Action	Procedure Section	Responsible Party						
		Location Mgr.	Authorized Associate	Site Supervisor	Sub-contractor	HS	All	Training Dept.
Comply with procedure	5.2				X		X	
Review plan & notify maintenance	5.2		X					
Verify proper procedures followed	5.2`	X		X		X		
Verification audit - daily	5.4.1			X				
Provide training to associates	5.5	X						
Attend appropriate training	5.5						X	
Maintain training records	5.5							X
Write/approve location lockout plan, if required	5.1		X			X		

ATTACHMENT 2

FLO DIAGRAM: OVERVIEW of the LOCKOUT/TAGOUT SYSTEM



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ATTACHMENT 4 LOCKOUT/TAGOUT FOR ELECTRICAL EQUIPMENT

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisor: _____

PREPARATION FOR SHUTDOWN

1. Determine power type and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of power (voltage)
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Shutoff power sources to machine.

LOCKOUT/TAGOUT

6. Lock and tag main power switches in the OFF position, remove fuses.
7. Verify that no power is available to the equipment using a voltmeter, if necessary.
8. Drain devices such as capacitor banks.
9. Verify that these devices have no stored energy by use of the voltmeter.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. The maintenance employee, while verifying the machine is repaired cannot leave the immediate area.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature: _____

Authorized Person: _____

Site Supervisor: _____



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ATTACHMENT 5 LOCKOUT/TAGOUT FOR COMPRESSED AIR AND GASES

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisor: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of compressed air, gas, steam, water, or fluids.
4. Notify affected employees in the area that equipment will be locked out for maintenance.
5. Shutoff main supply to machine.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Bleed line and verify that no air or gases remain in the equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify proper operation.
12. Remove tag.
13. Notify employees in the area that the equipment is available.

Signature: _____

Authorized Person: _____

Site Supervisor: _____



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ATTACHMENT 6 LOCKOUT/TAGOUT FOR STEAM, WATER, AND FLUID LINES

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisor: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of compressed air or gas.
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Disconnect/shutoff main steam, water or fluid lines to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply (i.e. chaining through valve handle with lock) in the OFF position with a bleeder open on the load side.
7. Drain fluids from shutoff valves to equipment.
8. Repair equipment.

RETURN TO SERVICE

9. Be sure all connections are made and any unused tools and equipment are removed.
10. Remove lock if necessary to verify machine is repaired. The maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
11. Remove tag from machine.
12. Notify employees in the area that the equipment is available.

Signature: _____

Authorized Person: _____

Site Supervisor: _____



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ATTACHMENT 7 LOCKOUT/TAGOUT FOR HYDRAULIC EQUIPMENT

Job: _____

Device: _____

Location: _____

Authorized Person: _____

Site Supervisor: _____

PREPARATION FOR SHUTDOWN

1. Determine types and shutoff location
2. Determine if there is more than one energy source
3. Determine magnitude of energy (pressure).
4. Notify affected employees in the area that equipment will be under lockout for maintenance.
5. Shutoff main hydraulic to equipment.

LOCKOUT/TAGOUT

6. Lock and tag main supply in the OFF position.
7. Drain fluids from shutoff valves to equipment.
8. Verify that the hydraulic fluid is disconnected.
9. Block ram or items controlled by the hydraulic system using the appropriate blocking.
10. Repair equipment.

RETURN TO SERVICE

11. Be sure all connections are made and any unused tools and equipment are removed.
12. Remove lock if necessary to verify machine is repaired. Maintenance employee cannot leave the immediate area, while verifying the machine is repaired.
13. Remove tag from machine.
14. Notify employees in the area that the equipment is available.

Signature: _____

Authorized Person: _____

Site Supervisor: _____



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ATTACHMENT 8 LOCKOUT/TAGOUT PROCEDURE FOR SPECIFIC EQUIPMENT

Equipment:

Cat. No. and Location:

Serial Number (if available):

Electrical: Voltage: Location:

Describe:

Air (Type): Location:

Describe:

Gases (Type): Location:

Describe:

Steam (Type): Location:

Describe:

Water: Location:

Describe:

Fluids: Location:

Describe:

Hydraulic: Location:

Describe:

Stored Energy- Capacitors, Springs, Etc.:

Describe:

LOG DATA AND RETURN TO SITE-SUPERVISOR

PROCEDURE

Subject: HEAT STRESS

1.0 PURPOSE AND SUMMARY

This procedure establishes the guidelines to protect employees from the effects of heat related illness. It describes the four major types of heat-induced illnesses, methods of prevention, types of treatment, and includes discussions on the monitoring of heat stress situations.

Some clients may have monitoring requirements that differ from those contained in this procedure. In such circumstances, the more protective monitoring requirements will be followed.

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 - 5.1 Signs, Symptoms, and Treatment
 - 5.1.1 Heat Rash
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- 6.0 Exception Provisions
- 7.0 Cross References
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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.



4.0 DEFINITIONS

Acclimatization - Series of physiological and psychological adjustments that occur in an employee during initial exposures to hot environmental conditions that increase the employee's tolerance to elevated work environment temperature.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Maximum Heart Rate - Amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Maximum heart rate (MHR) is calculated by subtracting an employee's age from 200.

5.0 TEXT

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in deleterious health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, etc., to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn, since these garments prevent evaporative body cooling. Wearing personal protective equipment places employees at considerably higher risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

5.1 Signs, Symptoms, and Treatment

5.1.1 Heat Rash

Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

Treatment: Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.



5.1.2 Heat Cramps

Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can cause painful muscle spasms and pain.

Signs and Symptoms: Muscle spasms and pain in the extremities and abdomen.

Treatment: Remove employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or stroke.

5.1.3 Heat Exhaustion

Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within one hour.

Signs and Symptoms: Weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue.

Treatment: Remove employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continually to remove heat by convection. CAUTION: Do not allow the affected person to become chilled ☞ treat for shock if necessary.

5.1.4 Heat Stroke

Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. **THIS IS A MEDICAL EMERGENCY!**

Signs and Symptoms: Red, hot, dry skin (skin may be wet from previous perspiration particularly when evaporation-preventing clothing is worn); body temperature of 105 degrees Fahrenheit (☞F) or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse.

Treatment: Heat stroke is a true medical emergency. Transportation of the victim to a medical facility must not be delayed. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102☞F). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.



5.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1 percent salt water solution, a commercial mix such as Gatorade, or a combination of these with fresh water.

The replacement fluid temperature should be kept cool, 50 degrees F to 60 degree F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet in the prevention of heat stress and the harmful effects of excessive alcohol and caffeine consumption.

5.3 Monitoring

The initiation of heat stress monitoring will be required when employees are working in environments exceeding 90 degree F ambient air temperature. If employees are wearing impermeable clothing, this monitoring will begin at 78 degree F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT) and physiological. Attachment 2 will be used to record the results of heat stress monitoring.

5.3.1 Wet Bulb Globe Temperature

The WBGT index is the simplest and most suitable technique to measure the environmental factors which most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25.9 degree C (78 degree F), the work regimen in Table 2 of the section "Heat Stress" in the latest edition of the American Conference of Governmental Industrial Hygiene (ACGIH) Threshold Limit Value (TLV) Booklet should be followed.

5.3.2 Physiological

Physiological monitoring can be used in lieu of or in addition to WBGT. It is anticipated that this monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:



- Heart Rate - Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate ($MHR = 200 - \text{age}$) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75 percent of their calculated maximum heart rate.
- Temperature - Each individual will measure his/her oral temperature with a disposable thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6 degrees F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same.
- An individual is not permitted to return to work if his/her temperature exceeds 100.4 degrees F

5.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS051 Tailgate Safety Meetings

8.0 ATTACHMENTS

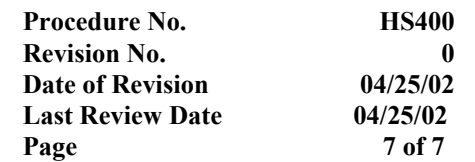
1. Responsibility Matrix
2. Heat Stress Monitoring Record



ATTACHMENT 1
HEAT STRESS

Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Vice President, Health and Safety	Project Supervisor	Health and Safety Representative
Issuance, Revision, and Maintenance of Procedure	3.1	X		
Conduct Monitoring	5.3			X
Inform Employees About Procedure	5.4		X	X



Project/Location _____ Date _____

[illegible]



PROCEDURE

Subject: COLD STRESS

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish the guidelines necessary to protect employees from the adverse health effects caused by exposure to low temperature environments.

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 - 4.1.1 Frostbite
 - 4.1.2 Hypothermia
 - 4.2 Precautionary Measures
 - 4.3 Training
- 5.0 Exception Provisions
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- 7.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The responsibility matrix is Attachment 1.

4.0 TEXT

Most cold related worker fatalities have resulted from failure to escape low air temperatures, or from immersion in low temperature water. Employees should be protected from exposure to cold so that their deep core temperature does not fall below 96.8 degrees Fahrenheit. Core body temperatures below this level will likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

4.1 Signs and Symptoms of Cold Stress



Several factors increase the harmful effects of cold including, being very young or old, wet clothing, having wounds or fractures, smoking, drinking alcoholic beverages, fatigue, emotional stress and certain diseases and medications. The two most prominent adverse effects from exposure to cold temperatures are frostbite and hypothermia. Treatment for cold related injuries should be administered by a person qualified in first aid or a professional medical provider.

4.1.1 Frostbite. Frostbite is the most common injury caused by exposure to cold temperatures. It occurs when cells of the body freeze restricting blood flow and causing tissue damage. The first sign of frostbite is slightly flushed skin which then changes to white or grayish yellow and finally grayish blue. Pain is sometimes initially felt but is often followed by a cold numb feeling.

4.1.2 Hypothermia. Hypothermia is the most severe form of cold stress and results from a drop in the body's core temperature. The initial signs include; shivering, numbness, confusion, weakness, impaired judgement, impaired vision, and drowsiness. Hypothermia victims typically progress through five stages of the condition including; (1) shivering, (2) apathy, (3) loss of consciousness, (4) decreasing pulse and breathing rate, and (5) death.

4.2 Precautionary Measures

It is recommended that employees wear insulated clothing to maintain core temperatures above 96.8 degrees F when working in air temperatures below 40 degrees F. This protective clothing may include but is not limited to:

- Insulated suits, such as whole-body thermal underwear
- Wool or polypropylene socks
- Insulated gloves and boots
- Insulated head cover, such as knit caps, hard hat liners, etc.

When conducting work in air temperatures below 35 degrees F, the following practices shall be followed:

- If the clothing of an employee is expected to become wet, the outer layers of clothing must be impermeable to water.
- If an employee's underclothing becomes wet it must be changed immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.
- Employees will be provided a warm area (65 degrees F or above) to change from work clothing into street clothing and for breaks.
- Hot liquids, such as soups, warm drinks, etc. shall be provided in the break area. The intake of caffeine containing products shall be discouraged due to their diuretic and circulatory effects.



- If appropriate, approved space heaters may be provided in the work area to warm the hands, feet, etc.
- The buddy system shall be practiced. Any employee observed with signs of cold stress shall immediately proceed to the break area.
- Employees will be reminded to layer their clothing, i.e., wear thinner, lighter clothing next to the body with heavier clothing layered outside the inner clothing.
- Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could potentially lead to heat stress situations.
- Auxiliary heated versions of handwear, footwear, etc., can be used in lieu of mittens, insulated socks, etc. if extremely cold conditions exist.
- Employees handling liquids with high evaporation rates (gasoline, hexane, alcohol, etc.) shall take special precautions to avoid soaking of clothing with the liquids because of the added danger of cold injury caused by evaporative cooling.
- Work shall be arranged in such a way that sitting still or standing for long periods is minimized.
- If the air temperature is 20 degrees F or below the hands shall be protected by mittens or gloves prior to contact with cold surfaces such as metal, etc.

Air temperature is not the only factor to be considered while evaluating cold stress situations. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed the greater the risk of experiencing cold related injuries. For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of -25 degrees F or less. The wind chill table provided in attachment two can be used to help assess hazardous conditions attributable to wind chill effects.

4.3 Training

Training on the contents of this procedure will be conducted during tailgate safety meetings held at project or office locations where employees are exposed to cold temperatures. Topics to be discussed during this training will include:

- Proper rewarming procedures and first aid treatment of cold related cases
- Proper clothing practices
- Eating and drinking habits
- Recognition of signs and symptoms of cold stress
- Safe cold weather work practices.



5.0 EXCEPTION PROVISIONS

Variances may be requested as described in procedure HS013; Health and Safety Procedure Variances.

6.0 CROSS REFERENCES

Shaw Environmental & Infrastructure, Inc. (Shaw E & I) Procedure HS051-Tailgate Safety Meetings

Shaw E & I Procedure HS600-Personal Protective Equipment

Threshold Limit Values and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists.

Standard First Aid Workbook, American Red Cross

7.0 ATTACHMENTS

1. Responsibility Matrix
2. Windchill Table



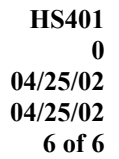
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ATTACHMENT 1 COLD STRESS

Responsibility Matrix

Action	Procedure Section	Employee	Local HS Representative	Vice President Health and Safety
Issuance, revision and maintenance of this procedure	3.1			X
Provide training	4.2		X	
Receive training	4.2	X		



	Actual Temperature Reading (°F)											
Estimated Wind Speed (mph)	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In under an hour with dry skin. Maximum danger is false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.				
	Trenchfoot and immersion foot may occur at any point on this chart.											



PROCEDURE

Subject: HEARING CONSERVATION PROGRAM

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to establish guidelines for the company hearing conservation program. Regulatory requirements mandate that the company administer a hearing conservation program whenever employee sound exposures equal or exceed an 8-hour time-weighted average (TWA) sound level of 85 decibels (dB).

Evidence is well established that worker exposure to sound of sufficient intensity and duration can result in hearing damage. This procedure prescribes the control measures required to prevent employee exposure to excessive sound levels and includes provisions for:

- Monitoring of the workplace to determine employee exposures.
- An audiometric testing program which includes baseline and annual audiograms.
- An employee training and information program.
- Description of various control measures that can be used to decrease exposures.
- Providing hearing protection to all affected employees when administrative or engineering controls fail to reduce sound levels to below the action level.
- Recordkeeping requirements.

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 - 5.2 Monitoring
 - 5.3 Audiometric Testing
 - 5.3.1 Baseline Audiogram
 - 5.3.2 Annual Audiograms
 - 5.4 Employee Training and Information
 - 5.5 Control Measures



- 5.5.1 Sound Control at the Source
- 5.5.2 Sound Control in the Transmission Path
- 5.5.3 Protection for the Receiver
- 5.6 Recordkeeping
- 6.0 Exception Provisions
- 7.0 Cross References
- 8.0 Attachments

3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level - An 8-hour TWA of 85 dB or a dose of 50 percent.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Standard Threshold Shift (STS) - Change in hearing threshold relative to the baseline audiogram of 10 dB or more at 2,000, 3,000, and 4,000 hertz (Hz) in either ear.

5.0 TEXT

5.1 General

The company hearing conservation program will be implemented and protection against the effects of sound exposure will be provided whenever sound levels exceed the action level.

5.2 Monitoring

Monitoring of employee exposures to sound will be conducted whenever it is anticipated that exposure may exceed the action level. This monitoring will be conducted by a qualified individual who, through professional credentials, training, or experience, has the necessary qualifications to specify and use the type of monitoring equipment (area or personal) that will best represent employee exposures. This monitoring will be repeated whenever changes in the work environment lead to the possibility of additional exposures or inadequacy of selected hearing protection. Employees will be provided the opportunity to observe monitoring and will be notified when the results exceed the action level.



Sound level monitoring instrumentation will be operated on the A-weighted scale in slow response mode. Employee sound exposures will be computed in accordance with Attachment 2 and without regard to any attenuation provided by the use of hearing protection.

5.3 Audiometric Testing

Audiometric testing will be provided to all employees exposed at or above the action level. Testing will be in accordance with Procedure HS100, Medical Policies and Procedures.

5.3.1 Baseline Audiogram. Audiometric test results obtained from the pre-hire medical examination will be used as the baseline audiogram. Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace sound. Employees will also be notified of the need to avoid high levels of non-occupational sound exposure during this 14-hour period.

5.3.2 Annual Audiograms. Annual audiograms will be conducted for all employees exposed at or above the action level during the preceding year. Each annual audiogram will be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a STS has occurred.

5.4 Employee Training and Information

All employees who are exposed to sound levels above the action level are required to participate in a formal training program. This program will be presented by a health and safety representative and include, as a minimum, the following information:

- The effects of sound on hearing.
- The purpose of hearing protection; the advantages, disadvantages, and attenuation of various types; and instructions on selection, fitting, use, and care.
- The specific nature of operations which could result in exposure to excessive sound levels.
- The purpose of audiometric testing and an explanation of the test procedures.
- The engineering controls and administrative practices associated with the employee's job assignment.

This training program will be repeated annually. Participating employees are required to complete the Hearing Protection Training Completion Record (Attachment 3). This record will be maintained by the company Training Department in Knoxville. In addition, tailgate safety meetings will be periodically used to instruct employees on the need for hearing protection in designated areas.



The project/location manager will make available to affected employees or their authorized representatives a copy of 29 Code of Federal Regulations (CFR) 1910.95 and will also post a copy in the workplace.

5.5 Control Measures

A straightforward method of controlling sound exposure is to examine the problem in terms of its three basic elements including:

- Sound arises from a source;
- Travels over a path; and
- Affects a receiver or listener.

The solution to a given sound problem might require alteration or modification of any or all of these three basic elements including:

- Modifying the source to reduce its sound output;
- Altering or controlling the transmission path to reduce the sound level reaching the listener; or
- Providing the receiver with hearing protection (but only if the sound source or path cannot be controlled).

5.5.1 Sound Control at the Source. Perhaps the best method for controlling sound at its source is the initial equipment selection process. The following summarizes those features that the buyer should look for and steps to be taken in selecting equipment:

- Low-sound certification.
- Advertisement of “quiet” operation, evidence of sound control design.
- Evidence of “lower” and “slower” operating characteristics.
- Conductance of side-by-side sound tests of equipment.
- Request an “on-site” or “in operation” inspection of mechanical equipment before purchase.

Most mechanical devices are complex sound generators. Though it is impractical to discuss all possible solutions to all sound problems, some general control measures and methods have been provided below:



- Reduce impact or impulse sound by reducing the weight, size, or height of fall of impacting mass.
- Reduce speed in machines and flow velocities and pressure in fluid conveyance systems.
- Balance rotating parts to control machinery sound and vibration of fans, fly wheels, pulleys, cams, shafts, etc.
- Reduce frictional resistance between rotating, sliding, or moving parts by frequent lubrication and proper alignment; static and dynamic balancing of rotating parts; and/or correction of eccentricity or “out-of-roundness” of wheels, gears, rollers, pulleys, etc.
- Reduce resistance in air or fluid systems by use of low flow velocities, smooth surfaces of duct or pipe systems, and long-radius turns and flared sections in pipes, etc., to reduce turbulence.
- Isolate vibration elements in machinery; install motors, pumps, etc., on most massive part of machine; use belt or roller drives in place of gear trains; use flexible hoses and wiring instead of rigid piping and stiff wiring; etc.
- Apply vibration damping materials such as liquid mastics; pads of rubber, felt, foam, or fibrous blankets; or sheet metal viscoelastic laminates or composites to vibrating machine surface.
- Reduce sound leakage from the interior of machines such as compressors by sealing or covering all openings or applying acoustical materials to machine interiors.

5.5.2 Sound Control in the Transmission Path. Another effective way to limit employee exposure to sound is through the use of transmission path controls. These controls may include, but are not necessarily limited to:

- Separation of the sound source and receiver.
- Use of sound absorbing materials on ceiling, floor, or wall surfaces.
- Use of sound barriers and deflectors in the sound path.
- Use of acoustical lining on inside surfaces of passageways, ducts, pipe chases, or electrical channels.



- Use of mufflers or silencers on all gasoline or diesel engines, regardless of size, and particularly on equipment when large quantities of high-pressure, high-velocity gases, liquids, steam, or air are discharged.
- Use vibration isolators and flexible couplers where the sound transmission path is structural in character.

5.5.3 Protection for the Receiver. When engineering controls fail to reduce sound levels to below the action level, hearing protection will be provided. Hearing protection will be provided at no cost to employees and will be replaced as necessary.

Supervisors will ensure that hearing protection is worn by all employees who are exposed at or above the action level. Employees will be given the opportunity to select their hearing protection from a variety of suitable protection devices that attenuate their exposure to the action level or below. Attenuations are determined by subtracting 7 dB from the noise reduction rating (NRR) of the protector and subtracting the remainder from the TWA sound level.

5.6 Recordkeeping

The company will maintain records of all audiometric test records required by this procedure and retain them for at least the following periods:

- Sound exposure measurement records will be retained for two (2) years.
- Audiometric test records will be retained for the duration of the affected employee's employment.

All records required by this procedure will be provided upon request to employees, former employees, representatives designated by the individual employee, and any authorized government representative.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HS013 Health and Safety Procedure Variances
HS100 Medical Policies and Procedures

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Sound Exposure Computation
3. Hearing Protection Training Completion Record



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ATTACHMENT 1
HEARING CONSERVATION PROGRAM

Responsibility Matrix

Action	Procedure Section	Responsible Party		
		Health and Safety Representative	Project/Location Manager	Vice President, Health and Safety
Issue, Revise, and Maintain Procedure	3.1			X
Monitor Employee Exposures	5.2	X		
Provide Training	5.4	X		
Make Available/Post 29 CFR 1910.95	5.4		X	



ATTACHMENT 2

SOUND EXPOSURE COMPUTATION

Computation of Employee Sound Exposure

- A. Sound dose is computed using Table 1 as follows:

When the sound level is constant over the entire work shift, the sound dose (D), in percent, is given by:

$$D = 100 C/T$$

Where C is the total length of the work day, in hours, and T is given in Table 1.

- B. When the work shift sound exposure is composed of two or more periods of sound at different levels, the total sound dose over the work day is given by:

$$D = 100 (C_1/T_1 + C_2/T_2 \dots + C_n/T_n)$$

Where C_n indicates the total time of exposure at a specific sound level and T_n indicates the reference duration for that level as given by Table 1.

- C. The eight-hour TWA sound level, in decibels, may be computed from the dose, in percent, by means of the formula:

$$TWA = 16.61 \log_{10} (D/100) + 90$$

For an eight-hour work shift with the sound level constant over the entire shift, the TWA is equal to the measured sound level.

Conversion Between ◀Dose▶ and ◀8-Hour TWA▶ Sound Level

Sound exposure is usually measured with an audio dosimeter which gives a readout in terms of “dose.” Dosimeter readings can be converted to an 8-hour TWA sound level.

In order to convert the reading of a dosimeter into TWA, use Table 2. This table applies to dosimeters that are set to calculate dose or percent exposure according to the relationships in Table 1. So, for example, a dose of 91 percent over an 8-hour day results in a TWA of 89.3 decibels and a dose of 50 percent corresponds to a TWA of 85 decibels.

If the dose as read on the dosimeter is less than or greater than the values found in Table 2, the TWA may be calculated by using the formula:

$$TWA = 16.61 \log_{10} (D/100) + 90$$

Where TWA equals 8-hour TWA sound level and D equals accumulated dose in percent exposure.



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Table 1
Permissible Sound Exposure

A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)	A-Weighted Sound Level (decibels)	Permitted Duration Per Workday (T) (hours)
80	32.0	106	0.87
81	27.9	107	0.76
82	24.3	108	0.66
83	21.1	109	0.57
84	18.4	110	0.50
85	16.0	111	0.44
86	13.9	112	0.38
87	12.1	113	0.33
88	10.6	114	0.29
89	9.2	115	0.25
90	8.0	116	0.22
91	7.0	117	0.19
92	6.1	118	0.16
93	5.3	119	0.14
94	4.6	120	0.125
95	4.0	121	0.11
96	3.5	122	0.095
97	3.0	123	0.082
98	2.6	124	0.072
99	2.3	125	0.063
100	2.0	126	0.054
101	1.7	127	0.047
102	1.5	128	0.041
103	1.3	129	0.036
104	1.1	130	0.031
105	1.0		



Table 2
Conversion From ◀Percent Sound Exposure▶ or ◀Dose▶ To ◀8-Hour TWA Sound Level▶

Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA	Dose or Percent Sound Exposure (D)	TWA
10	73.4	104	90.3	260	96.9	640	103.4
15	76.3	105	90.4	270	97.2	650	103.5
20	78.4	106	90.4	280	97.4	660	103.6
25	80.0	107	90.5	290	97.7	670	103.7
30	81.3	108	90.6	300	97.9	680	103.8
35	82.4	109	90.6	310	98.2	690	103.9
40	83.4	110	90.7	320	98.4	700	104.0
45	84.2	111	90.8	330	98.6	710	104.1
50	85.0	112	90.8	340	98.8	720	104.2
55	85.7	113	90.9	350	99.0	730	104.3
60	86.3	114	90.9	360	99.2	740	104.4
65	86.9	115	91.1	370	99.4	750	104.5
70	87.4	116	91.1	380	99.6	760	104.6
75	87.9	117	91.1	390	99.8	770	104.7
80	88.4	118	91.2	400	100.0	780	104.8
81	88.5	119	91.3	410	100.2	790	104.9
82	88.6	120	91.3	420	100.4	800	105.0
83	88.7	125	91.6	430	100.5	810	105.1
84	88.7	130	91.9	440	100.7	820	105.2
85	88.8	135	92.2	450	100.8	830	105.3
86	88.9	140	92.4	460	101.0	840	105.4
87	89.0	145	92.7	470	101.2	850	105.4
88	89.1	150	92.9	480	101.3	860	105.5
89	89.2	155	93.2	490	101.5	870	105.6
90	89.2	160	93.2	500	101.6	880	105.7
91	89.3	165	93.6	510	101.8	890	105.8
92	89.4	170	93.8	520	101.9	900	105.8
93	89.5	175	94.0	530	102.0	910	105.9
94	89.6	180	94.2	540	102.2	920	106.0
95	89.6	185	94.4	550	102.3	930	106.1
96	89.7	190	94.6	560	102.4	940	106.2
97	89.8	195	94.8	570	102.6	950	106.2
98	89.9	200	95.0	580	102.7	960	106.3
99	89.9	210	95.4	590	102.8	970	106.4
100	90.0	220	95.7	600	102.9	980	106.5
101	90.1	230	96.0	610	103.0	990	106.5
102	90.1	240	96.3	620	103.2	999	106.6
103	90.2	250	96.6	630	103.3		



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ATTACHMENT 3

HEARING PROTECTION TRAINING COMPLETION RECORD

INITIAL

1. I have been informed about the health hazards associated with exposure to excessive sound levels and its potential effect on hearing.
2. I have been informed about the types of work that may result in exposure to excessive sound levels, and the necessary protective steps to prevent excessive exposure, including engineering controls and administrative practices.
3. I understand the purpose for, proper use, and limitations of hearing protection devices, and I have received instructions on selection, fitting, use, and care of such devices.
4. I have been informed about the purpose of audiometric testing and an explanation of the test procedures.
5. Copies of the applicable regulations governing occupational exposure to excessive sound have been made available to me.

PRINT NAME: _____

SIGNATURE: _____

EMPLOYEE NUMBER: _____

DATE: _____

Please File Completed Forms and Forward a Copy to the Knoxville Training Department



PROCEDURE

Subject: CADMIUM COMPLIANCE PLAN

1.0 PURPOSE AND SUMMARY

The purpose of this document is to provide associate protection against cadmium, and to comply with the OSHA requirement for a written compliance plan. It essentially duplicates OSHA language in the Shaw Environmental & Infrastructure, Inc. (Shaw E & I) format and should be referenced (not duplicated) in applicable HASPs.

Key provisions include:

- \$ Definitions
- \$ Exposure monitoring
- \$ Regulated areas
- \$ Methods of compliance
- \$ Compliance program
- \$ Respiratory Protection (exposures > 10 x PEL require quantitative fit testing)
- \$ Personal Protective Equipment
- \$ Hygiene practices
- \$ Medical requirements
- \$ Hazard Communication
- \$ Recordkeeping
- \$ Observation of monitoring
- \$ Reporting requirements

It is the responsibility of the Project Manager (PM) and Site Safety Officer (SSO) to implement the provisions of this document as appropriate for a particular project. This document shall work in conjunction with the site-specific HASP to form a complete site plan. Topics which must be addressed in the site-specific HASP are listed below:

- \$ Describe each operation or task where cadmium is or may be emitted.
- \$ Describe the specific means (work practices, equipment, etc.) that will be used to comply with this plan.
- \$ Describe the technologies considered to keep exposures below the Permissible Exposure Limit.
- \$ Results and sources of any previous air monitoring, if any.
- \$ Briefly describe how and when engineering and administrative controls will be implemented, if any.
- \$ Work practices for emergency situations.
- \$ Personal protective equipment requirements.
- \$ Hygiene facilities.
- \$ Emergency contingency planning.
- \$ Specific identity of the competent person(s).



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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Corporate Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Action Level (AL) is defined as an airborne concentration of cadmium of 2.5 micrograms per cubic meter of air (2.5 Fg/m³), calculated as an 8-hour time-weighted average (TWA).

Associate exposure and similar language referring to the air cadmium level to which an associate is exposed means the exposure to airborne cadmium that would occur if the associate were not using respiratory protective equipment.



Authorized person means any person authorized by the company and required by work duties to be present in regulated areas or any person authorized by the OSH Act or regulations issued under it.

Chief means the Chief of the Division of Occupational Safety and Health (OSHA), or designee.

Competent person means a person who is capable of identifying existing and potential cadmium hazards in the workplace and the proper methods to control them in order to protect workers, and has the authority necessary to take prompt corrective measures to eliminate or control such hazards. The duties of a competent person include at least the following: determining prior to the performance of work whether cadmium is present in the workplace; establishing, where necessary, regulated areas and assuring that access to and from those areas is limited to authorized associates; assuring the adequacy of any associate exposure monitoring required by the standard; verifying that associates exposed to air cadmium levels above the PEL wear appropriate personal protective equipment and are trained in the use of appropriate methods of exposure control; verifying that proper hygiene facilities are provided and that workers are trained to use those facilities; and verifying that the engineering controls required by this standard are implemented, maintained in proper operating condition, and functioning properly. Generally, this will be a member of the Shaw E & I HS staff.

Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which results in an unexpected and potentially hazardous release of cadmium.

Final medical determination is the written medical opinion of the associate's health status by the examining physician under sections 58.3-.12 or, if multiple physician review under section 5.8.13 or the alternative physician determination under section 5.8.14 is involved, it is the final, written medical finding, recommendation or determination that emerges from that process.

High-efficiency particulate air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

NIOSH means the Director of the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.

Permissible Exposure Limit (PEL) means an airborne concentration of cadmium of 5 micrograms per cubic meter of air (5 Fg/m^3), calculated as an 8-hour time-weighted average exposure (TWA).

Regulated area means an area demarcated by the company where an associate's exposure to airborne concentrations of cadmium exceeds, or can reasonably be expected to exceed the permissible exposure limit (PEL).

5.0 TEXT

This procedure applies to all occupational exposures to cadmium and cadmium compounds, in all forms, in all construction work where an associate may potentially be exposed to cadmium.



Construction work is defined as work involving construction, alteration and/or repair, including but not limited to the following:

1. Wrecking, demolition or salvage of structures where cadmium or materials containing cadmium are present;
2. Use of cadmium containing-paints and cutting, brazing, burning, grinding or welding on surfaces that were painted with cadmium-containing paints;
3. Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain cadmium, or materials containing cadmium;
4. Cadmium welding; cutting and welding cadmium-plated steel; brazing or welding with cadmium alloys;
5. Installation of products containing cadmium;
6. Electrical grounding with cadwelding, or electrical work using cadmium-coated conduit;
7. Maintaining or retrofitting cadmium-coated equipment;
8. Cadmium contamination/emergency cleanup; and
9. Transportation, disposal, storage, or containment of cadmium or materials containing cadmium on the site or location at which construction activities are performed.

5.1 Exposure Monitoring

5.1.1 General. Prior to performance of any construction work where associates may be potentially exposed to cadmium, establish the applicability of this standard by determining whether cadmium is present in the workplace and whether there is the possibility that associate exposures will be at or above the action level. The Project Manager shall designate a competent person who will make this determination. Investigation and material testing techniques shall be used, as appropriate, in the determination. Investigation shall include a review of relevant plans, past reports, material safety data sheets, and other available records, and consultations with the property owner and discussions with appropriate individuals and agencies.

Where cadmium has been determined to be present in the workplace, and it has been determined that there is a possibility the associate's airborne exposure will be at or above the action level, the competent person shall identify associates potentially exposed to cadmium at or above the action level.

Determinations of associate exposure shall be made from breathing-zone air samples that reflect the monitored associate's regular, daily 8-hour TWA exposure to cadmium.



Eight-hour TWA exposures shall be determined for each associate on the basis of one or more personal breathing-zone air samples reflecting full shift exposure on each shift, for each job classification, in each work area. Where several associates perform the same job tasks, in the same job classification, on the same shift, in the same work area, and the length, duration, and level of cadmium exposures are similar, sample a representative fraction of the associates instead of all associates in order to meet this requirement. In representative sampling, the company shall sample the associate(s) expected to have the highest cadmium exposures.

- 5.1.2 Specific.** During initial monitoring, where a determination shows the possibility of associate exposure to cadmium at or above the action level, the company shall immediately conduct exposure monitoring that is representative of the exposure for each associate in the workplace who is or may be exposed to cadmium at or above the action level (see 29 CFR 1910.1027, Appendix E).

In addition, if the associate periodically performs tasks that may expose the associate to a higher concentration of airborne cadmium, the associate shall be monitored while performing those tasks.

Where we have objective data, demonstrating that associate exposure to cadmium will not exceed airborne concentrations at or above the action level under the expected conditions of processing, use, or handling, we may rely upon such data instead of implementing initial monitoring.

Where a determination is made that a potentially exposed associate is not exposed to airborne concentrations of cadmium at or above the action level, the PM or SSO shall make a written record of such determination. The record shall include data developed and shall also include the date of determination, and the name and social security number of each associate.

- 5.1.3 Monitoring Frequency (Periodic Monitoring).** If the initial monitoring or periodic monitoring reveal exposures to be at or above the action level, monitoring will be conducted at a frequency and pattern needed to assure that the monitoring results reflect with reasonable accuracy the associate's typical exposure levels, given the variability in the tasks performed, work practices, and environmental conditions on the job site, and to assure the adequacy of respiratory selection and the effectiveness of engineering and work practice controls.

If the initial monitoring or the periodic monitoring indicates that exposures are below the action level and that result is confirmed by the results of another monitoring taken at least seven days later, the SSO may discontinue the monitoring for those associates whose exposures are represented by such monitoring.



5.1.4 Additional Monitoring. The PM shall institute the initial exposure monitoring required whenever there has been a change in the raw materials, equipment, personnel, work practices, or finished products that may result in additional associates being exposed to cadmium at or above the action level or in associates already exposed to cadmium at or above the action level being exposed above the PEL, or whenever the competent person has any reason to suspect that any other change might result in such further exposure.

5.1.5 Associate Notification of Monitoring Results. No later than five working days after the receipt of the results of any monitoring performed under this section, the SSO shall notify each affected associate individually in writing of the results. In addition, within the same time period, the SSO shall post the results of the exposure monitoring in an appropriate location that is accessible to all affected associates.

Wherever monitoring results indicate that associate exposure exceeds the PEL, the SSO shall include in the written notice a statement that the PEL has been exceeded and a description of the corrective action being taken by the company to reduce associate exposure to or below the PEL.

5.1.6 Accuracy of Measurement. The company shall use a method of monitoring and analysis that has an accuracy of not less than plus or minus 25 percent ("25%"), with a confidence level of 95 percent, for airborne concentrations of cadmium at or above the action level and the permissible exposure limit.

5.2 Regulated Areas

The company shall establish a regulated area wherever an associate's exposure to airborne concentrations of cadmium is, or can reasonably be expected to be in excess of the permissible exposure limit (PEL).

Regulated areas shall be demarcated from the rest of the workplace in any manner that adequately establishes and alerts associates of the boundaries of the regulated area, including associates who are or may be incidentally in the regulated areas, and that protects persons outside the area from exposure to airborne concentrations of cadmium in excess of the PEL.

Access to regulated areas shall be limited to authorized persons.

Each person entering a regulated area shall be supplied with and required to use a respirator, selected in accordance with section 5.5.

The company shall assure that associates do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas, or carry the products associated with any of these activities into regulated areas or store such products in those areas.



5.3 **Methods of Compliance/Compliance Hierarchy**

Except as specified below, the PM shall implement engineering and work practice controls to reduce and maintain associate exposure to cadmium at or below the PEL, except to the extent that it can be demonstrated that such controls are not feasible.

The requirement to implement engineering controls to achieve the PEL does not apply where it can be demonstrated that:

1. The associate is only intermittently exposed; and
2. The associate is not exposed above the PEL on 30 or more days per year (12 consecutive months)

Wherever engineering and work practice controls are not sufficient to reduce associate exposure to or below the PEL, the company nonetheless shall implement such controls to reduce exposures to the lowest achievable levels. Such controls shall be supplemented with respiratory protection.

Use of associate rotation as a method of compliance is prohibited.

High speed abrasive disc saws and similar abrasive power equipment shall not be used for work on cadmium or cadmium-containing materials unless they are equipped with appropriate engineering controls to minimize emissions, if the exposure levels are above the PEL.

Materials containing cadmium shall not be applied by spray methods, if exposures are above the PEL, unless associates are protected with supplied-air respirators with full face piece, hood, helmet, suit, operated in positive pressure mode and measures are instituted to limit overspray and prevent contamination of adjacent areas.

Mechanical Ventilation

When ventilation is used to control exposure, measurements that demonstrate the effectiveness of the system in controlling exposure, such as capture velocity, duct velocity, or static pressure shall be made as necessary to maintain its effectiveness.

Measurements of the system's effectiveness in controlling exposure shall be made as necessary within five working days of any change in production, process, or control that might result in a significant increase in associate exposure to cadmium.

If air from exhaust ventilation is recirculated into the workplace, the system shall have a high efficiency filter and be monitored to assure effectiveness.

If mechanical ventilation is used, procedures shall be developed and implemented to minimize associate exposure to cadmium when maintenance of ventilation systems and changing of filters is being conducted.



5.4 Compliance Program

Written compliance programs shall be reviewed and updated at least annually, but as often and as promptly as necessary to reflect significant changes in compliance status or significant changes in the lowest air cadmium level that is technologically feasible.

A competent person shall review the comprehensive compliance program initially and after each change.

5.5 Respirator Protection

5.5.1 General. Where respirators are required, they shall be provided at no cost to the associate and the PM shall assure that they are used in compliance with the requirements. Respirators shall be used in the following circumstances:

- \$ Where exposure levels exceed the PEL, during the time period necessary to install or implement feasible engineering and work practice controls;
- \$ In those maintenance and repair activities and during those brief or intermittent operations where exposures exceed the PEL and engineering and work practice controls are not feasible, or are not required;
- \$ In regulated areas;
- \$ Where all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL;
- \$ In emergencies;
- \$ Wherever an associate who is exposed to cadmium at or above the action level requests a respirator; and
- \$ Wherever an associate is exposed to cadmium above the PEL and engineering controls are not required.

5.5.2 Respirator Selection. Where respirators are required, the SSO shall select and provide the appropriate respirator as specified below. Respirators will be selected from among those jointly approved as acceptable protection against cadmium dust, fume, and mist by the Mine Safety and Health Administration (MSHA) and by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11 and Shaw E & I Procedure HS601.

The SSO shall provide a powered, air-purifying respirator (PAPR) in lieu of a negative pressure respirator wherever:

- (1) An associate entitled to a respirator chooses to use this type of respirator; and
- (2) This respirator will provide adequate protection.
- (3) **Respirator Program**
Where respiratory protection is required, the provisions of HS601 shall be followed.



RESPIRATORY PROTECTION FOR CADMIUM

Airborne Concentration or Condition of Use ^a (1)	Required Respirator Type ^b (2)
10 X or less	A half mask, air-purifying respirator equipped with a HEPA ^{c(3)} filter ^{d(4)}
25 X or less	A powered air-purifying respirator ('PAPR') with a loose-fitting hood or helmet equipped with a HEPA filter, or a supplied-air respirator with a loose-fitting hood or helmet face piece operated in the continuous flow mode
50 X or less	A full face piece air-purifying respirator equipped with a HEPA filter, or a powered air-purifying respirator with a tight-fitting half mask equipped with a HEPA filter, or a supplied air respirator with a tight-fitting half mask operated in the continuous flow mode
250 X or less	A powered air-purifying respirator with a tight-fitting full face piece equipped with a HEPA filter, or supplied-air respirator with a tight-fitting full face piece operated in the continuous flow mode
1000 X or less	A supplied-air respirator with half mask or full face piece operated in the pressure demand or other positive pressure mode
1000 X or unknown	A self-contained breathing apparatus with unknown concentrations, a full face piece operated in the pressure demand or other positive pressure mode, or a supplied-air respirator with a full face piece operated in the pressure demand or other positive pressure mode and equipped with an auxiliary escape type self-contained breathing apparatus operated in the pressure demand mode

^a Concentrations expressed as multiple of the PEL.

^b Respirators assigned for higher environmental concentrations may be used at lower exposure levels. Quantitative fit testing is required for all tight-fitting air purifying respirators where airborne concentration of cadmium exceeds 10 times the TWA PEL (10 x 5 m/m³ = 50 m/m³). A full face piece respirator is required when eye irritation is experienced.

^c HEPA means High Efficiency Particulate Air.

^d Fit testing, qualitative or quantitative, is required.



5.5.3 Respirator Fit Testing. For each associate wearing a tight-fitting, air purifying respirator (either negative or positive pressure) who is exposed to airborne concentrations of cadmium that do not exceed 10 times the PEL ($10 \times 5 \text{ mg/m}^3 = 50 \text{ mg/m}^3$), either quantitative or qualitative fit test will be performed at the time of initial fitting and at least annually thereafter. If quantitative fit testing is used for a negative pressure respirator, a fit factor that is at least 10 times the protection factor for that class of respirators shall be achieved at testing.

For each associate wearing a tight-fitting air purifying respirator (either negative or positive pressure) who is exposed to airborne concentrations of cadmium that exceed 10 times the PEL ($10 \times 5 \text{ mg/m}^3 = 50 \text{ mg/m}^3$), the company shall perform quantitative fit testing at the time of initial fitting and at least annually thereafter. For negative-pressure respirators, a fit factor that is at least ten times the protection factor for that class of respirators shall be achieved during quantitative fit testing.

For each associate wearing a tight-fitting, supplied-air respirator or self-contained breathing apparatus, the company shall perform quantitative fit testing at the time of initial fitting and at least annually thereafter. This shall be accomplished by fit testing an air purifying respirator of identical type face piece, make, model, and size as the supplied air respirator or self-contained breathing apparatus that is equipped with HEPA filters and tested as a surrogate (substitute) in the negative pressure mode. A fit factor that is at least 10 times the protection factor for that class of respirators shall be achieved during quantitative fit testing. A supplied-air respirator or self-contained breathing apparatus with the same type face piece, make, model, and size as the air purifying respirator with which the associate passed the quantitative fit test may then be used by that associate up to the protection factor listed for that class of respirators.

Fit testing shall be conducted in accordance with 29 CFR 1910.1027, Appendix C.

Emergency Situations

Each project-specific HASP shall provide for dealing with emergency situations involving substantial releases of airborne cadmium. The plan shall include provisions for the use of appropriate respirators and personal protective equipment. In addition, associates not essential to correcting the emergency situation shall be restricted from the area and normal operations halted in that area until the emergency is abated.

5.6 Protective Work Clothing and Equipment

5.6.1 Provision and Use. If an associate is exposed to airborne cadmium above the PEL or where skin or eye irritation is associated with cadmium exposure at any level, the PM shall provide at no cost to the associate, and assure that the associate uses, appropriate protective work clothing and equipment that prevent



contamination of the associate. Protective work clothing and equipment includes, but is not limited to:

- \$ Coveralls or similar full-body work clothing;
- \$ Gloves, head coverings, and boots or foot coverings; and
- \$ Face shields, vented goggles, or other appropriate protective equipment.

5.6.2 Removal and Storage. Associates shall remove all protective clothing and equipment contaminated with cadmium at the completion of the work shift and do so only in change rooms.

No associate may take cadmium-contaminated protective clothing or equipment from the workplace, except for associates authorized to do so for purposes of laundering, cleaning, maintaining, or disposing of cadmium-contaminated protective clothing and equipment at an appropriate location or facility away from the workplace.

Contaminated protective clothing and equipment, when removed for laundering, cleaning, maintenance, or disposal, must be placed and stored in sealed, impermeable bags or other closed, impermeable containers that are designed to prevent dispersion of cadmium dust.

Containers of contaminated protective clothing and equipment that are to be taken out of the change rooms or the workplace for laundering, cleaning, maintenance or disposal shall bear labels in accordance with section 5.9.3.

5.6.3 Cleaning, Replacement, and Disposal. Provide the protective clothing and equipment in a clean and dry condition as often as necessary to maintain its effectiveness, but in any event at least weekly. The PM is responsible for cleaning and laundering the protective clothing and equipment to maintain its effectiveness and is also responsible for disposing of such clothing and equipment

The PM also is responsible for repairing or replacing required protective clothing and equipment as needed to maintain its effectiveness. When rips or tears are detected while an associate is working they shall be immediately mended, or the worksuit shall be immediately replaced.

The removal of cadmium from protective clothing and equipment by blowing, shaking, or any other means that disperses cadmium into the air is prohibited.

Laundering of contaminated clothing or cleaning of contaminated equipment in the workplace will be done in a manner that prevents the release of airborne cadmium in excess of the permissible exposure limit.

Any person who launders or cleans protective clothing or equipment contaminated with cadmium will be informed of the potentially harmful effects



of exposure to cadmium, and that the clothing and equipment should be laundered or cleaned in a manner to effectively prevent the release of airborne cadmium in excess of the PEL.

5.7 Hygiene Areas and Practices

5.7.1 General. For associates whose airborne exposure to cadmium is above the PEL, provide clean change rooms, handwashing facilities, showers, and lunchroom facilities.

5.7.2 Change Rooms. Change rooms must be equipped with separate storage facilities for street clothes and for protective clothing and equipment, which are designed to prevent dispersion of cadmium and contamination of the associate's street clothes (see also 29 CFR 1910.141).

5.7.3 Showers and Handwashing Facilities. Associates whose airborne exposure to cadmium is above the PEL must shower during the end of the work shift.

Associates who are exposed to cadmium above the PEL must wash their hands and faces prior to eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics.

5.7.4 Lunchroom Facilities. Lunchroom facilities must be readily accessible to associates, tables for eating must be maintained free of cadmium, and no associate in a lunchroom facility may be exposed at any time to cadmium at or above a concentration of 2.5 mg/m³.

Associates may not enter lunchroom facilities with protective work clothing or equipment unless surface cadmium has been removed from the clothing and equipment by HEPA vacuuming or some other method that removes cadmium dust without dispersing it.

5.7.5 Housekeeping. All surfaces shall be maintained as free as practicable of accumulations of cadmium.

All spills and sudden releases of material containing cadmium shall be cleaned up as soon as possible.

Surfaces contaminated with cadmium shall, wherever possible, be cleaned by vacuuming or other methods that minimize the likelihood of cadmium becoming airborne.

HEPA-filtered vacuuming equipment or equally effective filtration methods shall be used for vacuuming. The equipment shall be used and emptied in a manner that minimizes the reentry of cadmium into the workplace.



Shoveling, dry or wet sweeping, and brushing may be used only where vacuuming or other methods that minimize the likelihood of cadmium becoming airborne have been tried and found not to be effective.

Compressed air shall not be used to remove cadmium from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the dust cloud created by the compressed air.

Waste, scrap, debris, bags, containers, personal protective equipment, and clothing contaminated with cadmium and consigned for disposal shall be collected and disposed of in sealed impermeable bags or other closed, impermeable containers. These bags and containers shall be labeled in accordance with Section 5.9.3.

5.8 Medical Surveillance

5.8.1 General. Currently exposed - A medical surveillance program shall be instituted for all associates who are or may be exposed at or above the action level and all associates who perform the following tasks, operations or jobs: remediation of cadmium containing wastes, electrical grounding with cadwelding; cutting, brazing, burning, grinding or welding on surfaces that were painted with cadmium -containing paints; electrical work using cadmium-coated conduit; use of cadmium containing paints; cutting and welding cadmium-plated steel; brazing or welding with cadmium alloys; fusing of reinforcing steel by cadmium welding; maintaining or retrofitting cadmium-coated equipment; and, wrecking and demolition where cadmium is present. A medical surveillance program will not be required if the associate:

- \$** Is not currently exposed by the company to airborne concentrations of cadmium at or above the action level on 30 or more days per year (twelve consecutive months); and,
- \$** Is not currently exposed by the company in those tasks on 30 or more days per year (twelve consecutive months).

Previously exposed - A medical surveillance program shall be instituted for all associates who might previously have been exposed to cadmium prior to the effective date of this standard in tasks specified under above, unless the company demonstrates that the associate did not in the years prior to the effective date of this section work in those tasks with exposure to cadmium for an aggregated total of more than 12 months.

To determine an associate's fitness for using a respirator, the company shall provide the limited medical examination specified in section 5.5.

The company shall assure that all medical examinations and procedures required by this section are performed by or under the supervision of a licensed physician, who has read and is familiar with the health effects section of 29 CFR 1910.1027,



Appendix A, the regulatory text of this section, the protocol for sample handling and lab selection in 29 CFR 1910.1027, Appendix F, and the questionnaire of 29 CFR 1910.1027, Appendix D.

The company shall provide the medical surveillance required by this section, including multiple physician review without cost to associates, and at a time and place that is reasonable and convenient to associates.

The company shall assure that the collecting and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (b2-M) taken from associates under this section is done in a manner that assures their reliability and that analysis of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (b2-M) taken from associates under this section is performed in laboratories with demonstrated proficiency to perform the particular analysis. (See 29 CFR 1910.1027, Appendix F)

5.8.2 Initial Examination. For associates covered by medical surveillance, the company shall provide an initial medical examination. The examination shall be provided to those associates within 30 days after initial assignment to a job with exposure to cadmium.

The initial medical examination shall include:

- \$ A detailed medical and work history, with emphasis on:
- \$ Past, present, and anticipated future exposure to cadmium;
- \$ Any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculo-skeletal system dysfunction;
- \$ Current usage of medication with potential nephrotoxic side-effects;
- \$ Smoking history and current status; and
- \$ Biological monitoring that includes the following tests:
 - a. Cadmium in urine (CdU), standardized to grams of creatinine (g/Cr);
 - b. Beta-2 microglobulin in urine (b2-M), standardized to grams of creatinine (g/Cr), with pH specified, as described in 29 CFR 1910.1027, Appendix F; and
 - c. Cadmium in blood (CdB), standardized to liters of whole blood (lwb).

Recent Examination: An initial examination is not required to be provided if adequate records show that the associate has been examined in accordance with the requirements of this section within the past 12 months. In that case, such records shall be maintained as part of the associate's medical record and the prior exam shall be treated as if it were an initial examination.



5.8.3 Actions Triggered by Initial Biological Monitoring. If the results of the biological monitoring tests in the initial examination show the associate's CdU level to be at or below 3 mg/g Cr, b2-M level to be at or below 300 mg/g Cr and CdB level to be at or below 5 mg/lwb, then:

1. For associates who are subject to medical surveillance because of current or anticipated exposure to cadmium, the company shall provide the minimum level of periodic medical surveillance.
2. For associates who are subject to medical surveillance because of prior but not current exposure, the company shall provide biological monitoring for CdU, b2-M, and CdB within one year after the initial biological monitoring and then follow the requirements for periodic medical surveillance.

For all associates who are subject to initial medical surveillance if the results of the initial biological monitoring tests show the level of CdU to exceed 3 mg/g Cr, the level of b2-M to be in excess of 300 mg/g Cr, or the level of CdB to be in excess of 5 mg/lwb, the company shall:

1. Within two weeks after receipt of biological monitoring results, reassess the associate's occupational exposure to cadmium as follows:
 - \$ Reassess the associate's work practices and personal hygiene;
 - \$ Reevaluate the associate's respirator use, if any, and the respirator program;
 - \$ Review the hygiene facilities;
 - \$ Reevaluate the maintenance and effectiveness of the relevant engineering controls; and
 - \$ Assess the associate's smoking history and status;
2. Within 30 days after the exposure reassessment, take reasonable steps to correct any deficiencies found in the reassessment that may be responsible for the associate's excess exposure to cadmium; and,
3. Within 90 days after receipt of biological monitoring results, provide a full medical examination to the associate. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the associate. If the physician determines that medical removal is not necessary, then until the associate's CdU level falls to or below 3 mg/g Cr, b2-M level falls to or



below 300 mg/g Cr and CdB level falls to or below 5 mg/lwb, the company shall:

- \$ Provide biological monitoring in accordance with section 5.8.2. on a semiannual basis; and
- \$ Provide annual medical examinations in accordance with section 5.8.4.

For all associates who are subject to medical surveillance under section 5.8.1 (Current), if the results of the initial biological monitoring tests show the level of CdU to be in excess of 15 mg/g Cr, or the level of CdB to be in excess of 15 mg/lwb, or the level of b2-M to be in excess of 1,500 mg/g Cr, the company shall comply with the requirements of section 5.8.3. Within 90 days after receipt of biological monitoring results, the company shall provide a full medical examination. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the associate. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 15 mg/g Cr, or CdB exceeds 15 mg/lwb; or b2-M exceeds 1500 mg/g Cr, and in addition CdU exceeds 3 mg/g Cr or CdB exceeds 5 mg/liter of whole blood, then the physician shall medically remove the associate from exposure to cadmium at or above the action level. If the second set of biological monitoring results obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the associate is not required to be removed by the mandatory provisions of this section. If the associate is not required to be removed by the mandatory provisions of this section or by the physician's determination, then until the associate's CdU level falls to or below 3 mg/g Cr, b2-M level falls to or below 300 mg/g Cr and CdB level falls to or below 5 mg/lwb, the company shall:

1. Periodically reassess the associate's occupational exposure to cadmium;
2. Provide biological monitoring on a quarterly basis; and
3. Provide semiannual medical examinations.

For all associates to whom medical surveillance is provided, beginning on January 1, 1999, whenever the results of initial biological monitoring tests show the associate's CdU level to be in excess of 7 mg/g Cr, or b2-M level to be in excess of 750 mg/g Cr, or CdB level to be in excess of 10 mg/lwb, the company shall comply with the requirements of section 5.8.3 for initial surveillance. Within 90 days after receipt of biological monitoring results, the company shall provide a full medical examination to the associate. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the associate. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 7 mg/g Cr; or CdB exceeds 10 mg/lwb; or b2-M exceeds 750 mg/g Cr, and in addition



CdU exceeds 3 mg/g Cr or CdB exceeds 5 mg/liter of whole blood, then the physician shall medically remove the associate from exposure to cadmium at or above the action level. If the second set of biological monitoring results obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the associate is not required to be removed by the mandatory provisions of this section. If the associate is not required to be removed by the mandatory provisions of this section or by the physician's determination, then until the associate's CdU level falls to or below 3 mg/g Cr, b2-M level falls to or below 300 mg/g Cr and CdB level falls to or below 5 mg/lwb, the company shall:

1. Periodically reassess the associate's occupational exposure to cadmium;
2. Provide biological monitoring on a quarterly basis; and
3. Provide semiannual medical examinations.

5.8.4 Periodic Medical Surveillance. For each associate who is covered by initial medical surveillance because of current or anticipated exposure to cadmium, the company shall provide at least the minimum level of periodic medical surveillance, which consists of periodic medical examinations and periodic biological monitoring. A periodic medical examination shall be provided within one year after the initial examination and thereafter at least biennially. Biological sampling shall be provided at least annually either as part of a periodic medical examination or separately as periodic biological monitoring.

The periodic medical examination shall include:

1. A detailed medical and work history, or update thereof, with emphasis on: past, present and anticipated future exposure to cadmium; smoking history and current status; reproductive history; current use of medications with potential nephrotoxic side-effects; any history of renal, cardiovascular, respiratory, hematopoietic, and/or musculo-skeletal system dysfunction; and as part of the medical and work history, for associates who wear respirators, questions 3-11 and 25-32 in 29 CFR 1910.1027, Appendix D;
2. A complete physical examination with emphasis on: blood pressure, the respiratory system, and the urinary system;
3. A 14 inch by 17 inch, or a reasonably standard sized posterior-anterior chest X-ray (after the initial X-ray, the frequency of chest X-rays is to be determined by the examining physician);
4. Pulmonary function tests, including forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV1);
5. Biological monitoring;



6. Blood analysis, including blood urea nitrogen, complete blood count, and serum creatinine;
7. Urinalysis, including the determination of albumin, glucose, and total and low molecular weight proteins;
8. For males over 40 years old, prostate palpation, or other at least as effective diagnostic test(s); and
9. Any additional tests or procedures deemed appropriate by the examining physician.

Periodic biological monitoring shall be provided in accordance with section 5.8.3.

If the results of periodic biological monitoring or the results of biological monitoring performed as part of the periodic medical examination show the level of the associate's CdU, b2-M, or CdB to be in excess of the levels specified in sections 5.8.1; or, beginning on January 1, 1999, in excess of the levels specified, the company shall take the appropriate actions specified in section 5.8.3.

For previously exposed associates:

1. If the associate's levels of CdU did not exceed 3 mg/g Cr, CdB did not exceed 5 mg/lwb, and b2-M did not exceed 300 mg/g Cr in the initial biological monitoring tests, and if the results of the followup biological monitoring within one year after the initial examination confirm the previous results, the company may discontinue all periodic medical surveillance for that associate.
2. If the initial biological monitoring results for CdU, CdB, or b2-M were in excess of the levels specified in section 5.8.3, but subsequent biological monitoring results show that the associate's CdU levels no longer exceed 3 mg/g Cr, CdB levels no longer exceed mg/lwb, and b2-M levels no longer exceed 30 mg/g Cr, the company shall provide biological monitoring for CdU, CdB, and b2-M within one year after these most recent biological monitoring results. If the results of the followup biological monitoring within one year confirm the previous results, the company may discontinue all periodic medical surveillance for that associate.
3. However, if the results of the follow-up tests indicate that the level of the associate's CdU, b2-M, or CdB exceeds these same levels, the company is required to provide annual medical examinations until the results of biological monitoring are consistently below these levels or the examining physician determines in a written medical opinion that further medical surveillance is not required to protect the associate's health.



A routine, biennial medical examination is not required to be provided if adequate medical records show that the associate has been examined in accordance with the requirements of section 5.8.4 within the past 12 months. In that case, such records shall be maintained by the company as part of the associate's medical record, and the next routine, periodic medical examination shall be made available to the associate within two years of the previous examination.

5.8.5 Actions Triggered by Medical Examinations. If the results of a medical examination carried out in accordance with this section indicate any laboratory or clinical finding consistent with cadmium toxicity that does not require action under sections 5.8.2-4, the company shall take the following steps and continue to take them until the physician determines that they are no longer necessary.

1. Periodically reassess: the associate's work practices and personal hygiene; the associate's respirator use, if any; the associate's smoking history and status; the respiratory protection program; the hygiene facilities; the maintenance and effectiveness of the relevant engineering controls; and take all reasonable steps to correct the deficiencies found in the reassessment that may be responsible for the associate's excess exposure to cadmium.
2. Provide semi-annual medical reexaminations to evaluate the abnormal clinical sign(s) of cadmium toxicity until the results are normal or the associate is medically removed; and
3. Where the results of tests for total proteins in urine are abnormal, provide a more detailed medical evaluation of the toxic effects of cadmium on the associate's renal system.

5.8.6 Examination for Respirator Use. To determine an associate's fitness for respirator use, the company shall provide a medical examination that includes the elements specified below. This examination shall be provided prior to the associate's being assigned to a job that requires the use of a respirator to any associate without a medical examination within the preceding 12 months that satisfies the requirements of this section. It will include:

1. A detailed medical and work history, or update thereof, with emphasis on: past exposure to cadmium; smoking history and current status; any history of renal, cardiovascular, respiratory, hematopoietic, and/or musculo-skeletal system dysfunction; a description of the job for which the respirator is required; and questions 3-11 and 25-32 in 29 CFR 1910.1027, Appendix D;
2. A blood pressure test;



3. Biological monitoring of the associate's levels of CdU, CdB and b2-M, unless such results already have been obtained within the twelve months; and
4. Any other test or procedure that the examining physician deems appropriate.

After reviewing all the information obtained from the medical examination, the physician shall determine whether the associate is fit to wear a respirator.

Whenever an associate has exhibited difficulty in breathing during a respirator fit test or during use of a respirator, the company, as soon as possible, shall provide the associate with a periodic medical examination to determine the associate's fitness to wear a respirator.

Where the results of the examination are abnormal, medical limitation or prohibition of respirator use shall be considered. If the associate is allowed to wear a respirator, the associate's ability to continue to do so shall be periodically evaluated by a physician.

- 5.8.7 Emergency Examinations.** In addition to the medical surveillance, the company shall provide a medical examination as soon as possible to any associate who may have been acutely exposed to cadmium because of an emergency.

The examination shall include the requirements of section 5.8.4, with emphasis on the respiratory system, other organ systems considered appropriate by the examining physician, and symptoms of acute overexposure, per 29 CFR 1910.1027, Appendix A.

- 5.8.8 Termination of Employment Examination.** At termination of employment, the company shall provide a medical examination, including a chest X-ray where necessary, to any associate to whom at any prior time the company was required to provide medical surveillance (5.8.1 or .7) However, if the last examination satisfied the requirements and was less than six months prior to the date of termination, no further examination is required unless otherwise specified in sections 5.8.3 or .5.

In addition, if the company has discontinued all periodic medical surveillance under 5.8.4, no termination of employment medical examination is required.

- 5.8.9 Information Provided to the Physician.** The company shall provide the following information to the examining physician:

- \$ A copy of this standard and appendices;
- \$ A description of the affected associate's former, current, and anticipated duties as they relate to the associate's occupational exposure to cadmium;



- \$ The associate's former, current, and anticipated future levels of occupational exposure to cadmium;
- \$ A description of any personal protective equipment, including respirators, used or to be used by the associate, including when and for how long the associate has used that equipment; and
- \$ Relevant results of previous biological monitoring and medical examinations.

5.8.10 Physician's Written Medical Opinion. The company shall promptly obtain a written, signed medical opinion from the examining physician for each medical examination performed on each associate. This written opinion shall contain:

- \$ The physician's diagnosis for the associate;
- \$ The physician's opinion as to whether the associate has any detected medical condition(s) that would place the associate at increased risk of material impairment to health from further exposure to cadmium, including any indications of potential cadmium toxicity;
- \$ The results of any biological or other testing or related evaluations that directly assess the associate's absorption of cadmium;
- \$ Any recommended removal from, or limitation to, the activities or duties of the associate or to the associate's use of personal protective equipment, such as respirators; and
- \$ A statement that the physician has clearly and carefully explained to the associate the results of the medical examination, including all biological monitoring results and any medical conditions related to cadmium exposure that requires further evaluation or treatment, and any limitation on the associate's diet or use of medications.

The company shall promptly obtain a copy of the results of any biological monitoring provided by the company to an associate independently of a medical examination, and, in lieu of a written medical opinion, an explanation sheet explaining those results.

The company shall instruct the physician not to reveal orally or in the written medical opinion given to the company specific findings or diagnoses unrelated to occupational exposure to cadmium.

5.8.11 Medical Removal Protection (MRP). The company shall temporarily remove an associate from work where there is excess exposure to cadmium on each occasion that medical removal is required under sections 5.8.3, .4, or .6 and on



each occasion that a physician determines in a written medical opinion that the associate should be removed from such exposure. The physician's determination may be based on biological monitoring results, inability to wear a respirator, evidence of illness, other signs or symptoms of cadmium-related dysfunction or disease, or any other reason deemed medically sufficient by the physician.

The company shall medically remove an associate in accordance with section 5.8.11 regardless of whether at the time of removal a job is available into which the removed associate may be transferred.

Whenever an associate is medically removed under section 5.8.11, the company shall transfer the removed associate to a job where the exposure to cadmium is within the permissible levels specified in that section as soon as one becomes available.

For any associate who is medically removed under the provisions of section 5.8.11, the company shall provide follow-up medical examinations semi-annually until, in a written medical opinion, the examining physician determines that either the associate may be returned to his/her former job status or the associate must be permanently removed from excess cadmium exposure.

The company may not return an associate who has been medically removed for any reason to his/her former job status until a physician determines in a written medical opinion that continued medical removal is no longer necessary to protect the associate's health.

Where an associate is found unfit to wear a respirator, the company shall remove the associate from work where exposure to cadmium is above the PEL.

Where removal is based upon any reason other than the associate's inability to wear a respirator, the company shall remove the associate from work where exposure to cadmium is at or above the action level.

Except as specified in section 5.8.11, no associate who was removed because his/her level of CdU, CdB and/or b2-M exceeded the trigger levels in sections 5.8.3 or .4 may be returned to work with exposure to cadmium at or above the action level until the associate's levels of CdU fall to or below 3 m/g Cr, CdB fall to or below 5 m/lwb, and b2-M fall to or below 300 m/g Cr.

However, when in the examining physician's opinion continued exposure to cadmium will not pose an increased risk to the associate's health and there are special circumstances that make continued medical removal an inappropriate remedy, the physician shall fully discuss these matters with the associate, and then in a written determination may return a worker to his/her former job status despite what would otherwise be unacceptably high biological monitoring results. Thereafter and until such time as the associate's biological monitoring results have decreased to levels where he/she could have been returned to his/her former



job status, the returned associate shall continue medical surveillance as if he/she were still on medical removal. Until such time, the associate is no longer subject to mandatory medical removal. Subsequent questions regarding the associate's medical removal shall be decided solely by a final medical determination.

Where the company, although not required by this section to do so, removes an associate from exposure to cadmium or otherwise places limitations on an associate due to the effects of cadmium exposure on the associate's medical condition, the company shall provide the same medical removal protection benefits to that associate as would have been provided had the removal been required under section 5.8.11.

5.8.12 Medical Removal Protection Benefits. The company shall provide medical removal protection benefits to an associate for up to a maximum of 18 months each time, and while the associate is temporarily medically removed.

For purposes of this section, the requirement that the company provide medical removal protection benefits means that the company shall maintain the total normal earnings, seniority, and all other associate rights and benefits of the removed associate, including the associate's right to his/her former job status, as if the associate had not been removed from the associate's job or otherwise medically limited.

Where, after 18 months on medical removal because of elevated biological monitoring results, the associate's monitoring results have not declined to a low enough level to permit the associate to be returned to his/her former job status:

1. The company shall make available to the associate a medical examination pursuant to this section in order to obtain a final medical determination as to whether the associate may be returned to his/her former job status or must be permanently removed from excess cadmium exposure; and
2. The company shall assure that the final medical determination indicates whether the associate may be returned to his/her former job status and what steps, if any, should be taken to protect the associate's health;

The company may condition the provision of medical removal protection benefits upon the associate's participation in medical surveillance provided in accordance with this section.

5.8.13 Multiple Physician Review. If the company selects the initial physician to conduct any medical examination or consultation provided to an associate under this section, the associate may designate a second physician to:

1. Review any findings, determinations, or recommendations of the initial physician; and



2. Conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.

The company shall promptly notify an associate of the right to seek a second medical opinion after each occasion that an initial physician provided by the company conducts a medical examination or consultation pursuant to this section. The company may condition its participation in, and payment for, multiple physician review upon the associate doing the following within fifteen (15) days after receipt of this notice, or receipt of the initial physician's written opinion, whichever is later:

1. Informing the company that he or she intends to seek a medical opinion; and
2. Initiating steps to make an appointment with a second physician.

If the findings, determinations, or recommendations of the second physician differ from those of the initial physician, then the company and the associate shall assure that efforts are made for the two physicians to resolve any disagreement.

If the two physicians have been unable to quickly resolve their disagreement, then the company and the associate, through their respective physicians, shall designate a third physician to:

1. Review any findings, determinations, or recommendations of the other two physicians; and
2. Conduct such examinations, consultations, laboratory tests, and discussions with the other two physicians as the third physician deems necessary to resolve the disagreement among them.

The company shall act consistently with the findings, determinations, and recommendations of the third physician, unless the company and the associate reach an agreement that is consistent with the recommendations of at least one of the other two physicians.

5.8.14 Alternate Physician Determination. The company and an associate may agree upon the use of any alternate form of physician determination in lieu of the multiple physician review, so long as the alternative is expeditious and at least as protective of the associate.

5.8.15 Information the Company Must Provide the Associate. The company shall provide a copy of the physician's written medical opinion to the examined associate within five working days after receipt thereof.



The company shall provide the associate with a copy of the associate's biological monitoring results and an explanation sheet explaining the results within five working days after receipt thereof.

Within 30 days after a request by an associate, the company shall provide the associate with the information the company is required to provide the examining physician.

5.8.16 Reporting. In addition to other medical events that are required to be reported on the OSHA Form No. 200, the company shall report any abnormal condition or disorder caused by occupational exposure to cadmium associated with employment as specified in Chapter (V)(E) of the Reporting Guidelines for Occupational Injuries and Illnesses.

5.9 Communication of Cadmium Hazards to Associates

5.9.1 General. In communications concerning cadmium hazards, companies shall comply with the requirements of the Hazard Communication Standard, including but not limited to the requirements concerning warning signs and labels, material safety data sheets (MSDS), and associate information and training.

5.9.2 Warning Signs. Warning signs shall be provided and displayed in regulated areas. In addition, warning signs shall be posted at all approaches to regulated areas so that an associate may read the signs and take necessary protective steps before entering the area.

Warning signs required by this section shall bear the following information:

DANGER
CADMIUM
CANCER HAZARD
CAN CAUSE LUNG AND KIDNEY DISEASE
AUTHORIZED PERSONNEL ONLY
RESPIRATORS REQUIRED IN THIS AREA

The company shall ensure that signs required by this section are illuminated, cleaned, and maintained as necessary so that the legend is readily visible.

5.9.3 Warning Labels. Shipping and storage containers containing cadmium, cadmium compounds, or cadmium contaminated clothing, equipment, waste, scrap, or debris shall bear appropriate warning labels, as specified in Section 5.9.2.



The warning labels shall include at least the following information:

DANGER - CONTAINS CADMIUM - CANCER HAZARD - AVOID CREATING DUST - CAN CAUSE LUNG AND KIDNEY DISEASE

Where feasible, installed cadmium products shall have a visible label or other indication that cadmium is present.

5.9.4 Associate Information and Training. The company shall institute a training program for all associates who are potentially exposed to cadmium, assure associate participation in the program, and maintain a record of the contents of such program.

Training shall be provided prior to or at the time of initial assignment to a job involving potential exposure to cadmium and at least annually thereafter.

The company shall make the training program understandable to the associate and shall assure that each associate is informed of the following:

- \$ The health hazards associated with cadmium exposure, with special attention to the information incorporated in 29 CFR 1910.1027, Appendix A;
- \$ The quantity, location, manner of use, release, and storage of cadmium in the workplace and the specific nature of operations that could result in exposure to cadmium, especially exposures above the PEL;
- \$ The engineering controls and work practices associated with the associate's job assignment;
- \$ The measures associates can take to protect themselves from exposure to cadmium, including modification of such habits as smoking and personal hygiene, and specific procedures the company has implemented to protect associates from exposure to cadmium such as appropriate work practices, emergency procedures, and the provision of personal protective equipment;
- \$ The purpose, proper selection, fitting, proper use, and limitations of respirators and protective clothing;
- \$ The purpose and a description of the medical surveillance program required by section 5.8;
- \$ The contents of this procedure and its attachments, and
- \$ The associate's rights of access to records.



The company shall make a copy of this section and its appendices readily available to all affected associates and shall provide a copy without cost if requested.

In a multi-company workplace, if the company produces, uses, or stores cadmium in a manner that may expose employees of other companies to cadmium, those companies will be notified of the potential hazard.

5.10 Recordkeeping

5.10.1 Exposure Monitoring. The company shall establish and keep an accurate record of all air monitoring for cadmium in the workplace.

This record shall include at least the following information:

- \$ The monitoring date, shift, duration, air volume, and results in terms of an 8-hour TWA of each sample taken, and if cadmium is not detected, the detection level;
- \$ The name, social security number, and job classification of all associates monitored and of all other associates whose exposures the monitoring result is intended to represent, including, where applicable, a description of how it was determined that the associate's monitoring result could be taken to represent other associate's exposures;
- \$ A description of the sampling and analytical methods used and evidence of their accuracy;
- \$ The type of respiratory protective device, if any, worn by the monitored associate and by any other associate whose exposure the monitoring result is intended to represent;
- \$ A notation of any other conditions that might have affected the monitoring results.
- \$ Any exposure monitoring or objective data that were used and the levels.

The company shall maintain this record for at least thirty (30) years.

5.10.2 Objective Data for Exemption from Requirement for Initial Monitoring.

For purposes of this section, objective data are information demonstrating that a particular product or material containing cadmium or a specific process, operation, or activity involving cadmium cannot release dust or fumes in concentrations at or above the action level even under the worst-case release conditions. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of cadmium-containing products or materials. The data the company uses from an industry-wide survey



must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the company's current operations.

The company shall maintain the record of the objective data relied upon for at least 30 years.

5.10.3 Medical Surveillance. Records shall be maintained per Shaw E & I Procedure HS102.

5.10.4 Training. The company shall certify that associates have been trained by preparing a certification record which includes the identity of the person trained, the signature of the company or the person who conducted the training, and the date the training was completed. The certification records shall be prepared at the completion of training and shall be maintained on file for one (1) year beyond the date of training of that associate.

5.10.5 Availability. Access to records shall be per Shaw E & I Procedure HS102. Within 15 days after a request, the company shall make an associate's medical records available for examination and copying to the subject associate, to designated representatives, to anyone having the specific written consent of the subject associate, and after the associate's death or incapacitation, to the associate's family members.

5.11 Observation of Monitoring

5.11.1 Associate Observation. The company shall provide affected associates or their designated representatives an opportunity to observe any monitoring of associate exposure to cadmium.

5.11.2 Observation Procedures. When observation of monitoring requires entry into an area where the use of protective clothing or equipment is required, the company shall provide the observer with that clothing and equipment and shall assure that the observer uses such clothing and equipment and complies with all other applicable safety and health procedures.

5.12 Reporting Requirements

5.12.1 Use (California Only). All uses of cadmium that are covered by this procedure and require the establishment of regulated areas shall be reported in writing to Cal/OSHA within 15 calendar days. Any changes in the reported information shall be similarly reported in writing within 15 calendar days of such change. The report shall include:

\$ The name of the company and the address of each workplace where regulated areas are required;



- \$ An identifying description of where the regulated areas are located in the workplace;
- \$ A brief description of each process or operation which creates associate exposure to cadmium including the estimated number of associates engaged in each process or operation; and
- \$ The names and addresses of any collective bargaining units or other representatives of the affected associates.

5.12.2 Temporary Worksite Notification (California Only). Temporary worksites need to be reported to Cal/OSHA only once. Such notice shall also provide the time and date of commencement of work, the approximate duration of the work, the location, the type of business, and the kind of work for each temporary worksite at least 24 hours prior to the commencement of each job when feasible, to the nearest OSHA office.

5.12.3 Emergency (California Only). Any emergency as defined shall be reported as follows:

- \$ A report of the occurrence of the emergency and the facts obtainable at that time shall be made within 24 hours to the nearest district office of Cal/OSHA.
- \$ A written report shall be filed within 15 calendar days after the emergency occurred. The written report shall include:
 1. A description of the operation or process involved including its location, the amount of cadmium released, and the duration of the emergency.
 2. A statement of the known or estimated extent of associate exposure to cadmium and area of contamination.
 3. An analysis of the circumstances that led up to the emergency.
 4. A description of the measures taken or to be taken, with specific completion dates, to prevent further similar emergencies from occurring again.

5.12.4 Posting. A copy of each written report shall be posted in the regulated areas or other appropriate location where the posting is conspicuous to affected associates.



6.0 EXCEPTION PROVISIONS

(None Permitted.)

7.0 CROSS REFERENCES

HS100	Medical Policies and Procedures
HS102	Management of Employee Exposure and Medical Records
HS104	Employee Notification of Industrial Hygiene
29 CFR 1910.1027	Appendix B: Substance Technical Guidelines for Cadmium
29 CFR 1910.1027	Appendix C: Qualitative and Quantitative Fit Testing Requirements
29 CFR 1910.102	Appendix D: Occupational Health History Interview with Reference to Cadmium Exposure
29 CFR 1910.1027	Appendix E: Cadmium in Workplace Atmospheres
29 CFR 1910.1027	Appendix F: Non-Mandatory Protocol for Biological Monitoring

8.0 ATTACHMENTS

1. Responsibility Matrix
2. 29 CFR 1910.1027, Appendix A: Substance Safety Data Sheet



ATTACHMENT 1

Responsibility Matrix

Action	Procedure Section	Responsible Party	
		Project Manager	Site Safety Officer
Implement the provisions of this document as appropriate for a particular project.	1.0	X	X



ATTACHMENT 2
29 CFR 1910.1027 APPENDIX A

Title:	Substance Safety Data Sheet - Cadmium
Subpart	Z
Subpart Title:	Toxic and Hazardous Substances

I. Substance Identification

A. Substance: Cadmium.

1910.1027 App A, Paragraph 1 B. 8-Hour, Time-weighted-average, Permissible Exposure Limit (TWA PEL):

1910.1027 App A, Paragraph 2 1. TWA PEL: Five micrograms of cadmium per cubic meter of air 5 ug/m(3), time-weighted average (TWA) for an 8-hour workday.

