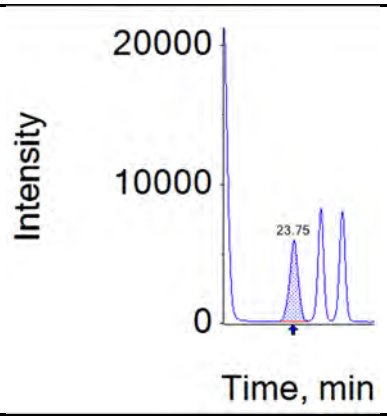
EXP121621023.wiff
1204977877

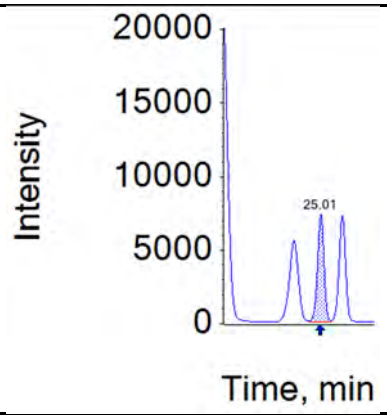



Compound Name: 2-Nitrotoluene

Expected RT: 23.70
Actual RT: 23.75
RRT: 1.22
Area Counts: 166014.143
Integration Type:Valley

Amount: 462.91
%Accuracy: N/A

EXP121621023.wiff
1204977877

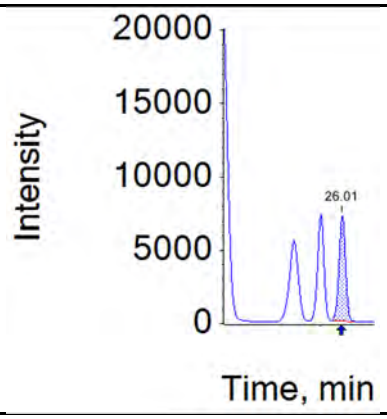



Compound Name: 4-Nitrotoluene

Expected RT: 24.96
Actual RT: 25.01
RRT: 1.29
Area Counts: 154438.819
Integration Type:Valley

Amount: 498.24
%Accuracy: N/A

EXP121621023.wiff
1204977877

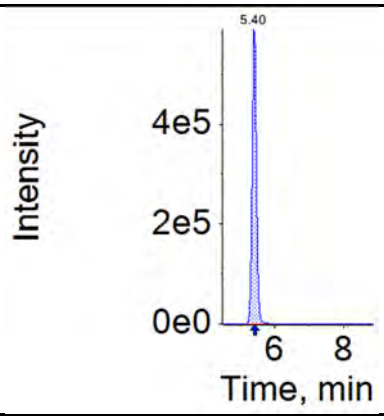



Compound Name: 3-Nitrotoluene

Expected RT: 25.96
Actual RT: 26.01
RRT: 1.34
Area Counts: 151624.401
Integration Type:Baseline

Amount: 467.70
%Accuracy: N/A

EXP121621023.wiff
1204977877

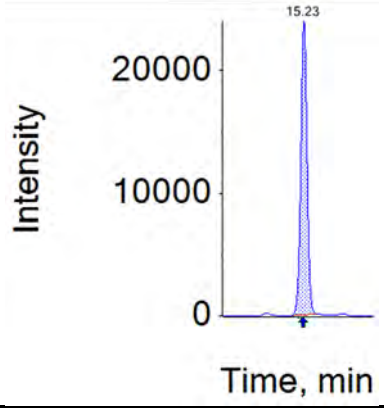



Compound Name: HMX

Expected RT: 5.40
Actual RT: 5.40
RRT: 0.41
Area Counts: 4963814.226
Integration Type:Baseline

Amount: 547.10
%Accuracy: N/A

EXP121621023.wiff
1204977877

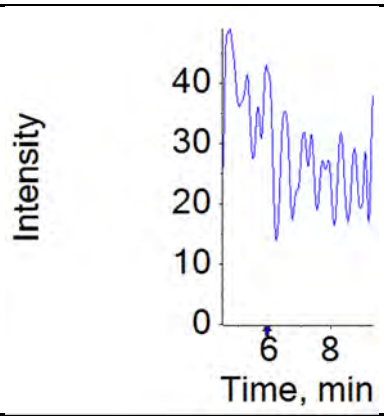



Compound Name: Nitrobenzene

Expected RT: 15.17
Actual RT: 15.23
RRT: 1.14
Area Counts: 477236.209
Integration Type:Baseline

Amount: 453.23
%Accuracy: N/A

EXP121621023.wiff
1204977877

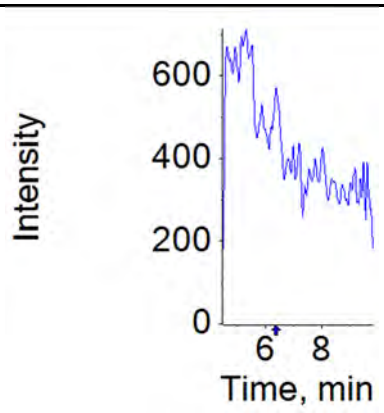



Compound Name: TNX

Expected RT: 5.90
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621023.wiff
1204977877

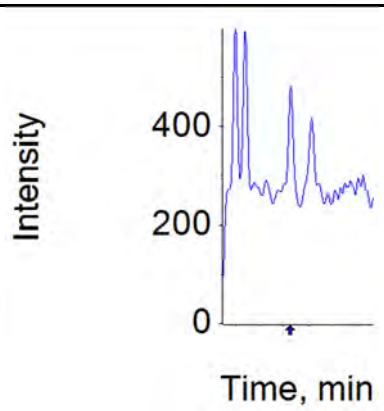



Compound Name: DNX

Expected RT: 6.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621023.wiff
1204977877

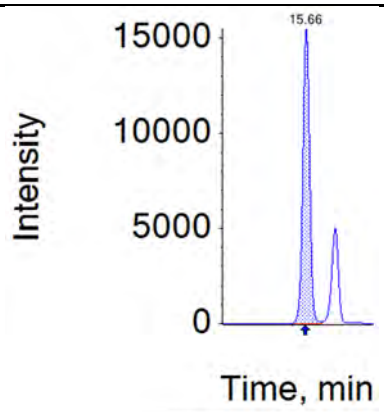



Compound Name: MNX

Expected RT: 7.25
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621023.wiff
1204977877

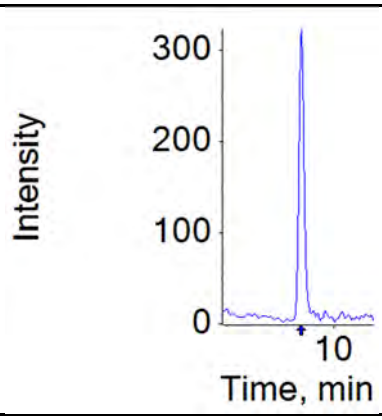



Compound Name: Nitroglycerin

Expected RT: 15.60
Actual RT: 15.66
RRT: 0.81
Area Counts: 342820.893
Integration Type:Valley

Amount: 438.88
%Accuracy: N/A

EXP121621023.wiff
1204977877

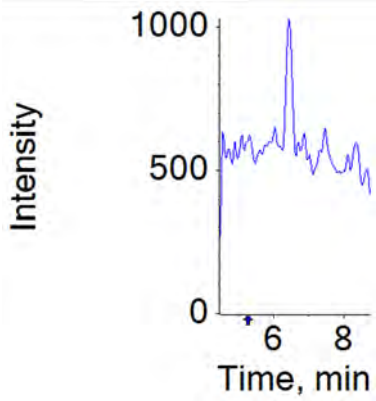



Compound Name: TATB

Expected RT: 8.47
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621023.wiff
1204977877

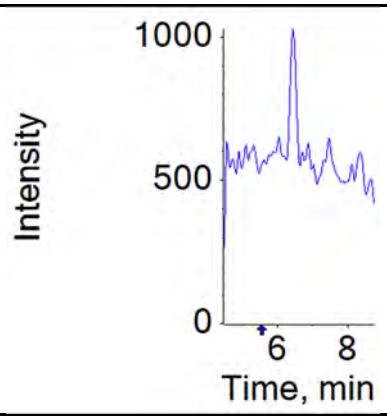



Compound Name: 26-Diamino-4-nitrotoluene

Expected RT: 5.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621023.wiff
1204977877

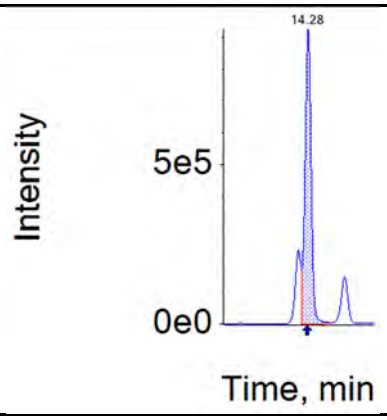



Compound Name: 24-Diamino-6-nitrotoluene

Expected RT: 5.54
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621023.wiff
1204977877

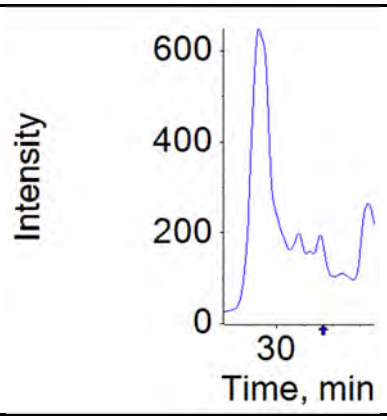



Compound Name: 35-Dinitroaniline

Expected RT: 14.23
Actual RT: 14.28
RRT: 0.74
Area Counts: 18344614.230
Integration Type:Valley

Amount: 491.99
%Accuracy: N/A

EXP121621023.wiff
1204977877



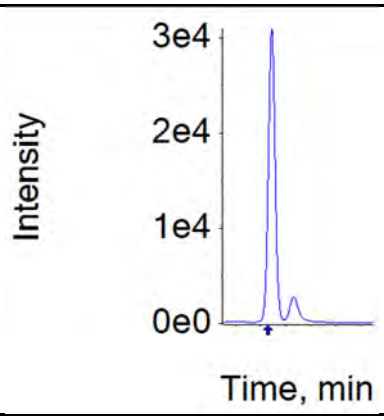

Compound Name: tris(o-cresyl)phosphate

Expected RT: 31.67
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621023.wiff

1204977877




Compound Name: Picric Acid

Expected RT: 6.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type: N/A

Amount: N/A
%Accuracy: N/A

# Explosives Initial Calibration Blank

**Lab Name:** GEL Laboratories LLC

**GEL Job No(SDG):** J2116762

**Lab Code:** GEL

**Lab Sample ID:** XIBLK01

**Analysis Date:** 16-DEC-21 18:47

**GEL Data File:** EXP121621002.wiff

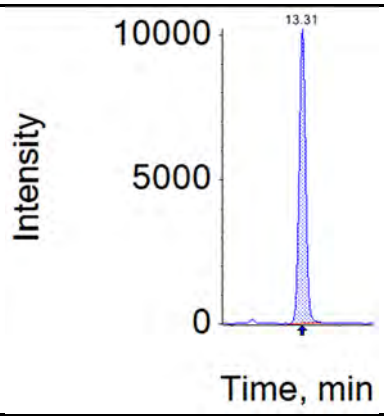
**Instrument ID:** LCMSMS7

**Column:** Ultracarb Phenomenex 5u ODS (20)

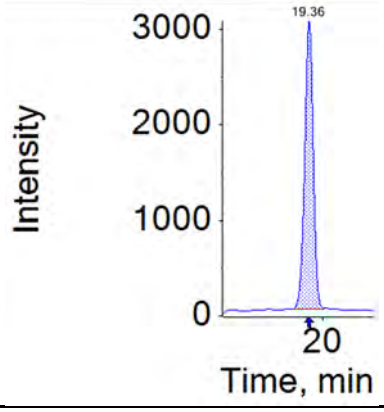
| Compound | True | Found (ug/L) |
|---|---|---|
| 3,4-Dinitrotoluene | 0 | 0 |
| RDX | 0 | 0 |

JISB 12/20/2021 MAE 12/20/2021

| Data File | EXP121621002.wiff | Acquisition Date | 12/16/2021 18:47:57 |
|---|---|---|---|
| Sample Name | XIBLK01 | Acquisition Method | 8330BFull.dam |
| Batch\|Dilution\|Analyst | \|1\|JLS | Result Table | 12162021A |
| Procedure Code | LCMSEXP_B | Sample Type | Unknown |




| | |
|---|---|
| Compound Name: | 13-Dinitrobenzene-d4 |
| Expected RT: | 13.29 |
| Actual RT: | 13.31 |
| Area Counts: | 212911.405 |
| Integration Type: | Baseline |
| Amount: | 10.00 |

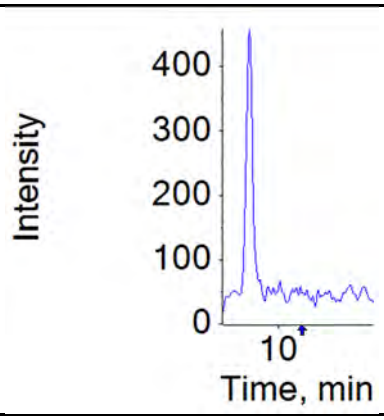



| | |
|---|---|
| Compound Name: | 26-Dinitrotoluene-d3 |
| Expected RT: | 19.34 |
| Actual RT: | 19.36 |
| Area Counts: | 82918.482 |
| Integration Type: | Valley |
| Amount: | 10.00 |

Please refer to Form 8 of the data package for a complete list of Internal Standard Recoveries.

Relative Retention Time (RRT) is used by the laboratory to establish peak identity. The RRT of each target analyte is calculated using the retention time of the corresponding internal standard. The RRT of each analyte in a sample must be within 2.0 of the analyte's calculated RRT in the ICV.

EXP121621002.wiff
XIBLK01

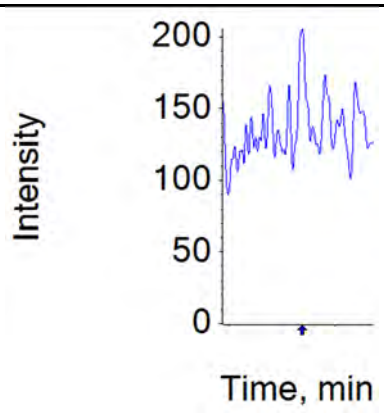



Compound Name: 135-Trinitrobenzene

Expected RT: 11.09
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

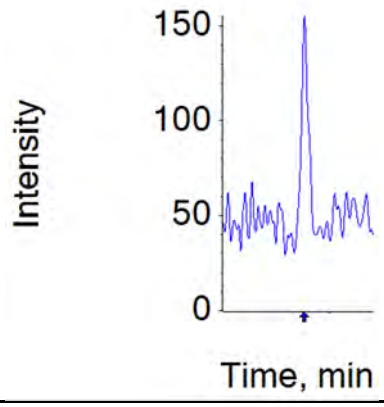



Compound Name: 13-Dinitrobenzene

Expected RT: 13.45
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

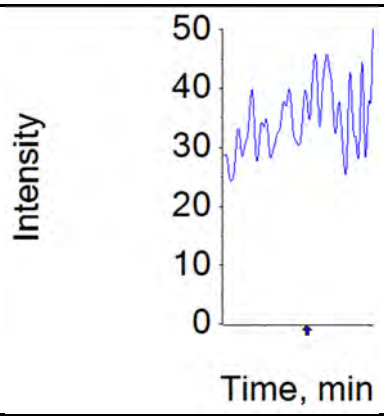



Compound Name: Tetryl

Expected RT: 13.78
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

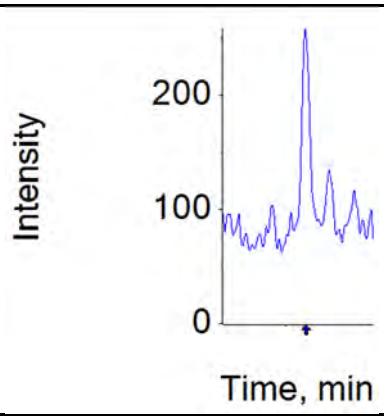



Compound Name: 246-Trinitrotoluene

Expected RT: 16.98
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

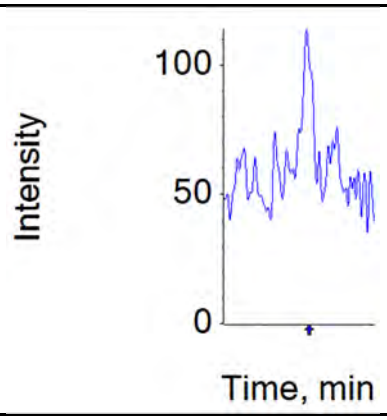



Compound Name: 34-dinitrotoluene

Expected RT: 15.94
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

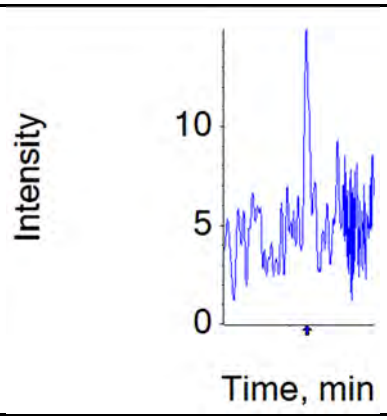



Compound Name: 4-Amino-26-dinitrotoluene

Expected RT: 17.06
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

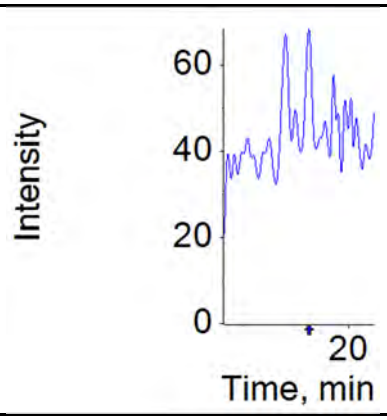



Compound Name: PETN

Expected RT: 25.80
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01



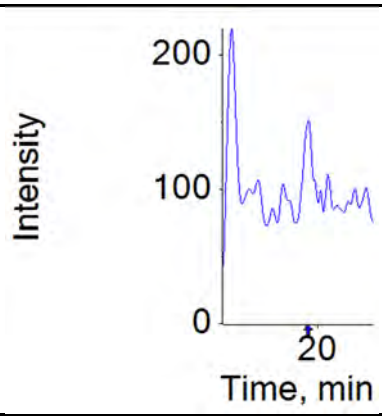

Compound Name: 2-Amino-46-dinitrotoluene

Expected RT: 18.12
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff

XIBLK01

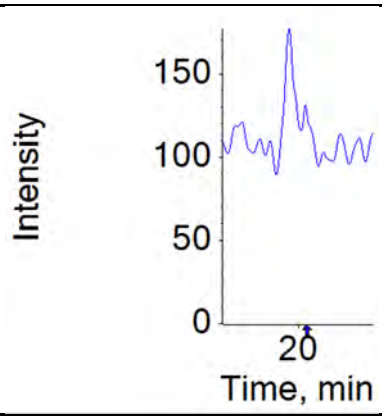



Compound Name: 26-dinitrotoluene

Expected RT: 19.52
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

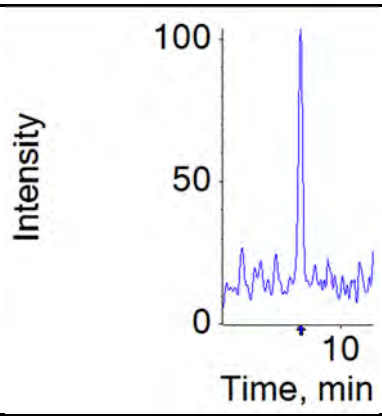



Compound Name: 24-dinitrotoluene

Expected RT: 20.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

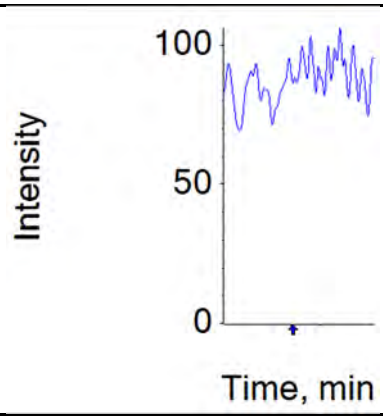



Compound Name: RDX

Expected RT: 8.11
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

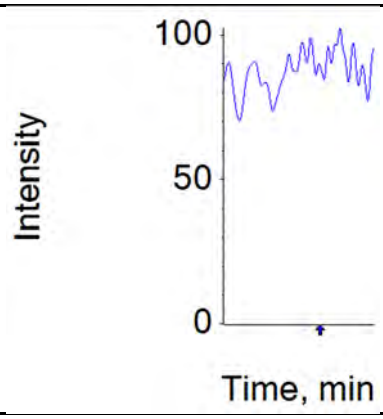



Compound Name: 2-Nitrotoluene

Expected RT: 23.70
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

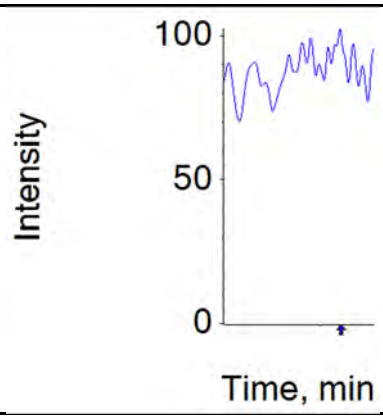



Compound Name: 4-Nitrotoluene

Expected RT: 24.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

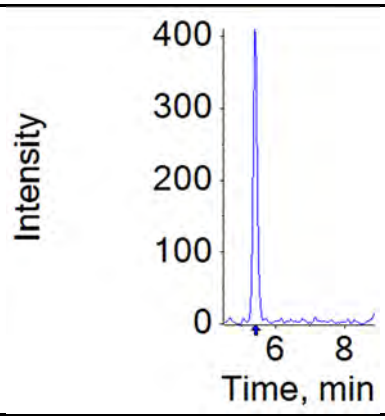



Compound Name: 3-Nitrotoluene

Expected RT: 25.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

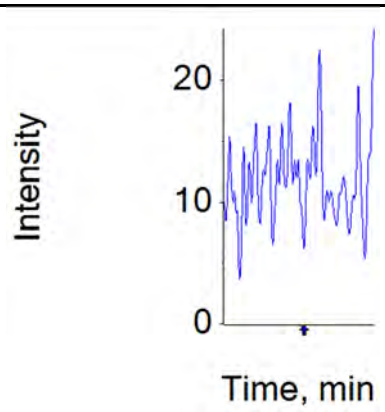



Compound Name: HMX

Expected RT: 5.40
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

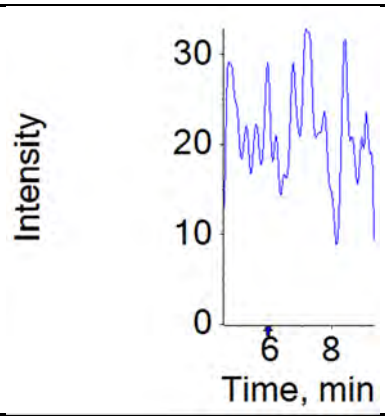



Compound Name: Nitrobenzene

Expected RT: 15.17
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

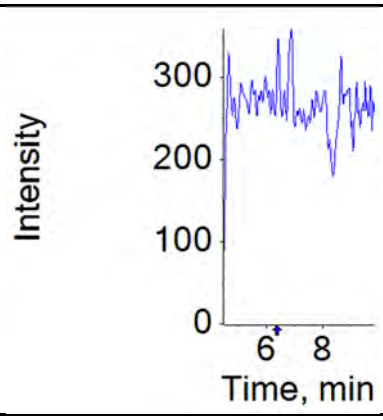



Compound Name: TNX

Expected RT: 5.90
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

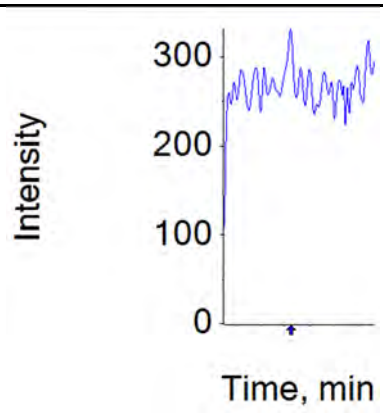



Compound Name: DNX

Expected RT: 6.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

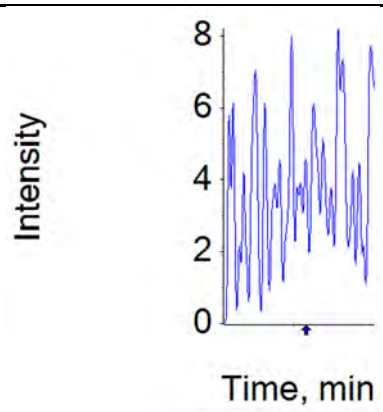



Compound Name: MNX

Expected RT: 7.25
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

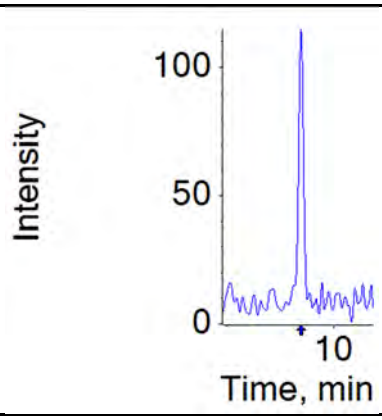



Compound Name: Nitroglycerin

Expected RT: 15.60
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

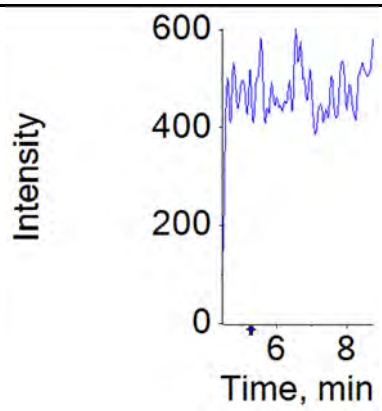



Compound Name: TATB

Expected RT: 8.47
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

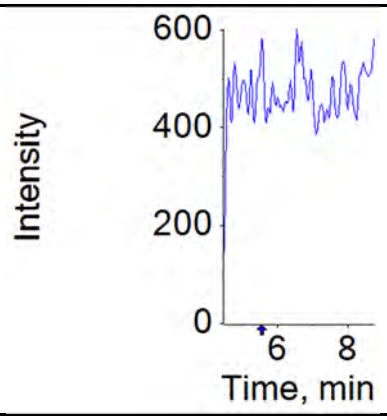



Compound Name: 26-Diamino-4-nitrotoluene

Expected RT: 5.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

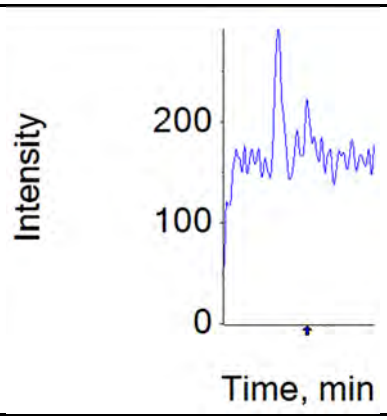



Compound Name: 24-Diamino-6-nitrotoluene

Expected RT: 5.54
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01

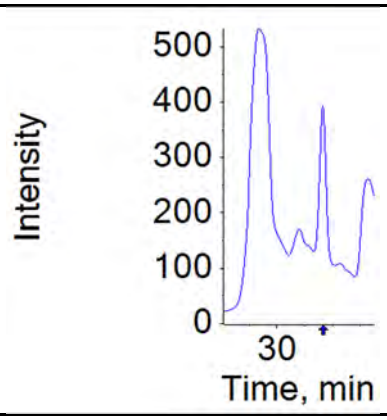



Compound Name: 35-Dinitroaniline

Expected RT: 14.23
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff
XIBLK01



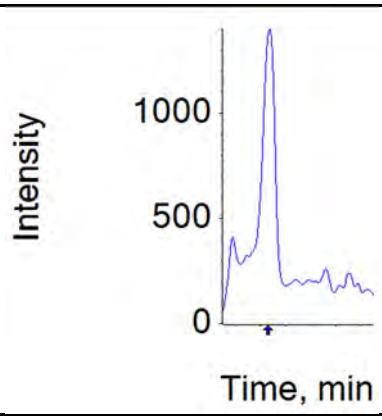

Compound Name: tris(o-cresyl)phosphate

Expected RT: 31.67
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621002.wiff

XIBLK01




Compound Name: Picric Acid

Expected RT: 6.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type: N/A

Amount: N/A
%Accuracy: N/A

**4A**
**Explosives Continuing Calibration Blank**

**Lab Name:** GEL Laboratories LLC **GEL Job No(SDG):** J2116762

**Lab Code:** GEL **Lab Sample ID:** XIBLK02

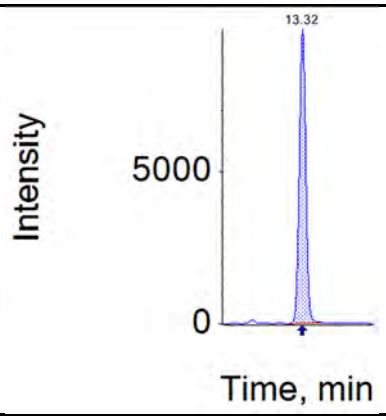
**Analysis Date:** 16-DEC-21 23:29 **GEL Data File:** EXP121621010.wiff

**Instrument ID:** LCMSMS7 **Column:** Ultracarb Phenomenex 5u ODS (20)

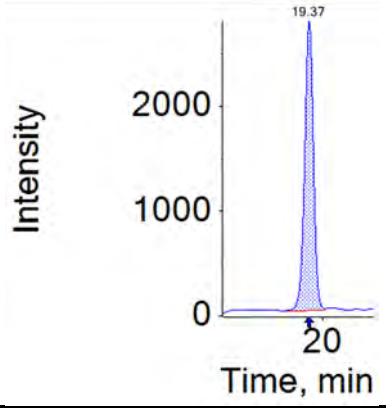
| Compound | True | Found (ug/L) |
|---|---|---|
| 3,4-Dinitrotoluene | 0 | 1.6 |
| RDX | 0 | 0 |

JISB 12/20/2021 MAE 12/20/2021

| Data File | EXP121621010.wiff | Acquisition Date | 12/16/2021 23:29:26 |
|---|---|---|---|
| Sample Name | XIBLK02 | Acquisition Method | 8330BFull.dam |
| Batch\|Dilution\|Analyst | \|1\|JLS | Result Table | 12162021A |
| Procedure Code | LCMSEXP_B | Sample Type | Unknown |




| | |
|---|---|
| Compound Name: | 13-Dinitrobenzene-d4 |
| Expected RT: | 13.29 |
| Actual RT: | 13.32 |
| Area Counts: | 201365.156 |
| Integration Type: | Baseline |
| Amount: | 10.00 |

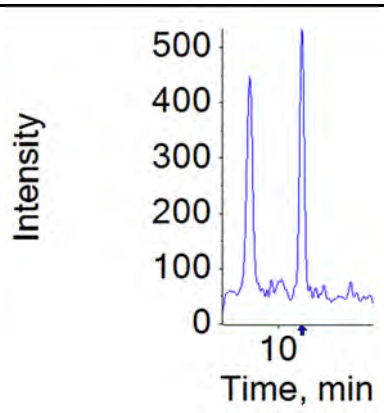



| | |
|---|---|
| Compound Name: | 26-Dinitrotoluene-d3 |
| Expected RT: | 19.34 |
| Actual RT: | 19.37 |
| Area Counts: | 78195.835 |
| Integration Type: | Valley |
| Amount: | 10.00 |

Please refer to Form 8 of the data package for a complete list of Internal Standard Recoveries.

Relative Retention Time (RRT) is used by the laboratory to establish peak identity. The RRT of each target analyte is calculated using the retention time of the corresponding internal standard. The RRT of each analyte in a sample must be within 2.0 of the analyte's calculated RRT in the ICV.

EXP121621010.wiff
XIBLK02

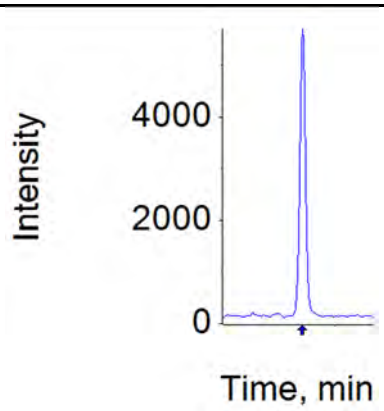



Compound Name: 135-Trinitrobenzene

Expected RT: 11.09
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

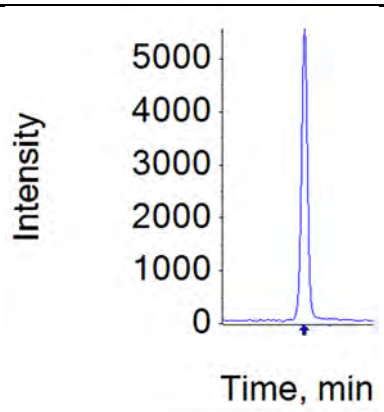



Compound Name: 13-Dinitrobenzene

Expected RT: 13.45
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

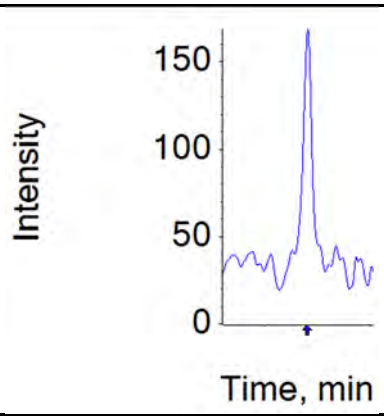



Compound Name: Tetryl

Expected RT: 13.78
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

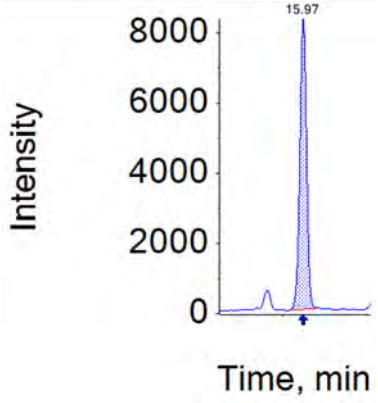



Compound Name: 246-Trinitrotoluene

Expected RT: 16.98
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

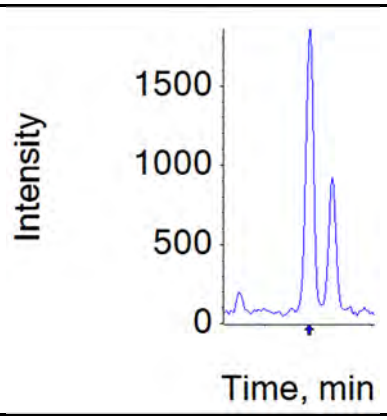



Compound Name: 34-dinitrotoluene

Expected RT: 15.94
Actual RT: 15.97
RRT: 0.82
Area Counts: 178182.647
Integration Type:Baseline

Amount: 1.60
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

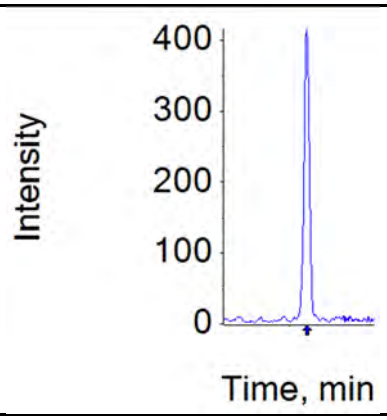



Compound Name: 4-Amino-26-dinitrotoluene

Expected RT: 17.06
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

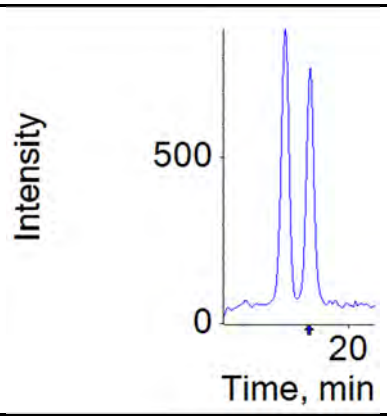



Compound Name: PETN

Expected RT: 25.80
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02



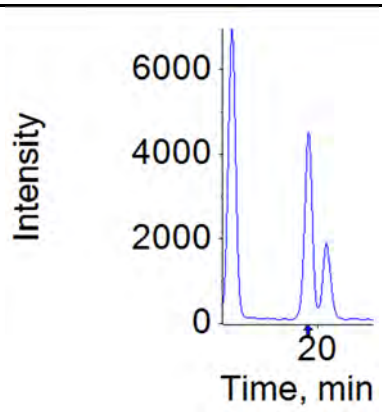

Compound Name: 2-Amino-46-dinitrotoluene

Expected RT: 18.12
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff

XIBLK02

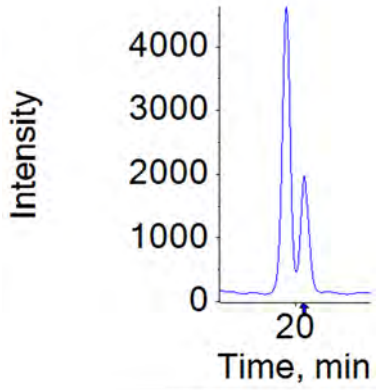



Compound Name: 26-dinitrotoluene

Expected RT: 19.52
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

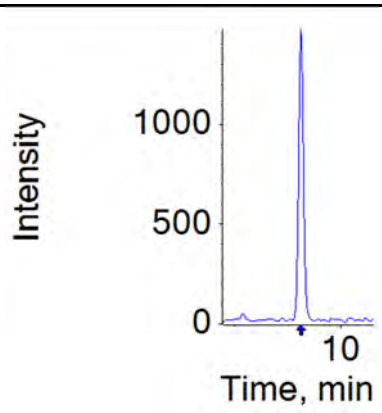



Compound Name: 24-dinitrotoluene

Expected RT: 20.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

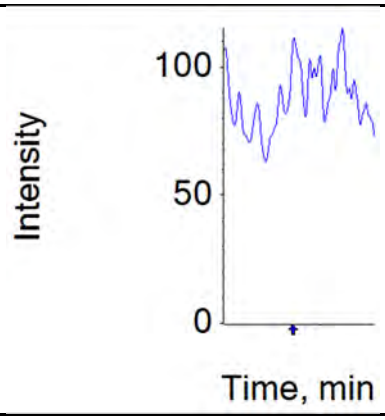



Compound Name: RDX

Expected RT: 8.11
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

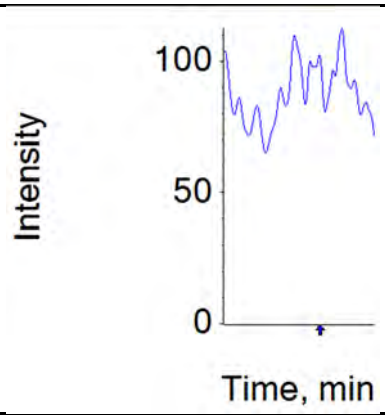



Compound Name: 2-Nitrotoluene

Expected RT: 23.70
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

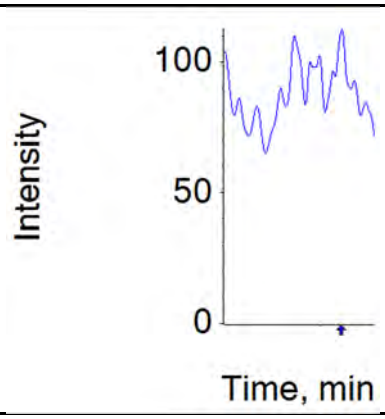



Compound Name: 4-Nitrotoluene

Expected RT: 24.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

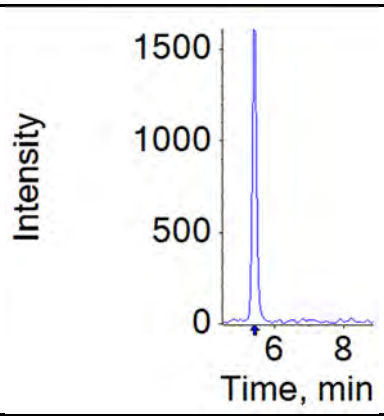



Compound Name: 3-Nitrotoluene

Expected RT: 25.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

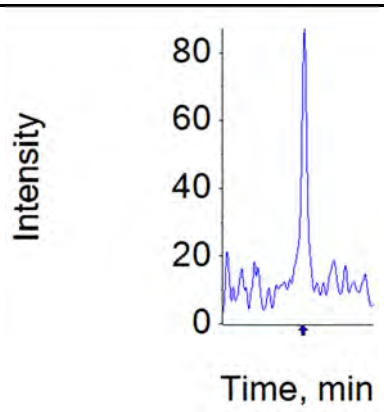



Compound Name: HMX

Expected RT: 5.40
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

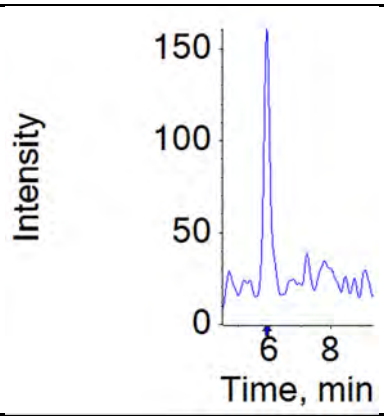



Compound Name: Nitrobenzene

Expected RT: 15.17
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

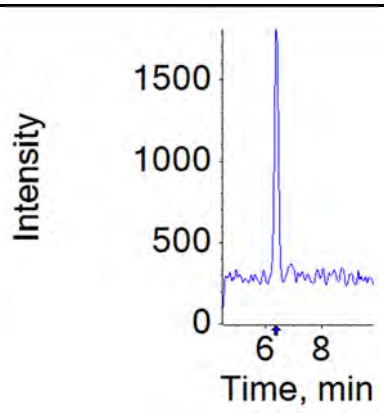



Compound Name: TNX

Expected RT: 5.90
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

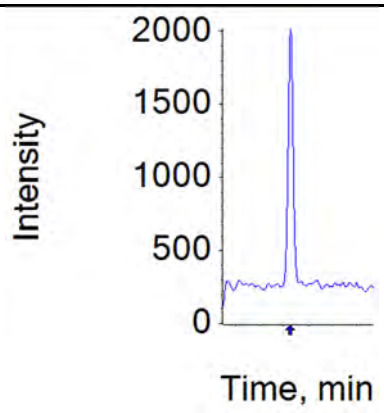



Compound Name: DNX

Expected RT: 6.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

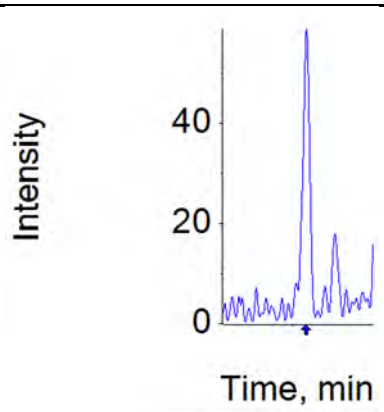



Compound Name: MNX

Expected RT: 7.25
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

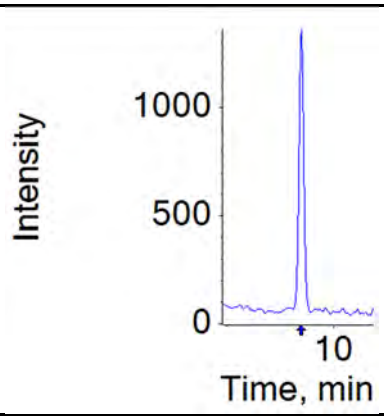



Compound Name: Nitroglycerin

Expected RT: 15.60
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

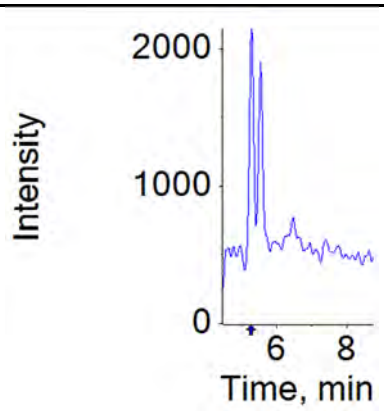



Compound Name: TATB

Expected RT: 8.47
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

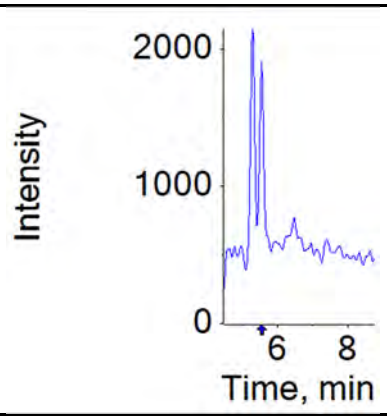



Compound Name: 26-Diamino-4-nitrotoluene

Expected RT: 5.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

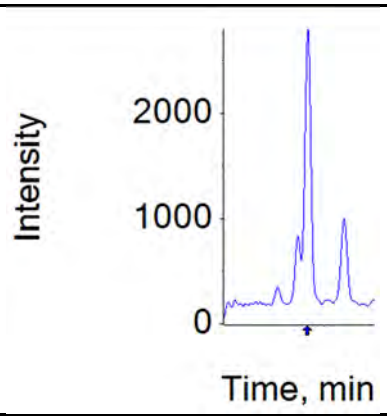



Compound Name: 24-Diamino-6-nitrotoluene

Expected RT: 5.54
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02

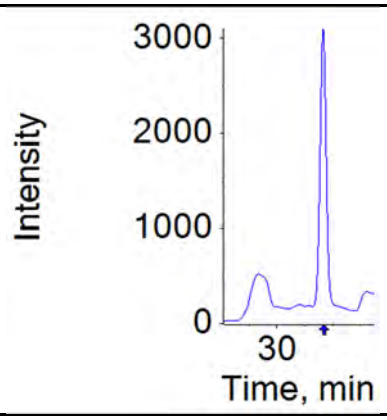



Compound Name: 35-Dinitroaniline

Expected RT: 14.23
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff
XIBLK02



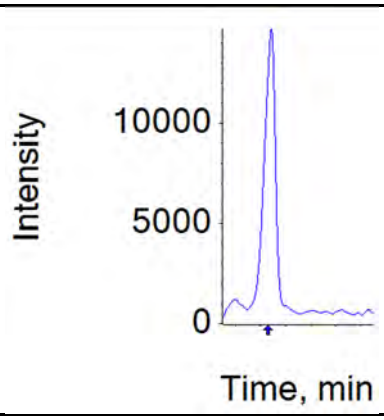

Compound Name: tris(o-cresyl)phosphate

Expected RT: 31.67
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621010.wiff

XIBLK02




Compound Name: Picric Acid

Expected RT: 6.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type: N/A

Amount: N/A
%Accuracy: N/A

**4A**
**Explosives Continuing Calibration Blank**

**Lab Name:** GEL Laboratories LLC **GEL Job No(SDG):** J2116762

**Lab Code:** GEL **Lab Sample ID:** XIBLK03

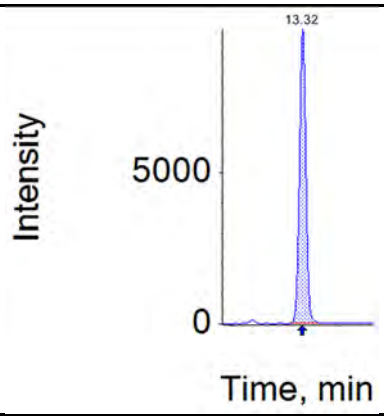
**Analysis Date:** 17-DEC-21 01:50 **GEL Data File:** EXP121621014.wiff

**Instrument ID:** LCMSMS7 **Column:** Ultracarb Phenomenex 5u ODS (20)

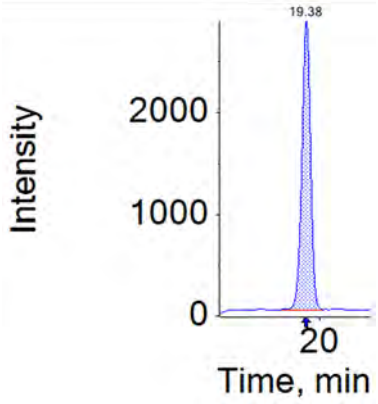
| Compound | True | Found (ug/L) |
|---|---|---|
| 3,4-Dinitrotoluene | 0 | 0 |
| RDX | 0 | 0 |

12/20/2021

| | | | |
|---|---|---|---|
| Data File | EXP121621014.wiff | Acquisition Date | 12/17/2021 01:50:08 |
| Sample Name | XIBLK03 | Acquisition Method | 8330BFull.dam |
| Batch\|Dilution\|Analyst | \|1\|JLS | Result Table | 12162021A |
| Procedure Code | LCMSEXP_B | Sample Type | Unknown |




| | |
|---|---|
| Compound Name: | 13-Dinitrobenzene-d4 |
| Expected RT: | 13.29 |
| Actual RT: | 13.32 |
| Area Counts: | 201802.948 |
| Integration Type: | Valley |
| Amount: | 10.00 |

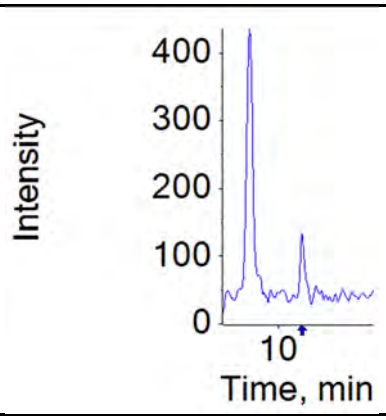



| | |
|---|---|
| Compound Name: | 26-Dinitrotoluene-d3 |
| Expected RT: | 19.34 |
| Actual RT: | 19.38 |
| Area Counts: | 80124.667 |
| Integration Type: | Baseline |
| Amount: | 10.00 |

Please refer to Form 8 of the data package for a complete list of Internal Standard Recoveries.

Relative Retention Time (RRT) is used by the laboratory to establish peak identity. The RRT of each target analyte is calculated using the retention time of the corresponding internal standard. The RRT of each analyte in a sample must be within 2.0 of the analyte's calculated RRT in the ICV.