1910.1027 App A, Paragraph 3 C. Appearance: Cadmium metal-soft, blue-white, malleable, lustrous metal or grayish-white powder. Some cadmium compounds may also appear as a brown, yellow, or red powdery substance.

1910.1027 App A, Paragraph 4

II. Health Hazard Data

A. Routes of Exposure. Cadmium can cause local skin or eye irritation. Cadmium can affect your health if you inhale it or if you swallow it.

1910.1027 App A, Paragraph 5

B. Effects of Overexposure.

1910.1027 App A, Paragraph 6 1. Short-term (acute) exposure: Cadmium is much more dangerous by inhalation than by ingestion. High exposures to cadmium that may be immediately dangerous to life or health occur in jobs where workers handle large quantities of cadmium dust or fume; heat cadmium-containing compounds or cadmium-coated surfaces; weld with cadmium solders or cut cadmium-containing materials such as bolts.

1910.1027 App A, Paragraph 7 2. Severe exposure may occur before symptoms appear. Early symptoms may include mild irritation of the upper respiratory tract, a sensation of constriction of the throat, a metallic taste and/or a cough. A period of 1-10 hours may precede the onset of rapidly progressing shortness of breath, chest pain, and flu-like symptoms with weakness, fever, headache, chills, sweating and muscular pain. Acute pulmonary edema usually develops within 24 hours and reaches a maximum by three days. If death from asphyxia does not occur, symptoms may resolve within a week.

1910.1027 App A, Paragraph 8 3. Long-term (chronic) exposure. Repeated or long-term exposure to cadmium, even at relatively low concentrations, may result in kidney damage and an increased risk of cancer of the lung and of the prostate.

1910.1027 App A, Paragraph 9

C. Emergency First Aid Procedures.

1910.1027 App A, Paragraph 10 1. Eye exposure: Direct contact may cause redness or pain. Wash eyes immediately with large amounts of water, lifting the upper and lower eyelids. Get medical attention immediately.



1910.1027 App A, Paragraph 11 2. Skin exposure: Direct contact may result in irritation. Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water. Get medical attention immediately.

1910.1027 App A, Paragraph 12 3. Ingestion: Ingestion may result in vomiting, abdominal pain, nausea, diarrhea, headache and sore throat. Treatment for symptoms must be administered by medical personnel. Under no circumstances should the employer allow any person whom he retains, employs, supervises or controls to engage in therapeutic chelation. Such treatment is likely to translocate cadmium from pulmonary or other tissue to renal tissue. Get medical attention immediately.

1910.1027 App A, Paragraph 13 4. Inhalation: If large amounts of cadmium are inhaled, the exposed person must be moved to fresh air at once. If breathing has stopped, perform cardiopulmonary resuscitation. Administer oxygen if available. Keep the affected person warm and at rest. Get medical attention immediately.

1910.1027 App A, Paragraph 14 5. Rescue: Move the affected person from the hazardous exposure. If the exposed person has been overcome, attempt rescue only after notifying at least one other person of the emergency and putting into effect established emergency procedures. Do not become a casualty yourself. Understand your emergency rescue procedures and know the location of the emergency equipment before the need arises.

1910.1027 App A, Paragraph 15

III. Employee Information

A. Protective Clothing and Equipment.

1910.1027 App A, Paragraph 16 1. Respirators: You may be required to wear a respirator for non-routine activities; in emergencies; while your employer is in the process of reducing cadmium exposures through engineering controls; and where engineering controls are not feasible. If respirators are worn in the future, they must have a joint Mine Safety and Health Administration (MSHA) and National Institute for Occupational Safety and Health (NIOSH) label of approval. Cadmium does not have a detectable odor except at levels well above the permissible exposure limits. If you can smell cadmium while wearing a respirator, proceed immediately to fresh air. If you experience difficulty breathing while wearing a respirator, tell your employer.

1910.1027 App A, Paragraph 17 2. Protective Clothing: You may be required to wear impermeable clothing, gloves, foot gear, a face shield, or other appropriate protective clothing to prevent skin contact with cadmium. Where protective clothing is required, your employer must provide clean garments to you as necessary to assure that the clothing protects you adequately. The employer must replace or repair protective clothing that has become torn or otherwise damaged.

1910.1027 App A, Paragraph 18 3. Eye Protection: You may be required to wear splash-proof or dust resistant goggles to prevent eye contact with cadmium.

1910.1027 App A, Paragraph 19

B. Employer Requirements.

1910.1027 App A, Paragraph 20 1. Medical: If you are exposed to cadmium at or above the action level, your employer is required to provide a medical examination, laboratory tests and a medical history according to the medical surveillance provisions under paragraph (I) of this standard. (See summary chart and tables in this Appendix A.) These tests shall be provided without cost to you. In addition, if you are accidentally exposed to cadmium under conditions known or suspected to constitute toxic exposure to cadmium, your employer is required to make special tests available to you.

1910.1027 App A, Paragraph 21 2. Access to Records: All medical records are kept strictly confidential. You or your representative are entitled to see the records of measurements of your exposure to cadmium. Your medical examination records can be furnished to your personal physician or designated representative upon request by you to your employer.



1910.1027 App A, Paragraph 22 3. Observation of Monitoring: Your employer is required to perform measurements that are representative of your exposure to cadmium and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear the protective clothing and equipment.

1910.1027 App A, Paragraph 23

C. Employee Requirements.

You will not be able to smoke, eat, drink, chew gum or tobacco, or apply cosmetics while working with cadmium in regulated areas. You will also not be able to carry or store tobacco products, gum, food, drinks or cosmetics in regulated areas because these products easily become contaminated with cadmium from the workplace and can therefore create another source of unnecessary cadmium exposure.

1910.1027 App A, Paragraph 24 Some workers will have to change out of work clothes and shower at the end of the day, as part of their workday, in order to wash cadmium from skin and hair. Handwashing and cadmium-free eating facilities shall be provided by the employer and proper hygiene should always be performed before eating. It is also recommended that you do not smoke or use tobacco products, because among other things, they naturally contain cadmium. For further information, read the labeling on such products.

1910.1027 App A, Paragraph 25

IV. Physician Information

A. Introduction.

1910.1027 App A, Paragraph 26 The medical surveillance provisions of paragraph (l) generally are aimed at accomplishing three main interrelated purposes: First, identifying employees at higher risk of adverse health effects from excess, chronic exposure to cadmium; second, preventing cadmium-induced disease; and third, detecting and minimizing existing cadmium-induced disease. The core of medical surveillance in this standard is the early and periodic monitoring of the employee's biological indicators of: (a) recent exposure to cadmium; (b) cadmium body burden; and (c) potential and actual kidney damage associated with exposure to cadmium.

1910.1027 App A, Paragraph 27 The main adverse health effects associated with cadmium overexposure are lung cancer and kidney dysfunction. It is not yet known how to adequately biologically monitor human beings to specifically prevent cadmium-induced lung cancer. By contrast, the kidney can be monitored to provide prevention and early detection of cadmium-induced kidney damage. Since, for non-carcinogenic effects, the kidney is considered the primary target organ of chronic exposure to cadmium, the medical surveillance provisions of this standard effectively focus on cadmium-induced kidney disease. Within that focus, the aim, where possible, is to prevent the onset of such disease and, where necessary, to minimize such disease as may already exist. The by-products of successful prevention of kidney disease are anticipated to be the reduction and prevention of other cadmium-induced diseases.

1910.1027 App A, Paragraph 28

B. Health Effects.

1910.1027 App A, Paragraph 29 The major health effects associated with cadmium overexposure are described below.

1910.1027 App A, Paragraph 30 1. Kidney. The most prevalent non-malignant disease observed among workers chronically exposed to cadmium is kidney dysfunction. Initially, such dysfunction is manifested as proteinuria. The proteinuria associated with cadmium exposure is most commonly characterized by excretion of low-molecular weight proteins (15,000 to 40,000 MW) accompanied by loss of electrolytes, uric acid, calcium, amino acids, and phosphate. The compounds commonly excreted include: beta-2-microglobulin (B(2)-M), retinol binding protein



(RBP), immunoglobulin light chains, and lysozyme. Excretion of low molecular weight proteins are characteristic of damage to the proximal tubules of the kidney (Iwao et al., 1980).

1910.1027 App A, Paragraph 31 It has also been observed that exposure to cadmium may lead to urinary excretion of high-molecular weight proteins such as albumin, immunoglobulin G, and glycoproteins (Ex. 29). Excretion of high-molecular weight proteins is typically indicative of damage to the glomeruli of the kidney. Bernard et al., (1979) suggest that damage to the glomeruli and damage to the proximal tubules of the kidney may both be linked to cadmium exposure but they may occur independently of each other.

1910.1027 App A, Paragraph 32 Several studies indicate that the onset of low-molecular weight proteinuria is a sign of irreversible kidney damage (Friberg et al., 1974; Roels et al., 1982; Piscator 1984; Elinder et al., 1985; Smith et al., 1986). Above specific levels of B(2)-M associated with cadmium exposure it is unlikely that B(2)-M levels return to normal even when cadmium exposure is eliminated by removal of the individual from the cadmium work environment (Friberg, Ex. 29, 1990).

1910.1027 App A, Paragraph 33 Some studies indicate that such proteinuria may be progressive; levels of B(2)-M observed in the urine increase with time even after cadmium exposure has ceased. See, for example, Elinder et al., 1985. Such observations, however, are not universal, and it has been suggested that studies in which proteinuria has not been observed to progress may not have tracked patients for a sufficiently long time interval (Jarup, Ex. 8-661).

1910.1027 App A, Paragraph 34 When cadmium exposure continues after the onset of proteinuria, chronic nephrotoxicity may occur (Friberg, Ex. 29). Uremia results from the inability of the glomerulus to adequately filter blood. This leads to severe disturbance of electrolyte concentrations and may lead to various clinical complications including kidney stones (L-140-50).

1910.1027 App A, Paragraph 35 After prolonged exposure to cadmium, glomerular proteinuria, glucosuria, aminoaciduria, phosphaturia, and hypercalciuria may develop (Exs. 8-86, 4-28, 14-18). Phosphate, calcium, glucose, and amino acids are essential to life, and under normal conditions, their excretion should be regulated by the kidney. Once low molecular weight proteinuria has developed, these elements dissipate from the human body. Loss of glomerular function may also occur, manifested by decreased glomerular filtration rate and increased serum creatinine. Severe cadmium-induced renal damage may eventually develop into chronic renal failure and uremia (Ex. 55).

1910.1027 App A, Paragraph 36 Studies in which animals are chronically exposed to cadmium confirm the renal effects observed in humans (Friberg et al., 1986). Animal studies also confirm problems with calcium metabolism and related skeletal effects which have been observed among humans exposed to cadmium in addition to the renal effects. Other effects commonly reported in chronic animal studies include anemia, changes in liver morphology, immunosuppression and hypertension. Some of these effects may be associated with co-factors. Hypertension, for example, appears to be associated with diet as well as cadmium exposure. Animals injected with cadmium have also shown testicular necrosis (Ex. 8-86B).

1910.1027 App A, Paragraph 37 2. Biological Markers It is universally recognized that the best measures of cadmium exposures and its effects are measurements of cadmium in biological fluids, especially urine and blood. Of the two, CdU is conventionally used to determine body burden of cadmium in workers without kidney disease. CdB is conventionally used to monitor for recent exposure to cadmium. In addition, levels of CdU and CdB historically have been used to predict the percent of the population likely to develop kidney disease (Thun et al., Ex. L-140-50; WHO, Ex. 8-674; ACGIH, Exs. 8-667, 140-50).

1910.1027 App A, Paragraph 38 The third biological parameter upon which OSHA relies for medical surveillance is Beta-2-microglobulin in urine (B(2)-M), a low molecular weight protein. Excess B(2)-M has been widely accepted by physicians and scientists as a reliable indicator of functional damage to the proximal tubule of the kidney (Exs. 8-447, 144-3-C, 4-47, L-140-45, 19-43-A).

1910.1027 App A, Paragraph 39 Excess B(2)-M is found when the proximal tubules can no longer reabsorb this protein in a normal manner. This failure of the proximal tubules is an early stage of a kind of kidney disease that commonly occurs among workers with excessive cadmium exposure. Used in conjunction with biological test results indicating abnormal levels of CdU and CdB, the finding of excess B(2)-M can establish for an examining



physician that any existing kidney disease is probably cadmium-related (Trs. 6/6/90, pp. 82-86, 122, 134). The upper limits of normal levels for cadmium in urine and cadmium in blood are 3 ug Cd/gram creatinine in urine and 5 ug Cd/liter whole blood, respectively. These levels were derived from broad-based population studies.

1910.1027 App A, Paragraph 40 Three issues confront the physicians in the use of B(2)-M as a marker of kidney dysfunction and material impairment. First, there are a few other causes of elevated levels of B(2)-M not related to cadmium exposures, some of which may be rather common diseases and some of which are serious diseases (e.g., myeloma or transient flu, Exs. 29 and 8086). These can be medically evaluated as alternative causes (Friberg, Ex. 29). Also, there are other factors that can cause B(2)-M to degrade so that low levels would result in workers with tubular dysfunction. For example, regarding the degradation of B(2)-M, workers with acidic urine (pH > 6) might have B(2)-M levels that are within the "normal" range when in fact kidney dysfunction has occurred (Ex. L140-1) and the low molecular weight proteins are degraded in acid urine. Thus, it is very important that the pH of urine be measured, that urine samples be buffered as necessary (See Appendix F.), and that urine samples be handled correctly, i.e., measure the pH of freshly voided urine samples, then if necessary, buffer to pH > 6 (or above for shipping purposes), measure pH again and then, perhaps, freeze the sample for storage and shipping. (See also Appendix F.) Second, there is debate over the pathological significance of proteinuria, however, most world experts believe that B(2)-M levels greater than 300 ug/g Cr are abnormal (Elinder, Ex. 55, Friberg, Ex. 29). Such levels signify kidney dysfunction that constitutes material impairment of health. Finally, detection of B(2)-M at low levels has often been considered difficult, however, many laboratories have the capability of detecting excess B(2)-M using simple kits, such as the Phadebas Delphia test, that are accurate to levels of 100 ug B(2)-M/g Cr U (Ex. L-140-1).

1910.1027 App A, Paragraph 41 Specific recommendations for ways to measure B(2)-M and proper handling of urine samples to prevent degradation of B(2)-M have been addressed by OSHA in Appendix F, in the section on laboratory standardization. All biological samples must be analyzed in a laboratory that is proficient in the analysis of that particular analyte, under paragraph (l)(1)(iv). (See Appendix F). Specifically, under paragraph (l)(1)(iv), the employer is to assure that the collecting and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (B(2)-M) taken from employees is collected in a manner that assures reliability. The employer must also assure that analysis of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (B(2)-M) taken from employees is performed in laboratories with demonstrated proficiency for that particular analyte. (See Appendix F.)

1910.1027 App A, Paragraph 42 3. Lung and Prostrate Cancer. The primary sites for cadmium-associated cancer appear to be the lung and the prostate (L-140-50). Evidence for an association between cancer and cadmium exposure derives from both epidemiological studies and animal experiments. Mortality from prostate cancer associated with cadmium is slightly elevated in several industrial cohorts, but the number of cases is small and there is not clear dose-response relationship. More substantive evidence exists for lung cancer.

1910.1027 App A, Paragraph 43 The major epidemiological study of lung cancer was conducted by Thun et al., (Ex. 4-68). Adequate data on cadmium exposures were available to allow evaluation of dose-response relationships between cadmium exposure and lung cancer. A statistically significant excess of lung cancer attributed to cadmium exposure was observed in this study even when confounding variables such as co-exposure to arsenic and smoking habits were taken into consideration (Ex. L-140-50).

1910.1027 App A, Paragraph 44 The primary evidence for quantifying a link between lung cancer and cadmium exposure from animal studies derives from two rat bioassay studies; one by Takenaka et al., (1983), which is a study of cadmium chloride and a second study by Oldiges and Glaser (1990) of four cadmium compounds.

1910.1027 App A, Paragraph 45 Based on the above cited studies, the U.S. Environmental Protection Agency (EPA) classified cadmium as "B1", a probable human carcinogen, in 1985 (Ex. 44). The International Agency for Research on Cancer (IARC) in 1987 also recommended that cadmium be listed as "2A", a probable human carcinogen (Ex. 4-15). The American Conference of Governmental Industrial Hygienists (ACGIH) has recently recommended that cadmium be labeled as a carcinogen. Since 1984, NIOSH has concluded that cadmium is possibly a human carcinogen and has recommended that exposures be controlled to the lowest level feasible.

1910.1027 App A, Paragraph 46 4. Non-carcinogenic Effects. Acute pneumonitis occurs 10 to 24 hours after initial acute inhalation of high levels of cadmium fumes with symptoms such as fever and chest pain (Exs. 30,



8-86B). In extreme exposure cases pulmonary edema may develop and cause death several days after exposure. Little actual exposure measurement data is available on the level of airborne cadmium exposure that causes such immediate adverse lung effects, nonetheless, it is reasonable to believe a cadmium concentration of approximately 1 mg/m(3) over an eight hour period is "immediately dangerous" (55 FR 4052, ANSI; Ex. 8-86B).

1910.1027 App A, Paragraph 47 In addition to acute lung effects and chronic renal effects, long term exposure to cadmium may cause other severe effects on the respiratory system. Reduced pulmonary function and chronic lung disease indicative of emphysema have been observed in workers who have had prolonged exposure to cadmium dust or fumes (Exs. 4-29, 422, 442, 450, 463). In a study of workers conducted by Kazantzis et al., a statistically significant excess of worker deaths due to chronic bronchitis was found, which in his opinion was directly related to high cadmium exposures of 1 mg/m(3) or more (Tr. 6/8/90, pp. 156-157).

1910.1027 App A, Paragraph 48 Cadmium need not be respirable to constitute a hazard. Inspirable cadmium particles that are too large to be respirable but small enough to enter the tracheobronchial region of the lung can lead to bronchoconstriction, chronic pulmonary disease, and cancer of that portion of the lung. All of these diseases have been associated with occupational exposure to cadmium (Ex. 8-86B). Particles that are constrained by their size to the extra-thoracic regions of the respiratory system such as the nose and maxillary sinuses can be swallowed through mucociliary clearance and be absorbed into the body (ACGIH, Ex. 8-692). The impaction of these particles in the upper airways can lead to anosmia, or loss of sense of smell, which is an early indication of overexposure among workers exposed to heavy metals. This condition is commonly reported among cadmium-exposed workers (Ex. 8-86-B).

1910.1027 App A, Paragraph 49

C. Medical Surveillance.

In general, the main provisions of the medical surveillance section of the standard, under paragraphs (l)(1)-(17) of the regulatory text, are as follows:

1910.1027 App A, Paragraph 50 1. Workers exposed above the action level are covered;

1910.1027 App A, Paragraph 51 2. Workers with intermittent exposures are not covered;

1910.1027 App A, Paragraph 52 3. Past workers who are covered receive biological monitoring for at least one year;

1910.1027 App A, Paragraph 53 4. Initial examinations include a medical questionnaire and biological monitoring of cadmium in blood (CdB), cadmium in urine (CdU), and Beta-2-microglobulin in urine (B(2)-M);

1910.1027 App A, Paragraph 54 5. Biological monitoring of these three analytes is performed at least annually; full medical examinations are performed biennially;

1910.1027 App A, Paragraph 55 6. Until five years from the effective date of the standard, medical removal is required when CdU is greater than 15 ug/gram creatinine (g Cr), or CdB is greater than 15 ug/liter whole blood (lwb), or B(2)-M is greater than 1500 ug/g Cr, and CdB is greater than 5 ug/lwb or CdU is greater than 3 ug/g Cr;

1910.1027 App A, Paragraph 56 7. Beginning five years after the standard is in effect, medical removal triggers will be reduced;

1910.1027 App A, Paragraph 57 8. Medical removal protection benefits are to be provided for up to 18 months;

1910.1027 App A, Paragraph 58 9. Limited initial medical examinations are required for respirator usage;

1910.1027 App A, Paragraph 59 10. Major provisions are fully described under section (l) of the regulatory text; they are outlined here as follows:



1910.1027 App A, Paragraph 60 A. Eligibility B. Biological monitoring C. Actions triggered by levels of CdU, CdB, and B(2)-M (See Summary Charts and Tables in Attachment 1.)

1910.1027 App A, Paragraph 61 D. Periodic medical surveillance E. Actions triggered by periodic medical surveillance (See appendix A Summary Chart and Tables in Attachment 1.)

1910.1027 App A, Paragraph 62 F. Respirator usage G. Emergency medical examinations H. Termination examination I. Information to physician J. Physician's medical opinion K. Medical removal protection L. Medical removal protection benefits M. Multiple physician review N. Alternate physician review O. Information employer gives to employee P. Recordkeeping Q. Reporting on OSHA form 200 11. The above mentioned summary of the medical surveillance provisions, the summary chart, and tables for the actions triggered at different levels of CdU, CdB and B(2)-M (in Appendix A Attachment-1) are included only for the purpose of facilitating understanding of the provisions of paragraphs (l)(3) of the final cadmium standard. The summary of the provisions, the summary chart, and the tables do not add to or reduce the requirements in paragraph (l)(3).

1910.1027 App A, Paragraph 63

D. Recommendations to Physicians.

1. It is strongly recommended that patients with tubular proteinuria are counseled on: the hazards of smoking; avoidance of nephrotoxins and certain prescriptions and over-the-counter medications that may exacerbate kidney symptoms; how to control diabetes and/or blood pressure; proper hydration, diet, and exercise (Ex. 19-2). A list of prominent or common nephrotoxins is attached. (See Appendix A Attachment-2.)

1910.1027 App A, Paragraph 64 2. DO NOT CHELATE; KNOW WHICH DRUGS ARE NEPHROTOXINS OR ARE ASSOCIATED WITH NEPHRITIS.

1910.1027 App A, Paragraph 65 3. The gravity of cadmium-induced renal damage is compounded by the fact there is no medical treatment to prevent or reduce the accumulation of cadmium in the kidney (Ex. 8619). Dr. Friberg, a leading world expert on cadmium toxicity, indicated in 1992, that there is no form of chelating agent that could be used without substantial risk. He stated that tubular proteinuria has to be treated in the same way as other kidney disorders (Ex. 29).

1910.1027 App A, Paragraph 66 4. After the results of a workers' biological monitoring or medical examination are received the employer is required to provide an information sheet to the patient, briefly explaining the significance of the results. (See Attachment 3 of this Appendix A.)

1910.1027 App A, Paragraph 67 5. For additional information the physician is referred to the following additional resources:

1910.1027 App A, Paragraph 68 a. The physician can always obtain a copy of the preamble, with its full discussion of the health effects, from OSHA's Computerized Information System (OCIS).

1910.1027 App A, Paragraph 69 b. The Docket Officer maintains a record of the rulemaking. The Cadmium Docket (H-057A), is located at 200 Constitution Ave. N.W., Room N-2625, Washington, D.C. 20210; telephone: 202-219-7894.

1910.1027 App A, Paragraph 70 c. The following articles and exhibits in particular from that docket (H-057A):



Exhibit Number	Author and Paper Title
8-447	Lauwerys et. al., Guide for physicians, AHealth Maintenance of Workers Exposed to Cadmium®, published by the Cadmium Council
4-67	Takenaka, S., H. Oldiges, H. Konig, D. Hochrainer, G. Oberdorster. ACarcinogenicity of Cadmium Chloride Aerosols in Wistar Rats®. JNCI 70:367-373, 1983. (32)
4-68	Thun, M.J., T.M. Schnoor, A.B. Smith, W.E. Halperin, R.A. Lemen. AMortality Among a Cohort of U.S. Cadmium Production Workers - An Update®. JNCI 74(2) :325-33, 1985. (8)
4-25	Elinder, C.G., Kjellstrom, T., Hogstedt, C. et al., ACancer Mortality of Cadmium Workers®. Brit. J. Ind. Med. 42:651-655, 1985. (14)
4-26	K.J. Ellis et al., ACritical Concentrations of Cadmium in Human Renal Cortex: Dose Effect Studies to Cadmium Smelter Workers®. J. Toxicol. Environ. Health 7:691-703, 1981. (76)
4-27	K.J. Ellis, S.H. Cohn and T.J. Smith. ACadmium Inhalation Exposure Estimates: Their Significance with Respect to Kidney and Liver Cadmium Burden®. J. Toxicol. Environ. Health 15:173-187, 1985.
4-28	F.Y. Falck, Jr., L.J. Fine, R.G. Smith, K.D. McClatchey, T. Annesley, B. England, and A.M. Schork. AOccupational Cadmium Exposure and Renal Status®. Am. J. Ind. Med. 4:541, 1983. (64)
8-86A	L. Friberg, C.G. Elinder, et al. ACadmium and Health, a Toxicological and Epidemiological Appraisal Volume I Exposure, Dose, and Metabolism®. CRC Press, Inc., Boca Raton, FL, 1986. (Available from the OSHA Technical Data Center)
8-86B	L. Friberg, C.G. Eliner, et al. ACadmium and Health, a Toxicological and Epidemiological Appraisal Volume II Effects and Response®. CRC Press, Inc., Boca Raton, FL, 1986. (Available from the OSHA Technical Data Center)
L-140-45	C.G. Elinder, ACancer Morality of Cadmium Workers®, Brit. J. Ind. Med., 42, 651-655, 1985.
L-140-50	M. Thun, C.G. Elinder, L. Friberg. AScientific Basis for an Occupational Standard for Cadmium®. Am. J. Ind. Med., 20; 629-642, 1991.

V. Information Sheet. The information sheet (Appendix A Attachment-3.) or an equally explanatory one should be provided to you after any biological monitoring results are reviewed by the physician, or where applicable, after any medical examination.

1910.1027 App A, Paragraph 87

Appendix A

Attachment 1: Appendix A Summary Chart and Tables A and B of Actions Triggered by Biological Monitoring

Appendix A - Summary Chart: Section (1)(3) Medical Surveillance- Categorizing Biological Monitoring Results (A) Biological monitoring results categories are set forth in Appendix A Table A for the periods ending December 31, 1998 and for the period beginning January 1, 1999.

1910.1027 App A, Paragraph 88 (B) The results of the biological monitoring for the initial medical exam and the subsequent exams shall determine an employee's biological monitoring result category.

1910.1027 App A, Paragraph 89 Actions Triggered by Biological Monitoring (A)(i) The actions triggered by biological monitoring for an employee are set forth in Appendix A Table B.



1910.1027 App A, Paragraph 90 (ii) The biological monitoring results for each employee under section (1)(3) shall determine the actions required for that employee. That is, for any employee in biological monitoring category C, the employer will perform all of the actions for which there is an X in column C of Appendix A Table B.

1910.1027 App A, Paragraph 91 (iii) An employee is assigned the alphabetical category ("A" being the lowest) depending upon the test results of the three biological markers.

1910.1027 App A, Paragraph 92 (iv) An employee is assigned category A if monitoring results for all three biological markers fall at or below the levels indicated in the table listed for category A.

1910.1027 App A, Paragraph 93 (v) An employee is assigned category B if any monitoring result for any of the three biological markers fall within the range of levels indicated in the table listed for category B, providing no result exceeds the levels listed for category B.

1910.1027 App A, Paragraph 94 (vi) An employee is assigned category C if any monitoring result for any of the three biological markers are above the levels listed for category C.

1910.1027 App A, Paragraph 95 (B) The user of Appendix A Tables A and B should know that these tables are provided only to facilitate understanding of the relevant provisions of paragraph (1)(3) of this section. Appendix A Tables A and B are not meant to add to or subtract from the requirements of those provisions.

1910.1027 App A, Paragraph 96 Appendix A - Table A Categorization of Biological Monitoring Results

APPLICABLE THROUGH 1998 ONLY

Biological Marker	Monitoring Result Categories		
	A	B	C
Cadmium in urine (CdU) (ug/g creatinine)	<= 3	>3 and <= 15	>15
B(2)-microglobulin (B(2)-M) (ug/g creatinine)	<= 300	>300 and <= 1500	>1500 ⁽¹⁾
Cadmium in blood (CdB) (ug/liter whole blood)	<= 5	>5 and <= 15	>15

⁽¹⁾ If an employee's B(2)-M levels are above 1,500 ug/g creatinine, in order for mandatory medical removal to be required (See Appendix A Table B.), either the employee's CdU level must also be >3 ug/g creatinine or CdB level must also be >5 ug/liter whole blood.

1910.1027 App. A, Paragraph 97



APPLICABLE BEGINNING JANUARY 1, 1999

Biological Marker	Monitoring Result Categories		
	A	B	C
Cadmium in urine (CdU) (ug/g creatinine)	< = 3	>3 and < = 7	>7
B (2)-microglobulin (B(2)-M) (ug/g creatinine)	< = 300	>300 and < = 750	>750 ⁽¹⁾
Cadmium in blood (CdB) (ug/liter whole blood)	< = 5	>5 and < = 10	>10

⁽¹⁾ If an employee's B(2)-M levels are above 750 ug/g creatinine, in order for mandatory medical removal to be required (See Appendix A Table B.), either the employee's CdU level must also be >3 ug/g creatinine or CdB level must also be >5 ug/liter whole blood.

1910.1027 App A, Paragraph 98 Appendix A - Table B - Actions Determined by Biological Monitoring

This table presents the actions required based on the monitoring result in Appendix A Table A. Each item is a separate requirement in citing non-compliance. For example, a medical examination within 90 days for an employee in category B is separate from the requirement to administer a periodic medical examination for category B employees on an annual basis.



Required Actions	Monitoring Result Category		
	A ⁽¹⁾	B ⁽¹⁾	C ⁽¹⁾
(1) Biological Monitoring: (a) Annual (b) Semiannual (c) Quarterly	X	X	X
(2) Medical Examination: (a) Biennial (b) Annual (c) Semiannual (d) Within 90 days	X	X X	X
(3) Assess within two weeks: (a) Excess cadmium exposure (b) Work practices (c) Personal hygiene (d) Respirator usage (e) Smoking history (f) Hygiene facilities (g) Engineering controls (h) Correct within 30 days (i) Periodically Assess Exposures		X X X X X X X X X	X X X X X X X X X
(4) Discretionary Medical Removal		X	X
(5) Mandatory Medical Removal			X ⁽²⁾

⁽¹⁾ For all employees covered by medical surveillance exclusively because of exposures prior to the effective date of this standard, if they are in Category A, the employer shall follow the requirements of paragraphs (l)(3)(i)(B) and (l)(4)(v)(A). If they are in Category B or C, the employer shall follow the requirements of paragraphs (l)(4)(v)(B)-(C).

⁽²⁾ See footnote Appendix A Table A.

1910.1027 App A, Paragraph 101

Appendix A - Attachment - 2: List of Medications. A list of the more common medications that a physician, and the employee, may wish to review is likely to include some of the following:

- (1) anticonvulsants: paramethadione, phenytoin, trimethadone;
- (2) antihypertensive drugs: captopril, methyl dopa;
- (3) antimicrobials: aminoglycosides, amphotericin B, cephalosporins, ethambutol;
- (4) antineoplastic agents: cisplatin, methotrexate, mitomycin-C, nitrosoureas, radiation;
- (5) sulfonamide diuretics: acetazolamide, chlorthalidone, furosemide, thiazides;
- (6) halogenated alkanes, hydrocarbons, and solvents that may occur in some settings: carbon tetrachloride, ethylene glycol, toluene; iodinated radiographic contrast media; nonsteroidal anti-inflammatory drugs; and,
- (7) other miscellaneous compounds: acetaminophen, allopurinol, amphetamines, azathioprine, cimetidine, cyclosporine, lithium, methoxyflurane, methysergide, D-penicillamine, phenacetin, phenindione.

A list of drugs associated with acute interstitial nephritis includes:

- (1) antimicrobial drugs: cephalosporins, chloramphenicol, colistin, erythromycin, ethambutol, isoniazid, paraaminosalicylic acid, penicillins, polymyxin B, rifampin, sulfonamides, tetracyclines, and vancomycin;
- (2) other miscellaneous drugs: allopurinol, antipyrine, azathioprine, captopril, cimetidine, clofibrate, methyl dopa, phenindione, phenylpropanolamine, phenytoin, probenecid, sulfapyrazone, sulfonamid diuretics, triamterene; and,
- (3) metals: bismuth, gold.

1910.1027 App A, Paragraph 102 This list has been derived from commonly available medical textbooks (e.g., Ex. 14-18). The list has been included merely to facilitate the physician's, employer's, and employee's understanding. The list does not



represent an official OSHA opinion or policy regarding the use of these medications for particular employees. The use of such medications should be under physician discretion.

1910.1027 App A, Paragraph 103 - Appendix A - Attachment 3 - Biological Monitoring and Medical Examination Results

Employee

Testing Date

Cadmium in Urine _____ ug/g Cr

Cadmium in Blood _____ ug/lwb

Beta-2-microglobulin in Urine _____ ug/g Cr

(Normal Levels: ≤ 3 ug/g Cr, ≤ 5 ug/lwb, ≤ 300 ug/g Cr)

Physical Examination Results:

N/A

Satisfactory

Unsatisfactory _____ (see physician again)

Physician's Review of Pulmonary Function:

Test: N/A _____ Normal _____ Abnormal

Next biological monitoring or medical examination scheduled for

The biological monitoring program has been designed for three main purposes:

- 1) to identify employees at risk of adverse health effects from excess, chronic exposure to cadmium;
- 2) to prevent cadmium-induced disease(s); and
- 3) to detect and minimize existing cadmium-induced disease(s).

1910.1027 App A, Paragraph 104 The levels of cadmium in the urine and blood provide an estimate of the total amount of cadmium in the body. The amount of a specific protein in the urine (beta-2-microglobulin) indicates changes in kidney function. All three tests must be evaluated together. A single mildly elevated result may not be important if testing at a later time indicates that the results are normal and the workplace has been evaluated to decrease possible sources of cadmium exposure. The levels of cadmium or beta-2-microglobulin may change over a period of days to months and the time needed for those changes to occur is different for each worker.

1910.1027 App A, Paragraph 105 If the results for biological monitoring are above specific "high levels" [cadmium urine greater than 10 micrograms per gram of creatinine (ug/g Cr), cadmium blood greater than 10 micrograms per liter of whole blood (ug/lwb), or beta-2-microglobulin greater than 1000 micrograms per gram of creatinine (ug/g Cr)], the worker has a much greater chance of developing other kidney diseases.

1910.1027 App A, Paragraph 106 One way to measure for kidney function is by measuring beta-2-microglobulin in the urine. Beta-2-microglobulin is a protein which is normally found in the blood as it is being filtered in the kidney, and the kidney reabsorbs or returns almost all of the beta-2-microglobulin to the blood. A very small amount (less than 300 ug/g Cr in the urine) of beta-2-microglobulin is not reabsorbed into the blood, but is released in the urine. If cadmium damages the kidney, the amount of beta-2-microglobulin in the urine increases because the kidney cells are unable to reabsorb the beta-2-microglobulin normally. An increase in the amount of beta-2-microglobulin in the urine is a very early sign of kidney dysfunction. A small increase in beta-2-microglobulin in the urine will serve as an early warning sign that the worker may be absorbing cadmium from the air, cigarettes contaminated in the workplace, or eating in areas that are cadmium contaminated.



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1910.1027 App A, Paragraph 107 Even if cadmium causes permanent changes in the kidney's ability to reabsorb beta-2-microglobulin, and the beta-2-microglobulin is above the "high levels", the loss of kidney function may not lead to any serious health problems. Also, renal function naturally declines as people age. The risk for changes in kidney function for workers who have biological monitoring results between the "normal values" and the "high levels" is not well known. Some people are more cadmium-tolerant, while others are more cadmium-susceptible.

1910.1027 App A, Paragraph 108 For anyone with even a slight increase of beta-2-microglobulin, cadmium in the urine, or cadmium in the blood, it is very important to protect the kidney from further damage. Kidney damage can come from other sources than excess cadmium-exposure so it is also recommended that if a worker's levels are "high" he/she should receive counseling about drinking more water; avoiding cadmium-tainted tobacco and certain medications (nephrotoxins, acetaminophen); controlling diet, vitamin intake, blood pressure and diabetes; etc.

1910.1027 App A, Paragraph 109

[57 FR 42389, Sept. 14, 1992, as amended at 58 FR 21781, Apr. 23, 1993]

PROCEDURE

Subject: PERSONAL PROTECTIVE EQUIPMENT

1.0 PURPOSE AND SUMMARY

This procedure stipulates that the company will provide the personal protective equipment necessary for employees to perform their work safely, as established by the Health & Safety Department. Special purchasing programs for prescription safety glasses and safety shoes are also described. Head, eye, body, and foot protection are discussed in this procedure. Respiratory and hearing protection are cross referenced to the appropriate company procedures.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The EH&S Operations Manager, is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Company – All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc (Shaw E & I).



5.0 TEXT

The company will provide suitable personal protective equipment as required for the nature of the job being performed, such as, but not limited to, boots, protective clothing, respirators, face shields, safety eyewear, respirator ophthalmic hanger devices, hard hats, and gloves. This personal protective equipment will be specified by the Health & Safety Department prior to use, subject to an assessment of the hazards to which employees will be potentially exposed. Documentation shall be in the project-specific Health and Safety Plan (HASP) or equivalent document.

Employees shall use HS-approved protective equipment on any task where there is potential exposure to: physical hazards such as equipment operation, objects dropping from above, or flying particles; or exposure to toxic or irritating gases, fumes, vapors, liquids, or other materials which might cause respiratory distress or skin irritation.

Employees shall be trained in the proper use, maintenance, and limitations of protective equipment. Safety equipment shall be replaced when it is damaged, contaminated, or has worn out. Training requirements are summarized in company Procedure HS050.

Employees shall wear hard hats, eye protection, and steel-toed foot protection (chemical resistant when required) at all job sites (excluding field offices) and industrial facilities, unless HASP/site rules provide exemption. It is the responsibility of all employees to report to any work site prepared to work in Level D PPE. All other protective equipment is the responsibility of the project.

5.1 Eye Protection

All employees engaged in or working in areas adjacent to eye-hazardous activities or operations shall wear appropriate eye protection.

- Safety glasses are required for impact protection, and shall meet ANSI Standard Z87.1 requirements.
- Chemical goggles are required for protection against chemical splash.
- Face shields are required for face protection from chemical splash and are not a substitute for eye protection.
- Full-face respirators can provide eye and face protection in lieu of safety glasses, goggles, or face shields.

5.1.1 Prescription Eye Protection. The company will provide prescription safety glasses (meeting ANSI Standard Z87.1) for field/shop/lab personnel, and computer glasses for computer users, as required by their individual vision status and job. Glasses will be provided every two years unless damaged on-the-job, or the employee exhibits a significant change of prescription.



Lenses shall be clear polycarbonate or plastic. Special tints or dark lenses can be obtained for special applications (e.g., extended outdoor work) with prior written approval from the Health & Safety Department.

Employees requiring corrective lenses inside of respirator face-pieces will be provided with safety lenses and frames sized for respirators and the respirator insert, in addition to conventional prescription safety glasses.

Employees will arrange and pay for the eye examination through the company-provided vision care program. The company will pay for fitting services and the safety glasses.

The company has established a national contract with a protective eyewear provider. Employees should contact the local HS representative (with current lens prescription), who will coordinate with the local purchasing representative to order eyewear. Employees choosing to use another provider will be reimbursed up to \$65 for safety or computer glasses, after the Health & Safety Department has verified that the glasses meet the ANSI Standard requirements.

5.2 Foot Protection

Basic foot protection is required for all job sites and industrial locations. Specialized footwear shall be provided as required by the nature of the work. Special foot protection may include, but is not limited to, chemically resistant, thermally shielded, metatarsal guards, etc.

5.2.1 Leather Safety Shoes. Safety shoes may be used in place of chemical resistant footwear when an employee will be working in a clean or uncontaminated work areas. Generally, when the employee desires to use safety footwear other than standard chemical resistant footwear provided, the company considers it the responsibility of the employee to provide such footwear and ensure that it meets ANSI Standard Z41. Company supervision will enforce the use of appropriate protective footwear per the requirements of the site-specific Health and Safety Plan. Where state or local regulations require (i.e., California and Connecticut), the company will provide all necessary safety equipment.

Employees can purchase safety shoes through national purchasing agreements established by the company. Under the limited circumstances where the company will provide safety shoes, such purchases must be approved by the project or appropriate department/local manager. After the Health & Safety Department has verified that the safety shoes meet ANSI requirements, the employee will be reimbursed for the actual purchase price of the shoes up to a maximum of \$90.00.



Athletic-style safety shoes ("safety sneakers") are prohibited for all field operations due to the difficulties created by these styles in supervising proper use of protective footwear. Employees in fixed laboratory operations may wear athletic-style safety shoes with the prior approval of the Lab Director or HS Coordinator.

5.3 Head Protection

Hard hats meeting ANSI Z89.1 shall be provided to protect employees from impact, penetration, falling objects, and/or limited electrical shock and burn, as appropriate for work site hazards.

5.4 Respiratory Protection

Respirators shall be provided, in accordance with Procedure HS601, Respiratory Protection Program.

5.5 Hearing Protection

Hearing protection shall be provided, in accordance with Procedure HS402, Hearing Conservation Program.

5.6 Body Protection

Protective clothing, gloves, boots, and other protective equipment shall be provided as appropriate for the hazards associated with the tasks being performed.

5.7 Providing Personal Protective Equipment to Non-Company Personnel

The following personal protective equipment may be provided to non-company personnel:

- Hard hats
- Chemical goggles
- Safety glasses (non-prescription)
- Face shields
- Chemical resistant boots
- Chemical resistant gloves
- Hearing protectors
- Disposable chemical resistant personal protective clothing

5.8 Management Duties

It is the responsibility of the Health & Safety Department to specify safety equipment requirements for each job.

It is the responsibility of project managers or location managers to provide adequate quantities of safety equipment required for their job(s) or project(s).

It is the responsibility of supervisors to verify that required safety equipment is properly used and to ensure that any employee provided protective equipment is adequate, properly maintained and in a sanitary condition.



6.0 EXCEPTION PROVISIONS

Variances and exceptions shall be permitted pursuant to the provisions of Procedure HS013, "Health & Safety Procedure Variances".

7.0 CROSS REFERENCES

HS050 Training Requirements

HS402 Hearing Conservation Program

HS601 Respiratory Protection Program

ANSI Standard Z41, *Personal Protection - Protective Footwear*

ANSI Standard Z87.0, *Practice for Occupational and Educational Eye and Face Protection*

ANSI Standard Z89.1, *Protective Headwear for Industrial Workers*

8.0 ATTACHMENTS

1. Responsibility Matrix



ATTACHMENT 1 PERSONAL PROTECTIVE EQUIPMENT

Responsibility Matrix

Action	Procedure Section	Responsible Party			
		EH&S Operations Manager	Local HS Department	Project/ Location Managers	Supervisors
Issue, revise, and maintain this procedure.	3.1	X			
Approve all personal protective equipment prior to use.	5.0		X		
Coordinate reimbursement to employee for PPE purchases.	5.1.1, 5.2.1		X		
Provide adequate quantities of safety equipment as required.	5.8			X	
Verify that required safety equipment is properly used.	5.8				X



PROCEDURE

Subject: RESPIRATORY PROTECTION PROGRAM

1.0 PURPOSE AND SUMMARY

The purpose of this procedure is to prescribe the requirements of the company Respiratory Protection Program (RPP). This procedure provides information and guidance on the proper selection, medical evaluation, training, use, and care of respiratory protective equipment and complies with the requirements of 29 CFR 1910.134 (1998).

All operations which require the use of respiratory protection are subject to the provisions of this procedure.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President, Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

Program responsibilities are detailed throughout this procedure. The Responsibility Matrix summarizes these items and can be found as Attachment 1.

4.0 DEFINITIONS

Action Level (AL) - Airborne contaminant concentration which is one-half of the Permissible Exposure Guideline (PEG).

Air Purifying Respirator (APR) - Negative pressure respirator (also referred to as a cartridge respirator) which filters contaminated air through chemical or mechanical filter elements. APRs include: cartridge, canister, gas masks, and single-use respirators (single-use respirators are not approved for use by the company).

Approved Respirator - Any respirator, identified by manufacturer and model, that has been approved by NIOSH 42 CFR Part 84 and has been incorporated into the List of Approved Respiratory Protective Equipment (Attachment 2).

Assigned Protection Factor (APF) - A term that is reserved in the OSHA Standard 1910.134 (January, 1998). Attachment 3 provided PFs for the respiratory protective equipment based upon type of device and method of fit testing. The company will continue to use the PFs established by NIOSH until OSHA issues their definition of APF.

Company - All wholly-owned subsidiaries of Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

Contractor Personnel - A group of persons hired to perform a specific activity based on their expertise and ability to operate independent of direct supervision. Contractor personnel are supervised by their management group which reports to an employee of the company for project direction.

End-of-Service-Life Indicator (ESLI) - A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.



Emergency - Emergency means any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Exposure Limit - Several published airborne contaminant concentration values exist which are used in establishing acceptable personnel exposures to contaminants. OSHA publishes the Permissible Exposure Limit (PEL), NIOSH publishes the Recommended Exposure Limit (REL), and the ACGIH publishes the Threshold Limit Value (TLV). All of these exposure limits are based on an 8-hour work shift, 40-hour work week, and 40-year work life. The values may vary from contaminant to contaminant as well as between publishing bodies.

Field Office - Any office or satellite office performing field activities which may require the use of respiratory protection.

Filtering Facepiece (Dust Mask) - A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fit Factor (FF) - This term means a quantitative estimate of the fit of a particular respirator to a specific individual and typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn. The FF incorporates a safety factor of 10 because protection factors in the workplace tend to be much lower than the fit factors achieved during fit testing. Acceptable fit factors are 100 for a tight-fitting half facepiece and 500 for a tight-fitting full facepiece respirators.

HASP - Health and Safety Plan.

Health and Safety Representative - A member of the company Health and Safety Functional Resource Group who, through credentials, training, or experience, has the necessary qualifications and authority to specify respiratory protection and evaluate respiratory protection program elements.

Immediately Dangerous to Life or Health (IDLH) - An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Labor Pool Personnel - Temporary personnel hired for a given expertise or ability. Labor pool personnel report directly to an employee of the company.

Nuisance Level - Level of airborne contaminants which is below one-half the action level for that contaminant and presents no other health or safety hazard.

Permissible Exposure Guideline (PEG) - This term designates a specific exposure limit and is based on the best available information. The PEG will be the lower (more protective) of the values for the PEL and TLV. However, the REL shall take precedence for Hazardous Waste Operations (subject to 29 CFR 1910.120 or 1926.65) if no PEL exists, or for contaminants where no PEL or TLV exists. If there is no PEL, TLV, or REL, a Health and Safety Representative shall determine an appropriate permissible exposure guideline.



Permissible Exposure Limit (PEL) - An occupational exposure index promulgated by OSHA which carries the force of law. This value represents the allowable concentration to which it is believed an employee may be exposed to 8 hours a day, 40 days a week, for a 40-year working life without experiencing adverse health effects.

Positive Pressure Respirator - A respirator in which the pressure inside the respirator exceeds the ambient air pressure outside the respirator.

Powered Air Purifying Respirator (PAPR) - A positive pressure APR which incorporates a fan and a battery pack unit. The system pulls contaminated air through the filter elements before delivery to the facepiece under positive pressure. Air pressure in the mask must remain above ambient pressure.

Qualitative Fit Test - A procedure for assuring that the respirator provides adequate protection based on a pass/fail fit test that relies on the individual's response to the test agent. Standard fit test protocol will utilize the irritant smoke methods as described in Attachment 4.

Quantitative Fit Test - A fit test that provides an assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Respiratory Protection Program Coordinator (RPP Coordinator) - A person designated by the Health and Safety Representative to administer and supervise the respiratory program at a local facility or project location. This person will have the necessary training or credentials to execute this task.

Recommended Exposure Limit (REL) - An occupational exposure index published by NIOSH which is a recommended guideline for employee protection. This value represents the allowable concentration to which it is believed an employee may be exposed to 10 hours a day, 40 hours a week, for a 40-year working life without experiencing health effects.

Supplied Air Respirator (SAR) - Positive pressure respirator which supplies an independent source of breathing air to the user. Two types of SARs are available: self-contained breathing apparatus (SCBA) and airline.

Threshold Limit Value (TLV) - An occupational exposure index published by ACGIH which is recognized as an industry guideline and represents the concentration to which it is believed that nearly all employees may be exposed to 8 hours a day, 40 hours a week without experiencing adverse health effects.

5.0 TEXT

The company will employ engineering controls (e.g., enclosure, ventilation, material substitution, etc.) as the primary method to limit employee exposure. However, for those situations where engineering and administrative controls are ineffective at controlling employee exposure, the use of respiratory protective equipment may be required.



This RPP provides specific requirements for selection, assignment, training, and medical evaluation for persons expected to wear respiratory protection.

5.1 Assignment of Equipment to Contractor/Labor Pool Personnel

Contractor personnel shall provide their own respiratory protective equipment and shall also confirm meeting all other requirements of their own RPP and that of the company's RPP (i.e., medical clearance, training, etc.).

The company may provide the following respiratory protective equipment to Contractor Personnel:

- Disposable equipment such as filter elements.
- Hardware for airline systems (up to, but not including, the airline and facepiece) which employees are sharing.

The company will not provide the following respiratory protective equipment to Contractor Personnel:

- APR or PAPR facepieces.
- SCBAs, SAR respirators, or airline.

The company may provide respiratory protective equipment to Labor Pool Personnel if the following have been established:

- The labor pool personnel have successfully completed training as required by 29 CFR 1910.134 and other applicable regulations.
- The labor pool personnel have been fit tested in relation to projected exposure levels and contaminants to be encountered.
- The labor pool personnel have been medically approved to wear respirators.
- All other RPP requirements have been met.

5.2 Approval, Selection, and Purchase of Respiratory Protective Equipment

The following requirements are designed to guide correct selection of respiratory protective equipment.

5.2.1 Approval. The Vice President, Health and Safety has approved respirators manufactured by Survivair as the primary respirators for use by employees. For employees who cannot achieve a satisfactory fit or comfort factor in Survivair respirator, Mine Safety Appliance (MSA) respirators will be selected. The list of approved model respirators is included in Attachment 2. Contractor personnel may select any respiratory protective equipment that has received approval from NIOSH.



5.2.2 Selection. The Health and Safety Representative shall base the selection of respiratory protective equipment upon an assessment of potential respiratory hazards that may be encountered. This assessment may utilize a variety of written information such as the NIOSH Pocket Guide to Chemical Hazards, Material Safety Data Sheets, analytical data, air monitoring results, or other applicable information. The selection process shall incorporate the following guidelines:

- Respiratory protection is to be selected by Health and Safety Representatives only. Full facepiece respirators are the usual preference because of superior protection factor and the face/eye protection afforded. Half facepiece respirators can only be used in situations where less than one-half the PEG is expected. The type of respirator selected will be documented in the Project HASP.
- Selection of the appropriate respiratory protective equipment shall include factors such as the chemical state and physical form of the chemical contaminant, atmospheric concentration during routine and emergency events, potential physical hazards, expected job task requirements, and the performance of the respirator in providing the appropriate level of protection against these hazards.
- Consideration shall be given to the nature of the hazardous operation, location of the hazardous area relative to nonhazardous breathing air supply, duration of wear, activities to be performed, and characteristics and function of the respiratory protective equipment to be worn.
- Selected respirators (i.e., Survivair or MSA) shall be NIOSH certified and used in compliance with the conditions of its certification when employees are exposed to toxic materials or other hazardous atmospheres.
- Respirators must provide adequate face and eye protection for the expected task.
- If an APR or PAPR is used, the respirator shall be equipped with an end-of-service life-indicator (ESLI) certified by NIOSH for the contaminant. If an ESLI is not available for the contaminant, a cartridge element change schedule shall be implemented which is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. This information will be described in the HASP.
- The PF for the respirator selected (Attachment 3) shall be used according to the following relationship with the PEG to establish justification for selection:

$$PF \times PEG > \text{Maximum anticipated contaminant concentration}$$



If this equation is false, a respirator with a greater PF must be selected. Also review Attachment 3 to determine the required fit testing for the expected maximum anticipated contaminant concentration. The Health and Safety Representative may determine that a more conservative approach (e.g., 50 percent PF) may be needed. Decision to do so should be documented in the Project HASP.

- Manufacturer-established limitations of the APR filter elements relative to the contaminants of concern shall be used to establish further justification for the selected respirator should the APR's FF not disqualify its use (e.g., maximum anticipated contaminant concentration).

5.2.3 Purchase. The purchase request of respiratory protective equipment (including cartridges, airlines, compressed air) should be reviewed by a Health and Safety Representative to indicate that the ordered material meets established requirements. **Under no circumstances may anyone (purchasing, warehouse, project manager, etc.) purchase or provide other than the specific respiratory protection equipment selected by the Health and Safety Representative.**

5.3 Medical Evaluation

No employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator. The medical evaluation must be conducted prior to fit testing and work requiring the use of respiratory equipment.

The medical evaluation shall be performed by a physician typically in conjunction with a physical examination meeting the requirements of 29 CFR 1910.120 (f) *Medical Surveillance*. The physician will be informed of the type of work expected of the employee, the types of respiratory protection and personal protective equipment required, and other information indicating the expected stresses of the task. The company medical director shall be given a copy of the company RPP and a copy of 1910.134 (e) *Medical Evaluation*.

The company medical director shall provide a written recommendation regarding the employee's ability to use respiratory protection. The company shall ensure that the company medical director supplies the employee with a copy of this recommendation.

Additional medical evaluations will be provided to the employee if:

- Any medical signs or symptoms due to respirator use are reported by the employee, supervisory, or health and safety personnel.
- A change in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.



5.4 General Program Requirements

5.4.1 Responsibilities. The following information describes the responsibilities for the selection, use, and maintenance of respiratory protective equipment based upon job function:

Management

- Management shall take necessary and cost-effective measures to reduce, where possible, the need for respiratory protective equipment (e.g., enclosed cabs on heavy equipment to reduce airborne dust, operations performed upwind, etc.)
- Respiratory protective equipment shall be provided by management whenever it is determined that such equipment is necessary to protect the health of the employee or when requested by an employee and approved by the Health and Safety Representative.
- Management shall assign work tasks requiring the use of respiratory protective equipment to only those employees who are medically qualified to wear respiratory protective equipment.
- Management shall ensure that employees are trained in the use of respiratory protection prior to being assigned to an activity that requires its use.
- Management shall provide the means for the maintenance of respiratory protection as required.

Health and Safety Representative

- Health and Safety Representatives shall determine appropriate respiratory protection for each job. The decision logic for this selection shall be documented in the Project HASP.
- Health and Safety Representatives shall monitor compliance with the various aspects of this program, provide technical assistance regarding respirator selection and use, evaluate the effectiveness of the RPP, and support respirator training and fit testing at locations under their control.
- Health and Safety Representatives shall conduct regular audits to determine compliance with this procedure. This audit can include a review of maintenance, training, medical and air monitoring records, and review the status of this procedure with regard to current regulatory requirements.



- Health and Safety Representatives shall maintain or oversee maintenance of all other records required by this RPP and shall provide for the training and fit testing of personnel assigned respiratory protective equipment.
- Health and Safety Representatives shall appoint a RPP Coordinator for each location which uses or may have a need to use respiratory protection. The Health and Safety Representative must assure the RPP Coordinator has the necessary training to fulfill his/her responsibilities.

RPP Coordinator

- The RPP Coordinator shall be responsible for cleaning, maintenance, and storage of all respirators not routinely used or not individually assigned.
- The RPP Coordinator shall maintain respirator supplies, including spare parts; submit purchase requests for new equipment; and assure that sufficient quantities of cartridges are available for each field office/project.
- The RPP Coordinator shall assure that air supply and emergency respiratory protection is properly inspected and maintained.
- Respirators shall be repaired by either qualified personnel under the direction of the RPP Coordinator, or by contracted supplier.
- The RPP Coordinator shall maintain models and sizes of respirators available for selection and fitting.
- The RPP Coordinator shall conduct fit testing.

Training Department

- Records pertaining to training and fit testing will be maintained by the Training Department.

Employee

- The employee shall use the provided respiratory protective equipment when instructed to do so in accordance with training received.
- The employee shall clean, disinfect, and properly store the assigned respirator, unless other arrangements are made on a project level.
- The employee shall guard against damage to the assigned respirator.
- The employee shall inspect the respirator before each use and after cleaning.



- The employee shall report any malfunction of the respirator immediately to their supervisor and/or the RPP Coordinator.
- The employee shall report to their supervisor any change in their medical status that may impact their ability to wear a respirator safely.

5.4.2 Use of Corrective Lens Eyewear. In general, contact lenses are permitted to be worn when respiratory protection is used. Although in certain instances, client- or project-specific rules may not allow for their use.

If an employee chooses not to wear contact lenses, management shall assure that the appropriate frames or ophthalmic device attachments are obtained and provided at no cost to the employee.

5.4.3 Obstruction of Face Seal. Employees who wear respirators are required to be clean shaven to the extent that there is no obstruction between the wearer's skin and the facepiece. Trimmed mustaches and facial hair which does not interfere with the seal are allowable.

In addition, respirators shall not be worn when conditions prevent a good face-to-facepiece seal such as corrective lenses or goggles, or other personal protective equipment.

5.5 Instruction, Training, and Fit Test

5.5.1 Instruction and Training. The Training Department shall provide a standard respiratory protective equipment training program for use by qualified personnel such as the Health and Safety Representative or RPP Coordinator. The Training Department will support training at the project location if the project does not have the qualified personnel and/or the equipment to support its own program. As an alternative, the project location may use a respiratory manufacturer's training program if the program meets company requirements, a competent person conducts the training, adequate equipment is available for demonstration, and fit testing is conducted along guidelines established in this procedure. The Training Department must approve all alternative training methods.

The basic respirator training program shall include, as a minimum, the following:

- Training and annual retraining of employees in the selection, use, maintenance, and limitation of each respirator type used.
- Instruction on the nature of the respiratory hazards and potential health effects resulting from exposure.
- Opportunity for "hands on" experience with the respiratory protective equipment.



- Proper fitting, including demonstrations and practice in wearing, adjusting, and determining the fit of the respirator. A selection of respirators shall be available to determine the most comfortable respirator and the best fit.
- Instruction on how to test the face-to-facepiece seal.
- A familiarization period of wear in ambient air.
- For APRs, wearing the respirator in a test atmosphere (typically irritant smoke) for qualitative fit testing. The qualitative fit test shall follow the guidelines outlined in Section 5.5.2.
- Training to recognize and cope with emergency situations (including respirator failure)
- Training and fit testing shall be repeated annually, unless specific OSHA regulations require a more frequent time period (e.g., asbestos, lead operations). Each person receiving training shall complete the Respirator Fit Test Form (Attachment 5).
- Training records will be maintained by the Training Department and the location Health and Safety Representative. On-site records of training and fit testing will be maintained as required by specific regulation (e.g., asbestos work) (refer to Section 5.8).
- It is the responsibility of the RPP Coordinator to verify that all project personnel meet the requirements of this RPP.

5.5.2 Fit Testing. Prior to the use of any negative or positive pressure tight-fitting facepiece, the employee must be fit tested.

- All employees assigned to operations requiring the use of respiratory protective equipment shall have been fit tested within 12 months, or as required by specific regulations (e.g., asbestos, lead operations). Fit test and qualification cards (or a copy of the completed Attachment 5) must be available during operations.
- The employee shall be fit tested with the same size and model as they are expected to wear.
- Qualitative fit test (QLFT) shall be used when a protection factor of 10 or less is required for a negative pressure respirator.
- Quantitative fit test (QNFT) shall be used when a protection factor of greater than 10 is required for a negative pressure respirator. When



executing the QNFT, the acceptable test result is 100 for tight fitting half-facepiece respirators and 500 for full-facepiece respirators.

- Fit testing for tight-fitting atmosphere supplying respirators and tight-fitting APRs shall be in a negative pressure mode regardless of the mode of operation that is used for respiratory protection.
- Assessment of comfort shall be made after allowing adequate time for this evaluation. This evaluation shall include reviewing the following points with the employee: positioning of the mask on nose, room for eye protection if required, room to talk, and positioning of the mask on the face and cheeks.
- The following criteria shall be used to help determine the adequacy of the respirator fit: chin properly placed, strap tension, fit across the nose bridge, and tendency to slip.
- If physical obstruction (e.g., facial hair, eyeglasses) interferes with the face-to-facepiece seal, then it shall be altered or removed so as to eliminate any interference and allow for a satisfactory fit. If the employee refuses to alter the physical obstruction, then they shall be denied a satisfactory fit report and referred to his/her supervisor for consideration.
- The fit test protocol (Attachment 4) shall be followed. The Health and Safety Representative and Training Department shall determine which fit test protocol shall be followed depending upon the situation.

5.6 Maintenance Program

Each RPP Coordinator is responsible for verifying the respirator maintenance program is implemented in an effective manner for the facility or project site, the working conditions, and the potential hazards involved. As a minimum, the following aspects must be implemented:

- Inspection
- Cleaning and sanitizing
- Repair
- Respirator storage
- Inspection and repair documentation, as required
- Compliance with manufacturer recommendations.

Detailed information regarding cleaning, inspection, maintenance, and storage is found in Attachment 7. The RPP Coordinator shall verify compliance with the maintenance program by periodic inspections and field audits.



5.6.1 Inspection

- All respiratory protective equipment systems shall be inspected by the wearer for defects and/or deterioration immediately prior to and after each use.
- Any defects shall be reported to their supervisor immediately and the respirator removed from use until it can be repaired or replaced.
- Respiratory protective equipment systems not used routinely (including all SCBAs and equipment designated only for emergency use) shall be inspected before and after each use and at least every 30 days. Cylinders shall be recharged whenever the pressure falls below 90 percent of the manufacturer's recommended pressure level. This inspection shall be documented by some method on the unit (i.e., tag). Records of inspections shall be kept through appropriate documentation. Attachment 6 provides an example of inspection documentation for SCBAs. At a minimum, these records will include: date, inspector, and any unusual finding or condition. Any repairs or modifications shall be documented in detail.
- General field inspection shall include a check of the following: tightness of all connections, facepiece, valves, and any connecting tubes or filtering elements.
- Employees who are manufacturer-qualified repair technicians shall be used for all maintenance beyond field inspections, tests, and user-performed cleaning.
- Air supplied respiratory systems shall be inspected by a manufacturer's authorized representative at the manufacturer's recommended schedule. Manufacturers typically require an annual flow test and a complete overhaul every 5 to 7 years.
- **Specific inspection procedures are outlined in Attachment 7.**

5.6.2 Cleaning and Sanitizing. Employees maintaining their own respirators shall be thoroughly briefed on how to clean and disinfect them. On projects where employees clean their own respirator, the generally accepted procedure involves washing with detergent and warm water using a soft brush, submersion in sanitizing agent, thoroughly rinsing in clean water, drying in a clean place, and storage in sealed plastic bags or equivalent. Precautions to be taken to prevent damage from rough handling during this procedure are detailed in Attachment 7.

At locations where employees share respirators, a centralized cleaning and maintenance facility with specialized equipment and/or materials and personnel



trained in respirator maintenance must be established. Cleaning and inspection is primarily the responsibility of the user.

5.6.3 Repair. The company will only use respiratory protective equipment that is physically sound.

- If defects are found during any inspection, two remedies are possible. If parts and trained personnel are available, repair and/or adjustment may be made immediately. If parts or trained repair people are unavailable, the device shall be removed from service until it can be repaired. Under no circumstances shall a device that is known to be defective remain in service.
- Replacement or repair shall be done by adequately trained personnel. For negative pressure respirators, the Health and Safety Representative or RPP Coordinator may train or supervise personnel in the replacement of items such as inhalation/exhalation valves, head harness, cartridge adapters, and lenses. For air-supplied respirators, field repairs are limited to replacement of head harness and lenses. All other work must be completed by a factory-certified repair person.

Repair shall only be made with parts designed for the respirator. Substitution of parts from a different brand or type invalidates the respirator's approval and is prohibited.

5.6.4 Storage. Respirators must be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and mechanical damage.

- Respirators shall be stored in such a manner that the facepiece, exhalation valve, and straps are not distorted.
- Respirators shall be stored in sealable containers (e.g., ziplock bags) after cleaning and disinfecting.
- The storage location of emergency respiratory protection shall be readily accessible and prominently identified.
- Respirators shall be stored in an area free of contamination.

5.7 Field Use

The following guidelines for the use of respirators (or equivalent) shall be incorporated into the Project HASP as appropriate. Additional guidelines may be required based on working conditions and hazards involved. Each location where respiratory protective equipment is required or worn shall include in the Project HASP justification for the selected respiratory protective equipment systems worn as outlined in Section 5.2 of this procedure.



5.7.1 General Requirements. The following general requirements shall be followed whenever respiratory protection is used:

- Employees shall be allowed to leave the regulated area to readjust the facepiece or to wash their faces and to wipe clean the facepieces of their respirators in order to minimize potential skin irritation associated with respirator use.
- Respiratory protective equipment shall not be passed on from one person to another until it has been cleaned and sanitized, per program requirements.
- Respirators will be inspected, and a positive/negative pressure test performed prior to each use.
- Entry into oxygen-deficient (< 19.5 percent O₂) atmospheres, Immediately Dangerous to Life and Health (IDLH) atmospheres, or areas requiring EPA Level A protection is prohibited without the prior approval of the Vice President, Health and Safety or the CIH assigned to the business line.
- Head coverings such as Tyvek hoods shall not be allowed to pass between the face-to-facepiece seal.
- The harness straps of tight-fitting respirators shall not be positioned or worn over hard hats.

5.7.2 Specific Requirements. The following information details specific requirements by respirator class:

Air Purifying Systems

- When APRs are worn, new filter elements shall be installed at the beginning of operations. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "breakthrough" is perceived or whenever an increase in breathing resistance is detected. In most cases, the cartridges will be replaced a minimum of once daily, usually at the end of the work shift.

Powered Air Purifying Systems

- When PAPRs are worn, employees shall change filter elements after each day's activities. The filter elements shall be changed whenever the ESLI (color indicators) indicates that cartridge life has expired (e.g., mercury



cartridges). When no ESLIs are available, filter replacement will be based on the calculations performed by the Health and Safety Representative. Additionally, the cartridges will be replaced if "break-through" is perceived or when airflow through filter elements decreases to an unacceptable level as indicated by the manufacturer's test device.

Compressed Air

- Compressed air used for breathing shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G; not A, K, or L) as described in the American National Standard Commodity Specification for Air, ANSI/CGA G-7.1-1989. Further information is provided in Attachment 7, Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage.
- Breathing air suppliers must provide certification of analysis stating conformance, as a minimum, to Grade D breathing air standards as previously referenced for each cylinder and/or air lot.
- Air delivered in bulk, e.g., tube trailers, shall have each tube or unit, or a representative number of tubes or units verified as to oxygen content prior to using that tube.
- Pure oxygen shall NOT be used at any time in open-circuit SCBAs or airline respirators.
- Breathing air cylinders shall be legibly identified with the word "AIR" by means of stenciling, stamping, or labeling as near to the valve end as practical.
- Breathing air cylinders may be stored on their sides provided the valve caps are in place.

Supplied Air Breathing Systems

- Airline couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of airline respirators with nonrespirable gases or oxygen.
- Standard airline couplings for breathing air systems are Foster quick connect fittings with locking dots. Hansen quick connect fitting may also be used, but must not be used where they can be inadvertently actuated and disconnected. For example, Hansen fittings could be used at the regulator connection, but not on the airline unless protected from disconnection by some other means.



- The hose line length shall not exceed 300 feet from the air bank regulator to the user.
- No more than three connections, excluding the connection to the regulator and final connection to the respirator, shall be between the breathing air cylinders and the user.
- Breathing air hose shall be protected from direct contact with chemical materials which may permeate the hose. Acceptable methods of protection include suspension of the hose from the surface or covering with a commercially available sleeve or visqueen. Breathing air hose which has become contaminated will be removed from service and disposed of properly.
- The breathing air regulator shall be adjusted to provide air pressure as per the manufacturer's recommendations. For Survivair units, this pressure shall be between 80 to 125 psi pressure.
- Cascade systems shall be equipped with low pressure warning alarms or similar warning devices to indicate air pressure in the manifold below 500 psi.
- When a cascade system is used to supply breathing air, a worker outside the Exclusion Zone shall be assigned as safety standby within audible range of the low pressure alarm.
- When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3,000 psi. The supply hose and coupling shall be relatively short (≤ 3 feet) and secured to prevent whipping when pressurized.
- Large supplied air cylinders shall be stored and handled to prevent damage to the cylinder or valve. Cylinders shall be stored upright with the protective valve cover in place and in such a way (e.g., supported with substantial rope or chain in the upper one-third of the cylinder, or in racks designed for the purpose) as to prevent the cylinder from falling. Cylinders shall not be dropped, dragged, rolled, or allowed to strike each other or to be struck violently. Cylinders shall never be exposed to temperatures exceeding 125 degrees F. Cylinders with visible external damage, evidence of corrosion, or exposure to fire shall not be accepted or used.
- Only cylinders within current hydrostatic test periods shall be used. For fiber wrapped bottles designated by the DOT-E label, hydrostatic testing shall be completed every 3 years. Maximum service life for these cylinders is 15 years. Steel or aluminum cylinders shall be



hydrostatically tested every 5 years. No maximum service life is established for steel or aluminum cylinders.

- SCBAs shall only be used in the positive pressure mode when in the Exclusion Zone.
- Standby SCBA equipment must be present when air supply systems are used in IDLH or potentially IDLH atmospheres.

Escape/Egress Units

- These respirators are intended for use in areas where escape with a short-term (5 minute) air supply is necessary. They may be used as adjuncts to airline respirators as a backup air supply, or as independent emergency devices in areas where respiratory protective equipment is not normally required.
- Appropriate training shall be accomplished and documented prior to assigning employees to tasks or locations subject to the use of these respirators.
- Escape/egress units (5-minute air supply) shall never be used as primary standby respirators for confined space entry.
- Escape/egress units shall never be used to enter, or continue working in, a hazardous atmosphere.

5.7.3 IDLH Atmospheres. For all IDLH atmospheres, the company shall ensure that:

- One employee or, when needed, more than one employee is located outside the IDLH atmosphere.
- Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
- The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue.
- The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue.
- The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation.
- Employee(s) located outside the IDLH atmosphere are equipped with:



- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied air respirator with escape/egress unit.
- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry. Equivalent means of rescue can be considered.

5.8 Recordkeeping

The following documents must be part of the site recordkeeping program:

- Employees' medical clearances for respirator use
- Respirator training and fit testing forms.

5.9 Program Evaluation

This RPP shall be reviewed annually at the direction of the Vice President, Health and Safety.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

Title 29, Code of Federal Regulations, Section 1910.134.

AIHA, *Respiratory Protection, A Manual and Guideline*, 1980.

American National Standards Institute Practices for Respiratory Protection Z88.2-1992 (or most recent publication)

NIOSH, *Certified Equipment List* (most recent version)

Company Health and Safety Procedures:

- HS013 Health and Safety Procedure Variances
- HS040 Stop Work Authority
- HS050 Training Requirement
- HS052 Health and Safety Plans
- HS102 Management of Employee Exposure and Medical Records
- HS104 Employee Notification of Industrial Hygiene Monitoring Records
- HS300 Confined Spaces
- HS304 Compressed Gas Cylinders
- HS600 Personal Protective Equipment



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8.0 ATTACHMENTS

1. Responsibility Matrix
2. List of Approved Respiratory Protective Equipment
3. Respirator Type, Protection Factor, and Fit Testing Method
4. Mandatory Respirator Fit Test Protocol
5. Respirator Fit Test Form
6. Emergency Respiratory Protective Equipment Monthly Inspection Checklist
7. Guide to Respiratory Protective Equipment Cleaning, Inspection, Maintenance, and Storage



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ATTACHMENT 1 RESPIRATORY PROTECTION PROGRAM

Responsibility Matrix

Action	Procedure Section	Responsible Party					
		Employee	Health and Safety Representative	Project/ Location Management	VP, Health and Safety	Training	RPP Coordinator
Issue, Revise, and Maintain Procedure	3.1				X		
Assure Proper Selection of Respirators	5.2.2		X				
Review Purchase Requests for Respiratory Equipment	5.2.3		X				
Conduct Fit Testing	5.4		X				X
Assure Compliance with RPP	5.4		X	X			X
Assure Training	5.4		X	X			X
Audit Program Compliance	5.4		X		X		X
Assist/Approve Local Training Program	5.4					X	
Maintenance Program	5.6	X	X	X			X
Field Use	5.7	X	X	X			X
Recordkeeping	5.8	X	X			X	X
Program Evaluation	5.9				X		



ATTACHMENT 2

LIST OF APPROVED RESPIRATORY PROTECTIVE EQUIPMENT

AIR PURIFYING RESPIRATORS (APR)					
Respirator Class	Respirator Type	Respiratory Performance	Manufacturer	Model Name	Model Number
Standard APR	Half-Face	Negative Pressure	Survivair	Blue 1	2100-10 S 2200-10 M 2300-10 L
			MSA	Comfo II	479529 S 479428 M 479530 L
	Full-Face	Negative Pressure	Survivair	20/20	202062 S 202072 M 202082 L
			MSA	Ultra Twin	480263 S 480259 M 480267 L
Powered APR	Hood	Continuous Positive Pressure	Survivair MSA	PAPR Optimair 6	5200-15 480251 S 480247 M 480255 L

SUPPLIED AIR RESPIRATORS (SAR)					
Respirator Class	Respirator Type	Respiratory Performance	Manufacturer	Model Name	Model Number
Airline SAR	Full-Face	Positive Pressure Demand	Survivair	Panther	P968455
			MSA	Premaire	497291
SCBA SAR	Full-Face	Positive Pressure Demand	Survivair MSA	Cougar MMR WorkMask 2216	P 9643310 Varies on Components
Emergency	Escape/Egress Unit	Continuous Flow	Survivair MSA	5 min. EEGA Custom Air V	9750870 484353



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ATTACHMENT 3

RESPIRATOR TYPE, PROTECTION FACTOR, AND FIT TESTING METHOD

Respirator Type	Protection Factor	QLFT	QNFT
Half-Face, Negative Pressure (<100 Fit Factor) ¹	10	Yes	Yes
Full-Face, Negative Pressure (<100 Fit Factor) Used in Atmosphere up to 10 Times the PEG	10	Yes	Yes
Full-Face, Negative Pressure (>100 Fit Factor) Used in Atmospheres Over 10 Times the PEG ²	50	No	Yes
PAPR	100	Yes	Yes
SCBA/SAR Used in Positive Pressure (Pressure Demand Mode)	10,000	Yes	Yes

Footnotes:

1. If quantitatively fit tested, the device must demonstrate a fit factor of at least 100.
2. If quantitatively fit tested, the device must demonstrate a fit factor of at least 500.



ATTACHMENT 4

MANDATORY RESPIRATOR FIT TEST PROTOCOL

OSHA-Accepted Fit Test Protocols

A. Fit Testing Procedures - General Requirements

The company shall conduct fit testing using the following procedures. The requirements in this attachment apply to all OSHA-accepted fit test methods, both QLFT and QNFT. There are several OSHA-accepted fit test protocols for QLFT. This procedure includes only the irritant smoke protocol since it requires less equipment and is more practical for field use.

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.
3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
4. The test subject shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.
5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following Item A.6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.
6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
 - a. Position of the mask on the nose;
 - b. Room for eye protection;
 - c. Room to talk; and
 - d. Position of mask on face and cheeks.
7. The following criteria shall be used to help determine the adequacy of the respirator fit:
 - a. Chin properly placed;
 - b. Adequate strap tension, not overly tightened;
 - c. Fit across nose bridge;
 - d. Respirator of proper size to span distance from nose to chin;
 - e. Tendency of respirator to slip; and
 - f. Self-observation in mirror to evaluate fit and respirator position.



8. The test subject shall conduct a user seal check, either the negative and positive pressure seal checks. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.
9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache, or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.
10. If a test subject exhibits difficulty in breathing during the tests, he/she shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing his/her duties.
11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.
12. *Exercise Regimen:* Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.
13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.
14. *Test Exercises:* The following test exercises are to be performed for all fit testing methods prescribed in this attachment, except for the controlled negative pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol.

Each test exercise shall be performed for one minute, except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

The test subject shall perform exercises, in the test environment, in the following manner:

- a. *Normal Breathing:* In a normal standing position, without talking, the subject shall breathe normally.
- b. *Deep Breathing:* In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
- c. *Turning Head Side to Side:* Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.



- d. *Moving Head Up and Down:* Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
- e. *Talking:* The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can count backward from 100, recite a memorized poem or song or read from a prepared text such as the Rainbow Passage.

Rainbow Passage:

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

- f. *Grimace:* The test subject shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)
- g. *Bending Over:* The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.
- h. *Normal Breathing:* Same as Item A.14.a.

B. Qualitative Fit Test (QLFT) Protocols

- 1. General:
 - a. The employer shall ensure that persons administering QLFT are able to perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.
 - b. The employer shall ensure that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.
- 2. Irritant Smoke (Stannic Chloride) Protocol: This qualitative fit test uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.
 - a. General Requirements and Precautions:
 - 1. The respirator to be tested shall be equipped with high efficiency particulate air (HEPA) or P100 series filter(s).
 - 2. Only stannic chloride smoke tubes shall be used for this protocol.
 - 3. No form of test enclosure or hood for the test subject shall be used.