EXP121621014.wiff
XIBLK03

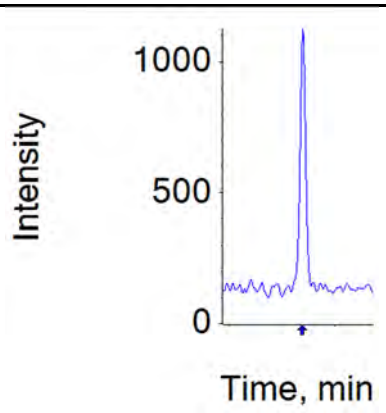



Compound Name: 135-Trinitrobenzene

Expected RT: 11.09
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

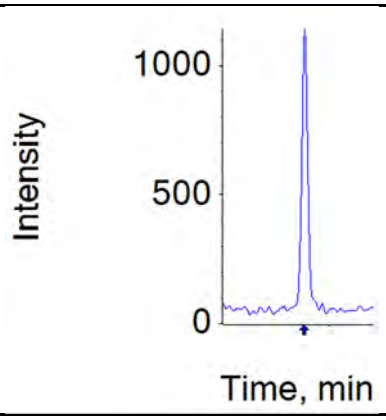



Compound Name: 13-Dinitrobenzene

Expected RT: 13.45
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

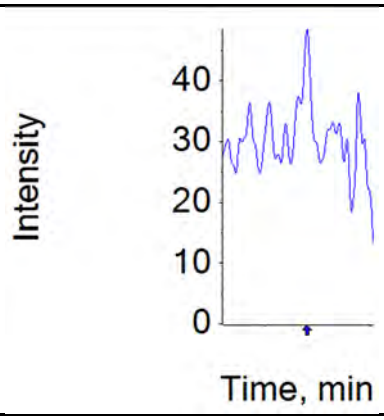



Compound Name: Tetryl

Expected RT: 13.78
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

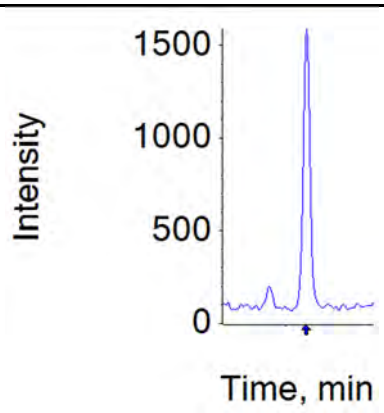



Compound Name: 246-Trinitrotoluene

Expected RT: 16.98
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

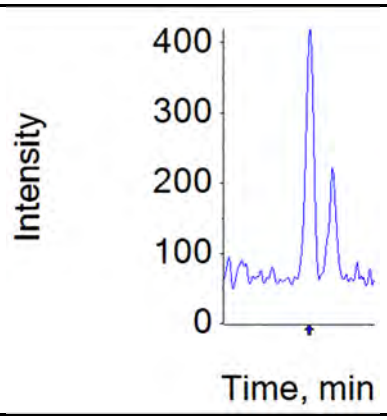



Compound Name: 34-dinitrotoluene

Expected RT: 15.94
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

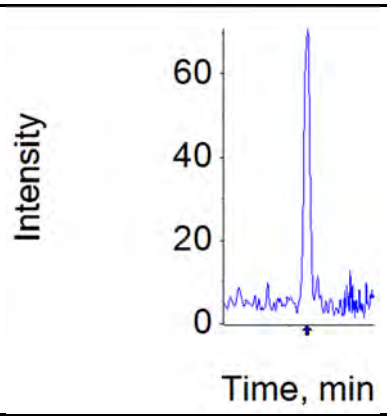



Compound Name: 4-Amino-26-dinitrotoluene

Expected RT: 17.06
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

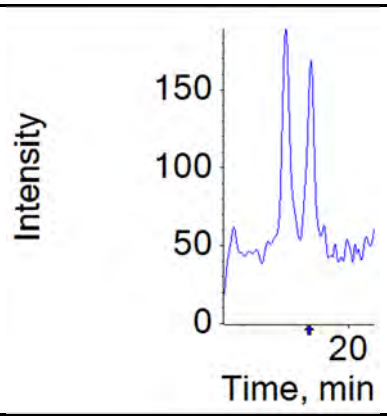



Compound Name: PETN

Expected RT: 25.80
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03



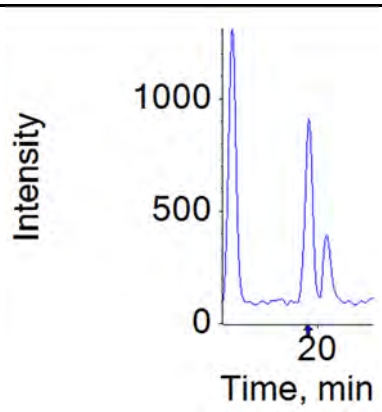

Compound Name: 2-Amino-46-dinitrotoluene

Expected RT: 18.12
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff

XIBLK03

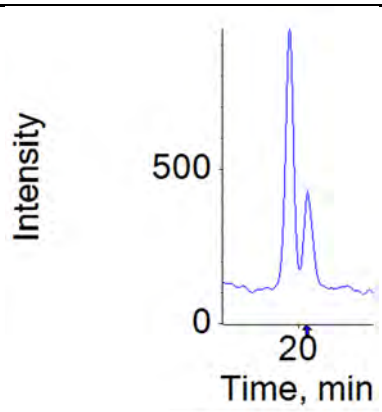



Compound Name: 26-dinitrotoluene

Expected RT: 19.52
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

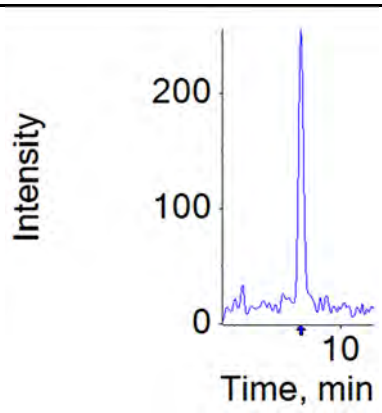



Compound Name: 24-dinitrotoluene

Expected RT: 20.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

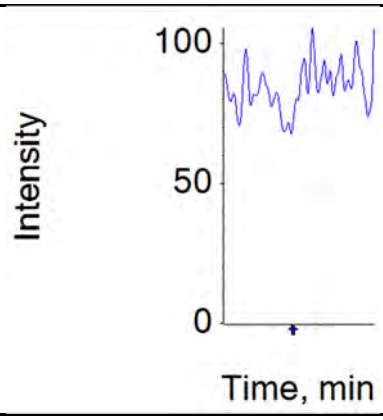



Compound Name: RDX

Expected RT: 8.11
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

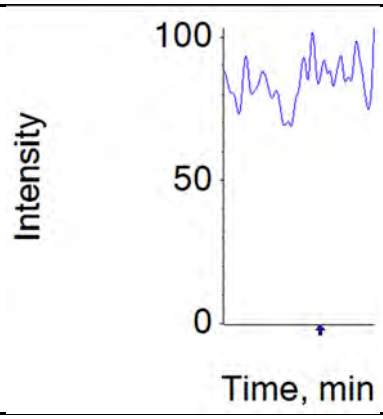



Compound Name: 2-Nitrotoluene

Expected RT: 23.70
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

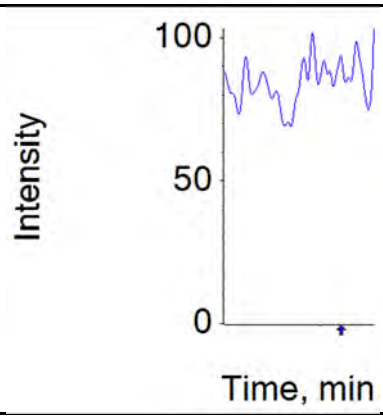



Compound Name: 4-Nitrotoluene

Expected RT: 24.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

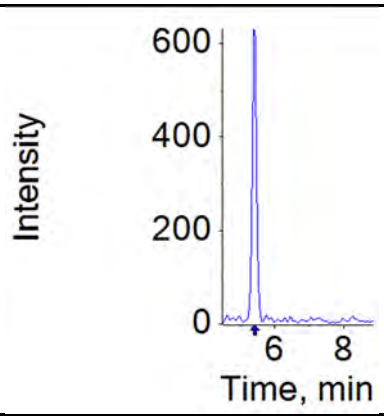



Compound Name: 3-Nitrotoluene

Expected RT: 25.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

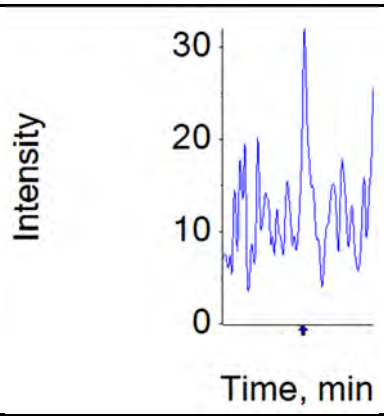



Compound Name: HMX

Expected RT: 5.40
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

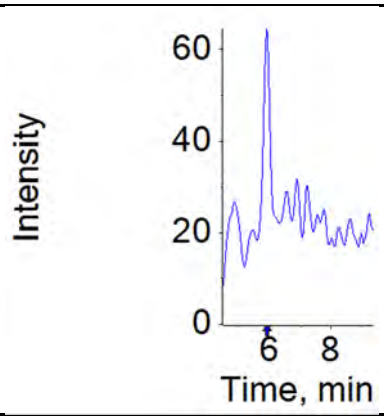



Compound Name: Nitrobenzene

Expected RT: 15.17
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

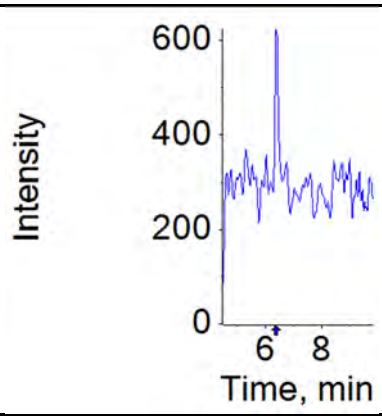



Compound Name: TNX

Expected RT: 5.90
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

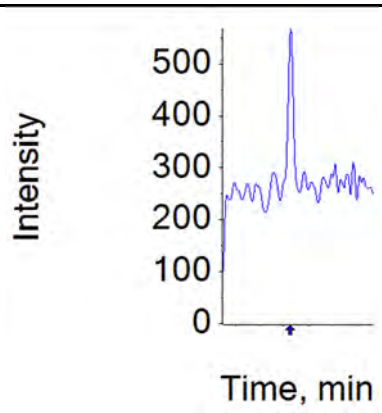



Compound Name: DNX

Expected RT: 6.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

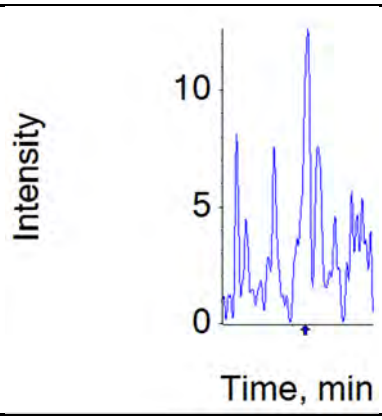



Compound Name: MNX

Expected RT: 7.25
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

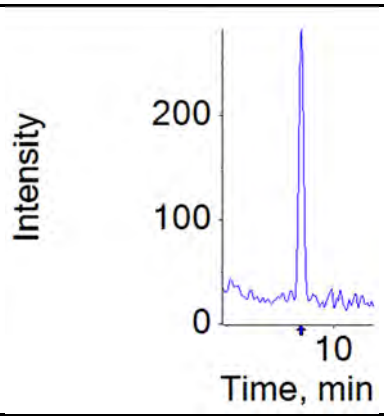



Compound Name: Nitroglycerin

Expected RT: 15.60
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

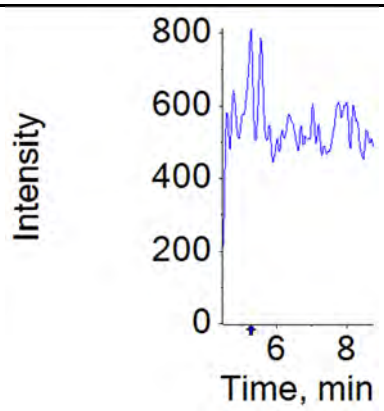



Compound Name: TATB

Expected RT: 8.47
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

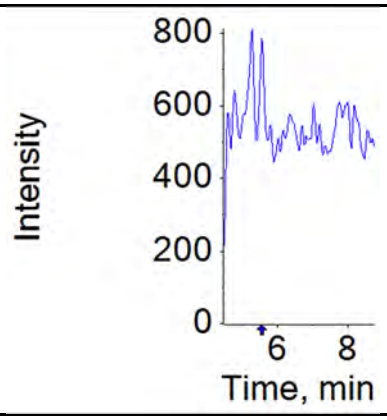



Compound Name: 26-Diamino-4-nitrotoluene

Expected RT: 5.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

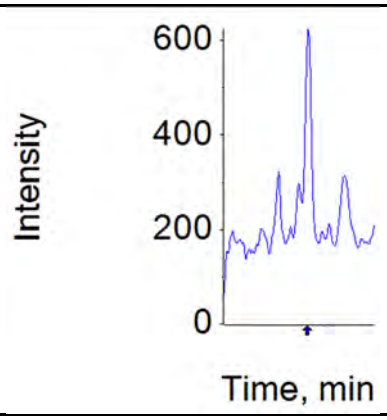



Compound Name: 24-Diamino-6-nitrotoluene

Expected RT: 5.54
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03

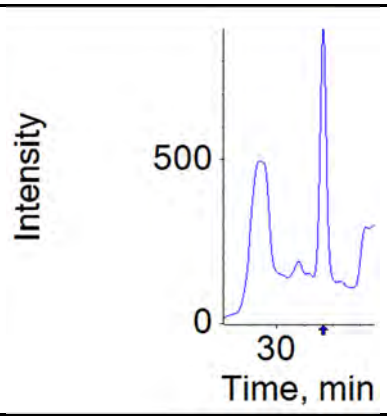



Compound Name: 35-Dinitroaniline

Expected RT: 14.23
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff
XIBLK03



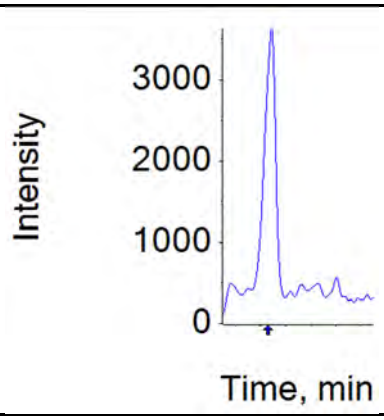

Compound Name: tris(o-cresyl)phosphate

Expected RT: 31.67
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621014.wiff

XIBLK03




Compound Name: Picric Acid

Expected RT: 6.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type: N/A

Amount: N/A
%Accuracy: N/A

**4A**
**Explosives Continuing Calibration Blank**

**Lab Name:** GEL Laboratories LLC **GEL Job No(SDG):** J2116762

**Lab Code:** GEL **Lab Sample ID:** XIBLK06

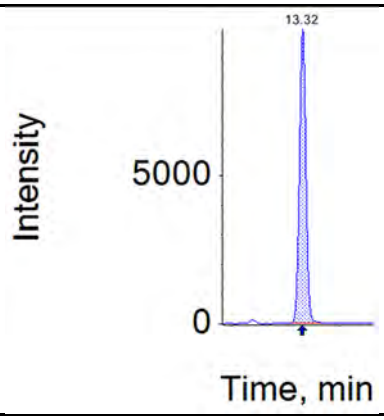
**Analysis Date:** 17-DEC-21 09:27 **GEL Data File:** EXP121621027.wiff

**Instrument ID:** LCMSMS7 **Column:** Ultracarb Phenomenex 5u ODS (20)

| Compound | True | Found (ug/L) |
|---|---|---|
| 3,4-Dinitrotoluene | 0 | 0 |
| RDX | 0 | 0 |

12/20/2021

| | | | |
|---|---|---|---|
| Data File | EXP121621027.wiff | Acquisition Date | 12/17/2021 09:27:23 |
| Sample Name | XIBLK06 | Acquisition Method | 8330BFull.dam |
| Batch\|Dilution\|Analyst | \|1\|JLS | Result Table | 12162021A |
| Procedure Code | LCMSEXP_B | Sample Type | Unknown |




Compound Name: 13-Dinitrobenzene-d4

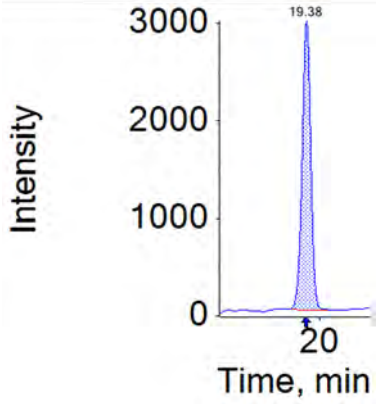
Expected RT: 13.29

Actual RT: 13.32

Area Counts: 206861.997

Integration Type: Valley

Amount: 10.00




Compound Name: 26-Dinitrotoluene-d3

Expected RT: 19.34

Actual RT: 19.38

Area Counts: 82517.622

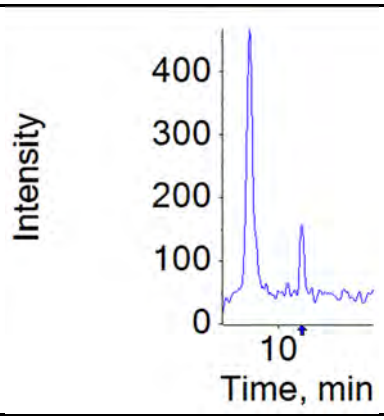
Integration Type: Baseline

Amount: 10.00

Please refer to Form 8 of the data package for a complete list of Internal Standard Recoveries.

Relative Retention Time (RRT) is used by the laboratory to establish peak identity. The RRT of each target analyte is calculated using the retention time of the corresponding internal standard. The RRT of each analyte in a sample must be within 2.0 of the analyte's calculated RRT in the ICV.

EXP121621027.wiff
XIBLK06

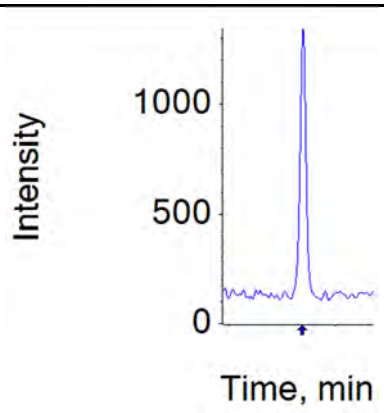



Compound Name: 135-Trinitrobenzene

Expected RT: 11.09
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

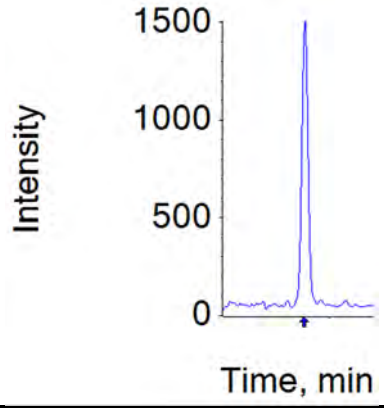



Compound Name: 13-Dinitrobenzene

Expected RT: 13.45
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

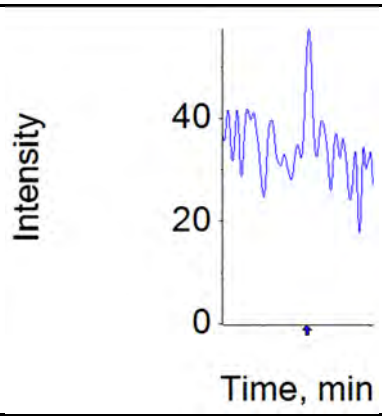



Compound Name: Tetryl

Expected RT: 13.78
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

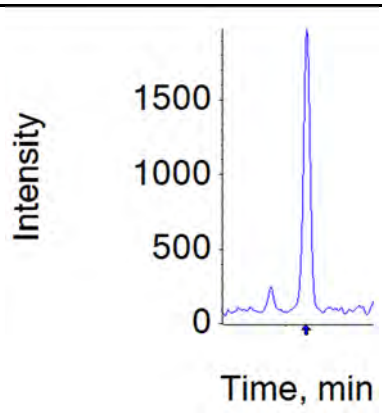



Compound Name: 246-Trinitrotoluene

Expected RT: 16.98
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

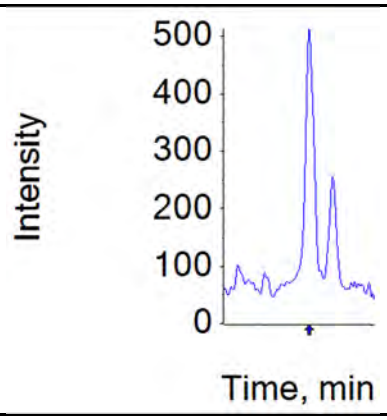



Compound Name: 34-dinitrotoluene

Expected RT: 15.94
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

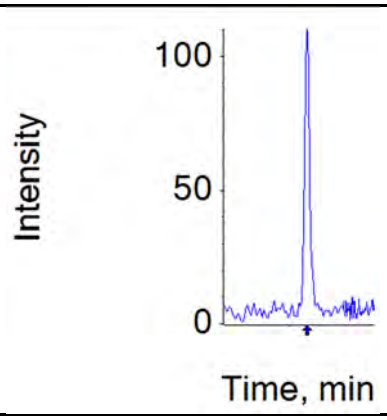



Compound Name: 4-Amino-26-dinitrotoluene

Expected RT: 17.06
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

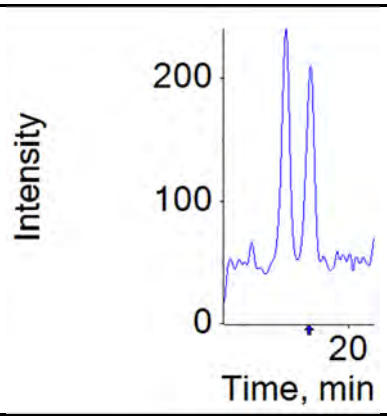



Compound Name: PETN

Expected RT: 25.80
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06



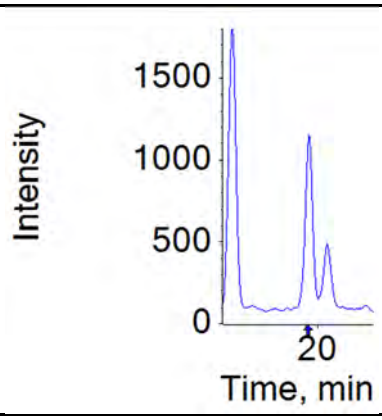

Compound Name: 2-Amino-46-dinitrotoluene

Expected RT: 18.12
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff

XIBLK06

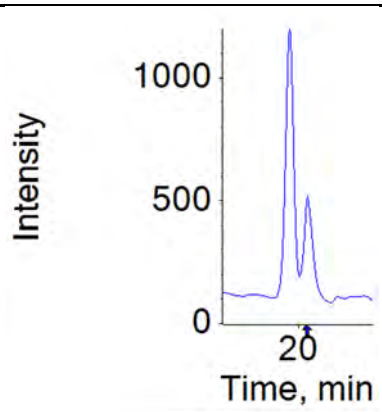



Compound Name: 26-dinitrotoluene

Expected RT: 19.52
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

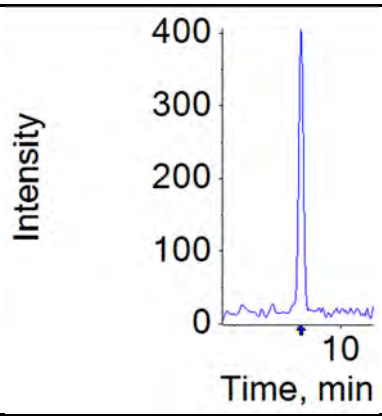



Compound Name: 24-dinitrotoluene

Expected RT: 20.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

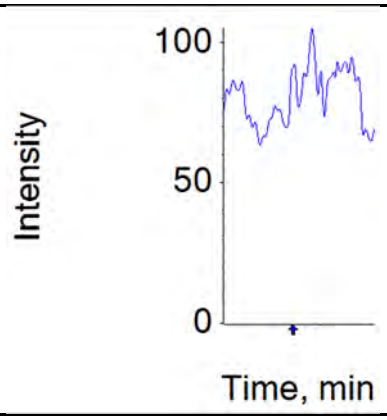



Compound Name: RDX

Expected RT: 8.11
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

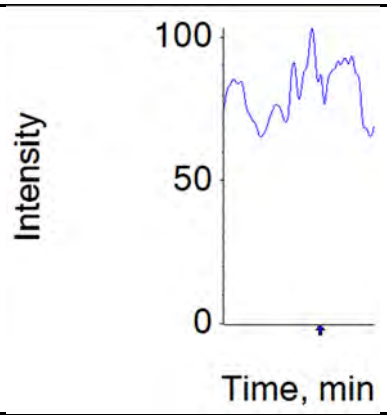



Compound Name: 2-Nitrotoluene

Expected RT: 23.70
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

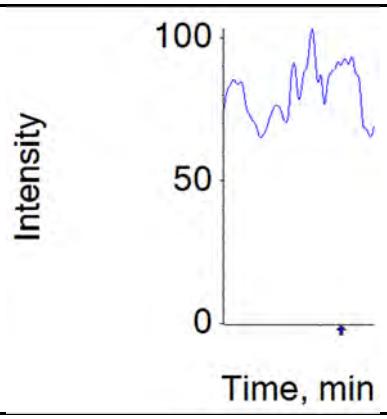



Compound Name: 4-Nitrotoluene

Expected RT: 24.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

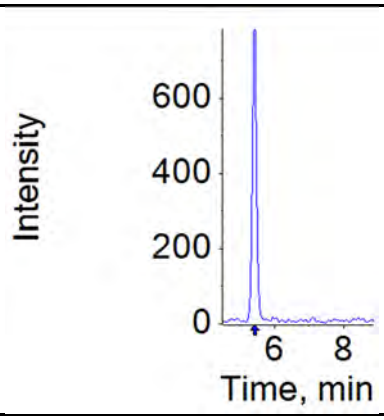



Compound Name: 3-Nitrotoluene

Expected RT: 25.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

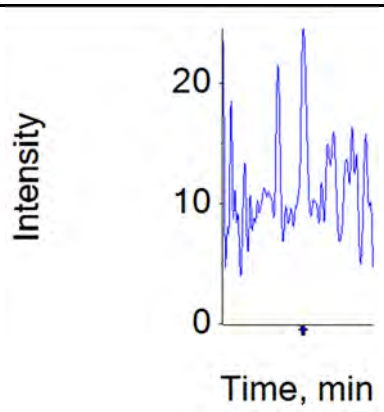



Compound Name: HMX

Expected RT: 5.40
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

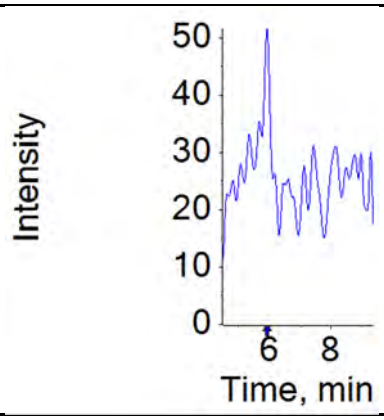



Compound Name: Nitrobenzene

Expected RT: 15.17
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

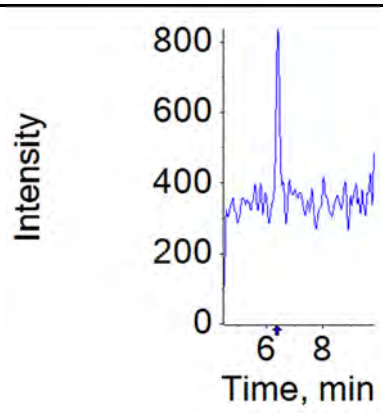



Compound Name: TNX

Expected RT: 5.90
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

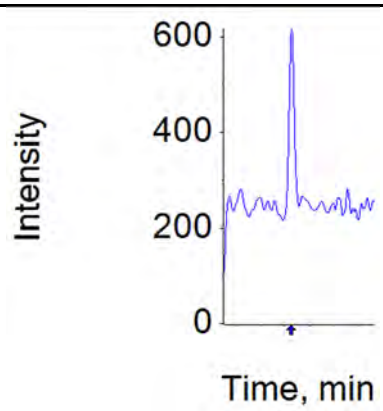



Compound Name: DNX

Expected RT: 6.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

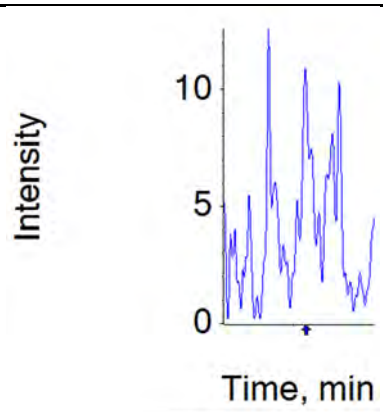



Compound Name: MNX

Expected RT: 7.25
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

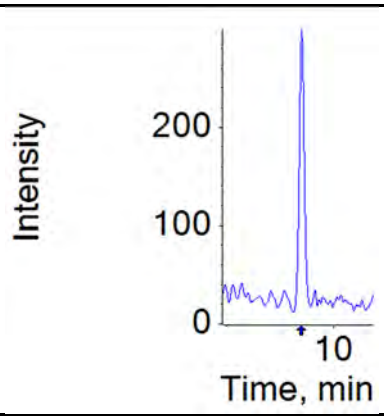



Compound Name: Nitroglycerin

Expected RT: 15.60
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

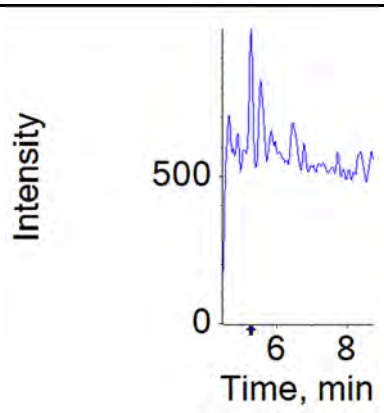



Compound Name: TATB

Expected RT: 8.47
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

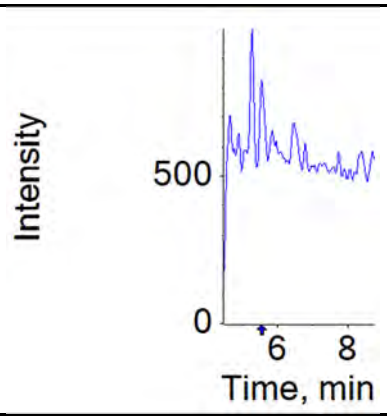



Compound Name: 26-Diamino-4-nitrotoluene

Expected RT: 5.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

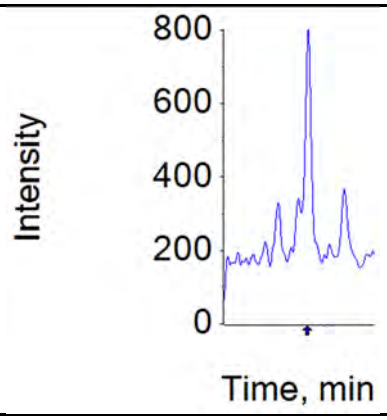



Compound Name: 24-Diamino-6-nitrotoluene

Expected RT: 5.54
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06

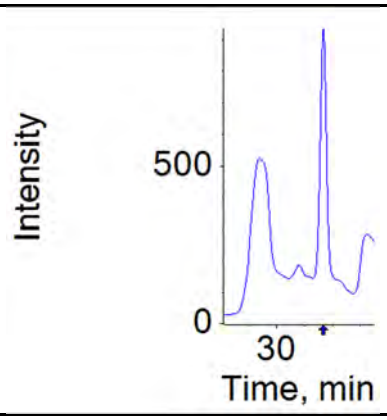



Compound Name: 35-Dinitroaniline

Expected RT: 14.23
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff
XIBLK06



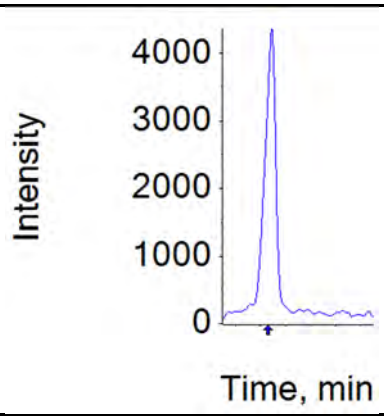

Compound Name: tris(o-cresyl)phosphate

Expected RT: 31.67
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621027.wiff

XIBLK06




Compound Name: Picric Acid

Expected RT: 6.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type: N/A

Amount: N/A
%Accuracy: N/A

**4A**
**Explosives Continuing Calibration Blank**

**Lab Name:** GEL Laboratories LLC **GEL Job No(SDG):** J2116762

**Lab Code:** GEL **Lab Sample ID:** XIBLK07

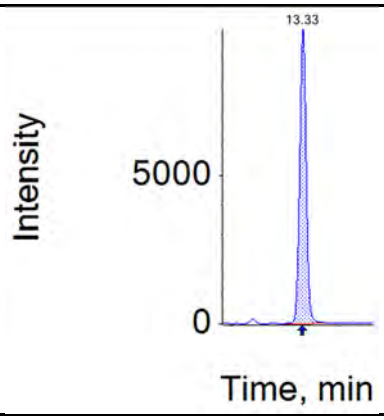
**Analysis Date:** 17-DEC-21 17:04 **GEL Data File:** EXP121621040.wiff

**Instrument ID:** LCMSMS7 **Column:** Ultracarb Phenomenex 5u ODS (20)

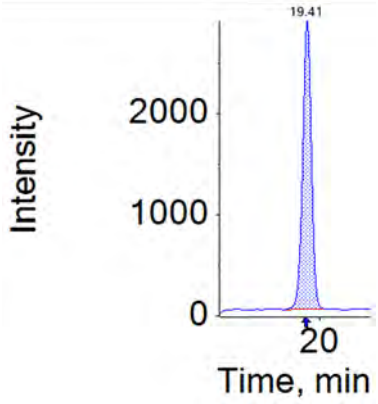
| Compound | True | Found (ug/L) |
|---|---|---|
| 3,4-Dinitrotoluene | 0 | 0 |
| RDX | 0 | 0 |

12/20/2021

| | | | |
|---|---|---|---|
| Data File | EXP121621040.wiff | Acquisition Date | 12/17/2021 17:04:31 |
| Sample Name | XIBLK07 | Acquisition Method | 8330BFull.dam |
| Batch\|Dilution\|Analyst | \|1\|JLS | Result Table | 12162021A |
| Procedure Code | LCMSEXP_B | Sample Type | Unknown |




| | |
|---|---|
| Compound Name: | 13-Dinitrobenzene-d4 |
| Expected RT: | 13.29 |
| Actual RT: | 13.33 |
| Area Counts: | 208520.258 |
| Integration Type: | Valley |
| Amount: | 10.00 |

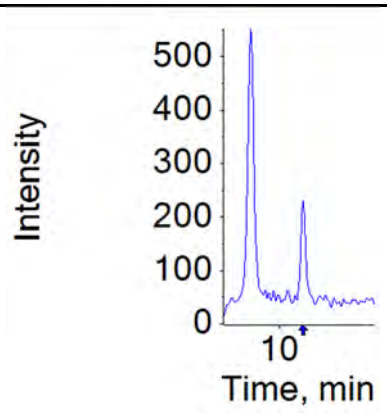



| | |
|---|---|
| Compound Name: | 26-Dinitrotoluene-d3 |
| Expected RT: | 19.34 |
| Actual RT: | 19.41 |
| Area Counts: | 80651.741 |
| Integration Type: | Baseline |
| Amount: | 10.00 |

Please refer to Form 8 of the data package for a complete list of Internal Standard Recoveries.

Relative Retention Time (RRT) is used by the laboratory to establish peak identity. The RRT of each target analyte is calculated using the retention time of the corresponding internal standard. The RRT of each analyte in a sample must be within 2.0 of the analyte's calculated RRT in the ICV.

EXP121621040.wiff
XIBLK07

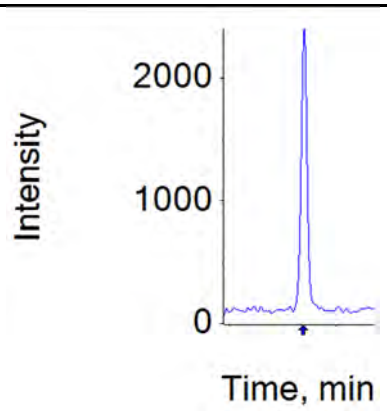



Compound Name: 135-Trinitrobenzene

Expected RT: 11.09
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

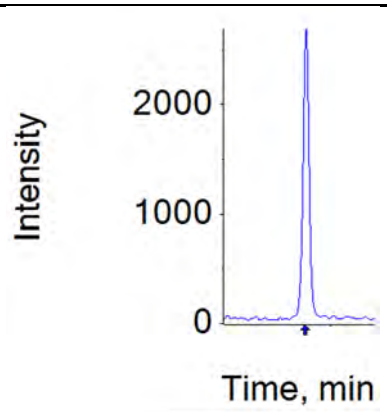



Compound Name: 13-Dinitrobenzene

Expected RT: 13.45
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

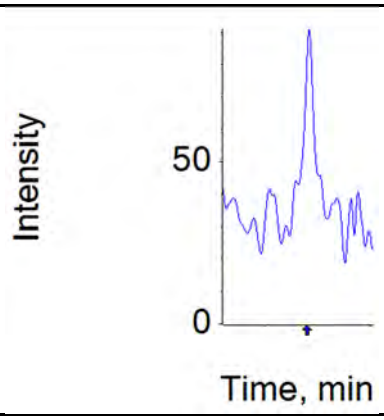



Compound Name: Tetryl

Expected RT: 13.78
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

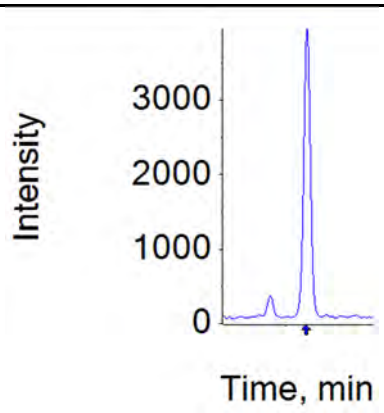



Compound Name: 246-Trinitrotoluene

Expected RT: 16.98
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

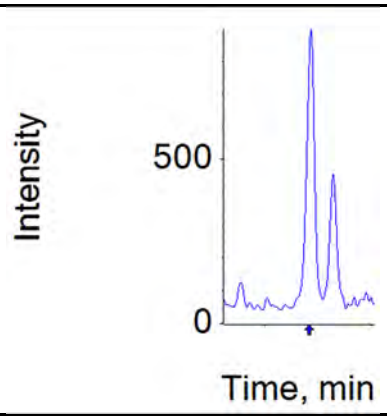



Compound Name: 34-dinitrotoluene

Expected RT: 15.94
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

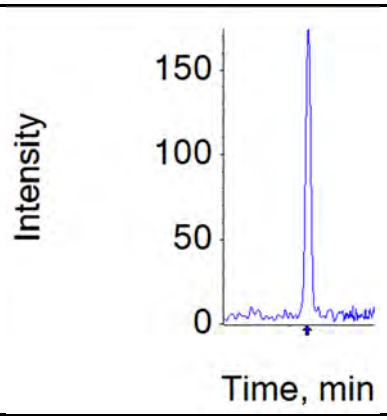



Compound Name: 4-Amino-26-dinitrotoluene

Expected RT: 17.06
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

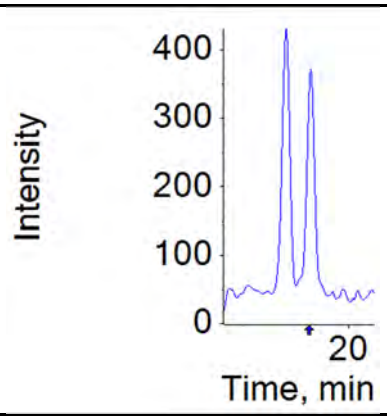



Compound Name: PETN

Expected RT: 25.80
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07



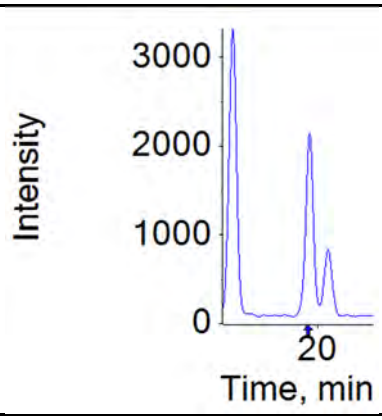

Compound Name: 2-Amino-46-dinitrotoluene

Expected RT: 18.12
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff

XIBLK07

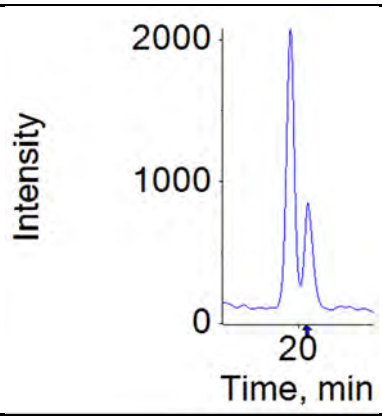



Compound Name: 26-dinitrotoluene

Expected RT: 19.52
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

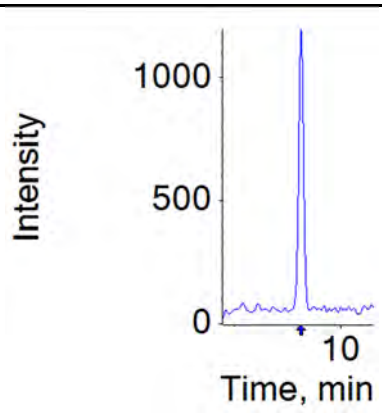



Compound Name: 24-dinitrotoluene

Expected RT: 20.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

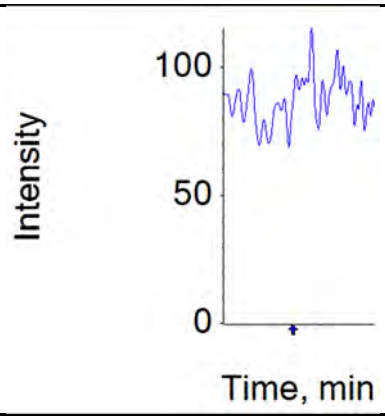



Compound Name: RDX

Expected RT: 8.11
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

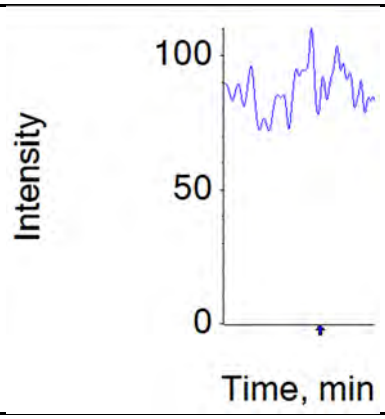



Compound Name: 2-Nitrotoluene

Expected RT: 23.70
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

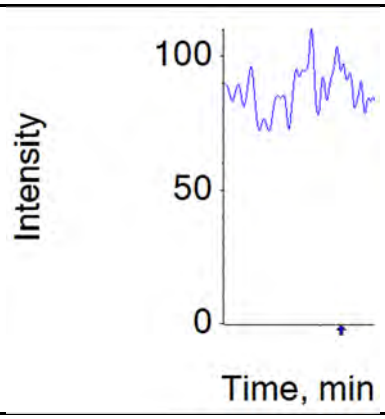



Compound Name: 4-Nitrotoluene

Expected RT: 24.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

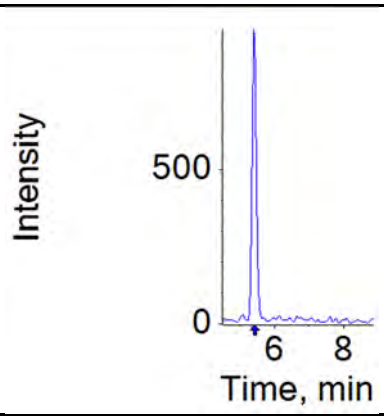



Compound Name: 3-Nitrotoluene

Expected RT: 25.96
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

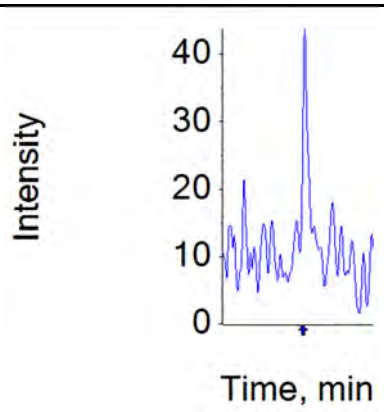



Compound Name: HMX

Expected RT: 5.40
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

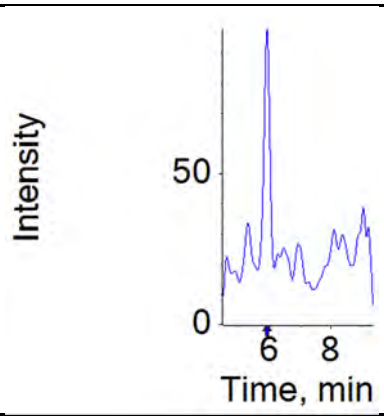



Compound Name: Nitrobenzene

Expected RT: 15.17
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

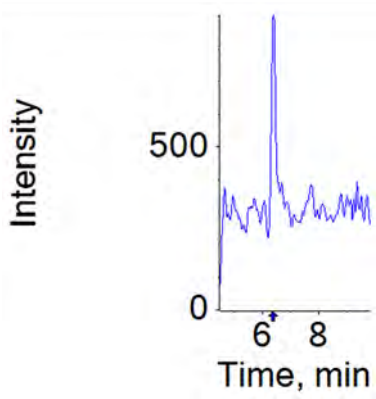



Compound Name: TNX

Expected RT: 5.90
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

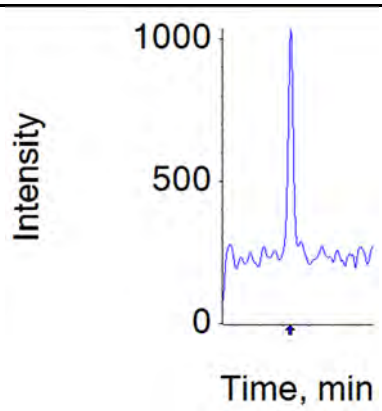



Compound Name: DNX

Expected RT: 6.36
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

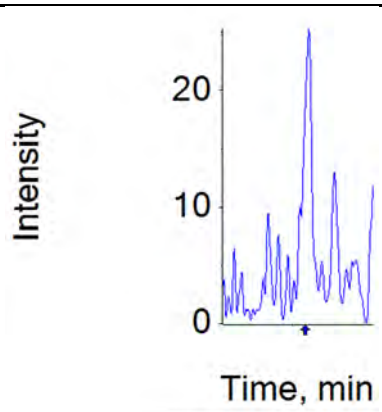



Compound Name: MNX

Expected RT: 7.25
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

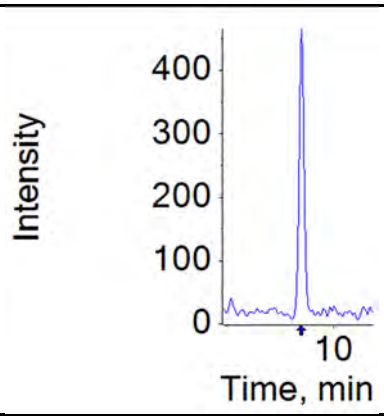



Compound Name: Nitroglycerin

Expected RT: 15.60
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

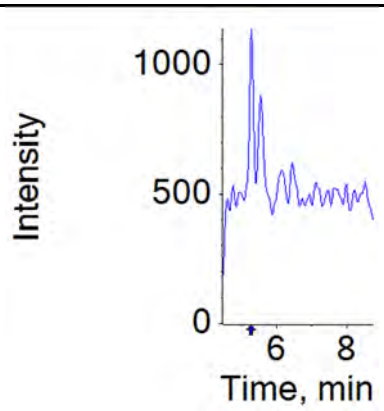



Compound Name: TATB

Expected RT: 8.47
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

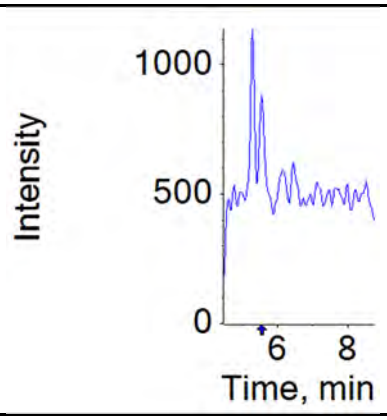



Compound Name: 26-Diamino-4-nitrotoluene

Expected RT: 5.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

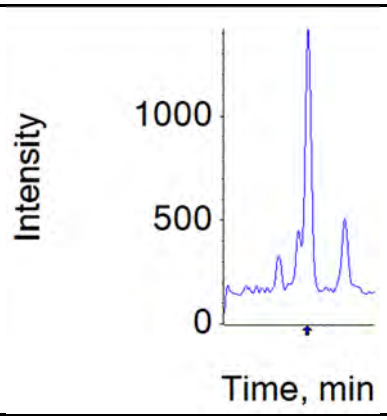



Compound Name: 24-Diamino-6-nitrotoluene

Expected RT: 5.54
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07

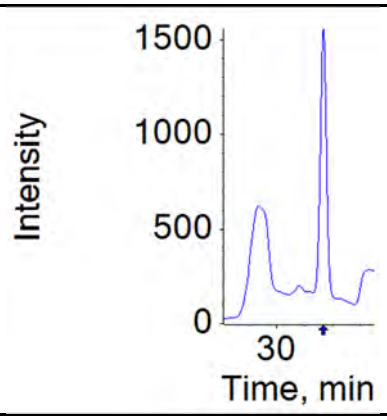



Compound Name: 35-Dinitroaniline

Expected RT: 14.23
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff
XIBLK07



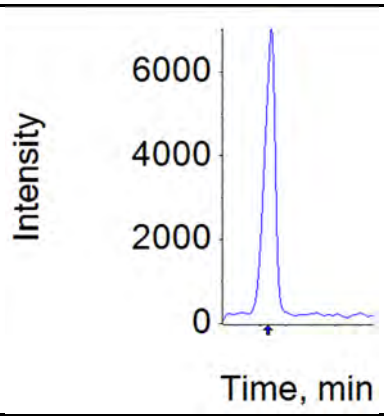

Compound Name: tris(o-cresyl)phosphate

Expected RT: 31.67
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type:N/A

Amount: N/A
%Accuracy: N/A

EXP121621040.wiff

XIBLK07




Compound Name: Picric Acid

Expected RT: 6.28
Actual RT: N/A
RRT: N/A
Area Counts: N/A
Integration Type: N/A

Amount: N/A
%Accuracy: N/A

# Miscellaneous

# Prep Logbook

## Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)

**Batch ID:** 2207512 **Verified by:** _____
**Analyst:** Sanquetta Coakley
**Method:** SW846 3535A

**Lab SOP:** GL-OA-E-033 REV# 25
**Instrument:** LCMSMS Manual Instrument

| Sample ID | Prep Date | Initial Wt (g) | Final Wt (g) | Initial Volume (mL) | Ph 1 | Final Volume (mL) | Prepped Factor (mL/mL) |
|---|---|---|---|---|---|---|---|
| 1204977874 MB | 14-DEC-2021 08:03:00 | | | 1000 | 7 | 5 | 0.005 |
| 1204977875 LCS | 14-DEC-2021 08:03:00 | | | 1000 | 7 | 5 | 0.005 |
| 564617001 | 14-DEC-2021 08:03:00 | 1345.46 | 405.56 | 939.9 | 7 | 5 | 0.00532 |
| 564617002 | 14-DEC-2021 08:03:00 | 1315.58 | 408.27 | 907.31 | 7 | 5 | 0.00551 |
| 564617003 | 14-DEC-2021 08:03:00 | 1292.59 | 408.3 | 884.29 | 7 | 5 | 0.00565 |
| 564617004 | 14-DEC-2021 08:03:00 | 1292.6 | 407.8 | 884.8 | 7 | 5 | 0.00565 |
| 564617005 | 14-DEC-2021 08:03:00 | 1296.88 | 408.25 | 888.63 | 7 | 5 | 0.00563 |
| 1204977876 MS (564617005) | 14-DEC-2021 08:03:00 | 1301.5 | 407.77 | 893.73 | 7 | 5 | 0.00559 |
| 1204977877 MSD (564617005) | 14-DEC-2021 08:03:00 | 1343.54 | 406.01 | 937.53 | 7 | 5 | 0.00533 |
| 564617006 | 14-DEC-2021 08:03:00 | 1334.04 | 451.23 | 882.81 | 7 | 5 | 0.00566 |
| 564617007 | 14-DEC-2021 08:03:00 | 1311.24 | 405.11 | 906.13 | 7 | 5 | 0.00552 |

| Type | Sample Id | Description | Serial Number | Spike Amt | Units |
|---|---|---|---|---|---|
| LCS | 1204977875 | 8330B Explosives LCS | IXX3337293-02 | .05 | mL |
| MS | 1204977876 | 8330B Explosives LCS | IXX3337293-02 | .05 | mL |
| MSD | 1204977877 | 8330B Explosives LCS | IXX3337293-02 | .05 | mL |
| SURR | All | 3,4-Dinitrotoluene (8330 Surr.) 100ppm | IXP3373722-01 | .025 | mL |
| REGNT | All | ACN Optima LC/MS Grade 4L | 3357764 | 5 | mL |

**Comments:**

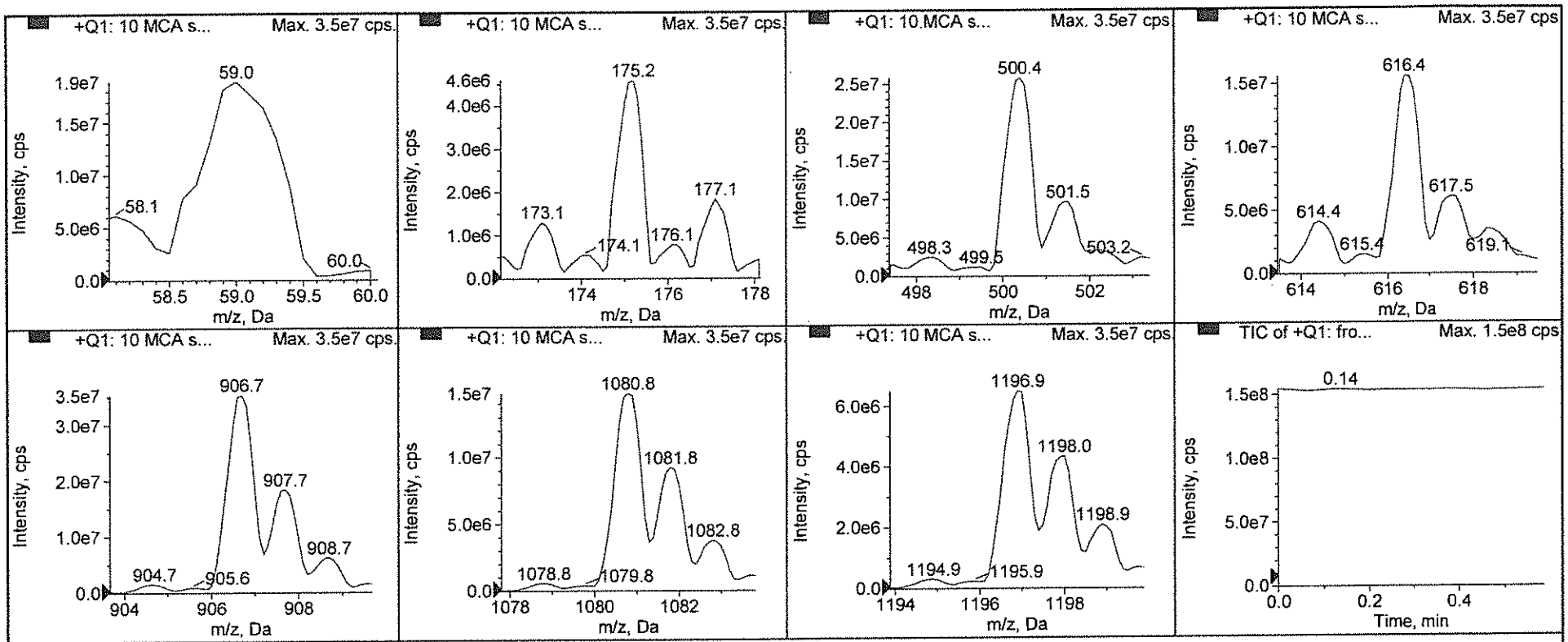
Cartridge lot #: 005231202A
Final Solvent: ACN
Verified by: LM

GEL ORGANIC RUN LOG INSTRUMENT ID: LCMSMS#7

Date: 12/16/21 Method: 8330B / DOD QSM 5.3
Extr. Injection Volume: 20 uL Int. Std.: 3364561
Sequence Number: 121621 Mobile Phase Lot#: 3358911 / 3357766 SOP: GL-OA-E-056 / GL-OA-E-068
Initial Calibration Date: 12/16/2021 Standard-Samp Reagent Lot#: 3146071 / 334432 Alt Check Std. ID: WXX211216-44

| DataFile | Sample | Analyst | Injection Date | Batch | SDG | Dilution | Client | Comments | QC Flag |
|---|---|---|---|---|---|---|---|---|---|
| EXP121621001.wiff | XIBLK01 | JLS | 12/16/2021 18:12 | | | 1 | | | B |
| EXP121621002.wiff | XIBLK01 | JLS | 12/16/2021 18:47 | | | 1 | | | B |
| EXP121621003.wiff | WXXICAL-37 | JLS | 12/16/2021 19:23 | | | 1 | | | I |
| EXP121621004.wiff | WXXICAL-38 | JLS | 12/16/2021 19:58 | | | 1 | | | I |
| EXP121621005.wiff | WXXICAL-39 | JLS | 12/16/2021 20:33 | | | 1 | | | I |
| EXP121621006.wiff | WXXICAL-40 | JLS | 12/16/2021 21:08 | | | 1 | | | I |
| EXP121621007.wiff | WXXICAL-41 | JLS | 12/16/2021 21:43 | | | 1 | | | I |
| EXP121621008.wiff | WXXICAL-42 | JLS | 12/16/2021 22:19 | | | 1 | | | I |
| EXP121621009.wiff | WXXICAL-43 | JLS | 12/16/2021 22:54 | | | 1 | | | I |
| EXP121621010.wiff | XIBLK02 | JLS | 12/16/2021 23:29 | | | 1 | | | B |
| EXP121621011.wiff | WXXIRA | JLS | 12/17/2021 00:04 | | | 1 | | | C |
| EXP121621012.wiff | WXXIRA | JLS | 12/17/2021 00:39 | | | 1 | | | C |
| EXP121621013.wiff | WXXICV | JLS | 12/17/2021 01:14 | | | 1 | | | C |
| EXP121621014.wiff | XIBLK03 | JLS | 12/17/2021 01:50 | | | 1 | | | B |
| EXP121621015.wiff | WXXCRI | JLS | 12/17/2021 02:25 | | | 1 | | | C |
| EXP121621016.wiff | 1204977875 | JLS | 12/17/2021 03:00 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621017.wiff | 564617001 | JLS | 12/17/2021 03:35 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621018.wiff | 564617002 | JLS | 12/17/2021 04:10 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621019.wiff | 564617003 | JLS | 12/17/2021 04:46 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621020.wiff | 564617004 | JLS | 12/17/2021 05:21 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621021.wiff | 564617005 | JLS | 12/17/2021 05:56 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621022.wiff | 1204977876 | JLS | 12/17/2021 06:31 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621023.wiff | 1204977877 | JLS | 12/17/2021 07:06 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621024.wiff | 564617006 | JLS | 12/17/2021 07:41 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621025.wiff | 564617007 | JLS | 12/17/2021 08:17 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621026.wiff | WXXCCV | JLS | 12/17/2021 08:52 | | | 1 | | | C |
| EXP121621027.wiff | XIBLK06 | JLS | 12/17/2021 09:27 | | | 1 | | | B |
| EXP121621028.wiff | WXXCRI | JLS | 12/17/2021 10:02 | | | 1 | | | C |
| EXP121621029.wiff | 1204977874 | JLS | 12/17/2021 10:37 | 2207513 | J2116762 | 2 | AELS | | L |
| EXP121621030.wiff | 1204979492 | JLS | 12/17/2021 11:12 | 2208286 | VARIOUS | 2 | N3BL | DUSE - IS ELEVATED | L |
| EXP121621031.wiff | 1204979493 | JLS | 12/17/2021 11:48 | 2208286 | VARIOUS | 2 | N3BL | | L |
| EXP121621032.wiff | 564822001 | JLS | 12/17/2021 12:23 | 2208286 | N3B-2022-520 | 2 | N3BL | | L |
| EXP121621033.wiff | 1204979494 | JLS | 12/17/2021 12:58 | 2208286 | N3B-2022-520 | 2 | N3BL | | L |
| EXP121621034.wiff | 1204979495 | JLS | 12/17/2021 13:33 | 2208286 | N3B-2022-520 | 2 | N3BL | | L |
| EXP121621035.wiff | 564826001 | JLS | 12/17/2021 14:08 | 2208286 | N3B-2022-528 | 2 | N3BL | | L |
| EXP121621036.wiff | 564826003 | JLS | 12/17/2021 14:43 | 2208286 | N3B-2022-528 | 2 | N3BL | | L |
| EXP121621037.wiff | 564826005 | JLS | 12/17/2021 15:19 | 2208286 | N3B-2022-528 | 2 | N3BL | | L |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| EXP121621038.wiff | 1204979492 | JLS | 12/17/2021 15:54 | 2208286 | N3B-2022-528 | 2 | N3BL | L |
| EXP121621039.wiff | WXXCCV | JLS | 12/17/2021 16:29 | | | 1 | | C |
| EXP121621040.wiff | XIBLK07 | JLS | 12/17/2021 17:04 | | | 1 | | B |
| EXP121621041.wiff | WXXCRI | JLS | 12/17/2021 17:39 | | | 1 | | C |
| EXP121621042.wiff | 564826001 | JLS | 12/17/2021 18:14 | 2208286 | N3B-2022-528 | 25 | N3BL | L |
| EXP121621043.wiff | 564826003 | JLS | 12/17/2021 18:50 | 2208286 | N3B-2022-528 | 25 | N3BL | L |
| EXP121621044.wiff | 1204981723 | JLS | 12/17/2021 19:25 | 2209470 | VARIOUS | 2 | VARIOUS | L |
| EXP121621045.wiff | 1204981724 | JLS | 12/17/2021 20:00 | 2209470 | VARIOUS | 2 | VARIOUS | L |
| EXP121621046.wiff | 565000009 | JLS | 12/17/2021 20:35 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621047.wiff | 565000002 | JLS | 12/17/2021 21:10 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621048.wiff | 1204981725 | JLS | 12/17/2021 21:45 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621049.wiff | 1204981726 | JLS | 12/17/2021 22:21 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621050.wiff | 565000003 | JLS | 12/17/2021 22:56 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621051.wiff | 565000004 | JLS | 12/17/2021 23:31 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621052.wiff | WXXCCV | JLS | 12/18/2021 00:06 | | | 1 | | C |
| EXP121621053.wiff | XIBLK08 | JLS | 12/18/2021 00:41 | | | 1 | | B |
| EXP121621054.wiff | WXXCRI | JLS | 12/18/2021 01:16 | | | 1 | | C |
| EXP121621055.wiff | 565000005 | JLS | 12/18/2021 01:52 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621056.wiff | 565000006 | JLS | 12/18/2021 02:27 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621057.wiff | 565000007 | JLS | 12/18/2021 03:02 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621058.wiff | 565000008 | JLS | 12/18/2021 03:37 | 2209470 | 565000 | 2 | ENFE | L |
| EXP121621059.wiff | 565101001 | JLS | 12/18/2021 04:12 | 2209470 | 2022-180 | 2 | TNSL | L |
| EXP121621060.wiff | 1204981727 | JLS | 12/18/2021 04:47 | 2209470 | 2022-180 | 2 | TNSL | L |
| EXP121621061.wiff | 1204981728 | JLS | 12/18/2021 05:23 | 2209470 | 2022-180 | 2 | TNSL | L |
| EXP121621062.wiff | XIBLK09 | JLS | 12/18/2021 05:58 | | | 1 | | B |
| EXP121621063.wiff | 564826003 | JLS | 12/18/2021 06:33 | 2208286 | N3B-2022-528 | 40 | N3BL | L |
| EXP121621064.wiff | WXXCCV | JLS | 12/18/2021 07:08 | | | 1 | | C |
| EXP121621065.wiff | XIBLK10 | JLS | 12/18/2021 07:43 | | | 1 | | B |
| EXP121621066.wiff | WXXCRI | JLS | 12/18/2021 08:19 | | | 1 | | C |