4. The smoke take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.
 5. The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the buildup of irritant smoke in the general atmosphere.
- b. Sensitivity Screening Check: The person to be tested must demonstrate his/her ability to detect a weak concentration of the irritant smoke.
1. The test operator shall break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
 2. The test operator shall advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his/her eyes closed while the test is performed.
 3. The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he/she can detect it.
- c. Irritant Smoke Fit Test Procedure:
1. The person being fit tested shall don the respirator without assistance, and perform the required user seal check(s).
 2. The test subject shall be instructed to keep his/her eyes closed.
 3. The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.
 4. If the person being tested has not had an involuntary response and/or detected the irritant smoke, proceed with the test exercises.
 5. The exercises identified in Item A.14 of this attachment shall be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of six inches.
 6. If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.



7. Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.

8. If a response is produced during this second sensitivity check, then the fit test is passed.

C. Quantitative Fit Test (QNFT) Protocols

The following quantitative fit testing procedures have been demonstrated to be acceptable: quantitative fit testing using a nonhazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit; quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

1. General:

- a. The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
- b. The employer shall ensure that QNFT equipment is kept clean, and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

2. Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol: The ambient aerosol CNC quantitative fit testing (Portacount[®]) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for quantitative fit tests. A probed respirator has a special sampling device, installed on the respirator, that allows the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. Portacount[®] Fit Test Requirements:

1. Check the respirator to make sure the sampling probe and line are properly attached to the facepiece and that the respirator is fitted with a particulate filter capable of preventing significant penetration by the ambient particles used for the fit test (e.g., NIOSH 42 CFR 84 Series 100, Series 99, or Series 95 particulate filter) per manufacturer's instruction.
2. Instruct the person to be tested to don the respirator for five minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the



wearer to make certain the respirator is comfortable. This individual shall already have been trained on how to wear the respirator properly.

3. Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; and self-observation in a mirror to evaluate fit and respirator position.
4. Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting facepiece, try another size of the same model respirator, or another model of respirator.
5. Follow the manufacturer's instructions for operating the Portacount^b and proceed with the test.
6. The test subject shall be instructed to perform the exercises in Item A.14 of this attachment.
7. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

b. Portacount^b Test Instrument:

1. The Portacount^b will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.
 2. Since the pass or fail criterion of the Portacount^b is user programmable, the test operator shall ensure that the pass or fail criterion meet the requirements for minimum respirator performance in this attachment.
 3. A record of the test needs to be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.
3. Controlled Negative Pressure (CNP) Quantitative Fit Testing Protocol - The CNP protocol provides an alternative to aerosol fit test methods. The CNP fit test method technology is based on exhausting air from a temporarily sealed respirator facepiece to generate and then maintain a constant negative pressure inside the facepiece. The rate of air exhaust is controlled so that a constant negative pressure is maintained in the respirator during the fit test. The level of pressure is selected to replicate the mean inspiratory pressure that causes leakage into the respirator under normal use conditions. With pressure held constant, air flow out of the respirator is equal to air flow into the respirator. Therefore, measurement of the exhaust stream that is required to hold the pressure in the temporarily sealed respirator constant yields a direct measure of leakage air flow into the respirator. The CNP fit test method measures leak rates through the facepiece as a method for determining the facepiece fit for negative pressure respirators. The CNP instrument manufacturer, Dynatech Nevada, also provides attachments (sampling manifolds) that replace the filter cartridges to permit fit testing in an employee's own respirator. To perform the test, the test subject closes his/her mouth and holds his/her breath, after which an air pump removes air from the respirator facepiece at a pre-selected constant pressure. The facepiece fit is expressed as the leak rate through the facepiece, expressed as milliliters per minute. The quality and validity



of the CNP fit tests are determined by the degree to which the in-mask pressure tracks the test pressure during the system measurement time of approximately five seconds. Instantaneous feedback in the form of a real-time pressure trace of the in-mask pressure is provided and used to determine test validity and quality. A minimum fit factor pass level of 100 is necessary for a half-mask respirator and a minimum fit factor of at least 500 is required for a full facepiece respirator. The entire screening and testing procedure shall be explained to the test subject prior to conducting the screening test.

a. CNP Fit Test Requirements:

1. The instrument shall have a non-adjustable test pressure of 15.0 mm water pressure.
2. The CNP system defaults selected for test pressure shall be set at 15 mm of water (-0.58 inches of water) and the modeled inspiratory flow rate shall be 53.8 liters per minute for performing fit tests.

(Note: CNP systems have built-in capability to conduct fit testing that is specific to unique work rate, mask, and gender situations that might apply in a specific workplace. Use of system default values, which were selected to represent respirator wear with medium cartridge resistance at a low-moderate work rate, will allow inter-test comparison of the respirator fit.)

3. The individual who conducts the CNP fit testing shall be thoroughly trained to perform the test.
4. The respirator filter or cartridge needs to be replaced with the CNP test manifold. The inhalation valve downstream from the manifold either needs to be temporarily removed or propped open.
5. The test subject shall be trained to hold his/her breath for at least 20 seconds.
6. The test subject shall don the test respirator without any assistance from the individual who conducts the CNP fit test.
7. The QNFT protocol shall be followed according to Item C.1 of this attachment with an exception for the CNP test exercises.

b. CNP Test Exercises:

1. Normal Breathing: In a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject needs to hold head straight ahead and hold his/her breath for 10 seconds during the test measurement.
2. Deep Breathing: In a normal standing position, the subject shall breathe slowly and deeply for 1 minute, being careful not to hyperventilate. After the deep breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during test measurement.
3. Turning Head Side to Side: Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side for 1 minute. The head shall be held at each extreme momentarily so the subject can inhale at each side. After the



turning head side to side exercise, the subject needs to hold head full left and hold his/her breath for 10 seconds during test measurement. Next, the subject needs to hold head full right and hold his/her breath for 10 seconds during test measurement.

4. Moving Head Up and Down: Standing in place, the subject shall slowly move his/her head up and down for 1 minute. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling). After the moving head up and down exercise, the subject shall hold his/her head full up and hold his/her breath for 10 seconds during test measurement. Next, the subject shall hold his/her head full down and hold his/her breath for 10 seconds during test measurement.
5. Talking: The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song for 1 minute. After the talking exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.
6. Grimace: The test subject shall grimace by smiling or frowning for 15 seconds.
7. Bending Over: The test subject shall bend at the waist as if he/she were to touch his/her toes for 1 minute. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT units that prohibit bending at the waist. After the bending over exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement.
8. Normal Breathing: The test subject shall remove and re-don the respirator within a one-minute period. Then, in a normal standing position, without talking, the subject shall breathe normally for 1 minute. After the normal breathing exercise, the subject shall hold his/her head straight ahead and hold his/her breath for 10 seconds during the test measurement. After the test exercises, the test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of a respirator shall be tried.

c. CNP Test Instrument:

1. The test instrument shall have an effective audio warning device when the test subject fails to hold his/her breath during the test. The test shall be terminated whenever the test subject failed to hold his/her breath. The test subject may be refitted and retested.
2. A record of the test shall be kept on file, assuming the fit test was successful. The record must contain the test subject's name; overall fit factor; make, model, style, and size of respirator used; and date tested.



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ATTACHMENT 5 RESPIRATOR FIT TEST FORM

NAME (Please Print): _____ SIGNATURE: _____

SSN: _____ - _____ - _____ HOME DEPT: _____ DATE: _____

CONDUCTED BY: _____ LOCATION: _____

FIT TEST PROTOCOL

QUANTITATIVE:

Fit Factor _____

QUALITATIVE:

Irritant Smoke:

Other (specify): _____

TYPE OF RESPIRATOR

(Circle Appropriate One)

APR/HF

APR/FF

SCBA

SAR/EGS

PAPR

OTHER

Respirator Manufacturer: _____

Model: _____

Size: _____

INITIAL:

1. I understand why respiratory protection is needed and where and when it should be used.

2. I know how to use this respirator properly.

3. I know how to clean and inspect this respirator.

4. I understand the limitations and restrictions of this respirator.

5. I wore this respirator in normal air and performed the user seal.

6. I wore this respirator equipment in a test atmosphere.

7. I understand that a good gas-tight face seal cannot be achieved with obstructions such as facial hair or glasses.

8. I understand that corrective lenses compatible with the full facepiece are available by my manager.



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ATTACHMENT 6

EMERGENCY RESPIRATORY PROTECTIVE EQUIPMENT MONTHLY INSPECTION CHECKLIST

INSPECTED BY (Print): _____

DATE: _____

BACKPACK#: _____

AIR CYLINDER#: _____

			PASS	FAIL
A. Backpack and Harness Assembly	1. Straps	Inspect for complete set	☐	☐
		Inspect for damaged straps	☐	☐
	2. Buckles	Inspect for mating ends	☐	☐
		Check locking function	☐	☐
	3. Backplate and Cylinder Lock	Inspect backplate for cracks, missing screws/rivets	☐	☐
		Inspect cylinder hold down strap	☐	☐
		Inspect strap tightener	☐	☐
B. Cylinder and Cylinder Valve Assembly	1. Cylinder	Cylinder tight to backplate	☐	☐
		Current Hydrostatic Test	☐	☐
		Inspect cylinder for dents, gouges	☐	☐
		Is cylinder at least 90% filled?	☐	☐
	2. Head and Valve Assembly	Inspect cylinder valve lock for presence	☐	☐
		Inspect cylinder gauge for condition	☐	☐
C. Regulator and High Pressure Hose	1. High Pressure Hose and Connector	Leakage in hose	☐	☐
		Leakage in hose to cylinder connector	☐	☐
	2. Regulator and Low Pressure Alarm	Read regulator gauge (at least 1,000 psi)	☐	☐
		Low pressure alarm sounds at 500 psi	☐	☐
		Test integrity of diaphragm	☐	☐
		Test for positive pressure	☐	☐
D. Facepiece and Corrugated Breathing Tube	1. Facepiece	Inspect harness for deterioration	☐	☐
		Inspect facepiece body for deterioration	☐	☐
		Inspect lens	☐	☐
		Inspect exhalation valve	☐	☐
	2. Breathing Tube and Connector	Inspect breathing tube for deterioration	☐	☐
		Inspect connector for threads and gasket	☐	☐
	3. Leak Test and Cleaning	Perform negative pressure test on facepiece/ breathing tube	☐	☐
		Clean and sanitize facepiece	☐	☐

Note: Any item marked ☐ Fail ☐ will place the equipment out of service until repaired or replaced.



ATTACHMENT 7

GUIDE TO RESPIRATORY PROTECTIVE EQUIPMENT: CLEANING, INSPECTION, MAINTENANCE, AND STORAGE

A program for the maintenance of respirators shall include the following:

- Cleaning and sanitizing
- Inspection for defects
- Maintenance and repair
- Storage
- Assurance of breathing air quality.

The following maintenance, inspection, and storage program is recommended.

1. **Cleaning and Sanitizing**

Respirators issued to an individual shall be cleaned and sanitized regularly. Each respirator shall be cleaned and sanitized before being worn by different individuals. Respirators intended for emergency use shall be cleaned and sanitized after being used. The following shall be completed in addition to the manufacturer's instruction for cleaning:

- a. Remove, when necessary, the following components of respiratory inlet covering assemblies before cleaning and sanitizing:
 1. Filters, cartridges, canisters
 2. Speaking diaphragms
 3. Valve assemblies
 4. Any components recommended by the respirator manufacturer.
- b. Wash respiratory inlet covering assemblies in warm (43 degrees C or 110 degrees F maximum temperature) cleaner sanitizer solution. A stiff bristle (not wire) brush may be used to facilitate removal of dirt or other foreign material.
- c. Rinse the respirator inlet covering assemblies in clean, warm (43 degrees C or 110 degrees F maximum temperature) water.
- d. Drain all water, and air dry the respiratory inlet covering assemblies.
- e. Clean and sanitize all parts removed from the respiratory inlet covering assemblies as recommended by the manufacturers
- f. If necessary to remove foreign material, hand wipe respiratory inlet covering assemblies, all parts, and all gasket- and valve-sealing surfaces with damp, lint-free cloth.
- g. Inspect parts and replace any that are defective.



- h. Reassemble parts on respirator inlet covering assemblies.
- i. Visually inspect and, where possible, test parts and respirator assemblies for proper function.
- j. Place assembled respirators in appropriate containers for storage.

Machines may be used to expedite the cleaning, sanitizing, rinsing, and drying of large numbers of respirators. Extreme care shall be taken to ensure against tumbling, agitation, or exposure to temperatures above those recommended by the manufacturer (normally 43 degrees C or 100 degrees F maximum), as these conditions are likely to result in damage to the respirators.

Ultrasonic cleaners, clothes washing machines, dishwashers, and clothes dryers have been specially adapted and successfully used for cleaning and drying respirators.

Cleaner sanitizers that effectively clean the respirator and contain a bactericidal agent are commercially available. The bactericidal agent frequently used is a quaternary ammonium compound. Strong cleaning and sanitizing agents and many solvents can damage rubber or elastomeric respirator parts. These materials must be used with caution.

Alternatively, respirators may be washed in a detergent solution and then sanitized by immersion in a sanitizing solution. Some sanitizing solutions that have proven effective are: (a) a hypochlorite (bleach) solution (50 parts per million chlorine), 2-minute immersion; (b) an aqueous iodine solution (50 parts per million of iodine), 2-minute immersion; or (c) a quaternary ammonium solution (200 parts per million of quaternary ammonium compounds in water with less than 500 parts per million total hardness), 2-minute immersion.

Inflammation of the skin of the respirator user (dermatitis) may occur if the quaternary ammonium compounds are not completely rinsed from the respirator. The hypochlorite and iodine solutions are unstable and break down with time; they may cause deterioration of rubber or other elastomeric parts and may be corrosive to metallic parts. Immersion times should not be extended beyond the mentioned time periods, and the sanitizers shall be thoroughly rinsed from the respirator parts.

Respirators may become contaminated with toxic materials. If the contamination is light, normal cleaning procedures should provide satisfactory decontamination; otherwise, separate decontamination steps may be required before cleaning.

2. Inspection

The user shall inspect the respirator immediately prior to each use to ensure that it is in proper working condition. After cleaning and sanitizing, each respirator shall be inspected to determine if it is in proper working condition, if it needs replacement parts or repairs, or if it should be discarded. Each respirator stored for emergency or rescue use shall be inspected at least monthly.



Respirator inspection shall include a check for tightness of connections; for the condition of the respiratory inlet covering, head harness, valves, connecting tubes, harness assemblies, hoses, filters, cartridges, canisters, end-of-service indicators, electrical components, and shelf-life date(s); and for the proper function of regulators, alarms, and other warning systems. Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturer's instructions.

A record of inspection dates shall be kept for each respirator maintained for emergency or rescue use. Respirators that do not meet applicable inspection criteria shall be immediately removed from service (a temporary replacement assigned) and repaired or permanently replaced.

Inspection of hoop-wrapped air cylinders will follow the recommendations set forth in the Compressed Gas Association, Inc. publication CGA C-6.2-1988, "Guidelines for Visual Inspection & Requalification of Fiber Reinforced High Pressure Cylinders," and will be examined for the following five types of damage:

- Abrasion is damage caused by wearing, grinding, or rubbing away by friction. Abrasions less than 0.005 inch (0.127 mm) deep are acceptable and should have no adverse effects on the safety of the cylinder. Abrasions with isolated groups of fibers exposed or flat spots with a depth greater than 0.005 inch (0.127 mm) but less than 0.0075 inch (0.191 mm) are acceptable if the damage is repaired. Cylinders abraded in excess of 0.0075 inch (0.191 mm) should be taken out of service until professionally inspected.
- Cuts are damage inflicted by a sharp object. Cuts or scratches less than 0.005 inch (0.127 mm) deep are acceptable regardless of length, number, or direction. For cuts greater than 0.005 inch (0.127 mm) deep and up to a depth of 0.015 inch (0.038 mm) with a maximum 1- or 2-inch (25.4 mm or 50.8 mm) length transverse to the fiber direction, the cylinder should be removed from service until repaired. Cylinders with cuts greater than 0.015 inch (0.038 mm) with a maximum greater than 2 inches (50.8 mm) length transverse to the fiber direction or with bare metal showing through must be condemned.
- Impact damage is caused by a cylinder striking or being struck by another object. Impact damage is considered slight if a frosted area is noted in the impact area. These cylinders may be returned to service. Impact damage is severe if evidence of fiber cutting, delamination, and possible structural damage is apparent. Cylinders sustaining severe impact damage should be evaluated using the guidelines for cuts and structural damage.
- Structural damage is damage which causes a visual change in original cylinder configuration. This change can include any evidence of bulges, a cocked end fitting, concave areas on the domes or on the cylinder section, or, if by visual inspection of the cylinder interior, there is evidence of damage involving deformation of the liner. Structurally damaged cylinders must be immediately removed from service and condemned.



- Heat or fire damage to a cylinder is evident by discoloration, charring, or burning of the composite, labels, paint, or plastic components of the valve. Such damage would cause a cylinder to be removed from service and condemned. Note: If the cylinder is only soiled from smoke or other debris and is found to be intact underneath, it may be returned to service.

3. **Maintenance and Repair**

Replacement of parts or repairs shall be done only by persons trained in proper respirator maintenance and assembly. Replacement parts shall be only those designated for the specific respirator repaired. Reducing or admission valves, regulators, and alarms shall be adjusted or repaired by the respirator manufacturer or a technician trained by the manufacturer. Instrumentation for valve, regulator, and alarm adjustments and tests should be calibrated to a standard traceable to the National Institute of Standards and Technology (NIST), at a minimum of every 3 years.

4. **Storage**

Respirators shall be stored in a manner that will protect them against physical and chemical agents such as vibration, shocks, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric parts. Respirators shall not be stored in such places as lockers and tool boxes, unless they are protected from contamination, distortion, and damage. Emergency and rescue respirators that are placed in the work areas shall be quickly accessible at all times, and the storage cabinet or container in which they are stored shall be clearly marked.

5. **Assurance of Breathing Air Quality**

Compressed gaseous air, compressed gaseous oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Compressed gaseous air shall meet at least the requirements of the specification for Type I-Grade D breathing air, and liquid air shall meet at least the requirements for Type II-Grade B breathing air as described in ANSI/CGA G-7.1-1989.

The CGA designation for Grade D and Grade E breathing air is as follows:

- Grade D breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 19.5 and 23.5 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, and a maximum of 1,000 ppm carbon dioxide.
- Grade E breathing air, as per ANSI/CGA G-7.1-1989, shall contain between 20 and 22 percent oxygen with the balance predominantly nitrogen, a maximum of 5 mg/m³ oil (condensed), a maximum of 10 ppm carbon monoxide, no pronounced odor, a maximum of 500 ppm carbon dioxide, and 25 ppm total hydrocarbon content (as methane).
- Note: The quality verification for oil is not required for synthesized air whose oxygen and nitrogen components are produced by air liquefaction. Carbon monoxide quality verification is not required for Grade D breathing air if synthesized air when nitrogen component was previously analyzed and meets National Foundry (NF) specification and



when the oxygen component was produced by air liquefaction and meets United States Pharmacopeia (USP) specification.

Compressed gaseous air may contain low concentrations of oil introduced from equipment during processing or normal operation. If high-pressure oxygen passes through an oil- or grease-coated orifice, an explosion or fire may occur. Therefore, compressed gaseous oxygen shall not be used in supplied air respirators or in open-circuit type self-contained breathing apparatus that have previously used compressed air. Oxygen concentrations greater than 23.5 percent shall be used only in equipment designed for oxygen service or distribution.

The dew point of air used to recharge self-contained breathing apparatus shall be –65 degrees F or lower (less than 25 ppm water vapor). The driest air obtainable (dew point of –100 degrees F or lower) should be used for recharging SCBA cylinders to be used in environments with ambient temperatures below –25 degrees F. The dew point of breathing air used with supplied air respirators should be lower than the lowest ambient temperature to which any regulator or control valve on the respirator or air-supplied system will be exposed.

Breathing air couplings shall be incompatible with outlets for nonrespirable plant air or other gas systems to prevent inadvertent servicing of supplied air respirators with nonrespirable gases. **It is recommended that Foster or Hansen fittings be reserved for breathing air systems.** Breathing air outlets shall be labeled.

Breathing air may be supplied to supplied air respirators from cylinders or air compressors. Cylinders shall be tested and maintained in accordance with applicable DOT specifications for shipping containers (49 CFR 173 and 178). Breathing gas containers shall be marked in accordance with ANSI/CGA C-4-1990. Specific test recommendations for purchased breathing air are given in the following table.

Method of Preparation	Analysis Recommended
Compression: Supplier does not fill cylinders with any other gases.	Check 10% of cylinders from each lot for ppm CO and odor.
Compression: Supplier fills cylinders with gases other than air.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.
Reconstitution.	Analyze all cylinders for percent oxygen. Check 10% of cylinders from each lot for ppm CO and odor.

A compressor shall be constructed so as to avoid entry of contaminated air. For all air compressors, including portable types, the air intake location shall be carefully selected, and monitored closely to ensure continued quality of air supply to the compressor. The system shall be equipped as necessary with a suitable in-line air-purifying sorbent bed and filter to further assure breathing air quality. Maintenance and replacement/refurbishment of compressor and associated air-purifying/filter media shall be performed periodically, by trained personnel following manufacturer's recommendations and instructions.



As part of acceptance testing, and prior to initial use, representative sampling of the compressor air output shall be performed to ensure that it complies with the requirements in Paragraph 1 of this section. To ensure a continued high-quality air supply, and to account for any distribution system contaminant input, a representative sample should be taken at distribution supply points. Samples should be collected on a periodic basis, as directed by the Program Coordinator. Specific test recommendations are given in the following table.

Type/Sample	Oil Lubricated	Non-Oil Lubricated	Combustion Engine Powered
Water Vapor	☒	☒	☒
Carbon Monoxide	☒		☒
Condensed Hydrocarbon	☒		☒
Carbon Dioxide			☒
Odor	☒	☒	☒

NOTES:

1. When using air compressors, intake location shall be carefully selected and monitored closely to ensure air supplied to the compressor is of adequate quality.
2. No frequency for periodic checks of air quality is specified, due to wide variation in equipment types, use, working environments, and operating experience.
3. Continuous monitoring of temperature and carbon monoxide are not required.
4. For non-oil lubricated compressors that operate at less than 35 psi, no sampling for water is required.
5. These requirements apply to systems designed for breathing air, other air-supply systems need to be evaluated on a case-by-case basis for the type and frequency of testing.

Further details on sources of compressed air and its safe use can be found in CGA G-7-1988.



PROCEDURE

Subject: MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS

1.0 PURPOSE AND SUMMARY

This procedure prescribes the general requirements for the operation of motor vehicles on company business. All operators of company owned, leased, and rented vehicles, as well as personal vehicles used on company business, are covered by this procedure. U.S. Department of Transportation (DOT) regulated personnel must also comply with the guidelines contained in Procedure HS810. Key elements of this procedure include:

- All employees who drive or may drive on company business must be familiar with the requirements of this procedure and certify their acceptance of the Company Rules for Motor Vehicle Operation (Attachment 2). In addition, covered employees shall sign a copy of the most current version of Attachment 2 on an annual basis.
- All new hire candidates shall complete the Pre-employment Driving Record Certification (Attachment 3). This certification will be evaluated via the established point system to determine driving privilege status.
- Employees must report all vehicular citations incurred while on company business to their supervisor as soon as possible, but not longer than 24 hours after the occurrence. Once reported, the established evaluation criteria in Section 5.4 will be used to determine corrective actions.
- Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria found in Section 5.3 to determine if their overall MVR citations exceed the Overall Driving Record limits (See Section 5.3.2).
- Employees utilizing vehicles while on company business are required to review this procedure and attend a company-designated driver training class at least once every two years.
- Requests for the re-instatement of denied or revoked driving privileges can be made to the appropriate business line Vice-President and the Director of Health & Safety.

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3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Director of Health and Safety is responsible for the issuance, revision, and maintenance of this procedure.

3.2 Action/Approval Responsibilities

The Responsibility Matrix is Attachment 1.

4.0 DEFINITIONS

Chargeable Vehicle Accident - Any at fault vehicle accident meeting any one of the following criteria:

- An individual other than an employee of the company is a party in the accident.
- Property owned by a person or entity other than the company is damaged.
- When only company employees, company owned or leased (not rented) vehicles, and property is involved and damage exceeds \$2,500.00.

Company - Shaw Environmental & Infrastructure, Inc. (Shaw E & I) and its subsidiaries and affiliates.



Motor Vehicle - Any passenger vehicle, including trucks, used upon the highway or in private facilities for transporting passengers and/or property. This includes personal vehicles operated on company business. For the purpose of this procedure, off-road vehicles, such as ATV's (Four Wheelers) earthmoving equipment, forklifts, non-highway use trucks, etc., are not considered vehicles. The use of motorcycles on company business is prohibited

Project Assigned Employees – Any employee that is assigned to a field operations project position. This designation includes Project Managers, Site Managers/Supervisors, Foremen, Technicians, Scientists, Geologists, Project Business Accountants, etc. This does not include employees that are typically assigned to an office but are visiting a site for brief periods of time, such as to provide technical assistance, perform audits, perform program reviews, etc.

5.0 TEXT

5.1 Company Rules for Motor Vehicle Operation

All employees who will or may be required to operate a company owned, leased, or rented motor vehicle or a personal vehicle used on company business shall acknowledge acceptance of the Company Rules for Motor Vehicle Operation (Attachment 2) prior to such operation. The signed form shall be retained by the Monroeville, PA Health & Safety Records Department. Each year, the company shall require covered employees to sign a copy of the most current Company Rules for Motor Vehicle Operation.

FAILURE OF EMPLOYEES TO COMPLY WITH COMPANY RULES FOR MOTOR VEHICLE OPERATION OR THIS POLICY SHALL BE SUBJECT TO DISCIPLINARY ACTION UP TO AND INCLUDING (BUT NOT LIMITED TO) REVOCATION OF DRIVING PRIVILEGES FOR COMPANY BUSINESS AND TERMINATION OF EMPLOYMENT.

5.1.1 Project Assigned Employee Vehicle Use Requirements

The following requirements are set forth as it pertains to Project Assigned Employees.

- Project-assigned employees are not permitted to operate company vehicle (owned, leased or rented) on non-company business after 10:00 p.m. without written authorization from the project manager or the appointed Site Manager/Supervisor with jurisdiction over the vehicle. In those cases where there is shift work, a non-traditional workday (i.e. 3PM to 11PM workday, etc.) or other non-typical circumstances, it is understood that the after 10:00 PM restriction would not be appropriate. However, even in these non-typical circumstances, the Project Manager or the appointed site manager/supervisor shall be required to execute the required written authorization for use of a company vehicle, including the time frame in which employees shall be permitted to use the vehicle after their non-traditional workday.
- Project assigned personnel that are residing in temporary housing / hotels are



granted permission to drive to and from the temporary residence and work. Additionally, the Project Manager, or the appointed Site Manager/Supervisor his/her designee (Site Manager, Supervisor, etc.) is required to evaluate and optimize the potential of carpooling of project assigned personnel in an effort to reduce the number of company vehicles being driven to and from the project site.

- Project assigned employees shall not use company vehicles for sight seeing or any other personal/recreational activities.
- Vehicles may be used in support of “daily life activities” such as going to restaurants for dinner, laundromats, local retail stores, grocery stores, etc.
- A maximum distance for “daily life activity” driving shall be no further than 20-miles from the temporary housing in which an employee resides. In those cases where the maximum allowed distance does not permit daily life activities to be conducted, a written authorization, from the Project Manager or the appointed Site Manager/Supervisor, is required to travel further distances.
- Should an employee be required to live at his/her permanent residence due to it’s proximity to the project site, that employee shall utilize his/her own personal transportation to drive to and from work. At the site, employees shall be allowed to use a company vehicle as required to perform project activities.
- If an employee is assigned to a project site that is located within driving distance from the employee’s permanent residence, but is too far away to allow for a daily commute, that employee shall utilize their own personal transportation to drive to and from their permanent residence and the project site. (i.e. for initial assignment arrival to the project, trips home on rotation, etc.) Upon arrival to the site, employees shall be allowed to use a company vehicle as required to perform project activities. In these cases, the employee will also be required to drive their personal vehicle to and from the project site from their temporary housing / hotel residence, for personal “daily life activities”, etc.

5.2 Pre-employment Evaluation

The local Health and Safety Assistant shall distribute a copy of this procedure to all new hire candidates for the completion of Attachments 2 and 3. Information provided should be evaluated via the point system in Section 5.3, and the hiring manager advised regarding any hiring or driving privilege restrictions that may apply. Hiring of persons with regular driving duties (e.g., field technicians and leadmen, sales persons, or others with assigned company motor vehicles) may only proceed after the information contained in Attachment 3 is evaluated.

Once Attachment 3 is completed, it is to be faxed to the Monroeville, PA Health and Safety Records Department at (412) 858-3976. The driving status of the prospective employee will be reported to the appropriate Human Resources Department in two to three working days. The local Health & Safety Assistant will notify the appropriate Human Resources manager when the attachments are not returned.



Discrepancies between the certified driving record report and Attachment 3 shall be reviewed with the prospective employee. Deliberate falsification of driving record information will disqualify prospective employees from being hired.

5.3 Driving Record Point System

The following point system will be used to evaluate the driving record of all existing employees and new hire candidates that can reasonably be expected to operate a motor vehicle during their employment. This data is to be collected through Motor Vehicle Records (MVR) search and by the employee completing Attachment 3 of this policy. Attachment 3 is to be completed by the new hire candidate and reviewed by the regional H&S Assistant to ensure compliance.

Driving Record Point System	
Description	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal, etc.	2
At-fault accident	3
Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, Open Container (Non-Work Related), etc.	6
Driving under the influence, Hit and Run (leaving the scene)	8
Open Alcohol Container (Work Related)	8

5.3.1 Pre-Employment Driving Record Point System Evaluation

If a new hire candidate has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24) months, they will be given the privilege to drive motor vehicles on company business without restrictions.

If a new hire has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, they will be placed on probation for a period of twelve (12) months. They will be afforded the privilege to drive motor vehicles on company business during this probationary period. Any driving infractions (i.e., speeding tickets, at-fault accidents, citations, etc.) accumulated during this probationary period will result in termination of the privilege to drive a motor vehicle on company business.

If the new hire candidate has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not be eligible for company driving privileges. Employment can only be offered with the strict understanding of denial of the privilege to drive motor vehicles on company business. After the first twelve (12) months of employment, the employee can petition the appropriate business line Vice President and the Director of Safety and Health for reconsideration of driving privileges.

If a new hire candidate is expected to drive a vehicle, to fulfill the responsibilities of his/her role, and there has been an accumulation of twelve (12) points or more in the last twelve (12) months or sixteen (16) points or more in the last twenty-four (24) months, the candidate shall not be hired. See Table below:



Candidate's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Not eligible for company driving privileges for first 12 months of employment.	7 to 11 points	9 to 15 points
Candidate not eligible for hire.	12 points or more	16 points or more

5.3.2 Existing Employee Driving Record Point System

An acceptable traffic record is one requirement for continued driving privileges. Accordingly, all affected employee's MVR traffic record is subject to periodic and annual review to ensure compliance with state and federal regulations, as well as company policy.

WORK RELATED TRAFFIC VIOLATIONS

It is the responsibility of all affected employees to provide verbal notice to their supervisor of any work related traffic violations that have occurred as soon as practicable but not longer than 24 hours after the occurrence. This verbal notice shall be followed by the employee completing an updated "Employee Driving Record Certification" (Attachment 3), and "Notification of Work Related Citation" form (Attachment 4). Both Attachment 3 and 4 shall then be immediately forwarded to the Monroeville, PA Health and Safety Records office.

NON-WORK RELATED TRAFFIC VIOLATIONS

Employees have the responsibility to keep track of their non-work related vehicular citations and utilize the established evaluation criteria, as described below, to determine if their overall traffic citations exceed acceptable company limits. It is not necessary for employees to report non-work related citations to their supervisor as they occur. However, if an employee's overall MVR record (work related or not) exceeds the company's established points system criteria, the employee must verbally inform their supervisor as soon as practicable but not longer than the following business day after the occurrence. This verbal notice shall be followed by the employee completing an updated "Employee Driving Record Certification" (Attachment 3), and it shall then be immediately forwarded to the Monroeville, PA Health and Safety Records office.

OVERALL DRIVING RECORD EVALUATION

If it is determined that an employee has accumulated three (3) points or less in the last twelve (12) months or five (5) points or less in the last twenty-four (24) months, they will be allowed to continue with the privilege to drive motor vehicles on company business without restrictions.

If an employee has accumulated four (4) to six (6) points in the last twelve (12) months or six (6) to eight (8) points in the last twenty-four (24) months, the employee will be placed on probation for a period of twelve (12) months. The employee can continue to drive motor vehicles on company business during this probationary period.

If the employee has accumulated seven (7) to eleven (11) points in the last twelve (12) months or nine (9) to fifteen (15) points in the last twenty-four (24) months, they will not



be eligible for company driving privileges. Continued employment may only be extended with the strict understanding of denial of the privilege to drive company owned, leased or rented motor vehicles on company business. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges. See Table below:

Employee's Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0 to 3 points	0 to 5 points
Can drive with understanding of probationary status.	4 to 6 points	6 to 8 points
Company driving privileges are revoked.	7 to 11 points	9 to 15 points

5.4 Employee Evaluation Criteria

All employees who may operate a motor vehicle on company business will become familiar with the requirements of this procedure, complete the currently-designated company driver training class, and complete Attachment 2 prior to such operation. The employee driving evaluation criteria is based upon all infractions including those incurred while on company business and during off-work hours. It is imperative that employees notify their supervisors as immediately as possible and no later than 24 hours following a work-related citation/accident. Once notified, the supervisor will ensure the completion of Attachment 3 and Attachment 4, forward it to the Monroeville, PA H&S Records Office, and initiate one of the following corrective actions as required. Additionally, as it relates to non-work related and work related traffic violations, it is the employee's responsibility to ensure that their overall driving record does not allow for the exceeding of the driving records points system. Should the employee's driving record points exceed the system limits, that they must notify their supervisor immediately, complete an updated "Employee Driving Record Certification" (Attachment 3) and forwarded it to the **Monroeville, PA Health & Safety Records Department**.

5.4.1 Work-Related Minor Citation

When an employee is given a work related minor citation (i.e., speeding ticket, moving violation, failure to signal turn, loss of load, etc.), the employee's supervisor will meet with the employee to discuss the corrective action that must be taken so that further violations do not occur. At a minimum, the supervisor shall require the employee to attend a recognized course in defensive driving on his/her own time and the cost of this training will be borne by the employee. This course shall be pre-approved by the Division Health & Safety Manager. The supervisor will provide written direction to the employee regarding the assigned corrective action(s). The supervisor shall forward a copy of an updated Employee Driving Record Evaluation form (Attachment 3) and a form of verification showing the employee's successful completion of an approved defensive driving course to the appropriate regional Human Resources Department for inclusion in the employee's personnel file. These documents shall also be forwarded to the **Monroeville, PA Health & Safety Records Department**.



5.4.2 Work Related Major Citation

When an employee is given a work related major citation (i.e., reckless driving, tailgating, suspended license, speed contest, etc.), the supervisor will hold a meeting with the employee, at which time the supervisor will complete the company Disciplinary Action Form (Procedure HR207) thereby informing the employee that any additional infractions will lead to more severe disciplinary action. In addition, the employee will be required to attend a recognized defensive driving course on his/her own time, as described in section 5.4.1, and will be suspended from work for one day without pay.

A copy of the Disciplinary Action Form shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.3 Failure to Notify

Should an employee fail to notify his/her supervisor of a citation or accident within the required reporting time, his/her company driving privilege may be revoked. The supervisor will also take disciplinary action that is appropriate for the unreported event.

If the unreported event is work related and is either an at-fault accident, driving under the influence case, or a hit and run violation, the termination process will be initiated.

All disciplinary actions shall be documented to the employee by the supervisor. This copy, and any written response by the employee, shall be forwarded to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.4 At-Fault Accident

Whenever an employee is operating a company owned/leased/rented vehicle or their personal vehicle on company business is involved in an at-fault vehicle accident, an Accident Review Board shall be convened and recommend the corrective action to be taken. At a minimum, the action shall include the completion of a recognized driver safety course on their time and at their expense, as described in section 5.4.1. All disciplinary actions resulting from at-fault vehicle accidents will be reviewed for consistency by the appropriate Safety Council.

Depending upon the circumstances and severity of the accident, termination of the employee can be considered. As above, this must be approved by the appropriate Human Resources Department. All communication to the employee regarding the accident and resulting action shall be in writing with a copy to the appropriate Human Resources Department for their information and inclusion in the employee's personnel file.

5.4.5 Driving Under the Influence, Hit & Run (Leaving The Scene) and Open Container

If an employee is charged with Driving Under the Influence, Hit and Run or an Open Alcohol Container violation, he/she will have their driving privileges temporarily suspended pending final resolution of the charge. If the charge is resolved in the employee's favor, with a final adjudication holding no penalty, driving privileges may be re-instated. However, if any penalty is attached, such as probation, license restrictions, etc., the employee may be considered unqualified to drive for the company. Whenever an employee is convicted or pleads no contest to a company-



related driving under the influence, hit and run or open container charge, he/she will be immediately terminated.

In a case that is not work related, and an employee is convicted or pleads no contest to a hit and run or driving under the influence charge, the employee shall notify his supervisor. Accordingly, the employee's company driving privileges will then be revoked for twelve (12) months. After the first twelve (12) months following driving privilege revocation, the employee can petition their respective Business Line VP and the Director of Safety and Health for reconsideration of driving privileges.

5.5 Training

All employees who will, or may reasonably be expected to, drive a company owned/leased/rented vehicle shall review this procedure and complete the currently-designated company driver training class prior to such operation. This class is designed to be taught either via the company's Web-based training program or by local Health and Safety personnel and must include the following elements: federal/state/local driving rules, company driving rules, emergency/accident procedures, and defensive driving techniques. Specific information on the vehicle to be operated will be provided locally.

Personnel conducting this class shall provide the Knoxville Health and Safety Training Department with a copy of the course attendance sheet for inclusion in individual training records. All affected employees shall complete a driver safety training class at least once every two years.

5.6 Reinstatement of Driving Privilege

Any employee who has had his/her privilege to drive a motor vehicle on company business revoked or denied, and who desires to reinstate this privilege, must apply to the business line Vice President and the Director of Health and Safety for reinstatement. The Director of H&S, or his designee, shall specify a rehabilitation program (if applicable), an external safe driving course, and any other requirements in which he/she deems appropriate. Once the employee completes the program, documentation of successful completion must be formally presented to the appropriate Vice President and the Director of H&S. If the documentation is accepted, the driving privilege may be reinstated. Copies of all documents shall then be forwarded, by the responsible H&S Manager, to Human Resources and to the Monroeville, PA Health & Safety Records Department.

Reinstatement of the driving privilege may occur one (1) time, at the discretion of the Director of Health & Safety and the responsible Business Line Vice President. If employee driving performance leads to a subsequent revocation of this privilege, such revocation shall be permanent.

5.7 Non-Shaw Employee Vehicle Use Requirements

Only approved non-Shaw employees (client, subcontractor or temporary/temp agency employees) who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw owned, leased, or rented vehicle. Upon completing the questionnaire and prior to the driver operating a Shaw vehicle, the subject questionnaire must be signed, dated and placed on file at



the job site. The primary vehicle operator or the Shaw Project Management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800. The driver qualification point system can be found in section 5.3 of this policy.

In addition to the above requirement, it is also a requirement of the responsible Shaw Project Manager to forward a fully executed, company specific version of the correspondence that is found in Attachment 6, to the employer of the non-Shaw driver. This correspondence should not be modified except for the fields that specify the name and address of the subcontractor or client to which the letter is being written. This written correspondence will serve to notify that any employee that is assigned by their company to a Shaw project, and is required to operate/drive a Shaw owned, leased, or rented vehicle, will be subject to either meeting or exceeding the operator requirements for Shaw employees.

As the employer of individuals who are assigned to a Shaw project, the authorized non-Shaw employer representative shall sign and return Attachment 6 to the respective Shaw Project Manager. By signing Attachment 6, the non-Shaw employer is acknowledging that they are either adopting the requirements set forth in this policy (HS800, Motor Vehicle Operation) or have developed a similar policy that meets or exceeds these requirements. Failure of a non-Shaw employer to comply with the requirements set forth in HS800 shall result in the prohibition of their employees driving any Shaw owned, leased or rented vehicles.

5.8 DRIVER SAFETY NOTIFICATION STICKER

A safety notification bumper sticker shall be applied to all Shaw owned / leased vehicles in an effort to ensure continued compliance with driving safety regulations. The notification service will be managed by a third party fleet safety management company and will serve as the recipient of all calls that are placed concerning unsafe driving behavior. The Findlay, OH equipment division will serve as the first point of contact as it pertains to notifications that are received from the third party company who administers the bumper sticker safety call in service. Upon receiving a report from the third party administrator, the equipment division shall determine what business line the vehicle / driver is located within and then contact the respective business line Divisional H&S Manager. The Divisional H&S Manager will then contact the affected employee and the employee's supervisor for a counseling/discussion meeting, concerning the complaint. Upon conclusion of the meeting, the information will be reviewed by the supervisor and the Divisional H&S Manager for determination of corrective or disciplinary action.

The company shall endeavor to ensure that all company owned/leased fleet vehicles shall have a safety notification bumper sticker applied to the rear of the vehicle. It is the responsibility of the driver, who is deemed the primary / responsible operator of the vehicle, to ensure that the sticker remains on the vehicle and remains legible and in no way defaced. If the vehicle is project or program assigned and there is no designated primary operator, then the Project Manager will be considered the primary / responsible



operator. The primary / responsible operator shall contact the Equipment Division in Findlay, OH, at 1-800-225-6464 ext. 6051 or direct dial 419-425-605, immediately upon recognizing that the sticker is defaced or removed such that a new one can be re-applied. Failure, on the part of the primary operator, to ensure that a legible sticker remains on the vehicle shall result in disciplinary action, up to and including vehicle usage being revoked, in addition to possible termination of employment.

5.9 INSURANCE

All employees who operate their personal vehicles for Company business, no matter how frequently, shall have in place the minimum insurance required for the state in which the vehicle is registered. If an employee uses his or her own personal vehicle for more than 60% of his working hours, Company may require employee to carry increased insurance coverage and limits. Employees agree that in the event of an accident occurring during working hours in his or her own vehicle, the insurance on the employee's vehicle will be primary and recovery of any claims by employee or third persons shall come first from the employee's personal vehicle insurance policy. By an employee driving his or her vehicle on Company business, employee consents to this policy including this provision for employee and employee's insurer.

6.0 EXCEPTION PROVISIONS

Variances and exceptions may be requested pursuant to the provisions of Procedure HS013, Health and Safety Procedure Variances.

7.0 CROSS REFERENCES

HR207 Employee Disciplinary Action
HS013 Health and Safety Procedure Variances
HS020 Accident Prevention Program: Reporting, Investigation, and Review
HS810 Motor Vehicle Operation: Federal Motor Carrier Safety Regulations for Driver Qualifications

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Company Rules for Motor Vehicle Operation
3. Pre-employment Driving Record Certification
4. Notification of Work-Related Citation
5. Non-Shaw Employee Driver Questionnaire
6. Memo Template for Employers of Non-Shaw Drivers



ATTACHMENT 1

MOTOR VEHICLE OPERATION: GENERAL REQUIREMENTS RESPONSIBILITY MATRIX

Action	Procedure Section	Responsible Party					
		Local Health & Safety Assistant	Business Line Health and Safety Manager	Supervisor	Accident Review Board	Corporate Human Resources	Director of H&S
Issue, Revise, and Maintain This Procedure	3.1						X
Ensure Employees Complete Attachment 2	5.1	X		X		X	
Distribute HS800 to New Hire Candidates for Completion of Attachments 2 and 3	5.2	X				X	
Request Evaluation of New Hire Driving Record	5.2	X				X	
Obtain Driving Record and Determine Driving Status	5.2	X					
Initiate Corrective Actions	5.4			X			
Ensure Completion and Distribution of Attachment 4	5.4			X			
Accident Review	5.4.4				X		
Ensure Drivers Meet Training Requirements	5.5			X			
Specify Program for Reinstatement of Driving Privilege	5.6						X
Reinstatement of Driving Privilege	5.6						X
Non-Shaw Employee Vehicle Use Requirements	5.7			X			
Contact Employee to discuss report from Safety Notification Sticker Service	5.8		X	X			



ATTACHMENT 2
COMPANY RULES FOR MOTOR VEHICLE OPERATION

1. Prior to motor vehicle operation, all motor vehicle operators are required to provide the company with current documentation of licensing for the motor vehicle(s) to be operated. Supervisors shall review and approve said documentation.
2. The motor vehicle operator is responsible for the vehicle, and for conducting a pre-trip, walk around inspection prior to use (including load evaluation, if applicable). No vehicle with any mechanical defect, which endangers the safety of the driver, passengers, or the public, shall be used.
3. All company owned/leased trucks, should have small convex mirrors attached to the side mirrors.
4. The operator shall drive defensively at all times and is responsible for complying with all state and local traffic laws, as well as customer regulations concerning motor vehicle operation.
5. The operator and all passengers shall use seat belts at all times when the vehicle is in motion.
6. No employee shall operate a motor vehicle when abnormally tired, temporarily disabled, or under the influence of alcohol or drugs.
7. No employee shall allow a company owned, leased, or rented motor vehicle to be operated by an unauthorized employee or non-employee. (See also: unauthorized personal use of company vehicles)
8. The operator shall not allow for any open alcoholic beverage containers within a company vehicle or within a personal vehicle while it is being utilized for company business.
9. No employee shall drive beyond any barricades or into any area with designations such as HAZARDOUS, DO NOT ENTER, etc.
10. Use caution when driving through congested areas, or near where personnel and equipment are working.
11. Whenever possible, a spotter shall be used for backing all vehicles. This may be a fellow company employee, or a non-company employee who is willing to help.
12. Unless required, such as on a client's property, keys shall not be left in an unattended vehicle.
13. Employees shall not leave the driver's seat of a vehicle while the motor is running. Exemption: Vehicles equipped with a power take-off device with parking brake set and chocks in place.
14. No motorcycles are to be operated on company business.
15. Radar detectors are prohibited in all company owned, leased, or rented vehicles or in personal vehicles while being used for company business.
16. Analytical samples will be transported in accordance with 49 CFR regulations. Regulated hazardous substances shall not be transported in personal vehicles.



17. In case of an accident, the following steps shall be taken:
 - A. Stop.
 - B. Call for medical assistance in case of injuries.
 - C. Notify police.
 - D. Complete Vehicle Accident Report and submit to your supervisor as soon as possible.
18. Whenever a vehicle is stopped upon the traveled portion of a highway or the shoulder of a highway, for any cause other than necessary traffic stops, the driver shall, as soon as possible, place or activate the warning devices with which the vehicle is equipped.
19. Employee must notify the supervisor as soon as possible, but not longer than 24 hours after occurrence, for work related citations, accidents, and license expiration, suspension, or revocation.
20. No employee is authorized to operate a company vehicle (including rentals) after having been on duty for a period of 16 hours. No employee may drive for more than 12 hours in any single on-duty period. Once either of these criteria has been met, a period of 8 consecutive hours off duty is required before driving duties may be resumed. These are maximum, not minimum, requirements and employees may be unfit to drive after shorter on-duty periods. Commercial DOT drivers are subject to the more restrictive hours of service regulations described in Procedure HS810.
21. Project-assigned employees are not permitted to operate company owned, leased, or rented vehicles after 10:00 p.m. without written authorization from their supervisor. (See section 5.1.1)
22. Employees shall not operate company vehicles for any type of personal use, no exceptions. Personal use includes any usage that is not directly related to company business. See section 5.1.1 for definitions concerning "daily life activities" for Project Assigned Employees.
23. Employees shall not use a company vehicle to visit an establishment that has a primary function of providing nighttime entertainment including the dispensing of alcoholic beverages.
24. Temporary or non-Shaw employees shall be allowed to utilize Shaw company vehicles only after the driver has completed Attachment 5 and has satisfied the point system requirements set forth in Section 5.3 of this policy. In addition, the employer of that driver shall have satisfied the requirement set forth in section 5.7 of this policy and signed a copy of the memo set forth in Attachment 6. This includes clients or subcontractors.
25. Employees shall not transport family members, friends or any other unauthorized guest passenger unless it is arising out of course and scope of company business.
26. No employee shall be assigned use of a vehicle to take home when off of duty.

I have read and understand company Procedure HS800 and the company Rules for Motor Vehicle Operation, and agree to abide by all requirements.

Employee's Name (Printed)

Employee's Signature

Date



Procedure No.	HS800
Revision No.	3
Date of Revision	03/15/04
Last Review Date	10/29/02
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ATTACHMENT 3

EMPLOYEE DRIVING RECORD CERTIFICATION

DATE _____ REQUESTOR _____ PHONE NO. _____

CANDIDATE / EMPLOYEE'S HOME
DEPARTMENT NUMBER _____

	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal turn, etc.	2
At-fault accident	3
Major citation: reckless driving, tailgating, suspended license, speed contest, improper lane usage, open container, etc.	6
Driving under the influence or Hit and Run (Leaving the Scene)	8

In the space provided below, please list all violations and accidents currently listed on your driving record by the state issuing your driver's license (include all states for which you have held a driver's license during the last two [2] years). Determine the number of points assigned from the table above, and write in column labeled Points. Finally, write the sum total of all points where indicated.

<u>Violations/Accidents</u>	<u>Driver License #/State</u>	<u>Date (mo/yr)</u>	<u>Points</u>

Total Points _____

I hereby certify that the information provided is a complete and accurate statement of my driving record for the previous twenty-four (24) months. I authorize the company to obtain a copy of my driving record from the state of issuance of my license(s). I understand that falsification of data will disqualify me from being hired or may result in revocation of my company driving privileges.

Driver's License No. _____

State of Issuance _____

Expiration Date _____

Date of Birth _____

New Hire Candidate Name (Printed)

Social Security Number

Signature

Date

PLEASE FAX THIS FORM TO THE MONROEVILLE H & S RECORDS DEPARTMENT AT (412) 858-3976



ATTACHMENT 4

NOTIFICATION OF WORK-RELATED CITATION

This form is to be completed by employees incurring a work-related vehicular citation. Once complete, it is to be signed by the employee's supervisor and forwarded to the appropriate Human Resources Department for inclusion in the employee's personnel file.

Employee Name _____ Employee No. _____ Date _____

Nature of Citation _____

Location of Citation (City, State) _____

Date/Time Citation Received _____

Is Citation Being Contested? ☐ No ☐ Yes Details _____

Employee Signature _____ Date _____

Corrective Action Being Taken _____

Supervisor Signature _____ Date _____

PLEASE FAX THIS FORM TO THE MONROEVILLE H & S RECORDS DEPARTMENT AT (412) 858-3976



ATTACHMENT 5

Non-Shaw Employee Driver Questionnaire

Date

Time

*Vehicle is assigned to what Shaw
Employee?*

Signature of Shaw Employee

Non-Shaw Driver's Name

Do you have a valid driver's license? Yes No

State in which license was issued, DL Number and Exp Date _____

Have you had any citations or accidents in the past 24 months? Yes No

If yes, please list type of citations and the associated dates below:

(Refer to HS800, Section 5.3, to determine driver eligibility based on the points system provided)

By signing below, I, the temporary driver, am acknowledging that the above information is true and accurately represents my driving record. I understand and agree that any misrepresentation or omission of material fact on this questionnaire will constitute sufficient grounds for your removal from the project site and will restrict the future use of Shaw vehicles.

I have read and fully understand the above:

Signature of Non-Shaw Driver

Date



Procedure No.	HS800
Revision No.	3
Date of Revision	03/15/04
Last Review Date	10/29/02
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ATTACHMENT 6

Address
Address
Phone
Fax:

Memorandum

Date:

To:

CC:

From: Project Manager

RE: Requirements for Motor Vehicle Operation

Attached is Shaw Environmental & Infrastructure, Inc. (Shaw) policy HS800 - Motor Vehicle Operation: General Requirements. As you can see, this policy applies to all operators of Shaw owned, leased, or rented vehicles, as well as personal vehicles used on Shaw business.

Accordingly, you are hereby notified that any employee that is assigned by your company to a Shaw Environmental & Infrastructure, Inc project and is required to operate/drive Shaw owned, leased, or rented vehicles, will be subject to either meeting or exceeding the operator requirements for Shaw employees. Please be aware that as the employer of individuals who are assigned to a Shaw project, you must ensure that your company either adopts the requirements set forth in policy HS800 (Motor Vehicle Operation) or develop a similar policy that meets or exceeds those requirements

Only approved non-Shaw employees, who have completed and signed the "Non-Shaw Employee Driver Questionnaire" (HS800 Attachment 5) will be allowed to drive a Shaw vehicle. Furthermore, prior to the driver operating a Shaw vehicle, the subject questionnaire must be completed and placed on file at the job site. The primary vehicle operator or responsible Shaw management representative shall review the questionnaire and determine whether the non-Shaw employee satisfies the driver qualification requirements of HS800.

Failure to comply with the requirements of this correspondence or the requirements set forth in HS800 shall result in disciplinary action up to and including driving privilege revocation or removal of an affected non-Shaw employee from a project site. If the duties of your employees are expected to include driving a Shaw owned, leased or rented vehicle, please complete Attachment 5, for all of your affected personnel, and provide these to Shaw's site management. Alternatively, please be aware and make your employees aware that they are not authorized to drive a Shaw owned, leased, or rented vehicle without such compliance.

By signing this document, I, an authorized employee and agent of the subject company/employer, am acknowledging acceptance of the above information and agree to my employer's compliance with the referenced requirements stated herein.

Signature / Title

Date

PROCEDURE

Subject: COMMERCIAL MOTOR VEHICLE OPERATION AND MAINTENANCE

1.0 PURPOSE AND SUMMARY

This procedure covers the general requirements for operation and maintenance of commercial motor vehicles. Requirements are based upon Federal regulations covering interstate (and intrastate for drug and alcohol testing) activity and/or activity in non-agreement states. Locations are authorized to use applicable State regulations for intrastate activity, but must fully comply with Federal regulations whenever an "intrastate" unit engages in "interstate" activity. Key provisions include:

- General Requirements;
- Financial Responsibility;
- Notification and Reporting of Accidents;
- Qualifications of Drivers;
- Driving of Motor Vehicles;
- Inspection, Repair and Maintenance;
- Hours of Service of Drivers; and
- Management Review and Follow-up.

Any location or major project wishing to establish a pool of commercial drivers, or even one commercial driver, **must** contact the DOT Administrator in Findlay and the Corporate Health & Safety office in Pittsburgh for enrollment in the random drug testing pool.

2.0 TABLE OF CONTENTS

- 1.0 Purpose and Summary
- 2.0 Table of Contents
- 3.0 Responsibility Matrix
- 4.0 Definitions
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 - 5.1 General Requirements
 - 5.2 Minimum Levels of Financial Responsibility for Motor Carriers
 - 5.3 Notification and Reporting of Accidents
 - 5.4 Qualifications of Drivers
 - 5.5 Driving of Motor Vehicles
 - 5.6 Inspection, Repair, and Maintenance
 - 5.7 Hours of Service of Drivers
 - 5.8 Transportation of Hazardous Materials Driving and Parking Rules
 - 5.9 Carriage by Public Highway
- 6.0 Exception Provisions
- 7.0 Cross Reference
- 8.0 Attachments



3.0 RESPONSIBILITY MATRIX

3.1 Procedure Responsibility

The Vice President of Health & Safety is responsible for the issuance, revision and maintenance of this procedure.

3.2 Action/Approval Responsibilities

See Responsibility Matrix, Attachment 1.

4.0 DEFINITIONS

General definitions can be found in 49 CFR 390.5. Other definitions can be found at the beginning of the regulatory reference for each section of this procedure.

Commercial Motor Vehicles Requiring CDL Drivers

In accordance with Federal Motor Carrier Safety Regulations (FMCSR) 383.91, there are three vehicle groups which require a fully qualified, documented DOT driver holding a Commercial Driver's License. These classes are as follows:

- Group A** "Any combination of vehicles with a GCWR of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds. (Holders of a Group A license may, with any appropriate endorsements, operate all vehicles within Groups B and C.)"
- Group B** "Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR. (Holders of a Group B license may, with any appropriate endorsements, operate all vehicles within Group C.)"
- Group C** "Any single vehicle, or combination of vehicles, that does not meet the definition of Group A or Group B as contained herein, but that either is designed to transport 16 or more passengers including the driver, or is placarded for hazardous materials."

All three of the above groups require a qualified driver holding a CDL. This includes a complete DQ file, filing Driver's Daily Logs (or time cards), etc.



Commercial Motor Vehicles NOT Requiring CDL Drivers

In accordance with FMCSR 390.5(a):

"Commercial motor vehicle means any self-propelled or towed vehicle used on public highways in interstate commerce to transport passengers or property when...the vehicle has a gross weight rating or gross combination weight rating of 10,001 or more pounds."

The CMV (commercial motor vehicle) described here is not covered in FMCSR 383.91 and thus would not require a driver holding a CDL. However, since the vehicle is considered a CMV by Federal regulations, any employee operating such a vehicle must have a complete DQ file in Findlay, is responsible for completing Driver's Daily Logs (or time cards), etc.; the regulations for the driver are exactly the same as for a driver holding a Commercial Driver's License, with the exception that these drivers are not required to hold a CDL; a State license is sufficient.

Also, the vehicle described in this section would automatically, as a CMV, fall into the group of vehicles requiring maintenance documentation at Findlay (Annual Inspections, Preventative Maintenance, Driver Inspection Reports, etc).

Company – All wholly-owned subsidiaries of the Shaw Environmental & Infrastructure, Inc. (Shaw E & I).

5.0 TEXT

This section is organized to follow the DOT Safety/Compliance Review Checklist.

5.1 General Requirements

- 5.1.1** All locations operating commercial motor vehicles shall maintain a current copy of the Federal Motor Carrier Safety Regulations (FMCSR) and the Hazardous Materials Regulations (HMR), both of which are found in Title 49 of the Code of Federal Regulations.
- 5.1.2** Training requirements for all drivers include the following minimum classes:
 - Safe Driver Training (SDT)
 - Hazardous Waste Hauling (HWH)
 - Vacuum Truck Safety Training (VTST) (Note: Vacuum truck operators only)Refresher training is required every two (2) years.
- 5.1.3** All locations shall include safe commercial motor vehicle operation in their safety incentive/awareness programs.
- 5.1.4** Each location shall monitor overall compliance as required in HS021, Accident Prevention Program: Management Safety Audits and Inspections; and HS018, Safety Councils.



5.1.5 A person is qualified to operate a commercial motor vehicle if he or she:

- Is at least 21 years old;
- Can read and speak the English language sufficiently to converse with the general public, to understand highway traffic signs and signals in the English language, to respond to official inquiries, and make entries on reports and records;
- Can by reason of experience, training, or both, safely operate the type of motor vehicle he or she drives;
- Can by reason of experience, training, or both, determine whether the cargo to be transported has been properly located, distributed and secured in or on the motor vehicle;
- Is familiar with methods and procedures for securing cargo in or on the motor vehicle; and
- Has a complete and current Driver Qualification File (See Section 5.2) in the possession of the Findlay DOT Administrator.

5.2 Minimum Levels of Financial Responsibility for Motor Carriers

(See 49 CFR 387 for further details)

5.2.1 The Corporate Risk Management Department shall maintain insurance/financial responsibility as required in the current version of referenced regulation.

5.2.2 An executed DOT MCS90 shall be maintained, with a copy forwarded to the DOT Administrator in Findlay.

5.3 Notification and Reporting of Accidents

(See 49 CFR 390 for further details)

5.3.1 All accidents and near misses shall be reported in accordance with HS020 Accident Prevention Program: Reporting, Investigation and Review, and HS091 Serious Injury and Fatality Reporting Requirements. All required accident documentation shall accompany the Monthly Loss Reports.

5.3.2 DOT procedures require that motor carriers maintain, for a period of one year after an accident occurs, an "Accident Register" containing specific information. This applies to all commercial vehicle accidents. Corporate Health & Safety will maintain the Register. The Register must include: date and time of accident, city/state, driver's name, number of injuries and/or fatalities, and whether hazardous materials other than fuel were released. Motor carriers are also required to maintain copies of all accident reports required by State or other governmental entities or insurers. **This is effective for all accidents occurring after March 3, 1993. Motor carriers must continue to retain copies of all accident reports previously submitted to FHWA for a period of three (3) years after the date of the accident.** (49 CFR 390, Subpart A)



5.3.3 Corporate Health & Safety must be notified by telephone or fax of all commercial vehicle accidents within 24 hours, or not later than the next business day. Use the current Vehicle Accident Report found in Shaw E & I Procedure HS020.

5.3.4 The Accident Register shall include the most reliable information on "reportable accidents" available to the motor carrier. A "reportable accident" means an occurrence involving a commercial motor vehicle operating on a public road which results in:

1. A fatality;
2. Bodily injury to a person who, as a result of the injury, immediately receives medical treatment away from the scene of the accident; or
3. One or more vehicles incurring disabling damage as a result of the accident, requiring the vehicle(s) to be transported away from the scene by a tow truck or other vehicle.

The term "accident" does not include:

1. An occurrence involving only boarding and alighting from a stationary motor vehicle;
2. An occurrence involving only the loading or unloading of cargo; or
3. An occurrence in the course of the operation of a passenger car or a multipurpose passenger vehicle (as defined in section 571.3 of 49 CFR) by a motor carrier and is not transporting passengers for hire or hazardous materials of a type and quantity that require the motor vehicle to be marked or placarded in accordance with section 177.823 of 49 CFR.

"Disabling damage" means damage which precludes departure of a motor vehicle from the scene of the accident in its usual manner in daylight after simple repairs.

Inclusions:

1. Damage to motor vehicles that could have been driven, but would have been further damaged if so driven.

Exclusions:

1. Damage which can be remedied temporarily at the scene of the accident without special tools or parts;
2. Tire disablement without other damage even if no spare tire is available;
3. Damage to turn signals, horn or windshield wipers which makes them inoperative.

"Fatality" means any injury which results in the death of a person at the time of the motor vehicle accident or within 30 days of the accident.



5.3.5 All Vehicle Accident Reports shall include the most reliable information available to the motor carrier on the following subjects:

1. Date of accident;
2. Time of accident;
3. Location (city, state) of the accident;
4. Name of driver;
5. Number of persons injured;
6. Number of persons killed; and
7. Whether hazardous materials were released (other than fuel).

5.3.6 Follow-up action with drivers involved with vehicle accidents shall be per HS800 Motor Vehicle Operation: General Requirements and the Shaw E & I progressive discipline system.

5.4 Qualifications of Drivers

(See 49 CFR 391 for further details)

5.4.1 All hiring of drivers shall be done in accordance with the requirements of HS800 Motor Vehicle Operation: General Requirements and 49 CFR 391.

5.4.2 All prospective drivers shall be interviewed to verify the accuracy of information on the application.

5.4.3 All prospective drivers shall be required to show proof of current automobile insurance prior to hiring.

5.4.4 All locations shall track and verify that the following driver documents are current: driver's license, Driver's Certification of Violations, Annual Review of Driving Record and medical. The Employee's Records Expiration Dates form may be used for this purpose.

5.4.5 Prior to being allowed to operate a commercial motor vehicle, all drivers will be required to establish with the company (original in Findlay, copy at home terminal) a Driver Qualification File with the following minimum contents.

- **Commercial Drivers License (CDL)**

Combination Vehicle (Group A) - Any combination of vehicles with a Gross Combination Weight Rating (GCWR) of 26,001 or more pounds provided the GVWR of the vehicle(s) being towed is in excess of 10,000 pounds.



Heavy Straight Vehicle (Group B) - Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR.

Small Vehicle (Group C) - Any single vehicle, or combination of vehicles, that meets neither the definition of Group A nor that of Group B as contained in this section, but that either is designed to transport 16 or more passengers including the driver, or is used in the transportation of materials found to be hazardous for the purposes of the Hazardous Materials Transportation Act and which require the motor vehicle to be placarded under the Hazardous Materials Regulations (49 CFR Part 172, Subpart F).

(See 49 CFR 383.91 Figure 1 for further details on vehicles and CDL Groups.)

- **State License** - A driver operating a combination vehicle with a gross combined weight rating exceeding 10,001 pounds, but never operating a vehicle in one of the CDL categories (A,B,C), may perform these duties with an appropriate state license instead of a CDL.
 - Receipt for Federal Motor Carrier Safety Regulations (FMCSR)
 - Application for Employment
 - DOT Driver Supplemental Application for Employment
 - Driver's Road Test Examination
 - Written Examination

This exam must be graded and incorrect responses reviewed with the driver. Supervisor and driver shall initial test when done.
 - Certification of Road Test and Written Examination

A copy of this form must be provided to the driver.
 - Annual Driver's Certification of Violations
 - Inquiry to Previous Employers

This form pertains to experience operating commercial motor vehicles.
 - Alcohol & Controlled Substance Test Information Inquiry to Previous Employers

This is a Federal requirement which went into effective January 1, 1995. Whereas the Inquiry to Previous Employers regarding experience does not required a response, this form requires a response from the previous employer with 14 days of the driver being qualified. If a response is not received within the specified time, the driver is automatically disqualified.
 - Inquiry to State Agencies for Driver's Record
 - Annual Review of Driving Record.
 - Driver Data Sheet
 - Medical Examiner's Certificate



The certificate must be signed by the driver and Shaw E & I's Medical Review Officer. A copy must also be provided to the driver.

- DOT Long Form
- Medical Clearance and Drug and Alcohol Test Report

NOTE: All drug and alcohol test results for commercial drivers must be retained in the Pittsburgh files only. Medical Clearance must be endorsed for DOT and signed on back by supervisor and driver. DOT requires examination every two years. Shaw E & I requires examination every year due to hazardous waste operations duties. Also note that issuance of medical clearance signifies a negative drug test result for baseline and update exams. See Shaw E & I Procedures HS100 Medical Policies and HS101 Drug and Alcohol Testing for further information.

- Vehicle Types
This list details which vehicles a driver is qualified and/or authorized to operate based on his CDL class and endorsements. Applicable to all states.
- Certification of Drug and Alcohol Awareness Training

5.5 Driving of Motor Vehicles

(See 49 CFR 392 for further detail)

- 5.5.1** Use, possession, or sale of drugs, alcohol, or other illicit substances is generally prohibited. Specific procedures are found in HR024 Illegal Drugs, Alcohol, and Other Substances and HS101 Drug and Alcohol Testing.
- 5.5.2** Authorized passengers are limited to employees of Shaw E & I and those subcontractor, client or regulatory personnel who are integral to a task being performed.
- 5.5.3** Management shall monitor compliance with speed laws by reviewing daily miles of operation versus actual driving time. Runs in excess of 500 miles shall have documentation attached that speed laws and hours of service rules were not violated (e.g. operations were in an area where speed laws exceed 55 mph).

5.6 Inspection, Repair, and Maintenance

(See 49 CFR 396 for further detail)

- 5.6.1** All commercial motor vehicles shall be included in a scheduled preventive maintenance program. Service intervals shall be in terms of miles or hours of operation. Service intervals and service requirements shall be per the manufacturer's recommendations with manufacturer recommendations documented in the Vehicle Maintenance File in Findlay.



- 5.6.2** Whenever manufacturer service recommendations either fail to cover company's utilization of the equipment or are unavailable, preventative maintenance shall be done in accordance with Shaw E & I Procedure FE006, Minimum Preventive Maintenance Standards for Corporate Equipment.
- 5.6.3** All drivers shall conduct and document a pre-trip inspection (including tow bars and saddle mounts as applicable) before operating a commercial motor vehicle. No vehicle shall be operated unless the following parts and accessories are in good working order: service brakes (including trailer brake connections), parking brake, steering mechanism, lighting devices and reflectors, tires, horn, windshield wiper(s), rear-vision mirror(s) and coupling devices. The Driver's Inspection Report Form shall be used. A copy is to be submitted to the Maintenance Supervisor and the original is to remain with the vehicle.
- When repairs are complete the mechanic is to make the appropriate entry in the Vehicle Maintenance File and sign the original Driver's Inspection Report in the vehicle. The on-coming driver shall verify that repairs have been made, sign the Driver's Inspection Report and turn in the final copy. Final (original) copy must be forwarded to the DOT Administrator in Findlay for comparison with Driver's Daily Logs and retention.
- 5.6.4** All Driver's Inspection Report forms shall be forwarded to the DOT Administrator in Findlay not later than the twentieth day of the following month, and retained there for three months.
- 5.6.5** All vehicles shall be subject to an annual safety inspection in accordance with 49 CFR 396.17. A copy of this inspection shall be forwarded to the DOT Administrator. Note that the vehicle must either carry a copy of the inspection or be marked with a sticker/decal displaying the information required in 49 CFR 396.17(c)(2).
- 5.6.6** A limited safety inspection is required no less often than 90 days, and is to be noted in the home terminal Vehicle Maintenance File.
- 5.6.7** Inspectors shall meet the qualification requirements in 49 CFR 396.19. (Use forms provided in DOT Manual.)
- 5.6.8** Brake inspectors shall meet the qualification requirement in 49 CFR 396.25, which generally includes completion of an approved training program or one year of documented experience. (Use forms provided in DOT Manual.) Any driver making brake adjustments must also have certification of qualifications on file in Findlay.
- 5.6.9** Where Shaw E & I employees perform inspections and repairs, documentation of qualifications shall be on file with the DOT Administrator.



5.6.10 Where an outside vendor is used for inspection and repair, Shaw E & I management shall verify that the vendor understands and will comply with inspector qualification requirements.

5.6.11 The Maintenance/Inspection Check list (see DOT Manual) shall be used to check completeness of Vehicle Maintenance Files.

5.6.12 The current version of the North American Uniform Out-of-Service criteria must be followed in determining the service status of all commercial motor vehicles.

5.6.13 All cargo tanks shall have a copy of the manufacturer's data report and required recertifications in the maintenance file. Qualifications for recertification vendors shall be on file with the DOT Administrator. Recertification requirements can be found in 49 CFR 180.

5.6.14 All exemption vehicles or trailers are required to carry a copy of the exemption on the vehicle.

5.7 Hours of Service of Drivers
(See 49 CFR 395 for further details)

5.7.1 Drivers shall not operate a commercial motor vehicle under the following conditions:

- More than 10 hours following 8 consecutive hours off-duty;
- For any period after having been on duty for 15 hours; or
- For any period after having been on duty for 70 hours during the period of eight consecutive days with the eighth day being the current date.

5.7.2 All drivers shall record their duty status on the Driver's Daily Log (see DOT Manual), including recap. Logs shall be completely filled out and submitted to home terminal management daily, or no less often than every 13 days for extended trips. Note that a drivers daily log cannot be used as a time card only.

5.7.3 Local management shall carefully review all Driver's Daily Logs. They shall require the driver to correct any errors, and take follow-up action (training or progressive discipline) where regulations or company procedures have been violated.

5.7.4 Dispatchers shall track drivers hours of service via the driver's recap for local service, and via recap and daily phone calls during extended trips.

5.7.5 100 air mile radius drivers may use the time card included in the DOT Manual, as long as they comply with the instructions provided. Whenever these instructions are not met, a Driver's Daily Log must be completed for that day or



days. Note that switching between time cards and daily logs makes it easy to introduce errors into the recap. It is recommended that driver logs be used so that switching between the two forms is minimized.

5.7.6 The DOT Log Book Compliance Checklist shall be used by management to review Driver's Daily Logs.

5.7.7 All original Driver's Daily Logs are to be forwarded to the DOT Administrator in Findlay by the twentieth day of the following month, and retained there for six months. Copies must also be retained at the local office for six months.

5.8 Transportation of Hazardous Materials Driving and Parking Rules
(See 49 CFR 397 for further details).

5.8.1 A motor vehicle containing hazardous materials must not be operated near an open fire unless its driver has first taken precautions to ascertain that the vehicle can safely pass the fire without stopping.

5.8.2 A motor vehicle containing hazardous materials must not be parked within 300 feet of an open fire.

5.8.3 No person may smoke or carry a lighted cigarette, cigar, or pipe on or within 25 feet of:

- A motor vehicle which contains explosives, oxidizing materials, or flammable materials; or
- An empty tank motor vehicle which has been used to transport flammable liquids or gases and which, when so used, was required to be marked or placarded in accordance with the rules in subsection 177.823 or 49 CFR.

5.8.4 When a motor vehicle which contains hazardous materials is being fueled:

- Its engine must not be operating, and
- A person must be in control of the fueling process at the point where the fuel tank is filled.

5.8.5 A motor vehicle transporting hazardous materials of a kind or quantity that require the vehicle to be marked or placarded in accordance with subsection 177.823 of 49 CFR must also display the information required in subsection 390.21 of 49 CFR, including USDOT 197183 (the Shaw E & I DOT number).

5.8.6 Special consideration shall be given to avoidance of heavily populated areas when hauling hazardous material/waste loads.

5.9 Carriage by Public Highway
(See 49 CFR 177 for further details)



- 5.9.1** All loads of hazardous materials or hazardous wastes shall be accompanied by shipping papers or hazardous waste manifest, respectively. These documents shall be prepared in accordance with 49 CFR 177.817 and 49 CFR 172 Subpart C. All documents shall be retained for at least three years. Shipping documents using any generic descriptions (e.g., "n.o.s.") must also contain the technical name of the hazardous substance in parentheses following the basic description.
- 5.9.2** Shipping documents shall be within the drivers reach and readily visible. When the driver is out of the cab, they shall be in the drivers door pocket or on the drivers seat.
- 5.9.3** All hazardous materials/wastes loads shall be marked, labeled, and placarded in accordance with 49 CFR 192 Subparts D, E, and F, respectively.
- 5.9.4** All hazardous materials/wastes loads shall be reported and segregated in accordance with 49 CFR 177.848.
- 5.9.5** Spill incidents meeting any of the criteria listed below shall be reported to the DOT Administrator on DOT Form F 5800.1 (Attachment 2):
- Any quantity of hazardous waste,
 - A reportable quantity (RQ) of hazardous material,
- (Criteria listed below require immediate phone notification)
- A fatal injury or hospitalization occurs;
 - Property damage exceeds \$50,000;
 - Radioactive materials are spilled;
 - The general public is evacuated for more than one hour; or
 - Etiologic agent(s) are discharged.

6.0 EXCEPTION PROVISIONS

Variances to this procedure shall be requested in accordance with procedure HS013 Health & Safety Procedure Variances.

7.0 CROSS REFERENCES

HS018	Safety Councils
HS020	Accident Prevention Program: Reporting, Investigation and Review
HS021	Accident Prevention Program: Management Safety Audits and Inspections
HS091	Serious Injury and Fatality Reporting Requirements
HS100	Medical Policies
HS101	Drug and Alcohol Testing
HS800	Motor Vehicle Operation: General Requirements



FE006 Minimum Preventive Maintenance Standards for Corporate Equipment

8.0 ATTACHMENTS

1. Responsibility Matrix
2. Hazardous Materials Incident Report (Form DOT F 5800.1)

NOTE: All other DOT forms can be found in the DOT Manual. Contact your DOT Administrator in Findlay.



ATTACHMENT 1

COMMERCIAL MOTOR VEHICLE OPERATION AND MAINTENANCE

Responsibility Matrix

Action	Procedure Section	Responsible Party			
		DOT Administrator	Risk Mgmt. Dept.	Corporate HS	Driver
Verify driver meets general requirements, including training	5.1	X		X	
Maintain statutory financial responsibility	5.2		X		
Accident Reporting: Internal	5.3	X			X
Accident Reporting: External	5.3			X	
Document driver qualification: ■ Establish DQ file	5.4	X			
■ Maintain DQ file	5.4	X			
Monitor driver performance	5.5	X			
Maintain, inspect and service vehicles, and document (retain working copy)	5.6	X			
Hold maintenance documents	5.6	X			
Verify drivers comply with and document hours of service requirements	5.7	X			
Hold Driver's Daily Logs for six (6) months	5.7	X			



Procedure No.	HS810
Revision No.	0
Date of Revision	04/25/02
Last Review Date	04/25/02
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ATTACHMENT 2

HAZARDOUS MATERIALS INCIDENT FORM

DEPARTMENT OF TRANSPORTATION HAZARDOUS MATERIALS INCIDENT REPORT

Form Approved DMB No. 2137 0039

INSTRUCTIONS: Submit this report in duplicate to the Information Systems Manager, Office of Hazardous Materials Transportation, DHM-63, Research and Special Programs Administration, U.S. Department of Transportation, Washington, D.C. 20590. If space provided for any item is inadequate, complete that item under Section IX, keying to the entry number being completed. Copies of this form, in limited quantities, may be obtained from the Information Systems Manager, Office of Hazardous Materials Transportation. Additional copies in this prescribed format may be reproduced and used, if on the same size and kind of paper.

I. MODE, DATE, AND LOCATION OF INCIDENT

1. MODE OF TRANSPORTATION	☐ Air	☐ Highway	☐ Rail	☐ Water	☐ Other
2. DATE AND TIME OF INCIDENT (Use Military time [e.g., 8:30 am=0830, Noon=1200, 6 pm=1800, Midnight=2400])	Date: _____ Time: _____				
3. LOCATION OF INCIDENT (Include airport name in ROUTE/STREET if incident occurs at an airport.)	CITY: _____ STATE: _____				
COUNTY: _____	ROUTE/STREET: _____				

II. DESCRIPTION OF CARRIER, COMPANY, OR INDIVIDUAL REPORTING

4. FULL NAME	5. ADDRESS (Principal place of business)
6. LIST YOUR OMC MOTOR CARRIER CENSUS NUMBER, REPORTING RAILROAD ALPHABETIC CODE, MERCHANT VESSEL NAME AND ID NUMBER OR OTHER REPORTING CODE OR NUMBER.	

III. SHIPMENT INFORMATION (From Shipping Paper or Packaging)

7. SHIPPER NAME AND ADDRESS (Principal place of business)	8. CONSIGNEE NAME AND ADDRESS (Principal place of business)
9. ORIGIN ADDRESS (If different from Shipper address)	10. DESTINATION ADDRESS (If different from Consignee address)
11. SHIPPING PAPER/WAYBILL IDENTIFICATION NO.	

IV. HAZARDOUS MATERIAL(S) SPILLED (NOTE: REFERENCE 49 CFR SECTION 172.101.)

12. PROPER SHIPPING NAME	13. CHEMICAL/TRADE NAME	14. HAZARD CLASS	15. IDENTIFICATION NO. (i.e., UN 2020)	
16. IS MATERIAL A HAZARDOUS SUBSTANCE? ☐ YES ☐ NO		17. WAS THE RO MET? ☐ YES ☐ NO		
18. ESTIMATED QUANTITY HAZARDOUS MATERIAL RELEASED (Include measurement)	19. FATALITIES	20. HOSPITALIZED	21. NON-HOSPITALIZED	
22. NUMBER OF PEOPLE EVACUATED				
23. ESTIMATED DOLLAR AMOUNT OF LOSS AND/OR PROPERTY DAMAGE, INCLUDING COST OF DECONTAMINATION OR CLEANUP (Round off in dollars):				
A. PRODUCT LOSS	B. CARRIER DAMAGE	C. PUBLIC/PRIVATE PROPERTY DAMAGE	D. DECONTAMINATION/ CLEANUP	E. OTHER
24. CONSEQUENCES ASSOCIATED WITH INCIDENT: ☐ SPILLAGE ☐ FIRE ☐ EXPLOSION ☐ VAPOR (GAS) DISPERSION ☐ ENVIRONMENTAL DAMAGE ☐ MATERIAL ENTERED WATERWAY SEWER ☐ NONE ☐ OTHER				



VI. TRANSPORT ENVIRONMENT

25. INDICATE TYPE(S) OF VEHICLE(S) INVOLVED: ☐ TANK CAR ☐ RAIL CAR ☐ TOFC/COFC ☐ CARGO TANK ☐ AIRCRAFT ☐ VAN TRUCK/TRAILER ☐ BARGE ☐ FLAT BED TRUCK TRAILER ☐ SHIP ☐ OTHER _____
26. TRANSPORTATION PHASE DURING WHICH INCIDENT OCCURRED OR WAS DISCOVERED: ☐ EN ROUTE BETWEEN ORIGIN/DESTINATION ☐ LOADING ☐ UNLOADING ☐ TEMPORARY STORAGE TERMINAL
27. LAND USE AT INCIDENT SITE: ☐ INDUSTRIAL ☐ COMMERCIAL ☐ RESIDENTIAL ☐ AGRICULTURAL ☐ UNDEVELOPED
28. COMMUNITY TYPE AT SITE: ☐ URBAN ☐ SUBURBAN ☐ RURAL
29. WAS THE SPILL THE RESULT OF A VEHICLE ACCIDENT/DERAILMENT? ☐ YES ☐ NO IF YES AND APPLICABLE, ANSWER PARTS A THRU C.

A. ESTIMATED SPEED:	B. HIGHWAY TYPE: ☐ DIVIDED/LIMITED ACCESS ☐ UNDIVIDED	C. TOTAL NUMBER OF LANES: [] ONE [] THREE [] TWO [] FOUR OR MORE	SPACE FOR DOT USE ONLY

VII. PACKAGING INFORMATION: If the package is overpacked (consists of several packages [e.g., glass jars within a fiberboard box]), begin with for information on the innermost package.

ITEM	A	B	C
30. TYPE OF PACKAGING. INCLUDE INNER RECEPTACLES (drum, tank car)			
31. CAPACITY OR WEIGHT PER UNIT PACKAGE (e.g., 55 gallons, 65 lbs.)			
32. NUMBER OF PACKAGES OF SAME TYPE WHICH FAILED IN SAME MANNER			
33. NUMBER OF PACKAGES OF SAME TYPE IN SHIPMENT			
34. PACKAGE SPECIFICATION IDENTIFICATION (e.g., DOT 17E, DOT 105A 100, UN1A1 or none)			
35. ANY OTHER PACKAGING MARKINGS (e.g., STC, 18/16-55-88, Y1.4/150/87)			
36. NAME AND ADDRESS, SYMBOL OR REGISTRATION OF PACKAGING MANUFACTURER			
37. SERIAL NUMBER OF CYLINDERS, PORTABLE TANKS, TANKS, TANK CARS			
38. TYPE OF LABELING OR PLACARDING APPLIED			
39. IF RECONDITIONED OR REPAIRED	A. REGISTRATION OR SYMBOL B. DATE OF LAST TEST OR INSPECTION		
40. EXEMPTION/APPROVAL/COMPETENT AUTHORITY IF APPLICABLE (e.g., DOT E1012)			

VIII. DESCRIPTION OF PACKAGING FAILURE: Check all applicable boxes for the package(s) identified above.



41. ACTION CONTRIBUTING TO PACKAGING FAILURE: <table> <tr> <td>A</td><td>B</td><td>C</td><td></td></tr> <tr> <td>a.</td><td>☐</td><td>☐</td><td>TRANSPORT VEHICLE COLLISION</td></tr> <tr> <td>b.</td><td>☐</td><td>☐</td><td>TRANSPORT VEHICLE OVERTURN</td></tr> <tr> <td>c.</td><td>☐</td><td>☐</td><td>OVERLOADING/OVERFILLING</td></tr> <tr> <td>d.</td><td>☐</td><td>☐</td><td>LOOSE FITTINGS, VALVES</td></tr> <tr> <td>e.</td><td>☐</td><td>☐</td><td>DEFECTIVE FITTINGS, VALVES</td></tr> <tr> <td>f.</td><td>☐</td><td>☐</td><td>DROPPED</td></tr> <tr> <td>g.</td><td>☐</td><td>☐</td><td>STRUCK/RAMMED</td></tr> <tr> <td>h.</td><td>☐</td><td>☐</td><td>IMPROPER LOADING</td></tr> <tr> <td>i.</td><td>☐</td><td>☐</td><td>IMPROPER BLOCKING</td></tr> </table>		A	B	C		a.	☐	☐	TRANSPORT VEHICLE COLLISION	b.	☐	☐	TRANSPORT VEHICLE OVERTURN	c.	☐	☐	OVERLOADING/OVERFILLING	d.	☐	☐	LOOSE FITTINGS, VALVES	e.	☐	☐	DEFECTIVE FITTINGS, VALVES	f.	☐	☐	DROPPED	g.	☐	☐	STRUCK/RAMMED	h.	☐	☐	IMPROPER LOADING	i.	☐	☐	IMPROPER BLOCKING	42. OBJECT CAUSING FAILURE: <table> <tr> <td>A</td><td>B</td><td>C</td><td></td></tr> <tr> <td>a.</td><td>☐</td><td>☐</td><td>OTHER FREIGHT</td></tr> <tr> <td>b.</td><td>☐</td><td>☐</td><td>FORKLIFT</td></tr> <tr> <td>c.</td><td>☐</td><td>☐</td><td>NAIL/PROTRUSION</td></tr> <tr> <td>d.</td><td>☐</td><td>☐</td><td>OTHER TRANSPORT VEHICLE</td></tr> <tr> <td>e.</td><td>☐</td><td>☐</td><td>WATER/OTHER LIQUID</td></tr> <tr> <td>f.</td><td>☐</td><td>☐</td><td>GROUND/FLOOR/ROADWAY</td></tr> <tr> <td>g.</td><td>☐</td><td>☐</td><td>ROADSIDE OBSTACLE</td></tr> <tr> <td>h.</td><td>☐</td><td>☐</td><td>NONE</td></tr> <tr> <td>i.</td><td>☐</td><td>☐</td><td>OTHER</td></tr> </table>		A	B	C		a.	☐	☐	OTHER FREIGHT	b.	☐	☐	FORKLIFT	c.	☐	☐	NAIL/PROTRUSION	d.	☐	☐	OTHER TRANSPORT VEHICLE	e.	☐	☐	WATER/OTHER LIQUID	f.	☐	☐	GROUND/FLOOR/ROADWAY	g.	☐	☐	ROADSIDE OBSTACLE	h.	☐	☐	NONE	i.	☐	☐	OTHER																											
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IX. DESCRIPTION OF EVENTS: Describe the sequence of events that led to incident, action taken at time discovered, and action taken to prevent incidents. Include any recommendations to improve packaging, handling, or transportation of hazardous materials. Photographs and diagrams should be taken when necessary for clarification. ATTACH A COPY OF THE HAZARDOUS WASTE MANIFEST FOR INCIDENTS INVOLVING HAZARDOUS WASTE. on additional sheets if necessary.																																																																																																														
46. NAME OF PERSON RESPONSIBLE FOR PREPARING REPORT (Please Print)		47. SIGNATURE																																																																																																												
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Appendix F

Material Safety Data Sheets

BDH UK
LEAD METAL **Revised:****MSDS Contents**

PRODUCT
PHYSICAL DATA
FIRE & EXPLOSION HAZARD
HEALTH HAZARD
REACTIVITY
SPILLAGE DISPOSAL
SPECIAL PROTECTIVE MEASURES
STORAGE AND HANDLING

BDH

HEALTH AND SAFETY INFORMATION

BDH CHEMICALS LTD
POOLE DORSET BH12 4NN

TELEPHONE: PARKSTONE 745520 (STD 0202)

PRODUCT

LEAD METAL

PHYSICAL DATA

APPEARANCE & ODOUR: GREY, FOIL, GRANULES, POWDER, GRAIN, SHOT, STICKS OR WIRE

MELTING POINT: 327 DEG. C

VAPOUR PRESSURE:

BOILING POINT: 1620 DEG. C

VAPOUR DENSITY:

WT. PER ML AT 20 DEG. C:

SOLUBILITY IN WATER: INSOLUBLE

FIRE & EXPLOSION HAZARD

FLASH POINT:

EXPLOSIVE LIMITS:

FIREFIGHTING MEASURES:

AUTOIGNITION TEMPERATURE:

HEALTH HAZARD

TLV: Pb FUME AND DUST - 0.15 MG/M3

LD50: TDLO 450 MG/KG/6 YEARS - ORAL, WOMAN (CNS EFFECTS)

EFFECT ON

EMERGENCY FIRST AID

INHALATION: SEE BELOW REMOVE FROM EXPOSURE

EYES: PHYSICAL IRRIGATE THOROUGHLY WITH WATER; OBTAIN MEDICAL
ATTENTION

SKIN CONTACT:

INGESTION: SEE BELOW WASH OUT MOUTH THOROUGHLY WITH WATER; OBTAIN
MEDICAL ATTENTION

OTHER COMMENTS:

HARMFUL IF TAKEN INTERNALLY FOR PROLONGED PERIODS. INHALATION OF FUME CAN
CAUSE NAUSEA, HEADACHE ETC

REACTIVITY

STABILITY: STABLE

REACTION WITH WATER:

FORMS A SURFACE COATING OF LEAD CARBONATE IN THE PRESENCE OF CO2

DECOMPOSITION PRODUCTS:

OTHER KNOWN HAZARDS:

FINELY DIVIDED MATERIAL CAN REACT VIGOROUSLY OR VIOLENTLY WITH OXIDIZING
MATERIALS, EG HYDROGEN PEROXIDE, AMMONIUM NITRATE.

SPILLAGE DISPOSAL

WEAR APPROPRIATE PROTECTIVE CLOTHING

SMALL SPILLAGE: DISPOSE OF AS GARBAGE

LARGE SPILLAGE:

TRANSFER TO SALVAGE CONTAINER AND DISPOSE OF RESIDUE AS GARBAGE

SPECIAL PROTECTIVE MEASURES

RESPIRATOR:
OR DUST MASK)
) IF HANDLING AS FUME OR DUST
)
VENTILATION:)
LOCAL EXHAUST
GENERAL
SPECIAL

GLOVES: RUBBER OR PLASTIC

EYE PROTECTION: GOGGLES

OTHER PRECAUTIONS:

STORAGE AND HANDLING

SPECIAL REQUIREMENTS:

IMPORTANT:

1. THE INFORMATION IN THIS DOCUMENT SHOULD BE REVIEWED PERIODICALLY.
2. THE HEALTH AND SAFETY INFORMATION DOES NOT COVER ALL USES AND SHOULD BE CHECKED FOR A PARTICULAR USE.

GENIUM PUBLISHING
ARSENIC AND COMPOUNDS **Revised: 04/01/1990****MSDS Contents**

SECTION 1. MATERIAL IDENTIFICATION
SECTION 2. INGREDIENTS AND OCCUPATIONAL EXPOSURE LIMITS
SECTION 3. PHYSICAL DATA*
SECTION 4. FIRE AND EXPLOSION DATA
SECTION 5. REACTIVITY DATA
SECTION 6. HEALTH HAZARD DATA
SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES
SECTION 8. SPECIAL PROTECTION DATA
SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

GP

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8854

MATERIAL SAFETY DATA SHEETS COLLECTION:

SHEET NO. 296
ARSENIC AND COMPOUNDS

ISSUED: 4/90

SECTION 1. MATERIAL IDENTIFICATION

31

ARSENIC DESCRIPTION: OBTAINED FROM FLUE DUST OF COPPER AND LEAD SMELTERS AS WHITE ARSENIC (ARSENIC TRIOXIDE). REDUCTION WITH CHARCOAL AND SUBLIMATION IN AN N2 CURRENT YIELDS PURE ARSENIC. METALLIC ARSENIC IS USED FOR HARDENING COPPER, LEAD, AND ALLOYS; AS A DOPING AGENT IN GERMANIUM AND SILICON SOLID-STATE PRODUCTS, SPECIAL SOLDERS, AND MEDICINE; AND TO MAKE GALLIUM ARSENIDE FOR DIPOLES AND OTHER ELECTRONIC DEVICES. ARSENIC COMPOUNDS ARE USED IN MANUFACTURING CERTAIN TYPES OF GLASS; IN TEXTILE PRINTING, TANNING, TAXIDERMY, PHARMACEUTICALS, INSECTICIDES AND FUNGICIDES, PIGMENT PRODUCTION, AND ANTIFOULING PAINTS; AND TO CONTROL SLUDGE FORMATION IN LUBRICATING OILS. ARSENIC TRIOXIDE IS THE SOURCE FOR 97% OF ALL ARSENIC PRODUCTS.

OTHER DESIGNATIONS: CAS NO. 7440-38-2; ARSEN; ARSENIC BLACK; AS; GRAY ARSENIC; METALLIC ARSENIC.

MANUFACTURER: CONTACT YOUR SUPPLIER OR DISTRIBUTOR. CONSULT THE LATEST CHEMICALWEEK BUYER'S GUIDE(73) FOR A SUPPLIERS LIST.

R 1
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S 2
K 0

GENIUM:

HEALTH: 3
FLAMMABILITY: 3
REACTIVITY: 2
SPECIAL: -

HMIS

H 3

F 2

R 2

PPG*

* SEC. 8

SECTION 2. INGREDIENTS AND OCCUPATIONAL EXPOSURE LIMITS

ARSENIC AND SOLUBLE COMPOUNDS, AS As

OSHA PEL	NIOSH REL, 1987	TOXICITY DATA***
8-HR TWA: 0.5 MG/M3,*	CEILING: 0.002 MG/M3	MAN, ORAL, TDLO: 76 MG/KG
0.01 MG/M3**		ADMINISTERED
		INTERMITTENTLY OVER A 12-
		YEAR PERIOD AFFECTS THE
		LIVER (TUMORS) AND BLOOD
		(HEMORRHAGE)
ACGIH TLV, 1989-90		MAN, ORAL: 7857 MG/KG
TLV-TWA: 0.2 MG/M3		ADMINISTERED OVER 55 YEARS
		PRODUCES GASTROINTESTINAL
		(IN THE STRUCTURE OR
		FUNCTION OF THE
		ESOPHAGUS), BLOOD
		(HEMORRHAGE), AND SKIN AND
		APPENDAGE (DERMATITIS)
		CHANGES
		RAT, ORAL, TCLO: 605 MICRO
		G/KG ADMINISTERED TO A 35-
		WEEK PREGNANT RAT AFFECTS
		FERTILITY (PRE- AND POST-
		IMPLANTATION MORTALITY)

* ORGANIC COMPOUNDS.

** INORGANIC COMPOUNDS.

***SEE NIOSH, RTECS (CG0525000), FOR ADDITIONAL MUTATIVE, REPRODUCTIVE, TUMORIGENIC, AND TOXICITY DATA.

SECTION 3. PHYSICAL DATA*

BOILING POINT: SUBLIMES AT 1134 DEG. F/612 DEG. C
ATOMIC WEIGHT: 74.92
MELTING POINT: 1497 DEG. F/814 DEG. C
DENSITY: 5.724 AT 57 DEG. F/14 DEG. C
VAPOR PRESSURE: 1 MM AT 702 DEG. F/372 DEG. C (SUBLIMES)
WATER SOLUBILITY: INSOLUBLE **

APPEARANCE AND ODOR: A BRITTLE, CRYSTALLINE, SILVERY TO BLACK METALLOID.

ODORLESS.

* THIS DATA PERTAINS TO ARSENIC ONLY.

** ARSENIC IS SOLUBLE IN NITRIC ACID (HNO₃).

SECTION 4. FIRE AND EXPLOSION DATA

FLASH POINT: NONE REPORTED

AUTOIGNITION TEMPERATURE: NONE REPORTED

LEL: NONE REPORTED

UEL: NONE REPORTED

EXTINGUISHING MEDIA: USE DRY CHEMICAL, CO₂, WATER SPRAY, OR FOAM TO FIGHT FIRES.

UNUSUAL FIRE OR EXPLOSION HAZARDS: FLAMMABLE AND SLIGHTLY EXPLOSIVE IN THE FORM OF DUST WHEN EXPOSED TO HEAT OR FLAME.

SPECIAL FIRE FIGHTING PROCEDURES: SINCE FIRE MAY PRODUCE TOXIC FUMES, WEAR A SELF-CONTAINED BREATHING APPARATUS (SCBA) WITH A FULL FACEPIECE OPERATED IN THE PRESSURE-DEMAND OR POSITIVE-PRESSURE MODE. BE AWARE OF RUNOFF FROM FIRE CONTROL METHODS. DO NOT RELEASE TO SEWERS OR WATERWAYS.

SECTION 5. REACTIVITY DATA

STABILITY/POLYMERIZATION: ARSENIC IS STABLE AT ROOM TEMPERATURE IN CLOSED CONTAINERS UNDER NORMAL STORAGE AND HANDLING CONDITIONS. HAZARDOUS POLYMERIZATION CANNOT OCCUR.

CHEMICAL INCOMPATIBILITIES: ARSENIC CAN REACT VIGOROUSLY ON CONTACT WITH POWERFUL OXIDIZERS SUCH AS BROMATES, PEROXIDES, CHLORATES, IODATES, LITHIUM, SILVER NITRATE, POTASSIUM NITRATE, POTASSIUM PERMANGANATE, AND CHROMIUM (VI) OXIDE. THIS MATERIAL IS ALSO INCOMPATIBLE WITH HALOGENS, BROMINE AZIDE, PALLADIUM, DIRUBIDIUM ACETYLIDE, ZINC, AND PLATINUM.

HAZARDOUS PRODUCTS OF DECOMPOSITION: THERMAL OXIDATIVE DECOMPOSITION OF ARSENIC AND ITS COMPOUNDS PRODUCES IRRITATING OR POISONOUS GASES.

SECTION 6. HEALTH HAZARD DATA

CARCINOGENICITY: THE IARC, NTP, AND OSHA LIST ARSENIC AS A HUMAN CARCINOGEN (GROUP 1). THIS EVALUATION APPLIES TO ARSENIC AND ARSENIC COMPOUNDS AS A WHOLE, AND NOT NECESSARILY TO ALL INDIVIDUAL CHEMICALS WITHIN THE GROUP. STUDIES REPORT THAT BOTH THE TRIVALENT AND PENTAVALENT COMPOUNDS ARE STRONGLY IMPLICATED AS CAUSES OF SKIN, LUNG, AND LYMPHATIC CANCERS. EXPERIMENTAL STUDIES HAVE SHOWN THAT ARSENIC HAS TUMORIGENIC AND TERATOGENIC EFFECTS IN LABORATORY ANIMALS.

SUMMARY OF RISKS: ARSENIC COMPOUNDS ARE IRRITANTS OF THE SKIN, MUCOUS

MEMBRANES, AND EYES. THE MOIST MUCOUS MEMBRANES ARE MOST SENSITIVE TO IRRITATION. PROLONGED CONTACT RESULTS IN LOCAL HYPEREMIA (BLOOD CONGESTION) AND LATER VESICULAR OR PUSTULAR ERUPTION. EPIDERMAL CARCINOMA IS A REPORTED RISK OF EXPOSURE. PERIPHERAL NEUROPATHY (DEGENERATIVE STATE OF THE NERVOUS SYSTEM) IS COMMON AFTER ACUTE OR CHRONIC ARSENIC POISONING. SYMPTOMS INCLUDE DECREASED SENSATION TO TOUCH, PINPRICK, AND TEMPERATURE; LOSS OF VIBRATION SENSE; AND PROFOUND MUSCLE WEAKNESS AND WASTING. OTHER COMPLICATIONS OF ACUTE AND CHRONIC ARSENIC POISONING ARE ENCEPHALOPATHY (ALTERATIONS OF BRAIN STRUCTURE) AND TOXIC DELIRIUM.

MEDICAL CONDITIONS AGGRAVATED BY LONG-TERM EXPOSURE: DAMAGE TO THE LIVER, NERVOUS, AND HEMATOPOIETIC (RESPONSIBLE FOR THE FORMATION OF BLOOD OR BLOOD CELLS IN THE BODY) SYSTEM MAY BE PERMANENT. PULMONARY AND LYMPHATIC CANCER MAY ALSO OCCUR.

TARGET ORGANS: LIVER, KIDNEYS, SKIN, LUNGS, LYMPHATIC SYSTEM.

PRIMARY ENTRY ROUTES: INHALATION, INGESTION OF DUST AND FUMES, VIA SKIN ABSORPTION.

ACUTE EFFECTS: ACUTE INDUSTRIAL INTOXICATION IS MORE LIKELY TO ARISE FROM INHALATION OR ARSINE. HOWEVER, WITH CORROSIVE AND ARSENICAL VAPORS, CONJUNCTIVITIS, EYELID EDEMA, AND EVEN CORNEAL EROSION MAY RESULT. INHALATION MAY RESULT IN NASAL IRRITATION WITH PERFORATION OF THE SEPTUM, COUGH, CHEST PAIN, HOARSENESS, PHARYNGITIS, AND INFLAMMATION OF THE MOUTH. IF INGESTED, METALLIC OR GARLIC TASTE, INTENSE THIRST, NAUSEA, VOMITING, ABDOMINAL PAIN, DIARRHEA, AND CARDIOVASCULAR ARRHYTHMIAS (HEARTBEAT IRREGULARITIES) MAY OCCUR. SYMPTOMS GENERALLY OCCUR WITHIN 30 MINUTES, BUT MAY BE DELAYED FOR SEVERAL HOURS IF INGESTED WITH FOOD. ACUTE POISONING MAY RESULT IN ACUTE HEMOLYSIS (BREAKDOWN OF RED BLOOD CELLS).

CHRONIC EFFECTS: CHRONIC SYMPTOMS INCLUDE WEIGHT LOSS, HAIR LOSS, NAUSEA, AND DIARRHEA ALTERNATING WITH CONSTIPATION, PALMAR AND PLANTAR HYPERKERATOSES (THICKENING OF THE CORNEOUS LAYER OF SKIN ON PALMS AND SOLES OF FEET), AND SKIN ERUPTIONS, AND PERIPHERAL NEURITIS (INFLAMMATION OF THE NERVES). LEUKEMIA, BONE MARROW DEPRESSION, OR APLASTIC ANEMIA (DYSFUNCTIONING OF BLOOD-FORMING ORGANS) MAY OCCUR AFTER CHRONIC EXPOSURE.

FIRST AID

EYES: FLUSH IMMEDIATELY, INCLUDING UNDER THE EYELIDS, GENTLY BUT THOROUGHLY WITH FLOODING AMOUNTS OF RUNNING WATER FOR AT LEAST 15 MIN.

SKIN: QUICKLY REMOVE CONTAMINATED CLOTHING. AFTER RINSING AFFECTED SKIN WITH FLOODING AMOUNTS OF WATER, WASH IT WITH SOAP AND WATER.

INHALATION: REMOVE EXPOSED PERSON TO FRESH AIR AND SUPPORT BREATHING AS NEEDED.

INGESTION: NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. IF INGESTED, HAVE A CONSCIOUS PERSON DRINK 1 OR 2 GLASSES OF WATER, THEN INDUCE REPEATED VOMITING UNTIL VOMIT IS CLEAR.

AFTER FIRST AID, GET APPROPRIATE IN-PLANT, PARAMEDICAL, OR COMMUNITY MEDICAL SUPPORT.

PHYSICIAN'S NOTE: IF EMESIS IS UNSUCCESSFUL AFTER TWO DOSES OF IPECAC, CONSIDER GASTRIC LAVAGE. MONITOR URINE ARSENIC LEVEL. ALKALINIZATION OF URINE MAY HELP PREVENT DISPOSITION OF RED CELL BREAKDOWN PRODUCTS IN RENAL TUBULAR CELLS. IF ACUTE EXPOSURE IS SIGNIFICANT, MAINTAIN HIGH URINE OUTPUT AND MONITOR VOLUME STATUS, PREFERABLY WITH CENTRAL VENOUS PRESSURE LINE. ABDOMINAL X-RAYS SHOULD BE DONE ROUTINELY FOR ALL INGESTIONS. CHELATION

THERAPY WITH BAL, FOLLOWED BY N-PENICILLAMINE IS RECOMMENDED, BUT SPECIFIC DOSING GUIDELINES ARE NOT CLEARLY ESTABLISHED.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: NOTIFY SAFETY PERSONNEL OF SPILL, EVACUATE ALL UNNECESSARY PERSONNEL, REMOVE ALL HEAT AND IGNITION SOURCES, AND PROVIDE ADEQUATE VENTILATION. CLEANUP PERSONNEL SHOULD PROTECT AGAINST DUST INHALATION AND CONTACT WITH SKIN AND EYES. USE NONSPARKING TOOLS. WITH A CLEAN SHOVEL, SCOOP MATERIAL INTO A CLEAN, DRY CONTAINER AND COVER. ABSORB LIQUID MATERIAL WITH SAND OR NONCOMBUSTIBLE INERT MATERIAL AND PLACE IN DISPOSAL CONTAINERS. DO NOT RELEASE TO SEWERS, DRAINS, OR WATERWAYS. FOLLOW APPLICABLE OSHA REGULATIONS (29 CFR 1910.120).

DISPOSAL: CONTACT YOUR SUPPLIER OR A LICENSED CONTRACTOR FOR DETAILED RECOMMENDATIONS FOLLOW APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS.

EPA DESIGNATIONS*

RCRA HAZARDOUS WASTE (40 CFR 261.33): NOT LISTED

LISTED AS A CERCLA HAZARDOUS SUBSTANCE** (40 CFR 302.4), REPORTABLE QUANTITY (RQ): 1 LB (0.454 KG) (** PER CLEAN WATER ACT, SEC. 307(A); PER CLEAN AIR ACT, SEC. 112)

SARA EXTREMELY HAZARDOUS SUBSTANCE (40 CFR 355): NOT LISTED

LISTED AS A SARA TOXIC CHEMICAL (40 CFR 372.65)

OSHA DESIGNATIONS:**

AIR CONTAMINANT (29 CFR 1910.1000, SUBPART Z): NOT LISTED

* DESIGNATIONS FOR ARSENIC ONLY.

** LISTED AS ARSENIC ORGANIC COMPOUNDS (AS As).

SECTION 8. SPECIAL PROTECTION DATA

GOGGLES: WEAR PROTECTIVE EYEGLASSES OR CHEMICAL SAFETY GOGGLES, PER OSHA EYE- AND FACE-PROTECTION REGULATIONS (29 CFR 1910.133).

RESPIRATOR: FOLLOW OSHA RESPIRATOR REGULATIONS (29 CFR 1910.134) AND, IF NECESSARY, WEAR A NIOSH-APPROVED RESPIRATOR. FOR EMERGENCY OR NONROUTINE OPERATIONS (CLEANING SPILLS, REACTOR VESSELS, OR STORAGE TANKS), WEAR AN SCBA.

WARNING: AIR-PURIFYING RESPIRATORS DO NOT PROTECT WORKERS IN OXYGEN-DEFICIENT ATMOSPHERES.

OTHER: WEAR IMPERVIOUS GLOVES, BOOTS, APRONS, AND GAUNTLETS TO PREVENT SKIN CONTACT.

VENTILATION: PROVIDE GENERAL AND LOCAL EXPLOSION-PROOF VENTILATION SYSTEMS TO MAINTAIN AIRBORNE CONCENTRATIONS BELOW THE OSHA PELs, ACGIH TLVs, AND NIOSH REL (SEC. 2.). LOCAL EXHAUST VENTILATION IS PREFERRED SINCE IT PREVENTS CONTAMINANT DISPERSION INTO THE WORK AREA BY CONTROLLING IT AT ITS SOURCE. (103)

SAFETY STATIONS: MAKE AVAILABLE IN THE WORK AREA EMERGENCY EYEWASH

STATIONS, SAFETY/QUICK-DRENCH SHOWERS, AND WASHING FACILITIES.

CONTAMINATED EQUIPMENT: NEVER WEAR CONTACT LENSES IN THE WORK AREA: SOFT LENSES MAY ABSORB, AND ALL LENSES CONCENTRATE, IRRITANTS. REMOVE THIS MATERIAL FROM YOUR SHOES AND EQUIPMENT. LAUNDRY CONTAMINATED CLOTHING BEFORE WEARING.

COMMENTS: NEVER EAT, DRINK, OR SMOKE IN WORK AREAS. PRACTICE GOOD PERSONAL HYGIENE AFTER USING THIS MATERIAL, ESPECIALLY BEFORE EATING, DRINKING, SMOKING, USING THE TOILET OR APPLYING COSMETICS.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE REQUIREMENTS: STORE IN CLOSED, PROPERLY LABELED, CONTAINERS IN A COOL, WELL-VENTILATED AREA AWAY FROM ALL INCOMPATIBLE MATERIALS (SEC. 5) AND HEAT AND IGNITION SOURCES. PROTECT CONTAINERS FROM PHYSICAL DAMAGE.

ENGINEERING CONTROLS: AVOID INHALATION OR INGESTION OF DUST AND FUMES, AND SKIN OR EYE CONTACT. PRACTICE GOOD PERSONAL HYGIENE AND HOUSEKEEPING PROCEDURES. USE ONLY WITH ADEQUATE VENTILATION AND APPROPRIATE PERSONAL PROTECTIVE GEAR. INSTITUTE A RESPIRATORY PROTECTION PROGRAM WITH TRAINING, MAINTENANCE, INSPECTION, AND EVALUATION. ALL ENGINEERING SYSTEMS SHOULD BE OF MAXIMUM EXPLOSION-PROOF DESIGN AND ELECTRICALLY GROUNDED AND BONDED. PROVIDE PREPLACEMENT AND ANNUAL PHYSICAL EXAMINATION WITH EMPHASIS ON THE SKIN, RESPIRATORY SYSTEM, AND BLOOD.

TRANSPORTATION DATA (49 CFR 172.101, 102)

DOT SHIPPING NAME: ARSENIC, SOLID

DOT HAZARD CLASS: POISON B

ID NO.: UN1558

DOT LABEL: POISON

DOT PACKAGING REQUIREMENTS: 173.366

DOT PACKAGING EXCEPTIONS: 173.364

IMO SHIPPING NAME: ARSENIC, METALLIC

IMO HAZARD CLASS: 6.1

IMO LABEL: POISON

IMDG PACKAGING GROUP: II

ID NO.: UN1558

MSDS COLLECTION REFERENCES: 7,26,38, 53, 73, 85, 87,88, 89,100,103,109,123,124,126,127,130,136,138

PREPARED BY: MJ ALLISON, BS; INDUSTRIAL HYGIENE REVIEW: DJ WILSON, CIH;
MEDICAL REVIEW: MJ HARDIES, MD

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MATERIALS INFORMATION SERVICES
VANADIUM METAL/POWDER **Revised: 11/14/1983**

MSDS Contents

SECTION I. MATERIAL IDENTIFICATION
SECTION II. INGREDIENTS AND HAZARDS
SECTION III. PHYSICAL DATA
SECTION IV. FIRE AND EXPLOSION DATA
SECTION V. REACTIVITY DATA
SECTION VI. HEALTH HAZARD INFORMATION
SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES
SECTION VIII. SPECIAL PROTECTION INFORMATION
SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

MATERIAL SAFETY DATA SHEET

MATERIALS INFORMATION SERVICES
MIS

CORPORATE RESEARCH & DEVELOPMENT
120 ERIE BOULEVARD
SCHENECTADY, N.Y. 12305

NO. 124

VANADIUM METAL/POWDER

DATE:
OCTOBER 1983

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME:
VANADIUM METAL/POWDER

OTHER DESIGNATIONS:
V, CAS #007 440 622

MANUFACTURER:
AVAILABLE FROM SEVERAL SUPPLIERS, INCLUDING:
ALPHA PRODUCTS
P.O. BOX 299
DANVERS, MA 01923

TEL:
(617) 777-1970

SECTION II. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
VANADIUM METAL	-	10-HR TWA 1.0 MG/M3*

(METAL PARTICULATE)

VANADIUM PENTOXIDE** (MSDS #88)

- 8-HR TWA 0.05 MG/M3**
(RESPIRABLE V2O5 DUST
& FUME)

*NIOSH PROPOSED IN 1977.

**CURRENT ACGIH (1983) TLV FOR V2O5. (WHEN METAL IS HEATED OXIDATION CAN OCCUR.)

FOR AIRBORNE SAMPLE ANALYSIS VANADIUM OXIDES CAN BE DISSOLVED WITH 0.01N NaOH,
LEAVING METAL BEHIND FOR SEPARATE DETERMINATION.

SECTION III. PHYSICAL DATA

BOILING POINT, DEG C, 1 ATM
3000

SPECIFIC GRAVITY, 18.7 C
6.1

VAPOR PRESSURE AT 2300 C, MM HG
CA 1.5

MELTING POINT, DEG C
CA 1900

WATER SOLUBILITY
INSOLUBLE

ATOMIC WEIGHT
50.9

APPEARANCE & ODOR:
LIGHT GRAY POWDER OR WHITE, LUSTROUS BULK SOLID; NO ODOR.

SECTION IV. FIRE AND EXPLOSION DATA

FLASH POINT AND METHOD:

AUTOIGNITION TEMP.:
DUST* LAYER 490 C CLOUD 500 C

FLAMMABILITY LIMITS IN AIR: VANADIUM METAL DUST*
LOWER: 0.22 OZ/FT3
UPPER: ---

VERY HOT VANADIUM CAN BURN IN AIR. EXTINGUISH METAL FIRE WITH DRY CHEMICAL.
(CONTACT SUPPLIER TO OBTAIN FIRE CONTROL RECOMMENDATIONS.) WHEN DISPERSED IN AIR
AS DUST, IT CAN BE EXPLODED BY AN IGNITION SOURCE*. HOWEVER, IT HAS A LOW
EXPLOSIBILITY INDEX (0.1) AND LOW IGNITION SENSITIVITY (0.3) ON SCALE OF 10.

FIREFIGHTERS NEED SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE,
OPERATED IN A PRESSURE DEMAND OR POSITIVE PRESSURE MODE WHEN VANADIUM METAL IS

INVOLVED IN FIRE.

*PARTICLE SIZE IS 100% BELOW 75 MICRO M. REPORTED MINIMUM IGNITION ENERGY IS 60 MJ FOR DUST CLOUD.

SECTION V. REACTIVITY DATA

MASSIVE METAL IS RELATIVELY INERT TO O₂, N₂ AND H₂O AT AMBIENT CONDITIONS, BUT IT REACTS WHEN HEATED AND STILL MORE READILY IF POWDERED. WHEN HEATED IN AIR, VANADIUM OXIDIZES TO BROWNISH-BLACK TRIOXIDE, BLUE-BLACK TETROXIDE OR YELLOW-RED PENTOXIDE, DEPENDING ON THE TEMPERATURE. IT REACTS IN Cl₂ AT 180 C TO GIVE VCl₄. IT REACTS WITH HOT NITRIC, HYDROFLUORIC, CONC. SULFURIC, AND PERCHLORIC ACIDS, BUT RESISTS HYDROCHLORIC AND DIL. SULFURIC ACIDS AND ALKALINE SOLUTIONS.

VANADIUM HAS HIGH SOLUBILITY IN IRON (FERROVANADIUM ALLOYS) AND A PRONOUNCED TENDENCY TO CARBIDE FORMATION. IT AND SOME OF ITS ALLOYS ARE DEOXIDIZERS IN METALLURGICAL PROCESSES.

VANADIUM REACTION PRODUCTS CAN POSE TOXIC HAZARDS. THE HIGHER VALENCE VANADIUM COMPOUNDS GENERALLY HAVE THE GREATER TOXIC POTENTIAL.

SECTION VI. HEALTH HAZARD INFORMATION

TLV: 1.0 MG/M³ FOR METAL (SEE SECT II)

VANADIUM IS AN ESSENTIAL TRACE ELEMENT IN THE CHICK AND RAT AND MAY BE IN MAN ALSO (CONTROVERSIAL). IT IS UBIQUITOUSLY PRESENT IN ENVIRONMENT AND BIOLOGICAL SYSTEMS.

INHALATION OF VANADIUM METAL AEROSOLS IS NOT HIGHLY TOXIC, BUT WHEN EXCESSIVE, HAS PRODUCED CATARRHAL BRONCHITIS, MODERATE INTERSTITIAL PNEUMOSCLEROSIS, AND, SYSTEMICALLY, SOME ADVERSE LIVER AND KIDNEY EFFECTS. THE CHIEF EFFECTS WERE ON THE LUNGS, BUT NO FIBROSIS OR LESIONS ARE REPORTED. INGESTION PRODUCED CATARRHAL GASTRITIS.

VANADIUM PENTOXIDE IS A PRIMARY IRRITANT AND CAN PROMOTE SENSITIZATION. ITS PRESENCE INCREASES ADVERSE INHALATION AND CONTACT EFFECTS TO THE LUNGS, SKIN AND EYES; "GREENISH-BLACK TONGUE" OCCURS ON INGESTION. (SEE MSDS #88).

FERROVANADIUM ALLOY HAS BEEN FOUND TO BE MORE TOXIC THAN FREE VANADIUM METAL, BECAUSE IT INCREASES THE SOLUBILITY OF VANADIUM IN BIOLOGIC MATERIAL.

FIRST AID:

EYE CONTACT:

FLUSH IMMEDIATELY AND THOROUGHLY WITH RUNNING WATER FOR 15 MINUTES, INCLUDING UNDER EYELIDS. GET MEDICAL HELP.

SKIN CONTACT:

WASH AREA WITH SOAP AND WATER. GET MEDICAL HELP FOR IRRITATION.

INHALATION:

REMOVE TO FRESH AIR. RESTORE AND/OR SUPPORT BREATHING. GET MEDICAL HELP.

INGESTION:

CONTACT PHYSICIAN. GASTRIC LAVAGE MAY BE NEEDED.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

NOTIFY SAFETY PERSONNEL OF SPILLS. CLEAN-UP PERSONNEL NEED PROTECTION AGAINST INHALATION OF DUST OR FUME. PICK UP SPILLS AND PLACE IN APPROPRIATE CONTAINERS FOR DISPOSAL, KEEPING AIRBORNE PARTICULATE AT A MINIMUM WHEN CLEANING UP.

FOR VANADIUM RECOVERY TECHNIQUES, POLLUTION ABATEMENT METHODS, AND DETECTION AND TREATMENT PROCESSES, SEE REFERENCE #40.

DISPOSAL:

RECOVER WASTE WHEN POSSIBLE AND SHIP TO SUPPLIER FOR REPROCESSING. AN APPROVED LANDFILL IS RECOMMENDED FOR WASTE MATERIAL THAT CAN NOT BE RECOVERED OR SALVAGED. FOLLOW FEDERAL, STATE, AND LOCAL REGULATIONS.

SECTION VIII. SPECIAL PROTECTION INFORMATION

PROVIDE ADEQUATE VENTILATION TO MEET TLV REQUIREMENT IN THE WORKPLACE. (EXHAUST VENTILATION MAY REQUIRE FILTRATION TO PROTECT ENVIRONMENT.) APPROVED NIOSH/MESA RESPIRATOR AS SPECIFIED UNDER PROVISION 30CFR11. EXPOSURE GREATER THAN 70 MG/M3 REQUIRES SELF-CONTAINED BREATHING APPARATUS WILL FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. PROVIDE CHEMICAL SAFETY GOGGLES AND/OR FACESHIELD (8 INCH MIN). WEAR RUBBER GLOVES AND PROTECTIVE CLOTHING AS NEEDED TO AVOID SKIN CONTACT.

PROVIDE PREPLACEMENT AND PERIODIC MEDICAL EXAMINATIONS INCLUDING COMPREHENSIVE MEDICAL HISTORIES, CHEST X-RAY, PULMONARY FUNCTION TESTS. PARTICULAR EMPHASIS ON RESPIRATORY TRACT, SKIN AND EYES. RETENTION OF MEDICAL RECORDS FOR 30 YEARS AFTER EMPLOYMENT HAS BEEN RECOMMENDED BY NIOSH.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

STORE IN CLOSED CONTAINERS IN A COOL, DRY, WELL-VENTILATED AREA. PROTECT CONTAINERS FROM DAMAGE. USE GOOD HOUSEKEEPING PRACTICES TO PREVENT ACCUMULATION OF DUST AND FOLLOW CLEANING TECHNIQUES THAT WILL KEEP AIRBORNE PARTICULATE AT A MINIMUM.

AVOID INHALATION OF DUST, VAPOR OR FUME WHEN GENERATED. PREVENT CONTACT WITH EYES AND SKIN. SENSITIZATION MAY OCCUR WITH REPEATED OR HEAVY EXPOSURES (SEE SECT. VI).

USE ONLY WITH ADEQUATE VENTILATION.

CLEAN WORK CLOTHES SHOULD BE SUPPLIED DAILY WHEN VANADIUM CONTAMINATION OCCURS. FOLLOW GOOD PERSONAL HYGIENE PRACTICE. CHRONIC EXPOSURE EFFECTS ARE NOT FULLY KNOWN.

REF. "VANADIUM. MEDICAL AND BIOLOGICAL EFFECTS OF ENVIRONMENTAL POLLUTANTS", NATIONAL ACADEMY OF SCIENCES, WASHINGTON, DC, 1974.

DATA SOURCE(S) CODE:
2-10,12,14,20,40,41 (MSDS 88)

APPROVALS: MIS/CRD

INDUST. HYGIENE/SAFETY

MEDICAL REVIEW:
14 NOVEMBER 1983

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SIGMA-ALDRICH-FLUKA

2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN-UL-14C

Revised: 04/30/1999

MSDS Contents

MFG. NAME:SIGMA CHEMICAL

TRADE NAME:2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN-UL-14C

REV DATE:04/30/99

CAS#:

MFG. PROD.#:315370G

START_MSDS

Sigma Chemical Co.

P.O. Box 14508

St. Louis, MO 63178 USA

Phone: 314-771-5765

PRODUCT #: 315370

NAME: 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN-
UL-14C

NO MATERIAL SAFETY DATA CURRENTLY AVAILABLE.

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Appendix G

Letter of Authority



Shaw Environmental, Inc.

2113 Emmorton Park Rd

Edgewood, MD 21040

410 612 6350

FAX: 410 612 6350

DATE

Mr. Steve Kritak
Shaw Environmental, Inc.
1725 Duke Street
Alexandria, VA 22314

**Re: CQC System Manager
USACE District Louisville LMARC
Radford AAP Interim Measures Removal/Demolition Action,
Contract No. W912QR-04-D-0027,
Delivery Order DA0101**

Dear Mr. Kritak:

This letter will serve as your appointment as the CQC System Manager on the referenced project and will also clarify your duties and authority in this position. In this position, you will be authorized to use available resources to satisfy all applicable quality requirements of the Program and Task Order Plan(s).

This authorization specifically gives you the authority to direct removal and replacement or correction of nonconforming materials or work and stop work authority when continuation would be unsafe to personnel, harmful to the environment, or result in a significant degradation of quality.

You will be expected to work closely with the Project Manager, Interim Measures Task Manager, customer and other project personnel, but you will not be directly responsible to anyone but myself for resolution of quality issues when working in your capacity.

If you have any question in this matter, please call me at (609) 584-6840.

Sincerely,

Charles W. Hunter
Shaw Quality Manager

Appendix H

Quality Control Forms

FINAL INSPECTION FORM

DATE:

Page ____ of ____

CONTRACT NO.:
W912QR-04-D-0027

TITLE AND LOCATION:
SWMU 39 IM, Radford, Virginia

DELIVERY ORDER
NO.:

CONTRACTOR: Shaw
Environmental, Inc.

NAME OF SITE SUPERINTENDENT: Steve Kritak

INSPECTED WORK:

COMPLETION DATE:

PERFORMANCE SPECIFICATION BY
CONTRACT DELIVERY ORDER REFERENCE

STATUS OF INSPECTION

On behalf of Shaw Environmental, Inc., I certify that the work inspected is complete and meets the performance specifications cited above and that all material and equipment used and work performed was completed in accordance with approved plans and work instructions and meets contract delivery order requirements.

QC Officer

Date

INITIAL INSPECTION

Contract No: W912QR-04-D-0027	Date:
Definable Feature of Work:	Specification References:
CQC System Manager: Steve Kritak	Project Manager: Jeff Parks
Notifications:	

I. Personnel Present

Name	Position	Affiliation

II. Preparatory Inspection

Verify full compliance with procedures identified at preparatory inspection. Coordinate plans, specifications, and submittals.

Comments:

III. Preliminary Work

Is all preliminary work complete and correct?

INITIAL INSPECTION

If not, what action is taken?

IV. Level of Workmanship

Where is work located?

Is a sample panel required?

Will the initial work be considered as a sample?

V. Discrepancies

Are there any discrepancies between planned and actual conditions and/or practices?

If so, explain the discrepancies and actions taken.

VI. Safety

Review job conditions against governing safety documents (e.g. HASP, USACE EM 385-1-1) and job hazard analysis.



Shaw Environmental, Inc.

INSPECTION SCHEDULE AND TRACKING FORM

Project: SWMU 39 IM	Project Manager: Jeff Parks	CQC System Manager: Steve Kritak

Reference No.	Definable Feature of Work	Preparatory		Initial		Follow-up		Completion		
		Date Planned	Actual Date	Date Planned	Actual Date	Planned Begin/End	Actual Dates	Planned Begin/End	Actual Dates	Status



I. Personnel Present

[illegible]

PREPARATORY INSPECTION

II. Submittals

Have all submittals been approved? If not, what items have not been submitted? The site Work Plan rewrite will be submitted for review and approval.
Are all materials on hand? If not, what items are missing?
Do approved submittals correspond to delivered materials? All delivered materials have been inspected to be in accordance with the Procurement Requisition. No discrepancies have been noted. If not, what discrepancies are found?

III. Material Storage

Are materials stored properly? If not, what action is taken?

IV. Specifications

Required Action	Comments
Review each paragraph of specifications.	
Discuss procedure for accomplishing work.	
Clarify any differences.	

PREPARATORY INSPECTION

V. Preliminary Work Permits

Ensure preliminary work is correct and permits are on file.

If not, what action is taken?

VI. Testing

Is test plan complete and accurate?

If not, what action is taken?

Has each testing organization been approved?

If not, what action is taken?

VII. Safety

Review applicable portion of governing safety document (e.g., USACE EM 385-1-1).

Activity Hazard Analysis approved?

VIII. Client Comments

CQC System Manager Signature/Date:



NCR Tracking Log

[illegible]



Shaw Environmental, Inc.

NCR Tracking Log

 NONCONFORMANCE REPORT		NCR Report No.
		Date:
Project:		Delivery/Task Order No.
Feature of Work:	Responsible Organization: (Shaw E&I, Subcontractor, Supplier, etc.)	
References: (Specification, Drawing, Procedure, incl. rev.)		
Description of Nonconforming Condition:		
Organization Code: _____ Inspection Code: _____ Nonconformance Cause Code: _____		
Disposition Category: Rework Repair Use-As-Is Return to Vendor Scrap/Reject		
Disposition & Corrective Action:		
NCR Initiated By: _____ Date: _____ QC Representative		
Disposition and Corrective Action Provided By: _____ Date: _____ Shaw Engineer / Responsible Organization		
Disposition and Corrective Action Approved By: _____ Date: _____ Project Manager		
Disposition and Corrective Action Completed By: _____ Date: _____ Responsible Organization		
Disposition and Corrective Action Verified By: _____ Date: _____ QC Representative		

Nonconformance Report Form Instructions:

Initiator: Complete the upper portion of the report by providing the following information:

NCR Report Number - Unique NCR number per procedure (e.g. 97-19656-01).

Date - Date that the Nonconforming Condition was detected.

Project - Name of the Project.

Delivery / Task Order Number - Delivery / Task Order number applicable to project work.

Feature of Work - Actual feature of work i.e. Soil/concrete placement, pump installation, etc.

Responsible Organization - Organization responsible for the nonconformance.

References - Source requirements in which the condition is nonconforming to.

Description Of Non-conforming Condition - Complete description of the condition supplemented by photographs, sketches, reports and other documents.

Organization Code - See below

Inspection Code - See Below

Cause Code - See Below

Provide signature and issue date at the bottom of the form

Organization Codes:

001 Engineering/Design

002 Vendor/Supplier

003 Operations

004 Subcontractor

005 Quality Control

006 Field Sampling/Analytical

007 Purchasing

008 Project Management

009 Health & Safety

010 Program Management

Inspection Codes:

100 Receipt Inspection

200 In-process Inspection (incl. Preparatory, Initial or Follow up)

300 Completion / Final Inspection

Nonconformance Codes:

101 Indeterminate

102 Inadequate Documentation

103 Inadequate Plan/Procedure

104 Failure to Follow Plan/Procedure

105 Fails to meet Specification

106 Fails to meet Drawing Dimensions

107 Damage

108 Improper Handling, Storage, or Shipping

109 Poor Workmanship

110 Incomplete Work Performance

111 Test Failure

112 Poor Maintenance

Disposition

Category: To be checked by the individual responsible for providing both disposition and corrective action. Check the appropriate box.

Corrective

Action: Provide a complete corrective action that will ensure that the condition will be made to meet the disposition requirements. Corrective action shall include identification of the cause, steps to be taken to correct the condition, and steps to be taken to preclude recurrence, where possible. Use attachments where necessary.

Responsible

Organization: Complete the corrective action as describe in the corrective action portion of the form and its attachments. Sign and date the Disposition and Corrective Action Completed By line at the bottom portion of the form.

Disposition & Corrective Action

Verification: Disposition and Corrective Action will be verified by QC Representative. Once verification is considered complete and acceptable the QC Representative will sign and date the Disposition and Corrective Action Verified By line at the bottom of the form indicating closure of the report.



Shaw Environmental, Inc.

DAILY CONSTRUCTION QUALITY CONTROL REPORT

SWMU 39 IM

Report No. _____

Contract No. W912QR-04-D-0027

CTO No. _____

Date: _____

Number of Manhours worked on site through today _____

WEATHER: ☐ Clear ☐ P. Cloudy ☐ Cloudy Wind _____

Temperature: High _____ Low _____

Precipitation: Today None Previous Period (e.g., weekend) _____

Site Conditions: Dry

Lost Time Due to Inclement Weather: _____ %

PRIME CONTRACTOR/SUBCONTRACTORS AND AREAS OF RESPONSIBILITY/LABOR COUNT:

(Include number, trade, hours, employer, location, and description of work)

a.

WORK PERFORMED (Include location and description of work performed including equipment used. Refer to work performed by prime and/or subcontractors as previously designated by letter above. Attach subcontractor daily activity reports when applicable):

1.

MATERIALS AND/OR EQUIPMENT DELIVERED: (Include a description of materials and/or equipment, quantity, date/hours used, date of safety check, and supplier).

RESULTS OF SURVEILLANCE: (Include satisfactory work completed or deficiencies with action to be taken)

a. Preparatory Inspection: (Attach minutes)

b. Initial Inspection: (Attach minutes) See attached Initial Inspection Form

c. Follow-Up Inspection: (List results of inspection compared to specification requirements.)

d. Final Inspection:

e. Completion Inspection: (USACE)

f. Safety Inspection: (Include safety violations and corrective actions taken.)

OFF-SITE SURVEILLANCE ACTIVITIES: (Include action taken)

QC TESTS PERFORMED AND RESULTS: (As required by plans and/or specifications.)

1.

VERBAL INSTRUCTIONS RECEIVED OR GIVEN: (List any instructions received from government personnel or given by IT on construction deficiencies identified, required retesting, etc., and the corresponding action to be taken.)

CHANGED CONDITIONS/DELAYS/CONFLICTS ENCOUNTERED: (List any conflicts with the delivery order [e.g., scope of work and/or drawings], delays to the project attributable to site, and weather conditions, etc)

SUBMITTALS REVIEWED: (Include submittal number, specification reference, and name of submitter.)

1.



Shaw Environmental, Inc.

DAILY CONSTRUCTION QUALITY CONTROL REPORT

MEETINGS: (List the meetings, e.g., Health and Safety, Site Operations, Cost/Schedule, etc.)

VISITORS: (See attached visitors log)

REMARKS: (Any additional information pertinent to the project not defined by the previous entries.)

Attachments:

CONTRACTOR'S VERIFICATION: The above report is complete and correct. All materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications except as noted above:

Construction QC System Manager



CORRECTIVE ACTION REQUEST

CAR Number: _____ Date Issued: _____
Subject: _____
Responsible Organization: _____ Location: _____ Project Number: _____

Reference Requirement(s):

Description of Condition:

Classification: Significant ? Yes _____ No _____ (If Yes, Corrective Actions 1, 2, 3, & 4 Below Apply)
Stop Work Warranted ? Yes _____ No _____.

Corrective Action Required:

1. Remedial Action Required (always)	Yes <u>X</u>	No _____.
2. Root Cause Determination	Yes _____	No _____.
3. Action to Prevent Recurrence	Yes _____	No _____.
4. Action Regarding Similar Work	Yes _____	No _____.

Response Due Date: _____.

Initiator: _____ Date: _____.

Proposed Corrective Action:

Proposed Completion Date: _____.

Responsible Individual: _____ Date: _____.

Evaluated By: _____ Date: _____.

Completed Corrective Action Verification & Closure:

Verification Method:

Verifier: _____ Date: _____.



CORRECTIVE ACTION REQUEST TRACKING & STATUS LOG

[illegible]

Appendix I
HWMU 39 Closure Evaluation Report



07-155



COMMONWEALTH of VIRGINIA

L. Preston Bryant, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
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David K. Paylor
Director

(804) 698-4000
1-800-592-5482

November 13, 2007

Ms. Paige Holt
Environmental Manager
Alliant Ammunition and Powder Company, LLC
Radford Army Ammunition Plant
Route 114, P. O. Box 1
Radford, Virginia 24143-0100

Re: **Closure Evaluation for Hazardous Waste Management Unit 39 – Approval
Radford Army Ammunition Plant, Radford, VA
EPA ID No. VA1210020730**

Dear Ms. Holt:

The Virginia Department of Environmental Quality, Office of Hazardous Waste (the Department) has received the *Closure Evaluation for Hazardous Waste Management Unit 39 (HWMU-39) – Interim Status*, dated September 2007, associated with the Radford Army Ammunition Plant (RFAAP) located in Radford, Virginia. The HWMU-39 Closure Evaluation, prepared by Draper Aden Associates, was received by the Department on October 3, 2007.

Based on the information submitted, the Department concurs that clean closure for Interim Status HWMU-39 has been achieved. Hazardous waste constituents are not present in groundwater at concentrations exceeding U.S. Environmental Protection Agency (EPA) Maximum Contaminant Levels (MCLs), and therefore, are not adversely impacting groundwater at the site. RFAAP is advised to discontinue the remaining post closure activities scheduled for HWMU-39. Please note however that the Department retains the authority to address possible corrective action of continuing releases pursuant to the Hazardous and Solid Waste Amendments of 1984.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate a legal appeal by filing a notice of appeal with:

David K. Paylor, Director
Department of Environmental Quality
629 East Main Street
PO Box 1105
Richmond VA 23218

In the event that this decision is served to you by mail, three days will be added to this period. Please refer to Part 2A of the Rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specifications of the Circuit Court to which the appeal is taken, and additional requirements concerning appeals from decisions of administrative agencies.

If you have questions concerning any of the above, please contact Matthew M. Stepien of my staff at (804) 698-4026 or by e-mail at mmstepien@deq.virginia.gov.

Sincerely,



Leslie A. Romanchik
Director, Office of Hazardous Waste

cc: Robert N. Davie, III
Radford Army Ammunition Plant
SMARF-OP, P. O. Box 2
Radford, Virginia 24141-0099

Tom Uybarreta – EPA Region III (3WC21)
Aziz Farahmand – DEQ, WCRO
Mathew M. Stepien – DEQ, CO
Jutta Schneider – DEQ, CO
Fuxing Zhou – DEQ, CO
Julia King-Collins – DEQ, CO
Durwood Willis – DEQ, CO
Central Hazardous Waste File

CLOSURE EVALUATION
HAZARDOUS WASTE MANAGEMENT UNIT 39
RADFORD ARMY AMMUNITION PLANT
RADFORD, VIRGINIA

Submitted to:
Mr. Matthew Stepien
Virginia Department of Environmental Quality
Office of Waste Permitting
629 East Main Street
Richmond, Virginia 23219
(804) 698-4500

Submitted by:
Alliant Techsystems Inc.
Radford Army Ammunition Plant
Route 114, P.O. Box 1
Radford, Virginia 24141
(540) 639-7631

Prepared by:
Draper Aden Associates, Inc.
Consulting Engineers
2206 South Main Street
Blacksburg, Virginia 24060
Phone: (540) 552-0444

September 2007
DAA JN: B03204-111

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1.0 INTRODUCTION

As discussed during a teleconference on May 22, 2007 between the Radford Army Ammunition Plant (RFAAP) and the Virginia Department of Environmental Quality (VDEQ), RFAAP conducted an evaluation of groundwater monitoring data from Hazardous Waste Management Unit 39 (HWMU-39) to determine whether hazardous waste constituents included on the Unit's hazardous waste constituent list have been released to groundwater in concentrations greater than established Drinking Water Standards (DWSs). Concentrations were compared to U.S. Environmental Protection Agency (USEPA) Maximum Contaminant Levels (MCLs) and VDEQ Alternate Concentration Limits (ACLs). This evaluation was conducted to determine the Unit's eligibility for clean closure for groundwater. RFAAP conducted the evaluation in accordance with procedures discussed during the May 22, 2007 teleconference.

1.1 Unit Description

HWMU-39 is located in the Horseshoe Area of RFAAP and is a closed former incinerator spray pond. The location of HWMU-39 is shown on the site location map included as **Figure 1**. The Unit was a concrete-lined rectangular impoundment and measured approximately 76 feet by 60 feet by 5 feet in depth. The maximum water level was three feet deep for a volume of 102,340 gallons. Groundwater flows to the northeast in the vicinity of the Unit toward the New River, as shown on **Figure 2**.

HWMU-39 received clean closure for soils in 1998. The approval letter for clean closure for soils is included in **Appendix A**. The Unit is in interim status.

1.2 Unit History

HWMU-39 was operated from 1979 to May 1992 and received clean closure for soils in 1998; the Unit has been in interim status since that time. No waste has been processed through the Unit since closure. As demonstrated in this Closure Evaluation, the Unit has not impacted groundwater.

In 1979, two incinerators were constructed for incineration of waste and off-specification explosives and propellants. During operation, HWMU-39 received incinerator scrubber wastewater, which was then reused as scrubber water for the incinerators. The wastewater contained lead from the incinerated propellants, and the sludges that formed in the spray pond met the definition of characteristic hazardous waste under the Virginia Hazardous Waste Management Regulations (VHWMR).

During closure, wastewater was pumped to the on-site wastewater treatment plant, and sludges were drummed and sent off-site for disposal as hazardous waste. The concrete basin was demolished and removed. Soil present underneath the concrete basin was tested at various depths, and a total of 18 to 24 inches of soil was removed from beneath the former concrete liner and disposed of as non-hazardous waste at the Montgomery County Landfill in Christiansburg, Virginia. The excavation was backfilled with eight to nine feet of clean soil and seeded.

1.3 Groundwater Monitoring Network

The groundwater monitoring network at HWMU-39 consists of five monitoring wells, including upgradient wells 39MW1 and 39MW4 and downgradient wells 39MW3, 39MW5, and 39MW6. Monitoring wells 39MW1, 39MW2, and 39MW3 are screened within carbonate bedrock, and wells 39MW4, 39MW5, and 39MW6 are screened in weathered bedrock and overburden. As shown on **Figure 2**, groundwater beneath the site flows to the northeast from the area around upgradient monitoring well 39MW4. Wells 39MW1, 39MW2, and 39MW3 were installed on June 2-4, 1993; and wells 39MW4, 39MW5, and 39MW6 were installed on September 23-25, 1997.

Additional information is available in annual groundwater monitoring reports submitted for the Unit along with the *Closure, Contingent Closure, and Contingent Post-Closure Plans for Radford Army Ammunition Plant's Incinerator Spray Pond (HWMU-39)* submitted in August 1995 and the *Closure Report* for the Unit submitted in June 1998 and revised in October 1998.

- **Arsenic**
Arsenic was detected during Fourth Quarter 2003 in well 39MW5 at a concentration of 7.4 ug/l, and during First Quarter 2004 and Second Quarter 2005 in well 39MW6 at concentrations of 7.8 ug/l and 5.8 ug/l, respectively, which are just above the LOQ of 5 ug/l.
- **Barium**
Barium has been detected in every well, including the background wells (39MW1 and 39MW4), during every event. Barium is naturally occurring and is consistently detected in groundwater across RFAAP.
- **Chromium**
Chromium has been detected sporadically in background well 39MW4 and in the three downgradient wells (39MW3, 39MW5, and 39MW6). Chromium was detected in background well 39MW4 during Fourth Quarter 2005 at a concentration of 7.1 ug/l and Second Quarter 2007 at a concentration of 7.52 ug/l. Chromium was detected in well 39MW3 during Fourth Quarter 2005, First Quarter 2006, and First and Second Quarters 2007 at concentrations of 5.2 ug/l, 5.5 ug/l, 5.4 ug/l, and 7.1 ug/l, respectively, which are just above the LOQ of 5 ug/l. Chromium was detected once in well 39MW5 during Fourth Quarter 2003 at a concentration of 24.5 ug/l. Chromium was detected in well 39MW6 during Fourth Quarter 2003, First and Second Quarters 2004, and Second Quarter 2005 at concentrations of 28.4 ug/l, 29.1 ug/l, 15.9 ug/l, and 30.2 ug/l, respectively.
- **Lead**
Lead was detected in background well 39MW4 at concentrations of 5.9 ug/l and 10.1 ug/l, respectively, during Fourth Quarter 2005 and Second Quarter 2007, and in well 39MW6 at 5.3 ug/l during Second Quarter 2005. These detections were at concentrations just above the LOQ of 5 ug/l. Lead was detected in Fourth Quarter 2003 in well 39MW5 at a concentration of 19.4 ug/l, which exceeded the USEPA MCL of 15 ug/l; however, all samples collected subsequently in well 39MW5 have been below the LOQ of 5 ug/l.
- **Nickel**
Nickel was detected in background well 39MW4 during Fourth Quarter 2005 at a concentration of 6.3 ug/l, which is just above the LOQ of 5 ug/l. Nickel was also detected once in well 39MW5 during Fourth Quarter 2003 at a concentration of 15.3 ug/l. Nickel was detected in well 39MW6 during Fourth Quarter 2003, First and Second Quarters 2004, and Second Quarter 2005 at concentrations of 17.4 ug/l, 19.8 ug/l, 10.8 ug/l, and 21.8 ug/l, respectively.
- **Gross Alpha**
Gross alpha particles were detected in background well 39MW4 at concentrations above the LOQ of 3 pCi/l during Fourth Quarter 2005, Second and Third Quarters 2006, and First and Second Quarters 2007. Gross alpha particles were also detected once in well 39MW3 during Second Quarter 2007 at a concentration of 3.7 ug/l. Gross alpha particles have been detected consistently in wells 39MW5 and 39MW6 at concentrations above the LOQ of 3 pCi/l.
- **Gross Beta**
Gross beta particles have been detected during every monitoring event from Second Quarter 2003 to Second Quarter 2007 in background well 39MW4 and wells 39MW3

and 39MW5 at concentrations exceeding the LOQ of 4 millirems/yr. Gross beta particles have been detected in well 39MW6 at concentrations above the LOQ during every event from Second Quarter 2003 to Second Quarter 2007 with the exception of Third and Fourth Quarters 2003 and Fourth Quarter 2006.

- **Total Radium**

Total radium was detected in well 39MW5 during First and Fourth Quarters 2004, First and Second Quarters 2006, and Second Quarter 2007 at concentrations of 1.35 pCi/l, 4.2 pCi/l, 1.5 pCi/l, 1.7 pCi/l, and 1.8 pCi/l, respectively. Total radium was detected in well 39MW6 during First Quarter 2004 at a concentration of 12.1 pCi/l and from Third Quarter 2004 through Third Quarter 2005 at concentrations of 1.1 pCi/l, 1.1 pCi/l, 2.2 pCi/l, 7.9 pCi/l, and 1.1 pCi/l, respectively. The LOQ for total radium is 1 pCi/l.

2.3 Comparison to Drinking Water Standards

Per discussions with VDEQ, groundwater impact related to HWMU-39 is evaluated by comparison of concentrations of constituents detected in wells at the Unit to established DWSs (USEPA MCLs and VDEQ ACLs). As shown on **Table 1**, the following exceedances of DWSs are noted:

- **Lead**

Lead was detected in Fourth Quarter 2003 in well 39MW5 at a concentration of 19.4 ug/l, which exceeded the USEPA Action Level of 15 ug/l. However, all samples collected subsequently in well 39MW5 have been below the LOQ of 5 ug/l.

- **Gross Alpha**

Detected concentrations of gross alpha particles exceeded the USEPA MCL of 15 pCi/l in well 39MW5 during Fourth Quarter 2004 (24.8 pCi/l). Gross alpha particles were detected in well 39MW6 during First Quarter 2004 and Second Quarter 2006 at concentrations of 15.4 pCi/l and 15.6 pCi/l, which exceed the MCL of 15 pCi/l. All other detections of gross alpha particles at the Unit have been at concentrations below the MCL. Gross alpha particles have also been detected at similar concentrations below the MCL in upgradient well 39MW4.

- **Gross Beta**

In Second Quarter 2006, gross beta particles were detected in well 39MW6 at a concentration of 54.9 pCi/l, which exceeded the USEPA level of concern of 50 pCi/l. However, concentrations in all other samples collected in upgradient well 39MW4 and wells 39MW3, 39MW5, and 39MW6 have been below 50 pCi/l.

- **Total Radium**

Total radium was detected in well 39MW6 at concentrations exceeding the USEPA MCL of 5 pCi/l during First Quarter 2004 and Second Quarter 2005. All other concentrations detected in well 39MW6 have been just above or below the LOQ of 1 pCi/l.

No other DWSs have been exceeded at the Unit during the period between Second Quarter 2003 and Second Quarter 2007.

3.0 CONCLUSIONS

RFAAP conducted an evaluation of groundwater monitoring data from HWMU-39 to determine the Unit's eligibility for clean closure for groundwater. Data collected from Second Quarter 2003 to Second Quarter 2007 were evaluated to determine whether hazardous waste constituents included on the Unit's groundwater monitoring constituent list have been released to groundwater in concentrations greater than USEPA MCLs and VDEQ ACLs. The evaluation was conducted in accordance with procedures discussed during the May 22, 2007 teleconference with VDEQ.

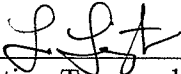
Based on results of the evaluation, hazardous waste constituents have not been detected in groundwater at concentrations exceeding USEPA MCLs or VDEQ ACLs with the exception of lead, gross alpha particles, gross beta particles, and total radium. Exceedances of DWSs have been sporadic and do not reflect overall groundwater quality at the Unit. No DWSs have been exceeded at the Unit since Second Quarter 2006.

In conclusion, HWMU-39 has not adversely impacted groundwater at the site. RFAAP respectfully requests that the Unit be granted clean closure for groundwater.

SIGNATURE/CERTIFICATION

Prepared by:

Name: Lori C. Livingston, Project Geologist

Signature: 

Virginia Professional Certification Type and Number: PG 1658

Company: Draper Aden Associates

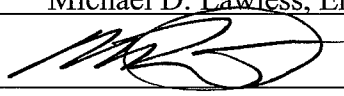
Address: 2206 South Main Street

City/State/Zip: Blacksburg, Virginia 24060-6600

Virginia Professional Certification:

I certify that I have prepared or supervised preparation of the attached report, that it has been prepared in accordance with industry standards and practices, and that the information contained herein is truthful and accurate to the best of my knowledge.