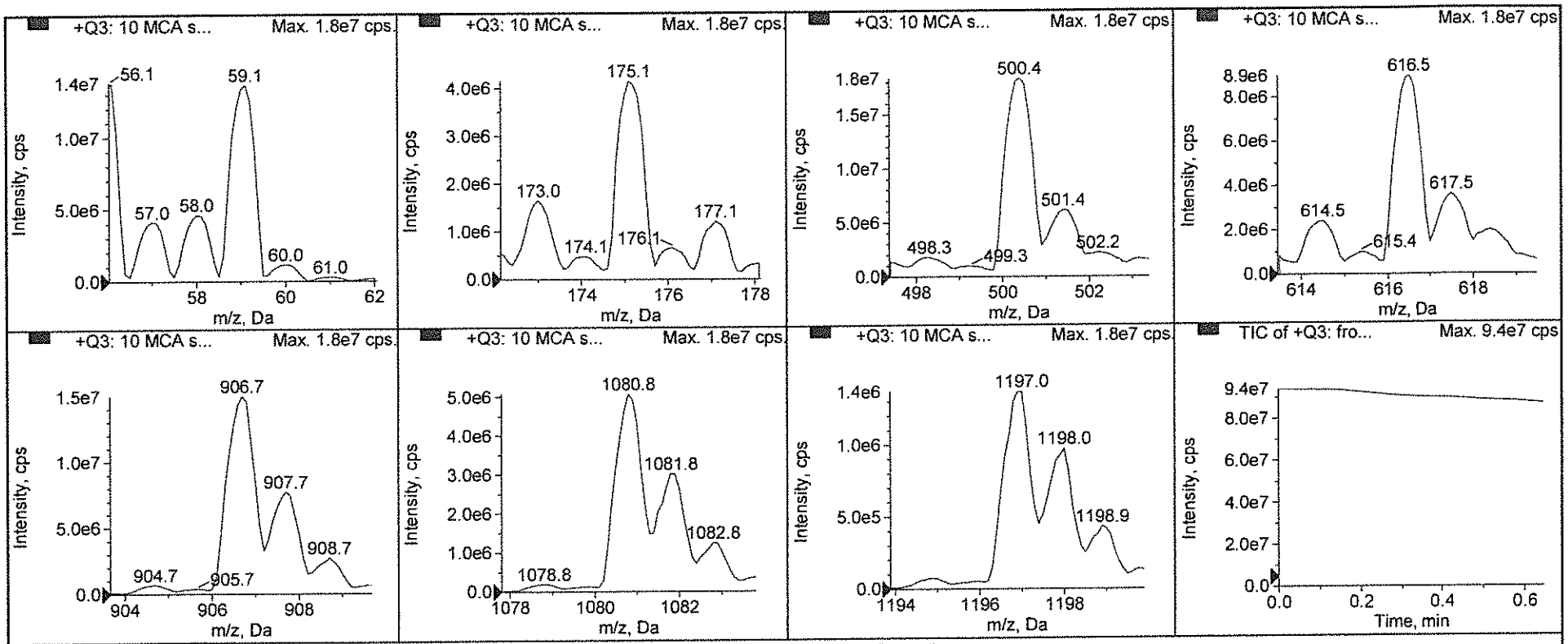



Peak List for " +Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200213102608.wiff (Turbo Spray)"

| | Target Mass (Da) | Found At (Da) | Intensity (cps) | Width (Da) | Mass Shift (Da) |
|---|---|---|---|---|---|
| 1 | 59.0500 | 59.0450 | 1.8905e7 | 0.6774 | 4.9875e-3 |
| 2 | 175.1330 | 175.1375 | 4.5871e6 | 0.6866 | -4.5229e-3 |
| 3 | 500.3800 | 500.3754 | 2.5750e7 | 0.7101 | 4.6082e-3 |
| 4 | 616.4640 | 616.4612 | 1.5594e7 | 0.6961 | 2.7843e-3 |
| 5 | 906.6730 | 906.6714 | 3.5329e7 | 0.6886 | 1.6455e-3 |
| 6 | 1080.7990 | 1080.7999 | 1.4791e7 | 0.7125 | -8.9985e-4 |
| 7 | 1196.8830 | 1196.8867 | 6.4916e6 | 0.7356 | -3.7469e-3 |

Polarity/Scan Type: Positive Q1 MS

*Post-repair
*FSE:Lynne Russell

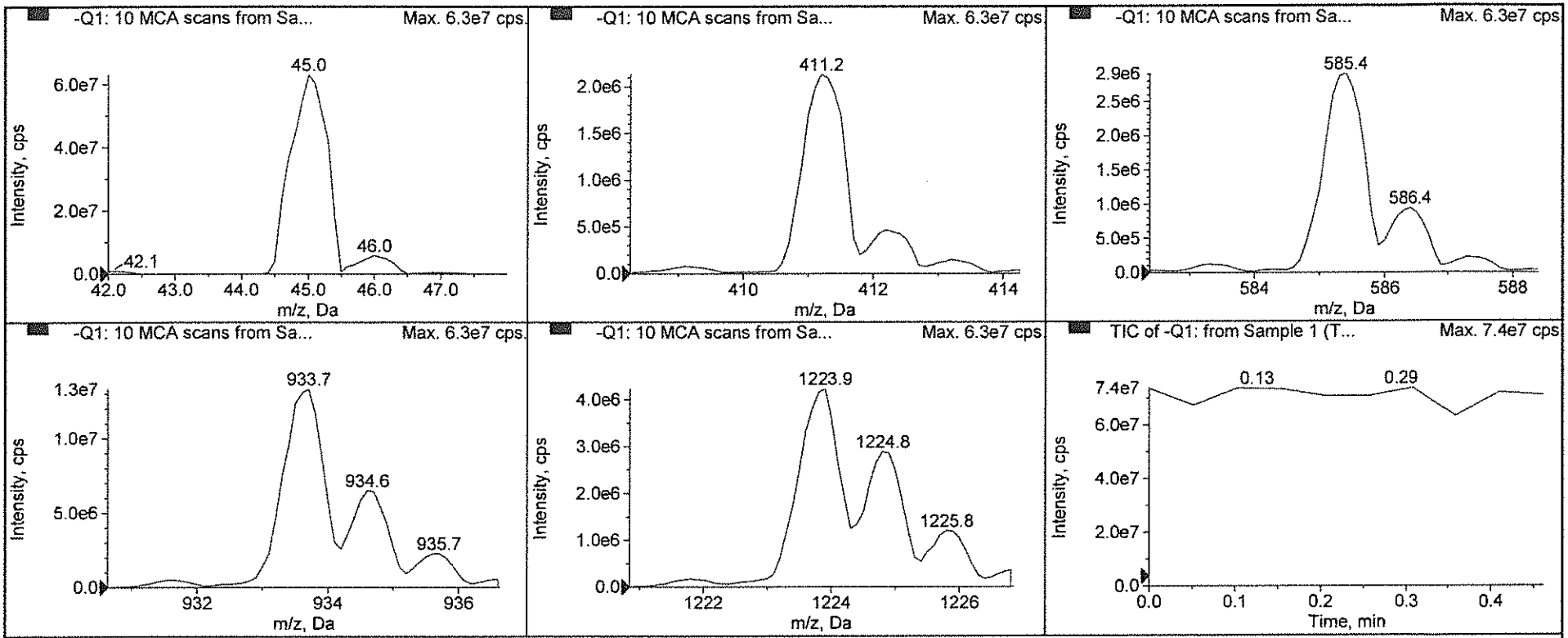



Peak List for "+Q3: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200213103108.wiff (Turbo Spray)"

| | Target Mass (Da) | Found At (Da) | Intensity (cps) | Width (Da) | Mass Shift (Da) |
|---|---|---|---|---|---|
| 1 | 59.0500 | 59.0491 | 1.3644e7 | 0.6384 | 8.8192e-4 |
| 2 | 175.1330 | 175.1282 | 4.1469e6 | 0.7033 | 4.8058e-3 |
| 3 | 500.3800 | 500.3846 | 1.8337e7 | 0.7371 | -4.6132e-3 |
| 4 | 616.4640 | 616.4649 | 8.9488e6 | 0.7442 | -8.7963e-4 |
| 5 | 906.6730 | 906.6701 | 1.4963e7 | 0.7474 | 2.9313e-3 |
| 6 | 1080.7990 | 1080.8063 | 5.0693e6 | 0.7338 | -7.3455e-3 |
| 7 | 1196.8830 | 1196.8945 | 1.3696e6 | 0.7462 | -0.0115 |

Polarity/Scan Type: Positive Q3 MS

*Post-repair
*FSE:Lynne Russell

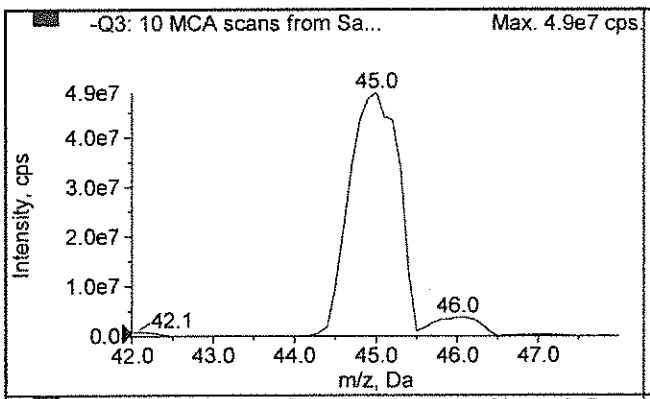


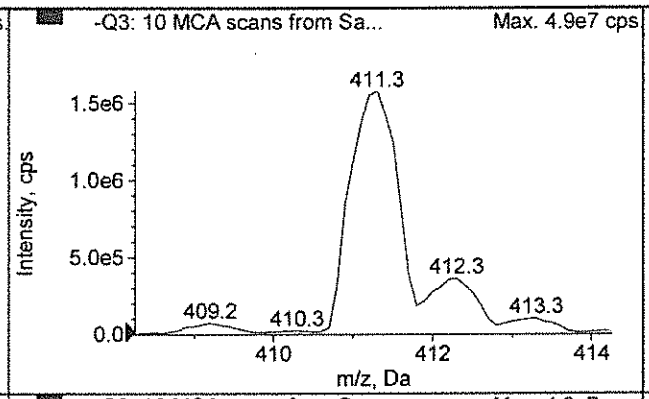

Peak List for " -Q1: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200213105004.wiff (Turbo Spray)"

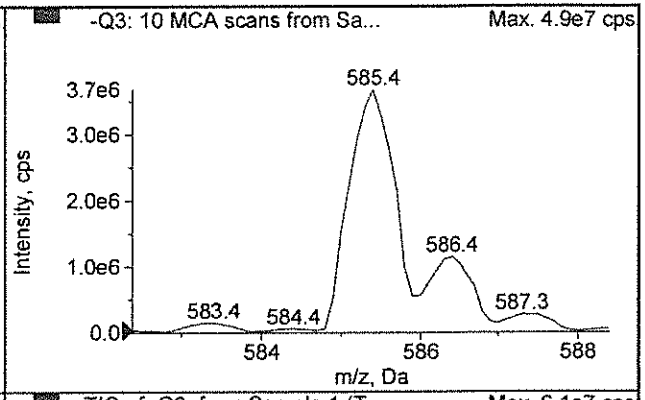
| | Target Mass (Da) | Found At (Da) | Intensity (cps) | Width (Da) | Mass Shift (Da) |
|---|---|---|---|---|---|
| 1 | 44.9980 | 45.0281 | 6.3010e7 | 0.6812 | -0.0301 |
| 2 | 411.2590 | 411.2436 | 2.1280e6 | 0.7218 | 0.0154 |
| 3 | 585.3850 | 585.3791 | 2.9062e6 | 0.6987 | 5.8991e-3 |
| 4 | 933.6360 | 933.6294 | 1.3321e7 | 0.6995 | 6.5909e-3 |
| 5 | 1223.8450 | 1223.8161 | 4.2302e6 | 0.7286 | 0.0289 |

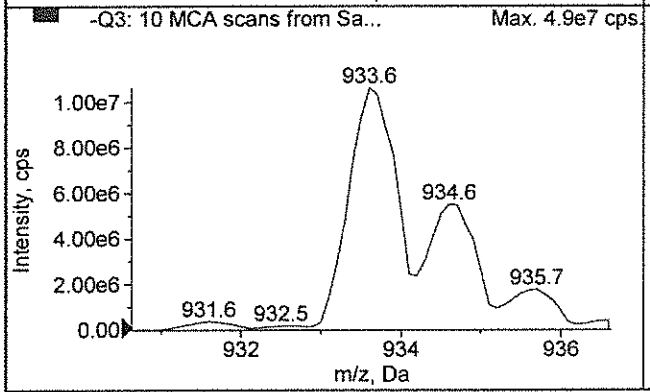
Polarity/Scan Type: Negative Q1 MS

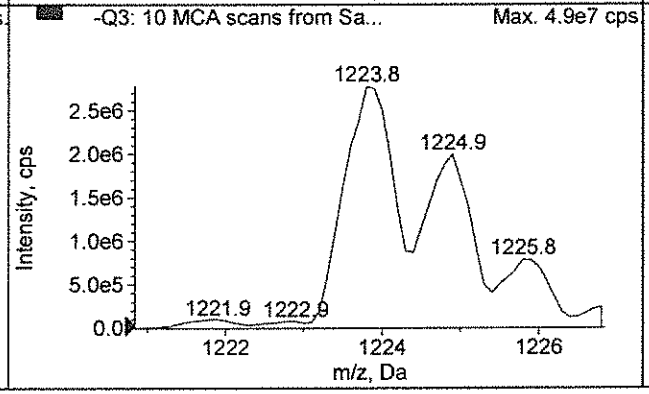
*Post-repair
*FSE:Lynne Russell

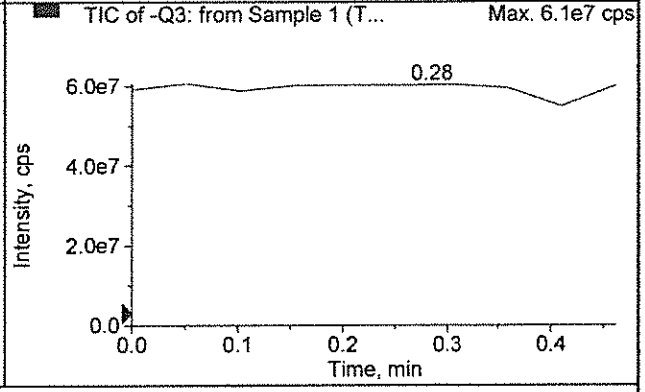



Peak List for "-Q3: 10 MCA scans from Sample 1 (TuneSampleID) of MT20200213110226.wiff (Turbo Spray)"

| | Target Mass (Da) | Found At (Da) | Intensity (cps) | Width (Da) | Mass Shift (Da) |
|---|---|---|---|---|---|
| 1 | 44.9980 | 44.9945 | 4.8991e7 | 0.7240 | 3.5386e-3 |
| 2 | 411.2590 | 411.2604 | 1.5775e6 | 0.7211 | -1.4235e-3 |
| 3 | 585.3850 | 585.3919 | 3.6816e6 | 0.6870 | -6.9460e-3 |
| 4 | 933.6360 | 933.6494 | 1.0626e7 | 0.6754 | -0.0134 |
| 5 | 1223.8450 | 1223.8367 | 2.7799e6 | 0.7420 | 8.2790e-3 |

Polarity/Scan Type: Negative Q3 MS

*Post-repair
*FSE:Lynne Russell

# APPENDIX C

# 2021 PRE-DESIGN SAMPLING EVENT DATA VALIDATION PACKAGE

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**ECC Data Review Worksheet** **Explosives Method SW846 8330B (LC/MS/MS)**
**Project: Redstone Arsenal** **Review Criteria: RSA Site SAP**

| Validation Level | Matrix | Preservation | Temperature Sample Receipt | Laboratory | SDG Number |
|---|---|---|---|---|---|
| Tier I+ | Groundwater (GW) | None | 2.9 °C | AEL Subcontracted GEL Laboratories Charleston, SC | AEL J2116762 GEL 564617 |

**FIELD IDENTIFICATION OF SAMPLES EVALUATED:**

| Field Identification (ID) | Sample Date | AEL Lab ID | GEL Lab Sample Number |
|---|---|---|---|
| 308-RS2347 | 12/6/21 | J2116762001 | 564617001 |
| 308-RS2346 | 12/7/21 | J2116762002 | 564617002 |
| 308-RS2346-FD | 12/7/21 | J2116762003 | 564617003 |
| 308-RS53035 | 12/7/21 | J2116762004 | 564617004 |
| 308-RS2349 | 12/7/21 | J2116762005 | 564617005 |
| 308-SITE | 12/7/21 | J2116762006 | 564617006 |
| 308-SITE-ER | 12/7/21 | J2116762007 | 564617007 |

Note: Samples are described below in the data worksheets by reference to the last two digits of the GEL Lab Sample Number or full GEL number.
Limited list reported: RDX only.

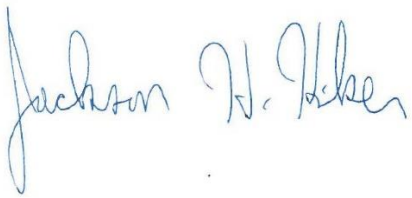
| REVIEW ITEMS | ACCEPTANCE CRITERIA | SAMPLES AFFECTED Narrative | Inven-tory | QUAL | BIAS |
|---|---|---|---|---|---|
| COC | Unbroken custody (accept or if broken R)<br>Temp<6 (Soil-J detects, R –non-detects)<br>No preservatives required.<br>Temperature. J, UJ, or R (function of HT and compound) | Cooler temperatures < 6C, therefore no sample qualifications. Sample custody transferred from Field Team Leader to lab sample custodian. Lab shipped samples to GEL lab. Unbroken Chain of Custody. No qualifications were required. | X | - | |
| Holding Time | 7 Days for water, 14 days for soil to extraction<br>40 days after extraction | In limits. | X | - | |
| % Solids check (SOLIDS) | 30%<Solids: if no sample weight adjustment made<br><10% R entire sample<br>10%.> and <30%; J-detects, NDs -R | Not Applicable | - | - | |
| Results > Cal Range or <Cal Range | >Upper Cal Range J-detects - ensure instrument blank performed | Data greater than the DL, but less than the LOQ were qualified as J. | X | RDX in sample 001 (J) | |
| Equipment Blank | < 5x (<10x common) contaminants for aqueous samples | EB (Sample 007) was ND. | X | - | |
| Surrogates | Surrogate acceptance limits are lab limits<br>Qualification: >UCL J –detects,<br>%R<10% J –detects, R –NDs,<br>%R >10% but <60% J-detects, UJ NDs | Case narrative states surrogate %R were within MPC limits. | X | - | |
| Lab Blanks (method blanks) | < 5x contaminants – U analytes <lab LOQ | Method Blank was ND. | X | - | |
| Internal Standard | Within -50% to 200% of standard | In limits. | X | - | |
| Laboratory Control Sample (LCS) Recovery | LCS acceptance limits: lab limits<br>10% and <LCL% J detects, UJ -NDs<br>>UCL% J detects <10% R NDs, J-detects | LCS %Rec were within MPC limits. | X | - | |

| REVIEW ITEMS | ACCEPTANCE CRITERIA | SAMPLES AFFECTED Narrative | Inven-tory | QUAL | BIAS |
|---|---|---|---|---|---|
| LCS/LCSD RPD | RPD<25% | Not analyzed/collected with this SDG. | - | - | |
| Matrix Spike/ Matrix Spike Duplicate (MS/MSD) Recovery | MS %R's use lab limits<br><br>If native levels >4X spike levels do not evaluate.<br>Qualification of MS sample: <10% J detects, R NDs.<br>>UCL – J detects<br><LCL J detects/ UJ NDs | Non-Native Sample 005<br>All MS recoveries within limits. | X | - | |
| MS/MSD RPD | RPD ≤ 30%<br>J –detects in MS sample UJ-non detects | Not analyzed/collected with this SDG. | - | - | |
| Field Dup RPD | RPD ≤ 30% water, 50% soil<br>J-detections, UJ non-detect<br>Other conditions: use judgment | Primary Sample Field Duplicate<br>002 003<br><br>FD RPD = 10.7% for all methods. No qual. | X | - | |
| Initial Cal (Linearity) | Correct calibration standards<br>%RSD < 20% use average RF for calibration<br>%RSD> 20% use least squares regression r><br>0.995 | Instrument: LCMSMS7<br>Date: 12/16/21<br>All calibrations within limits. | X | - | |
| 2nd Source Initial Calibration Verification (ICV) | %D < 20%<br>once after ICAL<br>Qualification: J detects, R or UJ NDs | Instrument: LCMSMS7<br>Date: 12/17/21<br>ICV %R's within MPC limits the initial calibration all methods. | X | - | |
| Continuing Calibration Verification (CCV) | 20 %D/drift of expected value | Instrument: LCMSMS7<br>Date: 12/17/21<br>CCV %R's within MPC limits.<br><br>CRI within limits.<br>LLCV within limits. | X | - | |
| Tune check | Method SOP | Tune in limits | X | - | |
| Quantitation Sensitivity | Sample results will be reported to the detection limit (DL)<br>Sample Results that are < LOQ, but >DL, will be reported as J<br>Dilution factors for samples – impacts to sensitivity | All results analyzed at 2x dilution. Analytical sensitivity meets project objectives. | X | - | |
| ICB/CCB | Within lab limits. | All ND. | X | - | |
| Overall Evaluation of Data | Appropriate method<br>Evaluate any analytical problems<br>Evaluate sampling errors – field contamination, sample hold times<br>Evaluate systemic, lab or matrix bias | Laboratory precision and accuracy acceptable. No apparent sample bias. Sample results are usable for making project decisions, as qualified.<br><br>Method blanks were free of COC contamination.<br>The laboratory accuracy is acceptable.<br>LCS %R were within limits.<br>MS %R were within limits.<br>Surrogates were within limits.<br>MB was ND.<br><br>ICAL: per methods | X | - | |

| REVIEW ITEMS | ACCEPTANCE CRITERIA | SAMPLES AFFECTED Narrative | Inven-tory | QUAL | BIAS |
|---|---|---|---|---|---|
| | | ICV: in limits.<br>CCV: in limits.<br><br>Sampling Error Evaluation:<br>Primary Sample Field Duplicate<br>002 003<br>FD RPD = 10.7% for all methods. No qual.<br><br>EB was ND.<br><br>Overall data evaluation:<br>Data is usable as qualified for decision making purposes.<br>No systemic matrix or analytical bias. | | | |

Completeness Check: Inventory Check Sheet X

**Laboratory Correspondence:** Data Package Revision 1 - This data package has been revised to change the sample IDs for J2116762006 and 007 per client request.
AEL Lab ID J2116762006 (GEL Lab ID- 56417006) (308-SITE-ER) change to 308-SITE
AEL Lab ID J2116762007 (GEL Lab ID- 56417007) (308-SITE) change to 308-SITE-ER

| Project Role | Name | Signature | Date |
|---|---|---|---|
| Data Validator | Roxann Williams |  | 2/22/22 |
| Chemistry QA Manager | Jackson Kiker |  | 25 Mar 2022 |

**ECC Data Review Worksheet** **Perchlorate SW-846 6850 Modified**
**Project: Redstone Arsenal** **Review Criteria: RSA-IWS SAP (Mar 2020)**

| Data Validation Level | Matrix | Preservation | Temperature Sample Receipt | Laboratory | SDG Number |
|---|---|---|---|---|---|
| Tier I+ | Groundwater | Not Applicable | 2.9 °C | AEL Subcontracted GEL Laboratories Charleston, SC | AEL J2116762 GEL 564617 |

**FIELD IDENTIFICATION OF SAMPLES EVALUATED:**

| Field Identification (ID) | Sample Date | AEL Lab ID | GEL Lab ID |
|---|---|---|---|
| 308-RS2347 | 12/6/21 | J2116762001 | 564617001 |
| 308-RS2346 | 12/7/21 | J2116762002 | 564617002 |
| 308-RS2346-FD | 12/7/21 | J2116762003 | 564617003 |
| 308-RS53035 | 12/7/21 | J2116762004 | 564617004 |
| 308-RS2349 | 12/7/21 | J2116762005 | 564617005 |
| 308-SITE | 12/7/21 | J2116762006 | 564617006 |
| 308-SITE-ER | 12/7/21 | J2116762007 | 564617007 |

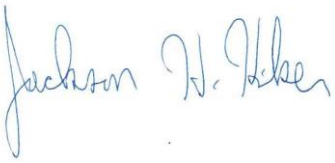
Note: Samples are described below in the data worksheets by reference to the last one to three digits of the Lab Sample Number or field ID.

| REVIEW ITEMS | ACCEPTANCE CRITERIA | SAMPLES AFFECTED | Inven-tory | QUAL | BIAS |
|---|---|---|---|---|---|
| Chain of Custody (COC) | Unbroken custody (accept or if broken R)<br>Temp≤6°C (Soil-J detects, R –nondetects)<br>No preservatives required. 1-125ml polyethylene bottle. Temperature. J, UJ, or R (function of HT and sample date and time) | Cooler temperatures < 6ºC. No preservatives required. Chain of custody was intact. Laboratory sample receipt and login checklist indicates that sample integrity was maintained during transport. No qualifications were required. | X | - | |
| Holding Time | 28 days to analysis<br>J –detects, UJ or R –nondetects (function of time) | All samples were analyzed within holding time. No qualifications were required. | X | - | |
| % Solids Check (SOLIDS) | 30%<Solids: if no sample weight adjustment made<br><10% R entire sample<br>10%> and <30%; J-detects, NDs -R | Not Applicable | - | - | |
| Results > Cal Range or <Cal Range | >Upper Cal Range J-detects - ensure instrument blank performed<br>Detected results<LOQ qualified as J | All positive results were within linear calibration range. | X | - | |
| Equip Blank | < 5x (<10x common) contaminants for aqueous samples | EB (Sample 006) was ND. | X | - | |
| Lab Blanks (method blanks) | < 5x contaminants – U analytes <lab RL | Method blanks associated with samples was ND. | X | - | |

| REVIEW ITEMS | ACCEPTANCE CRITERIA | SAMPLES AFFECTED | Inven-tory | QUAL | BIAS |
|---|---|---|---|---|---|
| Initial Calibration Blank (ICB) and Continuing Calibration Blank (CCB) | < 5x contaminants – U analytes <lab RL | ICB and CCB were ND. | X | - | |
| Laboratory Control Sample (LCS) Recovery | Laboratory Limits<br>85-1150% for water and soil<br>10% and <LCL% J detects, UJ - NDs<br>>UCL% J detects <10% R NDs, J-detects | LCS %R were within acceptance limit. | X | - | |
| LCS/LCSD RPD | RPD<15% for water | Not collected/analyzed with this SDG. | - | - | |
| Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recovery | One in every 20 samples<br>MS/MSD lab acceptance limits<br>75-125% for water and soil<br>Qualification of MS sample:<br><10% J detects, R NDs<br>>10% and <LCL J detects, UJ - NDs<br>>UCL J detects<br>If native levels >4X spike do not qualify | Native Sample 005<br>MS %Rs was <LCL. | X | Qualify perchlorate as J for sample 005. | |
| MS/MSD RPD | RPD ≤ 15% for water,<br>J –detects in MS sample<br>UJ-non detects | Native Sample 005<br>MS RPDs in limits. | X | - | |
| Retention times | RRT ± 2% IS for each analyte from ICAL/CCV –lab window limits.<br>Once per ICAL determined and evaluated with each CCV –DOD QSM<br>Exceeds: Review ICS sample and determine if false positives | All the retention time met the requirements. | X | - | |
| Lab duplicate | RPD<15% for water, 40% for soil | Not Applicable | - | - | |
| Field Dup RPD | RPD ≤20% water & 50% soil<br>J detects and UJ NDs exceeding criteria. | Primary Sample Field Duplicate<br>002 003<br><br>FD RPD =4.1% for all methods. No qual. | X | - | |
| Internal Standards (IS) | ±50% of ICAL in every batch | Internal Standards were ±50% of ICAL | X | - | |
| Initial Cal (Linearity) | Correct calibration standards<br>Least squares regression<br>r>0.995, y intercept<br>%R 85-115% or<br><15% RSD | Instrument: LCMSMS6<br>Date: 12/14/21<br>%RSD and R2 within limits. | X | - | |
| 2nd Source ICV | %D ≤15% once after ICAL<br><br>Qualification: J detects, R or UJ NDs | Not analyzed with this SDG. | - | - | |

| REVIEW ITEMS | ACCEPTANCE CRITERIA | SAMPLES AFFECTED | Inven-tory | QUAL | BIAS |
|---|---|---|---|---|---|
| Continuing Calibration Verification (CCV) | 15 %D/drift of expected value<br>Analyze at beginning and after every 10 samples and at end of sequence. | Instrument: LCMSMS6<br>All CCV's have %D within acceptance limit.<br>No qualifications were required. | X | - | |
| Interference Check Sample (ICS) | One in every 20 samples<br>%R: 70-130 Lab SOP | ICS had recovery within acceptance limit.<br>No qualifications were required. | X | - | |
| Isotope (83/85) Ratio | 2.3 to 3.8 (±25% of theoretical value of 3.06)<br>Ideally 2.4 to 2.8 for result >LOQ | In limits. | X | - | |
| Quantitation Sensitivity | Check if dilutions have raised LOQL>SAP limits | Acceptable.<br>All analyzed at 1x, except sample 001 at 25x, sample 002 and 003 at 100x, and sample 006 at 50x. | X | - | |
| Overall Evaluation of Data | Appropriate method<br>Evaluate any analytical problems<br>Evaluate sampling errors – field contamination, sample hold times<br>Evaluate any systemic, lab or matrix bias | Laboratory precision and accuracy acceptable. No apparent sample bias. The laboratory accuracy is acceptable. Sample results are usable for making project decisions, as qualified.<br><br>LCS within limits.<br>MS was outside limits. RPD within limits.<br>MB was ND.<br>CCB was ND.<br><br>ICAL: per methods<br>CCV: in limits.<br><br><u>Sampling Error Evaluation:</u><br><u>Primary Sample</u> <u>Field Duplicate</u><br>002 003<br>FD RPD =4.1% for all methods. No qual.<br><br>EB was ND.<br><br>Overall data evaluation:<br>Data is usable as qualified for decision making purposes. No systemic matrix or analytical bias. | X | - | |

**Laboratory Correspondence:** Data Package Revision 1 - This data package has been revised to change the sample IDs for J2116762006 and 007 per client request.
AEL Lab ID J2116762006 (GEL Lab ID- 56417006) (308-SITE-**ER**) change to 308-SITE
AEL Lab ID J2116762007 (GEL Lab ID- 56417007) (308-SITE) change to 308-SITE-**ER**

| Project Role | Name | Signature | Date |
|---|---|---|---|
| Data Validator | Roxann Williams |  | 2/22/22 |
| Chemistry QA Manager | Jackson Kiker |  | 25 Mar 2022 |

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# APPENDIX D

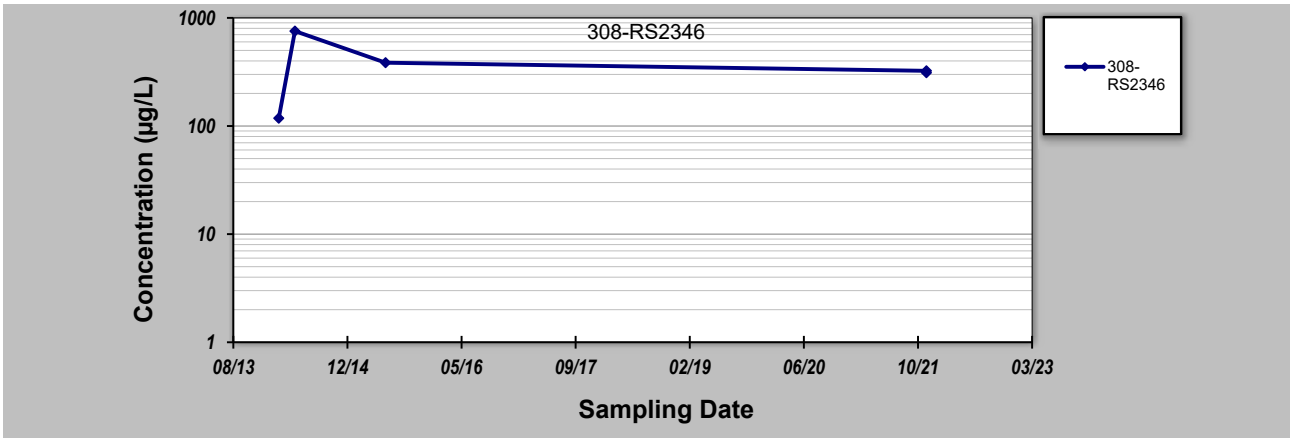
# PERCHLORATE SOIL-TO-GROUNDWATER MIGRATION EVALUATION

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# GSI MANN-KENDALL TOOLKIT
## for Constituent Trend Analysis

| | | | |
|---|---|---|---|
| Evaluation Date: | 29-May-23 | Job ID: | 5211.02 |
| Facility Name: | RSA-308 | Constituent: | Perchlorate |
| Conducted By: | Kristina Early | Concentration Units: | µg/L |
| Sampling Point ID: | 308-RS2346 | | |

| Sampling Event | Sampling Date | PERCHLORATE CONCENTRATION (µg/L) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 1-Mar-14 | 118 | | | | | | |
| 2 | 11-May-14 | 755 | | | | | | |
| 3 | 12-Jun-15 | 385 | | | | | | |
| 4 | 7-Dec-21 | 324 | | | | | | |
| 5 | 7-Dec-21 | 311 | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| Coefficient of Variation: | | 1.58 | 0.67 | | 0.68 | | | |
| Mann-Kendall Statistic (S): | | -66 | -39 | | -84 | | | |
| Confidence Factor: | | 99.9% | 97.1% | | >99.9% | | | |
| Concentration Trend: | | Decreasing | Decreasing | | Decreasing | | | |

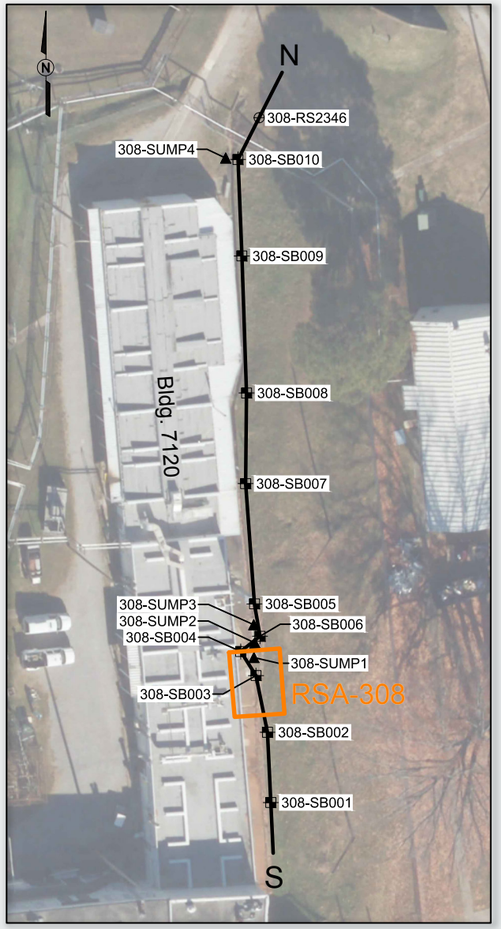


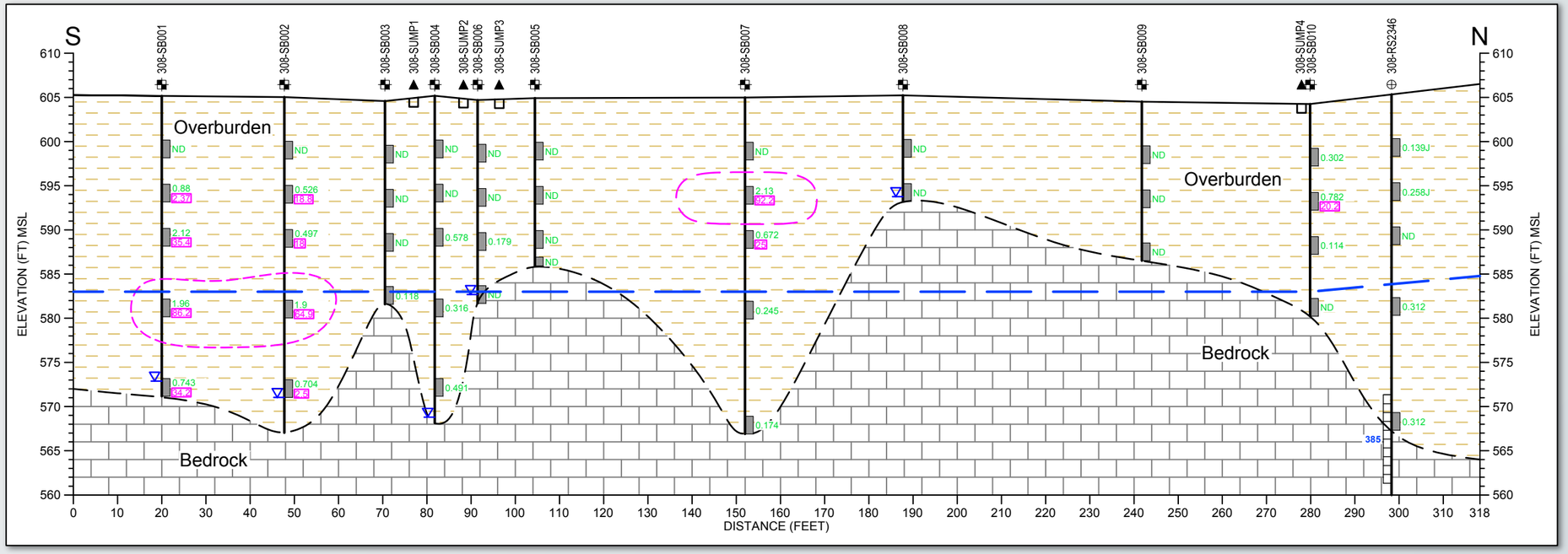

**Notes:**

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

***DISCLAIMER:*** *The GSI Mann-Kendall Toolkit is available "as is". Considerable care has been exercised in preparing this software product; however, no party, including without limitation GSI Environmental Inc., makes any representation or warranty regarding the accuracy, correctness, or completeness of the information contained herein, and no such party shall be liable for any direct, indirect, consequential, incidental or other damages resulting from the use of this product or the information contained herein. Information in this publication is subject to change without notice. GSI Environmental Inc., disclaims any responsibility or obligation to update the information contained herein.*

## CROSS-SECTION LOCATION MAP




## LEGEND

- 308-SB001 — Sample Location
- Ground Surface
- Top of Bedrock
- Soil Sample Interval
- Screened Interval
- Overburden Well
- Soil Boring
- Sump
- Environmental Site Boundary
- Water Level
- 0.743 — Perchlorate Concentration in Soil (mg/L)
- 34.2 — Leachable Perchlorate Fraction in Soil (ug/L)
- 385 — Perchlorate Concentration in Groundwater (ug/L)
- Perchlorate in Soil Exceeding Leachate-based Value
- Overburden
- Bedrock
- Average Depth to Groundwater

## NOTES

1. Horizontal Scale: 1" = 20'
   Vertical Scale: 1"=10' (2x Horizontal)
2. All sumps are projected.

**FIGURE D-1**
RSA-308
S-N Cross-section
With Perchlorate Concentrations
in Soil and Groundwater

*Redstone Arsenal*
*Madison County, Alabama*
*Contract No. W91ZLK-09-D-0006*

\\cfsknxfp01\cadd2\Redstone_PMC\RSA-308\Civil 3D 2016\RSA-308 xsecs.dwg

**Table D-1**

**Perchlorate Soil-to-Groundwater Migration Evaluation**

**UCL Statistics for Data Sets with Non-Detects**

| | |
|---|---|
| User Selected Options | |
| Date/Time of Computation | ProUCL 5.15/12/2023 11:02:48 AM |
| From File | RSA308-ProUCL Input-SPLP.xls |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**perchlorate_splp**

**General Statistics**

| | | | |
|---|---|---|---|
| Total Number of Observations | 10 | Number of Distinct Observations | 10 |
| | | Number of Missing Observations | 0 |
| Minimum | 2.37 | Mean | 41.21 |
| Maximum | 92.2 | Median | 34.6 |
| SD | 30.04 | Std. Error of Mean | 9.498 |
| Coefficient of Variation | 0.729 | Skewness | 0.767 |

**Normal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.894 | **Shapiro Wilk GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Normal at 5% Significance Level |
| Lilliefors Test Statistic | 0.277 | **Lilliefors GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data Not Normal at 5% Significance Level |

**Data appear Approximate Normal at 5% Significance Level**

**Assuming Normal Distribution**

| **95% Normal UCL** | | **95% UCLs (Adjusted for Skewness)** | |
|---|---|---|---|
| 95% Student's-t UCL | 58.62 | 95% Adjusted-CLT UCL (Chen-1995) | 59.29 |
| | | 95% Modified-t UCL (Johnson-1978) | 59 |

**Gamma GOF Test**

| | | |
|---|---|---|
| A-D Test Statistic | 0.349 | **Anderson-Darling Gamma GOF Test** |
| 5% A-D Critical Value | 0.739 | Detected data appear Gamma Distributed at 5% Significance Level |
| K-S Test Statistic | 0.167 | **Kolmogorov-Smirnov Gamma GOF Test** |
| 5% K-S Critical Value | 0.271 | Detected data appear Gamma Distributed at 5% Significance Level |

**Detected data appear Gamma Distributed at 5% Significance Level**

**Gamma Statistics**

| | | | |
|---|---|---|---|
| k hat (MLE) | 1.586 | k star (bias corrected MLE) | 1.177 |
| Theta hat (MLE) | 25.98 | Theta star (bias corrected MLE) | 35.01 |
| nu hat (MLE) | 31.72 | nu star (bias corrected) | 23.54 |
| MLE Mean (bias corrected) | 41.21 | MLE Sd (bias corrected) | 37.98 |
| | | Approximate Chi Square Value (0.05) | 13.5 |
| Adjusted Level of Significance | 0.0267 | Adjusted Chi Square Value | 12.2 |

**Assuming Gamma Distribution**

| | | | |
|---|---|---|---|
| 95% Approximate Gamma UCL (use when n>=50)) | 71.86 | 95% Adjusted Gamma UCL (use when n<50) | 79.53 |

**Lognormal GOF Test**

| | | |
|---|---|---|
| Shapiro Wilk Test Statistic | 0.857 | **Shapiro Wilk Lognormal GOF Test** |
| 5% Shapiro Wilk Critical Value | 0.842 | Data appear Lognormal at 5% Significance Level |
| Lilliefors Test Statistic | 0.224 | **Lilliefors Lognormal GOF Test** |
| 5% Lilliefors Critical Value | 0.262 | Data appear Lognormal at 5% Significance Level |

**Data appear Lognormal at 5% Significance Level**

**Lognormal Statistics**

| | | | |
|---|---|---|---|
| Minimum of Logged Data | 0.863 | Mean of logged Data | 3.371 |
| Maximum of Logged Data | 4.524 | SD of logged Data | 1.053 |

**Assuming Lognormal Distribution**

| | | | |
|---|---|---|---|
| 95% H-UCL | 156.7 | 90% Chebyshev (MVUE) UCL | 96.34 |
| 95% Chebyshev (MVUE) UCL | 118.7 | 97.5% Chebyshev (MVUE) UCL | 149.7 |
| 99% Chebyshev (MVUE) UCL | 210.7 | | |

**Nonparametric Distribution Free UCL Statistics**

**Data appear to follow a Discernible Distribution at 5% Significance Level**

**Table D-1**

**Perchlorate Soil-to-Groundwater Migration Evaluation**

**UCL Statistics for Data Sets with Non-Detects**

**Nonparametric Distribution Free UCLs**

| | | | |
|---|---|---|---|
| 95% CLT UCL | 56.83 | 95% Jackknife UCL | 58.62 |
| 95% Standard Bootstrap UCL | 56.11 | 95% Bootstrap-t UCL | 64.3 |
| 95% Hall's Bootstrap UCL | 63.14 | 95% Percentile Bootstrap UCL | 57.37 |
| 95% BCA Bootstrap UCL | 58.34 | | |
| 90% Chebyshev(Mean, Sd) UCL | 69.7 | 95% Chebyshev(Mean, Sd) UCL | 82.61 |
| 97.5% Chebyshev(Mean, Sd) UCL | 100.5 | 99% Chebyshev(Mean, Sd) UCL | 135.7 |

**Suggested UCL to Use**

| | |
|---|---|
| 95% Student's-t UCL | 58.62 |

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test

When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

# RSA-308
# (Exterior Sump at Building 7120 - OU 25)
# May 2023

Vision
Integrity
Results

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# RSA-308 - Statement of Problem

- ✓ Subsurface soil beneath the trench drain east of Building 7120 contains sporadic (4/48) perchlorate concentrations exceeding Site-specific soil to groundwater screening level (1.7 mg/kg).
- ✓ The presence of this source material is causing ongoing leaching of perchlorate from soil to groundwater resulting in groundwater contamination above the CG (15 µg/L).
- ✓ Corrective measures needed at RSA-308 to minimize or eliminate ongoing perchlorate migration from soil to groundwater at levels resulting in groundwater CG (15 µg/L) exceedances.

# RSA-308 – Statement of Problem, Cont'd

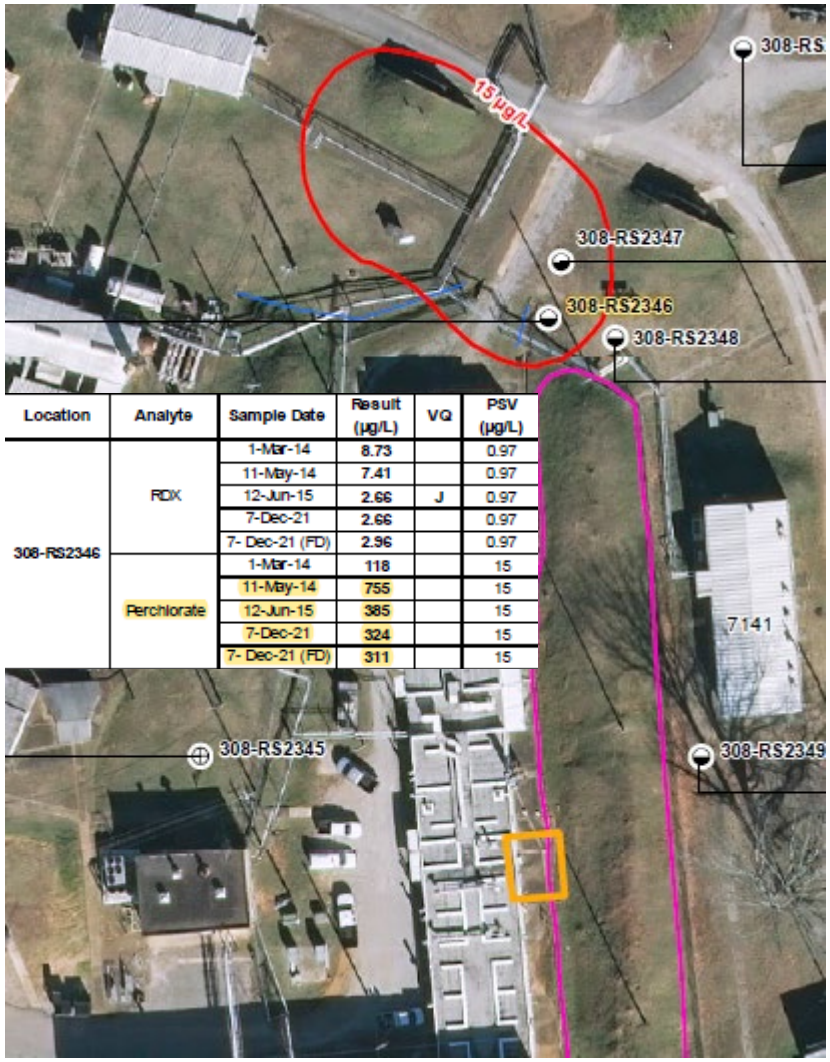
- ✓ **Selected Alternative -** *Soil Contamination Monitoring through Groundwater Concentration Reduction*:
  - Passive reduction of perchlorate in soil and groundwater by natural abiotic and biotic attenuation processes.
  - Groundwater monitoring to track the progress of the groundwater MNA.
  - Modeled attenuation of 19 years for achieving groundwater CG.

**ADEM Review and Comment Letter**, dated January 23, 2023**.**

*The Department does not agree with the corrective measures proposed for RSA-308. According to the CMI Plan, the selected remedy is subsurface soil contamination monitoring through groundwater concentration reduction and monitored natural attenuation (MNA). The proposed remedy only addresses groundwater and does not address the risks posed by subsurface soil contamination. Please evaluate alternative corrective measures to prevent and/or eliminate risks at RSA-308.*

# RSA-308 - Perchlorate in Groundwater

- Groundwater sampling of the perchlorate plume at RSA-308 performed since March 2014.
- Maximum perchlorate concentration of 755 µg/L at 308-RS2346 (source area well) in May 2014.
- Perchlorate detected at 324 µg/L in 308-RS2346, and at 3.55 µg/L at well 308- RS2712 (90 feet cross/downgradient of source area well 308-RS2346).
- Indication of depleted source area and demonstration of MNA effectiveness.




| Location | Analyte | Sample Date | Result (µg/L) | VQ | PSV (µg/L) |
|---|---|---|---|---|---|
| 308-RS2346 | RDX | 1-Mar-14 | 8.73 | | 0.97 |
| | | 11-May-14 | 7.41 | | 0.97 |
| | | 12-Jun-15 | 2.66 | J | 0.97 |
| | | 7-Dec-21 | 2.66 | | 0.97 |
| | | 7- Dec-21 (FD) | 2.96 | | 0.97 |
| | Perchlorate | 1-Mar-14 | 118 | | 15 |
| | | 11-May-14 | 755 | | 15 |
| | | 12-Jun-15 | 385 | | 15 |
| | | 7-Dec-21 | 324 | | 15 |
| | | 7- Dec-21 (FD) | 311 | | 15 |

# RSA-308 - Perchlorate in Groundwater Trends Graph

## GSI MANN-KENDALL TOOLKIT
### for Constituent Trend Analysis

| | | | |
|---|---|---|---|
| Evaluation Date: | 29-May-23 | Job ID: | 5211.02 |
| Facility Name: | RSA-308 | Constituent: | Perchlorate |
| Conducted By: | Kristina Early | Concentration Units: | µg/L |
| Sampling Point ID: | 308-RS2346 | | |

| Sampling Event | Sampling Date | PERCHLORATE CONCENTRATION (µg/L) |
|---|---|---|
| 1 | 1-Mar-14 | 118 |
| 2 | 11-May-14 | 755 |
| 3 | 12-Jun-15 | 385 |
| 4 | 7-Dec-21 | 324 |
| 5 | 7-Dec-21 | 311 |

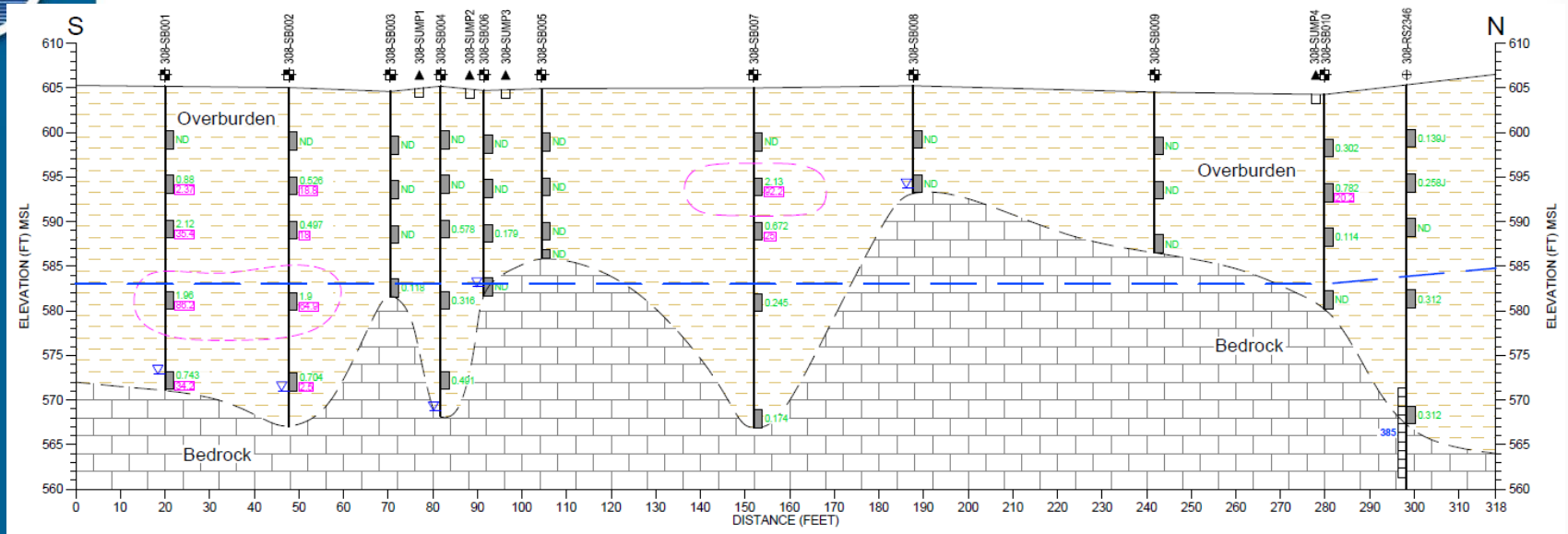
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Coefficient of Variation: | 1.58 | 0.67 | | 0.68 | | | |
| Mann-Kendall Statistic (S): | -66 | -39 | | -84 | | | |
| Confidence Factor: | 99.9% | 97.1% | | >99.9% | | | |
| Concentration Trend: | Decreasing | Decreasing | | Decreasing | | | |

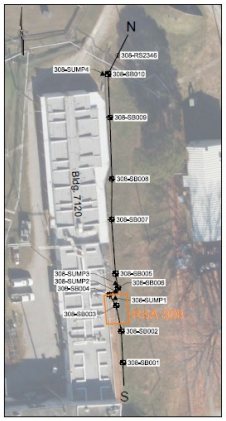



Vision Integrity Results

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# RSA-308 – Perchlorate Cross-Section




Cross-section Location Map

## Legend:

- 308-SB001 — Sample Location
- Ground Surface
- Top of Bedrock
- Soil Sample Interval
- Screened Interval
- Overburden Well
- Soil Boring
- Sump
- Environmental Site Boundary
- Water Level
- 0.743 — Perchlorate Concentration in Soil (mg/L)
- 54.4 — Leachable Perchlorate Fraction in Soil (ug/L)
- 385 — Perchlorate Concentration in Groundwater (ug/L)
- Perchlorate in Soil Exceeding Leachate-based Value
- Overburden
- Bedrock
- Average Depth to Groundwater

Vision Integrity Results

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# RSA-308 – Perchlorate and Site-Specific SPLP Analytical Results

| Boring Location | Depth Interval (feet) | Concentration (mg/kg) | SPLP (µg/L) |
|---|---|---|---|
| 308-SB001 | 0 – 1 | 0.364 | NA |
| | 5 – 7 | 0.449 | NA |
| | 10 – 12 | 0.88 | 2.37 |
| | 15 – 17 | **2.12** | 35.4 |
| | Avg DTW – 22 ft bgs | | |
| | 23 – 25 | **1.96** | **86.2** |
| | 32 – 34 | 0.743 | 34.2 |
| 308-SB002 | 0 – 1 | 0.464 | NA |
| | 5 – 7 | 0.352 | NA |
| | 10 – 12 | 0.526 | 18.8 |
| | 15 – 17 | 0.497 | 18 |
| | Avg DTW– 22 ft bgs | | |
| | 23 – 25 | **1.9** | **64.9** |
| | 33 – 35 | 0.704 | 25 |
| 308-SB007 | 0 – 1 | 0.421 | NA |
| | 5 – 7 | 0.426 | NA |
| | 10 – 12 | **2.13** | **92.2** |
| | 15 – 17 | 0.672 | 25 |
| | Avg DTW– 22 ft bgs | | |
| | 23 – 25 | 0.245 | NA |
| | 35 – 38 | 0.174 | NA |

**Bold/Red** indicates concentration above the Site-specific SSL (1.7 mg/kg) or the leachate threshold for SPLP (60 µg/L).
bgs – below ground surface
µg/L – micrograms per liter
DTW – depth to groundwater
mg/kg – milligrams per kilogram
SPLP – Synthetic Precipitation leaching procedure.