Name: Michael D. Lawless, Environmental Program Manager

Signature: 

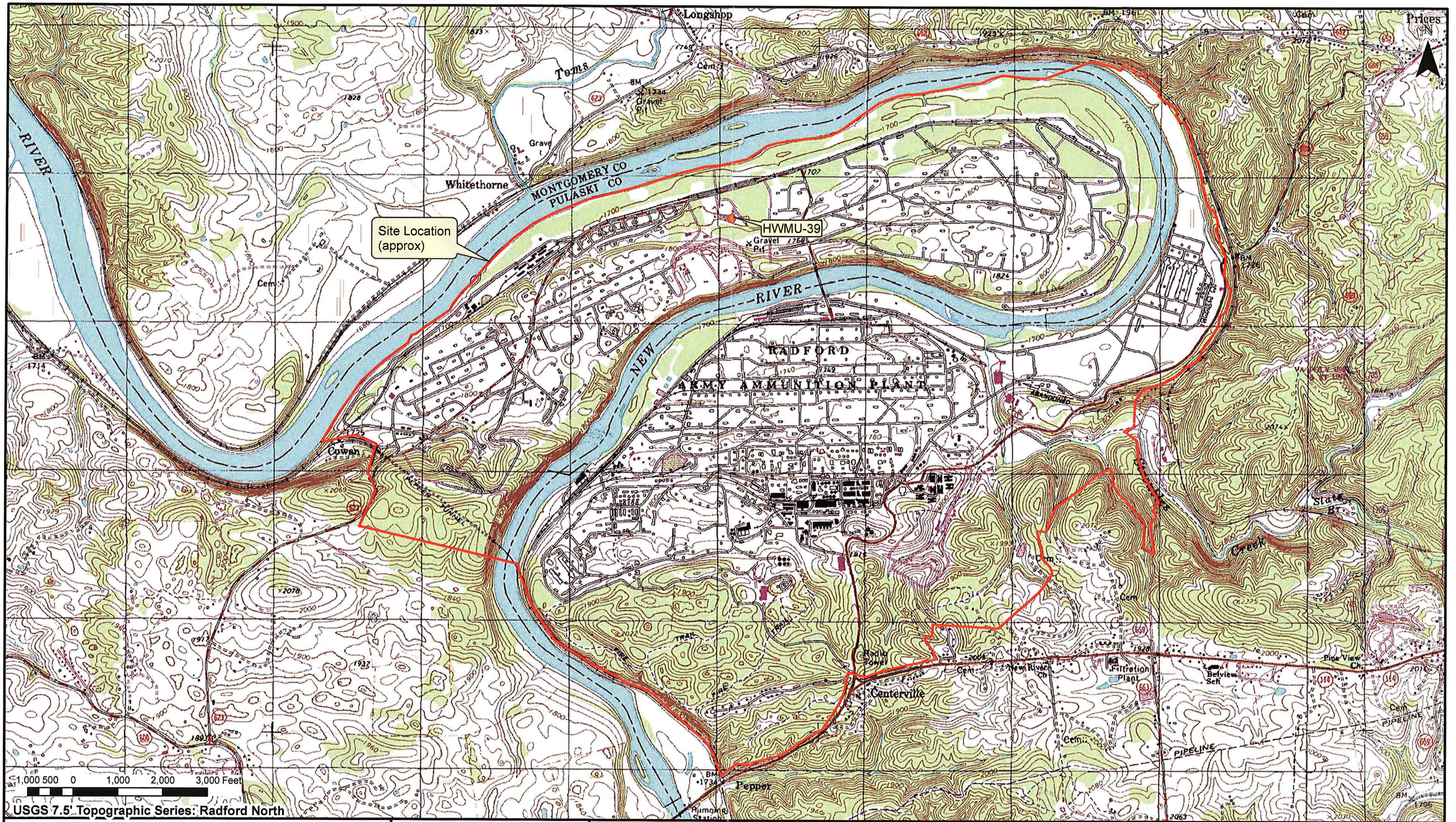
Virginia Professional Certification Type and Number: PG 832

Company: Draper Aden Associates

Address: 2206 South Main Street

City/State/Zip: Blacksburg, Virginia 24060-6600

FIGURES



Draper Aden Associates
Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
540-552-0444 Fax: 540-552-0291

Richmond, VA
Charlottesville, VA
Hampton Roads, VA

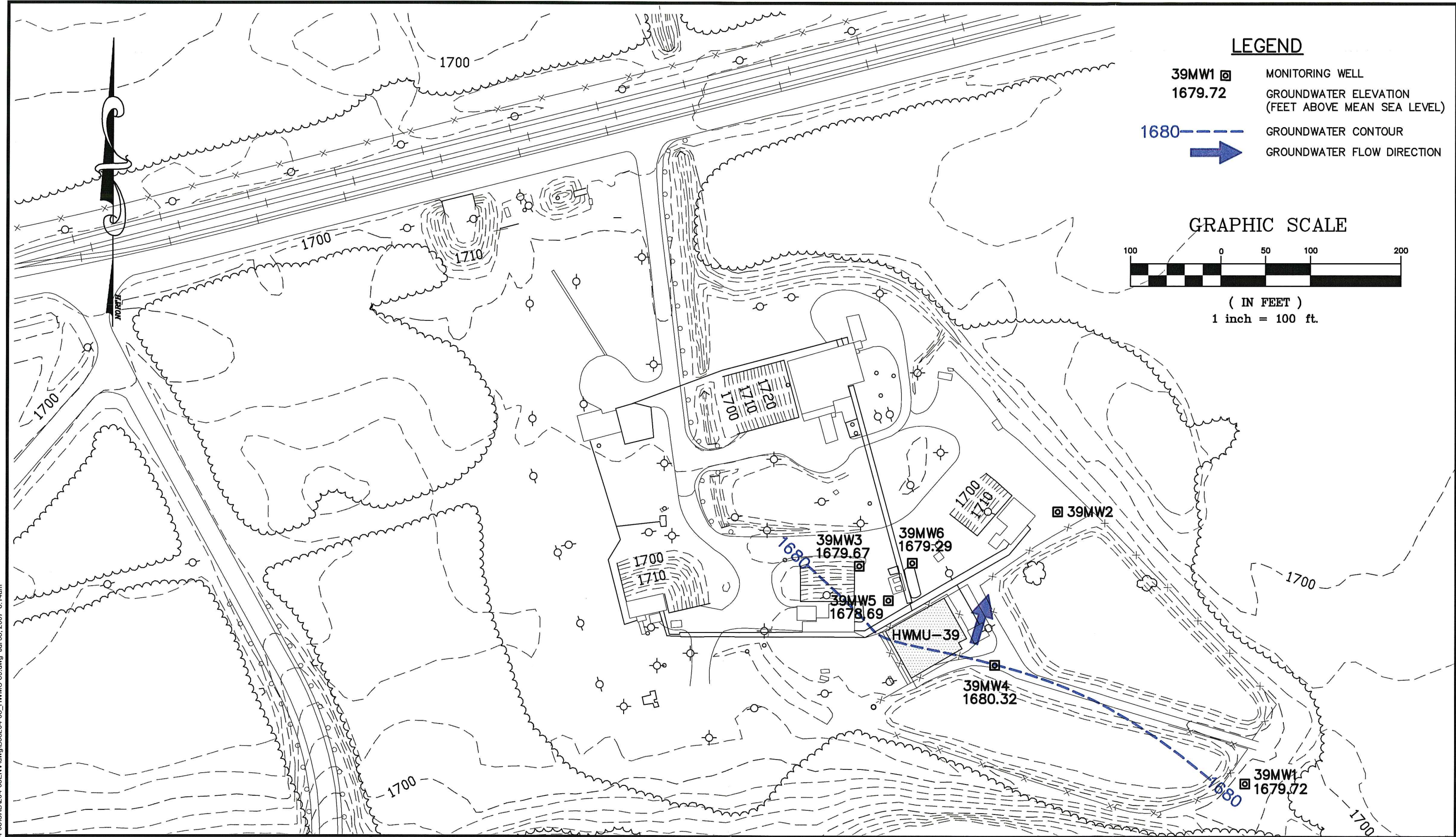
DESIGNED
DRAWN
CHECKED
DATE

LCL
KKD
MDL
06-26-07

Site Location Map
Radford Army Ammunition Plant
Montgomery County, Virginia

SCALE 1" = 2000'
PLAN NO. B03204-300

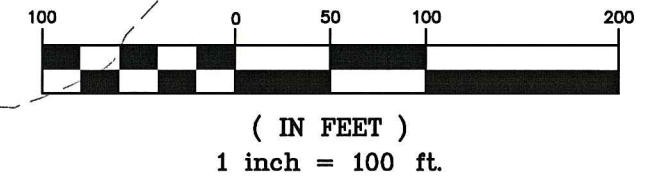
FIGURE
1



LEGEND

- 39MW1 1679.72 MONITORING WELL
- GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- 1680 --- GROUNDWATER CONTOUR
- ➡ GROUNDWATER FLOW DIRECTION

GRAPHIC SCALE



P:\B032001\B03204\B03204-03\CAD\204-03\ENV\dwg\B03204-03_HWMU-39.dwg Jul 03, 2007 8:14am



Draper Aden Associates

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Richmond, VA
Charlottesville, VA
Hampton Roads, VA

DESIGNED	LCL
DRAWN	KJO
CHECKED	MDL
DATE	07/02/2007

HWMU-39 POTENTIOMETRIC SURFACE MAP (2ND QUARTER 2007)
RADFORD ARMY AMMUNITION PLANT
 RADFORD, VIRGINIA

SCALE: 1"=100'
PLAN NO. B03204-111

FIGURE
2

TABLES

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Recoverable Phenolics									
	CAS # C-020								
Second Quarter 2003	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2003	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2003	U	U	U	U	10.3	5	-	ug/L	9065
First Quarter 2004	10 J	13 J	15 J	13 J	14 J	5	-	ug/L	9065
Second Quarter 2004	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2004	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2004	U	U	U	U	U	5	-	ug/L	9065
First Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
Second Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2005	U	U	U	U	U	5	-	ug/L	9065
First Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
Second Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
Third Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
Fourth Quarter 2006	U	U	U	U	U	5	-	ug/L	9065
First Quarter 2007	U	U	U	U	U	5	-	ug/L	9065
Second Quarter 2007	U	U	U	U	U	5	-	ug/L	9065
Antimony									
	CAS # 7440-36-0								
Second Quarter 2003	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	5	6	ug/L	6010B
First Quarter 2004	U	U	U	U	U	5	6	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2004	U	U J	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	6	ug/L	6010B
First Quarter 2005	U J	U J	U J	U J	U J	5	6	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	5	6	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	6	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	6	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	6	ug/L	6010B
Fourth Quarter 2006	U J	U J	U J	U J	U J	5	6	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	6	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	6	ug/L	6010B
Arsenic									
	CAS # 7440-38-2								
Second Quarter 2003	U	U	U	U	U	5	10	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2003	U	U	U	7.4 J	U	5	10	ug/L	6010B
First Quarter 2004	U	U	U	U	7.8 J	5	10	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	5	10	ug/L	6010B
Third Quarter 2004	U	U J	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	10	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	10	ug/L	6010B
Second Quarter 2005	U	U	U	U	5.8	5	10	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	5	10	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	10	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	10	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	10	ug/L	6010B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Barium CAS # 7440-39-3									
Second Quarter 2003	38.6	72.8	97.9	202	68.5	1	2000	ug/L	6010B
Third Quarter 2003	42.6	81.1	99.9	193	323	1	2000	ug/L	6010B
Fourth Quarter 2003	37.4	81.1	117	322	374	1	2000	ug/L	6010B
First Quarter 2004	39.9	84	102	200	342	1	2000	ug/L	6010B
Second Quarter 2004	40.9	77.8	97.1	190	217	1	2000	ug/L	6010B
Third Quarter 2004	34.2	72	104	172	237	1	2000	ug/L	6010B
Fourth Quarter 2004	40.2	81.1	113	224	263	1	2000	ug/L	6010B
First Quarter 2005	28.8	78.9	110	199	342	1	2000	ug/L	6010B
Second Quarter 2005	25.1	77.1	105	209	417	1	2000	ug/L	6010B
Third Quarter 2005	27.6	67.5 J	110	187	294	1	2000	ug/L	6010B
Fourth Quarter 2005	24.1	86.4	137	210	262	1	2000	ug/L	6010B
First Quarter 2006	23.9	74.8	125	201	210	1	2000	ug/L	6010B
Second Quarter 2006	20.7	83	131	205	240	1	2000	ug/L	6010B
Third Quarter 2006	22.8	90	124	197	164	1	2000	ug/L	6010B
Fourth Quarter 2006	31.7	88.7	121	206	207	1	2000	ug/L	6010B
First Quarter 2007	22.7	75.1	129	212	207	1	2000	ug/L	6010B
Second Quarter 2007	30	78.8	114	229	151	1	2000	ug/L	6010B
Beryllium CAS # 7440-41-7									
Second Quarter 2003	U	U	U	U	U	1	4	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2005	U J	U J	U J	U J	U J	1	4	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	1	4	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2006	U J	U J	U J	U J	U J	1	4	ug/L	6010B
Second Quarter 2006	U J	U J	U J	U J	U J	1	4	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	1	4	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	1	4	ug/L	6010B
First Quarter 2007	U	U	U	U	U	1	4	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	1	4	ug/L	6010B
Cadmium CAS # 7440-43-9									
Second Quarter 2003	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	1	5	ug/L	6010B
First Quarter 2007	U	U	U	U	U	1	5	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	1	5	ug/L	6010B

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Chromium									
CAS # 7440-47-3									
Second Quarter 2003	U	U	U	U	U	5	100	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2003	U	U	U	24.5	28.4	5	100	ug/L	6010B
First Quarter 2004	U	U	U	U	29.1	5	100	ug/L	6010B
Second Quarter 2004	U	U	U	U	15.9	5	100	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	100	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	100	ug/L	6010B
Second Quarter 2005	U	U	U	U	30.2	5	100	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2005	U	5.2	7.1	U	U	5	100	ug/L	6010B
First Quarter 2006	U	5.5	U	U	U	5	100	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	100	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	100	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	100	ug/L	6010B
First Quarter 2007	U	5.4	U	U	U	5	100	ug/L	6010B
Second Quarter 2007	U	7.1	7.52	U	U	5	100	ug/L	6010B
Iron									
CAS # 7439-89-6									
Second Quarter 2003	57.1	U	66.6	348	543	50	-	ug/L	6010B
Third Quarter 2003	U	U	U	138	1470	50	-	ug/L	6010B
Fourth Quarter 2003	87.7	U	U	19900	15300	50	-	ug/L	6010B
First Quarter 2004	127	U	U	833	15800	50	-	ug/L	6010B
Second Quarter 2004	U	U	U	U	8450	50	-	ug/L	6010B
Third Quarter 2004	U A	U	U	680	2190	50	-	ug/L	6010B
Fourth Quarter 2004	U	U	U	2630	774	50	-	ug/L	6010B
First Quarter 2005	U	U	U	U A	731	50	-	ug/L	6010B
Second Quarter 2005	33.5	U	U	1130	23600	50	-	ug/L	6010B
Third Quarter 2005	152	U	U	161 J	328	100	-	ug/L	6010B
Fourth Quarter 2005	U A	U	4990	161	170	50	-	ug/L	6010B
First Quarter 2006	U	U	1250	149	342	100	-	ug/L	6010B
Second Quarter 2006	U	U	892	350	178	50	-	ug/L	6010B
Third Quarter 2006	U	U	822	104	184	50	-	ug/L	6010B
Fourth Quarter 2006	U	U	350	116	301	50	-	ug/L	6010B
First Quarter 2007	U	U	1340	85.5	232	50	-	ug/L	6010B
Second Quarter 2007	U	857	4640	1200	343	100	-	ug/L	6010B
Lead									
CAS # 7439-92-1									
Second Quarter 2003	U	U	U	U	U	5	15	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2003	U	U	U	19.4	U	5	15	ug/L	6010B
First Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	15	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2005	U	U	U	U	5.3	5	15	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2005	U	U	5.9	U	U	5	15	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	15	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	15	ug/L	6010B
Second Quarter 2007	U	U	10.1	U	U	5	15	ug/L	6010B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Manganese CAS # 7439-96-5									
Second Quarter 2003	U	U	5.3	693	17	2	-	ug/L	6010B
Third Quarter 2003	U	U	2.6	104	54.5	2	-	ug/L	6010B
Fourth Quarter 2003	U	U	8.8	710	241	2	-	ug/L	6010B
First Quarter 2004	U	U	4	56.2	210	2	-	ug/L	6010B
Second Quarter 2004	U	U	U	113	125	2	-	ug/L	6010B
Third Quarter 2004	U	U	10.5	215	76.6	2	-	ug/L	6010B
Fourth Quarter 2004	U	U	6.2	207	52.5	2	-	ug/L	6010B
First Quarter 2005	U	U	U	A 33.6	60.3	2	-	ug/L	6010B
Second Quarter 2005	U	U	6.1	96.8	293	2	-	ug/L	6010B
Third Quarter 2005	U	U	2.2	48.6	57.8	2	-	ug/L	6010B
Fourth Quarter 2005	U	U	359	128	47	2	-	ug/L	6010B
First Quarter 2006	U	U	190	62.8	45.6	2	-	ug/L	6010B
Second Quarter 2006	U	U	149	54	42.5	2	-	ug/L	6010B
Third Quarter 2006	U	U	112	9.1	46.8	2	-	ug/L	6010B
Fourth Quarter 2006	U	U	26.9	19.4	54.5	2	-	ug/L	6010B
First Quarter 2007	U	U	126	6.2	50.8	2	-	ug/L	6010B
Second Quarter 2007	U	23.2	143	30.9	29.5	2	-	ug/L	6010B
Mercury CAS # 7439-97-6									
Second Quarter 2003	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2003	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2003	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2004	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2005	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
Third Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
Fourth Quarter 2006	U	U	U	U	U	0.5	2	ug/L	7470A
First Quarter 2007	U	U	U	U	U	0.5	2	ug/L	7470A
Second Quarter 2007	U	U	U	U	U	0.5	2	ug/L	7470A
Nickel CAS # 7440-02-0									
Second Quarter 2003	U	U	U	U	U	5	313	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2003	U	U	U	15.3	17.4	5	313	ug/L	6010B
First Quarter 2004	U	U	U	U	19.8	5	313	ug/L	6010B
Second Quarter 2004	U	U	U	U	10.8	5	313	ug/L	6010B
Third Quarter 2004	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	313	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	313	ug/L	6010B
Second Quarter 2005	U	U	U	U	21.8	5	313	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2005	U	U	6.3	U	U	5	313	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	5	313	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	313	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	313	ug/L	6010B

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Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Selenium CAS # 7782-49-2									
Second Quarter 2003	U	U	U	U	U	5	50	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	5	50	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	5	50	ug/L	6010B
First Quarter 2004	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2004	U J	U J	U J	U J	U J	5	50	ug/L	6010B
Third Quarter 2004	U J	U	U J	U J	U J	5	50	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	5	50	ug/L	6010B
First Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	5	50	ug/L	6010B
First Quarter 2006	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	5	50	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	5	50	ug/L	6010B
Fourth Quarter 2006	U J	U J	U J	U J	U J	5	50	ug/L	6010B
First Quarter 2007	U	U	U	U	U	5	50	ug/L	6010B
Second Quarter 2007	U	U	U	U	U	5	50	ug/L	6010B
Silver CAS # 7440-22-4									
Second Quarter 2003	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2003	U	U	U	U	U	2	78.3	ug/L	6010B
Fourth Quarter 2003	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2004	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2004	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2004	U J	U	U J	U J	U J	2	78.3	ug/L	6010B
Fourth Quarter 2004	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
Fourth Quarter 2005	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
Third Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
Fourth Quarter 2006	U	U	U	U	U	2	78.3	ug/L	6010B
First Quarter 2007	U	U	U	U	U	2	78.3	ug/L	6010B
Second Quarter 2007	U J	U J	U J	U J	U J	2	78.3	ug/L	6010B
Sodium CAS # 7440-23-5									
Second Quarter 2003	3710	17100	12300	15600	7740	100	-	ug/L	6010B
Third Quarter 2003	3380	22700	10700	15400	8650	100	-	ug/L	6010B
Fourth Quarter 2003	8080	23300	11700	14100	8960	100	-	ug/L	6010B
First Quarter 2004	8130	25900	12100	13800	9180	100	-	ug/L	6010B
Second Quarter 2004	4210	23400	11400	11800	7900	100	-	ug/L	6010B
Third Quarter 2004	9580	23200	11800	11400	7720	100	-	ug/L	6010B
Fourth Quarter 2004	7510	22600	12100	13500	8730	100	-	ug/L	6010B
First Quarter 2005	9630	17400	10700	10500	7240	100	-	ug/L	6010B
Second Quarter 2005	8290	22600	12100	12700	7690	100	-	ug/L	6010B
Third Quarter 2005	10400	24400	12100	11900	8070	500	-	ug/L	6010B
Fourth Quarter 2005	10800	30300	12600	10800	7620	100	-	ug/L	6010B
First Quarter 2006	10400	32400	11300	9650	7250	200	-	ug/L	6010B
Second Quarter 2006	10400	26300	13100	10200	7260	100	-	ug/L	6010B
Third Quarter 2006	15300	45000	16600	13100	9600	200	-	ug/L	6010B
Fourth Quarter 2006	8480	35600	13900	10800	7720	200	-	ug/L	6010B
First Quarter 2007	11300	40000	13500	10800	7860	200	-	ug/L	6010B
Second Quarter 2007	2840	34400	10900	10500	6920	200	-	ug/L	6010B

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Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Thallium CAS # 7440-28-0									
Second Quarter 2003	U	U	U	U	U	2	2	ug/L	7841
Third Quarter 2003	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2003	U	U	U	U	U	2	2	ug/L	7841
First Quarter 2004	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2004	U	U	U	U	U	2	2	ug/L	7841
Third Quarter 2004	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2004	U J	U J	U J	U J	U J	2	2	ug/L	7841
First Quarter 2005	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2005	U	U	U	U	U J	2	2	ug/L	7841
Third Quarter 2005	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2005	U	U	U	U	U	2	2	ug/L	7841
First Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
Third Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
Fourth Quarter 2006	U	U	U	U	U	2	2	ug/L	7841
First Quarter 2007	U	U	U	U	U	2	2	ug/L	7841
Second Quarter 2007	U	U	U	U	U	2	2	ug/L	7841
Chloride CAS # 16887006									
Second Quarter 2003	2260	3740	2020	9360	4620	100	-	ug/L	300.0
Third Quarter 2003	1830	9130	1570	8600	3630	100	-	ug/L	300.0
Fourth Quarter 2003	7700	8270	1810	7600	3610	100	-	ug/L	300.0
First Quarter 2004	4130	5060	U	4590	2570	1000	-	ug/L	300.0
Second Quarter 2004	2370	5300	2030	8230	4560	1000	-	ug/L	300.0
Third Quarter 2004	8970	6800	2760	7010	3550	1000	-	ug/L	300.0
Fourth Quarter 2004	5990	5430	2530	7450	3510	1000	-	ug/L	300.0
First Quarter 2005	10700 J	6160 J	2550 J	6590 J	2500 J	1000	-	ug/L	300.0
Second Quarter 2005	8220	6020	1920	7420	3080	1000	-	ug/L	300.0
Third Quarter 2005	8920	4980	1590	6800	2340	1000	-	ug/L	300.0
Fourth Quarter 2005	10400	5900	2540	6480	3120	1000	-	ug/L	300.0
First Quarter 2006	11200	6010	2860	5980	3120	1000	-	ug/L	300.0
Second Quarter 2006	12100	13800	5000	8601	5601	1000	-	ug/L	300.0
Third Quarter 2006	10900	17600	2930	6540	3080	1000	-	ug/L	300.0
Fourth Quarter 2006	7620	12800	2470	6500	2800	1000	-	ug/L	300.0
First Quarter 2007	12200	14000	4280	7970	4830	1000	-	ug/L	300.0
Second Quarter 2007	2900	10300	4240	8100	5460	1000	-	ug/L	300.0
Fluoride CAS # 16984-48-8									
Second Quarter 2003	258	299	188	951	416	100	-	ug/L	300.0
Third Quarter 2003	185	254	127	593	251	100	-	ug/L	300.0
Fourth Quarter 2003	253	211	104	704	242	100	-	ug/L	300.0
First Quarter 2004	133	169	U	474	197	100	-	ug/L	300.0
Second Quarter 2004	196	500	135	700	508	100	-	ug/L	300.0
Third Quarter 2004	331	311	183	776	380	100	-	ug/L	300.0
Fourth Quarter 2004	315	317	201	832	380	100	-	ug/L	300.0
First Quarter 2005	325	336	184	865	412	100	-	ug/L	300.0
Second Quarter 2005	321	310	200	1030	457	100	-	ug/L	300.0
Third Quarter 2005	309	363	142	983	388	100	-	ug/L	300.0
Fourth Quarter 2005	302	408	244	880	432	100	-	ug/L	300.0
First Quarter 2006	264	331	257	896	435	100	-	ug/L	300.0
Second Quarter 2006	U	U	U	660	180	100	-	ug/L	300.0
Third Quarter 2006	368	383	270	929	405	100	-	ug/L	300.0
Fourth Quarter 2006	364	402	223	1010	448	100	-	ug/L	300.0
First Quarter 2007	260	297	192	791	381	100	-	ug/L	300.0
Second Quarter 2007	291	283	175	802	343	100	-	ug/L	300.0

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Nitrate (as N) CAS # 14797558									
Second Quarter 2003	1660	1790	592	197	1010	100	10000	ug/L	300.0
Third Quarter 2003	930	1700	282	169	173	100	10000	ug/L	300.0
Fourth Quarter 2003	819	1440	237	U	U	100	10000	ug/L	300.0
First Quarter 2004	610 J	769 J	113 J	550 J	U J	100	10000	ug/L	300.0
Second Quarter 2004	1100	1300	432	361	U	100	10000	ug/L	300.0
Third Quarter 2004	1120	1120	334	169	143	100	10000	ug/L	300.0
Fourth Quarter 2004	1010	699	238	1060	149	100	10000	ug/L	300.0
First Quarter 2005	1290 J	1070 J	222 J	205 J	U J	100	10000	ug/L	300.0
Second Quarter 2005	1090	1190	281	472	162	100	10000	ug/L	300.0
Third Quarter 2005	1110	1430	153	240	U	100	10000	ug/L	300.0
Fourth Quarter 2005	1270	1910	312	116	U	100	10000	ug/L	300.0
First Quarter 2006	1220	3010	321	123	U	100	10000	ug/L	300.0
Second Quarter 2006	1320	4490	209	U	U	100	10000	ug/L	300.0
Third Quarter 2006	1470	5570	312	182	U	100	10000	ug/L	300.0
Fourth Quarter 2006	1240 J	3540 J	240	U	U	100	10000	ug/L	300.0
First Quarter 2007	1310	3990	201	U	U	100	10000	ug/L	300.0
Second Quarter 2007	1270	2670	252	1980	550	100	10000	ug/L	300.0
Sulfate CAS # 14808-79-8									
Second Quarter 2003	22100	76200	98800	43300	58600	5000	-	ug/L	300.0
Third Quarter 2003	18000	71400	71400	41300	25500	5000	-	ug/L	300.0
Fourth Quarter 2003	14400	69200	80500	35700	50700	5000	-	ug/L	300.0
First Quarter 2004	9200	58500	42200	26400	35800	5000	-	ug/L	300.0
Second Quarter 2004	18800	63000	68000	34000	48000	1000	-	ug/L	300.0
Third Quarter 2004	14600 J	76600 J	86700 J	35600 J	37900 J	1000	-	ug/L	300.0
Fourth Quarter 2004	15800	63800	85600	35700	31200	1000	-	ug/L	300.0
First Quarter 2005	13600	64900	81700	37800	39200	1000	-	ug/L	300.0
Second Quarter 2005	14100	72600	89000	38800	35900	1000	-	ug/L	300.0
Third Quarter 2005	12800	69800	87400	34100	32900	1000	-	ug/L	300.0
Fourth Quarter 2005	14600	71000	79700	34500	22100	1000	-	ug/L	300.0
First Quarter 2006	12100	74900	77200	31500	26600	1000	-	ug/L	300.0
Second Quarter 2006	13200	71400	92500	35100	36100	1000	-	ug/L	300.0
Third Quarter 2006	12400	80000	122000	34400	39100	1000	-	ug/L	300.0
Fourth Quarter 2006	15500	73800	82200	33700	22600	1000	-	ug/L	300.0
First Quarter 2007	10700	67600	61800	29000	18400	1000	-	ug/L	300.0
Second Quarter 2007	17300	64900	67100	29200	30800	1000	-	ug/L	300.0
Total Organic Halides (Rep 1) CAS # 59473-04-0									
Second Quarter 2003	12	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	59	U	U	U	U	10	-	ug/L	9020B
First Quarter 2004	38	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	21	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	65	U	15	U	23	10	-	ug/L	9020B
First Quarter 2005	131	56	41	68	246	10	-	ug/L	9020B
Second Quarter 2005	57	31	52	32	U	20	-	ug/L	9020B
Third Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
First Quarter 2006	27	U	U	20	27	20	-	ug/L	9020B
Second Quarter 2006	60	U	U	U	U	20	-	ug/L	9020B
Third Quarter 2006	106	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2006	98	31	35	24	25	20	-	ug/L	9020B
First Quarter 2007	89	25	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	32	U	U	U	U	20	-	ug/L	9020B

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Organic Halides (Rep 2)				CAS # 59473-04-0					
Second Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	52	U	U	U	U	10	-	ug/L	9020B
First Quarter 2004	36	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	20	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	66	U	18	U	25	10	-	ug/L	9020B
First Quarter 2005	135	59	107	117	167	10	-	ug/L	9020B
Second Quarter 2005	63	26	55	51	U	20	-	ug/L	9020B
Third Quarter 2005	32	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2005	U	U	U	28	U	20	-	ug/L	9020B
First Quarter 2006	U	U	U	U	U	20	-	ug/L	9020B
Second Quarter 2006	63	22	U	U	U	20	-	ug/L	9020B
Third Quarter 2006	112	22	U	24	U	20	-	ug/L	9020B
Fourth Quarter 2006	111	29	41	24	23	20	-	ug/L	9020B
First Quarter 2007	72	22	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	33	U	U	U	U	20	-	ug/L	9020B
Total Organic Halides (Rep 3)				CAS # 59473-04-0					
Second Quarter 2003	16	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	64	U	U	-	U	10	-	ug/L	9020B
First Quarter 2004	39	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	20	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	63	U	18	U	14	10	-	ug/L	9020B
First Quarter 2005	109	32	92	48	172	10	-	ug/L	9020B
Second Quarter 2005	53	32	29	66	U	20	-	ug/L	9020B
Third Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
Fourth Quarter 2005	U	U	U	U	U	20	-	ug/L	9020B
First Quarter 2006	22	U	U	28	U	20	-	ug/L	9020B
Second Quarter 2006	70	U	U	24	U	20	-	ug/L	9020B
Third Quarter 2006	98	U	U	26	U	20	-	ug/L	9020B
Fourth Quarter 2006	95	32	40	27	21	20	-	ug/L	9020B
First Quarter 2007	93	U	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	27	U	U	U	U	20	-	ug/L	9020B
Total Organic Halides (Rep 4)				CAS # 59473040					
Second Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2003	U	U	U	U	U	10	-	ug/L	9020B
Fourth Quarter 2003	59	U	U	U	U	10	-	ug/L	9020B
First Quarter 2004	42	U	U	U	U	10	-	ug/L	9020B
Second Quarter 2004	20	U	U	U	U	10	-	ug/L	9020B
Third Quarter 2004	-	-	-	-	-	10	-	ug/L	9020B
Fourth Quarter 2004	78	U	19	U	17	10	-	ug/L	9020B
First Quarter 2005	93	64	51	362	230	10	-	ug/L	9020B
Second Quarter 2005	81	44	65	44	U	20	-	ug/L	9020B
Third Quarter 2005	22	U	U	U	20	20	-	ug/L	9020B
Fourth Quarter 2005	U	27	U	U	U	20	-	ug/L	9020B
First Quarter 2006	U	U	U	U	U	20	-	ug/L	9020B
Second Quarter 2006	67	U	U	U	U	20	-	ug/L	9020B
Third Quarter 2006	102	U	U	21	U	20	-	ug/L	9020B
Fourth Quarter 2006	104	29	31	26	U	20	-	ug/L	9020B
First Quarter 2007	95	24	U	U	U	20	-	ug/L	9020B
Second Quarter 2007	29	U	U	U	U	20	-	ug/L	9020B

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Organic Carbon (Rep 1)									
				CAS # C-012					
Second Quarter 2003	2070	2400	2950	5300	2330	1000	-	ug/L	9060
Third Quarter 2003	1260	U	2550	3380	6540	1000	-	ug/L	9060
Fourth Quarter 2003	8980	19700 J	8050	10500	19600	1000	-	ug/L	9060
First Quarter 2004	4870	7630	10600	8930	10800	1000	-	ug/L	9060
Second Quarter 2004	U	U	U	1300	1900	1000	-	ug/L	9060
Third Quarter 2004	U	U	1120	U	2050	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1020	1240	2110	1000	-	ug/L	9060
First Quarter 2005	1010	1040	1360	1070	3370	1000	-	ug/L	9060
Second Quarter 2005	1220	U	1020	U	4090	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	1010	2410	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1310	U	2470	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	1800	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1140	U	2140	1000	-	ug/L	9060A
Third Quarter 2006	1110	U	1330	1110	2820	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1340	U	2270	1000	-	ug/L	9060A
First Quarter 2007	U	U	U	U	2120	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1130	1030	2050	1000	-	ug/L	9060A
Total Organic Carbon (Rep 2)									
				CAS # C-012					
Second Quarter 2003	1600	2670	4470	5330	2840	1000	-	ug/L	9060
Third Quarter 2003	1110	1530	2820	3270	5790	1000	-	ug/L	9060
Fourth Quarter 2003	9330	18800 J	7100	13300	27700	1000	-	ug/L	9060
First Quarter 2004	4380	5780	10700	6060	10800	1000	-	ug/L	9060
Second Quarter 2004	U	1120	1220	U	2300	1000	-	ug/L	9060
Third Quarter 2004	U	U	1120	U	1720	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1040	1200	2180	1000	-	ug/L	9060
First Quarter 2005	U	U	1360	1030	3270	1000	-	ug/L	9060
Second Quarter 2005	U	U	1050	U	4387	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	U	2650	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1030	U	2220	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	1920	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1190	U	2140	1000	-	ug/L	9060A
Third Quarter 2006	1110	U	1470	1030	2700	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1210	U	2090	1000	-	ug/L	9060A
First Quarter 2007	U	U	1080	U	2370	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1150	U	1770	1000	-	ug/L	9060A
Total Organic Carbon (Rep 3)									
				CAS # C-012					
Second Quarter 2003	1770	3310	3990	5080	2600	1000	-	ug/L	9060
Third Quarter 2003	U	1520	2060	3000	8290	1000	-	ug/L	9060
Fourth Quarter 2003	8480	27600 J	8280	13200	25700	1000	-	ug/L	9060
First Quarter 2004	4530	8390	9400	5710	8890	1000	-	ug/L	9060
Second Quarter 2004	U	2490	1260	U	1790	1000	-	ug/L	9060
Third Quarter 2004	U	U	1210	1120	1680	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1010	1490	2200	1000	-	ug/L	9060
First Quarter 2005	1070	U	1420	1060	3250	1000	-	ug/L	9060
Second Quarter 2005	U	U	1030	U	3739	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	U	2880	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1120	U	2420	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	2150	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1110	U	2160	1000	-	ug/L	9060A
Third Quarter 2006	1080	U	1460	1020	2740	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1090	U	2140	1000	-	ug/L	9060A
First Quarter 2007	U	U	1050	U	2030	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1210	U	1880	1000	-	ug/L	9060A

See definitions on last page.

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Total Organic Carbon (Rep 4)									
	CAS # C-012								
Second Quarter 2003	2000	2340	2380	4790	2110	1000	-	ug/L	9060
Third Quarter 2003	1950	1760	1770	3080	6200	1000	-	ug/L	9060
Fourth Quarter 2003	8550	24500 J	6900	7550	19600	1000	-	ug/L	9060
First Quarter 2004	5560	9090	9000	5220	9150	1000	-	ug/L	9060
Second Quarter 2004	U	U	1300	U	1810	1000	-	ug/L	9060
Third Quarter 2004	U	U	1150	U	1710	1000	-	ug/L	9060
Fourth Quarter 2004	U	U	1020	1390	2390	1000	-	ug/L	9060
First Quarter 2005	U	U	1330	1150	3480	1000	-	ug/L	9060
Second Quarter 2005	U	U	1030	U	3830	1000	-	ug/L	9060
Third Quarter 2005	U	U	U	U	2680	1000	-	ug/L	9060
Fourth Quarter 2005	U	U	1110	U	2520	1000	-	ug/L	9060
First Quarter 2006	U	U	U	U	1810	1000	-	ug/L	9060A
Second Quarter 2006	U	U	1120	U	2230	1000	-	ug/L	9060A
Third Quarter 2006	1110	U	1360	1040	2690	1000	-	ug/L	9060A
Fourth Quarter 2006	U	U	1120	U	2440	1000	-	ug/L	9060A
First Quarter 2007	U	U	1000	U	2100	1000	-	ug/L	9060A
Second Quarter 2007	U	U	1070	1030	2120	1000	-	ug/L	9060A
gamma-BHC									
	CAS # 58-89-9								
Second Quarter 2003	U	U	U	U	U	0.1	0.2	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	0.1	0.2	ug/L	8081A
First Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	0.1	0.2	ug/L	8081A
First Quarter 2005	U	U	U	U	U	0.1	0.2	ug/L	8081A
Second Quarter 2005	U	U	U	U	U J	0.1	0.2	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	0.1	0.2	ug/L	8081A
First Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	0.1	0.2	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	0.1	0.2	ug/L	8081A
Second Quarter 2007	U	U	U	U	U	0.1	0.2	ug/L	8081A
2,4-Dichlorophenoxyacetic acid									
	CAS # 94-75-7								
Second Quarter 2003	U	U	U	U	U	2.5	70	ug/L	8151A
Third Quarter 2003	U	U	U	U J	U	2.5	70	ug/L	8151A
Fourth Quarter 2003	U	U	U	U	U	2.5	70	ug/L	8151A
First Quarter 2004	U	U	U	U	U	2.5	70	ug/L	8151A
Second Quarter 2004	U	U	U	U	U	5	70	ug/L	8151A
Third Quarter 2004	U	U	U	U	U	5	70	ug/L	8151A
Fourth Quarter 2004	U	U	U	U	U	5	70	ug/L	8151A
First Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
Second Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
Third Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
Fourth Quarter 2005	U	U	U	U	U	5	70	ug/L	8151A
First Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
Second Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
Third Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
Fourth Quarter 2006	U	U	U	U	U	5	70	ug/L	8151A
First Quarter 2007	U	U	U	U	U	5	70	ug/L	8151A
Second Quarter 2007	U	U	U	U	U	5	70	ug/L	8151A

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Di-n-butyl phthalate CAS # 84-74-2									
Second Quarter 2003	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	1565	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	1565	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	10	1565	ug/L	8270C
Diethyl phthalate CAS # 84-66-2									
Second Quarter 2003	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	12520	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	12520	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	10	12520	ug/L	8270C
2,4-Dinitrotoluene CAS # 121-14-2									
Second Quarter 2003	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	31.3	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	31.3	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	10	31.3	ug/L	8270C

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
2,6-Dinitrotoluene CAS # 606-20-2									
Second Quarter 2003	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	10	15.65	ug/L	8270C
First Quarter 2007	U	U	U	U	U	10	15.65	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	10	15.65	ug/L	8270C
Endrin CAS # 72-20-8									
Second Quarter 2003	U	U	U	U	U	0.4	2	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	0.4	2	ug/L	8081A
First Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	0.4	2	ug/L	8081A
First Quarter 2005	U	U	U	U	U	0.4	2	ug/L	8081A
Second Quarter 2005	U	U	U	U	U	0.4	2	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	0.4	2	ug/L	8081A
First Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	0.4	2	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	0.4	2	ug/L	8081A
Second Quarter 2007	U	U	U J	U J	U	0.4	2	ug/L	8081A
Methoxychlor CAS # 72-43-5									
Second Quarter 2003	U	U	U	U	U	1	40	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	1	40	ug/L	8081A
First Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	1	40	ug/L	8081A
First Quarter 2005	U	U	U	U	U	1	40	ug/L	8081A
Second Quarter 2005	U	U	U	U	U J	1	40	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	1	40	ug/L	8081A
First Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	1	40	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	1	40	ug/L	8081A
Second Quarter 2007	U	U	U J	U J	U	1	40	ug/L	8081A

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Resorcinol CAS # 108-46-3									
Second Quarter 2003	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2003	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2003	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2004	U J	U J	U J	U J	U J	50	-	ug/L	8270C
Second Quarter 2004	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2004	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2004	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
Second Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2005	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
Second Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
Third Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
Fourth Quarter 2006	U	U	U	U	U	50	-	ug/L	8270C
First Quarter 2007	U	U	U	U	U	50	-	ug/L	8270C
Second Quarter 2007	U	U	U	U	U	50	-	ug/L	8270C
Silvex CAS # 93-72-1									
Second Quarter 2003	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2003	U	U	U	U J	U	2.5	50	ug/L	8151A
Fourth Quarter 2003	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
Fourth Quarter 2004	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
Fourth Quarter 2005	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
Third Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
Fourth Quarter 2006	U	U	U	U	U	2.5	50	ug/L	8151A
First Quarter 2007	U	U	U	U	U	2.5	50	ug/L	8151A
Second Quarter 2007	U	U	U	U	U	2.5	50	ug/L	8151A
Toxaphene CAS # 8001-35-2									
Second Quarter 2003	U	U	U	U	U	5	3	ug/L	8081A
Third Quarter 2003	U	U	U	U	U	5	3	ug/L	8081A
Fourth Quarter 2003	U	U	U	U	U	3	3	ug/L	8081A
First Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
Second Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
Third Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
Fourth Quarter 2004	U	U	U	U	U	3	3	ug/L	8081A
First Quarter 2005	U	U	U	U	U	3	3	ug/L	8081A
Second Quarter 2005	U	U	U	U	U J	3	3	ug/L	8081A
Third Quarter 2005	U	U	U	U	U	3	3	ug/L	8081A
Fourth Quarter 2005	U J	U J	U J	U J	U J	3	3	ug/L	8081A
First Quarter 2006	U	U	U	U	U	2.5	3	ug/L	8081A
Second Quarter 2006	U	U	U	U	U	3	3	ug/L	8081A
Third Quarter 2006	U	U	U	U	U	3	3	ug/L	8081A
Fourth Quarter 2006	U	U	U	U	U	3	3	ug/L	8081A
First Quarter 2007	U	U	U J	U J	U	3	3	ug/L	8081A
Second Quarter 2007	U	U	U J	U J	U	3	3	ug/L	8081A

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Fecal Coliform									
	CAS #								
Second Quarter 2003	U	U	30	U	U	2	-	MPN	9221
								Index/100 mL	
Third Quarter 2003	30	U	7	U	U	2	-	MPN	9221
								Index/100 mL	
Fourth Quarter 2003	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
First Quarter 2004	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
Second Quarter 2004	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
Third Quarter 2004	U	U	2	U	U	2	-	MPN	9221
								Index/100 mL	
Fourth Quarter 2004	23	U	2	U	U	2	-	MPN	9221
								Index/100 mL	
First Quarter 2005	U	U	U	U	U	2	-	MPN	9221
								Index/100 mL	
Second Quarter 2005	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Third Quarter 2005	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Fourth Quarter 2005	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
First Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Second Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Third Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Fourth Quarter 2006	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
First Quarter 2007	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Second Quarter 2007	U	U	U	U	U	2	-	MPN	9221C,E
								Index/100 mL	
Gross Alpha									
	CAS # 14127-62-9								
Second Quarter 2003	U	U	U	U	U	3	15	pCi/L	9310
Third Quarter 2003	U	U	U	U	U	3	15	pCi/L	9310
Fourth Quarter 2003	U	U	U	U	U	3	15	pCi/L	9310
First Quarter 2004	U	U	U	3.2	15.4	3	15	pCi/L	9310
Second Quarter 2004	U	U	U	U	6.7	3	15	pCi/L	9310
Third Quarter 2004	U	U	U	3.3	10.0	3	15	pCi/L	9310
Fourth Quarter 2004	U	U	U	24.8	7.0	3	15	pCi/L	9310
First Quarter 2005	U	U	U	U	10.9	3	15	pCi/L	9310
Second Quarter 2005	U	U	U	U	11.6	3	15	pCi/L	9310
Third Quarter 2005	U	U	U	U	4.7	3	15	pCi/L	9310
Fourth Quarter 2005	U	U	3.1	4.1	3.2	3	15	pCi/L	9310
First Quarter 2006	U	U	U	6.3	4.6	3	15	pCi/L	9310
Second Quarter 2006	U	U	9.7	11.7	15.6	3	15	pCi/L	9310
Third Quarter 2006	U	U	6.1	6.7	3.1	3	15	pCi/L	9310
Fourth Quarter 2006	U	U	U	6.3	U	3	15	pCi/L	9310
First Quarter 2007	U	U	9.5	5.8	5.7	3	15	pCi/L	9310
Second Quarter 2007	U	3.7	9.6	11.8	8.3	3	15	pCi/L	9310

Table 1. Target Analyte Monitoring Results - Second Quarter 2003 to First Quarter 2007
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	DWS	Unit	Method
Gross Beta									
	CAS # 12587-47-2								
Second Quarter 2003	U	5.5	6.1	7.6	5.1	4	50	pCi/L	9310
Third Quarter 2003	U	11.9	9.0	8.8	U	4	50	pCi/L	9310
Fourth Quarter 2003	U	11.9	9.0	8.8	U	4	50	pCi/L	9310
First Quarter 2004	U	12.5	9.9	6.5	37.5	4	50	pCi/L	9310
Second Quarter 2004	U	4.9	7.3	4.2	19.2	4	50	pCi/L	9310
Third Quarter 2004	U	10.3	9.8	6.1	15.0	4	50	pCi/L	9310
Fourth Quarter 2004	U	12.6	9.5	40.6	21.5	4	50	pCi/L	9310
First Quarter 2005	U	11.5	10.4	5.5	32.8	4	50	pCi/L	9310
Second Quarter 2005	U	12.7	8.9	4.9	37.3 J	4	50	pCi/L	9310
Third Quarter 2005	U	9.7	8.1	5.2	10.9	4	50	pCi/L	9310
Fourth Quarter 2005	U	7.9	14.1	9.6	6.9	4	50	pCi/L	9310
First Quarter 2006	U	9.9	11.8	14.5	6.7	4	50	pCi/L	9310
Second Quarter 2006	U	11.7	28.2	14.8	54.9	4	50	pCi/L	9310
Third Quarter 2006	U	13.8	20.5	10.2	4.7	4	50	pCi/L	9310
Fourth Quarter 2006	U	7.7	11	6.4	U	4	50	pCi/L	9310
First Quarter 2007	U	11.4	37.9	12.1	6.3	4	50	pCi/L	9310
Second Quarter 2007	U	9.9	30	15.6	14.9	4	50	pCi/L	9310
Total Radium									
	CAS # 7440-14-4								
Second Quarter 2003	U	U	U	U	U	1	5	pCi/L	9315
Third Quarter 2003	U	U	U	U	U	1	5	pCi/L	9315
Fourth Quarter 2003	U	U	U	U	U	1	5	pCi/L	9315
First Quarter 2004	U	U	U	1.35	12.1	1	5	pCi/L	9315
Second Quarter 2004	U	U	U	U	U	1	5	pCi/L	9315
Third Quarter 2004	U	U	U	U	1.1	1	5	pCi/L	9315
Fourth Quarter 2004	U	U	U	4.2	1.1	1	5	pCi/L	9315
First Quarter 2005	U	U	U	U	2.2	1	5	pCi/L	9315
Second Quarter 2005	U	U	U	U	7.9 J	1	5	pCi/L	9315
Third Quarter 2005	U	U	U	U	1.1	1	5	pCi/L	9315
Fourth Quarter 2005	U	U	U	U	U	1	5	pCi/L	9315
First Quarter 2006	U	U	U	1.5	U	1	5	pCi/L	9315
Second Quarter 2006	U	U	U	1.7	U	1	5	pCi/L	9315
Third Quarter 2006	U	U	U	U	U	1	5	pCi/L	9315
Fourth Quarter 2006	U	U	U	U	U	1	5	pCi/L	9315
First Quarter 2007	U	U	U	U	U	1	5	pCi/L	9315
Second Quarter 2007	U	U	U	1.8	U	1	5	pCi/L	9315

Definitions: QL Denotes project quantitation limit. Results reported to at or above QL. U Denotes analyte not detected at or above QL. UA Denotes analyte not detected at or above adjusted sample QL. J Denotes analyte reported at or above QL, and associated result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL, and adjusted QL is estimated. "-" Denotes not detected or not available/not sampled. R Denotes result rejected. Q Denotes data validation qualifier. NS Denotes not sampled. DWS Denotes Drinking Water Standard (USEPA MCL dated June 2003 or VDEQ ACL dated Dec. 2006). (The MCL for beta particles is 4 mrem/year. USEPA considers 50 pCi/L to be the level of concern for beta particles.) NA Denotes not analyzed.

Notes:

2,4-D QL increased to 5 µg/l due to new laboratory MDL study (effective 2Q 2003).

No TOX data 3Q 2004 due to instrument breakdown.

The unit of measurement for radiological analyses is pico curries/liter (pCi/l).

Radium 228 via SW846 9320 to be performed when total alpha emitting radium 226 via SW846 9315 exceeds 3 pico curries/liter; not performed in 2Q 2005.

APPENDIX A

APPROVAL OF HWMU-39 CLEAN CLOSURE FOR SOIL

Rec'd ENV 5-5-99



99-60

C: Jake
Redder
McKean
Olson
ENV file
Lib-Bv Cas

James S. Gilmore, III
Governor

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219

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Fax (804) 698-4500 TDD (804) 698-4021

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Dennis H. Treacy
Director

Shelf 2

Column 2 (804) 698-4000
1-800-592-5482
HW 4039

John Paul Woodley, Jr.
Secretary of Natural Resources

May 3, 1999

Ms. C.A. Jake
Alliant Techsystems Inc.
Radford Army Ammunition Plant
P.O. Box 1
Radford, VA 24141-0100

RE: Radford Army Ammunition Plant (RAAP)
EPA ID# VA12100207306
Incinerator Spray Pond
Closure Verification

Dear Ms. Jake:

On June 15, 1998, RAAP submitted the required closure certifications and report for its Equalization Basin. The report was revised and submitted on October 26, 1998, in accordance with the Department's comment letter. Additionally, on March 27, 1998, RAAP's Incinerator Spray Pond, SWMU #39, was visited by compliance staff of the Virginia Department of Environmental Quality's (DEQ) West Central Regional Office. The result of the closure verification inspection and the submitted information have been reviewed.

Based on this closure inspection, the closure certifications, and the closure report, clean closure of the unsaturated soils was achieved by background comparison for all constituents, except arsenic, barium, and chromium. Clean closure to a residential risk-based determination was achieved for these three constituents. Therefore, the DEQ concurs that clean closure for the unsaturated soils only has been achieved for RAAP's Incinerator Spray Pond. Please note, however, that the U.S. Environmental Protection Agency retains the authority to address possible corrective action of continuing releases pursuant to the Hazardous and Solid Waste Amendments of 1984. The saturated soils/groundwater underneath the unit is still undergoing closure and may be subject to the post-closure permit process established under Title 9 of the Virginia Administrative Code, Chapter 20-60 (9 VAC 20-60 et seq.), if clean closure cannot be achieved.

Ms. C.A. Jake
April 23, 1999
Page 2

If you have any questions regarding this letter, please contact Debra A. Miller,
Environmental Engineer Senior, of my staff at (804) 698-4206.

Very truly yours,

H. H. Vakil
For Dennis H. Treacy

c: Claire Ballard - DEQ
Melissa Porterfield- DEQ
Glenn VonGonten-DEQ
Aziz Farahmand-DEQ/WCRO
Central Hazardous Waste File

APPENDIX B

HISTORICAL DATA –
FIRST QUARTER 1998 TO FIRST QUARTER 2003

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW1	59604-1 Rep 1	03/23/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW1	59604-1 Rep 2	03/23/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW1	59604-1 Rep 3	03/23/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW1	59604-1 Rep 4	03/23/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW1	59604-1	03/23/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW1	59604-1	03/23/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW1	59604-1	03/23/98	ANTIMONY	PPB	ND	60		6020
39MW1	59604-1	03/23/98	ARSENIC	PPB	ND	1		6020
39MW1	59604-1	03/23/98	BARIUM	PPB	49	2		6020
39MW1	59604-1	03/23/98	BERYLLIUM	PPB	ND	0.2		6020
39MW1	59604-1	03/23/98	BHC-GAMMA	PPB	ND	2		8081
39MW1	59604-1	03/23/98	CADMIUM	PPB	ND	0.1		6020
39MW1	59604-1	03/23/98	CHLORIDE	PPB	2100	1000		9056
39MW1	59604-1	03/23/98	CHROMIUM	PPB	2	1		6020
39MW1	59604-1	03/23/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW1	59604-1	03/23/98	2,4-D	PPB	ND	1		8151
39MW1	59604-1	03/23/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW1	59604-1	03/23/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW1	59604-1	03/23/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW1	59604-1	03/23/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	59604-1	03/23/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	59604-1	03/23/98	ENDRIN	PPB	ND	2		8081
39MW1	59604-1	03/23/98	FLUORIDE	PPB	ND	100		EPA340.2/300
39MW1	59604-1	03/23/98	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
39MW1	59604-1	03/23/98	GROSS BETA	pCi/l	3.0	1		SW-846:9310
39MW1	59604-1	03/23/98	IRON	PPB	368	1		6010A
39MW1	59604-1	03/23/98	LEAD	PPB	ND	1		6020
39MW1	59604-1	03/23/98	MANGANESE	PPB	4.4	0.2		6020
39MW1	59604-1	03/23/98	MERCURY	PPB	ND	0.2		7470A
39MW1	59604-1	03/23/98	METHOXYCHLOR	PPB	ND	2		8081
39MW1	59604-1	03/23/98	NICKEL	PPB	ND	15		6020
39MW1	59604-1	03/23/98	NITRATE AS N	PPB	1430	100		9056
39MW1	59604-1	03/23/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW1	59604-1	03/23/98	RADIUM	pCi/L	ND	1		SW-846:9320
39MW1	59604-1	03/23/98	RESORCINOL	PPB	ND	10		8270B
39MW1	59604-1	03/23/98	SELENIUM	PPB	3	1		6020
39MW1	59604-1	03/23/98	SILVER	PPB	ND	0.2		6020
39MW1	59604-1	03/23/98	SODIUM	PPB	3200	100		6010A
39MW1	59604-1	03/23/98	SULFATE	PPB	17100	1000		9056
39MW1	59604-1	03/23/98	THALLIUM	PPB	ND	1		6020
39MW1	59604-1	03/23/98	TOXAPHENE	PPB	ND	2		8081
39MW1	59604-1	03/23/98	pH-Field	pHu	6.4	0.1		9040
39MW1	59604-1	03/23/98	pH-Field	pHu	6.5	0.1		9040
39MW1	59604-1	03/23/98	pH-Field	pHu	6.5	0.1		9040
39MW1	59604-1	03/23/98	pH-Field	pHu	6.5	0.1		9040
39MW1	59604-1	03/23/98	pH-Lab.	pHu	7.04	0.1		9040
39MW1	59604-1	03/23/98	Specific Conduct.-Field	µS/cm	360	1		9050
39MW1	59604-1	03/23/98	Specific Conduct.-Field	µS/cm	370	1		9050
39MW1	59604-1	03/23/98	Specific Conduct.-Field	µS/cm	380	1		9050
39MW1	59604-1	03/23/98	Specific Conduct.-Field	µS/cm	380	1		9050
39MW1	59604-1	03/23/98	Specific Conduct.-Lab	µS/cm	350	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
39MW4	59630-1 Rep 1	03/24/98	TOTAL ORGANIC CARBON	PPB	1500	1000		9060
39MW4	59630-1 Rep 2	03/24/98	TOTAL ORGANIC CARBON	PPB	1600	1000		9060
39MW4	59630-1 Rep 3	03/24/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW4	59630-1 Rep 4	03/24/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW4	59630-1	03/24/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW4	59630-1	03/24/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW4	59630-1	03/24/98	ANTIMONY	PPB	ND	60		6020
39MW4	59630-1	03/24/98	ARSENIC	PPB	2	1		6020
39MW4	59630-1	03/24/98	BARIUM	PPB	94	2		6020
39MW4	59630-1	03/24/98	BERYLLIUM	PPB	0.2	0.2		6020
39MW4	59630-1	03/24/98	BHC-GAMMA	PPB	ND	2		8081
39MW4	59630-1	03/24/98	CADMIUM	PPB	ND	0.1		6020
39MW4	59630-1	03/24/98	CHLORIDE	PPB	2400	1000		9056
39MW4	59630-1	03/24/98	CHROMIUM	PPB	7	1		6020
39MW4	59630-1	03/24/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW4	59630-1	03/24/98	2,4-D	PPB	ND	1		8151
39MW4	59630-1	03/24/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW4	59630-1	03/24/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW4	59630-1	03/24/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW4	59630-1	03/24/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	59630-1	03/24/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	59630-1	03/24/98	ENDRIN	PPB	ND	2		8081
39MW4	59630-1	03/24/98	FLUORIDE	PPB	ND	100		EPA340.2/300
39MW4	59630-1	03/24/98	GROSS ALPHA	pCi/l	2.3	1		SW-846:9310
39MW4	59630-1	03/24/98	GROSS BETA	pCi/l	11.6	1		SW-846:9310
39MW4	59630-1	03/24/98	IRON	PPB	5420	1		6010A
39MW4	59630-1	03/24/98	LEAD	PPB	6	1		6020
39MW4	59630-1	03/24/98	MANGANESE	PPB	67	0.2		6020
39MW4	59630-1	03/24/98	MERCURY	PPB	ND	0.2		7470A
39MW4	59630-1	03/24/98	METHOXYCHLOR	PPB	ND	2		8081
39MW4	59630-1	03/24/98	NICKEL	PPB	ND	15		6020
39MW4	59630-1	03/24/98	NITRATE AS N	PPB	1360	100		9056
39MW4	59630-1	03/24/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW4	59630-1	03/24/98	RADIUM	pCi/L	ND	1		SW-846:9320
39MW4	59630-1	03/24/98	RESORCINOL	PPB	ND	10		8270B
39MW4	59630-1	03/24/98	SELENIUM	PPB	ND	1		6020
39MW4	59630-1	03/24/98	SILVER	PPB	ND	0.2		6020
39MW4	59630-1	03/24/98	SODIUM	PPB	12300	100		6010A
39MW4	59630-1	03/24/98	SULFATE	PPB	71400	1000		9056
39MW4	59630-1	03/24/98	THALLIUM	PPB	ND	1		6020
39MW4	59630-1	03/24/98	TOXAPHENE	PPB	ND	2		8081
39MW4	59630-1	03/24/98	pH-Field	pHu	6.4	0.1		9040
39MW4	59630-1	03/24/98	pH-Field	pHu	6.5	0.1		9040
39MW4	59630-1	03/24/98	pH-Field	pHu	6.5	0.1		9040
39MW4	59630-1	03/24/98	pH-Field	pHu	6.5	0.1		9040
39MW4	59630-1	03/24/98	pH-Lab.	pHu	6.19	0.1		9040
39MW4	59630-1	03/24/98	Specific Conduct.-Field	µS/cm	580	1		9050
39MW4	59630-1	03/24/98	Specific Conduct.-Field	µS/cm	560	1		9050
39MW4	59630-1	03/24/98	Specific Conduct.-Field	µS/cm	550	1		9050
39MW4	59630-1	03/24/98	Specific Conduct.-Field	µS/cm	550	1		9050
39MW4	59630-1	03/24/98	Specific Conduct.-Lab	µS/cm	722	1		9050

3 LOCATION	SAMPLE		PARAMETERS	UNITS	DETECTION			METHOD
	LAB. NO.	DATE			RESULTS	LIMITS	QUALIF	
39MW3	59666-1 Rep 1	03/25/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW3	59666-1 Rep 2	03/25/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW3	59666-1 Rep 3	03/25/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW3	59666-1 Rep 4	03/25/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW3	59666-1	03/25/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	59666-1	03/25/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	59666-1	03/25/98	ANTIMONY	PPB	ND	60		6020
39MW3	59666-1	03/25/98	ARSENIC	PPB	ND	1		6020
39MW3	59666-1	03/25/98	BARIUM	PPB	85	2		6020
39MW3	59666-1	03/25/98	BERYLLIUM	PPB	ND	0.2		6020
39MW3	59666-1	03/25/98	BHC-GAMMA	PPB	ND	2		8081
39MW3	59666-1	03/25/98	CADMIUM	PPB	ND	0.1		6020
39MW3	59666-1	03/25/98	CHLORIDE	PPB	5800	1000		9056
39MW3	59666-1	03/25/98	CHROMIUM	PPB	5	1		6020
39MW3	59666-1	03/25/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW3	59666-1	03/25/98	2,4-D	PPB	ND	1		8151
39MW3	59666-1	03/25/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW3	59666-1	03/25/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW3	59666-1	03/25/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW3	59666-1	03/25/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	59666-1	03/25/98	2,6-DINITROTOLUENE	PPB	0.09	0.08		8090
39MW3	59666-1	03/25/98	ENDRIN	PPB	ND	2		8081
39MW3	59666-1	03/25/98	FLUORIDE	PPB	ND	100		EPA340.2/300
39MW3	59666-1	03/25/98	GROSS ALPHA	pCi/l	1.9	1		SW-846:9310
39MW3	59666-1	03/25/98	GROSS BETA	pCi/l	8.8	1		SW-846:9310
39MW3	59666-1	03/25/98	IRON	PPB	1640	1		6010A
39MW3	59666-1	03/25/98	LEAD	PPB	1	1		6020
39MW3	59666-1	03/25/98	MANGANESE	PPB	63	0.2		6020
39MW3	59666-1	03/25/98	MERCURY	PPB	ND	0.2		7470A
39MW3	59666-1	03/25/98	METHOXYCHLOR	PPB	ND	2		8081
39MW3	59666-1	03/25/98	NICKEL	PPB	ND	15		6020
39MW3	59666-1	03/25/98	NITRATE AS N	PPB	5410	100		9056
39MW3	59666-1	03/25/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW3	59666-1	03/25/98	RADIUM	pCi/L	ND	1		SW-846:9320
39MW3	59666-1	03/25/98	RESORCINOL	PPB	ND	10		8270B
39MW3	59666-1	03/25/98	SELENIUM	PPB	ND	1		6020
39MW3	59666-1	03/25/98	SILVER	PPB	ND	0.2		6020
39MW3	59666-1	03/25/98	SODIUM	PPB	23400	100		6010A
39MW3	59666-1	03/25/98	SULFATE	PPB	121000	1000		9056
39MW3	59666-1	03/25/98	THALLIUM	PPB	ND	1		6020
39MW3	59666-1	03/25/98	TOXAPHENE	PPB	ND	2		8081
39MW3	59666-1	03/25/98	pH-Field	pHu	6.6	0.1		9040
39MW3	59666-1	03/25/98	pH-Field	pHu	6.7	0.1		9040
39MW3	59666-1	03/25/98	pH-Field	pHu	6.6	0.1		9040
39MW3	59666-1	03/25/98	pH-Field	pHu	6.5	0.1		9040
39MW3	59666-1	03/25/98	pH-Lab.	pHu	7.14	0.1		9040
39MW3	59666-1	03/25/98	Specific Conduct.-Field	μS/cm	890	1		9050
39MW3	59666-1	03/25/98	Specific Conduct.-Field	μS/cm	990	1		9050
39MW3	59666-1	03/25/98	Specific Conduct.-Field	μS/cm	880	1		9050
39MW3	59666-1	03/25/98	Specific Conduct.-Field	μS/cm	880	1		9050
39MW3	59666-1	03/25/98	Specific Conduct.-Lab	μS/cm	842	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			METHOD
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	
39MW5	59666-2 Rep 1	03/25/98	TOTAL ORGANIC CARBON	PPB	2500	1000		9060
39MW5	59666-2 Rep 2	03/25/98	TOTAL ORGANIC CARBON	PPB	2600	1000		9060
39MW5	59666-2 Rep 3	03/25/98	TOTAL ORGANIC CARBON	PPB	2600	1000		9060
39MW5	59666-2 Rep 4	03/25/98	TOTAL ORGANIC CARBON	PPB	2700	1000		9060
39MW5	59666-2	03/25/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	59666-2	03/25/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	59666-2	03/25/98	ANTIMONY	PPB	ND	60		6020
39MW5	59666-2	03/25/98	ARSENIC	PPB	6	1		6020
39MW5	59666-2	03/25/98	BARIUM	PPB	453	2		6020
39MW5	59666-2	03/25/98	BERYLLIUM	PPB	1.6	0.2		6020
39MW5	59666-2	03/25/98	BHC-GAMMA	PPB	ND	2		8081
39MW5	59666-2	03/25/98	CADMIUM	PPB	0.3	0.1		6020
39MW5	59666-2	03/25/98	CHLORIDE	PPB	7300	1000		9056
39MW5	59666-2	03/25/98	CHROMIUM	PPB	80	1		6020
39MW5	59666-2	03/25/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW5	59666-2	03/25/98	2,4-D	PPB	ND	1		8151
39MW5	59666-2	03/25/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW5	59666-2	03/25/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW5	59666-2	03/25/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW5	59666-2	03/25/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	59666-2	03/25/98	2,6-DINITROTOLUENE	PPB	0.13	0.08		8090
39MW5	59666-2	03/25/98	ENDRIN	PPB	ND	2		8081
39MW5	59666-2	03/25/98	FLUORIDE	PPB	350	100		EPA340.2/300
39MW5	59666-2	03/25/98	GROSS ALPHA	pCi/l	48	1		SW-846-9310
39MW5	59666-2	03/25/98	GROSS BETA	pCi/l	60	1		SW-846-9310
39MW5	59666-2	03/25/98	IRON	PPB	70500	1		6010A
39MW5	59666-2	03/25/98	LEAD	PPB	70	1		6020
39MW5	59666-2	03/25/98	MANGANESE	PPB	1890	0.2		6010A
39MW5	59666-2	03/25/98	MERCURY	PPB	ND	0.2		7470A
39MW5	59666-2	03/25/98	METHOXYCHLOR	PPB	ND	2		8081
39MW5	59666-2	03/25/98	NICKEL	PPB	39	15		6020
39MW5	59666-2	03/25/98	NITRATE AS N	PPB	ND	100		9056
39MW5	59666-2	03/25/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW5	59666-2	03/25/98	RADIUM	pCi/L	6.2	1		SW-846-9320
39MW5	59666-2	03/25/98	RESORCINOL	PPB	ND	10		8270B
39MW5	59666-2	03/25/98	SELENIUM	PPB	ND	1		6020
39MW5	59666-2	03/25/98	SILVER	PPB	ND	0.2		6020
39MW5	59666-2	03/25/98	SODIUM	PPB	13800	100		6010A
39MW5	59666-2	03/25/98	SULFATE	PPB	41400	1000		9056
39MW5	59666-2	03/25/98	THALLIUM	PPB	ND	1		6020
39MW5	59666-2	03/25/98	TOXAPHENE	PPB	ND	2		8081
39MW5	59666-2	03/25/98	pH-Field	pHu	6.8	0.1		9040
39MW5	59666-2	03/25/98	pH-Field	pHu	6.7	0.1		9040
39MW5	59666-2	03/25/98	pH-Field	pHu	6.6	0.1		9040
39MW5	59666-2	03/25/98	pH-Field	pHu	6.6	0.1		9040
39MW5	59666-2	03/25/98	pH-Lab.	pHu	7.33	0.1		9040
39MW5	59666-2	03/25/98	Specific Conduct.-Field	µS/cm	780	1		9050
39MW5	59666-2	03/25/98	Specific Conduct.-Field	µS/cm	800	1		9050
39MW5	59666-2	03/25/98	Specific Conduct.-Field	µS/cm	900	1		9050
39MW5	59666-2	03/25/98	Specific Conduct.-Field	µS/cm	910	1		9050
39MW5	59666-2	03/25/98	Specific Conduct.-Lab	µS/cm	812	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			METHOD
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	
39MW6	59716-1 Rep 1	03/26/98	TOTAL ORGANIC CARBON	PPB	5100	1000		9060
39MW6	59716-1 Rep 2	03/26/98	TOTAL ORGANIC CARBON	PPB	5400	1000		9060
39MW6	59716-1 Rep 3	03/26/98	TOTAL ORGANIC CARBON	PPB	5400	1000		9060
39MW6	59716-1 Rep 4	03/26/98	TOTAL ORGANIC CARBON	PPB	5800	1000		9060
39MW6	59716-1	03/26/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	59716-1	03/26/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	59716-1	03/26/98	ANTIMONY	PPB	ND	60		6020
39MW6	59716-1	03/26/98	ARSENIC	PPB	98	1		6020
39MW6	59716-1	03/26/98	BARIUM	PPB	8380	2		6020
39MW6	59716-1	03/26/98	BERYLLIUM	PPB	8.3	0.2		6020
39MW6	59716-1	03/26/98	BHC-GAMMA	PPB	ND	2		8081
39MW6	59716-1	03/26/98	CADMIUM	PPB	0.9	0.1		6020
39MW6	59716-1	03/26/98	CHLORIDE	PPB	ND	1000		9056
39MW6	59716-1	03/26/98	CHROMIUM	PPB	432	1		6020
39MW6	59716-1	03/26/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW6	59716-1	03/26/98	2,4-D	PPB	ND	1		8151
39MW6	59716-1	03/26/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW6	59716-1	03/26/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW6	59716-1	03/26/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW6	59716-1	03/26/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	59716-1	03/26/98	2,6-DINITROTOLUENE	PPB	0.15	0.08		8090
39MW6	59716-1	03/26/98	ENDRIN	PPB	ND	2		8081
39MW6	59716-1	03/26/98	FLUORIDE	PPB	270	100		EPA340.2/300
39MW6	59716-1	03/26/98	GROSS ALPHA	pCi/l	1710	1		SW-846:9310
39MW6	59716-1	03/26/98	GROSS BETA	pCi/l	3880	1		SW-846:9310
39MW6	59716-1	03/26/98	IRON	PPB	729000	1		6010A
39MW6	59716-1	03/26/98	LEAD	PPB	144	1		6020
39MW6	59716-1	03/26/98	MANGANESE	PPB	11700	0.2		6010A
39MW6	59716-1	03/26/98	MERCURY	PPB	0.3	0.2		7470A
39MW6	59716-1	03/26/98	METHOXYCHLOR	PPB	ND	2		8081
39MW6	59716-1	03/26/98	NICKEL	PPB	299	15		6020
39MW6	59716-1	03/26/98	NITRATE AS N	PPB	ND	100		9056
39MW6	59716-1	03/26/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW6	59716-1	03/26/98	RADIUM	pCi/L	16.5	1		SW-846:9320
39MW6	59716-1	03/26/98	RESORCINOL	PPB	ND	10		8270B
39MW6	59716-1	03/26/98	SELENIUM	PPB	ND	1		6020
39MW6	59716-1	03/26/98	SILVER	PPB	ND	0.2		6020
39MW6	59716-1	03/26/98	SODIUM	PPB	17200	100		6010A
39MW6	59716-1	03/26/98	SULFATE	PPB	118000	1000		9056
39MW6	59716-1	03/26/98	THALLIUM	PPB	2	1		6020
39MW6	59716-1	03/26/98	TOXAPHENE	PPB	ND	2		8081
39MW6	59716-1	03/26/98	pH-Field	pHu	6.7	0.1		9040
39MW6	59716-1	03/26/98	pH-Field	pHu	7.1	0.1		9040
39MW6	59716-1	03/26/98	pH-Field	pHu	7.4	0.1		9040
39MW6	59716-1	03/26/98	pH-Field	pHu	7.4	0.1		9040
39MW6	59716-1	03/26/98	pH-Lab.	pHu	7.39	0.1		9040
39MW6	59716-1	03/26/98	Specific Conduct.-Field	µS/cm	900	1		9050
39MW6	59716-1	03/26/98	Specific Conduct.-Field	µS/cm	870	1		9050
39MW6	59716-1	03/26/98	Specific Conduct.-Field	µS/cm	880	1		9050
39MW6	59716-1	03/26/98	Specific Conduct.-Field	µS/cm	880	1		9050
39MW6	59716-1	03/26/98	Specific Conduct.-Lab	µS/cm	943	1		9050

3			SAMPLE		DETECTION			
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW1	61382-1 Rep 1	05/28/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61382-1 Rep 2	05/28/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61382-1 Rep 3	05/28/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61382-1 Rep 4	05/28/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61382-1	05/28/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW1	61382-1 Dup	05/28/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW1	61382-1	05/28/98	ANTIMONY	PPB	ND	60		6020
39MW1	61382-1	05/28/98	ARSENIC	PPB	ND	1		6020
39MW1	61382-1	05/28/98	BARIUM	PPB	65	2		6020
39MW1	61382-1	05/28/98	BERYLLIUM	PPB	ND	0.2		6020
39MW1	61382-1	05/28/98	BHC-GAMMA	PPB	ND	2		8081
39MW1	61382-1	05/28/98	CADMIUM	PPB	ND	0.1		6020
39MW1	61382-1	05/28/98	CHLORIDE	PPB	2400	1000		9056
39MW1	61382-1	05/28/98	CHROMIUM	PPB	4	1		6020
39MW1	61382-1	05/28/98	COLIFORM BACT.	MPN/ml	30	2		9221E
39MW1	61382-1	05/28/98	2,4-D	PPB	ND	1		8151
39MW1	61382-1	05/28/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW1	61382-1	05/28/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW1	61382-1	05/28/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW1	61382-1	05/28/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	61382-1	05/28/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	61382-1	05/28/98	ENDRIN	PPB	ND	2		8081
39MW1	61382-1	05/28/98	FLUORIDE	PPB	240	100		9056
39MW1	61382-1	05/28/98	GROSS ALPHA	pCi/l	2.8	1		SW-846:9310
39MW1	61382-1	05/28/98	GROSS BETA	pCi/l	6.7	1		SW-846:9310
39MW1	61382-1	05/28/98	IRON	PPB	1160	1		6010A
39MW1	61382-1	05/28/98	LEAD	PPB	ND	1		6020
39MW1	61382-1	05/28/98	MANGANESE	PPB	22	0.2		6020
39MW1	61382-1	05/28/98	MERCURY	PPB	ND	0.2		7470A
39MW1	61382-1	05/28/98	METHOXYCHLOR	PPB	ND	2		8081
39MW1	61382-1	05/28/98	NICKEL	PPB	ND	15		6020
39MW1	61382-1	05/28/98	NITRATE AS N	PPB	1840	100		9056
39MW1	61382-1	05/28/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW1	61382-1	05/28/98	RADIUM	pCi/L	0.2	1		SW-846:9320
39MW1	61382-1	05/28/98	RESORCINOL	PPB	ND	10		8270B
39MW1	61382-1	05/28/98	SELENIUM	PPB	2	1		6020
39MW1	61382-1	05/28/98	SILVER	PPB	ND	0.2		6020
39MW1	61382-1	05/28/98	SODIUM	PPB	3680	100		6010A
39MW1	61382-1	05/28/98	SULFATE	PPB	19200	1000		9056
39MW1	61382-1	05/28/98	THALLIUM	PPB	ND	1		6020
39MW1	61382-1	05/28/98	TOXAPHENE	PPB	ND	2		8081
			pH-Field	pHu	6.4	0.1		9040
			pH-Field	pHu	6.3	0.1		9040
			pH-Field	pHu	6.3	0.1		9040
			pH-Field	pHu	6.3	0.1		9040
			pH-Laboratory	pHu	7.18	0.1		9040
			Specific Conductivity- Field	µS/cm	490	1		9050
			Specific Conductivity- Field	µS/cm	490	1		9050
			Specific Conductivity- Field	µS/cm	500	1		9050
			Specific Conductivity- Field	µS/cm	500	1		9050
			Specific conductivity-Laboratory	µS/cm	507	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
39MW4	61382-2 Rep 1	05/28/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW4	61382-2 Rep 2	05/28/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW4	61382-2 Rep 3	05/28/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW4	61382-2 Rep 4	05/28/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW4	61382-2	05/28/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW4	61382-2 Dup	05/28/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW4	61382-2	05/28/98	ANTIMONY	PPB	ND	60		6020
39MW4	61382-2	05/28/98	ARSENIC	PPB	ND	1		6020
39MW4	61382-2	05/28/98	BARIUM	PPB	78	2		6020
39MW4	61382-2	05/28/98	BERYLLIUM	PPB	ND	0.2		6020
39MW4	61382-2	05/28/98	BHC-GAMMA	PPB	ND	2		8081
39MW4	61382-2	05/28/98	CADMIUM	PPB	ND	0.1		6020
39MW4	61382-2	05/28/98	CHLORIDE	PPB	2200	1000		9056
39MW4	61382-2	05/28/98	CHROMIUM	PPB	4	1		6020
39MW4	61382-2	05/28/98	COLIFORM BACT.	MPN/ml	9	2		9221E
39MW4	61382-2	05/28/98	2,4-D	PPB	ND	1		8151
39MW4	61382-2	05/28/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW4	61382-2	05/28/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW4	61382-2	05/28/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW4	61382-2	05/28/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	61382-2	05/28/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	61382-2	05/28/98	ENDRIN	PPB	ND	2		8081
39MW4	61382-2	05/28/98	FLUORIDE	PPB	ND	100		9056
39MW4	61382-2	05/28/98	GROSS ALPHA	pCi/l	3.3	1		SW-846-9310
39MW4	61382-2	05/28/98	GROSS BETA	pCi/l	14.2	1		SW-846-9310
39MW4	61382-2	05/28/98	IRON	PPB	2290	1		6010A
39MW4	61382-2	05/28/98	LEAD	PPB	2	1		6020
39MW4	61382-2	05/28/98	MANGANESE	PPB	42	0.2		6020
39MW4	61382-2	05/28/98	MERCURY	PPB	ND	0.2		7470A
39MW4	61382-2	05/28/98	METHOXYCHLOR	PPB	ND	2		8081
39MW4	61382-2	05/28/98	NICKEL	PPB	ND	15		6020
39MW4	61382-2	05/28/98	NITRATE AS N	PPB	910	100		9056
39MW4	61382-2	05/28/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW4	61382-2	05/28/98	RADIUM	pCi/L	0.1	1		SW-846-9320
39MW4	61382-2	05/28/98	RESORCINOL	PPB	ND	10		8270B
39MW4	61382-2	05/28/98	SELENIUM	PPB	ND	1		6020
39MW4	61382-2	05/28/98	SILVER	PPB	ND	0.2		6020
39MW4	61382-2	05/28/98	SODIUM	PPB	11300	100		6010A
39MW4	61382-2	05/28/98	SULFATE	PPB	95700	1000		9056
39MW4	61382-2	05/28/98	THALLIUM	PPB	ND	1		6020
39MW4	61382-2	05/28/98	TOXAPHENE	PPB	ND	2		8081
			pH-Field	pHu	6.3	0.1		9040
			pH-Field	pHu	6.4	0.1		9040
			pH-Field	pHu	6.4	0.1		9040
			pH-Field	pHu	6.4	0.1		9040
			pH-Laboratory	pHu	7.05	0.1		9040
			Specific Conductivity- Field	µS/cm	590	1		9050
			Specific Conductivity- Field	µS/cm	600	1		9050
			Specific Conductivity- Field	µS/cm	610	1		9050
			Specific Conductivity- Field	µS/cm	610	1		9050
			Specific conductivity-Laboratory	µS/cm	630	1		9050

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW3	61382-3 Rep 1	05/28/98	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW3	61382-3 Rep 2	05/28/98	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW3	61382-3 Rep 3	05/28/98	TOTAL ORGANIC CARBON	PPB	1000	1000		9060
39MW3	61382-3 Rep 4	05/28/98	TOTAL ORGANIC CARBON	PPB	1000	1000		9060
39MW3	61382-3	05/28/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	61382-3 Dup	05/28/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	61382-3	05/28/98	ANTIMONY	PPB	ND	60		6020
39MW3	61382-3	05/28/98	ARSENIC	PPB	ND	1		6020
39MW3	61382-3	05/28/98	BARIUM	PPB	58	2		6020
39MW3	61382-3	05/28/98	BERYLLIUM	PPB	ND	0.2		6020
39MW3	61382-3	05/28/98	BHC-GAMMA	PPB	ND	2		8081
39MW3	61382-3	05/28/98	CADMIUM	PPB	ND	0.1		6020
39MW3	61382-3	05/28/98	CHLORIDE	PPB	7200	1000		9056
39MW3	61382-3	05/28/98	CHROMIUM	PPB	3	1		6020
39MW3	61382-3	05/28/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW3	61382-3	05/28/98	2,4-D	PPB	ND	1		8151
39MW3	61382-3	05/28/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW3	61382-3	05/28/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW3	61382-3	05/28/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW3	61382-3	05/28/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	61382-3	05/28/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	61382-3	05/28/98	ENDRIN	PPB	ND	2		8081
39MW3	61382-3	05/28/98	FLUORIDE	PPB	160	100		9056
39MW3	61382-3	05/28/98	GROSS ALPHA	pCi/l	2.3	1		SW-846:9310
39MW3	61382-3	05/28/98	GROSS BETA	pCi/l	7.5	1		SW-846:9310
39MW3	61382-3	05/28/98	IRON	PPB	457	1		6010A
39MW3	61382-3	05/28/98	LEAD	PPB	ND	1		6020
39MW3	61382-3	05/28/98	MANGANESE	PPB	29	0.2		6020
39MW3	61382-3	05/28/98	MERCURY	PPB	ND	0.2		7470A
39MW3	61382-3	05/28/98	METHOXYCHLOR	PPB	ND	2		8081
39MW3	61382-3	05/28/98	NICKEL	PPB	ND	15		6020
39MW3	61382-3	05/28/98	NITRATE AS N	PPB	3360	100		9056
39MW3	61382-3	05/28/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW3	61382-3	05/28/98	RADIUM	pCi/L	0.8	1		SW-846:9320
39MW3	61382-3	05/28/98	RESORCINOL	PPB	ND	10		8270B
39MW3	61382-3	05/28/98	SELENIUM	PPB	ND	1		6020
39MW3	61382-3	05/28/98	SILVER	PPB	ND	0.2		6020
39MW3	61382-3	05/28/98	SODIUM	PPB	14200	100		6010A
39MW3	61382-3	05/28/98	SULFATE	PPB	90400	1000		9056
39MW3	61382-3	05/28/98	THALLIUM	PPB	ND	1		6020
39MW3	61382-3	05/28/98	TOXAPHENE	PPB	ND	2		8081
			pH-Field	pHu	6.4	0.1		9040
			pH-Field	pHu	6.3	0.1		9040
			pH-Field	pHu	6.3	0.1		9040
			pH-Field	pHu	6.3	0.1		9040
			pH-Laboratory	pHu	7.06	0.1		9040
			Specific Conductivity- Field	µS/cm	840	1		9050
			Specific Conductivity- Field	µS/cm	810	1		9050
			Specific Conductivity- Field	µS/cm	760	1		9050
			Specific Conductivity- Field	µS/cm	720	1		9050
			Specific conductivity-Laboratory	µS/cm	752	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
39MW6	61425-1 Rep 1	05/29/98	TOTAL ORGANIC CARBON	PPB	4300	1000		9060
39MW6	61425-1 Rep 2	05/29/98	TOTAL ORGANIC CARBON	PPB	4600	1000		9060
39MW6	61425-1 Rep 3	05/29/98	TOTAL ORGANIC CARBON	PPB	4800	1000		9060
39MW6	61425-1 Rep 4	05/29/98	TOTAL ORGANIC CARBON	PPB	4800	1000		9060
39MW6	61425-1	05/29/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	61425-1 Dup	05/29/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	61425-1	05/29/98	ANTIMONY	PPB	ND	60		6020
39MW6	61425-1	05/29/98	ARSENIC	PPB	6	1		6020
39MW6	61425-1	05/29/98	BARIUM	PPB	275	2		6020
39MW6	61425-1	05/29/98	BERYLLIUM	PPB	0.5	0.2		6020
39MW6	61425-1	05/29/98	BHC-GAMMA	PPB	ND	2		8081
39MW6	61425-1	05/29/98	CADMIUM	PPB	ND	0.1		6020
39MW6	61425-1	05/29/98	CHLORIDE	PPB	10100	1000		9056
39MW6	61425-1	05/29/98	CHROMIUM	PPB	20	1		6020
39MW6	61425-1	05/29/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW6	61425-1	05/29/98	2,4-D	PPB	ND	1		8151
39MW6	61425-1	05/29/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW6	61425-1	05/29/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW6	61425-1	05/29/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW6	61425-1	05/29/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	61425-1	05/29/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	61425-1	05/29/98	ENDRIN	PPB	ND	2		8081
39MW6	61425-1	05/29/98	FLUORIDE	PPB	410	100		9056
39MW6	61425-1	05/29/98	GROSS ALPHA	pCi/l	17.6	1		SW-846:9310
39MW6	61425-1	05/29/98	GROSS BETA	pCi/l	52	1		SW-846:9310
39MW6	61425-1	05/29/98	IRON	PPB	18600	1		6010A
39MW6	61425-1	05/29/98	LEAD	PPB	3	1		6020
39MW6	61425-1	05/29/98	MANGANESE	PPB	370	0.2		6010A
39MW6	61425-1	05/29/98	MERCURY	PPB	ND	0.2		7470A
39MW6	61425-1	05/29/98	METHOXYCHLOR	PPB	ND	2		8081
39MW6	61425-1	05/29/98	NICKEL	PPB	21	15		6020
39MW6	61425-1	05/29/98	NITRATE AS N	PPB	680	100		9056
39MW6	61425-1	05/29/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW6	61425-1	05/29/98	RADIUM	pCi/L	0.4	1		SW-846:9320
39MW6	61425-1	05/29/98	RESORCINOL	PPB	ND	10		8270B
39MW6	61425-1	05/29/98	SELENIUM	PPB	ND	1		6020
39MW6	61425-1	05/29/98	SILVER	PPB	ND	0.2		6020
39MW6	61425-1	05/29/98	SODIUM	PPB	10300	100		6010A
39MW6	61425-1	05/29/98	SULFATE	PPB	48100	1000		9056
39MW6	61425-1	05/29/98	THALLIUM	PPB	ND	1		6020
39MW6	61425-1	05/29/98	TOXAPHENE	PPB	ND	2		8081
			pH-Field	pHu	6.9	0.1		9040
			pH-Field	pHu	6.8	0.1		9040
			pH-Field	pHu	6.8	0.1		9040
			pH-Field	pHu	6.8	0.1		9040
			pH-Laboratory	pHu	7.55	0.1		9040
			Specific Conductivity- Field	µS/cm	710	1		9050
			Specific Conductivity- Field	µS/cm	720	1		9050
			Specific Conductivity- Field	µS/cm	730	1		9050
			Specific Conductivity- Field	µS/cm	730	1		9050
			Specific conductivity-Laboratory	µS/cm	729	1		9050

3			DETECTION					
LOCATION	LAB. NO.	SAMPLE DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW5	61472-1 Rep 1	06/01/98	TOTAL ORGANIC CARBON	PPB	1800	1000		9060
39MW5	61472-1 Rep 2	06/01/98	TOTAL ORGANIC CARBON	PPB	1800	1000		9060
39MW5	61472-1 Rep 3	06/01/98	TOTAL ORGANIC CARBON	PPB	1600	1000		9060
39MW5	61472-1 Rep 4	06/01/98	TOTAL ORGANIC CARBON	PPB	1700	1000		9060
39MW5	61472-1	06/01/98	TOTAL ORGANIC HALIDES	PPB	6	5		9020A
39MW5	61472-1 Dup	06/01/98	TOTAL ORGANIC HALIDES	PPB	6	5		9020A
39MW5	61472-1	06/01/98	ANTIMONY	PPB	ND	60		6020
39MW5	61472-1	06/01/98	ARSENIC	PPB	4	1		6020
39MW5	61472-1	06/01/98	BARIUM	PPB	379	2		6020
39MW5	61472-1	06/01/98	BERYLLIUM	PPB	1.2	0.2		6020
39MW5	61472-1	06/01/98	BHC-GAMMA	PPB	ND	2		8081
39MW5	61472-1	06/01/98	CADMIUM	PPB	0.4	0.1		6020
39MW5	61472-1	06/01/98	CHLORIDE	PPB	6500	1000		9056
39MW5	61472-1	06/01/98	CHROMIUM	PPB	38	1		6020
39MW5	61472-1	06/01/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW5	61472-1	06/01/98	2,4-D	PPB	ND	1		8151
39MW5	61472-1	06/01/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW5	61472-1	06/01/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW5	61472-1	06/01/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW5	61472-1	06/01/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	61472-1	06/01/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	61472-1	06/01/98	ENDRIN	PPB	ND	2		8081
39MW5	61472-1	06/01/98	FLUORIDE	PPB	700	100		9056
39MW5	61472-1	06/01/98	GROSS ALPHA	pCi/l	92	1		SW-846:9310
39MW5	61472-1	06/01/98	GROSS BETA	pCi/l	109	1		SW-846:9310
39MW5	61472-1	06/01/98	IRON	PPB	40100	1		6010A
39MW5	61472-1	06/01/98	LEAD	PPB	52	1		6020
39MW5	61472-1	06/01/98	MANGANESE	PPB	923	0.2		6010A
39MW5	61472-1	06/01/98	MERCURY	PPB	ND	0.2		7470A
39MW5	61472-1	06/01/98	METHOXYCHLOR	PPB	ND	2		8081
39MW5	61472-1	06/01/98	NICKEL	PPB	44	15		6020
39MW5	61472-1	06/01/98	NITRATE AS N	PPB	220	100		9056
39MW5	61472-1	06/01/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW5	61472-1	06/01/98	RADIUM	pCi/L	3.6	1		SW-846:9320
39MW5	61472-1	06/01/98	RESORCINOL	PPB	ND	10		8270B
39MW5	61472-1	06/01/98	SELENIUM	PPB	ND	1		6020
39MW5	61472-1	06/01/98	SILVER	PPB	ND	0.2		6020
39MW5	61472-1	06/01/98	SODIUM	PPB	9470	100		6010A
39MW5	61472-1	06/01/98	SULFATE	PPB	34800	1000		9056
39MW5	61472-1	06/01/98	THALLIUM	PPB	ND	1		6020
39MW5	61472-1	06/01/98	TOXAPHENE	PPB	ND	2		8081
			pH-Field	pHu	6.8	0.1		9040
			pH-Field	pHu	69	0.1		9040
			pH-Field	pHu	6.4	0.1		9040
			pH-Field	pHu	6.4	0.1		9040
			pH-Laboratory	pHu	7.33	0.1		9040
			Specific Conductivity- Field	µS/cm	770	1		9050
			Specific Conductivity- Field	µS/cm	780	1		9050
			Specific Conductivity- Field	µS/cm	710	1		9050
			Specific Conductivity- Field	µS/cm	700	1		9050
			Specific conductivity-Laboratory	µS/cm	812	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
39MW5	L64388-1 Rep 1	09/04/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW5	L64388-1 Rep 2	09/04/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW5	L64388-1 Rep 3	09/04/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW5	L64388-1 Rep 4	09/04/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW5	L64388-1	09/04/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	L64388-1 Dup	09/04/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	L64388-1	09/04/98	ANTIMONY	PPB	ND	60		6020
39MW5	L64388-1	09/04/98	ARSENIC	PPB	2	1		6020
39MW5	L64388-1	09/04/98	BARIUM	PPB	783	2		6020
39MW5	L64388-1	09/04/98	BERYLLIUM	PPB	2.9	0.2		6020
39MW5	L64388-1	09/04/98	BHC-GAMMA	PPB	ND	2		8081
39MW5	L64388-1	09/04/98	CADMIUM	PPB	0.6	0.1		6020
39MW5	L64388-1	09/04/98	CHLORIDE	PPB	7000	1000		9056
39MW5	L64388-1	09/04/98	CHROMIUM	PPB	146	1		6020
39MW5	L64388-1	09/04/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW5	L64388-1	09/04/98	2,4-D	PPB	ND	1		8151
39MW5	L64388-1	09/04/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW5	L64388-1	09/04/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW5	L64388-1	09/04/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW5	L64388-1	09/04/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	L64388-1	09/04/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	L64388-1	09/04/98	ENDRIN	PPB	ND	2		8081
39MW5	L64388-1	09/04/98	FLUORIDE	PPB	640	100		9056
39MW5	L64388-1	09/04/98	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
39MW5	L64388-1	09/04/98	GROSS BETA	pCi/l	ND	1		SW-846:9310
39MW5	L64388-1	09/04/98	IRON	PPB	149000	1		6010A
39MW5	L64388-1	09/04/98	LEAD	PPB	159	1		6020
39MW5	L64388-1	09/04/98	MANGANESE	PPB	2250	0.2		6020
39MW5	L64388-1	09/04/98	MERCURY	PPB	ND	0.2		7470A
39MW5	L64388-1	09/04/98	METHOXYCHLOR	PPB	ND	2		8081
39MW5	L64388-1	09/04/98	NICKEL	PPB	65	15		6020
39MW5	L64388-1	09/04/98	NITRATE AS N	PPB	ND	100		9056
39MW5	L64388-1	09/04/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW5	L64388-1	09/04/98	RADIUM	pCi/L	ND	1		SW-846:9320
39MW5	L64388-1	09/04/98	RESORCINOL	PPB	ND	10		8270B
39MW5	L64388-1	09/04/98	SELENIUM	PPB	ND	1		6020
39MW5	L64388-1	09/04/98	SILVER	PPB	ND	0.2		6020
39MW5	L64388-1	09/04/98	SODIUM	PPB	10500	100		6010A
39MW5	L64388-1	09/04/98	SULFATE	PPB	39600	1000		9056
39MW5	L64388-1	09/04/98	THALLIUM	PPB	1	1		6020
39MW5	L64388-1	09/04/98	TOXAPHENE	PPB	ND	2		8081
39MW5		09/04/98	pH-Field	pHu	6.9	0.1		9040
39MW5		09/04/98	pH-Field	pHu	6.8	0.1		9040
39MW5		09/04/98	pH-Field	pHu	6.8	0.1		9040
39MW5		09/04/98	pH-Field	pHu	6.7	0.1		9040
39MW5		09/04/98	pH-Laboratory	pHu	7.83	0.1		9040
39MW5		09/04/98	Specific Conductivity-Field	µS/cm	820	1		9050
39MW5		09/04/98	Specific Conductivity-Field	µS/cm	840	1		9050
39MW5		09/04/98	Specific Conductivity-Field	µS/cm	840	1		9050
39MW5		09/04/98	Specific Conductivity-Field	µS/cm	830	1		9050
39MW5		09/04/98	Specific Conductivity-Laboratory	µS/cm	645	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
39MW4	L64296-3 Rep 1	09/2/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW4	L64296-3 Rep 2	09/2/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW4	L64296-3 Rep 3	09/2/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW4	L64296-3 Rep 4	09/2/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW4	L64296-3	09/2/98	TOTAL ORGANIC HALIDES	PPB	5	5		9020A
39MW4	L64296-3 Dup	09/2/98	TOTAL ORGANIC HALIDES	PPB	5	5		9020A
39MW4	L64296-3	09/2/98	ANTIMONY	PPB	ND	60		6020
39MW4	L64296-3	09/2/98	ARSENIC	PPB	4	1		6020
39MW4	L64296-3	09/2/98	BARIUM	PPB	175	2		6020
39MW4	L64296-3	09/2/98	BERYLLIUM	PPB	0.4	0.2		6020
39MW4	L64296-3	09/2/98	BHC-GAMMA	PPB	ND	2		8081
39MW4	L64296-3	09/2/98	CADMIUM	PPB	0.2	0.1		6020
39MW4	L64296-3	09/2/98	CHLORIDE	PPB	3300	1000		9056
39MW4	L64296-3	09/2/98	CHROMIUM	PPB	25	1		6020
39MW4	L64296-3	09/2/98	COLIFORM BACT.	MPN/ml	30	2		9221E
39MW4	L64296-3	09/2/98	2,4-D	PPB	ND	1		8151
39MW4	L64296-3	09/2/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW4	L64296-3	09/2/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW4	L64296-3	09/2/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW4	L64296-3	09/2/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	L64296-3	09/2/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	L64296-3	09/2/98	ENDRIN	PPB	ND	2		8081
39MW4	L64296-3	09/2/98	FLUORIDE	PPB	ND	100		9056
39MW4	L64296-3	09/2/98	GROSS ALPHA	pCi/l	7.9	1		SW-846-9310
39MW4	L64296-3	09/2/98	GROSS BETA	pCi/l	19.8	1		SW-846-9310
39MW4	L64296-3	09/2/98	IRON	PPB	13800	1		6010A
39MW4	L64296-3	09/2/98	LEAD	PPB	24	1		6020
39MW4	L64296-3	09/2/98	MANGANESE	PPB	599	0.2		6020
39MW4	L64296-3	09/2/98	MERCURY	PPB	ND	0.2		7470A
39MW4	L64296-3	09/2/98	METHOXYCHLOR	PPB	ND	2		8081
39MW4	L64296-3	09/2/98	NICKEL	PPB	16	15		6020
39MW4	L64296-3	09/2/98	NITRATE AS N	PPB	620	100		9056
39MW4	L64296-3	09/2/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW4	L64296-3	09/2/98	RADIUM	pCi/L	1.9	1		SW-846-9320
39MW4	L64296-3	09/2/98	RESORCINOL	PPB	ND	10		8270B
39MW4	L64296-3	09/2/98	SELENIUM	PPB	ND	1		6020
39MW4	L64296-3	09/2/98	SILVER	PPB	ND	0.2		6020
39MW4	L64296-3	09/2/98	SODIUM	PPB	13700	100		6010A
39MW4	L64296-3	09/2/98	SULFATE	PPB	98700	1000		9056
39MW4	L64296-3	09/2/98	THALLIUM	PPB	ND	1		6020
39MW4	L64296-3	09/2/98	TOXAPHENE	PPB	ND	2		8081
39MW4		09/2/98	pH-Field	pHu	7	0.1		9040
39MW4		09/2/98	pH-Field	pHu	7.1	0.1		9040
39MW4		09/2/98	pH-Field	pHu	7	0.1		9040
39MW4		09/2/98	pH-Field	pHu	6.9	0.1		9040
39MW4		09/2/98	pH-Laboratory	pHu	6.92	0.1		9040
39MW4		09/2/98	Specific Conductivity-Field	µS/cm	710	1		9050
39MW4		09/2/98	Specific Conductivity-Field	µS/cm	720	1		9050
39MW4		09/2/98	Specific Conductivity-Field	µS/cm	720	1		9050
39MW4		09/2/98	Specific Conductivity-Field	µS/cm	730	1		9050
39MW4		09/2/98	Specific Conductivity-Laboratory	µS/cm	719	1		9050

3 LOCATION	SAMPLE		PARAMETERS	UNITS	DETECTION			
	LAB. NO.	DATE			RESULTS	LIMITS	QUALIF	METHOD
39MW3	L64296-1 Rep 1	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L64296-1 Rep 2	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L64296-1 Rep 3	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L64296-1 Rep 4	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L64296-1	09/2/98	TOTAL ORGANIC HALIDES	PPB	5	5		9020A
39MW3	L64296-1 Dup	09/2/98	TOTAL ORGANIC HALIDES	PPB	5	5		9020A
39MW3	L64296-1	09/2/98	ANTIMONY	PPB	ND	60		6020
39MW3	L64296-1	09/2/98	ARSENIC	PPB	3	1		6020
39MW3	L64296-1	09/2/98	BARIUM	PPB	188	2		6020
39MW3	L64296-1	09/2/98	BERYLLIUM	PPB	0.5	0.2		6020
39MW3	L64296-1	09/2/98	BHC-GAMMA	PPB	ND	2		8081
39MW3	L64296-1	09/2/98	CADMIUM	PPB	0.2	0.1		6020
39MW3	L64296-1	09/2/98	CHLORIDE	PPB	12900	1000		9056
39MW3	L64296-1	09/2/98	CHROMIUM	PPB	25	1		6020
39MW3	L64296-1	09/2/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW3	L64296-1	09/2/98	2,4-D	PPB	ND	1		8151
39MW3	L64296-1	09/2/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW3	L64296-1	09/2/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW3	L64296-1	09/2/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW3	L64296-1	09/2/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	L64296-1	09/2/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	L64296-1	09/2/98	ENDRIN	PPB	ND	2		8081
39MW3	L64296-1	09/2/98	FLUORIDE	PPB	160	100		9056
39MW3	L64296-1	09/2/98	GROSS ALPHA	pCi/l	28	1		SW-846:9310
39MW3	L64296-1	09/2/98	GROSS BETA	pCi/l	42	1		SW-846:9310
39MW3	L64296-1	09/2/98	IRON	PPB	21700	1		6010A
39MW3	L64296-1	09/2/98	LEAD	PPB	15	1		6020
39MW3	L64296-1	09/2/98	MANGANESE	PPB	502	0.2		6020
39MW3	L64296-1	09/2/98	MERCURY	PPB	ND	0.2		7470A
39MW3	L64296-1	09/2/98	METHOXYCHLOR	PPB	ND	2		8081
39MW3	L64296-1	09/2/98	NICKEL	PPB	22	15		6020
39MW3	L64296-1	09/2/98	NITRATE AS N	PPB	8540	100		9056
39MW3	L64296-1	09/2/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW3	L64296-1	09/2/98	RADIUM	pCi/L	5.3	1		SW-846:9320
39MW3	L64296-1	09/2/98	RESORCINOL	PPB	ND	10		8270B
39MW3	L64296-1	09/2/98	SELENIUM	PPB	ND	1		6020
39MW3	L64296-1	09/2/98	SILVER	PPB	ND	0.2		6020
39MW3	L64296-1	09/2/98	SODIUM	PPB	34000	100		6010A
39MW3	L64296-1	09/2/98	SULFATE	PPB	190000	1000		9056
39MW3	L64296-1	09/2/98	THALLIUM	PPB	ND	1		6020
39MW3	L64296-1	09/2/98	TOXAPHENE	PPB	ND	2		8081
39MW3		09/2/98	pH-Field	pHu	6.8	0.1		9040
39MW3		09/2/98	pH-Field	pHu	6.7	0.1		9040
39MW3		09/2/98	pH-Field	pHu	6.7	0.1		9040
39MW3		09/2/98	pH-Field	pHu	6.6	0.1		9040
39MW3		09/2/98	pH-Laboratory	pHu	6.88	0.1		9040
39MW3		09/2/98	Specific Conductivity-Field	µS/cm	1070	1		9050
39MW3		09/2/98	Specific Conductivity-Field	µS/cm	1080	1		9050
39MW3		09/2/98	Specific Conductivity-Field	µS/cm	1080	1		9050
39MW3		09/2/98	Specific Conductivity-Field	µS/cm	1090	1		9050
39MW3		09/2/98	Specific Conductivity-Laboratory	µS/cm	1060	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
39MW6	L64388-2 Rep 1	09/3/98	TOTAL ORGANIC CARBON	PPB	2400	1000		9060
39MW6	L64388-2 Rep 2	09/3/98	TOTAL ORGANIC CARBON	PPB	2500	1000		9060
39MW6	L64388-2 Rep 3	09/3/98	TOTAL ORGANIC CARBON	PPB	2500	1000		9060
39MW6	L64388-2 Rep 4	09/3/98	TOTAL ORGANIC CARBON	PPB	2600	1000		9060
39MW6	L64388-2	09/3/98	TOTAL ORGANIC HALIDES	PPB	11	5		9020A
39MW6	L64388-2 Dup	09/3/98	TOTAL ORGANIC HALIDES	PPB	11	5		9020A
39MW6	L64388-2	09/3/98	ANTIMONY	PPB	ND	60		6020
39MW6	L64388-2	09/3/98	ARSENIC	PPB	4	1		6020
39MW6	L64388-2	09/3/98	BARIIUM	PPB	416	2		6020
39MW6	L64388-2	09/3/98	BERYLLIUM	PPB	0.3	0.2		6020
39MW6	L64388-2	09/3/98	BHC-GAMMA	PPB	ND	2		8081
39MW6	L64388-2	09/3/98	CADMIUM	PPB	0.2	0.1		6020
39MW6	L64388-2	09/3/98	CHLORIDE	PPB	10900	1000		9056
39MW6	L64388-2	09/3/98	CHROMIUM	PPB	20	1		6020
39MW6	L64388-2	09/3/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW6	L64388-2	09/3/98	2,4-D	PPB	ND	1		8151
39MW6	L64388-2	09/3/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW6	L64388-2	09/3/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW6	L64388-2	09/3/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW6	L64388-2	09/3/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L64388-2	09/3/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L64388-2	09/3/98	ENDRIN	PPB	ND	2		8081
39MW6	L64388-2	09/3/98	FLUORIDE	PPB	480	100		9056
39MW6	L64388-2	09/3/98	GROSS ALPHA	pCi/l	49	1		SW-846:9310
39MW6	L64388-2	09/3/98	GROSS BETA	pCi/l	159	1		SW-846:9310
39MW6	L64388-2	09/3/98	IRON	PPB	16200	1		6010A
39MW6	L64388-2	09/3/98	LEAD	PPB	6	1		6020
39MW6	L64388-2	09/3/98	MANGANESE	PPB	354	0.2		6010A
39MW6	L64388-2	09/3/98	MERCURY	PPB	ND	0.2		7470A
39MW6	L64388-2	09/3/98	METHOXYCHLOR	PPB	ND	2		8081
39MW6	L64388-2	09/3/98	NICKEL	PPB	26	15		6020
39MW6	L64388-2	09/3/98	NITRATE AS N	PPB	680	100		9056
39MW6	L64388-2	09/3/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW6	L64388-2	09/3/98	RADIUM	pCi/L	0.8	1		SW-846:9320
39MW6	L64388-2	09/3/98	RESORCINOL	PPB	ND	10		8270B
39MW6	L64388-2	09/3/98	SELENIUM	PPB	ND	1		6020
39MW6	L64388-2	09/3/98	SILVER	PPB	ND	0.2		6020
39MW6	L64388-2	09/3/98	SODIUM	PPB	9020	100		6010A
39MW6	L64388-2	09/3/98	SULFATE	PPB	42400	1000		9056
39MW6	L64388-2	09/3/98	THALLIUM	PPB	ND	1		6020
39MW6	L64388-2	09/3/98	TOXAPHENE	PPB	ND	2		8081
39MW6		09/3/98	pH-Field	pHu	6.3	0.1		9040
39MW6		09/3/98	pH-Field	pHu	6.4	0.1		9040
39MW6		09/3/98	pH-Field	pHu	6.7	0.1		9040
39MW6		09/3/98	pH-Field	pHu	6.7	0.1		9040
39MW6		09/3/98	pH-Laboratory	pHu	7.34	0.1		9040
39MW6		09/3/98	Specific Conductivity-Field	μS/cm	940	1		9050
39MW6		09/3/98	Specific Conductivity-Field	μS/cm	940	1		9050
39MW6		09/3/98	Specific Conductivity-Field	μS/cm	760	1		9050
39MW6		09/3/98	Specific Conductivity-Field	μS/cm	750	1		9050
39MW6		09/3/98	Specific Conductivity-Laboratory	μS/cm	674	1		9050

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW1	61472-1 Rep 1	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61472-1 Rep 2	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61472-1 Rep 3	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61472-1 Rep 4	09/2/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	61472-1	09/2/98	TOTAL ORGANIC HALIDES	PPB	16	5		9020A
39MW1	61472-1 Dup	09/2/98	TOTAL ORGANIC HALIDES	PPB	15	5		9020A
39MW1	61472-1	09/2/98	ANTIMONY	PPB	ND	60		6020
39MW1	61472-1	09/2/98	ARSENIC	PPB	ND	1		6020
39MW1	61472-1	09/2/98	BARIUM	PPB	67	2		6020
39MW1	61472-1	09/2/98	BERYLLIUM	PPB	ND	0.2		6020
39MW1	61472-1	09/2/98	BHC-GAMMA	PPB	ND	2		8081
39MW1	61472-1	09/2/98	CADMIUM	PPB	ND	0.1		6020
39MW1	61472-1	09/2/98	CHLORIDE	PPB	2600	1000		9056
39MW1	61472-1	09/2/98	CHROMIUM	PPB	3	1		6020
39MW1	61472-1	09/2/98	COLIFORM BACT.	MPN/ml	30	2		9221E
39MW1	61472-1	09/2/98	2,4-D	PPB	ND	1		8151
39MW1	61472-1	09/2/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW1	61472-1	09/2/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW1	61472-1	09/2/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW1	61472-1	09/2/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	61472-1	09/2/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	61472-1	09/2/98	ENDRIN	PPB	ND	2		8081
39MW1	61472-1	09/2/98	FLUORIDE	PPB	330	100		9056
39MW1	61472-1	09/2/98	GROSS ALPHA	pCi/l	2.4	1		SW-846:9310
39MW1	61472-1	09/2/98	GROSS BETA	pCi/l	54	1		SW-846:9310
39MW1	61472-1	09/2/98	IRON	PPB	154	1		6010A
39MW1	61472-1	09/2/98	LEAD	PPB	ND	1		6020
39MW1	61472-1	09/2/98	MANGANESE	PPB	2.5	0.2		6010A
39MW1	61472-1	09/2/98	MERCURY	PPB	ND	0.2		7470A
39MW1	61472-1	09/2/98	METHOXYCHLOR	PPB	ND	2		8081
39MW1	61472-1	09/2/98	NICKEL	PPB	44	15		6020
39MW1	61472-1	09/2/98	NITRATE AS N	PPB	1400	100		9056
39MW1	61472-1	09/2/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW1	61472-1	09/2/98	RADIUM	pCi/L	0.6	1		SW-846:9320
39MW1	61472-1	09/2/98	RESORCINOL	PPB	ND	10		8270B
39MW1	61472-1	09/2/98	SELENIUM	PPB	2	1		6020
39MW1	61472-1	09/2/98	SILVER	PPB	ND	0.2		6020
39MW1	61472-1	09/2/98	SODIUM	PPB	4550	100		6010A
39MW1	61472-1	09/2/98	SULFATE	PPB	19200	1000		9056
39MW1	61472-1	09/2/98	THALLIUM	PPB	ND	1		6020
39MW1	61472-1	09/2/98	TOXAPHENE	PPB	ND	2		8081
39MW1		09/2/98	pH-Field	pHu	7	0.1		9040
39MW1		09/2/98	pH-Field	pHu	6.9	0.1		9040
39MW1		09/2/98	pH-Field	pHu	6.9	0.1		9040
39MW1		09/2/98	pH-Field	pHu	7	0.1		9040
39MW1		09/2/98	pH-Laboratory	pHu	7.25	0.1		9040
39MW1		09/2/98	Specific Conductivity-Field	μS/cm	460	1		9050
39MW1		09/2/98	Specific Conductivity-Field	μS/cm	470	1		9050
39MW1		09/2/98	Specific Conductivity-Field	μS/cm	480	1		9050
39MW1		09/2/98	Specific Conductivity-Field	μS/cm	470	1		9050
39MW1		09/2/98	Specific Conductivity-Laboratory	μS/cm	471	1		9050

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW1	L67215-1 Rep 1	12/08/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW1	L67215-1 Rep 2	12/08/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW1	L67215-1 Rep 3	12/08/98	TOTAL ORGANIC CARBON	PPB	1500	1000		9060
39MW1	L67215-1 Rep 4	12/08/98	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW1	L67215-1	12/08/98	TOTAL ORGANIC HALIDES	PPB	22	5		9020A
39MW1	L67215-1 Dup	12/08/98	TOTAL ORGANIC HALIDES	PPB	24	5		9020A
39MW1	L67215-1	12/08/98	ANTIMONY	PPB	ND	60		6020
39MW1	L67215-1	12/08/98	ARSENIC	PPB	1	1		6020
39MW1	L67215-1	12/08/98	BARIUM	PPB	64	2		6020
39MW1	L67215-1	12/08/98	BERYLLIUM	PPB	ND	0.2		6020
39MW1	L67215-1	12/08/98	BHC-GAMMA	PPB	ND	2		8081
39MW1	L67215-1	12/08/98	CADMIUM	PPB	ND	0.1		6020
39MW1	L67215-1	12/08/98	CHLORIDE	PPB	5700	1000		9056
39MW1	L67215-1	12/08/98	CHROMIUM	PPB	4	1		6020
39MW1	L67215-1	12/08/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW1	L67215-1	12/08/98	2,4-D	PPB	ND	1		8151
39MW1	L67215-1	12/08/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW1	L67215-1	12/08/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW1	L67215-1	12/08/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW1	L67215-1	12/08/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	L67215-1	12/08/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	L67215-1	12/08/98	ENDRIN	PPB	ND	2		8081
39MW1	L67215-1	12/08/98	FLUORIDE	PPB	350	100		9056
39MW1	L67215-1	12/08/98	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
39MW1	L67215-1	12/08/98	GROSS BETA	pCi/l	ND	1		SW-846:9310
39MW1	L67215-1	12/08/98	IRON	PPB	141	1		6010A
39MW1	L67215-1	12/08/98	LEAD	PPB	ND	1		6020
39MW1	L67215-1	12/08/98	MANGANESE	PPB	2.6	0.2		6020
39MW1	L67215-1	12/08/98	MERCURY	PPB	ND	0.2		7470A
39MW1	L67215-1	12/08/98	METHOXYCHLOR	PPB	ND	2		8081
39MW1	L67215-1	12/08/98	NICKEL	PPB	ND	15		6020
39MW1	L67215-1	12/08/98	NITRATE AS N	PPB	1150	100		9056
39MW1	L67215-1	12/08/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW1	L67215-1	12/08/98	RADIUM	pCi/L	ND	1		SW-846:9320
39MW1	L67215-1	12/08/98	RESORCINOL	PPB	ND	10		8270B
39MW1	L67215-1	12/08/98	SELENIUM	PPB	2	1		6020
39MW1	L67215-1	12/08/98	SILVER	PPB	ND	0.2		6020
39MW1	L67215-1	12/08/98	SODIUM	PPB	8710	100		6010A
39MW1	L67215-1	12/08/98	SULFATE	PPB	20500	1000		9056
39MW1	L67215-1	12/08/98	THALLIUM	PPB	ND	1		6020
39MW1	L67215-1	12/08/98	TOXAPHENE	PPB	ND	2		8081
39MW1		12/08/98	pH-FIELD	pHu	6.6	0.1		9040
39MW1		12/08/98	pH-FIELD	pHu	6.9	0.1		9040
39MW1		12/08/98	pH-FIELD	pHu	7	0.1		9040
39MW1		12/08/98	pH-FIELD	pHu	7.1	0.1		9040
39MW1		12/08/98	pH-Laboratory	pHu	7.28	0.1		9040
39MW1		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	450	1		9050
39MW1		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	460	1		9050
39MW1		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	470	1		9050
39MW1		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	470	1		9050
39MW1		12/08/98	SPECIFIC CONDUCT.-LAB.	µS/cm	495	1		9050

3		SAMPLE			DETECTION			
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW4	L67215-2 Rep 1	12/08/98	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW4	L67215-2 Rep 2	12/08/98	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW4	L67215-2 Rep 3	12/08/98	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW4	L67215-2 Rep 4	12/08/98	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW4	L67215-2	12/08/98	TOTAL ORGANIC HALIDES	PPB	16	5		9020A
39MW4	L67215-2 Dup	12/08/98	TOTAL ORGANIC HALIDES	PPB	18	5		9020A
39MW4	L67215-2	12/08/98	ANTIMONY	PPB	ND	60		6020
39MW4	L67215-2	12/08/98	ARSENIC	PPB	3	1		6020
39MW4	L67215-2	12/08/98	BARIUM	PPB	170	2		6020
39MW4	L67215-2	12/08/98	BERYLLIUM	PPB	0.3	0.2		6020
39MW4	L67215-2	12/08/98	BHC-GAMMA	PPB	ND	2		8081
39MW4	L67215-2	12/08/98	CADMIUM	PPB	ND	0.1		6020
39MW4	L67215-2	12/08/98	CHLORIDE	PPB	4400	1000		9056
39MW4	L67215-2	12/08/98	CHROMIUM	PPB	71	1		6020
39MW4	L67215-2	12/08/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW4	L67215-2	12/08/98	2,4-D	PPB	ND	1		8151
39MW4	L67215-2	12/08/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW4	L67215-2	12/08/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW4	L67215-2	12/08/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW4	L67215-2	12/08/98	2,4-DINITROTOLUENE	PPB	0.14	0.08		8090
39MW4	L67215-2	12/08/98	2,6-DINITROTOLUENE	PPB	0.11	0.08		8090
39MW4	L67215-2	12/08/98	ENDRIN	PPB	ND	2		8081
39MW4	L67215-2	12/08/98	FLUORIDE	PPB	240	100		9056
39MW4	L67215-2	12/08/98	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
39MW4	L67215-2	12/08/98	GROSS BETA	pCi/l	ND	1		SW-846:9310
39MW4	L67215-2	12/08/98	IRON	PPB	7770	1		6010A
39MW4	L67215-2	12/08/98	LEAD	PPB	7	1		6020
39MW4	L67215-2	12/08/98	MANGANESE	PPB	631	0.2		6020
39MW4	L67215-2	12/08/98	MERCURY	PPB	ND	0.2		7470A
39MW4	L67215-2	12/08/98	METHOXYCHLOR	PPB	ND	2		8081
39MW4	L67215-2	12/08/98	NICKEL	PPB	43	15		6020
39MW4	L67215-2	12/08/98	NITRATE AS N	PPB	800	100		9056
39MW4	L67215-2	12/08/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW4	L67215-2	12/08/98	RADIUM	pCi/l	ND	1		SW-846:9320
39MW4	L67215-2	12/08/98	RESORCINOL	PPB	ND	10		8270B
39MW4	L67215-2	12/08/98	SELENIUM	PPB	3	1		6020
39MW4	L67215-2	12/08/98	SILVER	PPB	ND	0.2		6020
39MW4	L67215-2	12/08/98	SODIUM	PPB	15800	100		6010A
39MW4	L67215-2	12/08/98	SULFATE	PPB	100000	1000		9056
39MW4	L67215-2	12/08/98	THALLIUM	PPB	ND	1		6020
39MW4	L67215-2	12/08/98	TOXAPHENE	PPB	ND	2		8081
39MW4		12/08/98	pH-FIELD	pHu	7	0.1		9040
39MW4		12/08/98	pH-FIELD	pHu	6.9	0.1		9040
39MW4		12/08/98	pH-FIELD	pHu	6.9	0.1		9040
39MW4		12/08/98	pH-FIELD	pHu	6.9	0.1		9040
39MW4		12/08/98	pH-Laboratory	pHu	6.95	0.1		9040
39MW4		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	760	1		9050
39MW4		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	770	1		9050
39MW4		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	770	1		9050
39MW4		12/08/98	SPECIFIC CONDUCT.-FIELD	µS/cm	770	1		9050
39MW4		12/08/98	SPECIFIC CONDUCT.-LAB.	µS/cm	794	1		9050

3	LOCATION	SAMPLE		UNITS	DETECTION			
		LAB. NO.	DATE		RESULTS	LIMITS	QUALIF	METHOD
39MW3	L67215-3 Rep 1	12/08/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L67215-3 Rep 2	12/08/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L67215-3 Rep 3	12/08/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L67215-3 Rep 4	12/08/98	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L67215-3	12/08/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	L67215-3 Dup	12/08/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	L67215-3	12/08/98	ANTIMONY	PPB	ND	60		6020
39MW3	L67215-3	12/08/98	ARSENIC	PPB	2	1		6020
39MW3	L67215-3	12/08/98	BARIUM	PPB	112	2		6020
39MW3	L67215-3	12/08/98	BERYLLIUM	PPB	ND	0.2		6020
39MW3	L67215-3	12/08/98	BHC-GAMMA	PPB	ND	2		8081
39MW3	L67215-3	12/08/98	CADMIUM	PPB	ND	0.1		6020
39MW3	L67215-3	12/08/98	CHLORIDE	PPB	8100	1000		9056
39MW3	L67215-3	12/08/98	CHROMIUM	PPB	9	1		6020
39MW3	L67215-3	12/08/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW3	L67215-3	12/08/98	2,4-D	PPB	ND	1		8151
39MW3	L67215-3	12/08/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW3	L67215-3	12/08/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW3	L67215-3	12/08/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW3	L67215-3	12/08/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	L67215-3	12/08/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	L67215-3	12/08/98	ENDRIN	PPB	ND	2		8081
39MW3	L67215-3	12/08/98	FLUORIDE	PPB	ND	100		9056
39MW3	L67215-3	12/08/98	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
39MW3	L67215-3	12/08/98	GROSS BETA	pCi/l	ND	1		SW-846:9310
39MW3	L67215-3	12/08/98	IRON	PPB	4320	1		6010A
39MW3	L67215-3	12/08/98	LEAD	PPB	3	1		6020
39MW3	L67215-3	12/08/98	MANGANESE	PPB	134	0.2		6020
39MW3	L67215-3	12/08/98	MERCURY	PPB	ND	0.2		7470A
39MW3	L67215-3	12/08/98	METHOXYCHLOR	PPB	ND	2		8081
39MW3	L67215-3	12/08/98	NICKEL	PPB	37	15		6020
39MW3	L67215-3	12/08/98	NITRATE AS N	PPB	6560	100		9056
39MW3	L67215-3	12/08/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW3	L67215-3	12/08/98	RADIUM	pCi/L	ND	1		SW-846:9320
39MW3	L67215-3	12/08/98	RESORCINOL	PPB	ND	10		8270B
39MW3	L67215-3	12/08/98	SELENIUM	PPB	3	1		6020
39MW3	L67215-3	12/08/98	SILVER	PPB	ND	0.2		6020
39MW3	L67215-3	12/08/98	SODIUM	PPB	27600	100		6010A
39MW3	L67215-3	12/08/98	SULFATE	PPB	138000	1000		9056
39MW3	L67215-3	12/08/98	THALLIUM	PPB	ND	1		6020
39MW3	L67215-3	12/08/98	TOXAPHENE	PPB	ND	2		8081
39MW3		12/08/98	pH-FIELD	pHu	6.9	0.1		9040
39MW3		12/08/98	pH-FIELD	pHu	6.9	0.1		9040
39MW3		12/08/98	pH-FIELD	pHu	7	0.1		9040
39MW3		12/08/98	pH-FIELD	pHu	7	0.1		9040
39MW3		12/08/98	pH-Laboratory	pHu	7.17	0.1		9040
39MW3		12/08/98	SPECIFIC CONDUCT.-FIELD	μS/cm	850	1		9050
39MW3		12/08/98	SPECIFIC CONDUCT.-FIELD	μS/cm	970	1		9050
39MW3		12/08/98	SPECIFIC CONDUCT.-FIELD	μS/cm	1050	1		9050
39MW3		12/08/98	SPECIFIC CONDUCT.-FIELD	μS/cm	1060	1		9050
39MW3		12/08/98	SPECIFIC CONDUCT.-LAB.	μS/cm	1150	1		9050

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW5	L67266-1 Rep 1	12/10/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW5	L67266-1 rep 2	12/10/98	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW5	L67266-1 Rep 3	12/10/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW5	L67266-1 Rep 4	12/10/98	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW5	L67266-1	12/10/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	L67266-1 Dup	12/10/98	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	L67266-1	12/10/98	ANTIMONY	PPB	ND	60		6020
39MW5	L67266-1	12/10/98	ARSENIC	PPB	3	1		6020
39MW5	L67266-1	12/10/98	BARIUM	PPB	719	2		6020
39MW5	L67266-1	12/10/98	BERYLLIUM	PPB	1.7	0.2		6020
39MW5	L67266-1	12/10/98	BHC-GAMMA	PPB	ND	2		8081
39MW5	L67266-1	12/10/98	CADMIUM	PPB	0.6	0.1		6020
39MW5	L67266-1	12/10/98	CHLORIDE	PPB	6700	1000		9056
39MW5	L67266-1	12/10/98	CHROMIUM	PPB	42	1		6020
39MW5	L67266-1	12/10/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW5	L67266-1	12/10/98	2,4-D	PPB	ND	1		8151
39MW5	L67266-1	12/10/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW5	L67266-1	12/10/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW5	L67266-1	12/10/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW5	L67266-1	12/10/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	L67266-1	12/10/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	L67266-1	12/10/98	ENDRIN	PPB	ND	2		8081
39MW5	L67266-1	12/10/98	FLUORIDE	PPB	740	100		9056
39MW5	L67266-1	12/10/98	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
39MW5	L67266-1	12/10/98	GROSS BETA	pCi/l	ND	1		SW-846:9310
39MW5	L67266-1	12/10/98	IRON	PPB	153000	1		6010A
39MW5	L67266-1	12/10/98	LEAD	PPB	104	1		6020
39MW5	L67266-1	12/10/98	MANGANESE	PPB	1920	0.2		6010A
39MW5	L67266-1	12/10/98	MERCURY	PPB	ND	0.2		7470A
39MW5	L67266-1	12/10/98	METHOXYCHLOR	PPB	ND	2		8081
39MW5	L67266-1	12/10/98	NICKEL	PPB	127	15		6020
39MW5	L67266-1	12/10/98	NITRATE AS N	PPB	ND	100		9056
39MW5	L67266-1	12/10/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW5	L67266-1	12/10/98	RADIUM	pCi/L	ND	1		SW-846:9320
39MW5	L67266-1	12/10/98	RESORCINOL	PPB	ND	10		8270B
39MW5	L67266-1	12/10/98	SELENIUM	PPB	26	1		6020
39MW5	L67266-1	12/10/98	SILVER	PPB	ND	0.2		6020
39MW5	L67266-1	12/10/98	SODIUM	PPB	9350	100		6010A
39MW5	L67266-1	12/10/98	SULFATE	PPB	45500	1000		9056
39MW5	L67266-1	12/10/98	THALLIUM	PPB	1	1		6020
39MW5	L67266-1	12/10/98	TOXAPHENE	PPB	ND	2		8081
39MW5		12/10/98	pH-FIELD	pHu	6.9	0.1		9040
39MW5		12/10/98	pH-FIELD	pHu	7	0.1		9040
39MW5		12/10/98	pH-FIELD	pHu	6.9	0.1		9040
39MW5		12/10/98	pH-FIELD	pHu	6.9	0.1		9040
39MW5		12/10/98	pH-Laboratory	pHu	6.95	0.1		9040
39MW5		12/10/98	SPECIFIC CONDUCT.-FIELD	µS/cm	760	1		9050
39MW5		12/10/98	SPECIFIC CONDUCT.-FIELD	µS/cm	770	1		9050
39MW5		12/10/98	SPECIFIC CONDUCT.-FIELD	µS/cm	770	1		9050
39MW5		12/10/98	SPECIFIC CONDUCT.-FIELD	µS/cm	770	1		9050
39MW5		12/10/98	SPECIFIC CONDUCT.-LAB.	µS/cm	794	1		9050

3		SAMPLE			DETECTION			
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW6	L67266-2 Rep 1	#####	TOTAL ORGANIC CARBON	PPB	3500	1000		9060
39MW6	L67266-2 Rep 2	#####	TOTAL ORGANIC CARBON	PPB	3700	1000		9060
39MW6	L67266-2 Rep 3	#####	TOTAL ORGANIC CARBON	PPB	3600	1000		9060
39MW6	L67266-2 Rep 4	#####	TOTAL ORGANIC CARBON	PPB	3800	1000		9060
39MW6	L67266-2	#####	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L67266-2 Dup	#####	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L67266-2	#####	ANTIMONY	PPB	ND	60		6020
39MW6	L67266-2	12/10/98	ARSENIC	PPB	5	1		6020
39MW6	L67266-2	12/10/98	BARIUM	PPB	409	2		6020
39MW6	L67266-2	12/10/98	BERYLLIUM	PPB	ND	0.2		6020
39MW6	L67266-2	12/10/98	BHC-GAMMA	PPB	ND	2		8081
39MW6	L67266-2	12/10/98	CADMIUM	PPB	0.2	0.1		6020
39MW6	L67266-2	12/10/98	CHLORIDE	PPB	11900	1000		9056
39MW6	L67266-2	12/10/98	CHROMIUM	PPB	7	1		6020
39MW6	L67266-2	12/10/98	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW6	L67266-2	12/10/98	2,4-D	PPB	ND	1		8151
39MW6	L67266-2	12/10/98	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW6	L67266-2	12/10/98	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW6	L67266-2	12/10/98	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW6	L67266-2	12/10/98	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L67266-2	12/10/98	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L67266-2	12/10/98	ENDRIN	PPB	ND	2		8081
39MW6	L67266-2	12/10/98	FLUORIDE	PPB	530	100		9056
39MW6	L67266-2	12/10/98	GROSS ALPHA	pCi/l	ND	1		SW-846-9310
39MW6	L67266-2	12/10/98	GROSS BETA	pCi/l	ND	1		SW-846-9310
39MW6	L67266-2	12/10/98	IRON	PPB	4210	1		6010A
39MW6	L67266-2	12/10/98	LEAD	PPB	2	1		6020
39MW6	L67266-2	12/10/98	MANGANESE	PPB	239	0.2		6010A
39MW6	L67266-2	12/10/98	MERCURY	PPB	ND	0.2		7470A
39MW6	L67266-2	12/10/98	METHOXYCHLOR	PPB	ND	2		8081
39MW6	L67266-2	12/10/98	NICKEL	PPB	51	15		6020
39MW6	L67266-2	12/10/98	NITRATE AS N	PPB	ND	100		9056
39MW6	L67266-2	12/10/98	PHENOLS, TOTAL	PPB	ND	10		9065
39MW6	L67266-2	12/10/98	RADIUM	pCi/L	ND	1		SW-846-9320
39MW6	L67266-2	12/10/98	RESORCINOL	PPB	ND	10		8270B
39MW6	L67266-2	12/10/98	SELENIUM	PPB	5	1		6020
39MW6	L67266-2	12/10/98	SILVER	PPB	ND	0.2		6020
39MW6	L67266-2	12/10/98	SODIUM	PPB	11500	100		6010A
39MW6	L67266-2	12/10/98	SULFATE	PPB	23400	1000		9056
39MW6	L67266-2	12/10/98	THALLIUM	PPB	ND	1		6020
39MW6	L67266-2	12/10/98	TOXAPHENE	PPB	ND	2		8081
39MW6		12/10/98	pH-FIELD	pHu	6.9	0.1		9040
39MW6		12/10/98	pH-FIELD	pHu	7	0.1		9040
39MW6		12/10/98	pH-FIELD	pHu	7.1	0.1		9040
39MW6		12/10/98	pH-FIELD	pHu	7.1	0.1		9040
39MW6		12/10/98	pH-Laboratory	pHu	7.85	0.1		9040
39MW6		12/10/98	SPECIFIC CONDUCT.-FIELD	μS/cm	800	1		9050
39MW6		12/10/98	SPECIFIC CONDUCT.-FIELD	μS/cm	810	1		9050
39MW6		12/10/98	SPECIFIC CONDUCT.-FIELD	μS/cm	820	1		9050
39MW6		12/10/98	SPECIFIC CONDUCT.-FIELD	μS/cm	820	1		9050
39MW6		12/10/98	SPECIFIC CONDUCT.-LAB.	μS/cm	760	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
39MW1	L69967-1 Rep 1	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L69967-1 Rep 2	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L69967-1 Rep 3	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L69967-1 Rep 4	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L69967-1	03/22/99	TOTAL ORGANIC HALIDES	PPB	14	5		9020A
39MW1	L69967-1 Dup	03/22/99	TOTAL ORGANIC HALIDES	PPB	13	5		9020A
39MW1	L69967-1	03/22/99	ANTIMONY	PPB	ND	60		6020
39MW1	L69967-1	03/22/99	ARSENIC	PPB	ND	1		6020
39MW1	L69967-1	03/22/99	BARIUM	PPB	76	2		6020
39MW1	L69967-1	03/22/99	BERYLLIUM	PPB	ND	0.2		6020
39MW1	L69967-1	03/22/99	BHC-GAMMA	PPB	ND	2		8081
39MW1	L69967-1	03/22/99	CADMIUM	PPB	ND	0.1		6020
39MW1	L69967-1	03/22/99	CHLORIDE	PPB	2300	1000		9056
39MW1	L69967-1	03/22/99	CHROMIUM	PPB	4	1		6020
39MW1	L69967-1	03/22/99	COLIFORM BACT.	MPN/ml	4	2		9221E
39MW1	L69967-1	03/22/99	2,4-D	PPB	ND	1		8151
39MW1	L69967-1	03/22/99	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW1	L69967-1	03/22/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW1	L69967-1	03/22/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW1	L69967-1	03/22/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	L69967-1	03/22/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	L69967-1	03/22/99	ENDRIN	PPB	ND	2		8081
39MW1	L69967-1	03/22/99	FLUORIDE	PPB	270	100		9056
39MW1	L69967-1	03/22/99	GROSS ALPHA	pCi/l	4.0	1		SW-846:9310
39MW1	L69967-1	03/22/99	GROSS BETA	pCi/l	7.8	1		SW-846:9310
39MW1	L69967-1	03/22/99	IRON	PPB	4220	1		6010A
39MW1	L69967-1	03/22/99	LEAD	PPB	2	1		6020
39MW1	L69967-1	03/22/99	MANGANESE	PPB	59	0.2		6020
39MW1	L69967-1	03/22/99	MERCURY	PPB	ND	0.2		7470A
39MW1	L69967-1	03/22/99	METHOXYCHLOR	PPB	ND	2		8081
39MW1	L69967-1	03/22/99	NICKEL	PPB	ND	15		6020
39MW1	L69967-1	03/22/99	NITRATE AS N	PPB	2110	100		9056
39MW1	L69967-1	03/22/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW1	L69967-1	03/22/99	RADIUM	pCi/L	0.4	1		SW-846:9320
39MW1	L69967-1	03/22/99	RESORCINOL	PPB	ND	10		8270B
39MW1	L69967-1	03/22/99	SELENIUM	PPB	2	1		6020
39MW1	L69967-1	03/22/99	SILVER	PPB	ND	0.2		6020
39MW1	L69967-1	03/22/99	SODIUM	PPB	4340	100		6010A
39MW1	L69967-1	03/22/99	SULFATE	PPB	19700	1000		9056
39MW1	L69967-1	03/22/99	THALLIUM	PPB	ND	1		6020
39MW1	L69967-1	03/22/99	TOXAPHENE	PPB	ND	2		8081
39MW1		03/22/99	pH-Field	pHu	8.59	0.1		9040
39MW1		03/22/99	pH-Field	pHu	8.65	0.1		9040
39MW1		03/22/99	pH-Field	pHu	8.48	0.1		9040
39MW1		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW1		03/22/99	Specific Conductance-Field	µS/cm	330	1		9050
39MW1		03/22/99	Specific Conductance-Field	µS/cm	360	1		9050
39MW1		03/22/99	Specific Conductance-Field	µS/cm	370	1		9050
39MW1		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050

3	SAMPLE			DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW3	L69967-2 Rep 1	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L69967-2 Rep 2	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L69967-2 Rep 3	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L69967-2 Rep 4	03/22/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW3	L69967-2	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	L69967-2 Dup	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW3	L69967-2	03/22/99	ANTIMONY	PPB	ND	60		6020
39MW3	L69967-2	03/22/99	ARSENIC	PPB	3	1		6020
39MW3	L69967-2	03/22/99	BARIUM	PPB	180	2		6020
39MW3	L69967-2	03/22/99	BERYLLIUM	PPB	0.9	0.2		6020
39MW3	L69967-2	03/22/99	BHC-GAMMA	PPB	ND	2		8081
39MW3	L69967-2	03/22/99	CADMIUM	PPB	0.2	0.1		6020
39MW3	L69967-2	03/22/99	CHLORIDE	PPB	10400	1000		9056
39MW3	L69967-2	03/22/99	CHROMIUM	PPB	34	1		6020
39MW3	L69967-2	03/22/99	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW3	L69967-2	03/22/99	2,4-D	PPB	ND	1		8151
39MW3	L69967-2	03/22/99	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW3	L69967-2	03/22/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW3	L69967-2	03/22/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW3	L69967-2	03/22/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	L69967-2	03/22/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW3	L69967-2	03/22/99	ENDRIN	PPB	ND	2		8081
39MW3	L69967-2	03/22/99	FLUORIDE	PPB	ND	100		9056
39MW3	L69967-2	03/22/99	GROSS ALPHA	pCi/l	36	1		SW-846:9310
39MW3	L69967-2	03/22/99	GROSS BETA	pCi/l	47	1		SW-846:9310
39MW3	L69967-2	03/22/99	IRON	PPB	36600	1		6010A
39MW3	L69967-2	03/22/99	LEAD	PPB	17	1		6020
39MW3	L69967-2	03/22/99	MANGANESE	PPB	1000	0.2		6020
39MW3	L69967-2	03/22/99	MERCURY	PPB	ND	0.2		7470A
39MW3	L69967-2	03/22/99	METHOXYCHLOR	PPB	ND	2		8081
39MW3	L69967-2	03/22/99	NICKEL	PPB	45	15		6020
39MW3	L69967-2	03/22/99	NITRATE AS N	PPB	6470	100		9056
39MW3	L69967-2	03/22/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW3	L69967-2	03/22/99	RADIUM	pCi/L	1.7	1		SW-846:9320
39MW3	L69967-2	03/22/99	RESORCINOL	PPB	ND	10		8270B
39MW3	L69967-2	03/22/99	SELENIUM	PPB	2	1		6020
39MW3	L69967-2	03/22/99	SILVER	PPB	0.2	0.2		6020
39MW3	L69967-2	03/22/99	SODIUM	PPB	34600	100		6010A
39MW3	L69967-2	03/22/99	SULFATE	PPB	137000	1000		9056
39MW3	L69967-2	03/22/99	THALLIUM	PPB	ND	1		6020
39MW3	L69967-2	03/22/99	TOXAPHENE	PPB	ND	2		8081
39MW3		03/22/99	pH-Field	pHu	7.97	0.1		9040
39MW3		03/22/99	pH-Field	pHu	8.03	0.1		9040
39MW3		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW3		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW3		03/22/99	Specific Conductance-Field	µS/cm	800	1		9050
39MW3		03/22/99	Specific Conductance-Field	µS/cm	770	1		9050
39MW3		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050
39MW3		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050

3 LOCATION	SAMPLE		PARAMETERS	UNITS	DETECTION			METHOD
	LAB. NO.	DATE			RESULTS	LIMITS	QUALIF	
39MW4	L69967-3 Rep 1	03/22/99	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW4	L69967-3 Rep 2	03/22/99	TOTAL ORGANIC CARBON	PPB	1400	1000		9060
39MW4	L69967-3 Rep 3	03/22/99	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW4	L69967-3 Rep 4	03/22/99	TOTAL ORGANIC CARBON	PPB	1300	1000		9060
39MW4	L69967-3	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW4	L69967-3 Dup	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW4	L69967-3	03/22/99	ANTIMONY	PPB	ND	60		6020
39MW4	L69967-3	03/22/99	ARSENIC	PPB	7	1		6020
39MW4	L69967-3	03/22/99	BARIUM	PPB	249	2		6020
39MW4	L69967-3	03/22/99	BERYLLIUM	PPB	2.4	0.2		6020
39MW4	L69967-3	03/22/99	BHC-GAMMA	PPB	ND	2		8081
39MW4	L69967-3	03/22/99	CADMIUM	PPB	0.4	0.1		6020
39MW4	L69967-3	03/22/99	CHLORIDE	PPB	2500	1000		9056
39MW4	L69967-3	03/22/99	CHROMIUM	PPB	57	1		6020
39MW4	L69967-3	03/22/99	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW4	L69967-3	03/22/99	2,4-D	PPB	ND	1		8151
39MW4	L69967-3	03/22/99	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW4	L69967-3	03/22/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW4	L69967-3	03/22/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW4	L69967-3	03/22/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	L69967-3	03/22/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW4	L69967-3	03/22/99	ENDRIN	PPB	ND	2		8081
39MW4	L69967-3	03/22/99	FLUORIDE	PPB	ND	100		9056
39MW4	L69967-3	03/22/99	GROSS ALPHA	pCi/l	53	1		SW-846:9310
39MW4	L69967-3	03/22/99	GROSS BETA	pCi/l	115	1		SW-846:9310
39MW4	L69967-3	03/22/99	IRON	PPB	83300	1		6010A
39MW4	L69967-3	03/22/99	LEAD	PPB	65	1		6020
39MW4	L69967-3	03/22/99	MANGANESE	PPB	1660	0.2		6020
39MW4	L69967-3	03/22/99	MERCURY	PPB	ND	0.2		7470A
39MW4	L69967-3	03/22/99	METHOXYCHLOR	PPB	ND	2		8081
39MW4	L69967-3	03/22/99	NICKEL	PPB	63	15		6020
39MW4	L69967-3	03/22/99	NITRATE AS N	PPB	1140	100		9056
39MW4	L69967-3	03/22/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW4	L69967-3	03/22/99	RADIUM	pCi/L	5.0	1		SW-846:9320
39MW4	L69967-3	03/22/99	RESORCINOL	PPB	ND	10		8270B
39MW4	L69967-3	03/22/99	SELENIUM	PPB	4	1		6020
39MW4	L69967-3	03/22/99	SILVER	PPB	0.7	0.2		6020
39MW4	L69967-3	03/22/99	SODIUM	PPB	14000	100		6010A
39MW4	L69967-3	03/22/99	SULFATE	PPB	87100	1000		9056
39MW4	L69967-3	03/22/99	THALLIUM	PPB	ND	1		6020
39MW4	L69967-3	03/22/99	TOXAPHENE	PPB	ND	2		8081
39MW4		03/22/99	pH-Field	pHu	8.38	0.1		9040
39MW4		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW4		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW4		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW4		03/22/99	Specific Conductance-Field	µS/cm	470	1		9050
39MW4		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050
39MW4		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050
39MW4		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050

3		SAMPLE			DETECTION			METHOD
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	
39MW5	L69967-4 Rep 1	03/22/99	TOTAL ORGANIC CARBON	PPB	95800	1000		9060
39MW5	L69967-4 Rep 2	03/22/99	TOTAL ORGANIC CARBON	PPB	96400	1000		9060
39MW5	L69967-4 Rep 3	03/22/99	TOTAL ORGANIC CARBON	PPB	95000	1000		9060
39MW5	L69967-4 Rep 4	03/22/99	TOTAL ORGANIC CARBON	PPB	95600	1000		9060
39MW5	L69967-4	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	L69967-4 Dup	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW5	L69967-4	03/22/99	ANTIMONY	PPB	ND	60		6020
39MW5	L69967-4	03/22/99	ARSENIC	PPB	3	1		6020
39MW5	L69967-4	03/22/99	BARIUM	PPB	663	2		6020
39MW5	L69967-4	03/22/99	BERYLLIUM	PPB	3.5	0.2		6020
39MW5	L69967-4	03/22/99	BHC-GAMMA	PPB	ND	2		8081
39MW5	L69967-4	03/22/99	CADMIUM	PPB	0.4	0.1		6020
39MW5	L69967-4	03/22/99	CHLORIDE	PPB	6100	1000		9056
39MW5	L69967-4	03/22/99	CHROMIUM	PPB	93	1		6020
39MW5	L69967-4	03/22/99	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW5	L69967-4	03/22/99	2,4-D	PPB	ND	1		8151
39MW5	L69967-4	03/22/99	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW5	L69967-4	03/22/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW5	L69967-4	03/22/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW5	L69967-4	03/22/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	L69967-4	03/22/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW5	L69967-4	03/22/99	ENDRIN	PPB	ND	2		8081
39MW5	L69967-4	03/22/99	FLUORIDE	PPB	690	100		9056
39MW5	L69967-4	03/22/99	GROSS ALPHA	pCi/l	67	1		SW-846:9310
39MW5	L69967-4	03/22/99	GROSS BETA	pCi/l	99	1		SW-846:9310
39MW5	L69967-4	03/22/99	IRON	PPB	155000	1		6010A
39MW5	L69967-4	03/22/99	LEAD	PPB	121	1		6020
39MW5	L69967-4	03/22/99	MANGANESE	PPB	2080	0.2		6020
39MW5	L69967-4	03/22/99	MERCURY	PPB	ND	0.2		7470A
39MW5	L69967-4	03/22/99	METHOXYCHLOR	PPB	ND	2		8081
39MW5	L69967-4	03/22/99	NICKEL	PPB	80	15		6020
39MW5	L69967-4	03/22/99	NITRATE AS N	PPB	ND	100		9056
39MW5	L69967-4	03/22/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW5	L69967-4	03/22/99	RADIUM	pCi/L	8.2	1		SW-846:9320
39MW5	L69967-4	03/22/99	RESORCINOL	PPB	ND	10		8270B
39MW5	L69967-4	03/22/99	SELENIUM	PPB	5	1		6020
39MW5	L69967-4	03/22/99	SILVER	PPB	0.5	0.2		6020
39MW5	L69967-4	03/22/99	SODIUM	PPB	9490	100		6010A
39MW5	L69967-4	03/22/99	SULFATE	PPB	39400	1000		9056
39MW5	L69967-4	03/22/99	THALLIUM	PPB	1	1		6020
39MW5	L69967-4	03/22/99	TOXAPHENE	PPB	ND	2		8081
39MW5		03/22/99	pH-Field	pHu	8.59	0.1		9040
39MW5		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW5		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW5		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW5		03/22/99	Specific Conductance-Field	µS/cm	570	1		9050
39MW5		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050
39MW5		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050
39MW5		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW6	L69967-5 Rep 1	03/22/99	TOTAL ORGANIC CARBON	PPB	4900	1000		9060
39MW6	L69967-5 Rep 2	03/22/99	TOTAL ORGANIC CARBON	PPB	5100	1000		9060
39MW6	L69967-5 Rep 3	03/22/99	TOTAL ORGANIC CARBON	PPB	4200	1000		9060
39MW6	L69967-5 Rep 4	03/22/99	TOTAL ORGANIC CARBON	PPB	4500	1000		9060
39MW6	L69967-5	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L69967-5 Dup	03/22/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L69967-5	03/22/99	ANTIMONY	PPB	ND	60		6020
39MW6	L69967-5	03/22/99	ARSENIC	PPB	25	1		6020
39MW6	L69967-5	03/22/99	BARIUM	PPB	1810	2		6020
39MW6	L69967-5	03/22/99	BERYLLIUM	PPB	3.5	0.2		6020
39MW6	L69967-5	03/22/99	BHC-GAMMA	PPB	ND	2		8081
39MW6	L69967-5	03/22/99	CADMIUM	PPB	0.3	0.1		6020
39MW6	L69967-5	03/22/99	CHLORIDE	PPB	8000	1000		9056
39MW6	L69967-5	03/22/99	CHROMIUM	PPB	143	1		6020
39MW6	L69967-5	03/22/99	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW6	L69967-5	03/22/99	2,4-D	PPB	ND	1		8151
39MW6	L69967-5	03/22/99	2,4,5 TP SILVEX	PPB	ND	1		8151
39MW6	L69967-5	03/22/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW6	L69967-5	03/22/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW6	L69967-5	03/22/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L69967-5	03/22/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L69967-5	03/22/99	ENDRIN	PPB	ND	2		8081
39MW6	L69967-5	03/22/99	FLUORIDE	PPB	400	100		9056
39MW6	L69967-5	03/22/99	GROSS ALPHA	pCi/l	334	1		SW-846:9310
39MW6	L69967-5	03/22/99	GROSS BETA	pCi/l	695	1		SW-846:9310
39MW6	L69967-5	03/22/99	IRON	PPB	153000	1		6010A
39MW6	L69967-5	03/22/99	LEAD	PPB	30	1		6020
39MW6	L69967-5	03/22/99	MANGANESE	PPB	2110	0.2		6020
39MW6	L69967-5	03/22/99	MERCURY	PPB	ND	0.2		7470A
39MW6	L69967-5	03/22/99	METHOXYCHLOR	PPB	ND	2		8081
39MW6	L69967-5	03/22/99	NICKEL	PPB	176	15		6020
39MW6	L69967-5	03/22/99	NITRATE AS N	PPB	ND	100		9056
39MW6	L69967-5	03/22/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW6	L69967-5	03/22/99	RADIUM	pCi/L	3.1	1		SW-846:9320
39MW6	L69967-5	03/22/99	RESORCINOL	PPB	ND	10		8270B
39MW6	L69967-5	03/22/99	SELENIUM	PPB	7	1		6020
39MW6	L69967-5	03/22/99	SILVER	PPB	0.8	0.2		6020
39MW6	L69967-5	03/22/99	SODIUM	PPB	10500	100		6010A
39MW6	L69967-5	03/22/99	SULFATE	PPB	35900	1000		9056
39MW6	L69967-5	03/22/99	THALLIUM	PPB	ND	1		6020
39MW6	L69967-5	03/22/99	TOXAPHENE	PPB	ND	2		8081
39MW6		03/22/99	pH-Field	pHu	9.36	0.1		9040
39MW6		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW6		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW6		03/22/99	pH-Field	pHu	NS	0.1		9040
39MW6		03/22/99	Specific Conductance-Field	µS/cm	400	1		9050
39MW6		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050
39MW6		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050
39MW6		03/22/99	Specific Conductance-Field	µS/cm	NS	1		9050

3 LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			METHOD
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	
39MW1	L72269-1 Rep 1	05/28/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L72269-1 Rep 2	05/28/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L72269-1 Rep 3	05/28/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L72269-1 Rep 4	05/28/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
39MW1	L72269-1	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW1	L72269-1 Dup	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW1	L72269-1	05/28/99	ANTIMONY	PPB	ND	60		6020
39MW1	L72269-1	05/28/99	ARSENIC	PPB	ND	1		6020
39MW1	L72269-1	05/28/99	BARIUM	PPB	57	2		6020
39MW1	L72269-1	05/28/99	BERYLLIUM	PPB	ND	0.2		6020
39MW1	L72269-1	05/28/99	BHC-GAMMA	PPB	ND	2		8081
39MW1	L72269-1	05/28/99	CADMIUM	PPB	ND	0.1		6020
39MW1	L72269-1	05/28/99	CHLORIDE	PPB	5500	1000		9056
39MW1	L72269-1	05/28/99	CHROMIUM	PPB	3	1		6020
39MW1	L72269-1	05/28/99	COLIFORM BACT.	MPN/ml	30	2		9221E
39MW1	L72269-1	05/28/99	2,4-D	PPB	ND	1.00		8151
39MW1	L72269-1	05/28/99	2,4,5 TP SILVEX	PPB	ND	1.00		8151
39MW1	L72269-1	05/28/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW1	L72269-1	05/28/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW1	L72269-1	05/28/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	L72269-1	05/28/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW1	L72269-1	05/28/99	ENDRIN	PPB	ND	2		8081
39MW1	L72269-1	05/28/99	FLUORIDE	PPB	360	100		9056
39MW1	L72269-1	05/28/99	GROSS ALPHA	pCi/l	1.1	1		SW-846:9310
39MW1	L72269-1	05/28/99	GROSS BETA	pCi/l	2.7	1		SW-846:9310
39MW1	L72269-1	05/28/99	IRON	PPB	128	1		6010A
39MW1	L72269-1	05/28/99	LEAD	PPB	ND	1		6020
39MW1	L72269-1	05/28/99	MANGANESE	PPB	1.7	0.2		6020
39MW1	L72269-1	05/28/99	MERCURY	PPB	ND	0.2		7470A
39MW1	L72269-1	05/28/99	METHOXYCHLOR	PPB	ND	2		8081
39MW1	L72269-1	05/28/99	NICKEL	PPB	ND	15		6020
39MW1	L72269-1	05/28/99	NITRATE AS N	PPB	1220	100		9056
39MW1	L72269-1	05/28/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW1	L72269-1	05/28/99	RADIUM	pCi/L	ND	1		SW-846:9320
39MW1	L72269-1	05/28/99	RESORCINOL	PPB	ND	10		8270B
39MW1	L72269-1	05/28/99	SELENIUM	PPB	3	1		6020
39MW1	L72269-1	05/28/99	SILVER	PPB	ND	0.2		6020
39MW1	L72269-1	05/28/99	SODIUM	PPB	6020	100		6010A
39MW1	L72269-1	05/28/99	SULFATE	PPB	18000	1000		9056
39MW1	L72269-1	05/28/99	THALLIUM	PPB	ND	1		6020
39MW1	L72269-1	05/28/99	TOXAPHENE	PPB	ND	2		8081

39MW3	L72269-2 Rep 1	05/28/99	TOTAL ORGANIC CARBON	PPB	1600	1000	9060
39MW3	L72269-2 Rep 2	05/28/99	TOTAL ORGANIC CARBON	PPB	1500	1000	9060
39MW3	L72269-2 Rep 3	05/28/99	TOTAL ORGANIC CARBON	PPB	1600	1000	9060
39MW3	L72269-2 Rep 4	05/28/99	TOTAL ORGANIC CARBON	PPB	1600	1000	9060
39MW3	L72269-2	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW3	L72269-2 Dup	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW3	L72269-2	05/28/99	ANTIMONY	PPB	ND	60	6020
39MW3	L72269-2	05/28/99	ARSENIC	PPB	ND	1	6020
39MW3	L72269-2	05/28/99	BARIUM	PPB	82	2	6020
39MW3	L72269-2	05/28/99	BERYLLIUM	PPB	ND	0.2	6020
39MW3	L72269-2	05/28/99	BHC-GAMMA	PPB	ND	2	8081
39MW3	L72269-2	05/28/99	CADMIUM	PPB	ND	0.1	6020
39MW3	L72269-2	05/28/99	CHLORIDE	PPB	7100	1000	9056
39MW3	L72269-2	05/28/99	CHROMIUM	PPB	5	1	6020
39MW3	L72269-2	05/28/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
39MW3	L72269-2	05/28/99	2,4-D	PPB	ND	1.00	8151
39MW3	L72269-2	05/28/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
39MW3	L72269-2	05/28/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
39MW3	L72269-2	05/28/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
39MW3	L72269-2	05/28/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
39MW3	L72269-2	05/28/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
39MW3	L72269-2	05/28/99	ENDRIN	PPB	ND	2	8081
39MW3	L72269-2	05/28/99	FLUORIDE	PPB	ND	100	9056
39MW3	L72269-2	05/28/99	GROSS ALPHA	pCi/l	0.9	1	SW-846:9310
39MW3	L72269-2	05/28/99	GROSS BETA	pCi/l	4.9	1	SW-846:9310
39MW3	L72269-2	05/28/99	IRON	PPB	37	1	6010A
39MW3	L72269-2	05/28/99	LEAD	PPB	ND	1	6020
39MW3	L72269-2	05/28/99	MANGANESE	PPB	1.5	0.2	6020
39MW3	L72269-2	05/28/99	MERCURY	PPB	ND	0.2	7470A
39MW3	L72269-2	05/28/99	METHOXYCHLOR	PPB	ND	2	8081
39MW3	L72269-2	05/28/99	NICKEL	PPB	ND	15	6020
39MW3	L72269-2	05/28/99	NITRATE AS N	PPB	6020	100	9056
39MW3	L72269-2	05/28/99	PHENOLS, TOTAL	PPB	ND	10	9065
39MW3	L72269-2	05/28/99	RADIUM	pCi/L	ND	1	SW-846:9320
39MW3	L72269-2	05/28/99	RESORCINOL	PPB	ND	10	8270B
39MW3	L72269-2	05/28/99	SELENIUM	PPB	2	1	6020
39MW3	L72269-2	05/28/99	SILVER	PPB	ND	0.2	6020
39MW3	L72269-2	05/28/99	SODIUM	PPB	39600	100	6010A
39MW3	L72269-2	05/28/99	SULFATE	PPB	119000	1000	9056
39MW3	L72269-2	05/28/99	THALLIUM	PPB	ND	1	6020
39MW3	L72269-2	05/28/99	TOXAPHENE	PPB	ND	2	8081

39MW5	L72269-3 Rep 1	05/28/99	TOTAL ORGANIC CARBON	PPB	1000	1000	9060
39MW5	L72269-3 Rep 2	05/28/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW5	L72269-3 Rep 3	05/28/99	TOTAL ORGANIC CARBON	PPB	1000	1000	9060
39MW5	L72269-3 Rep 4	05/28/99	TOTAL ORGANIC CARBON	PPB	1100	1000	9060
39MW5	L72269-3	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW5	L72269-3 Dup	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW5	L72269-3	05/28/99	ANTIMONY	PPB	ND	60	6020
39MW5	L72269-3	05/28/99	ARSENIC	PPB	2	1	6020
39MW5	L72269-3	05/28/99	BARIUM	PPB	136	2	6020
39MW5	L72269-3	05/28/99	BERYLLIUM	PPB	ND	0.2	6020
39MW5	L72269-3	05/28/99	BHC-GAMMA	PPB	ND	2	8081
39MW5	L72269-3	05/28/99	CADMIUM	PPB	ND	0.1	6020
39MW5	L72269-3	05/28/99	CHLORIDE	PPB	5700	1000	9056
39MW5	L72269-3	05/28/99	CHROMIUM	PPB	1	1	6020
39MW5	L72269-3	05/28/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
39MW5	L72269-3	05/28/99	2,4-D	PPB	ND	1.00	8151
39MW5	L72269-3	05/28/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
39MW5	L72269-3	05/28/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
39MW5	L72269-3	05/28/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
39MW5	L72269-3	05/28/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
39MW5	L72269-3	05/28/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
39MW5	L72269-3	05/28/99	ENDRIN	PPB	ND	2	8081
39MW5	L72269-3	05/28/99	FLUORIDE	PPB	820	100	9056
39MW5	L72269-3	05/28/99	GROSS ALPHA	pCi/l	1.9	1	SW-846:9310
39MW5	L72269-3	05/28/99	GROSS BETA	pCi/l	4.7	1	SW-846:9310
39MW5	L72269-3	05/28/99	IRON	PPB	8610	1	6010A
39MW5	L72269-3	05/28/99	LEAD	PPB	ND	1	6020
39MW5	L72269-3	05/28/99	MANGANESE	PPB	2040	0.2	6020
39MW5	L72269-3	05/28/99	MERCURY	PPB	ND	0.2	7470A
39MW5	L72269-3	05/28/99	METHOXYCHLOR	PPB	ND	2	8081
39MW5	L72269-3	05/28/99	NICKEL	PPB	ND	15	6020
39MW5	L72269-3	05/28/99	NITRATE AS N	PPB	ND	100	9056
39MW5	L72269-3	05/28/99	PHENOLS, TOTAL	PPB	ND	10	9065
39MW5	L72269-3	05/28/99	RADIUM	pCi/L	ND	1	SW-846:9320
39MW5	L72269-3	05/28/99	RESORCINOL	PPB	ND	10	8270B
39MW5	L72269-3	05/28/99	SELENIUM	PPB	ND	1	6020
39MW5	L72269-3	05/28/99	SILVER	PPB	0.5	0.2	6020
39MW5	L72269-3	05/28/99	SODIUM	PPB	9220	100	6010A
39MW5	L72269-3	05/28/99	SULFATE	PPB	32100	1000	9056
39MW5	L72269-3	05/28/99	THALLIUM	PPB	ND	1	6020
39MW5	L72269-3	05/28/99	TOXAPHENE	PPB	ND	2	8081

39MW4	L72269-4 Rep 1	05/28/99	TOTAL ORGANIC CARBON	PPB	1900	1000	9060
39MW4	L72269-4 Rep 2	05/28/99	TOTAL ORGANIC CARBON	PPB	1800	1000	9060
39MW4	L72269-4 Rep 3	05/28/99	TOTAL ORGANIC CARBON	PPB	1600	1000	9060
39MW4	L72269-4 Rep 4	05/28/99	TOTAL ORGANIC CARBON	PPB	1800	1000	9060
39MW4	L72269-4	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW4	L72269-4 Dup	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW4	L72269-4	05/28/99	ANTIMONY	PPB	ND	60	6020
39MW4	L72269-4	05/28/99	ARSENIC	PPB	ND	1	6020
39MW4	L72269-4	05/28/99	BARIUM	PPB	131	2	6020
39MW4	L72269-4	05/28/99	BERYLLIUM	PPB	ND	0.2	6020
39MW4	L72269-4	05/28/99	BHC-GAMMA	PPB	ND	2	8081
39MW4	L72269-4	05/28/99	CADMIUM	PPB	ND	0.1	6020
39MW4	L72269-4	05/28/99	CHLORIDE	PPB	2600	1000	9056
39MW4	L72269-4	05/28/99	CHROMIUM	PPB	3	1	6020
39MW4	L72269-4	05/28/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
39MW4	L72269-4	05/28/99	2,4-D	PPB	ND	1.00	8151
39MW4	L72269-4	05/28/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
39MW4	L72269-4	05/28/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
39MW4	L72269-4	05/28/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
39MW4	L72269-4	05/28/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
39MW4	L72269-4	05/28/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
39MW4	L72269-4	05/28/99	ENDRIN	PPB	ND	2	8081
39MW4	L72269-4	05/28/99	FLUORIDE	PPB	ND	100	9056
39MW4	L72269-4	05/28/99	GROSS ALPHA	pCi/l	3.6	1	SW-846:9310
39MW4	L72269-4	05/28/99	GROSS BETA	pCi/l	17.3	1	SW-846:9310
39MW4	L72269-4	05/28/99	IRON	PPB	4590	1	6010A
39MW4	L72269-4	05/28/99	LEAD	PPB	4	1	6020
39MW4	L72269-4	05/28/99	MANGANESE	PPB	231	0.2	6020
39MW4	L72269-4	05/28/99	MERCURY	PPB	ND	0.2	7470A
39MW4	L72269-4	05/28/99	METHOXYCHLOR	PPB	ND	2	8081
39MW4	L72269-4	05/28/99	NICKEL	PPB	ND	15	6020
39MW4	L72269-4	05/28/99	NITRATE AS N	PPB	1020	100	9056
39MW4	L72269-4	05/28/99	PHENOLS, TOTAL	PPB	ND	10	9065
39MW4	L72269-4	05/28/99	RADIUM	pCi/L	ND	1	SW-846:9320
39MW4	L72269-4	05/28/99	RESORCINOL	PPB	ND	10	8270B
39MW4	L72269-4	05/28/99	SELENIUM	PPB	ND	1	6020
39MW4	L72269-4	05/28/99	SILVER	PPB	ND	0.2	6020
39MW4	L72269-4	05/28/99	SODIUM	PPB	14300	100	6010A
39MW4	L72269-4	05/28/99	SULFATE	PPB	88500	1000	9056
39MW4	L72269-4	05/28/99	THALLIUM	PPB	ND	1	6020
39MW4	L72269-4	05/28/99	TOXAPHENE	PPB	ND	2	8081