Vision Integrity Results
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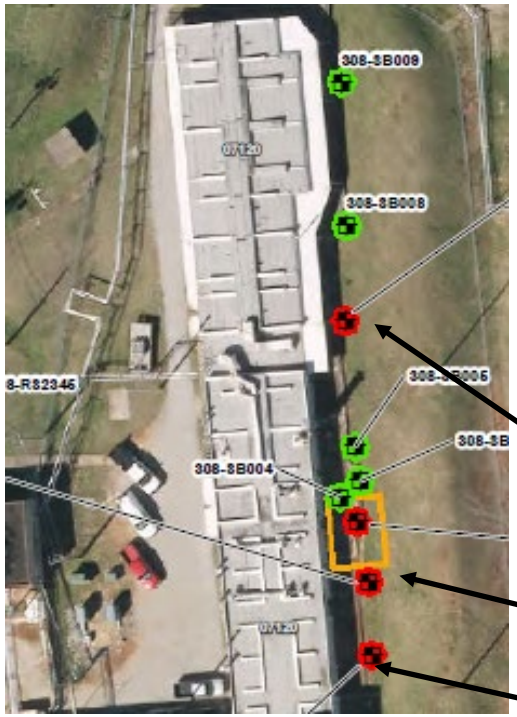
# RSA-308 – Perchlorate SPLP Summary Statistics

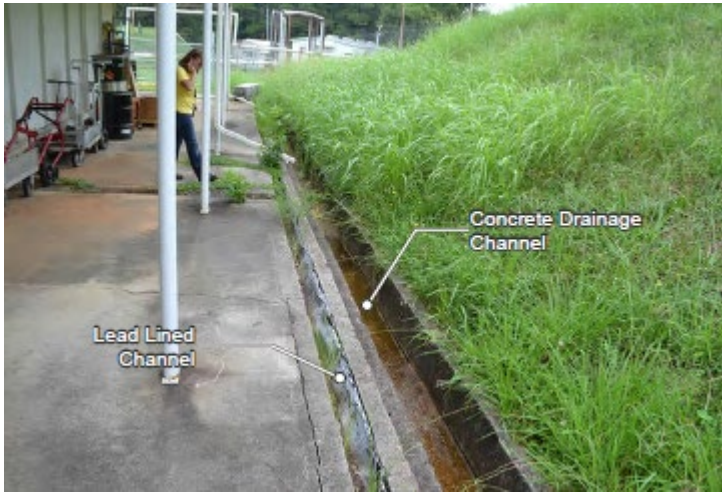
| Locations | Average (µg/L) | UCL* (µg/L) |
|---|---|---|
| 308-SB001 | 39.5 | NC |
| 308-SB002 | 31.6 | NC |
| 308-SB007 | 58.6 | NC |
| 308-SB001 – 308SB0007 | 43.3 | 58.62 |

*UCL calculated using USEPA's ProUCL Version 5.2.
µg/L – micrograms per liter
SPLP – Synthetic Precipitation leaching procedure.

*Note that average SPLP concentrations and 95% UCL are all below perchlorate leachate threshold of 60 µg/L.*

# RSA-308 – Source Removal




RSA308-SB007

RSA308-SB002

RSA308-SB001

*Proximity of soil exceedances creates source removal challenges*

Vision Integrity Results

Never Compromising Safety

# RSA-308 – Findings and Conclusions

- ✓ ADEM ARBCA Guidance recommends characterization of COPCs in subsurface soil be sampled immediately above saturated zone (ADEM, 2017).
- ✓ Subsurface exceedances of the Site-specific soil to groundwater SSL (1.7 mg/kg) in only 4 (2 within saturation zone) of 48 total soil samples.
- ✓ Single isolated SPLP exceedance within the vadose zone (308-SB007). Remaining exceedances within saturated zone (308-SB001 & 308-SB002).
- ✓ Average SPLP concentrations and 95% UCL are below perchlorate leachate threshold of 60 µg/L.

# RSA-308 – Findings and Conclusions, Cont'd

- ✓ Trends indicate statistically decreasing perchlorate concentrations in groundwater.
- ✓ Evidence of natural source zone depletion through natural attenuation.
- ✓ MNA effectiveness observed within source area well.

*MNA refers to natural attenuation processes to achieve site-specific remedial objectives within a time frame that is reasonable compared to other methods. The"natural attenuation processes" include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and ground water (*OSWER Directive 9200.4-17, 1997).

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# APPENDIX E

# REGULATORY CONCURRENCE LETTERS

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**LANCE R. LEFLEUR**
DIRECTOR

**ROBERT J. BENTLEY**
GOVERNOR

Alabama Department of Environmental Management
adem.alabama.gov

1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ■ FAX (334) 271-7950

March 6, 2017

91 7199 9991 7037 0387 3802

**CERTIFIED MAIL #**

Mr. Terry Hazle, Director
Directorate of Environmental Management
DEPARTMENT OF THE ARMY
Installation Restoration Division
(AMSAM-RA-DEM-IR)
US Army Aviation and Missile Command
Building 4488
Redstone Arsenal, AL 35898

Re: **ADEM Review and Concurrence:**
*Revision 1 RCRA Facility Investigation Report, RSA-308, Exterior Sump at Building 7120, Operable Unit 25,* dated January 2017
Redstone Arsenal, Madison County, Alabama
DSMOA Site No 535-223-5545
Facility ID No: AL7 210 020 742

Dear Mr. Hazle:

The Alabama Department of Environmental Management (ADEM or the Department) has completed the review of the *RCRA Facility Investigation Report RSA-308, Exterior Sump at Building 7120,* dated January 2017. Based on this review, the Department has determined that all comments on the previous version of this document have been resolved and concurs with the recommendation of corrective measures for soil and groundwater at surface media site RSA-308.

Therefore, RSA should submit a CMI Plan for RSA-308 within 120 calendar days of receipt of this letter. ADEM will move RSA-308 to Table VI.6 (sites requiring a Corrective Measures Implementation Plan) in the facility's Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) permit as part of the next permit modification.

**Birmingham Branch**
110 Vulcan Road
Birmingham, AL 35209-4702
(205) 942-6168
(205) 941-1603 (FAX)

**Decatur Branch**
2715 Sandlin Road, S.W.
Decatur, AL 35603-1333
(256) 353-1713
(256) 340-9359 (FAX)

**Mobile Branch**
2204 Perimeter Road
Mobile, AL 36615-1131
(251) 450-3400
(251) 479-2593 (FAX)

**Mobile-Coastal**
3664 Dauphin Street, Suite B
Mobile, AL 36608
(251) 304-1176
(251) 304-1189 (FAX)

If you have any questions on this matter, please contact Samantha Downing of the Remediation Engineering Section via e-mail at rsdowning@adem.alabama.gov or at (334) 270-5687.

Sincerely,

Stephen A. Cobb, Chief
Governmental Hazardous Waste Branch
Land Division

SAC/ATM/RSD/akr

cc: Terry de la Paz, Redstone Arsenal
Ashley T. Mastin, ADEM
Brian Roberson, NASA MSFC
J. Jason Wilson, ADEM

cc/via email: Salee Downey, Redstone Arsenal
Kelley Hartley, ADEM
Robert Morris, US EPA Region IV
Michelle Thornton, US EPA Region IV

**LANCE R. LEFLEUR**
**DIRECTOR**

**KAY IVEY**
**GOVERNOR**

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Montgomery, Alabama 36130-1463
(334) 271-7700 • FAX (334) 271-7950

March 13, 2023

**ELECTRONICALLY TRANSMITTED**

Mr. Clint Howard
Environmental Management Division
US Army Garrison - Redstone Arsenal
4488 Martin Road
Redstone Arsenal, AL 35898

Re: **ADEM Review and Comment:**
Extension Request for Submittal of the Revision 1, Corrective Measures Implementation Work Plan (CMIP), RSA-308, Exterior Sump at Building 7120, Operable Unit 25, US Army Garrison Redstone, Madison County, Alabama, dated March 2, 2023
Redstone Arsenal (RSA)
U.S. EPA I.D. No. AL7 210 020 742

Dear Mr. Howard:

The Alabama Department of Environmental Management (ADEM or the Department) has reviewed the aforementioned letter received March 2, 2023. Based on this review, it appears that RSA is requesting an extension to the submittal date of the Revision 1 CMIP and plans to submit the Revision 1 CMIP by May 30, 2024.

According to this letter, the additional time is necessary for contractual processes and the completion of alternative corrective measure evaluations for the site. The Department understands the need for additional time to evaluate and determine the alternative corrective measures needed for RSA-308, however, the requested extension is considered prolonged for this submittal. As such, the Department grants a 180-day extension from the date the Department's comments on the Revision 0 CMIP for RSA-308 were received. Therefore, the Army should plan to submit the Revision 1 CMIP for RSA-308 on or before July 23, 2023.

If you have any questions on this matter, please contact Mrs. Samantha Downing of the Remediation Engineering Section at (334) 270-5687 or at rsdowning@adem.alabama.gov.

Sincerely,

Ashley Mastin, Chief
Governmental Hazardous Waste Branch
Land Division

ATM/RDA/RSD/jlm

cc: Holly Gallier, Redstone Arsenal
Paige Blankenship, Redstone Arsenal
Kelley Hartley, ADEM
Heather Guerrero, ADEM
Daniel Arthur, ADEM
Brian Roberson, NASA MSFC
Robert Pope, US EPA Region IV
Kevin Greaney, US EPA Region IV
Robert Morris, US EPA Region IV
Anna Martin, US EPA Region IV

# APPENDIX F

# REDSTONE ARSENAL RCRA PERMIT MODIFICATION REQUEST

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**REQUEST FOR PERMIT MODIFICATION**
**RSA-308, EXTERIOR SUMP AT BUILDING 7120**
**OPERABLE UNIT 25**
**U.S. ARMY GARRISON – REDSTONE MADISON COUNTY, ALABAMA**
**December 2023**

## 1. INTRODUCTION

As specified in Section VI.E.3 of the U.S. Army Garrison–Redstone's (hereinafter referred to as the Army) Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) Hazardous Waste Storage Facility/Thermal Treatment/Solid Waste Management Unit (SWMU) Corrective Action Permit, Modification No. 12 (hereafter referred to as the Permit) (dated 12 August 2022) (Alabama Department of Environmental Management [ADEM], 2022), a request for permit modification is to be submitted along with a Corrective Measures Implementation (CMI) Work Plan. Therefore, the Army has prepared this request for modification to the Permit for RSA-308, Exterior Sump at Building 7120, Operable Unit (OU) 25, at Redstone Arsenal (RSA) in Madison County, Alabama.

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) (CB&I Federal Services LLC [CB&I], 2017) was prepared for RSA-308 to determine the nature and extent of contamination. The RFI report received concurrence from ADEM on 6 March 2017. The Army has prepared the CMI Work Plan and is ready to implement the remaining corrective measures (subsurface soil contamination monitoring through groundwater concentration reduction and monitored natural attenuation [MNA] for soil and groundwater) and land-use controls (LUCs) to evaluate the MNA effectiveness and permanence.

ADEM has listed RSA-308 in Table VI.6 in the Permit as requiring corrective measures for soil and groundwater. Following approval of the CMI Work Plan, the Army requests that ADEM list in Table VI.6 that groundwater beneath RSA-308 will be addressed with the RSA-146 corrective measures. As specified in Section VI.E.3 of the Permit, this modification will serve to incorporate the proposed remedy, including all procedures necessary to implement and monitor the final corrective measure for RSA-308, into the Permit in accordance with Alabama Administrative Code (AAC) R. 335-14-8-.04(2).

## 2. FACILITY AND SITE DESCRIPTION

RSA is located in the southwestern portion of Madison County, which is in the northern portion of Alabama. RSA is an Army facility that encompasses approximately 38,300 acres and is approximately 10 miles long from north to south and six miles wide from east to west. The Army controls 36,459 acres of the total acreage, of which approximately 15,500 acres are woodlands, 5,360 acres are leased for agricultural use, and approximately 12,000 acres are managed as military test areas/ranges. Development within RSA has largely centered on the historical production (and later disposal) of conventional and chemical munitions and, more recently, development and testing of missiles and rockets. These processes have produced chemical wastes since operations began in the early-1940s.

RSA-308 is identified as the east-side exterior sump at Building 7120. Building 7120 is located north of the intersection of Redstone Road and West Line Road (Figure 1 of the CMI Work Plan). Building 7120 was originally built in 1945 to serve as the Ordnance Missile Laboratories propulsion laboratory. The building was expanded several times since the original construction and now includes office space, laboratories, an auditorium, and 28 test bays (Figure 2 of the CMI Work Plan). The site boundary for RSA-308 encompasses approximately 509 square feet. However, as presented in Figure 7 of the CMI Work Plan, the area of contamination created by the release at RSA-308, as displayed by the administrative boundary, is much larger than 509 square feet.

RSA-308, Exterior Sump at Building 7120, is listed as the exterior lead-lined collection sump (Sump 1) located east of the test bays. However, during a site visit in August 2012, Sump 1 and two additional sumps (Sumps 2 and 3) were observed at the location of Sump 1. A fourth sump (Sump 4) was identified north of Building 7120 and along the open concrete drainage channel connecting all four of the sumps. Sumps 1, 2, and 3 operated in series. When Sump 1 filled, the wastewater drained to the Sump 2, which in turn drained to Sump 3. After Sump 3, wastewater flowed to the drainage channel, which flowed to the north (Figure 2 of the CMI Work Plan). The concrete drainage channel flowed into Sump 4 and then to an outfall and stormwater collection area north of the test bays. The drainage channel also collects precipitation runoff from the concrete walkway, the roof drains, and the earthen berm located immediately east of the test bays. Open, lead-lined trenches from Test Bays 8, 10, and 12 collected discharges such as floor washings and spills and drained into Sump 1.

Sump 1 is 39 inches square, and Sumps 2 and 3 are circular and approximately 52 inches in diameter. Sump 1 is the original sump, and Sumps 2 and 3 were added at a later unknown date. Sumps 1, 2, and 3 and the test bays are separated by a 10-foot-wide concrete walkway for Building 7120. Each sump has a steel cover preventing large debris from entering.

Additional lead-lined trenches that drained Test Bays 17 through 28 were also observed during the 2012 site visit. The trenches are covered by steel grates. The trenches drained into a larger open, lead-lined channel that runs adjacent and parallel to the concrete drainage channel and emptied into Sump 4 (Figure 2 of the CMI Work Plan). Sump 4 is covered by a steel grate. Overflow from Sump 4 drained into the same stormwater collection area as the concrete drainage system. At the time of the site visit in August 2012, and during RFI sampling activities, all four sumps contained water. The four sumps, the concrete drainage channel, the lead-lined channel, and the outfall were included in the RSA-308 RFI.

Immediately east of the sumps, concrete drainage channel, lead-lined channel, and concrete walkway is a grass-covered earthen fragmentation berm approximately 15 feet high. The berm separates the test bays in Building 7120 from adjacent Buildings 7141 and 7111 to the east (Figure 2 of the CMI Work Plan).

No detailed written descriptions of historical operational activities for Building 7120 were available. However, activities in general were related to physical testing of rocket and missile propellants. These activities were assumed to have included small-scale propellant mixing, casting,

curing, testing, painting, and/or degreasing. Facility personnel indicate that current activities conducted in the test bays include mixing and testing of small batches of propellants. Site personnel indicate that the sumps are not currently used in operations. In the future, the Army will permanently close the sumps by pumping and sampling water present followed by proper disposal. The sumps will then be filled with an inert material such as gravel and topped with concrete. This action will eliminate potential future releases during current operations. According to the SWMU Assessment Report (Shaw Environmental, Inc. [Shaw], 2009a), only small amounts of waste are generated during current test bay and laboratory operations. Waste currently generated at Building 7120 is containerized, managed at satellite accumulation areas, and when containers are full, they are transferred to less-than-90-day storage areas before final disposition.

## 3. INVESTIGATIVE HISTORY AND INTERIM REMEDIAL ACTIONS

Environmental investigations have been conducted in the vicinity of RSA-308 since 2002. This chapter describes the data collection efforts that contributed to the RFI at RSA-308. Results utilized in the RSA-308 RFI.

- OU 10 field investigations (Shaw, 2007a, 2007b; and 2010a)
- RSA-146 potential source area (PSA) investigation (Shaw, 2005)
- RSA-308 RFI (Shaw, 2013 and CB&I, 2017)
- 2021 Pre-Design Sampling Event

## 4. SCOPE OF THE CORRECTIVE MEASURES FOR RSA-308

The overall strategy for cleanup at RSA has been presented to the regulators in two cleanup strategy documents, the *Installation-Wide Groundwater (IWGW) Cleanup Strategy* (Shaw, 2009b) and the *Installation-Wide Strategy for Cleanup of Impacted Wetlands* (Shaw, 2010b). The overall RSA cleanup strategy includes the following elements:

1. Expedite evaluation and release of surface media sites to allow for efficient, mission-related property reuse.
2. Expedite cleanup of sources area at surface media sites and secondary sources of ongoing groundwater contamination, including dense nonaqueous-phase liquid.
3. At SWMUs without approved decision documents, exposures to surface media will be managed through the use of the Army's Site Access Control (SAC) program, and exposure to groundwater that may result in unacceptable risks will be prevented or managed as required by RSA's IWGW Interim Record of Decision (IROD).
4. Coordinate the evaluation of groundwater units and their associated surface sites so that approval of groundwater RFIs is not delayed by unresolved surface media site issues.
5. Design and implement an IWGW monitoring network to monitor remedial progress and ensure that the selected remedies are protective of human health and the environment on a long-term basis.

The media and contaminant scope covered by the corrective measures at RSA-308 are limited to perchlorate and RDX soil and/or groundwater contamination. Exposure to soil does not result in

unacceptable health threats to human health or ecological receptors. However, perchlorate in subsurface soil has the potential to leach to groundwater. Groundwater contaminants would pose unacceptable risk to potable users including construction worker, commercial/industrial worker, and hypothetical residential receptors both now and in the future. Potable groundwater use is currently restricted by the IWGW IROD (Shaw, 2007c) and the Army's SAC program (Army, 2012). The Army has elected to perform corrective measures to address soil and groundwater contamination:

- Soil contamination monitoring through groundwater concentration reduction and MNA sampling for groundwater until all constituents of concern (COCs) requiring action (perchlorate and 1,3,5-trinitroperhydro-1,3,5-triazine/Royal Demolition Explosive [RDX]) have attained cleanup goals (CG) for three consecutive years.
- Administrative controls currently in place for groundwater include the IWGW IROD (Shaw, 2007c) as implemented using the RSA SAC program (Army, 2012). While this IROD is interim in nature, it will apply to groundwater at RSA-308 until groundwater at the site meets CGs.
- The decision to implement permanent LUC for groundwater will occur in conjunction with the RSA-146 groundwater unit.

## 5. SITE CHARACTERISTICS

RSA-308 is identified as the east-side exterior sump at Building 7120. The administrative boundary of RSA-308 covers approximately 509 square feet. The area immediately surrounding Building 7120 is either paved, graveled, or grassed. Topography at the site is generally flat. However, a protective earthen berm is present along the eastern side of RSA-308 and Building 7120 Test Bays (Figure 2 of the CMI Work Plan). The berm is approximately 15 feet high. There are no wetlands or surface water in the vicinity of RSA-308 and the site is not within the 100-year floodplain. Drainage of the area is through a series of engineered ditches to collection points and infiltration areas.

The following summarizes the RSA-308 site characteristics, including the Conceptual Site Model (CSM):

- Building 7120 was originally built in 1945 to serve as the Ordnance Missile Laboratories propulsion laboratory. The building now includes office space, laboratories, an auditorium, and 28 test bays. RSA-308, Exterior Sump at Building 7120, is listed as the exterior lead-lined collection sump (Sump 1) located east of the test bays. Two additional sumps (Sumps 2 and 3) exist at the location of Sump 1 and a fourth sump (Sump 4) exists north of Building 7120. In addition to the four sumps, RSA-308 also consists of a concrete drainage channel, a lead-lined channel, and an outfall.
- Historical activities were related to physical testing of rocket and missile propellants including small-scale propellant mixing, casting, curing, testing, painting, and/or degreasing. Current activities conducted in the test bays include mixing and testing of small batches of propellants. The sumps are not currently used in operations. Only small amounts of waste are generated during current test bay and laboratory operations and are

containerized, managed, and ultimately transferred to less-than-90-day storage areas before final disposal.

- Chemicals associated with rocket propellant testing include metals, perchlorate, explosives, polycyclic aromatic hydrocarbons (PAHs), and chlorinated solvents used to clean equipment.
- Potential receptors could be exposed to contaminated groundwater at the site. Current human receptors are limited to commercial and construction workers. Future potential receptors include all current receptors plus, under a land reuse scenario, hypothetical child and adult residents.

# 6. INVESTIGATIVE RESULTS

A complete discussion of the previous site investigations is available in the RSA-308 RFI report (CB&I, 2017) and within Section 2.0 of the CMI Work Plan. Investigations discussed within the RFI include analytical results from 13 surface soil samples, 48 subsurface soil samples, and 15 groundwater samples. Soil and groundwater samples were analyzed for metals, volatile organic compound (VOC), semivolatile organic compound (SVOCs) with PAHs, explosives, and perchlorate. The RFI concluded that although the vertical and horizontal delineation of contamination at RSA-308 has been achieved, there is the potential for perchlorate to leach from subsurface soils to groundwater and the potential for perchlorate, RDX, and dibenz(a,h)anthracene in groundwater to pose a future threat to human health if the groundwater is developed for potable use. As discussed further in Section 2.4 of the CMI Work Plan, revisions to the dibenz(a,h)anthracene toxicity values resulted in dibenz(a,h)anthracene no longer being identified as a groundwater COC requiring further action at RSA-308.

In order to confirm the findings of the 2017 RFI and current contaminant concentrations of the two remaining COCs (perchlorate and RDX), a pre-design sampling event was performed in December 2021 that included the collection of groundwater samples from six monitoring wells (308-RS2345, 308-RS2345, 308-RS2347, 308-RS2348, 308-RS2349, and 308-RS2712). As perchlorate and RDX were the only COCs identified in the RFI, these were the only constituents analyzed for in the pre-design sampling event. Table 1 within the CMI Work Plan presents the analytical results from both the December 2021 groundwater sampling event and the historical groundwater sampling events presented in RFI (CB&I, 2017). Perchlorate and RDX concentrations from 2021 were found to be similar to those detected in June of 2015 and therefore confirm the Corrective Measure Objectives (CMOs) discussed within the CMI Work Plan.

A summary of the contaminant fate and transport evaluation for RDX and perchlorate is presented below.

## 6.1 Explosive Compounds

No explosive compounds were detected in surface or subsurface soil samples collected as part of the RFI and six explosive compounds were detected in groundwater. Two of the explosive compounds (nitrobenzene and RDX) exceeded their respective PSVs in one well (308-RS2346). Note that the PSV for nitrobenzene has been updated from 0.12 µg/L to 0.137 µg/L based on the

most recent United States Environmental Protection Agency (USEPA) Tapwater Regional Screening Levels (RSLs) (USEPA, 2021). The updated Preliminary Screening Value (PSV) results in an elimination of the nitrobenzene exceedance within 308-RS2346. The subsequent installation of well 308-RS2712 bounds the horizontal extent of nitrobenzene and RDX downgradient of well 308-RS2346. Historical activities at RSA-308 are the likely source of explosive compounds in groundwater beneath RSA-308. Because no explosive compounds were detected in the surface or subsurface soil during the RFI, the historical release was concluded as not a continuing source of groundwater contamination.

Similar to the findings of the RFI, RDX exceeded its PSV of 0.97 µg/L at 308-RS2346 (and field duplicate) during the 2021 pre-design groundwater sampling event (see Figure 6 of the CMI Work Plan). RDX was also detected within 308-RS2347 but at a concentration below the PSV. Although not enough data points exist to evaluate statistical trends (i.e., Mann-Kendall analysis) for RDX in groundwater, concentrations have continued to decrease over time in both 308-RS2346 and 308-RS2347 (see Table 1 of the CMI Work Plan).

## 6.2 Perchlorate

Perchlorate concentrations in surface and subsurface soil collected as part of the RFI were below the PSV. Perchlorate groundwater detections from the RFI were found in exceedance of the PSV, based on the Health Advisory Leven (HAL) of 15 micrograms per Liter (µg/L), within two monitoring wells (308-RS2346 and 308-RS2347). The installation of well 308-RS2712 bounds the extent of perchlorate downgradient of wells 308-RS2346 and 308-RS2347 (see Figure 6 of the CMI Work Plan). The RFI concluded that historical activities at RSA-308 are the likely source of perchlorate detected in soil and groundwater beneath RSA-308.

Similar to the RFI findings, perchlorate was detected at concentrations in exceedance of the PSV at both 308-RS2346 (and field duplicate) and 308-RS2347 during the 2021 pre-design groundwater sampling event. Perchlorate was also detected within 308-RS2349 and 308-RS2712, but at concentrations below the PSV. Concentrations have either decreased or remained stable in both 308-RS2346 and 308-RS2347 based on the 2015 and 2021 sampling events (see Table 1 of the CMI Work Plan).

## 6.3 Fate and Transport

Potential release mechanisms and migration routes for contaminants were identified and evaluated at RSA-308 in a fate and transport evaluation in the RFI report (CB&I, 2017). The conclusions of the fate and transport analysis indicate MNA effectiveness within the source area well and evidence of source zone depletion through natural attenuation. . Perchlorate is being flushed from shallower soil horizons to deeper soil horizons in the vicinity of boring 308-SB007 by natural processes and that eventually the leachable fraction of perchlorate will be completely removed from the soil. The remaining subsurface soil exceedances are within the capillary fringe zone and are subject to ongoing recontamination from groundwater. As MNA refers to natural attenuation processes for contaminants within both soil and groundwater, perchlorate contamination will be addressed in conjunction with the corrective measures for contaminants in groundwater.

# 7. CURRENT AND POTENTIAL FUTURE LAND AND RESOURCES USE

RSA-308 is located in an area designated as Industrial in the RSA Master Plan. The site was originally identified as an exterior sump to the east of Building 7120. However, a site visit revealed a series of sumps which were all included in the investigation area, as discussed previously in **Section 2.0**. The sumps are not currently used in operations and will be closed by the Army in the future.