39MW6	L72269-5 Rep 1	05/28/99	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW6	L72269-5 Rep 2	05/28/99	TOTAL ORGANIC CARBON	PPB	1000	1000		9060
39MW6	L72269-5 Rep 3	05/28/99	TOTAL ORGANIC CARBON	PPB	1100	1000		9060
39MW6	L72269-5 Rep 4	05/28/99	TOTAL ORGANIC CARBON	PPB	1200	1000		9060
39MW6	L72269-5	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L72269-5 Dup	05/28/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L72269-5	05/28/99	ANTIMONY	PPB	ND	60		6020
39MW6	L72269-5	05/28/99	ARSENIC	PPB	ND	1		6020
39MW6	L72269-5	05/28/99	BARIUM	PPB	110	2		6020
39MW6	L72269-5	05/28/99	BERYLLIUM	PPB	ND	0.2		6020
39MW6	L72269-5	05/28/99	BHC-GAMMA	PPB	ND	2		8081
39MW6	L72269-5	05/28/99	CADMIUM	PPB	ND	0.1		6020
39MW6	L72269-5	05/28/99	CHLORIDE	PPB	5700	1000		9056
39MW6	L72269-5	05/28/99	CHROMIUM	PPB	ND	1		6020
39MW6	L72269-5	05/28/99	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW6	L72269-5	05/28/99	2,4-D	PPB	ND	1.00		8151
39MW6	L72269-5	05/28/99	2,4,5 TP SILVEX	PPB	ND	1.00		8151
39MW6	L72269-5	05/28/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW6	L72269-5	05/28/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW6	L72269-5	05/28/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L72269-5	05/28/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L72269-5	05/28/99	ENDRIN	PPB	ND	2		8081
39MW6	L72269-5	05/28/99	FLUORIDE	PPB	430	100		9056
39MW6	L72269-5	05/28/99	GROSS ALPHA	pCi/l	1.6	1		SW-846:9310
39MW6	L72269-5	05/28/99	GROSS BETA	pCi/l	4.5	1		SW-846:9310
39MW6	L72269-5	05/28/99	IRON	PPB	2610	1		6010A
39MW6	L72269-5	05/28/99	LEAD	PPB	ND	1		6020
39MW6	L72269-5	05/28/99	MANGANESE	PPB	128	0.2		6020
39MW6	L72269-5	05/28/99	MERCURY	PPB	ND	0.2		7470A
39MW6	L72269-5	05/28/99	METHOXYCHLOR	PPB	ND	2		8081
39MW6	L72269-5	05/28/99	NICKEL	PPB	ND	15		6020
39MW6	L72269-5	05/28/99	NITRATE AS N	PPB	170	100		9056
39MW6	L72269-5	05/28/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW6	L72269-5	05/28/99	RADIUM	pCi/L	ND	1		SW-846:9320
39MW6	L72269-5	05/28/99	RESORCINOL	PPB	ND	10		8270B
39MW6	L72269-5	05/28/99	SELENIUM	PPB	ND	1		6020
39MW6	L72269-5	05/28/99	SILVER	PPB	ND	0.2		6020
39MW6	L72269-5	05/28/99	SODIUM	PPB	10000	100		6010A
39MW6	L72269-5	05/28/99	SULFATE	PPB	91100	1000		9056
39MW6	L72269-5	05/28/99	THALLIUM	PPB	ND	1		6020
39MW6	L72269-5	05/28/99	TOXAPHENE	PPB	ND	2		8081
39	39mw1	7.22	7.21	7.28	7.21	3900	3890	3890
39	39mw3	7.04	7.12	7.03	7.03	10220	10070	9610
39	39mw4							
39	39mw5	6.94	6.96	6.97	6.97	7060	7050	7050
39	39mw6	7.09	7.10	7.10	7.11	8110	8120	8110

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
39MW6	L74093-1 Rep 1	07/27/99	TOTAL ORGANIC CARBON	PPB	2400	1000		9060
39MW6	L74093-1 Rep 2	07/27/99	TOTAL ORGANIC CARBON	PPB	2600	1000		9060
39MW6	L74093-1 Rep 3	07/27/99	TOTAL ORGANIC CARBON	PPB	2500	1000		9060
39MW6	L74093-1 Rep 4	07/27/99	TOTAL ORGANIC CARBON	PPB	2400	1000		9060
39MW6	L74093-1	07/27/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L74093-1 Dup	07/27/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
39MW6	L74093-1	07/27/99	ANTIMONY	PPB	ND	60		6020
39MW6	L74093-1	07/27/99	ARSENIC	PPB	6	1		6020
39MW6	L74093-1	07/27/99	BARIUM	PPB	458	2		6020
39MW6	L74093-1	07/27/99	BERYLLIUM	PPB	0.6	0.2		6020
39MW6	L74093-1	07/27/99	BHC-GAMMA	PPB	ND	2		8081
39MW6	L74093-1	07/27/99	CADMIUM	PPB	ND	0.1		6020
39MW6	L74093-1	07/27/99	CHLORIDE	PPB	6100	1000		9056
39MW6	L74093-1	07/27/99	CHROMIUM	PPB	22	1		6020
39MW6	L74093-1	07/27/99	COLIFORM BACT.	MPN/ml	ND	2		9221E
39MW6	L74093-1	07/27/99	2,4-D	PPB	ND	1.00		8151
39MW6	L74093-1	07/27/99	2,4,5 TP SILVEX	PPB	ND	1.00		8151
39MW6	L74093-1	07/27/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
39MW6	L74093-1	07/27/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
39MW6	L74093-1	07/27/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L74093-1	07/27/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
39MW6	L74093-1	07/27/99	ENDRIN	PPB	ND	2		8081
39MW6	L74093-1	07/27/99	FLUORIDE	PPB	510	100		9056
39MW6	L74093-1	07/27/99	GROSS ALPHA	pCi/l	66	1		SW-846:9310
39MW6	L74093-1	07/27/99	GROSS BETA	pCi/l	130	1		SW-846:9310
39MW6	L74093-1	07/27/99	IRON	PPB	31400	1		6010A
39MW6	L74093-1	07/27/99	LEAD	PPB	8	1		6020
39MW6	L74093-1	07/27/99	MANGANESE	PPB	358	0.2		6020
39MW6	L74093-1	07/27/99	MERCURY	PPB	ND	0.2		7470A
39MW6	L74093-1	07/27/99	METHOXYCHLOR	PPB	ND	2		8081
39MW6	L74093-1	07/27/99	NICKEL	PPB	27	15		6020
39MW6	L74093-1	07/27/99	NITRATE AS N	PPB	ND	100		9056
39MW6	L74093-1	07/27/99	PHENOLS, TOTAL	PPB	ND	10		9065
39MW6	L74093-1	07/27/99	RADIUM	pCi/L	1.8	1		SW-846:9320
39MW6	L74093-1	07/27/99	RESORCINOL	PPB	ND	10		8270B
39MW6	L74093-1	07/27/99	SELENIUM	PPB	ND	1		6020
39MW6	L74093-1	07/27/99	SILVER	PPB	ND	0.2		6020
39MW6	L74093-1	07/27/99	SODIUM	PPB	9050	100		6010A
39MW6	L74093-1	07/27/99	SULFATE	PPB	70700	1000		9056
39MW6	L74093-1	07/27/99	THALLIUM	PPB	ND	1		6020
39MW6	L74093-1	07/27/99	TOXAPHENE	PPB	ND	2		8081

39MW5	L74093-2 Rep 1	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW5	L74093-2 Rep 2	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW5	L74093-2 Rep 3	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW5	L74093-2 Rep 4	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW5	L74093-2	07/27/99	TOTAL ORGANIC HALIDES	PPB	10	5	9020A
39MW5	L74093-2 Dup	07/27/99	TOTAL ORGANIC HALIDES	PPB	9	5	9020A
39MW5	L74093-2	07/27/99	ANTIMONY	PPB	ND	60	6020
39MW5	L74093-2	07/27/99	ARSENIC	PPB	3	1	6020
39MW5	L74093-2	07/27/99	BARIUM	PPB	294	2	6020
39MW5	L74093-2	07/27/99	BERYLLIUM	PPB	0.8	0.2	6020
39MW5	L74093-2	07/27/99	BHC-GAMMA	PPB	ND	2	8081
39MW5	L74093-2	07/27/99	CADMIUM	PPB	0.3	0.1	6020
39MW5	L74093-2	07/27/99	CHLORIDE	PPB	5900	1000	9056
39MW5	L74093-2	07/27/99	CHROMIUM	PPB	20	1	6020
39MW5	L74093-2	07/27/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
39MW5	L74093-2	07/27/99	2,4-D	PPB	ND	1.00	8151
39MW5	L74093-2	07/27/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
39MW5	L74093-2	07/27/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
39MW5	L74093-2	07/27/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
39MW5	L74093-2	07/27/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
39MW5	L74093-2	07/27/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
39MW5	L74093-2	07/27/99	ENDRIN	PPB	ND	2	8081
39MW5	L74093-2	07/27/99	FLUORIDE	PPB	870	100	9056
39MW5	L74093-2	07/27/99	GROSS ALPHA	pCi/l	20	1	SW-846:9310
39MW5	L74093-2	07/27/99	GROSS BETA	pCi/l	37	1	SW-846:9310
39MW5	L74093-2	07/27/99	IRON	PPB	37800	1	6010A
39MW5	L74093-2	07/27/99	LEAD	PPB	32	1	6020
39MW5	L74093-2	07/27/99	MANGANESE	PPB	2170	0.2	6020
39MW5	L74093-2	07/27/99	MERCURY	PPB	ND	0.2	7470A
39MW5	L74093-2	07/27/99	METHOXYCHLOR	PPB	ND	2	8081
39MW5	L74093-2	07/27/99	NICKEL	PPB	ND	15	6020
39MW5	L74093-2	07/27/99	NITRATE AS N	PPB	330	100	9056
39MW5	L74093-2	07/27/99	PHENOLS, TOTAL	PPB	ND	10	9065
39MW5	L74093-2	07/27/99	RADIUM	pCi/L	1.9	1	SW-846:9320
39MW5	L74093-2	07/27/99	RESORCINOL	PPB	ND	10	8270B
39MW5	L74093-2	07/27/99	SELENIUM	PPB	ND	1	6020
39MW5	L74093-2	07/27/99	SILVER	PPB	0.3	0.2	6020
39MW5	L74093-2	07/27/99	SODIUM	PPB	8910	100	6010A
39MW5	L74093-2	07/27/99	SULFATE	PPB	32500	1000	9056
39MW5	L74093-2	07/27/99	THALLIUM	PPB	ND	1	6020
39MW5	L74093-2	07/27/99	TOXAPHENE	PPB	ND	2	8081

39MW3	L74093-3 Rep 1	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW3	L74093-3 Rep 2	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW3	L74093-3 Rep 3	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW3	L74093-3 Rep 4	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW3	L74093-3	07/27/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW3	L74093-3 Dup	07/27/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW3	L74093-3	07/27/99	ANTIMONY	PPB	ND	60	6020
39MW3	L74093-3	07/27/99	ARSENIC	PPB	ND	1	6020
39MW3	L74093-3	07/27/99	BARIUM	PPB	72	2	6020
39MW3	L74093-3	07/27/99	BERYLLIUM	PPB	ND	0.2	6020
39MW3	L74093-3	07/27/99	BHC-GAMMA	PPB	ND	2	8081
39MW3	L74093-3	07/27/99	CADMIUM	PPB	ND	0.1	6020
39MW3	L74093-3	07/27/99	CHLORIDE	PPB	7000	1000	9056
39MW3	L74093-3	07/27/99	CHROMIUM	PPB	5	1	6020
39MW3	L74093-3	07/27/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
39MW3	L74093-3	07/27/99	2,4-D	PPB	ND	1.00	8151
39MW3	L74093-3	07/27/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
39MW3	L74093-3	07/27/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
39MW3	L74093-3	07/27/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
39MW3	L74093-3	07/27/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
39MW3	L74093-3	07/27/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
39MW3	L74093-3	07/27/99	ENDRIN	PPB	ND	2	8081
39MW3	L74093-3	07/27/99	FLUORIDE	PPB	ND	100	9056
39MW3	L74093-3	07/27/99	GROSS ALPHA	pCi/l	1.5	1	SW-846-9310
39MW3	L74093-3	07/27/99	GROSS BETA	pCi/l	5.5	1	SW-846-9310
39MW3	L74093-3	07/27/99	IRON	PPB	65	1	6010A
39MW3	L74093-3	07/27/99	LEAD	PPB	ND	1	6020
39MW3	L74093-3	07/27/99	MANGANESE	PPB	1.9	0.2	6020
39MW3	L74093-3	07/27/99	MERCURY	PPB	ND	0.2	7470A
39MW3	L74093-3	07/27/99	METHOXYCHLOR	PPB	ND	2	8081
39MW3	L74093-3	07/27/99	NICKEL	PPB	ND	15	6020
39MW3	L74093-3	07/27/99	NITRATE AS N	PPB	6670	100	9056
39MW3	L74093-3	07/27/99	PHENOLS, TOTAL	PPB	ND	10	9065
39MW3	L74093-3	07/27/99	RADIUM	pCi/L	ND	1	SW-846-9320
39MW3	L74093-3	07/27/99	RESORCINOL	PPB	ND	10	8270B
39MW3	L74093-3	07/27/99	SELENIUM	PPB	ND	1	6020
39MW3	L74093-3	07/27/99	SILVER	PPB	ND	0.2	6020
39MW3	L74093-3	07/27/99	SODIUM	PPB	33500	100	6010A
39MW3	L74093-3	07/27/99	SULFATE	PPB	129000	1000	9056
39MW3	L74093-3	07/27/99	THALLIUM	PPB	ND	1	6020
39MW3	L74093-3	07/27/99	TOXAPHENE	PPB	ND	2	8081

39MW1	L74093-4 Rep 1	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW1	L74093-4 Rep 2	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW1	L74093-4 Rep 3	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW1	L74093-4 Rep 4	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW1	L74093-4	07/27/99	TOTAL ORGANIC HALIDES	PPB	6	5	9020A
39MW1	L74093-4 Dup	07/27/99	TOTAL ORGANIC HALIDES	PPB	7	5	9020A
39MW1	L74093-4	07/27/99	ANTIMONY	PPB	ND	60	6020
39MW1	L74093-4	07/27/99	ARSENIC	PPB	ND	1	6020
39MW1	L74093-4	07/27/99	BARIUM	PPB	41	2	6020
39MW1	L74093-4	07/27/99	BERYLLIUM	PPB	ND	0.2	6020
39MW1	L74093-4	07/27/99	BHC-GAMMA	PPB	ND	2	8081
39MW1	L74093-4	07/27/99	CADMIUM	PPB	0.4	0.1	6020
39MW1	L74093-4	07/27/99	CHLORIDE	PPB	9000	1000	9056
39MW1	L74093-4	07/27/99	CHROMIUM	PPB	4	1	6020
39MW1	L74093-4	07/27/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
39MW1	L74093-4	07/27/99	2,4-D	PPB	ND	1.00	8151
39MW1	L74093-4	07/27/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
39MW1	L74093-4	07/27/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
39MW1	L74093-4	07/27/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
39MW1	L74093-4	07/27/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
39MW1	L74093-4	07/27/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
39MW1	L74093-4	07/27/99	ENDRIN	PPB	ND	2	8081
39MW1	L74093-4	07/27/99	FLUORIDE	PPB	380	100	9056
39MW1	L74093-4	07/27/99	GROSS ALPHA	pCi/l	ND	1	SW-846:9310
39MW1	L74093-4	07/27/99	GROSS BETA	pCi/l	1.5	1	SW-846:9310
39MW1	L74093-4	07/27/99	IRON	PPB	102	1	6010A
39MW1	L74093-4	07/27/99	LEAD	PPB	ND	1	6020
39MW1	L74093-4	07/27/99	MANGANESE	PPB	ND	0.2	6020
39MW1	L74093-4	07/27/99	MERCURY	PPB	ND	0.2	7470A
39MW1	L74093-4	07/27/99	METHOXYCHLOR	PPB	ND	2	8081
39MW1	L74093-4	07/27/99	NICKEL	PPB	ND	15	6020
39MW1	L74093-4	07/27/99	NITRATE AS N	PPB	1190	100	9056
39MW1	L74093-4	07/27/99	PHENOLS, TOTAL	PPB	ND	10	9065
39MW1	L74093-4	07/27/99	RADIUM	pCi/L	ND	1	SW-846:9320
39MW1	L74093-4	07/27/99	RESORCINOL	PPB	ND	10	8270B
39MW1	L74093-4	07/27/99	SELENIUM	PPB	ND	1	6020
39MW1	L74093-4	07/27/99	SILVER	PPB	ND	0.2	6020
39MW1	L74093-4	07/27/99	SODIUM	PPB	9460	100	6010A
39MW1	L74093-4	07/27/99	SULFATE	PPB	16100	1000	9056
39MW1	L74093-4	07/27/99	THALLIUM	PPB	ND	1	6020
39MW1	L74093-4	07/27/99	TOXAPHENE	PPB	ND	2	8081

39MW4	L74093-5 Rep 1	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW4	L74093-5 Rep 2	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW4	L74093-5 Rep 3	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW4	L74093-5 Rep 4	07/27/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
39MW4	L74093-5	07/27/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW4	L74093-5 Dup	07/27/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
39MW4	L74093-5	07/27/99	ANTIMONY	PPB	ND	60	6020
39MW4	L74093-5	07/27/99	ARSENIC	PPB	2	1	6020
39MW4	L74093-5	07/27/99	BARIUM	PPB	56	2	6020
39MW4	L74093-5	07/27/99	BERYLLIUM	PPB	0.3	0.2	6020
39MW4	L74093-5	07/27/99	BHC-GAMMA	PPB	ND	2	8081
39MW4	L74093-5	07/27/99	CADMIUM	PPB	0.2	0.1	6020
39MW4	L74093-5	07/27/99	CHLORIDE	PPB	1300	1000	9056
39MW4	L74093-5	07/27/99	CHROMIUM	PPB	8	1	6020
39MW4	L74093-5	07/27/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
39MW4	L74093-5	07/27/99	2,4-D	PPB	ND	1.00	8151
39MW4	L74093-5	07/27/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
39MW4	L74093-5	07/27/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
39MW4	L74093-5	07/27/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
39MW4	L74093-5	07/27/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
39MW4	L74093-5	07/27/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
39MW4	L74093-5	07/27/99	ENDRIN	PPB	ND	2	8081
39MW4	L74093-5	07/27/99	FLUORIDE	PPB	ND	100	9056
39MW4	L74093-5	07/27/99	GROSS ALPHA	pCi/l	7.0	1	SW-846:9310
39MW4	L74093-5	07/27/99	GROSS BETA	pCi/l	20	1	SW-846:9310
39MW4	L74093-5	07/27/99	IRON	PPB	8860	1	6010A
39MW4	L74093-5	07/27/99	LEAD	PPB	10	1	6020
39MW4	L74093-5	07/27/99	MANGANESE	PPB	284	0.2	6020
39MW4	L74093-5	07/27/99	MERCURY	PPB	ND	0.2	7470A
39MW4	L74093-5	07/27/99	METHOXYCHLOR	PPB	ND	2	8081
39MW4	L74093-5	07/27/99	NICKEL	PPB	ND	15	6020
39MW4	L74093-5	07/27/99	NITRATE AS N	PPB	430	100	9056
39MW4	L74093-5	07/27/99	PHENOLS, TOTAL	PPB	ND	10	9065
39MW4	L74093-5	07/27/99	RADIUM	pCi/L	ND	1	SW-846:9320
39MW4	L74093-5	07/27/99	RESORCINOL	PPB	ND	10	8270B
39MW4	L74093-5	07/27/99	SELENIUM	PPB	ND	1	6020
39MW4	L74093-5	07/27/99	SILVER	PPB	ND	0.2	6020
39MW4	L74093-5	07/27/99	SODIUM	PPB	3840	100	6010A
39MW4	L74093-5	07/27/99	SULFATE	PPB	24400	1000	9056
39MW4	L74093-5	07/27/99	THALLIUM	PPB	ND	1	6020
39MW4	L74093-5	07/27/99	TOXAPHENE	PPB	ND	2	8081

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
MW1	9911298-01A Rep 1	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	9911298-01A Rep 2	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	9911298-01A Rep 3	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	9911298-01A Rep 4	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	9911298-01A	11/08/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW1	9911298-01A Dup	11/08/99	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW1	9911298-01A	11/08/99	ANTIMONY	PPB	ND	60		6020
MW1	9911298-01A	11/08/99	ARSENIC	PPB	ND	1		6020
MW1	9911298-01A	11/08/99	BARIUM	PPB	57	2		6020
MW1	9911298-01A	11/08/99	BERYLLIUM	PPB	ND	0.2		6020
MW1	9911298-01A	11/08/99	BHC-GAMMA	PPB	ND	2		8081
MW1	9911298-01A	11/08/99	CADMIUM	PPB	ND	0.1		6020
MW1	9911298-01A	11/08/99	CHLORIDE	PPB	ND	1000		9056
MW1	9911298-01A	11/08/99	CHROMIUM	PPB	4	1		6020
MW1	9911298-01A	11/08/99	COLIFORM BACT.	MPN/ml	2	2		9221E
MW1	9911298-01A	11/08/99	2,4-D	PPB	ND	1.00		8151
MW1	9911298-01A	11/08/99	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW1	9911298-01A	11/08/99	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW1	9911298-01A	11/08/99	DIETHYL PHTHALATE	PPB	ND	5		8270B
MW1	9911298-01A	11/08/99	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	9911298-01A	11/08/99	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	9911298-01A	11/08/99	ENDRIN	PPB	ND	2		8081
MW1	9911298-01A	11/08/99	FLUORIDE	PPB	ND	100		9056
MW1	9911298-01A	11/08/99	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
MW1	9911298-01A	11/08/99	GROSS BETA	pCi/l	ND	1		SW-846:9310
MW1	9911298-01A	11/08/99	IRON	PPB	133	1		6010A
MW1	9911298-01A	11/08/99	LEAD	PPB	ND	1		6020
MW1	9911298-01A	11/08/99	MANGANESE	PPB	2.3	0.2		6020
MW1	9911298-01A	11/08/99	MERCURY	PPB	ND	0.2		7470A
MW1	9911298-01A	11/08/99	METHOXYCHLOR	PPB	ND	2		8081
MW1	9911298-01A	11/08/99	NICKEL	PPB	ND	15		6020
MW1	9911298-01A	11/08/99	NITRATE AS N	PPB	ND	100		9056
MW1	9911298-01A	11/08/99	PHENOLS, TOTAL	PPB	ND	10		9065
MW1	9911298-01A	11/08/99	RADIUM	pCi/L	ND	1		SW-846:9320
MW1	9911298-01A	11/08/99	RESORCINOL	PPB	ND	10		8270B
MW1	9911298-01A	11/08/99	SELENIUM	PPB	2	1		6020
MW1	9911298-01A	11/08/99	SILVER	PPB	ND	0.2		6020
MW1	9911298-01A	11/08/99	SODIUM	PPB	8480	100		6010A
MW1	9911298-01A	11/08/99	SULFATE	PPB	ND	1000		9056
MW1	9911298-01A	11/08/99	THALLIUM	PPB	ND	1		6020
MW1	9911298-01A	11/08/99	TOXAPHENE	PPB	ND	2		8081

MW3	9911298-02A Rep 1	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW3	9911298-02A Rep 2	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW3	9911298-02A Rep 3	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW3	9911298-02A Rep 4	11/08/99	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW3	9911298-02A	11/08/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
MW3	9911298-02A Dup	11/08/99	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
MW3	9911298-02A	11/08/99	ANTIMONY	PPB	ND	60	6020
MW3	9911298-02A	11/08/99	ARSENIC	PPB	2	1	6020
MW3	9911298-02A	11/08/99	BARIUM	PPB	89	2	6020
MW3	9911298-02A	11/08/99	BERYLLIUM	PPB	ND	0.2	6020
MW3	9911298-02A	11/08/99	BHC-GAMMA	PPB	ND	2	8081
MW3	9911298-02A	11/08/99	CADMIUM	PPB	ND	0.1	6020
MW3	9911298-02A	11/08/99	CHLORIDE	PPB	ND	1000	9056
MW3	9911298-02A	11/08/99	CHROMIUM	PPB	5	1	6020
MW3	9911298-02A	11/08/99	COLIFORM BACT.	MPN/ml	ND	2	9221E
MW3	9911298-02A	11/08/99	2,4-D	PPB	ND	1.00	8151
MW3	9911298-02A	11/08/99	2,4,5 TP SILVEX	PPB	ND	1.00	8151
MW3	9911298-02A	11/08/99	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
MW3	9911298-02A	11/08/99	DIETHYL PHTHALATE	PPB	ND	5	8270B
MW3	9911298-02A	11/08/99	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	9911298-02A	11/08/99	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	9911298-02A	11/08/99	ENDRIN	PPB	ND	2	8081
MW3	9911298-02A	11/08/99	FLUORIDE	PPB	ND	100	9056
MW3	9911298-02A	11/08/99	GROSS ALPHA	pCi/l	ND	1	SW-846:9310
MW3	9911298-02A	11/08/99	GROSS BETA	pCi/l	ND	1	SW-846:9310
MW3	9911298-02A	11/08/99	IRON	PPB	52	1	6010A
MW3	9911298-02A	11/08/99	LEAD	PPB	ND	1	6020
MW3	9911298-02A	11/08/99	MANGANESE	PPB	2.3	0.2	6020
MW3	9911298-02A	11/08/99	MERCURY	PPB	ND	0.2	7470A
MW3	9911298-02A	11/08/99	METHOXYCHLOR	PPB	ND	2	8081
MW3	9911298-02A	11/08/99	NICKEL	PPB	ND	15	6020
MW3	9911298-02A	11/08/99	NITRATE AS N	PPB	ND	100	9056
MW3	9911298-02A	11/08/99	PHENOLS, TOTAL	PPB	ND	10	9065
MW3	9911298-02A	11/08/99	RADIUM	pCi/L	ND	1	SW-846:9320
MW3	9911298-02A	11/08/99	RESORCINOL	PPB	ND	10	8270B
MW3	9911298-02A	11/08/99	SELENIUM	PPB	ND	1	6020
MW3	9911298-02A	11/08/99	SILVER	PPB	ND	0.2	6020
MW3	9911298-02A	11/08/99	SODIUM	PPB	29000	100	6010A
MW3	9911298-02A	11/08/99	SULFATE	PPB	ND	1000	9056
MW3	9911298-02A	11/08/99	THALLIUM	PPB	ND	1	6020
MW3	9911298-02A	11/08/99	TOXAPHENE	PPB	ND	2	8081

LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			METHOD
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	
MW1	0003667-01A Rep 1	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0003667-01A Rep 2	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0003667-01A Rep 3	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0003667-01A Rep 4	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0003667-01A	03/15/00	TOTAL ORGANIC HALIDES	PPB	14	5		9020A
MW1	0003667-01A Dup	03/15/00	TOTAL ORGANIC HALIDES	PPB	12	5		9020A
MW1	0003667-01A	03/15/00	ANTIMONY	PPB	ND	60		6020
MW1	0003667-01A	03/15/00	ARSENIC	PPB	ND	1		6020
MW1	0003667-01A	03/15/00	BARIIUM	PPB	54	2		6020
MW1	0003667-01A	03/15/00	BERYLLIUM	PPB	ND	0.2		6020
MW1	0003667-01A	03/15/00	BHC-GAMMA	PPB	ND	2		8081
MW1	0003667-01A	03/15/00	CADMIUM	PPB	ND	0.1		6020
MW1	0003667-01A	03/15/00	CHLORIDE	PPB	6500	1000		9056
MW1	0003667-01A	03/15/00	CHROMIUM	PPB	2	1		6020
MW1	0003667-01A	03/15/00	COLIFORM BACT.	MPN/ml	ND	2		9221E
MW1	0003667-01A	03/15/00	2,4-D	PPB	ND	1.00		8151
MW1	0003667-01A	03/15/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW1	0003667-01A	03/15/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW1	0003667-01A	03/15/00	DIETHYL PHTHALATE	PPB	ND	5		8270B
MW1	0003667-01A	03/15/00	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0003667-01A	03/15/00	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0003667-01A	03/15/00	ENDRIN	PPB	ND	2		8081
MW1	0003667-01A	03/15/00	FLUORIDE	PPB	390	100		9056
MW1	0003667-01A	03/15/00	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
MW1	0003667-01A	03/15/00	GROSS BETA	pCi/l	1.6	1		SW-846:9310
MW1	0003667-01A	03/15/00	IRON	PPB	96	1		6010A
MW1	0003667-01A	03/15/00	LEAD	PPB	ND	1		6020
MW1	0003667-01A	03/15/00	MANGANESE	PPB	0.7	0.2		6020
MW1	0003667-01A	03/15/00	MERCURY	PPB	ND	0.2		7470A
MW1	0003667-01A	03/15/00	METHOXYCHLOR	PPB	ND	2		8081
MW1	0003667-01A	03/15/00	NICKEL	PPB	ND	15		6020
MW1	0003667-01A	03/15/00	NITRATE AS N	PPB	1570	100		9056
MW1	0003667-01A	03/15/00	PHENOLS, TOTAL	PPB	ND	10		9065
MW1	0003667-01A	03/15/00	RADIUM	pCi/L	ND	1		SW-846:9320
MW1	0003667-01A	03/15/00	RESORCINOL	PPB	ND	10		8270B
MW1	0003667-01A	03/15/00	SELENIUM	PPB	2	1		6020
MW1	0003667-01A	03/15/00	SILVER	PPB	ND	0.2		6020
MW1	0003667-01A	03/15/00	SODIUM	PPB	6210	100		6010A
MW1	0003667-01A	03/15/00	SULFATE	PPB	21400	1000		9056
MW1	0003667-01A	03/15/00	THALLIUM	PPB	ND	1		6020
MW1	0003667-01A	03/15/00	TOXAPHENE	PPB	ND	2		8081
MW3	0003667-02A Rep 1	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0003667-02A Rep 2	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0003667-02A Rep 3	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0003667-02A Rep 4	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0003667-02A	03/15/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0003667-02A Dup	03/15/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0003667-02A	03/15/00	ANTIMONY	PPB	ND	60		6020
MW3	0003667-02A	03/15/00	ARSENIC	PPB	ND	1		6020
MW3	0003667-02A	03/15/00	BARIIUM	PPB	96	2		6020
MW3	0003667-02A	03/15/00	BERYLLIUM	PPB	ND	0.2		6020
MW3	0003667-02A	03/15/00	BHC-GAMMA	PPB	ND	2		8081
MW3	0003667-02A	03/15/00	CADMIUM	PPB	ND	0.1		6020
MW3	0003667-02A	03/15/00	CHLORIDE	PPB	10900	1000		9056
MW3	0003667-02A	03/15/00	CHROMIUM	PPB	4	1		6020
MW3	0003667-02A	03/15/00	COLIFORM BACT.	MPN/ml	ND	2		9221E
MW3	0003667-02A	03/15/00	2,4-D	PPB	ND	1.00		8151
MW3	0003667-02A	03/15/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW3	0003667-02A	03/15/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW3	0003667-02A	03/15/00	DIETHYL PHTHALATE	PPB	ND	5		8270B

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MW3	0003667-02A	03/15/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0003667-02A	03/15/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0003667-02A	03/15/00	ENDRIN	PPB	ND	2	8081
MW3	0003667-02A	03/15/00	FLUORIDE	PPB	300	100	9056
MW3	0003667-02A	03/15/00	GROSS ALPHA	pCi/l	0.5	1	SW-846:9310
MW3	0003667-02A	03/15/00	GROSS BETA	pCi/l	7.2	1	SW-846:9310
MW3	0003667-02A	03/15/00	IRON	PPB	28	1	6010A
MW3	0003667-02A	03/15/00	LEAD	PPB	ND	1	6020
MW3	0003667-02A	03/15/00	MANGANESE	PPB	ND	0.2	6020
MW3	0003667-02A	03/15/00	MERCURY	PPB	ND	0.2	7470A
MW3	0003667-02A	03/15/00	METHOXYCHLOR	PPB	ND	2	8081
MW3	0003667-02A	03/15/00	NICKEL	PPB	ND	15	6020
MW3	0003667-02A	03/15/00	NITRATE AS N	PPB	6820	100	9056
MW3	0003667-02A	03/15/00	PHENOLS, TOTAL	PPB	ND	10	9065
MW3	0003667-02A	03/15/00	RADIUM	pCi/L	1.6	1	SW-846:9320
MW3	0003667-02A	03/15/00	RESORCINOL	PPB	ND	10	8270B
MW3	0003667-02A	03/15/00	SELENIUM	PPB	ND	1	6020
MW3	0003667-02A	03/15/00	SILVER	PPB	ND	0.2	6020
MW3	0003667-02A	03/15/00	SODIUM	PPB	35200	100	6010A
MW3	0003667-02A	03/15/00	SULFATE	PPB	168000	1000	9056
MW3	0003667-02A	03/15/00	THALLIUM	PPB	ND	1	6020
MW3	0003667-02A	03/15/00	TOXAPHENE	PPB	ND	2	8081
MW4	0003667-03A Rep 1	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0003667-03A Rep 2	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0003667-03A Rep 3	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0003667-03A Rep 4	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0003667-03A	03/15/00	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
MW4	0003667-03A Dup	03/15/00	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
MW4	0003667-03A	03/15/00	ANTIMONY	PPB	ND	60	6020
MW4	0003667-03A	03/15/00	ARSENIC	PPB	ND	1	6020
MW4	0003667-03A	03/15/00	BARIUM	PPB	132	2	6020
MW4	0003667-03A	03/15/00	BERYLLIUM	PPB	ND	0.2	6020
MW4	0003667-03A	03/15/00	BHC-GAMMA	PPB	ND	2	8081
MW4	0003667-03A	03/15/00	CADMIUM	PPB	ND	0.1	6020
MW4	0003667-03A	03/15/00	CHLORIDE	PPB	380	1000	9056
MW4	0003667-03A	03/15/00	CHROMIUM	PPB	ND	1	6020
MW4	0003667-03A	03/15/00	COLIFORM BACT.	MPN/ml	ND	2	9221E
MW4	0003667-03A	03/15/00	2,4-D	PPB	ND	1.00	8151
MW4	0003667-03A	03/15/00	2,4,5 TP SILVEX	PPB	ND	1.00	8151
MW4	0003667-03A	03/15/00	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
MW4	0003667-03A	03/15/00	DIETHYL PHTHALATE	PPB	ND	5	8270B
MW4	0003667-03A	03/15/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
MW4	0003667-03A	03/15/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
MW4	0003667-03A	03/15/00	ENDRIN	PPB	ND	2	8081
MW4	0003667-03A	03/15/00	FLUORIDE	PPB	220	100	9056
MW4	0003667-03A	03/15/00	GROSS ALPHA	pCi/l	ND	1	SW-846:9310
MW4	0003667-03A	03/15/00	GROSS BETA	pCi/l	11.6	1	SW-846:9310
MW4	0003667-03A	03/15/00	IRON	PPB	396	1	6010A
MW4	0003667-03A	03/15/00	LEAD	PPB	ND	1	6020
MW4	0003667-03A	03/15/00	MANGANESE	PPB	33	0.2	6020
MW4	0003667-03A	03/15/00	MERCURY	PPB	ND	0.2	7470A
MW4	0003667-03A	03/15/00	METHOXYCHLOR	PPB	ND	2	8081
MW4	0003667-03A	03/15/00	NICKEL	PPB	ND	15	6020
MW4	0003667-03A	03/15/00	NITRATE AS N	PPB	1210	100	9056
MW4	0003667-03A	03/15/00	PHENOLS, TOTAL	PPB	ND	10	9065
MW4	0003667-03A	03/15/00	RADIUM	pCi/L	ND	1	SW-846:9320
MW4	0003667-03A	03/15/00	RESORCINOL	PPB	ND	10	8270B
MW4	0003667-03A	03/15/00	SELENIUM	PPB	ND	1	6020
MW4	0003667-03A	03/15/00	SILVER	PPB	ND	0.2	6020
MW4	0003667-03A	03/15/00	SODIUM	PPB	12500	100	6010A
MW4	0003667-03A	03/15/00	SULFATE	PPB	90100	1000	9056
MW4	0003667-03A	03/15/00	THALLIUM	PPB	ND	1	6020
MW4	0003667-03A	03/15/00	TOXAPHENE	PPB	ND	2	8081

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D-00	0003667-04A Rep 1	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
D-00	0003667-04A Rep 2	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
D-00	0003667-04A Rep 3	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
D-00	0003667-04A Rep 4	03/15/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
D-00	0003667-04A	03/15/00	TOTAL ORGANIC HALIDES	PPB	14	5	9020A
D-00	0003667-04A Dup	03/15/00	TOTAL ORGANIC HALIDES	PPB	15	5	9020A
D-00	0003667-04A	03/15/00	ANTIMONY	PPB	ND	60	6020
D-00	0003667-04A	03/15/00	ARSENIC	PPB	ND	1	6020
D-00	0003667-04A	03/15/00	BARIUM	PPB	54	2	6020
D-00	0003667-04A	03/15/00	BERYLLIUM	PPB	ND	0.2	6020
D-00	0003667-04A	03/15/00	BHC-GAMMA	PPB	ND	2	8081
D-00	0003667-04A	03/15/00	CADMIUM	PPB	ND	0.1	6020
D-00	0003667-04A	03/15/00	CHLORIDE	PPB	6400	1000	9056
D-00	0003667-04A	03/15/00	CHROMIUM	PPB	2	1	6020
D-00	0003667-04A	03/15/00	COLIFORM BACT.	MPN/ml	ND	2	9221E
D-00	0003667-04A	03/15/00	2,4-D	PPB	ND	1.00	8151
D-00	0003667-04A	03/15/00	2,4,5 TP SILVEX	PPB	ND	1.00	8151
D-00	0003667-04A	03/15/00	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
D-00	0003667-04A	03/15/00	DIETHYL PHTHALATE	PPB	ND	5	8270B
D-00	0003667-04A	03/15/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
D-00	0003667-04A	03/15/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
D-00	0003667-04A	03/15/00	ENDRIN	PPB	ND	2	8081
D-00	0003667-04A	03/15/00	FLUORIDE	PPB	400	100	9056
D-00	0003667-04A	03/15/00	GROSS ALPHA	pCi/l	ND	1	SW-846:9310
D-00	0003667-04A	03/15/00	GROSS BETA	pCi/l	1.5	1	SW-846:9310
D-00	0003667-04A	03/15/00	IRON	PPB	46	1	6010A
D-00	0003667-04A	03/15/00	LEAD	PPB	ND	1	6020
D-00	0003667-04A	03/15/00	MANGANESE	PPB	0.2	0.2	6020
D-00	0003667-04A	03/15/00	MERCURY	PPB	ND	0.2	7470A
D-00	0003667-04A	03/15/00	METHOXYCHLOR	PPB	ND	2	8081
D-00	0003667-04A	03/15/00	NICKEL	PPB	ND	15	6020
D-00	0003667-04A	03/15/00	NITRATE AS N	PPB	1620	100	9056
D-00	0003667-04A	03/15/00	PHENOLS, TOTAL	PPB	ND	10	9065
D-00	0003667-04A	03/15/00	RADIUM	pCi/L	ND	1	SW-846:9320
D-00	0003667-04A	03/15/00	RESORCINOL	PPB	ND	10	8270B
D-00	0003667-04A	03/15/00	SELENIUM	PPB	2	1	6020
D-00	0003667-04A	03/15/00	SILVER	PPB	ND	0.2	6020
D-00	0003667-04A	03/15/00	SODIUM	PPB	6400	100	6010A
D-00	0003667-04A	03/15/00	SULFATE	PPB	21300	1000	9056
D-00	0003667-04A	03/15/00	THALLIUM	PPB	ND	1	6020
D-00	0003667-04A	03/15/00	TOXAPHENE	PPB	ND	2	8081

LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			METHOD
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	
MW1	0005318-01A Rep 1	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0005318-01A Rep 2	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0005318-01A Rep 3	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0005318-01A Rep 4	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0005318-01A	05/08/00	TOTAL ORGANIC HALIDES	PPB	7	5		9020A
MW1	0005318-01A Dup	05/08/00	TOTAL ORGANIC HALIDES	PPB	6	5		9020A
MW1	0005318-01A	05/08/00	ANTIMONY	PPB	ND	60		6020
MW1	0005318-01A	05/08/00	ARSENIC	PPB	ND	1		6020
MW1	0005318-01A	05/08/00	BARIUM	PPB	43	2		6020
MW1	0005318-01A	05/08/00	BERYLLIUM	PPB	ND	0.2		6020
MW1	0005318-01A	05/08/00	BHC-GAMMA	PPB	ND	2		8081
MW1	0005318-01A	05/08/00	CADMIUM	PPB	ND	0.1		6020
MW1	0005318-01A	05/08/00	CHLORIDE	PPB	4400	1000		9056
MW1	0005318-01A	05/08/00	CHROMIUM	PPB	2	1		6020
MW1	0005318-01A	05/08/00	COLIFORM BACT.	MPN/ml	130	2		9221E
MW1	0005318-01A	05/08/00	2,4-D	PPB	ND	1.00		8151
MW1	0005318-01A	05/08/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW1	0005318-01A	05/08/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW1	0005318-01A	05/08/00	DIETHYL PHTHALATE	PPB	ND	5		8270B
MW1	0005318-01A	05/08/00	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0005318-01A	05/08/00	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0005318-01A	05/08/00	ENDRIN	PPB	ND	2		8081
MW1	0005318-01A	05/08/00	FLUORIDE	PPB	250	100		9056
MW1	0005318-01A	05/08/00	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
MW1	0005318-01A	05/08/00	GROSS BETA	pCi/l	3	1		SW-846:9310
MW1	0005318-01A	05/08/00	IRON	PPB	171	1		6010A
MW1	0005318-01A	05/08/00	LEAD	PPB	ND	1		6020
MW1	0005318-01A	05/08/00	MANGANESE	PPB	2.0	0.2		6020
MW1	0005318-01A	05/08/00	MERCURY	PPB	ND	0.2		7470A
MW1	0005318-01A	05/08/00	METHOXYCHLOR	PPB	ND	2		8081
MW1	0005318-01A	05/08/00	NICKEL	PPB	ND	15		6020
MW1	0005318-01A	05/08/00	NITRATE AS N	PPB	1670	100		9056
MW1	0005318-01A	05/08/00	PHENOLS, TOTAL	PPB	ND	10		9065
MW1	0005318-01A	05/08/00	RADIUM	pCi/L	1	1		SW-846:9320
MW1	0005318-01A	05/08/00	RESORCINOL	PPB	ND	10		8270B
MW1	0005318-01A	05/08/00	SELENIUM	PPB	ND	1		6020
MW1	0005318-01A	05/08/00	SILVER	PPB	ND	0.2		6020
MW1	0005318-01A	05/08/00	SODIUM	PPB	ND	100		6010A
MW1	0005318-01A	05/08/00	SULFATE	PPB	19800	1000		9056
MW1	0005318-01A	05/08/00	THALLIUM	PPB	ND	1		6020
MW1	0005318-01A	05/08/00	TOXAPHENE	PPB	ND	2		8081
MW3	0005318-02A Rep 1	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0005318-02A Rep 2	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0005318-02A Rep 3	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0005318-02A Rep 4	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0005318-02A	05/08/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0005318-02A Dup	05/08/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0005318-02A	05/08/00	ANTIMONY	PPB	ND	60		6020
MW3	0005318-02A	05/08/00	ARSENIC	PPB	ND	1		6020
MW3	0005318-02A	05/08/00	BARIUM	PPB	69	2		6020
MW3	0005318-02A	05/08/00	BERYLLIUM	PPB	ND	0.2		6020
MW3	0005318-02A	05/08/00	BHC-GAMMA	PPB	ND	2		8081
MW3	0005318-02A	05/08/00	CADMIUM	PPB	ND	0.1		6020
MW3	0005318-02A	05/08/00	CHLORIDE	PPB	8800	1000		9056
MW3	0005318-02A	05/08/00	CHROMIUM	PPB	5	1		6020
MW3	0005318-02A	05/08/00	COLIFORM BACT.	MPN/ml	ND	2		9221E
MW3	0005318-02A	05/08/00	2,4-D	PPB	ND	1.00		8151
MW3	0005318-02A	05/08/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW3	0005318-02A	05/08/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW3	0005318-02A	05/08/00	DIETHYL PHTHALATE	PPB	ND	5		8270B

MW3	0005318-02A	05/08/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0005318-02A	05/08/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0005318-02A	05/08/00	ENDRIN	PPB	ND	2	8081
MW3	0005318-02A	05/08/00	FLUORIDE	PPB	300	100	9056
MW3	0005318-02A	05/08/00	GROSS ALPHA	pCi/l	3	1	SW-846:9310
MW3	0005318-02A	05/08/00	GROSS BETA	pCi/l	6	1	SW-846:9310
MW3	0005318-02A	05/08/00	IRON	PPB	17	1	6010A
MW3	0005318-02A	05/08/00	LEAD	PPB	2	1	6020
MW3	0005318-02A	05/08/00	MANGANESE	PPB	0.8	0.2	6020
MW3	0005318-02A	05/08/00	MERCURY	PPB	ND	0.2	7470A
MW3	0005318-02A	05/08/00	METHOXYCHLOR	PPB	ND	2	8081
MW3	0005318-02A	05/08/00	NICKEL	PPB	ND	15	6020
MW3	0005318-02A	05/08/00	NITRATE AS N	PPB	7080	100	9056
MW3	0005318-02A	05/08/00	PHENOLS, TOTAL	PPB	ND	10	9065
MW3	0005318-02A	05/08/00	RADIUM	pCi/L	3	1	SW-846:9320
MW3	0005318-02A	05/08/00	RESORCINOL	PPB	ND	10	8270B
MW3	0005318-02A	05/08/00	SELENIUM	PPB	ND	1	6020
MW3	0005318-02A	05/08/00	SILVER	PPB	ND	0.2	6020
MW3	0005318-02A	05/08/00	SODIUM	PPB	ND	100	6010A
MW3	0005318-02A	05/08/00	SULFATE	PPB	159000	1000	9056
MW3	0005318-02A	05/08/00	THALLIUM	PPB	ND	1	6020
MW3	0005318-02A	05/08/00	TOXAPHENE	PPB	ND	2	8081
MW4	0005318-03A Rep 1	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0005318-03A Rep 2	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0005318-03A Rep 3	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0005318-03A Rep 4	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
MW4	0005318-03A	05/08/00	TOTAL ORGANIC HALIDES	PPB	6	5	9020A
MW4	0005318-03A Dup	05/08/00	TOTAL ORGANIC HALIDES	PPB	7	5	9020A
MW4	0005318-03A	05/08/00	ANTIMONY	PPB	ND	60	6020
MW4	0005318-03A	05/08/00	ARSENIC	PPB	ND	1	6020
MW4	0005318-03A	05/08/00	BARIUM	PPB	108	2	6020
MW4	0005318-03A	05/08/00	BERYLLIUM	PPB	ND	0.2	6020
MW4	0005318-03A	05/08/00	BHC-GAMMA	PPB	ND	2	8081
MW4	0005318-03A	05/08/00	CADMIUM	PPB	ND	0.1	6020
MW4	0005318-03A	05/08/00	CHLORIDE	PPB	2100	1000	9056
MW4	0005318-03A	05/08/00	CHROMIUM	PPB	ND	1	6020
MW4	0005318-03A	05/08/00	COLIFORM BACT.	MPN/ml	4	2	9221E
MW4	0005318-03A	05/08/00	2,4-D	PPB	ND	1.00	8151
MW4	0005318-03A	05/08/00	2,4,5 TP SILVEX	PPB	ND	1.00	8151
MW4	0005318-03A	05/08/00	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
MW4	0005318-03A	05/08/00	DIETHYL PHTHALATE	PPB	ND	5	8270B
MW4	0005318-03A	05/08/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
MW4	0005318-03A	05/08/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
MW4	0005318-03A	05/08/00	ENDRIN	PPB	ND	2	8081
MW4	0005318-03A	05/08/00	FLUORIDE	PPB	160	100	9056
MW4	0005318-03A	05/08/00	GROSS ALPHA	pCi/l	2	1	SW-846:9310
MW4	0005318-03A	05/08/00	GROSS BETA	pCi/l	11	1	SW-846:9310
MW4	0005318-03A	05/08/00	IRON	PPB	29	1	6010A
MW4	0005318-03A	05/08/00	LEAD	PPB	ND	1	6020
MW4	0005318-03A	05/08/00	MANGANESE	PPB	13.8	0.2	6020
MW4	0005318-03A	05/08/00	MERCURY	PPB	ND	0.2	7470A
MW4	0005318-03A	05/08/00	METHOXYCHLOR	PPB	ND	2	8081
MW4	0005318-03A	05/08/00	NICKEL	PPB	ND	15	6020
MW4	0005318-03A	05/08/00	NITRATE AS N	PPB	870	100	9056
MW4	0005318-03A	05/08/00	PHENOLS, TOTAL	PPB	ND	10	9065
MW4	0005318-03A	05/08/00	RADIUM	pCi/L	ND	1	SW-846:9320
MW4	0005318-03A	05/08/00	RESORCINOL	PPB	ND	10	8270B
MW4	0005318-03A	05/08/00	SELENIUM	PPB	ND	1	6020
MW4	0005318-03A	05/08/00	SILVER	PPB	ND	0.2	6020
MW4	0005318-03A	05/08/00	SODIUM	PPB	ND	100	6010A
MW4	0005318-03A	05/08/00	SULFATE	PPB	93400	1000	9056
MW4	0005318-03A	05/08/00	THALLIUM	PPB	ND	1	6020
MW4	0005318-03A	05/08/00	TOXAPHENE	PPB	ND	2	8081

EquipBlank	0005318-04A Rep 1	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0005318-04A Rep 2	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0005318-04A Rep 3	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0005318-04A Rep 4	05/08/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0005318-04A	05/08/00	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
EquipBlank	0005318-04A Dup	05/08/00	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
EquipBlank	0005318-04A	05/08/00	ANTIMONY	PPB	ND	60	6020
EquipBlank	0005318-04A	05/08/00	ARSENIC	PPB	ND	1	6020
EquipBlank	0005318-04A	05/08/00	BARIUM	PPB	ND	2	6020
EquipBlank	0005318-04A	05/08/00	BERYLLIUM	PPB	ND	0.2	6020
EquipBlank	0005318-04A	05/08/00	BHC-GAMMA	PPB	ND	2	8081
EquipBlank	0005318-04A	05/08/00	CADMIUM	PPB	ND	0.1	6020
EquipBlank	0005318-04A	05/08/00	CHLORIDE	PPB	ND	1000	9056
EquipBlank	0005318-04A	05/08/00	CHROMIUM	PPB	ND	1	6020
EquipBlank	0005318-04A	05/08/00	COLIFORM BACT.	MPN/ml	ND	2	9221E
EquipBlank	0005318-04A	05/08/00	2,4-D	PPB	ND	1.00	8151
EquipBlank	0005318-04A	05/08/00	2,4,5 TP SILVEX	PPB	ND	1.00	8151
EquipBlank	0005318-04A	05/08/00	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
EquipBlank	0005318-04A	05/08/00	DIETHYL PHTHALATE	PPB	ND	5	8270B
EquipBlank	0005318-04A	05/08/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
EquipBlank	0005318-04A	05/08/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
EquipBlank	0005318-04A	05/08/00	ENDRIN	PPB	ND	2	8081
EquipBlank	0005318-04A	05/08/00	FLUORIDE	PPB	ND	100	9056
EquipBlank	0005318-04A	05/08/00	GROSS ALPHA	pCi/l	ND	1	SW-846:9310
EquipBlank	0005318-04A	05/08/00	GROSS BETA	pCi/l	ND	1	SW-846:9310
EquipBlank	0005318-04A	05/08/00	IRON	PPB	15	1	6010A
EquipBlank	0005318-04A	05/08/00	LEAD	PPB	ND	1	6020
EquipBlank	0005318-04A	05/08/00	MANGANESE	PPB	0.4	0.2	6020
EquipBlank	0005318-04A	05/08/00	MERCURY	PPB	ND	0.2	7470A
EquipBlank	0005318-04A	05/08/00	METHOXYCHLOR	PPB	ND	2	8081
EquipBlank	0005318-04A	05/08/00	NICKEL	PPB	ND	15	6020
EquipBlank	0005318-04A	05/08/00	NITRATE AS N	PPB	ND	100	9056
EquipBlank	0005318-04A	05/08/00	PHENOLS, TOTAL	PPB	ND	10	9065
EquipBlank	0005318-04A	05/08/00	RADIUM	pCi/L	ND	1	SW-846:9320
EquipBlank	0005318-04A	05/08/00	RESORCINOL	PPB	ND	10	8270B
EquipBlank	0005318-04A	05/08/00	SELENIUM	PPB	ND	1	6020
EquipBlank	0005318-04A	05/08/00	SILVER	PPB	ND	0.2	6020
EquipBlank	0005318-04A	05/08/00	SODIUM	PPB	ND	100	6010A
EquipBlank	0005318-04A	05/08/00	SULFATE	PPB	ND	1000	9056
EquipBlank	0005318-04A	05/08/00	THALLIUM	PPB	ND	1	6020
EquipBlank	0005318-04A	05/08/00	TOXAPHENE	PPB	ND	2	8081

LOCATION	LAB. NO.	SAMPLE		UNITS	DETECTION			
		DATE	PARAMETERS		RESULTS	LIMITS	QUALIF	METHOD
MW1	0008037-01A Rep 1	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0008037-01A Rep 2	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0008037-01A Rep 3	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0008037-01A Rep 4	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0008037-01A	08/01/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW1	0008037-01A Dup	08/01/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW1	0008037-01A	08/01/00	ANTIMONY	PPB	ND	60		6020
MW1	0008037-01A	08/01/00	ARSENIC	PPB	ND	1		6020
MW1	0008037-01A	08/01/00	BARIIUM	PPB	46	2		6020
MW1	0008037-01A	08/01/00	BERYLLIUM	PPB	ND	0.2		6020
MW1	0008037-01A	08/01/00	BHC-GAMMA	PPB	ND	2		8081
MW1	0008037-01A	08/01/00	CADMIUM	PPB	ND	0.1		6020
MW1	0008037-01A	08/01/00	CHLORIDE	PPB	7400	1000		9056
MW1	0008037-01A	08/01/00	CHROMIUM	PPB	3	1		6020
MW1	0008037-01A	08/01/00	COLIFORM BACT.	MPN/ml	ND	2		9221E
MW1	0008037-01A	08/01/00	2,4-D	PPB	ND	1.00		8151
MW1	0008037-01A	08/01/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW1	0008037-01A	08/01/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW1	0008037-01A	08/01/00	DIETHYL PHTHALATE	PPB	ND	5		8270B
MW1	0008037-01A	08/01/00	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0008037-01A	08/01/00	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0008037-01A	08/01/00	ENDRIN	PPB	ND	2		8081
MW1	0008037-01A	08/01/00	FLUORIDE	PPB	410	100		9056
MW1	0008037-01A	08/01/00	GROSS ALPHA	pCi/l	ND	1		SW-846:9310
MW1	0008037-01A	08/01/00	GROSS BETA	pCi/l	3.2	1		SW-846:9310
MW1	0008037-01A	08/01/00	IRON	PPB	513	1		6010A
MW1	0008037-01A	08/01/00	LEAD	PPB	ND	1		6020
MW1	0008037-01A	08/01/00	MANGANESE	PPB	5.6	0.2		6020
MW1	0008037-01A	08/01/00	MERCURY	PPB	ND	0.2		7470A
MW1	0008037-01A	08/01/00	METHOXYCHLOR	PPB	ND	2		8081
MW1	0008037-01A	08/01/00	NICKEL	PPB	ND	15		6020
MW1	0008037-01A	08/01/00	NITRATE AS N	PPB	1230	100		9056
MW1	0008037-01A	08/01/00	PHENOLS, TOTAL	PPB	ND	10		9065
MW1	0008037-01A	08/01/00	RADIUM	pCi/L	ND	1		SW-846:9320
MW1	0008037-01A	08/01/00	RESORCINOL	PPB	ND	10		8270B
MW1	0008037-01A	08/01/00	SELENIUM	PPB	ND	1		6020
MW1	0008037-01A	08/01/00	SILVER	PPB	ND	0.2		6020
MW1	0008037-01A	08/01/00	SODIUM	PPB	ND	100		6010A
MW1	0008037-01A	08/01/00	SULFATE	PPB	17500	1000		9056
MW1	0008037-01A	08/01/00	THALLIUM	PPB	ND	1		6020
MW1	0008037-01A	08/01/00	TOXAPHENE	PPB	ND	2		8081
MW3	0008037-02A Rep 1	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0008037-02A Rep 2	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0008037-02A Rep 3	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0008037-02A Rep 4	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0008037-02A	08/01/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0008037-02A Dup	08/01/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0008037-02A	08/01/00	ANTIMONY	PPB	ND	60		6020
MW3	0008037-02A	08/01/00	ARSENIC	PPB	ND	1		6020
MW3	0008037-02A	08/01/00	BARIIUM	PPB	96	2		6020
MW3	0008037-02A	08/01/00	BERYLLIUM	PPB	ND	0.2		6020
MW3	0008037-02A	08/01/00	BHC-GAMMA	PPB	ND	2		8081
MW3	0008037-02A	08/01/00	CADMIUM	PPB	ND	0.1		6020
MW3	0008037-02A	08/01/00	CHLORIDE	PPB	22100	1000		9056
MW3	0008037-02A	08/01/00	CHROMIUM	PPB	4	1		6020
MW3	0008037-02A	08/01/00	COLIFORM BACT.	MPN/ml	23	2		9221E
MW3	0008037-02A	08/01/00	2,4-D	PPB	ND	1.00		8151
MW3	0008037-02A	08/01/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW3	0008037-02A	08/01/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW3	0008037-02A	08/01/00	DIETHYL PHTHALATE	PPB	ND	5		8270B

MW3	0008037-02A	08/01/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0008037-02A	08/01/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0008037-02A	08/01/00	ENDRIN	PPB	ND	2	8081
MW3	0008037-02A	08/01/00	FLUORIDE	PPB	330	100	9056
MW3	0008037-02A	08/01/00	GROSS ALPHA	pCi/l	1	1	SW-846:9310
MW3	0008037-02A	08/01/00	GROSS BETA	pCi/l	9	1	SW-846:9310
MW3	0008037-02A	08/01/00	IRON	PPB	15	1	6010A
MW3	0008037-02A	08/01/00	LEAD	PPB	ND	1	6020
MW3	0008037-02A	08/01/00	MANGANESE	PPB	ND	0.2	6020
MW3	0008037-02A	08/01/00	MERCURY	PPB	ND	0.2	7470A
MW3	0008037-02A	08/01/00	METHOXYCHLOR	PPB	ND	2	8081
MW3	0008037-02A	08/01/00	NICKEL	PPB	ND	15	6020
MW3	0008037-02A	08/01/00	NITRATE AS N	PPB	6420	100	9056
MW3	0008037-02A	08/01/00	PHENOLS, TOTAL	PPB	ND	10	9065
MW3	0008037-02A	08/01/00	RADIUM	pCi/L	6.1	1	SW-846:9320
MW3	0008037-02A	08/01/00	RESORCINOL	PPB	ND	10	8270B
MW3	0008037-02A	08/01/00	SELENIUM	PPB	ND	1	6020
MW3	0008037-02A	08/01/00	SILVER	PPB	ND	0.2	6020
MW3	0008037-02A	08/01/00	SODIUM	PPB	ND	100	6010A
MW3	0008037-02A	08/01/00	SULFATE	PPB	189000	1000	9056
MW3	0008037-02A	08/01/00	THALLIUM	PPB	ND	1	6020
MW3	0008037-02A	08/01/00	TOXAPHENE	PPB	ND	2	8081
EquipBlank	0008037-03A Rep 1	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0008037-03A Rep 2	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0008037-03A Rep 3	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0008037-03A Rep 4	08/01/00	TOTAL ORGANIC CARBON	PPB	ND	1000	9060
EquipBlank	0008037-03A	08/01/00	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
EquipBlank	0008037-03A Dup	08/01/00	TOTAL ORGANIC HALIDES	PPB	ND	5	9020A
EquipBlank	0008037-03A	08/01/00	ANTIMONY	PPB	ND	60	6020
EquipBlank	0008037-03A	08/01/00	ARSENIC	PPB	ND	1	6020
EquipBlank	0008037-03A	08/01/00	BARIUM	PPB	ND	2	6020
EquipBlank	0008037-03A	08/01/00	BERYLLIUM	PPB	ND	0.2	6020
EquipBlank	0008037-03A	08/01/00	BHC-GAMMA	PPB	ND	2	8081
EquipBlank	0008037-03A	08/01/00	CADMIUM	PPB	ND	0.1	6020
EquipBlank	0008037-03A	08/01/00	CHLORIDE	PPB	ND	1000	9056
EquipBlank	0008037-03A	08/01/00	CHROMIUM	PPB	ND	1	6020
EquipBlank	0008037-03A	08/01/00	COLIFORM BACT.	MPN/ml	ND	2	9221E
EquipBlank	0008037-03A	08/01/00	2,4-D	PPB	ND	1.00	8151
EquipBlank	0008037-03A	08/01/00	2,4,5 TP SILVEX	PPB	ND	1.00	8151
EquipBlank	0008037-03A	08/01/00	DI-N-BUTYL PHTHALATE	PPB	ND	5	8270B
EquipBlank	0008037-03A	08/01/00	DIETHYL PHTHALATE	PPB	ND	5	8270B
EquipBlank	0008037-03A	08/01/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
EquipBlank	0008037-03A	08/01/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
EquipBlank	0008037-03A	08/01/00	ENDRIN	PPB	ND	2	8081
EquipBlank	0008037-03A	08/01/00	FLUORIDE	PPB	ND	100	9056
EquipBlank	0008037-03A	08/01/00	GROSS ALPHA	pCi/l	ND	1	SW-846:9310
EquipBlank	0008037-03A	08/01/00	GROSS BETA	pCi/l	ND	1	SW-846:9310
EquipBlank	0008037-03A	08/01/00	IRON	PPB	3	1	6010A
EquipBlank	0008037-03A	08/01/00	LEAD	PPB	ND	1	6020
EquipBlank	0008037-03A	08/01/00	MANGANESE	PPB	ND	0.2	6020
EquipBlank	0008037-03A	08/01/00	MERCURY	PPB	ND	0.2	7470A
EquipBlank	0008037-03A	08/01/00	METHOXYCHLOR	PPB	ND	2	8081
EquipBlank	0008037-03A	08/01/00	NICKEL	PPB	ND	15	6020
EquipBlank	0008037-03A	08/01/00	NITRATE AS N	PPB	ND	100	9056
EquipBlank	0008037-03A	08/01/00	PHENOLS, TOTAL	PPB	ND	10	9065
EquipBlank	0008037-03A	08/01/00	RADIUM	pCi/L	ND	1	SW-846:9320
EquipBlank	0008037-03A	08/01/00	RESORCINOL	PPB	ND	10	8270B
EquipBlank	0008037-03A	08/01/00	SELENIUM	PPB	ND	1	6020
EquipBlank	0008037-03A	08/01/00	SILVER	PPB	ND	0.2	6020
EquipBlank	0008037-03A	08/01/00	SODIUM	PPB	ND	100	6010A
EquipBlank	0008037-03A	08/01/00	SULFATE	PPB	ND	1000	9056
EquipBlank	0008037-03A	08/01/00	THALLIUM	PPB	ND	1	6020
EquipBlank	0008037-03A	08/01/00	TOXAPHENE	PPB	ND	2	8081

3		SAMPLE		DETECTION				
LOCATION	LAB. NO.	DATE	PARAMETERS	UNITS	RESULTS	LIMITS	QUALIF	METHOD
MW1	0011898-01A Rep 1	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0011898-01A Rep 2	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0011898-01A Rep 3	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0011898-01A Rep 4	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW1	0011898-01A	11/29/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW1	0011898-01A Dup	11/29/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW1	0011898-01A	11/29/00	ANTIMONY	PPB	ND	60		6020
MW1	0011898-01A	11/29/00	ARSENIC	PPB	ND	1		6020
MW1	0011898-01A	11/29/00	BARIIUM	PPB	46	2		6020
MW1	0011898-01A	11/29/00	BERYLLIUM	PPB	ND	0.2		6020
MW1	0011898-01A	11/29/00	BHC-GAMMA	PPB	ND	2		8081
MW1	0011898-01A	11/29/00	CADMIUM	PPB	ND	0.1		6020
MW1	0011898-01A	11/29/00	CHLORIDE	PPB	10100	1000		9056
MW1	0011898-01A	11/29/00	CHROMIUM	PPB	3	1		6020
MW1	0011898-01A	11/29/00	COLIFORM BACT.	MPN/ml	6	2		9221E
MW1	0011898-01A	11/29/00	2,4-D	PPB	ND	1.00		8151
MW1	0011898-01A	11/29/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW1	0011898-01A	11/29/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW1	0011898-01A	11/29/00	DIETHYL PHTHALATE	PPB	ND	5		8270B
MW1	0011898-01A	11/29/00	2,4-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0011898-01A	11/29/00	2,6-DINITROTOLUENE	PPB	ND	0.08		8090
MW1	0011898-01A	11/29/00	ENDRIN	PPB	ND	2		8081
MW1	0011898-01A	11/29/00	FLUORIDE	PPB	340	100		9056
MW1	0011898-01A	11/29/00	GROSS ALPHA	pCi/l	1.5	1		SW-846:9310
MW1	0011898-01A	11/29/00	GROSS BETA	pCi/l	2.8	1		SW-846:9310
MW1	0011898-01A	11/29/00	IRON	PPB	27	1		6010A
MW1	0011898-01A	11/29/00	LEAD	PPB	ND	1		6020
MW1	0011898-01A	11/29/00	MANGANESE	PPB	10	0.2		6020
MW1	0011898-01A	11/29/00	MERCURY	PPB	ND	0.2		7470A
MW1	0011898-01A	11/29/00	METHOXYCHLOR	PPB	ND	2		8081
MW1	0011898-01A	11/29/00	NICKEL	PPB	ND	15		6020
MW1	0011898-01A	11/29/00	NITRATE AS N	PPB	1290	100		9056
MW1	0011898-01A	11/29/00	PHENOLS, TOTAL	PPB	ND	10		9065
MW1	0011898-01A	11/29/00	RADIUM	pCi/L	ND	1		SW-846:9320
MW1	0011898-01A	11/29/00	RESORCINOL	PPB	ND	10		8270B
MW1	0011898-01A	11/29/00	SELENIUM	PPB	3	1		6020
MW1	0011898-01A	11/29/00	SILVER	PPB	ND	0.2		6020
MW1	0011898-01A	11/29/00	SODIUM	PPB	ND	100		6010A
MW1	0011898-01A	11/29/00	SULFATE	PPB	17800	1000		9056
MW1	0011898-01A	11/29/00	THALLIUM	PPB	ND	1		6020
MW1	0011898-01A	11/29/00	TOXAPHENE	PPB	ND	2		8081
MW3	0011898-02A Rep 1	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0011898-02A Rep 2	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0011898-02A Rep 3	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0011898-02A Rep 4	11/29/00	TOTAL ORGANIC CARBON	PPB	ND	1000		9060
MW3	0011898-02A	11/29/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0011898-02A Dup	11/29/00	TOTAL ORGANIC HALIDES	PPB	ND	5		9020A
MW3	0011898-02A	11/29/00	ANTIMONY	PPB	ND	60		6020
MW3	0011898-02A	11/29/00	ARSENIC	PPB	ND	1		6020
MW3	0011898-02A	11/29/00	BARIIUM	PPB	87	2		6020
MW3	0011898-02A	11/29/00	BERYLLIUM	PPB	ND	0.2		6020
MW3	0011898-02A	11/29/00	BHC-GAMMA	PPB	ND	2		8081
MW3	0011898-02A	11/29/00	CADMIUM	PPB	ND	0.1		6020
MW3	0011898-02A	11/29/00	CHLORIDE	PPB	11500	1000		9056
MW3	0011898-02A	11/29/00	CHROMIUM	PPB	6	1		6020
MW3	0011898-02A	11/29/00	COLIFORM BACT.	MPN/ml	ND	2		9221E
MW3	0011898-02A	11/29/00	2,4-D	PPB	ND	1.00		8151
MW3	0011898-02A	11/29/00	2,4,5 TP SILVEX	PPB	ND	1.00		8151
MW3	0011898-02A	11/29/00	DI-N-BUTYL PHTHALATE	PPB	ND	5		8270B
MW3	0011898-02A	11/29/00	DIETHYL PHTHALATE	PPB	ND	5		8270B

MW3	0011898-02A	11/29/00	2,4-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0011898-02A	11/29/00	2,6-DINITROTOLUENE	PPB	ND	0.08	8090
MW3	0011898-02A	11/29/00	ENDRIN	PPB	ND	2	8081
MW3	0011898-02A	11/29/00	FLUORIDE	PPB	270	100	9056
MW3	0011898-02A	11/29/00	GROSS ALPHA	pCi/l	19.7	1	SW-846:9310
MW3	0011898-02A	11/29/00	GROSS BETA	pCi/l	9.2	1	SW-846:9310
MW3	0011898-02A	11/29/00	IRON	PPB	ND	1	6010A
MW3	0011898-02A	11/29/00	LEAD	PPB	ND	1	6020
MW3	0011898-02A	11/29/00	MANGANESE	PPB	2	0.2	6020
MW3	0011898-02A	11/29/00	MERCURY	PPB	ND	0.2	7470A
MW3	0011898-02A	11/29/00	METHOXYCHLOR	PPB	ND	2	8081
MW3	0011898-02A	11/29/00	NICKEL	PPB	ND	15	6020
MW3	0011898-02A	11/29/00	NITRATE AS N	PPB	5690	100	9056
MW3	0011898-02A	11/29/00	PHENOLS, TOTAL	PPB	ND	10	9065
MW3	0011898-02A	11/29/00	RADIUM	pCi/L	1.1	1	SW-846:9320
MW3	0011898-02A	11/29/00	RESORCINOL	PPB	ND	10	8270B
MW3	0011898-02A	11/29/00	SELENIUM	PPB	2	1	6020
MW3	0011898-02A	11/29/00	SILVER	PPB	ND	0.2	6020
MW3	0011898-02A	11/29/00	SODIUM	PPB	ND	100	6010A
MW3	0011898-02A	11/29/00	SULFATE	PPB	151000	1000	9056
MW3	0011898-02A	11/29/00	THALLIUM	PPB	ND	1	6020
MW3	0011898-02A	11/29/00	TOXAPHENE	PPB	ND	2	8081

Site ID	Well ID	Coll. Date	Analyte	Units	Result	Quant Limit	Test No	Qualifiers
HWMU 39	39MW1	3/14/2001	Phenolics, Total	µg/L	ND	5	SW9065	
HWMU 39	39MW1	3/14/2001	Nitrogen, Nitrate	µg/L	1520	100	SW9056	
HWMU 39	39MW1	3/14/2001	Sulfate	µg/L	17900	5,000	SW9056	
HWMU 39	39MW1	3/14/2001	Fluoride	µg/L	290	100	SW9056	
HWMU 39	39MW1	3/14/2001	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
HWMU 39	39MW1	3/14/2001	Mercury	µg/L	ND	1	SW7470	
HWMU 39	39MW1	3/14/2001	Iron	µg/L	140	100	SW6010B	
HWMU 39	39MW1	3/14/2001	Sodium	µg/L	9460	10	SW6010B	
HWMU 39	39MW1	3/14/2001	Endrin	µg/L	ND	0.5	SW8081	
HWMU 39	39MW1	3/14/2001	gamma-BHC Lindane	µg/L	ND	0.2	SW8081	
HWMU 39	39MW1	3/14/2001	Methoxychlor	µg/L	ND	0.5	SW8081	
HWMU 39	39MW1	3/14/2001	Toxaphene	µg/L	ND	3	SW8081	
HWMU 39	39MW1	3/14/2001	Antimony	µg/L	ND	1	SW6020	
HWMU 39	39MW1	3/14/2001	Arsenic	µg/L	ND	10	SW6020	
HWMU 39	39MW1	3/14/2001	Barium	µg/L	40.5	10	SW6020	
HWMU 39	39MW1	3/14/2001	Beryllium	µg/L	ND	1	SW6020	
HWMU 39	39MW1	3/14/2001	Cadmium	µg/L	ND	1	SW6020	
HWMU 39	39MW1	3/14/2001	Chromium	µg/L	ND	5	SW6020	
HWMU 39	39MW1	3/14/2001	Lead	µg/L	ND	1	SW6020	
HWMU 39	39MW1	3/14/2001	Manganese	µg/L	ND	50	SW6020	
HWMU 39	39MW1	3/14/2001	Nickel	µg/L	ND	10	SW6020	
HWMU 39	39MW1	3/14/2001	Silver	µg/L	ND	2	SW6020	
HWMU 39	39MW1	3/14/2001	Thallium	µg/L	ND	1	SW6020	
HWMU 39	39MW1	3/14/2001	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151	
HWMU 39	39MW1	3/14/2001	2,4-D	µg/L	ND	50	SW8151	
HWMU 39	39MW1	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1	3/14/2001	Chloride	µg/L	10600	1,000	SW9056	
HWMU 39	39MW1	3/14/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW1	3/14/2001	2,4-dinitrotoluene	µg/L	ND	10	SW8270C	
HWMU 39	39MW1	3/14/2001	2,6-dinitrotoluene	µg/L	ND	10	SW8270C	
HWMU 39	39MW1	3/14/2001	di-n-butyl phthalate	µg/L	ND	10	SW8270C	
HWMU 39	39MW1	3/14/2001	diethylphthalate	µg/L	ND	10	SW8270C	
HWMU 39	39MW1	3/14/2001	Resorcinol	µg/L	ND	10	SW8270C	
HWMU 39	39MW1	3/14/2001	Selenium	µg/L	ND	10	SW7740	
HWMU 39	39MW1 REP-2	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1 REP-2	3/14/2001	Total Organic Carbon	µg/L	1000	1,000	SW9060	
HWMU 39	39MW1 REP-3	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1 REP-3	3/14/2001	Total Organic Carbon	µg/L	1000	1,000	SW9060	
HWMU 39	39MW1 REP-4	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1 REP-4	3/14/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW1	3/14/2001	Gross Alpha	pCi/L	2	1	SW9310	
HWMU 39	39MW1	3/14/2001	Gross Beta	pCi/L	3.3	1	SW9310	
HWMU 39	39MW1	3/14/2001	Radium	pCi/L	1	1	SW9320	
HWMU 39	39MW3	3/14/2001	Phenolics, Total	µg/L	ND	5	SW9065	
HWMU 39	39MW3	3/14/2001	Nitrogen, Nitrate	µg/L	3760	100	SW9056	
HWMU 39	39MW3	3/14/2001	Sulfate	µg/L	106000	5,000	SW9056	
HWMU 39	39MW3	3/14/2001	Fluoride	µg/L	330	100	SW9056	
HWMU 39	39MW3	3/14/2001	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
HWMU 39	39MW3	3/14/2001	Mercury	µg/L	ND	1	SW7470	
HWMU 39	39MW3	3/14/2001	Iron	µg/L	ND	100	SW6010B	
HWMU 39	39MW3	3/14/2001	Sodium	µg/L	32200	10	SW6010B	
HWMU 39	39MW3	3/14/2001	Endrin	µg/L	ND	0.5	SW8081	
HWMU 39	39MW3	3/14/2001	gamma-BHC Lindane	µg/L	ND	0.2	SW8081	
HWMU 39	39MW3	3/14/2001	Methoxychlor	µg/L	ND	0.5	SW8081	
HWMU 39	39MW3	3/14/2001	Toxaphene	µg/L	ND	3	SW8081	
HWMU 39	39MW3	3/14/2001	Antimony	µg/L	ND	1	SW6020	
HWMU 39	39MW3	3/14/2001	Arsenic	µg/L	ND	10	SW6020	
HWMU 39	39MW3	3/14/2001	Barium	µg/L	63.8	10	SW6020	
HWMU 39	39MW3	3/14/2001	Beryllium	µg/L	ND	1	SW6020	
HWMU 39	39MW3	3/14/2001	Cadmium	µg/L	ND	1	SW6020	
HWMU 39	39MW3	3/14/2001	Chromium	µg/L	ND	5	SW6020	
HWMU 39	39MW3	3/14/2001	Lead	µg/L	ND	1	SW6020	
HWMU 39	39MW3	3/14/2001	Manganese	µg/L	ND	50	SW6020	
HWMU 39	39MW3	3/14/2001	Nickel	µg/L	ND	10	SW6020	
HWMU 39	39MW3	3/14/2001	Silver	µg/L	ND	2	SW6020	
HWMU 39	39MW3	3/14/2001	Thallium	µg/L	ND	1	SW6020	
HWMU 39	39MW3	3/14/2001	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151	
HWMU 39	39MW3	3/14/2001	2,4-D	µg/L	ND	50	SW8151	
HWMU 39	39MW3	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW3	3/14/2001	Chloride	µg/L	5300	1,000	SW9056	
HWMU 39	39MW3	3/14/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	

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HWMU 39

HWMU 39	39MW3	3/14/2001	2,4-dinitrotoluene	µg/L	ND	10	SW8270C	
HWMU 39	39MW3	3/14/2001	2,6-dinitrotoluene	µg/L	ND	10	SW8270C	
HWMU 39	39MW3	3/14/2001	di-n-butyl phthalate	µg/L	ND	10	SW8270C	
HWMU 39	39MW3	3/14/2001	diethylphthalate	µg/L	ND	10	SW8270C	
HWMU 39	39MW3	3/14/2001	Resorcinol	µg/L	ND	10	SW8270C	
HWMU 39	39MW3	3/14/2001	Selenium	µg/L	ND	10	SW7740	
HWMU 39	39MW3 REP-2	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW3 REP-2	3/14/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW3 REP-3	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW3 REP-3	3/14/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW3 REP-4	3/14/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW3 REP-4	3/14/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW3	3/14/2001	Gross Alpha	pCi/L	3.8	1	SW9310	
HWMU 39	39MW3	3/14/2001	Gross Beta	pCi/L	7.1	1	SW9310	
HWMU 39	39MW3	3/14/2001	Radium	pCi/L	ND	1	SW9320	
HWMU 39	TRIP BLANK	3/14/2001	Iron	µg/L	ND	100	SW6010B	
HWMU 39	TRIP BLANK	3/14/2001	Sodium	µg/L	ND	10	SW6010B	
HWMU 39	TRIP BLANK	3/14/2001	Antimony	µg/L	ND	1	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Arsenic	µg/L	ND	10	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Barium	µg/L	ND	10	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Beryllium	µg/L	ND	1	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Cadmium	µg/L	ND	1	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Chromium	µg/L	ND	5	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Lead	µg/L	ND	1	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Manganese	µg/L	ND	10	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Nickel	µg/L	ND	10	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Silver	µg/L	ND	2	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Thallium	µg/L	ND	1	SW6020	
HWMU 39	TRIP BLANK	3/14/2001	Mercury	µg/L	ND	1	SW7470	
HWMU 39	TRIP BLANK	3/14/2001	Selenium	µg/L	ND	10	SW7740	

SiteID	ClientSampleID	CollectionDate	Analyte	Units	Result	QuantLimit	TestNo	Qualifiers
HWMU 39	39MW1-A	6/6/2001	Phenolics, Total	µg/L	ND	5	SW9065	
HWMU 39	39MW1-A	6/6/2001	Fluoride	µg/L	220	100	SW9056	
HWMU 39	39MW1-A	6/6/2001	Chloride	µg/L	4100	1,000	SW9056	
HWMU 39	39MW1-A	6/6/2001	Nitrogen, Nitrate	µg/L	1850	100	SW9056	
HWMU 39	39MW1-A	6/6/2001	Sulfate	µg/L	18400	5,000	SW9056	
HWMU 39	39MW1-A	6/6/2001	Selenium	µg/L	ND	10	SW7740	
HWMU 39	39MW1-A	6/6/2001	Iron	µg/L	ND	100	SW6010B	
HWMU 39	39MW1-A	6/6/2001	Sodium	µg/L	4760	500	SW6010B	
HWMU 39	39MW1-A	6/6/2001	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
HWMU 39	39MW1-A	6/6/2001	Mercury	µg/L	ND	1	SW7470	
HWMU 39	39MW1-A	6/6/2001	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
HWMU 39	39MW1-A	6/6/2001	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
HWMU 39	39MW1-A	6/6/2001	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
HWMU 39	39MW1-A	6/6/2001	Diethyl phthalate	µg/L	ND	9	SW8270C	
HWMU 39	39MW1-A	6/6/2001	Resorcinol	µg/L	ND	9	SW8270C	
HWMU 39	39MW1-A	6/6/2001	Antimony	µg/L	ND	1	SW6020	
HWMU 39	39MW1-A	6/6/2001	Barium	µg/L	54.2	10	SW6020	
HWMU 39	39MW1-A	6/6/2001	Cadmium	µg/L	ND	1	SW6020	
HWMU 39	39MW1-A	6/6/2001	Chromium	µg/L	ND	5	SW6020	
HWMU 39	39MW1-A	6/6/2001	Lead	µg/L	ND	1	SW6020	
HWMU 39	39MW1-A	6/6/2001	Manganese	µg/L	ND	50	SW6020	
HWMU 39	39MW1-A	6/6/2001	Nickel	µg/L	ND	10	SW6020	
HWMU 39	39MW1-A	6/6/2001	Silver	µg/L	ND	2	SW6020	
HWMU 39	39MW1-A	6/6/2001	Thallium	µg/L	ND	1	SW6020	
HWMU 39	39MW1-A	6/6/2001	Arsenic	µg/L	ND	10	SW6020	
HWMU 39	39MW1-A	6/6/2001	Beryllium	µg/L	ND	1	SW6020	
HWMU 39	39MW1-A	6/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW1-A	6/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1-A	6/6/2001	Endrin	µg/L	ND	0.5	SW8081	
HWMU 39	39MW1-A	6/6/2001	gamma-BHC	µg/L	ND	0.2	SW8081	
HWMU 39	39MW1-A	6/6/2001	Methoxychlor	µg/L	ND	0.5	SW8081	
HWMU 39	39MW1-A	6/6/2001	Toxaphene	µg/L	ND	3	SW8081	
HWMU 39	39MW1-A	6/6/2001	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151	
HWMU 39	39MW1-A	6/6/2001	2,4-D	µg/L	ND	50	SW8151	
HWMU 39	39MW1-B	6/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW1-B	6/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1-C	6/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW1-C	6/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1-D	6/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW1-D	6/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW1	6/6/2001	Gross Alpha	pCi/L	0.8	1	SW9310	
HWMU 39	39MW1	6/6/2001	Gross Beta	pCi/L	3.3	1	SW9310	
HWMU 39	39MW1	6/6/2001	Radium	pCi/L	0.3	1	SW9320	
HWMU 39	39MW3-A	6/6/2001	Phenolics, Total	µg/L	ND	5	SW9065	
HWMU 39	39MW3-A	6/6/2001	Fluoride	µg/L	350	100	SW9056	
HWMU 39	39MW3-A	6/6/2001	Chloride	µg/L	6000	1,000	SW9056	
HWMU 39	39MW3-A	6/6/2001	Nitrogen, Nitrate	µg/L	3510	100	SW9056	
HWMU 39	39MW3-A	6/6/2001	Sulfate	µg/L	141000	5,000	SW9056	
HWMU 39	39MW3-A	6/6/2001	Selenium	µg/L	ND	10	SW7740	
HWMU 39	39MW3-A	6/6/2001	Iron	µg/L	ND	100	SW6010B	
HWMU 39	39MW3-A	6/6/2001	Sodium	µg/L	35200	500	SW6010B	
HWMU 39	39MW3-A	6/6/2001	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
HWMU 39	39MW3-A	6/6/2001	Mercury	µg/L	ND	1	SW7470	
HWMU 39	39MW3-A	6/6/2001	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
HWMU 39	39MW3-A	6/6/2001	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
HWMU 39	39MW3-A	6/6/2001	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
HWMU 39	39MW3-A	6/6/2001	Diethyl phthalate	µg/L	ND	9	SW8270C	
HWMU 39	39MW3-A	6/6/2001	Resorcinol	µg/L	ND	9	SW8270C	
HWMU 39	39MW3-A	6/6/2001	Antimony	µg/L	ND	1	SW6020	
HWMU 39	39MW3-A	6/6/2001	Barium	µg/L	80.9	10	SW6020	
HWMU 39	39MW3-A	6/6/2001	Cadmium	µg/L	ND	1	SW6020	
HWMU 39	39MW3-A	6/6/2001	Chromium	µg/L	8.3	5	SW6020	
HWMU 39	39MW3-A	6/6/2001	Lead	µg/L	ND	1	SW6020	
HWMU 39	39MW3-A	6/6/2001	Manganese	µg/L	ND	50	SW6020	
HWMU 39	39MW3-A	6/6/2001	Nickel	µg/L	ND	10	SW6020	
HWMU 39	39MW3-A	6/6/2001	Silver	µg/L	ND	2	SW6020	
HWMU 39	39MW3-A	6/6/2001	Thallium	µg/L	ND	1	SW6020	
HWMU 39	39MW3-A	6/6/2001	Arsenic	µg/L	ND	10	SW6020	
HWMU 39	39MW3-A	6/6/2001	Beryllium	µg/L	ND	1	SW6020	
HWMU 39	39MW3-A	6/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
HWMU 39	39MW3-A	6/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
HWMU 39	39MW3-A	6/6/2001	Endrin	µg/L	ND	0.5	SW8081	
HWMU 39	39MW3-A	6/6/2001	gamma-BHC	µg/L	ND	0.2	SW8081	
HWMU 39	39MW3-A	6/6/2001	Methoxychlor	µg/L	ND	0.5	SW8081	
HWMU 39	39MW3-A	6/6/2001	Toxaphene	µg/L	ND	3	SW8081	
HWMU 39	39MW3-A	6/6/2001	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151	
HWMU 39	39MW3-A	6/6/2001	2,4-D	µg/L	ND	50	SW8151	

SiteID	ClientSampleID	CollectionDate	Analyte	Units	Result	QuantLimit	TestNo	Qualifiers
SITE 39	39MW1-A	8/7/2001	MPN, Fecal Coliform	MPN Index	11	2	SM9223 B	
SITE 39	39MW1-A	8/7/2001	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW1-A	8/7/2001	Fluoride	µg/L	240	100	SW9056	
SITE 39	39MW1-A	8/7/2001	Chloride	µg/L	4900	1,000	SW9056	
SITE 39	39MW1-A	8/7/2001	Nitrogen, Nitrate	µg/L	1520	100	SW9056	
SITE 39	39MW1-A	8/7/2001	Sulfate	µg/L	16600	5,000	SW9056	
SITE 39	39MW1-A	8/7/2001	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW1-A	8/7/2001	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	8/7/2001	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	8/7/2001	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	8/7/2001	Diethyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	8/7/2001	Resorcinol	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	8/7/2001	Mercury	µg/L	ND	1	SW7470	
SITE 39	39MW1-A	8/7/2001	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW1-A	8/7/2001	Sodium	µg/L	6670	10	SW6010B	
SITE 39	39MW1-A	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-A	8/7/2001	Endrin	µg/L	ND		0.5 SW8081	
SITE 39	39MW1-A	8/7/2001	gamma-BHC	µg/L	ND		0.2 SW8081	
SITE 39	39MW1-A	8/7/2001	Methoxychlor	µg/L	ND		0.5 SW8081	
SITE 39	39MW1-A	8/7/2001	Toxaphene	µg/L	ND	3	SW8081	
SITE 39	39MW1-A	8/7/2001	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	8/7/2001	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	8/7/2001	Barium	µg/L	59.3	10	SW6020	
SITE 39	39MW1-A	8/7/2001	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	8/7/2001	Chromium	µg/L	ND	5	SW6020	
SITE 39	39MW1-A	8/7/2001	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW1-A	8/7/2001	Nickel	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	8/7/2001	Thallium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	8/7/2001	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	8/7/2001	Lead	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	8/7/2001	Silver	µg/L	ND	2	SW6020	
SITE 39	39MW1-A	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-A	8/7/2001	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151	
SITE 39	39MW1-A	8/7/2001	2,4-D	µg/L	ND	50	SW8151	
SITE 39	39MW1-A	8/7/2001	Gross Alpha	Pci/l	2.1 ± 0.5	1	SW-846:9310	
SITE 39	39MW1-A	8/7/2001	Gross Beta	Pci/l	4.1 ± 0.5	1	SW-846:9310	
SITE 39	39MW1-A	8/7/2001	Radium - 228	Pci/l	0.4 ± 0.7	1	SW-846:9320	
SITE 39	39MW1-B	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-B	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-C	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-C	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-D	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-D	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW3-A	8/7/2001	MPN, Fecal Coliform	MPN Index	ND	2	SM9223 B	
SITE 39	39MW3-A	8/7/2001	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW3-A	8/7/2001	Fluoride	µg/L	260	100	SW9056	
SITE 39	39MW3-A	8/7/2001	Chloride	µg/L	7400	1,000	SW9056	
SITE 39	39MW3-A	8/7/2001	Nitrogen, Nitrate	µg/L	3110	100	SW9056	
SITE 39	39MW3-A	8/7/2001	Sulfate	µg/L	118000	5,000	SW9056	
SITE 39	39MW3-A	8/7/2001	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW3-A	8/7/2001	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	8/7/2001	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	8/7/2001	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	8/7/2001	Diethyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	8/7/2001	Resorcinol	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	8/7/2001	Mercury	µg/L	ND	1	SW7470	
SITE 39	39MW3-A	8/7/2001	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW3-A	8/7/2001	Sodium	µg/L	33600	10	SW6010B	
SITE 39	39MW3-A	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW3-A	8/7/2001	Endrin	µg/L	ND		0.5 SW8081	
SITE 39	39MW3-A	8/7/2001	gamma-BHC	µg/L	ND		0.2 SW8081	
SITE 39	39MW3-A	8/7/2001	Methoxychlor	µg/L	ND		0.5 SW8081	
SITE 39	39MW3-A	8/7/2001	Toxaphene	µg/L	ND	3	SW8081	
SITE 39	39MW3-A	8/7/2001	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	8/7/2001	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW3-A	8/7/2001	Barium	µg/L	78.8	10	SW6020	
SITE 39	39MW3-A	8/7/2001	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	8/7/2001	Chromium	µg/L	6.59	5	SW6020	
SITE 39	39MW3-A	8/7/2001	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW3-A	8/7/2001	Nickel	µg/L	ND	10	SW6020	
SITE 39	39MW3-A	8/7/2001	Thallium	µg/L	ND	1	SW6020	

SITE 39	39MW3-A	8/7/2001	Beryllium	µg/L	ND	1	SW6020
SITE 39	39MW3-A	8/7/2001	Lead	µg/L	ND	1	SW6020
SITE 39	39MW3-A	8/7/2001	Silver	µg/L	ND	2	SW6020
SITE 39	39MW3-A	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-A	8/7/2001	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151
SITE 39	39MW3-A	8/7/2001	2,4-D	µg/L	ND	50	SW8151
SITE 39	39MW3-A	8/7/2001	Gross Alpha	Pci/l	4.3 ± 1.1	1	SW-846:9310
SITE 39	39MW3-A	8/7/2001	Gross Beta	Pci/l	10.2 ± 0.7	1	SW-846:9310
SITE 39	39MW3-A	8/7/2001	Radium - 228	Pci/l	1.3 ± 0.8	1	SW-846:9320
SITE 39	39MW3-B	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-B	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-C	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-C	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-D	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-D	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE- A	8/7/2001	MPN, Fecal Coliform	MPN Index		17 2	SM9223 B
SITE 39	DUPLICATE- A	8/7/2001	Selenium	µg/L	ND	10	SW7740
SITE 39	DUPLICATE- A	8/7/2001	Fluoride	µg/L		260 100	SW9056
SITE 39	DUPLICATE- A	8/7/2001	Chloride	µg/L		5000 1,000	SW9056
SITE 39	DUPLICATE- A	8/7/2001	Nitrogen, Nitrate	µg/L		1410 100	SW9056
SITE 39	DUPLICATE- A	8/7/2001	Sulfate	µg/L		16000 5,000	SW9056
SITE 39	DUPLICATE- A	8/7/2001	Phenolics, Total	µg/L	ND	5	SW9065
SITE 39	DUPLICATE- A	8/7/2001	2,4-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE- A	8/7/2001	2,6-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE- A	8/7/2001	Di-n-butyl phthalate	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE- A	8/7/2001	Diethyl phthalate	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE- A	8/7/2001	Resorcinol	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE- A	8/7/2001	Mercury	µg/L	ND	1	SW7470
SITE 39	DUPLICATE- A	8/7/2001	Iron	µg/L	ND	100	SW6010B
SITE 39	DUPLICATE- A	8/7/2001	Sodium	µg/L		6440 10	SW6010B
SITE 39	DUPLICATE- A	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE- A	8/7/2001	Endrin	µg/L	ND		0.5 SW8081
SITE 39	DUPLICATE- A	8/7/2001	gamma-BHC	µg/L	ND		0.2 SW8081
SITE 39	DUPLICATE- A	8/7/2001	Methoxychlor	µg/L	ND		0.5 SW8081
SITE 39	DUPLICATE- A	8/7/2001	Toxaphene	µg/L	ND	3	SW8081
SITE 39	DUPLICATE- A	8/7/2001	Antimony	µg/L	ND	1	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Arsenic	µg/L	ND	10	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Barium	µg/L		61 10	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Cadmium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Chromium	µg/L	ND	5	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Manganese	µg/L	ND	50	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Nickel	µg/L	ND	10	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Thallium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Beryllium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Lead	µg/L	ND	1	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Silver	µg/L	ND	2	SW6020
SITE 39	DUPLICATE- A	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE- A	8/7/2001	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151
SITE 39	DUPLICATE- A	8/7/2001	2,4-D	µg/L	ND	50	SW8151
SITE 39	DUPLICATE- A	8/7/2001	Gross Alpha	Pci/l	1.8 ± 0.5	1	SW-846:9310
SITE 39	DUPLICATE- A	8/7/2001	Gross Beta	Pci/l	3.3 ± 0.5	1	SW-846:9310
SITE 39	DUPLICATE- A	8/7/2001	Radium - 228	Pci/l	1.0 ± 0.8	1	SW-846:9320
SITE 39	DUPLICATE- B	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE- B	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE- C	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE- C	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE- D	8/7/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE- D	8/7/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	TRIP BLANK 8/07	8/7/2001	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	TRIP BLANK 8/07	8/7/2001	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	TRIP BLANK 8/07	8/7/2001	Di-n-butyl phthalate	µg/L	ND	9	SW8270C
SITE 39	TRIP BLANK 8/07	8/7/2001	Diethyl phthalate	µg/L	ND	9	SW8270C
SITE 39	TRIP BLANK 8/07	8/7/2001	Resorcinol	µg/L	ND	9	SW8270C

SiteID	ClientSampID	CollectionDate	Analyte	Units	Result	QuantLimit	TestNo	Qualifiers
SITE 39	39MW1-A	11/6/2001	MPN, Fecal Coliform	MPN Index		2 2	SM9221 E	
SITE 39	39MW1-A	11/6/2001	Chloride	µg/L	10000	1,000	SW9056	
SITE 39	39MW1-A	11/6/2001	Fluoride	µg/L	280	100	SW9056	
SITE 39	39MW1-A	11/6/2001	Nitrogen, Nitrate	µg/L	1470	100	SW9056	
SITE 39	39MW1-A	11/6/2001	Sulfate	µg/L	20200	5,000	SW9056	
SITE 39	39MW1-A	11/6/2001	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW1-A	11/6/2001	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW1-A	11/6/2001	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW1-A	11/6/2001	Endrin	µg/L	ND		0.5 SW8081	
SITE 39	39MW1-A	11/6/2001	gamma-BHC	µg/L	ND		0.2 SW8081	
SITE 39	39MW1-A	11/6/2001	Methoxychlor	µg/L	ND		0.5 SW8081	
SITE 39	39MW1-A	11/6/2001	Toxaphene	µg/L	ND	3	SW8081	
SITE 39	39MW1-A	11/6/2001	2,4,5-TP (Silvex)	µg/L	ND	12	SW8151	
SITE 39	39MW1-A	11/6/2001	2,4-D	µg/L	ND	58	SW8151	
SITE 39	39MW1-A	11/6/2001	2,4-Dinitrotoluene	µg/L	ND	10	SW8270C	
SITE 39	39MW1-A	11/6/2001	2,6-Dinitrotoluene	µg/L	ND	10	SW8270C	
SITE 39	39MW1-A	11/6/2001	Di-n-butyl phthalate	µg/L	ND	10	SW8270C	
SITE 39	39MW1-A	11/6/2001	Diethyl phthalate	µg/L	ND	10	SW8270C	
SITE 39	39MW1-A	11/6/2001	Resorcinol	µg/L	ND	10	SW8270C	
SITE 39	39MW1-A	11/6/2001	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW1-A	11/6/2001	Sodium	µg/L	9840	10	SW6010B	
SITE 39	39MW1-A	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-A	11/6/2001	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	11/6/2001	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	11/6/2001	Barium	µg/L	52	10	SW6020	
SITE 39	39MW1-A	11/6/2001	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	11/6/2001	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	11/6/2001	Chromium	µg/L	ND	5	SW6020	
SITE 39	39MW1-A	11/6/2001	Lead	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	11/6/2001	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW1-A	11/6/2001	Nickel	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	11/6/2001	Thallium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	11/6/2001	Silver	µg/L	ND	2	SW6020	
SITE 39	39MW1-A	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-B	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-B	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-C	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-C	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-D	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-D	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1	11/6/2001	Gross Alpha	Pci/l	1.3 ± 0.5	1	SW-846:9310	
SITE 39	39MW1	11/6/2001	Gross Beta	Pci/l	4.9 ± 0.7	1	SW-846:9310	
SITE 39	39MW1	11/6/2001	Radium - 228	Pci/l	0.3 ± 0.4	1	SW-846:9320	
SITE 39	39MW3-A	11/6/2001	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
SITE 39	39MW3-A	11/6/2001	Chloride	µg/L	4600	1,000	SW9056	
SITE 39	39MW3-A	11/6/2001	Fluoride	µg/L	220	100	SW9056	
SITE 39	39MW3-A	11/6/2001	Nitrogen, Nitrate	µg/L	2850	100	SW9056	
SITE 39	39MW3-A	11/6/2001	Sulfate	µg/L	105000	5,000	SW9056	
SITE 39	39MW3-A	11/6/2001	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW3-A	11/6/2001	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW3-A	11/6/2001	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW3-A	11/6/2001	Endrin	µg/L	ND		0.5 SW8081	
SITE 39	39MW3-A	11/6/2001	gamma-BHC	µg/L	ND		0.2 SW8081	
SITE 39	39MW3-A	11/6/2001	Methoxychlor	µg/L	ND		0.5 SW8081	
SITE 39	39MW3-A	11/6/2001	Toxaphene	µg/L	ND	3	SW8081	
SITE 39	39MW3-A	11/6/2001	2,4,5-TP (Silvex)	µg/L	ND	12	SW8151	
SITE 39	39MW3-A	11/6/2001	2,4-D	µg/L	ND	58	SW8151	
SITE 39	39MW3-A	11/6/2001	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	11/6/2001	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	11/6/2001	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	11/6/2001	Diethyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	11/6/2001	Resorcinol	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	11/6/2001	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW3-A	11/6/2001	Sodium	µg/L	17500	10	SW6010B	
SITE 39	39MW3-A	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW3-A	11/6/2001	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	11/6/2001	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW3-A	11/6/2001	Barium	µg/L	90.6	10	SW6020	
SITE 39	39MW3-A	11/6/2001	Beryllium	µg/L	ND	1	SW6020	

SITE 39	39MW3-A	11/6/2001	Cadmium	µg/L	ND	1	SW6020
SITE 39	39MW3-A	11/6/2001	Chromium	µg/L	5.73	5	SW6020
SITE 39	39MW3-A	11/6/2001	Lead	µg/L	ND	1	SW6020
SITE 39	39MW3-A	11/6/2001	Manganese	µg/L	ND	50	SW6020
SITE 39	39MW3-A	11/6/2001	Nickel	µg/L	ND	10	SW6020
SITE 39	39MW3-A	11/6/2001	Thallium	µg/L	ND	1	SW6020
SITE 39	39MW3-A	11/6/2001	Silver	µg/L	ND	2	SW6020
SITE 39	39MW3-A	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-B	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-B	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-C	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-C	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-D	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-D	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3	11/6/2001	Gross Alpha	Pci/l	2.5 ± 1.0	1	SW-846:9310
SITE 39	39MW3	11/6/2001	Gross Beta	Pci/l	14.2 ± 0.7	1	SW-846:9310
SITE 39	39MW3	11/6/2001	Radium - 228	Pci/l	1.4 ± 0.7	1	SW-846:9320
SITE 39	DUPLICATE-A	11/6/2001	MPN, Fecal Coliform	MPN Index		2 2	SM9221 E
SITE 39	DUPLICATE-A	11/6/2001	Chloride	µg/L	9600	1,000	SW9056
SITE 39	DUPLICATE-A	11/6/2001	Fluoride	µg/L	320	100	SW9056
SITE 39	DUPLICATE-A	11/6/2001	Nitrogen, Nitrate	µg/L	1440	100	SW9056
SITE 39	DUPLICATE-A	11/6/2001	Sulfate	µg/L	20700	5,000	SW9056
SITE 39	DUPLICATE-A	11/6/2001	Phenolics, Total	µg/L	ND	5	SW9065
SITE 39	DUPLICATE-A	11/6/2001	Selenium	µg/L	ND	10	SW7740
SITE 39	DUPLICATE-A	11/6/2001	Mercury	µg/L	ND	1	SW7470A
SITE 39	DUPLICATE-A	11/6/2001	Endrin	µg/L	ND		0.5 SW8081
SITE 39	DUPLICATE-A	11/6/2001	gamma-BHC	µg/L	ND		0.2 SW8081
SITE 39	DUPLICATE-A	11/6/2001	Methoxychlor	µg/L	ND		0.5 SW8081
SITE 39	DUPLICATE-A	11/6/2001	Toxaphene	µg/L	ND	3	SW8081
SITE 39	DUPLICATE-A	11/6/2001	2,4,5-TP (Silvex)	µg/L	ND	12	SW8151
SITE 39	DUPLICATE-A	11/6/2001	2,4-D	µg/L	ND	58	SW8151
SITE 39	DUPLICATE-A	11/6/2001	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	11/6/2001	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	11/6/2001	Di-n-butyl phthalate	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	11/6/2001	Diethyl phthalate	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	11/6/2001	Resorcinol	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	11/6/2001	Iron	µg/L	ND	100	SW6010B
SITE 39	DUPLICATE-A	11/6/2001	Sodium	µg/L	9360	10	SW6010B
SITE 39	DUPLICATE-A	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-A	11/6/2001	Antimony	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Arsenic	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Barium	µg/L	53.1	10	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Beryllium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Cadmium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Chromium	µg/L	ND	5	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Lead	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Manganese	µg/L	ND	50	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Nickel	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Thallium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Silver	µg/L	ND	2	SW6020
SITE 39	DUPLICATE-A	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-B	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-B	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-C	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-C	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-D	11/6/2001	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-D	11/6/2001	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE	11/6/2001	Gross Alpha	Pci/l	1.0 ± 0.4	1	SW-846:9310
SITE 39	DUPLICATE	11/6/2001	Gross Beta	Pci/l	2.5 ± 0.5	1	SW-846:9310
SITE 39	DUPLICATE	11/6/2001	Radium - 228	Pci/l	0.3 ± 0.5	1	SW-846:9320
SITE 39	TRIP BLANK	11/6/2001	2,4-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	11/6/2001	2,6-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	11/6/2001	Di-n-butyl phthalate	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	11/6/2001	Diethyl phthalate	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	11/6/2001	Resorcinol	µg/L	ND	10	SW8270C

Site ID	ClientSampleID	CollectionDate	Analyte	Units	Result	QuantLimit	TestNo	Qualifiers
SITE 39	39MW1-A	3/7/2002	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW1-A	3/7/2002	Chloride	µg/L	12900	1,000	SW9056	
SITE 39	39MW1-A	3/7/2002	Fluoride	µg/L	310	100	SW9056	
SITE 39	39MW1-A	3/7/2002	Nitrogen, Nitrate	µg/L	1240	100	SW9056	
SITE 39	39MW1-A	3/7/2002	Sulfate	µg/L	18300	5,000	SW9056	
SITE 39	39MW1-A	3/7/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
SITE 39	39MW1-A	3/7/2002	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW1-A	3/7/2002	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW1-A	3/7/2002	Iron	µg/L	274	100	SW6010B	
SITE 39	39MW1-A	3/7/2002	Sodium	µg/L	12600	10	SW6010B	
SITE 39	39MW1-A	3/7/2002	Endrin	µg/L	ND	0.5	SW8081	
SITE 39	39MW1-A	3/7/2002	gamma-BHC	µg/L	ND	0.2	SW8081	
SITE 39	39MW1-A	3/7/2002	Methoxychlor	µg/L	ND	0.5	SW8081	
SITE 39	39MW1-A	3/7/2002	Toxaphene	µg/L	ND	3	SW8081	
SITE 39	39MW1-A	3/7/2002	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151	
SITE 39	39MW1-A	3/7/2002	2,4-D	µg/L	ND	50	SW8151	
SITE 39	39MW1-A	3/7/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-A	3/7/2002	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	3/7/2002	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	3/7/2002	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	3/7/2002	Diethyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	3/7/2002	Resorcinol	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	3/7/2002	Total Organic Halides (TOX)	µg/L	54.5	20	SW9020B	
SITE 39	39MW1-A	3/7/2002	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	3/7/2002	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	3/7/2002	Barium	µg/L	41.8	10	SW6020	
SITE 39	39MW1-A	3/7/2002	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	3/7/2002	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	3/7/2002	Chromium	µg/L	ND	5	SW6020	
SITE 39	39MW1-A	3/7/2002	Lead	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	3/7/2002	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW1-A	3/7/2002	Nickel	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	3/7/2002	Silver	µg/L	ND	2	SW6020	
SITE 39	39MW1-A	3/7/2002	Thallium	µg/L	ND	1	SW6020	
SITE 39	39MW1-B	3/7/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-B	3/7/2002	Total Organic Halides (TOX)	µg/L	58.9	20	SW9020B	
SITE 39	39MW1-C	3/7/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-C	3/7/2002	Total Organic Halides (TOX)	µg/L	59.5	20	SW9020B	
SITE 39	39MW1-D	3/7/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-D	3/7/2002	Total Organic Halides (TOX)	µg/L	56.9	20	SW9020B	
SITE 39	39MW3-A	3/7/2002	Gross Alpha	pCi/l	0.7 ± 0.6		SW9310	
SITE 39	39MW3-A	3/7/2002	Gross Beta	pCi/l	2.9 ± 0.7		SW9310	
SITE 39	39MW3-A	3/7/2002	Total Radium	pCi/l	0.7 ± 0.5		SW9320	
SITE 39	39MW3-A	3/7/2002	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW3-A	3/7/2002	Chloride	µg/L	7800	1,000	SW9056	
SITE 39	39MW3-A	3/7/2002	Fluoride	µg/L	180	100	SW9056	
SITE 39	39MW3-A	3/7/2002	Nitrogen, Nitrate	µg/L	3250	100	SW9056	
SITE 39	39MW3-A	3/7/2002	Sulfate	µg/L	130000	5,000	SW9056	
SITE 39	39MW3-A	3/7/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
SITE 39	39MW3-A	3/7/2002	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW3-A	3/7/2002	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW3-A	3/7/2002	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW3-A	3/7/2002	Sodium	µg/L	37500	10	SW6010B	
SITE 39	39MW3-A	3/7/2002	Endrin	µg/L	ND	0.5	SW8081	
SITE 39	39MW3-A	3/7/2002	gamma-BHC	µg/L	ND	0.2	SW8081	
SITE 39	39MW3-A	3/7/2002	Methoxychlor	µg/L	ND	0.5	SW8081	
SITE 39	39MW3-A	3/7/2002	Toxaphene	µg/L	ND	3	SW8081	
SITE 39	39MW3-A	3/7/2002	2,4,5-TP (Silvex)	µg/L	ND	10	SW8151	
SITE 39	39MW3-A	3/7/2002	2,4-D	µg/L	ND	50	SW8151	
SITE 39	39MW3-A	3/7/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW3-A	3/7/2002	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	3/7/2002	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	3/7/2002	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	3/7/2002	Diethyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	3/7/2002	Resorcinol	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	3/7/2002	Total Organic Halides (TOX)	µg/L	37.4	20	SW9020B	
SITE 39	39MW3-A	3/7/2002	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	3/7/2002	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW3-A	3/7/2002	Barium	µg/L	88.8	10	SW6020	
SITE 39	39MW3-A	3/7/2002	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	3/7/2002	Cadmium	µg/L	ND	1	SW6020	

SITE 39	39MW3-A	3/7/2002 Chromium	µg/L	ND	5	SW6020
SITE 39	39MW3-A	3/7/2002 Lead	µg/L	ND	1	SW6020
SITE 39	39MW3-A	3/7/2002 Manganese	µg/L	ND	50	SW6020
SITE 39	39MW3-A	3/7/2002 Nickel	µg/L	ND	10	SW6020
SITE 39	39MW3-A	3/7/2002 Silver	µg/L	ND	2	SW6020
SITE 39	39MW3-A	3/7/2002 Thallium	µg/L	ND	1	SW6020
SITE 39	39MW3-B	3/7/2002 Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-B	3/7/2002 Total Organic Halides (TOX)	µg/L		35.3 20	SW9020B
SITE 39	39MW3-C	3/7/2002 Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-C	3/7/2002 Total Organic Halides (TOX)	µg/L		36.7 20	SW9020B
SITE 39	39MW3-D	3/7/2002 Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-D	3/7/2002 Total Organic Halides (TOX)	µg/L		34.6 20	SW9020B
SITE 39	39MW3-A	3/7/2002 Gross Alpha	pCi/l	4.4 ± 1.9		SW9310
SITE 39	39MW3-A	3/7/2002 Gross Beta	pCi/l	10.0 ± 1.1		SW9310
SITE 39	39MW3-A	3/7/2002 Total Radium	pCi/l	0.9 ± 0.5		SW9320
SITE 39	DUPLICATE-A	3/7/2002 Phenolics, Total	µg/L	ND	5	SW9065
SITE 39	DUPLICATE-A	3/7/2002 Chloride	µg/L		12300 1,000	SW9056
SITE 39	DUPLICATE-A	3/7/2002 Fluoride	µg/L		290 100	SW9056
SITE 39	DUPLICATE-A	3/7/2002 Nitrogen, Nitrate	µg/L		1290 100	SW9056
SITE 39	DUPLICATE-A	3/7/2002 Sulfate	µg/L		18500 5,000	SW9056
SITE 39	DUPLICATE-A	3/7/2002 MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E
SITE 39	DUPLICATE-A	3/7/2002 Mercury	µg/L	ND	1	SW7470A
SITE 39	DUPLICATE-A	3/7/2002 Selenium	µg/L	ND	10	SW7740
SITE 39	DUPLICATE-A	3/7/2002 Iron	µg/L	ND	100	SW6010B
SITE 39	DUPLICATE-A	3/7/2002 Sodium	µg/L		11300 10	SW6010B
SITE 39	DUPLICATE-A	3/7/2002 Endrin	µg/L	ND		0.5 SW8081
SITE 39	DUPLICATE-A	3/7/2002 gamma-BHC	µg/L	ND		0.2 SW8081
SITE 39	DUPLICATE-A	3/7/2002 Methoxychlor	µg/L	ND		0.5 SW8081
SITE 39	DUPLICATE-A	3/7/2002 Toxaphene	µg/L	ND	3	SW8081
SITE 39	DUPLICATE-A	3/7/2002 2,4,5-TP (Silvex)	µg/L	ND	10	SW8151
SITE 39	DUPLICATE-A	3/7/2002 2,4-D	µg/L	ND	50	SW8151
SITE 39	DUPLICATE-A	3/7/2002 Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-A	3/7/2002 2,4-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	3/7/2002 2,6-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	3/7/2002 Di-n-butyl phthalate	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	3/7/2002 Diethyl phthalate	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	3/7/2002 Resorcinol	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-A	3/7/2002 Total Organic Halides (TOX)	µg/L		63.4 20	SW9020B
SITE 39	DUPLICATE-A	3/7/2002 Antimony	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Arsenic	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Barium	µg/L		42.3 10	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Beryllium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Cadmium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Chromium	µg/L	ND	5	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Lead	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Manganese	µg/L	ND	50	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Nickel	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Silver	µg/L	ND	2	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Thallium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	3/7/2002 Gross Alpha	pCi/l	1.1 ± 0.6		SW9310
SITE 39	DUPLICATE-A	3/7/2002 Gross Beta	pCi/l	2.7 ± 0.7		SW9310
SITE 39	DUPLICATE-A	3/7/2002 Total Radium	pCi/l	0.7 ± 0.5		SW9320
SITE 39	DUPLICATE-B	3/7/2002 Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-B	3/7/2002 Total Organic Halides (TOX)	µg/L		58.2 20	SW9020B
SITE 39	DUPLICATE-C	3/7/2002 Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-C	3/7/2002 Total Organic Halides (TOX)	µg/L		61.6 20	SW9020B
SITE 39	DUPLICATE-D	3/7/2002 Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-D	3/7/2002 Total Organic Halides (TOX)	µg/L		63.8 20	SW9020B
SITE 39	TRIP BLANK	3/7/2002 2,4-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	3/7/2002 2,6-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	3/7/2002 Di-n-butyl phthalate	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	3/7/2002 Diethyl phthalate	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	3/7/2002 Resorcinol	µg/L	ND	10	SW8270C

Duplicate Well: 39MW1

SiteID	ClientSampleID	CollectionDate	Analyte	Units	Result	QuantLimit	TestNo	Qualifiers
SITE 39	39MW1-A	5/14/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151	
SITE 39	39MW1-A	5/14/2002	2,4-D	µg/L	ND	39	SW8151	
SITE 39	39MW1-A	5/14/2002	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	5/14/2002	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	5/14/2002	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	5/14/2002	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	5/14/2002	Barium	µg/L	51.7	10	SW6020	
SITE 39	39MW1-A	5/14/2002	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	5/14/2002	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	5/14/2002	Chloride	µg/L	8500	1,000	SW9056	
SITE 39	39MW1-A	5/14/2002	Chromium	µg/L	ND	5	SW6020	
SITE 39	39MW1-A	5/14/2002	Diethyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	5/14/2002	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	5/14/2002	Endrin	µg/L	ND	0	SW8081	
SITE 39	39MW1-A	5/14/2002	Fluoride	µg/L	160	100	SW9056	
SITE 39	39MW1-A	5/14/2002	gamma-BHC	µg/L	ND	0	SW8081	
SITE 39	39MW1-A	5/14/2002	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW1-A	5/14/2002	Lead	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	5/14/2002	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW1-A	5/14/2002	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW1-A	5/14/2002	Methoxychlor	µg/L	ND	0	SW8081	
SITE 39	39MW1-A	5/14/2002	MPN, Fecal Coliform	MPN Index	300	2	SM9221 E	
SITE 39	39MW1-A	5/14/2002	Nickel	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	5/14/2002	Nitrogen, Nitrate	µg/L	1410	100	SW9056	
SITE 39	39MW1-A	5/14/2002	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW1-A	5/14/2002	Resorcinol	µg/L	ND	9	SW8270C	
SITE 39	39MW1-A	5/14/2002	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW1-A	5/14/2002	Silver	µg/L	ND	2	SW6020	
SITE 39	39MW1-A	5/14/2002	Sodium	µg/L	7990	10	SW6010B	
SITE 39	39MW1-A	5/14/2002	Sulfate	µg/L	18500	5,000	SW9056	
SITE 39	39MW1-A	5/14/2002	Thallium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-A	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-A	5/14/2002	Toxaphene	µg/L	ND	2	SW8081	
SITE 39	39MW1-B	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-B	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-C	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-C	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-D	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-D	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-A	5/14/2002	Gross Alpha	pCi/l	1.6 ± 0.4	1	SW9310	
SITE 39	39MW1-A	5/14/2002	Gross Beta	pCi/l	2.8 ± 0.5	1	SW9310	
SITE 39	39MW1-A	5/14/2002	Total Radium	pCi/l	0.9 ± 0.8	1	SW9320	
SITE 39	39MW3-A	5/14/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151	
SITE 39	39MW3-A	5/14/2002	2,4-D	µg/L	ND	40	SW8151	
SITE 39	39MW3-A	5/14/2002	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	5/14/2002	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	5/14/2002	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	5/14/2002	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW3-A	5/14/2002	Barium	µg/L	103	10	SW6020	
SITE 39	39MW3-A	5/14/2002	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	5/14/2002	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	5/14/2002	Chloride	µg/L	15000	1,000	SW9056	
SITE 39	39MW3-A	5/14/2002	Chromium	µg/L	ND	5	SW6020	
SITE 39	39MW3-A	5/14/2002	Diethyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	5/14/2002	Di-n-butyl phthalate	µg/L	ND	9	SW8270C	
SITE 39	39MW3-A	5/14/2002	Endrin	µg/L	ND	0	SW8081	
SITE 39	39MW3-A	5/14/2002	Fluoride	µg/L	480	100	SW9056	
SITE 39	39MW3-A	5/14/2002	gamma-BHC	µg/L	ND	0	SW8081	
SITE 39	39MW3-A	5/14/2002	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW3-A	5/14/2002	Lead	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	5/14/2002	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW3-A	5/14/2002	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW3-A	5/14/2002	Methoxychlor	µg/L	ND	0	SW8081	
SITE 39	39MW3-A	5/14/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
SITE 39	39MW3-A	5/14/2002	Nickel	µg/L	12.4	10	SW6020	

SITE 39	39MW3-A	5/14/2002	Nitrogen, Nitrate	µg/L	2800	100	SW9056
SITE 39	39MW3-A	5/14/2002	Phenolics, Total	µg/L	ND	5	SW9065
SITE 39	39MW3-A	5/14/2002	Resorcinol	µg/L	ND	9	SW8270C
SITE 39	39MW3-A	5/14/2002	Selenium	µg/L	ND	10	SW7740
SITE 39	39MW3-A	5/14/2002	Silver	µg/L	ND	2	SW6020
SITE 39	39MW3-A	5/14/2002	Sodium	µg/L	43000	10	SW6010B
SITE 39	39MW3-A	5/14/2002	Sulfate	µg/L	151000	5,000	SW9056
SITE 39	39MW3-A	5/14/2002	Thallium	µg/L	ND	1	SW6020
SITE 39	39MW3-A	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-A	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-A	5/14/2002	Toxaphene	µg/L	ND	2	SW8081
SITE 39	39MW3-B	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-B	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-C	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-C	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-D	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-D	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-A	5/14/2002	Gross Alpha	pCi/l	1.3 ± 0.6	1	SW9310
SITE 39	39MW3-A	5/14/2002	Gross Beta	pCi/l	12.1 ± 0.7	1	SW9310
SITE 39	39MW3-A	5/14/2002	Total Radium	pCi/l	0.6 ± 0.8	1	SW9320
SITE 39	DUPLICATE-	5/14/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151
SITE 39	DUPLICATE-	5/14/2002	2,4-D	µg/L	ND	40	SW8151
SITE 39	DUPLICATE-	5/14/2002	2,4-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-	5/14/2002	2,6-Dinitrotoluene	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-	5/14/2002	Antimony	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-	5/14/2002	Arsenic	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-	5/14/2002	Barium	µg/L	53.8	10	SW6020
SITE 39	DUPLICATE-	5/14/2002	Beryllium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-	5/14/2002	Cadmium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-	5/14/2002	Chloride	µg/L	8500	1,000	SW9056
SITE 39	DUPLICATE-	5/14/2002	Chromium	µg/L	ND	5	SW6020
SITE 39	DUPLICATE-	5/14/2002	Diethyl phthalate	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-	5/14/2002	Di-n-butyl phthalate	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-	5/14/2002	Endrin	µg/L	ND	0	SW8081
SITE 39	DUPLICATE-	5/14/2002	Fluoride	µg/L	160	100	SW9056
SITE 39	DUPLICATE-	5/14/2002	gamma-BHC	µg/L	ND	0	SW8081
SITE 39	DUPLICATE-	5/14/2002	Iron	µg/L	ND	100	SW6010B
SITE 39	DUPLICATE-	5/14/2002	Lead	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-	5/14/2002	Manganese	µg/L	ND	50	SW6020
SITE 39	DUPLICATE-	5/14/2002	Mercury	µg/L	ND	1	SW7470A
SITE 39	DUPLICATE-	5/14/2002	Methoxychlor	µg/L	ND	0	SW8081
SITE 39	DUPLICATE-	5/14/2002	MPN, Fecal Coliform	MPN Index	30	2	SM9221 E
SITE 39	DUPLICATE-	5/14/2002	Nickel	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-	5/14/2002	Nitrogen, Nitrate	µg/L	1480	100	SW9056
SITE 39	DUPLICATE-	5/14/2002	Phenolics, Total	µg/L	ND	5	SW9065
SITE 39	DUPLICATE-	5/14/2002	Resorcinol	µg/L	ND	9	SW8270C
SITE 39	DUPLICATE-	5/14/2002	Selenium	µg/L	ND	10	SW7740
SITE 39	DUPLICATE-	5/14/2002	Silver	µg/L	ND	2	SW6020
SITE 39	DUPLICATE-	5/14/2002	Sodium	µg/L	7990	10	SW6010B
SITE 39	DUPLICATE-	5/14/2002	Sulfate	µg/L	18900	5,000	SW9056
SITE 39	DUPLICATE-	5/14/2002	Thallium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-	5/14/2002	Toxaphene	µg/L	ND	2	SW8081
SITE 39	DUPLICATE-	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-	5/14/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-	5/14/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-	5/14/2002	Gross Alpha	pCi/l	1.0 ± 0.4	1	SW9310
SITE 39	DUPLICATE-	5/14/2002	Gross Beta	pCi/l	2.9 ± 0.5	1	SW9310
SITE 39	DUPLICATE-	5/14/2002	Total Radium	pCi/l	0.4 ± 0.8	1	SW9320
SITE 39	TRIP BLANK	5/14/2002	2,4-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	5/14/2002	2,6-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	5/14/2002	Diethyl phthalate	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	5/14/2002	Di-n-butyl phthalate	µg/L	ND	10	SW8270C

SITE 39 TRIP BLANK 5/14/2002 Resorcinol
Duplicate well 39MW1

µg/L

ND

10

SW8270C

SiteID	ClientSampleID	CollectionDate	Analyte	Units	Result	QuantLimit	TestNo	Qualifiers
SITE 39	39MW1-A	9/18/2002	Chloride	µg/L	12100	1,000	SW9056	
SITE 39	39MW1-A	9/18/2002	Fluoride	µg/L	260	100	SW9056	
SITE 39	39MW1-A	9/18/2002	Nitrogen, Nitrate	µg/L	1480	100	SW9056	
SITE 39	39MW1-A	9/18/2002	Sulfate	µg/L	21400	5,000	SW9056	
SITE 39	39MW1-A	9/18/2002	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW1-A	9/18/2002	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW1-A	9/18/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
SITE 39	39MW1-A	9/18/2002	Iron	µg/L	174	100	SW6010B	
SITE 39	39MW1-A	9/18/2002	Sodium	µg/L	11700	10	SW6010B	
SITE 39	39MW1-A	9/18/2002	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW1-A	9/18/2002	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	9/18/2002	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	9/18/2002	Barium	µg/L	39.3	10	SW6020	
SITE 39	39MW1-A	9/18/2002	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	9/18/2002	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	9/18/2002	Chromium	µg/L	ND	5	SW6020	
SITE 39	39MW1-A	9/18/2002	Lead	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	9/18/2002	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW1-A	9/18/2002	Nickel	µg/L	ND	10	SW6020	
SITE 39	39MW1-A	9/18/2002	Silver	µg/L	ND	2	SW6020	
SITE 39	39MW1-A	9/18/2002	Thallium	µg/L	ND	1	SW6020	
SITE 39	39MW1-A	9/18/2002	Total Organic Carbon	µg/L	1000	1,000	SW9060	
SITE 39	39MW1-A	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-A	9/18/2002	2,4-Dinitrotoluene	µg/L	ND	8	SW8270C	
SITE 39	39MW1-A	9/18/2002	2,6-Dinitrotoluene	µg/L	ND	8	SW8270C	
SITE 39	39MW1-A	9/18/2002	Di-n-butyl phthalate	µg/L	ND	8	SW8270C	
SITE 39	39MW1-A	9/18/2002	Diethyl phthalate	µg/L	ND	8	SW8270C	
SITE 39	39MW1-A	9/18/2002	Resorcinol	µg/L	ND	8	SW8270C	
SITE 39	39MW1-A	9/18/2002	Endrin	µg/L	ND	0.393	SW8081	
SITE 39	39MW1-A	9/18/2002	gamma-BHC	µg/L	ND	0.157	SW8081	
SITE 39	39MW1-A	9/18/2002	Methoxychlor	µg/L	ND	0.393	SW8081	
SITE 39	39MW1-A	9/18/2002	Toxaphene	µg/L	ND	2.36	SW8081	
SITE 39	39MW1-A	9/18/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151	
SITE 39	39MW1-A	9/18/2002	2,4-D	µg/L	ND	39	SW8151	
SITE 39	39MW1-B	9/18/2002	Total Organic Carbon	µg/L	1100	1,000	SW9060	
SITE 39	39MW1-B	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-C	9/18/2002	Total Organic Carbon	µg/L	1400	1,000	SW9060	
SITE 39	39MW1-C	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-D	9/18/2002	Total Organic Carbon	µg/L	1500	1,000	SW9060	
SITE 39	39MW1-D	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW1-A	9/18/2002	Gross Alpha	pCi/l	0.8 ± 0.4	1	SW9310	
SITE 39	39MW1-A	9/18/2002	Gross Beta	pCi/l	2.4 ± 0.5	1	SW9310	
SITE 39	39MW1-A	9/18/2002	Total Radium	pCi/l	0.6 ± 0.8	1	SW9320	
SITE 39	39MW3-A	9/18/2002	Chloride	µg/L	4200	1,000	SW9056	
SITE 39	39MW3-A	9/18/2002	Fluoride	µg/L	240	100	SW9056	
SITE 39	39MW3-A	9/18/2002	Nitrogen, Nitrate	µg/L	2490	100	SW9056	
SITE 39	39MW3-A	9/18/2002	Sulfate	µg/L	92400	5,000	SW9056	
SITE 39	39MW3-A	9/18/2002	Mercury	µg/L	ND	1	SW7470A	
SITE 39	39MW3-A	9/18/2002	Selenium	µg/L	ND	10	SW7740	
SITE 39	39MW3-A	9/18/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E	
SITE 39	39MW3-A	9/18/2002	Iron	µg/L	ND	100	SW6010B	
SITE 39	39MW3-A	9/18/2002	Sodium	µg/L	23300	10	SW6010B	
SITE 39	39MW3-A	9/18/2002	Phenolics, Total	µg/L	ND	5	SW9065	
SITE 39	39MW3-A	9/18/2002	Antimony	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	9/18/2002	Arsenic	µg/L	ND	10	SW6020	
SITE 39	39MW3-A	9/18/2002	Barium	µg/L	90.6	10	SW6020	
SITE 39	39MW3-A	9/18/2002	Beryllium	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	9/18/2002	Cadmium	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	9/18/2002	Chromium	µg/L	ND	5	SW6020	
SITE 39	39MW3-A	9/18/2002	Lead	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	9/18/2002	Manganese	µg/L	ND	50	SW6020	
SITE 39	39MW3-A	9/18/2002	Nickel	µg/L	ND	10	SW6020	
SITE 39	39MW3-A	9/18/2002	Silver	µg/L	ND	2	SW6020	
SITE 39	39MW3-A	9/18/2002	Thallium	µg/L	ND	1	SW6020	
SITE 39	39MW3-A	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW3-A	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B	
SITE 39	39MW3-A	9/18/2002	2,4-Dinitrotoluene	µg/L	ND	8	SW8270C	
SITE 39	39MW3-A	9/18/2002	2,6-Dinitrotoluene	µg/L	ND	8	SW8270C	
SITE 39	39MW3-A	9/18/2002	Di-n-butyl phthalate	µg/L	ND	8	SW8270C	
SITE 39	39MW3-A	9/18/2002	Diethyl phthalate	µg/L	ND	8	SW8270C	
SITE 39	39MW3-A	9/18/2002	Resorcinol	µg/L	ND	8	SW8270C	

SITE 39	39MW3-A	9/18/2002	Endrin	µg/L	ND	0.392	SW8081
SITE 39	39MW3-A	9/18/2002	gamma-BHC	µg/L	ND	0.157	SW8081
SITE 39	39MW3-A	9/18/2002	Methoxychlor	µg/L	ND	0.392	SW8081
SITE 39	39MW3-A	9/18/2002	Toxaphene	µg/L	ND	2.35	SW8081
SITE 39	39MW3-A	9/18/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151
SITE 39	39MW3-A	9/18/2002	2,4-D	µg/L	ND	39	SW8151
SITE 39	39MW3-B	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-B	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-C	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-C	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-D	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-D	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-D	9/18/2002	Gross Alpha	pCi/l	3.3 ± 1.1	1	SW9310
SITE 39	39MW3-D	9/18/2002	Gross Beta	pCi/l	10.8 ± 0.7	1	SW9310
SITE 39	39MW3-D	9/18/2002	Total Radium	pCi/l	0.2 ± 0.8	1	SW9320
SITE 39	DUPLICATE-A	9/18/2002	Chloride	µg/L	11700	1,000	SW9056
SITE 39	DUPLICATE-A	9/18/2002	Fluoride	µg/L	270	100	SW9056
SITE 39	DUPLICATE-A	9/18/2002	Nitrogen, Nitrate	µg/L	1500	100	SW9056
SITE 39	DUPLICATE-A	9/18/2002	Sulfate	µg/L	20200	5,000	SW9056
SITE 39	DUPLICATE-A	9/18/2002	Mercury	µg/L	ND	1	SW7470A
SITE 39	DUPLICATE-A	9/18/2002	Selenium	µg/L	ND	10	SW7740
SITE 39	DUPLICATE-A	9/18/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E
SITE 39	DUPLICATE-A	9/18/2002	Iron	µg/L	104	100	SW6010B
SITE 39	DUPLICATE-A	9/18/2002	Sodium	µg/L	13300	10	SW6010B
SITE 39	DUPLICATE-A	9/18/2002	Phenolics, Total	µg/L	ND	5	SW9065
SITE 39	DUPLICATE-A	9/18/2002	Antimony	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Arsenic	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Barium	µg/L	40.8	10	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Beryllium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Cadmium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Chromium	µg/L	ND	5	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Lead	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Manganese	µg/L	ND	50	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Nickel	µg/L	ND	10	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Silver	µg/L	ND	2	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Thallium	µg/L	ND	1	SW6020
SITE 39	DUPLICATE-A	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-A	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-A	9/18/2002	2,4-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE-A	9/18/2002	2,6-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE-A	9/18/2002	Di-n-butyl phthalate	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE-A	9/18/2002	Diethyl phthalate	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE-A	9/18/2002	Resorcinol	µg/L	ND	8	SW8270C
SITE 39	DUPLICATE-A	9/18/2002	Endrin	µg/L	ND	0.389	SW8081
SITE 39	DUPLICATE-A	9/18/2002	gamma-BHC	µg/L	ND	0.156	SW8081
SITE 39	DUPLICATE-A	9/18/2002	Methoxychlor	µg/L	ND	0.389	SW8081
SITE 39	DUPLICATE-A	9/18/2002	Toxaphene	µg/L	ND	2.33	SW8081
SITE 39	DUPLICATE-A	9/18/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151
SITE 39	DUPLICATE-A	9/18/2002	2,4-D	µg/L	ND	39	SW8151
SITE 39	DUPLICATE-B	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-B	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-C	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-C	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE-D	9/18/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	DUPLICATE-D	9/18/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	DUPLICATE	9/18/2002	Gross Alpha	pCi/l	1.0 ± 0.4	1	SW9310
SITE 39	DUPLICATE	9/18/2002	Gross Beta	pCi/l	2.7 ± 0.5	1	SW9310
SITE 39	DUPLICATE	9/18/2002	Total Radium	pCi/l	0.6 ± 1.1	1	SW9320
SITE 39	TRIP BLANK	9/18/2002	2,4-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	9/18/2002	2,6-Dinitrotoluene	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	9/18/2002	Di-n-butyl phthalate	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	9/18/2002	Diethyl phthalate	µg/L	ND	10	SW8270C
SITE 39	TRIP BLANK	9/18/2002	Resorcinol	µg/L	ND	10	SW8270C

Duplicate well - 39MW1

SiteID	ClientSampleID	CollectionDate	Analyte	Units	Result	QuantLimit	TestNo	Qualifiers
SITE 39	39MW1-A	12/16/2002	MPN, Fecal Coliform	MPN Index	ND		2 SM9221 E	
SITE 39	39MW1-A	12/16/2002	Mercury	µg/L	ND		1 SW7470A	
SITE 39	39MW1-A	12/16/2002	Phenolics, Total	µg/L	ND		5 SW9065	
SITE 39	39MW1-A	12/16/2002	Iron	µg/L	ND		100 SW6010B	
SITE 39	39MW1-A	12/16/2002	Sodium	µg/L	4520		10 SW6010B	
SITE 39	39MW1-A	12/16/2002	Chloride	µg/L	3230	1,000	SW9056	
SITE 39	39MW1-A	12/16/2002	Fluoride	µg/L	210	100	SW9056	
SITE 39	39MW1-A	12/16/2002	Nitrogen, Nitrate	µg/L	1750	100	SW9056	
SITE 39	39MW1-A	12/16/2002	Sulfate	µg/L	24400	5,000	SW9056	
SITE 39	39MW1-A	12/16/2002	Antimony	µg/L	ND		1 SW6020	
SITE 39	39MW1-A	12/16/2002	Arsenic	µg/L	ND		10 SW6020	
SITE 39	39MW1-A	12/16/2002	Barium	µg/L	51.7	10	SW6020	
SITE 39	39MW1-A	12/16/2002	Beryllium	µg/L	ND		1 SW6020	
SITE 39	39MW1-A	12/16/2002	Cadmium	µg/L	ND		1 SW6020	
SITE 39	39MW1-A	12/16/2002	Chromium	µg/L	ND		5 SW6020	
SITE 39	39MW1-A	12/16/2002	Lead	µg/L	ND		1 SW6020	
SITE 39	39MW1-A	12/16/2002	Manganese	µg/L	ND		50 SW6020	
SITE 39	39MW1-A	12/16/2002	Nickel	µg/L	ND		10 SW6020	
SITE 39	39MW1-A	12/16/2002	Silver	µg/L	ND		2 SW6020	
SITE 39	39MW1-A	12/16/2002	Thallium	µg/L	ND		1 SW6020	
SITE 39	39MW1-A	12/16/2002	Selenium	µg/L	ND		10 SW7740	
SITE 39	39MW1-A	12/16/2002	Endrin	µg/L	ND	0.388	SW8081	
SITE 39	39MW1-A	12/16/2002	gamma-BHC	µg/L	ND	0.155	SW8081	
SITE 39	39MW1-A	12/16/2002	Methoxychlor	µg/L	ND	0.388	SW8081	
SITE 39	39MW1-A	12/16/2002	Toxaphene	µg/L	ND		2 SW8081	
SITE 39	39MW1-A	12/16/2002	2,4,5-TP (Silvex)	µg/L	ND		8 SW8151	
SITE 39	39MW1-A	12/16/2002	2,4-D	µg/L	ND		41 SW8151	
SITE 39	39MW1-A	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-A	12/16/2002	Total Organic Halides (TOX)	µg/L	ND		20 SW9020B	
SITE 39	39MW1-A	12/16/2002	2,4-Dinitrotoluene	µg/L	ND		8 SW8270C	
SITE 39	39MW1-A	12/16/2002	2,6-Dinitrotoluene	µg/L	ND		8 SW8270C	
SITE 39	39MW1-A	12/16/2002	Di-n-butyl phthalate	µg/L	ND		8 SW8270C	
SITE 39	39MW1-A	12/16/2002	Diethyl phthalate	µg/L	ND		8 SW8270C	
SITE 39	39MW1-A	12/16/2002	Resorcinol	µg/L	ND		8 SW8270C	
SITE 39	39MW1-B	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-B	12/16/2002	Total Organic Halides (TOX)	µg/L	ND		20 SW9020B	
SITE 39	39MW1-C	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-C	12/16/2002	Total Organic Halides (TOX)	µg/L	ND		20 SW9020B	
SITE 39	39MW1-D	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060	
SITE 39	39MW1-D	12/16/2002	Total Organic Halides (TOX)	µg/L	ND		20 SW9020B	
SITE 39	39MW1-A	12/16/2002	Gross Alpha	pCi/l	0.8 ± 0.4		1 SW9310	
SITE 39	39MW1-A	12/16/2002	Gross Beta	pCi/l	2.6 ± 0.7		1 SW9310	
SITE 39	39MW1-A	12/16/2002	Total Radium	pCi/l	0.0 ± 0.6		1 SW9320	
SITE 39	39MW3-A	12/16/2002	MPN, Fecal Coliform	MPN Index	ND		2 SM9221 E	
SITE 39	39MW3-A	12/16/2002	Mercury	µg/L	ND		1 SW7470A	
SITE 39	39MW3-A	12/16/2002	Phenolics, Total	µg/L	ND		5 SW9065	
SITE 39	39MW3-A	12/16/2002	Iron	µg/L	ND		100 SW6010B	
SITE 39	39MW3-A	12/16/2002	Sodium	µg/L	29800		10 SW6010B	
SITE 39	39MW3-A	12/16/2002	Chloride	µg/L	3420	1,000	SW9056	
SITE 39	39MW3-A	12/16/2002	Fluoride	µg/L	290	100	SW9056	
SITE 39	39MW3-A	12/16/2002	Nitrogen, Nitrate	µg/L	2640	100	SW9056	
SITE 39	39MW3-A	12/16/2002	Sulfate	µg/L	99300	5,000	SW9056	
SITE 39	39MW3-A	12/16/2002	Antimony	µg/L	ND		1 SW6020	
SITE 39	39MW3-A	12/16/2002	Arsenic	µg/L	ND		10 SW6020	
SITE 39	39MW3-A	12/16/2002	Barium	µg/L	61.1	10	SW6020	
SITE 39	39MW3-A	12/16/2002	Beryllium	µg/L	ND		1 SW6020	
SITE 39	39MW3-A	12/16/2002	Cadmium	µg/L	ND		1 SW6020	
SITE 39	39MW3-A	12/16/2002	Chromium	µg/L	96.8	5	SW6020	
SITE 39	39MW3-A	12/16/2002	Lead	µg/L	ND		1 SW6020	
SITE 39	39MW3-A	12/16/2002	Manganese	µg/L	ND		50 SW6020	
SITE 39	39MW3-A	12/16/2002	Nickel	µg/L	88.7	10	SW6020	
SITE 39	39MW3-A	12/16/2002	Silver	µg/L	ND		2 SW6020	
SITE 39	39MW3-A	12/16/2002	Thallium	µg/L	ND		1 SW6020	
SITE 39	39MW3-A	12/16/2002	Selenium	µg/L	ND		10 SW7740	
SITE 39	39MW3-A	12/16/2002	Endrin	µg/L	ND	0.388	SW8081	

SITE 39	39MW3-A	12/16/2002	gamma-BHC	µg/L	ND	0.155	SW8081
SITE 39	39MW3-A	12/16/2002	Methoxychlor	µg/L	ND	0.388	SW8081
SITE 39	39MW3-A	12/16/2002	Toxaphene	µg/L	ND	2	SW8081
SITE 39	39MW3-A	12/16/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151
SITE 39	39MW3-A	12/16/2002	2,4-D	µg/L	ND	41	SW8151
SITE 39	39MW3-A	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-A	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-A	12/16/2002	2,4-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	39MW3-A	12/16/2002	2,6-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	39MW3-A	12/16/2002	Di-n-butyl phthalate	µg/L	ND	8	SW8270C
SITE 39	39MW3-A	12/16/2002	Diethyl phthalate	µg/L	ND	8	SW8270C
SITE 39	39MW3-A	12/16/2002	Resorcinol	µg/L	ND	8	SW8270C
SITE 39	39MW3-B	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-B	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-C	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-C	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-D	12/16/2002	Total Organic Carbon	µg/L	ND	1,000	SW9060
SITE 39	39MW3-D	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW3-A	12/16/2002	Gross Alpha	pCi/l	1.6 ± 0.7	1	SW9310
SITE 39	39MW3-A	12/16/2002	Gross Beta	pCi/l	4.8 ± 0.8	1	SW9310
SITE 39	39MW3-A	12/16/2002	Total Radium	pCi/l	2.6 ± 0.9	1	SW9320
SITE 39	39MW4-A	12/16/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E
SITE 39	39MW4-A	12/16/2002	Mercury	µg/L	ND	1	SW7470A
SITE 39	39MW4-A	12/16/2002	Phenolics, Total	µg/L	ND	5	SW9065
SITE 39	39MW4-A	12/16/2002	Iron	µg/L	ND	100	SW6010B
SITE 39	39MW4-A	12/16/2002	Sodium	µg/L	12500	10	SW6010B
SITE 39	39MW4-A	12/16/2002	Chloride	µg/L	2240	1,000	SW9056
SITE 39	39MW4-A	12/16/2002	Fluoride	µg/L	150	100	SW9056
SITE 39	39MW4-A	12/16/2002	Nitrogen, Nitrate	µg/L	660	100	SW9056
SITE 39	39MW4-A	12/16/2002	Sulfate	µg/L	96600	5,000	SW9056
SITE 39	39MW4-A	12/16/2002	Antimony	µg/L	ND	1	SW6020
SITE 39	39MW4-A	12/16/2002	Arsenic	µg/L	ND	10	SW6020
SITE 39	39MW4-A	12/16/2002	Barium	µg/L	120	10	SW6020
SITE 39	39MW4-A	12/16/2002	Beryllium	µg/L	ND	1	SW6020
SITE 39	39MW4-A	12/16/2002	Cadmium	µg/L	ND	1	SW6020
SITE 39	39MW4-A	12/16/2002	Chromium	µg/L	ND	5	SW6020
SITE 39	39MW4-A	12/16/2002	Lead	µg/L	ND	1	SW6020
SITE 39	39MW4-A	12/16/2002	Manganese	µg/L	ND	50	SW6020
SITE 39	39MW4-A	12/16/2002	Nickel	µg/L	15.3	10	SW6020
SITE 39	39MW4-A	12/16/2002	Silver	µg/L	ND	2	SW6020
SITE 39	39MW4-A	12/16/2002	Thallium	µg/L	ND	1	SW6020
SITE 39	39MW4-A	12/16/2002	Selenium	µg/L	ND	10	SW7740
SITE 39	39MW4-A	12/16/2002	Endrin	µg/L	ND	0.392	SW8081
SITE 39	39MW4-A	12/16/2002	gamma-BHC	µg/L	ND	0.157	SW8081
SITE 39	39MW4-A	12/16/2002	Methoxychlor	µg/L	ND	0.392	SW8081
SITE 39	39MW4-A	12/16/2002	Toxaphene	µg/L	ND	2	SW8081
SITE 39	39MW4-A	12/16/2002	2,4,5-TP (Silvex)	µg/L	ND	8	SW8151
SITE 39	39MW4-A	12/16/2002	2,4-D	µg/L	ND	41	SW8151
SITE 39	39MW4-A	12/16/2002	Total Organic Carbon	µg/L	1600	1,000	SW9060
SITE 39	39MW4-A	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW4-A	12/16/2002	2,4-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	39MW4-A	12/16/2002	2,6-Dinitrotoluene	µg/L	ND	8	SW8270C
SITE 39	39MW4-A	12/16/2002	Di-n-butyl phthalate	µg/L	ND	8	SW8270C
SITE 39	39MW4-A	12/16/2002	Diethyl phthalate	µg/L	ND	8	SW8270C
SITE 39	39MW4-A	12/16/2002	Resorcinol	µg/L	ND	8	SW8270C
SITE 39	39MW4-B	12/16/2002	Total Organic Carbon	µg/L	1400	1,000	SW9060
SITE 39	39MW4-B	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW4-C	12/16/2002	Total Organic Carbon	µg/L	1400	1,000	SW9060
SITE 39	39MW4-C	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW4-D	12/16/2002	Total Organic Carbon	µg/L	1400	1,000	SW9060
SITE 39	39MW4-D	12/16/2002	Total Organic Halides (TOX)	µg/L	ND	20	SW9020B
SITE 39	39MW4-A	12/16/2002	Gross Alpha	pCi/l	0.5 ± 0.6	1	SW9310
SITE 39	39MW4-A	12/16/2002	Gross Beta	pCi/l	10.8 ± 0.9	1	SW9310
SITE 39	39MW4-A	12/16/2002	Total Radium	pCi/l	0.2 ± 0.7	1	SW9320
SITE 39	DUPLICATE-A	12/16/2002	MPN, Fecal Coliform	MPN Index	ND	2	SM9221 E
SITE 39	DUPLICATE-A	12/16/2002	Mercury	µg/L	ND	1	SW7470A

SITE 39	DUPLICATE-A	12/16/2002 Phenolics, Total	µg/L	ND	5 SW9065
SITE 39	DUPLICATE-A	12/16/2002 Iron	µg/L	130	100 SW6010B
SITE 39	DUPLICATE-A	12/16/2002 Sodium	µg/L	5930	10 SW6010B
SITE 39	DUPLICATE-A	12/16/2002 Chloride	µg/L	4160	1,000 SW9056
SITE 39	DUPLICATE-A	12/16/2002 Fluoride	µg/L	200	100 SW9056
SITE 39	DUPLICATE-A	12/16/2002 Nitrogen, Nitrate	µg/L	1620	100 SW9056
SITE 39	DUPLICATE-A	12/16/2002 Sulfate	µg/L	20800	5,000 SW9056
SITE 39	DUPLICATE-A	12/16/2002 Antimony	µg/L	ND	1 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Arsenic	µg/L	ND	10 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Barium	µg/L	52.7	10 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Beryllium	µg/L	ND	1 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Cadmium	µg/L	ND	1 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Chromium	µg/L	ND	5 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Lead	µg/L	ND	1 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Manganese	µg/L	ND	50 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Nickel	µg/L	ND	10 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Silver	µg/L	ND	2 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Thallium	µg/L	ND	1 SW6020
SITE 39	DUPLICATE-A	12/16/2002 Selenium	µg/L	ND	10 SW7740
SITE 39	DUPLICATE-A	12/16/2002 Endrin	µg/L	ND	0.388 SW8081
SITE 39	DUPLICATE-A	12/16/2002 gamma-BHC	µg/L	ND	0.155 SW8081
SITE 39	DUPLICATE-A	12/16/2002 Methoxychlor	µg/L	ND	0.388 SW8081
SITE 39	DUPLICATE-A	12/16/2002 Toxaphene	µg/L	ND	2 SW8081
SITE 39	DUPLICATE-A	12/16/2002 2,4,5-TP (Silvex)	µg/L	ND	8 SW8151
SITE 39	DUPLICATE-A	12/16/2002 2,4-D	µg/L	ND	41 SW8151
SITE 39	DUPLICATE-A	12/16/2002 Total Organic Carbon	µg/L	ND	1,000 SW9060
SITE 39	DUPLICATE-A	12/16/2002 Total Organic Halides (TOX)	µg/L	ND	20 SW9020B
SITE 39	DUPLICATE-A	12/16/2002 2,4-Dinitrotoluene	µg/L	ND	8 SW8270C
SITE 39	DUPLICATE-A	12/16/2002 2,6-Dinitrotoluene	µg/L	ND	8 SW8270C
SITE 39	DUPLICATE-A	12/16/2002 Di-n-butyl phthalate	µg/L	ND	8 SW8270C
SITE 39	DUPLICATE-A	12/16/2002 Diethyl phthalate	µg/L	ND	8 SW8270C
SITE 39	DUPLICATE-A	12/16/2002 Resorcinol	µg/L	ND	8 SW8270C
SITE 39	DUPLICATE-B	12/16/2002 Total Organic Carbon	µg/L	ND	1,000 SW9060
SITE 39	DUPLICATE-B	12/16/2002 Total Organic Halides (TOX)	µg/L	ND	20 SW9020B
SITE 39	DUPLICATE-C	12/16/2002 Total Organic Carbon	µg/L	ND	1,000 SW9060
SITE 39	DUPLICATE-C	12/16/2002 Total Organic Halides (TOX)	µg/L	ND	20 SW9020B
SITE 39	DUPLICATE-D	12/16/2002 Total Organic Carbon	µg/L	ND	1,000 SW9060
SITE 39	DUPLICATE-D	12/16/2002 Total Organic Halides (TOX)	µg/L	ND	20 SW9020B
SITE 39	DUPLICATE-A	12/16/2002 Gross Alpha	pCi/l	1.7 ± 0.5	1 SW9310
SITE 39	DUPLICATE-A	12/16/2002 Gross Beta	pCi/l	3.2 ± 0.7	1 SW9310
SITE 39	DUPLICATE-A	12/16/2002 Total Radium	pCi/l	0.4 ± 0.7	1 SW9320
SITE 39	TRIP BLANK	12/16/2002 2,4-Dinitrotoluene	µg/L	ND	8 SW8270C
SITE 39	TRIP BLANK	12/16/2002 2,6-Dinitrotoluene	µg/L	ND	8 SW8270C
SITE 39	TRIP BLANK	12/16/2002 Di-n-butyl phthalate	µg/L	ND	8 SW8270C
SITE 39	TRIP BLANK	12/16/2002 Diethyl phthalate	µg/L	ND	8 SW8270C
SITE 39	TRIP BLANK	12/16/2002 Resorcinol	µg/L	ND	8 SW8270C

Duplicate well 39MW1

Target Analyte Monitoring Results - First Quarter 2003
Radford Army Ammunition Plant - Facility HWMU-39
Upgradient wells = 39MW1 and 39MW4

All Results in ug/L (unless noted)

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	Method
Total Recoverable Phenolics			CAS # C-020				
First Quarter 2003	U	U	U	-	-	5	9065
Antimony			CAS # 7440-36-0				
First Quarter 2003	U	U	U	-	-	1	6020
Arsenic			CAS # 7440-38-2				
First Quarter 2003	U	U	U	-	-	10	6020
Barium			CAS # 7440-39-3				
First Quarter 2003	43.8	65.9	92	-	-	10	6020
Beryllium			CAS # 7440-41-7				
First Quarter 2003	U	U	U	-	-	1	6020
Cadmium			CAS # 7440-43-9				
First Quarter 2003	U	U	U	-	-	1	6020
Chromium			CAS # 7440-47-3				
First Quarter 2003	U	5.4	U	-	-	5	6020
Iron			CAS # 7439-89-6				
First Quarter 2003	U	U	U	-	-	100	6010B
Lead			CAS # 7439-92-1				
First Quarter 2003	U	U	U	-	-	1	6020
Manganese			CAS # 7439-96-5				
First Quarter 2003	U	U	U	-	-	50	6020
Mercury			CAS # 7439-97-6				
First Quarter 2003	U	U	U	-	-	1	7470A
Nickel			CAS # 7440-02-0				
First Quarter 2003	U	U	U	-	-	10	6020
Selenium			CAS # 7782-49-2				
First Quarter 2003	U	U	U	-	-	10	7470A
Silver			CAS # 7440-22-4				
First Quarter 2003	U	U	U	-	-	2	6020
Sodium			CAS # 7440-23-5				
First Quarter 2003	5800	38800	12800	-	-	10	6010B
Thallium			CAS # 7440-28-0				
First Quarter 2003	U	U	U	-	-	1	6020
Chloride			CAS # 16887-00-6				
First Quarter 2003	3710	4550	2260	-	-	1000	9056
Fluoride			CAS # 16984-48-8				
First Quarter 2003	270	320	150	-	-	100	9056
Nitrate (as N)			CAS # 14797-55-8				
First Quarter 2003	1150	2380	680	-	-	100	9056
Sulfate			CAS # 14808-79-8				
First Quarter 2003	19500	115000	98900	-	-	5000	9056
Total Organic Halides (Rep 1)			CAS # 59473-04-0				
First Quarter 2003	U	U	U	-	-	20	9020B
Total Organic Halides (Rep 2)			CAS # 59473-04-0				
First Quarter 2003	U	U	U	-	-	20	9020B
Total Organic Halides (Rep 3)			CAS # 59473-04-0				
First Quarter 2003	U	U	U	-	-	20	9020B
Total Organic Halides (Rep 4)			CAS # 59473-04-0				
First Quarter 2003	U	U	U	-	-	20	9020B
Total Organic Carbon (Rep 1)			CAS # C-012				
First Quarter 2003	U	U	1100	-	-	1000	9060
Total Organic Carbon (Rep 2)			CAS # C-012				
First Quarter 2003	U	U	1100	-	-	1000	9060
Total Organic Carbon (Rep 3)			CAS # C-012				
First Quarter 2003	U	U	1100	-	-	1000	9060
Total Organic Carbon (Rep 4)			CAS # C-012				
First Quarter 2003	U	U	1100	-	-	1000	9060
gamma-BHC			CAS # 58-89-9				
First Quarter 2003	U	U	U	-	-	0.15	8081
2,4-Dichlorophenoxyacetic acid			CAS # 94-75-7				
First Quarter 2003	U	U	U	-	-	39	8151

See definitions on last page.

Target Analyte Monitoring Results - First Quarter 2003
Radford Army Ammunition Plant - Facility HWMU-39
 Upgradient wells = 39MW1 and 39MW4

All Results in ug/L (unless noted)

Analyte/Quarter	39MW1 Q	39MW3 Q	39MW4 Q	39MW5 Q	39MW6 Q	QL	Method
Di-n-butyl phthalate			CAS # 84-74-2				
First Quarter 2003	U	U	U	-	-	8	8270C
Diethyl phthalate			CAS # 84-66-2				
First Quarter 2003	U	U	U	-	-	8	8270C
2,4-Dinitrotoluene			CAS # 121-14-2				
First Quarter 2003	U	U	U	-	-	8	8270C
2,6-Dinitrotoluene			CAS # 606-20-2				
First Quarter 2003	U	U	U	-	-	8	8270C
Endrin			CAS # 72-20-8				
First Quarter 2003	U	U	U	-	-	0.4	8081
Methoxychlor			CAS # 72-43-5				
First Quarter 2003	U	U	U	-	-	0.4	8081
Resorcinol			CAS # 108-46-3				
First Quarter 2003	U	U	U	-	-	8	8270C
Silvex			CAS # 93-72-1				
First Quarter 2003	U	U	U	-	-	8	8151
Toxaphene			CAS # 8001-35-2				
First Quarter 2003	U	U	U	-	-	2.3	8081
Fecal Coliform			CAS #				
First Quarter 2003	U	U	U	-	-	2	9221
Gross Alpha			CAS # 14127-62-9				
First Quarter 2003	0.7 + 0.4	4.7 + 1.9	3.3 + 1.3	-	-	1	9310
Gross Beta			CAS # 12587-47-2				
First Quarter 2003	1.6 + 0.5	5.4 + 1.0	10.0 + 1.1	-	-	1	9310

Definitions: QL Denotes project quantitation limit. Results reported to at or above QL. U Denotes analyte not detected at or above QL. UA Denotes analyte not detected at or above adjusted sample QL. J Denotes analyte reported at or above QL, and associated result is estimated. When used with "U" (i.e., "UJ"), denotes analyte not detected at or above QL and QL is estimated. When used with "UA" (i.e., "UAJ"), denotes analyte not detected at or above adjusted QL, and adjusted QL is estimated. "--" Denotes not detected or not available/not sampled. R Denotes result rejected. Q Denotes data validation qualifier. NS Denotes not sampled. NA Denotes not analyzed.

Notes:

2,4-D QL increased to 5 µg/l due to new laboratory MDL study (effective 2Q 2003).

No TOX data 3Q 2004 due to instrument breakdown.

The unit of measurement for radiological analyses is pico curries/liter (pCi/l).

Radium 228 via SW846 9320 to be performed when total alpha emitting radium 226 via SW846 9315 exceeds 3 pico curries/liter; not performed in 2Q 2005.