## 7.1 Land Use

The current and future land use within the boundary of the RSA-308 site is light industrial. The residential scenario was included in the ARBCA evaluation in order to evaluate this potential future use and determine if this site is eligible for unrestricted reuse in accordance with ADEM requirements. In RSA's Permit, issued under the AHWMMA, ADEM has specified that investigations must comply with Alabama Environmental Investigation and Remediation Guidance (AEIRG) and Alabama Risk-Based Corrective Action (ARBCA) guidance. In order to determine if this site is eligible for unrestricted reuse as defined in AAC 335-5 (ADEM, 2013), risks to a residential site user were assessed.

## 7.2 Current Groundwater Use

There is no current potable use of groundwater at RSA-308. An IWGW IROD was instituted and implemented by the Army's SAC program to prevent potable use and provide management control over nonpotable uses of all groundwater beneath RSA (Shaw, 2007c).

## 7.3 Future Groundwater Use

Future use of groundwater beneath RSA-308 is possible. Currently, under the provisions of the IWGW IROD (Shaw, 2007c) and the Army's SAC program (Army, 2012), groundwater resources beneath RSA-308 and elsewhere on RSA may not be developed for potable purposes without a final remedy, and groundwater withdrawals for nonpotable uses are subject to Army review and approval. The IWGW IROD is interim in nature and is not a final remedy. RSA's SAC program was designed to be used at sites that have not implemented a final remedy. This interim remedy will remain in place for groundwater under RSA-308 until a final remedy has been selected in a decision document for the RSA-146 groundwater unit.

As part of the Permit, ADEM has required that the Army perform ongoing annual and semi-annual monitoring of wells located within the RSA perimeter (ADEM, 2022). This annual and semi-annual monitoring will allow the Army and ADEM to assess rate of long-term groundwater recovery and also to ensure protection for residents living outside of the boundary of RSA (CB&I, 2017). Following regulatory approval of the CMI Work Plan, the Army will begin groundwater monitoring for RSA-308 (as detailed in Appendix J to the CMI Work Plan) to evaluate the effectiveness and permanence of the MNA corrective action to protect human health and the environment.

# 8. SITE RISKS

An ARBCA Human Health Risk Assessment (HHRA) which includes a vapor intrusion evaluation, as well as a Screening-Level Ecological Risk Assessment (SLERA) was performed for RSA-308 (CB&I, 2017). The complete ARBCA evaluation for human health and the ecological risk evaluation is provided in the RFI report. The site risks are summarized below.

## 8.1 HHRA

The HHRA for RSA-308 was prepared in accordance with the ARBCA guidance and consisted of a three-tiered process: the preliminary screening level (PSL) evaluation (Tier 1), the Risk Management (RM) -1 evaluation (Tier 2), and the RM-2 evaluation (Tier 3) (ADEM, 2008). In the case of RSA-308, the RM-1 evaluation was not performed; instead, the evaluation proceeded directly from the PSL evaluation to the cumulative risk assessment in the RM-2 evaluation. The PSL evaluation consists of a simple comparison of site concentrations with PSVs, which generally were the, then current, USEPA RSLs (USEPA, 2013), based on the lower of an individual excess lifetime cancer risk (IELCR) of 1E-06 and a noncancer hazard index (HI) of 0.1. In the case of groundwater, maximum contaminant levels (MCLs) were used as the PSVs, if available. Otherwise, tap water RSLs (USEPA, 2013) were used. Residential PSVs were selected for the evaluation of this site in order to consider alternatives to attain unrestricted land use.

The PSL evaluation is conducted for all chemicals that are determined to be site-related. Inorganics with maximum detected concentrations that did not exceed their Background Screening Values (BSVs) or shown in a site-to-background evaluation to be naturally occurring were judged not to be site related and therefore not evaluated further. All other detected chemicals were initially identified as contaminants of potential concern (COPCs), and site concentrations were compared to PSVs in the PSL evaluation. A COPC was identified as a COC if the maximum detected concentration was greater than a PSV.

The soil and groundwater COCs identified in the PSL evaluation were brought forward for evaluation in the cumulative risk assessment (RM-2 evaluation). Dibenz(a,h)anthracene was also included in the HHRA for the hypothetical resident and was assumed to be present at its method detection limit (MDL) since its MDL exceeded the published PSV during development of the RFI (CB&I, 2017). Since completion and concurrence of the RFI report, toxicity values for PAHs have been revised (USEPA, 2017). These revisions result in changes to the conclusions of HHRA for dibenz(a,h)anthracene. Based on the newly published toxicity values, the groundwater dibenz(a,h)anthracene PSV is 0.025 µg/L. The most current MDL for dibenz(a,h)anthracene in groundwater is 0.0118 µg/L, which is below the current PSV. As such, dibenz(a,h)anthracene is no longer identified as a groundwater COC requiring action for RSA-308.

Receptor scenarios evaluated in the cumulative risk assessment included a commercial worker, a construction worker, and a hypothetical residential receptor. A hypothetical future residential receptor was evaluated as required by ADEM to evaluate future use without restrictions and determine whether or not remedial measures and/or LUCs are warranted to Achieve No Further Action status (ADEM, 2008).

Groundwater was evaluated as if developed as a source of potable water in the future. Risks from exposure to groundwater were assessed even though groundwater use at this site is currently precluded by the terms of the IROD (Shaw, 2007c) and nonpotable uses are managed by RSA's SAC program (Army, 2012). The ARBCA guidance considers an IELCR of 1E-05 to be the target cumulative risk. The target cumulative noncancer hazard is an HI of 1.0. Estimated cumulative risks/hazards at or below these targets do not require additional action.

Cumulative IELCR and HI estimates for all receptor scenarios for RSA-308 are summarized in Table 2 of the CMI Work Plan. The cumulative IELCR estimates for exposure to RSA-308 soil alone are less than the ADEM trigger level of 1E-05 for the commercial worker and the construction worker but are above for the hypothetical lifetime resident due to the presence of arsenic. However, the representative concentration of arsenic was less than its BSV, and it is therefore not identified as a relevant COC requiring action. The cumulative HI values are less than the trigger level of 1.0 for all receptors. For groundwater, the cumulative IELCR estimates for the commercial worker and the construction worker are less than 1E-05; however, the IELCR is greater than 1E-05 for the hypothetical resident driven by a total IELCR of 1.44E-05 for RDX. The cumulative HI for groundwater also exceeded 1.0 for all receptors, driven by total perchlorate HIs for the commercial worker (19), construction worker (21.1), and hypothetical resident (68.9).

The soil and groundwater RM-2 human health evaluations, indicating the relevant COCs that require action for RSA-308, are summarized in Table 3 of the CMI Work Plan. No relevant COCs were identified in soil. RDX was identified as a relevant COC in groundwater for the commercial worker and hypothetical residential receptor and perchlorate was identified as a relevant COC in groundwater for all receptors. As noted above, dibenz(a,h)anthracene was not detected in RSA-308 groundwater but was included in the RM-2 evaluation because its MDL was greater than its PSV. However, dibenz(a,h)anthracene no longer represents a COC requiring action in groundwater.

In addition to the ARBCA, a screening-level vapor intrusion evaluation was also conducted for RSA-308 as part of the RFI (CB&I, 2015) to determine whether or not there has been a release of VOCs to groundwater or soil at RSA-308 that may volatilize and migrate upward to pose an unacceptable risk to occupants of commercial/industrial buildings or a hypothetical residential building. The evaluation was limited to a hypothetical residential building, which was considered to be sufficiently protective for occupants of commercial/industrial buildings. It was concluded that VOCs in soil and groundwater at RSA-308 do not represent a source that would pose an unacceptable health threat to future residents, as well as current workers in Building 7120, through the vapor intrusion pathway.

## 8.2 SLERA

A SLERA was completed for RSA-308 as part of the RFI (CB&I, 2017). The surface soil data for this site was compared to relevant BSVs and Ecological Screening Values (ESV). A Weight-Of-Evidence (WOE) evaluation was completed to further evaluate the constituents identified in the initial screening. The WOE evaluation examined a number of lines of evidence in order to draw

conclusions as to whether site-related constituents have the potential to pose hazards to ecological receptors.

The initial comparison of the detected constituent concentrations in RSA-308 surface soil to ESVs and BSVs identified arsenic, calcium, chromium, iron, magnesium, mercury, vanadium, perchlorate, chloroform, and methylene chloride as contaminants of potential ecological concern (COPECs) that required further assessment. The WOE evaluation concluded that metals detected in the RSA-308 samples were likely to be naturally occurring, essential nutrients that do not require further evaluation, or not part of the CSM. The results of the screening evaluation and COPEC refinement process indicated that perchlorate, chloroform, and methylene chloride warranted further evaluation for potential impacts to community-level receptors, but further assessment for food chain impacts was not warranted due to the fact that these COPECs are not bioaccumulative.

The results of the terrestrial community-level assessments of perchlorate, chloroform, and methylene chloride indicated that perchlorate and methylene chloride in surface soil at RSA-308 are unlikely to pose hazards to terrestrial invertebrate communities, and chloroform and methylene chloride in surface soil at RSA-308 are unlikely to pose hazards to terrestrial plant communities. Although chloroform could not be assessed for potential impacts to terrestrial invertebrate communities and perchlorate could not be assessed for potential impacts to terrestrial plant communities due to the absence of screening values, a spatial analysis showed that chloroform and perchlorate were detected in approximately 5 percent (%) and 4%, respectively, of the surface soil area sampled at RSA-308. These percentages represent areas of insignificant ecological relevance on site or within the context of the over 38,000-acre RSA facility.

The SLERA presented in the RFI (CB&I, 2017) concluded that COPECs in surface soil are unlikely to pose hazards to terrestrial invertebrate and plant communities or terrestrial food chain populations, and further evaluation of ecological hazards at RSA-308 is not warranted.

## 9. CORRECTIVE MEASURE OBJECTIVES

Based on the results of the RFI (CB&I, 2017) and the subsequent 2021 pre-design groundwater sampling event, the CMO for RSA-308 is to reduce or prevent human exposure to groundwater used for potable purposes contaminated with COCs requiring action such that regulatory limits are achieved or no unacceptable hazard or risk is present.

While the above is the overarching goal, the Army has additional objectives that will be considered in the selection of corrective measures, in particular, because it is recognized that the achievement of the above goal may require an extended period of time. These additional objectives are oriented towards the selection of corrective measures that will reduce, to the extent feasible, the time to achieve the above objective. The additional objectives that will be considered in the development and selection of corrective measures are as follows:

- Reduce contaminant mass (through source reduction)
- Minimize the footprint of contamination (plumes)

- Minimize life-cycle costs associated with long-term monitoring and maintaining institutional controls (e.g., SAC program)

The corrective measure objective for RSA-308 subsurface soil and groundwater will be accomplished by MNA sampling of groundwater for perchlorate and RDX and ongoing implementation of existing administrative controls for groundwater to protect potential receptors until CGs are attained for the COCs in groundwater.

The Army intends to achieve site closure for soil and groundwater and protect human health through implementation of corrective measures that are needed to reduce the concentrations of COCs requiring action to the CGs. For relevant COCs in groundwater with MCLs, the MCLs are selected as the CGs. In the case of perchlorate, the HAL of 15 µg/L (Department of Defense [DoD], 2009) is used as the CG. For RDX, the other groundwater COC requiring action, the CG is based on risk, with the objective of achieving a cumulative cancer risk of 1E-05 and a cumulative HI of 1.0 or less.

## 10. DESCRIPTION AND COMPARISON OF ALTERNATIVES

The following information summarizes the analysis of technologies and alternatives and the selection of the corrective measures for RSA-308. Considering the limited area of the site and the relatively low COC concentrations found in the subsurface soil and groundwater, alternatives to address these COCs were developed.

The following process options were evaluated for alternative development to meet the CMOs for the soil and groundwater at RSA-308:

- **Perchlorate in Soil**
  - **Soil 1 (S1):** No Action
  - **Soil 2 (S2):** Soil Monitoring through Groundwater Concentration Reduction
- **Perchlorate and RDX in Groundwater**
  - **Groundwater 1 (GW1):** No Action
  - **Groundwater 2 (GW2):** MNA

These process options were assembled into the following soil and groundwater corrective measure alternatives:

- **Alternative 1** - S1 and GW1: No Action
- **Alternative 2** - S2 and GW2: Soil Contamination Monitoring through Groundwater Concentration Reduction

### 10.1.1 Soil

The following two alternatives were evaluated for soil: 1) no action for soil contamination and 2) soil contamination monitoring through groundwater concentration reduction as summarized below.

#### *10.1.1.1 Alternative S1 – No Action*

Under the no action alternative, no corrective measures would be made to address the contaminated media at RSA-308, which poses potential unacceptable risk to human health. This corrective measures alternative is not considered eligible to be selected as the final corrective measure for soil at RSA-308. Evaluation of the no-action alternative serves as a baseline for evaluating other corrective measures.

#### *10.1.1.2 Alternative S2 - Soil Contamination Monitoring through Groundwater Concentration Reduction*

Under the soil contamination monitoring through groundwater concentration reduction alternative, no active soil corrective measures will be conducted. In addition to their only being a single isolated vadose zone exceedance, active remediation of subsurface soil between the building and the fragmentation berm is impractical considering the access restrictions in this area of the site, the depths of subsurface soil contamination, and local topography. Continued natural movement of precipitation through the subsurface soil column will flush perchlorate from the deep subsurface soil in the small area around Sump 1 into the groundwater. Through soil and groundwater MNA, natural processes will act to reduce the perchlorate groundwater contamination to below the CG. Closure for soils will be achieved when the concentrations in groundwater reach the CG.

### 10.1.2 Groundwater

The following two alternatives were evaluated for groundwater: 1) no action for groundwater contamination and 2) MNA as summarized below:

#### *10.1.2.1 Alternative GW1 – No Action*

Evaluation of the no action alternative will serve as a baseline for evaluating other corrective measures.

#### *10.1.2.2 Alternative GW2 – MNA*

Alternative 2 involves the use of MNA to achieve the CMO for groundwater at RSA-308. The primary active component of remediation within this alternative is natural attenuation. Groundwater monitoring to assess contaminant reductions via natural attenuation would be conducted in the existing wells within the existing contaminant plumes. Groundwater monitoring and reporting would be conducted for 19 years (Years 0 through 19).

## 11. SELECTED CORRECTIVE MEASURE

Alternative 2, Soil Contamination Monitoring through Groundwater Concentration Reduction and MNA, most appropriately addresses the contaminated subsurface soil and groundwater at RSA-308.

Alternative 2 involves the passive reduction in the concentrations of COCs in soil and groundwater by natural abiotic and biotic attenuation processes. The existing soil analytical data suggest that the leaching front is migrating vertically through the subsurface soil column and that, in the absence of a source replenishing the leached perchlorate from the soil, infiltrating precipitation

will continue to deplete the leachable fraction of perchlorate from the smear zone soil. The rate of soil perchlorate attenuation is undefined, but the existing data suggest the migration front has moved from the soil layer immediately under the trench drain to a minimum depth of 8 feet bgs. Leaching will continue until the leachable fraction of perchlorate has been removed from the soil and transferred to the groundwater. Reduction in soil and groundwater contamination will be documented by groundwater monitoring and continued until CGs are attained.

The major components of the selected corrective measures in Alternative 2 include the following:

- One baseline groundwater sampling event would be conducted in Year 0. Groundwater samples would be collected from seven monitoring wells, which include the new interface well. Groundwater samples would be analyzed for COCs (perchlorate and RDX).
- Semiannual groundwater sampling for performance monitoring of MNA processes would be conducted in Years 1 through 19 or until CGs are achieved and confirmed. Groundwater samples would be collected from seven monitoring wells during each sampling event and analyzed for COCs (perchlorate and RDX, if applicable). If appropriate, a permit modification will be submitted to decrease sampling frequency from semiannual to annual.
- At the end of Year 19, it is assumed that the CGs will be achieved, and site monitoring wells would be decommissioned. All groundwater monitoring for MNA will be discontinued if CGs are attained for all COCs in each of the monitoring wells for three consecutive years (individual wells may be removed from the program sooner if this criteria is satisfied). Waste characterization sampling of investigation-derived waste generated during well installation, development, and groundwater sampling activities.

## 12. PUBLIC PARTICIPATION

Public participation requirements specified under AAC 335-14-8-.08(6) will be met during the permit modification process for the RSA-308 corrective measures.

## 13. REFERENCES

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USEPA. 2021. *Regional Screening Table.* November.

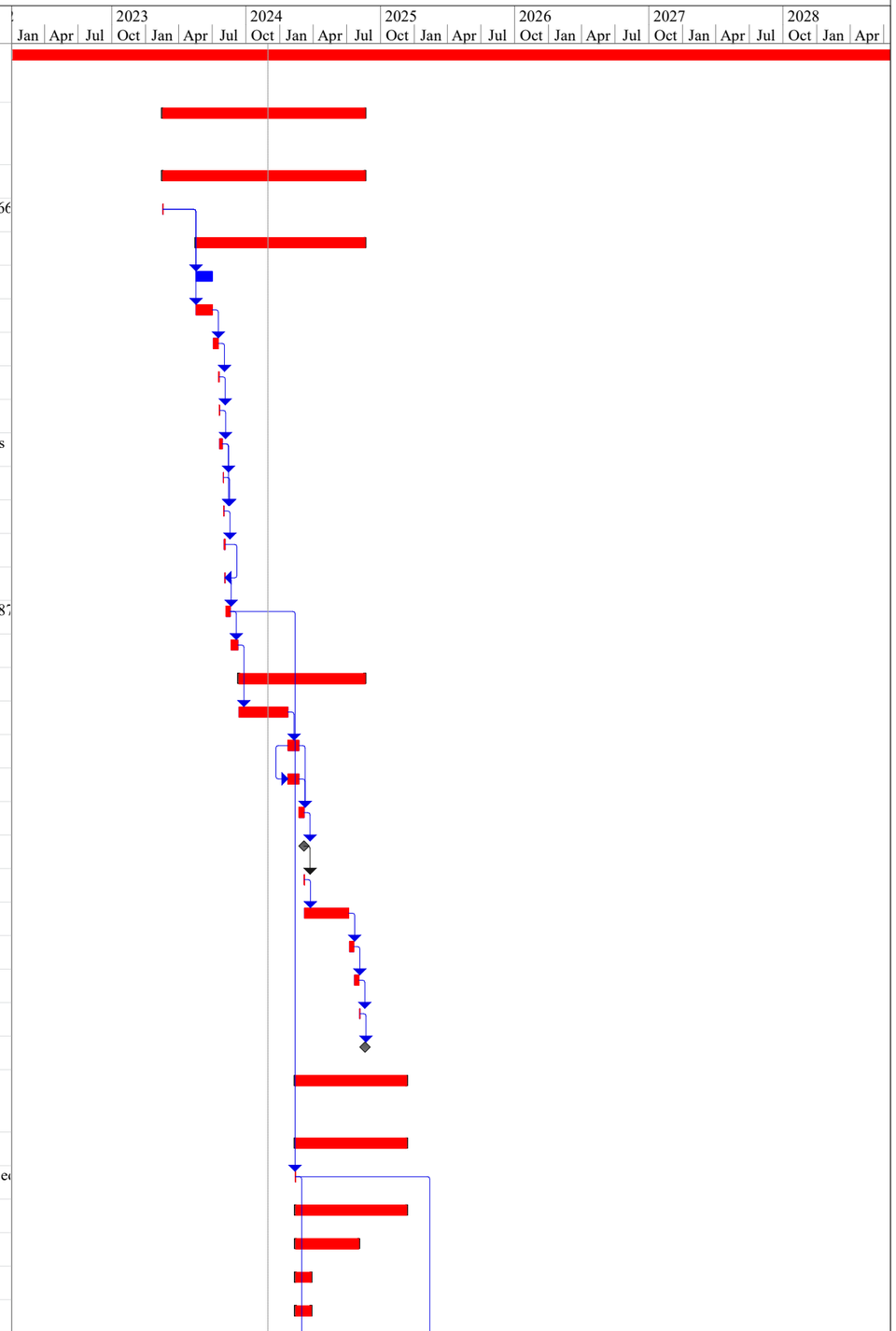
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# APPENDIX G

# CORRECTIVE MEASURES IMPLEMENTATION SCHEDULE

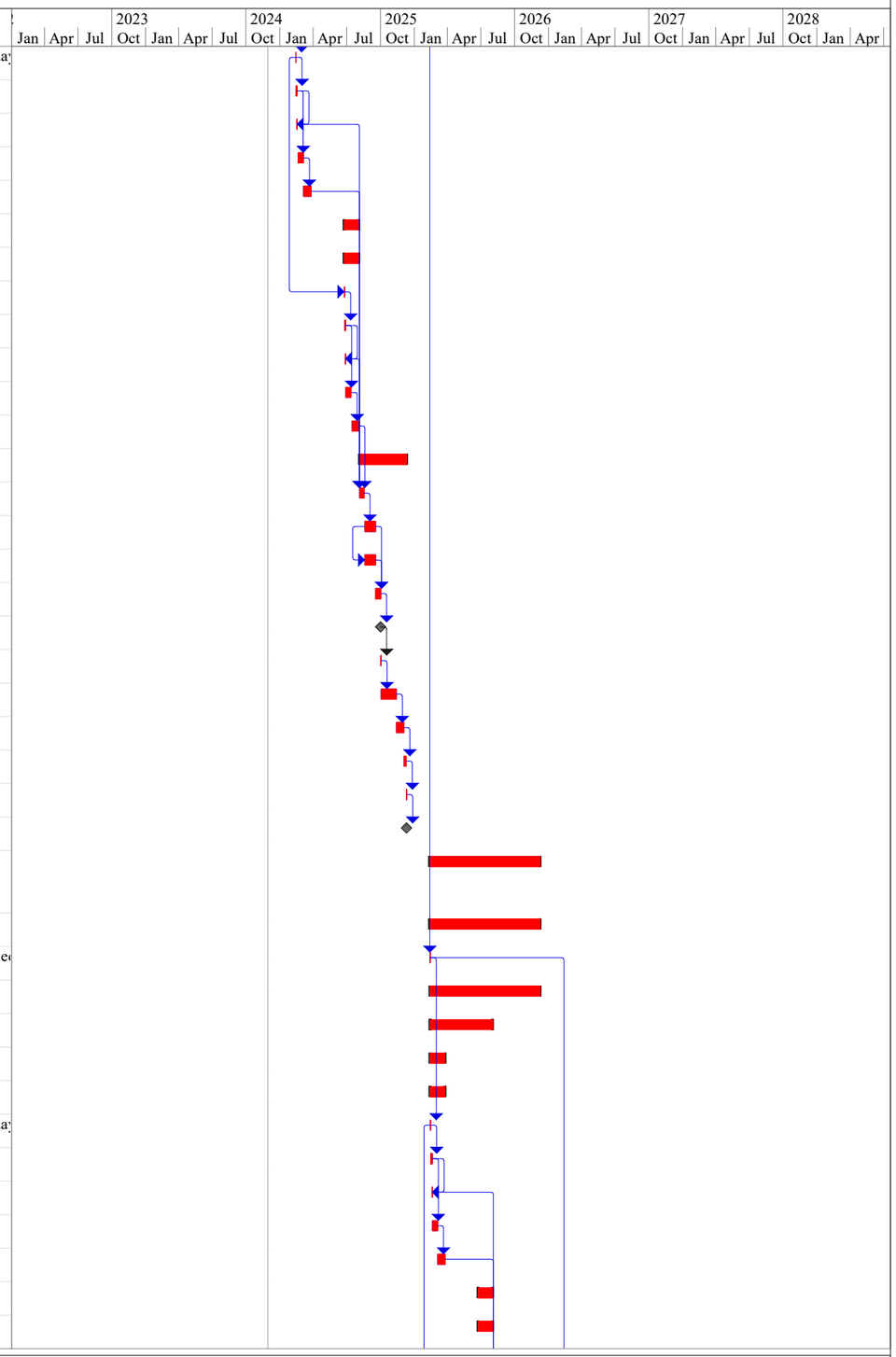
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| ID | Task Name | Duration | Start | Finish | Predecessors | Successors |
|---|---|---|---|---|---|---|
| 1 | **Environmental Remediation Multiple Award Indefinite Delivery Indefinite Quantity (IDIQ) Contract Redstone Arsenal, AL** | **2122 days** | **Fri 1/15/21** | **Wed 9/13/28** | | |
| 861 | **CLIN 0018 - Achieve Corrective Measures Implementation – Construction (CMI-C) and Corrective Measures Implementation Report (CMIR) for Site RSA-308 - OPTION (24 Months)** | **382 days** | **Thu 2/16/23** | **Mon 8/19/24** | | |
| 862 | **RSA-308** | **382 days** | **Thu 2/16/23** | **Mon 8/19/24** | | |
| 863 | Notice to Proceed | 1 day | Thu 2/16/23 | Thu 2/16/23 | 188,197,206 | 865FS+90 edays,866 |
| 864 | **Corrective Measures Implementation – Construction (CMI-C) - Field Work** | **318 days** | **Thu 5/18/23** | **Mon 8/19/24** | | |
| 865 | Subcontractor Procurement | 31 days | Thu 5/18/23 | Fri 6/30/23 | 863FS+90 edays | |
| 866 | Obtain Job Order Request/RER Approval | 31 days | Thu 5/18/23 | Fri 6/30/23 | 863FS+90 edays | 867 |
| 867 | Utility Markout/Land Clearing | 10 days | Mon 7/3/23 | Mon 7/17/23 | 866 | 868 |
| 868 | Mobilization | 2 days | Tue 7/18/23 | Wed 7/19/23 | 867 | 869 |
| 869 | Pre-Installation Survey of 2 Interface Wells | 1 day | Thu 7/20/23 | Thu 7/20/23 | 868 | 870 |
| 870 | Installation of 2 Wells | 6 days | Fri 7/21/23 | Fri 7/28/23 | 869 | 871,872FS+2 edays |
| 871 | Post-Installation Survey  of 2 Interface Wells | 1 day | Mon 7/31/23 | Mon 7/31/23 | 870 | 872 |
| 872 | Interface Well Development | 1 day | Tue 8/1/23 | Tue 8/1/23 | 871,870FS+2 edays | 873 |
| 873 | Baseline Sampling | 3 days | Wed 8/2/23 | Fri 8/4/23 | 872 | 874FF |
| 874 | Demobilization | 1 day | Fri 8/4/23 | Fri 8/4/23 | 873FF | 875 |
| 875 | Laboratory Analysis | 10 days | Mon 8/7/23 | Fri 8/18/23 | 874 | 1080FS+119 days,87 |
| 876 | Data Validation | 15 days | Mon 8/21/23 | Fri 9/8/23 | 875 | 878 |
| 877 | **Corrective Measures Implantation Report (CMIR)** | **238 days** | **Mon 9/11/23** | **Mon 8/19/24** | | |
| 878 | Prepare and Develop Draft CMIR | 90 days | Mon 9/11/23 | Mon 1/22/24 | 876 | 879 |
| 879 | Army Review of Draft CMIR | 21 days | Tue 1/23/24 | Wed 2/21/24 | 878 | 880SS,881 |
| 880 | OPSEC Review of Draft CMIR | 21 days | Tue 1/23/24 | Wed 2/21/24 | 879SS | 881 |
| 881 | Respond to Army Comments on Draft CMIR | 10 days | Thu 2/22/24 | Wed 3/6/24 | 879,880 | 882 |
| 882 | Army approve of Draft CMIR | 0 days | Wed 3/6/24 | Wed 3/6/24 | 881 | 883 |
| 883 | Submit Draft  Final CMIR to ADEM / EPA | 1 day | Thu 3/7/24 | Thu 3/7/24 | 882 | 884 |
| 884 | ADEM / EPA Review of Draft Final CMIR | 85 days | Fri 3/8/24 | Fri 7/5/24 | 883 | 885 |
| 885 | Develop response to ADEM / EPA Comments on Draft Final CMIR | 10 days | Mon 7/8/24 | Fri 7/19/24 | 884 | 886 |
| 886 | Army Review of RTCs | 10 days | Mon 7/22/24 | Fri 8/2/24 | 885 | 887 |
| 887 | Submit Final (Revision 1) CMIR | 1 day | Mon 8/5/24 | Mon 8/5/24 | 886 | 888FS+10 days |
| 888 | ADEM / EPA Approval of Final (Revision 1) CMIR | 0 days | Mon 8/19/24 | Mon 8/19/24 | 887FS+10 days | 21 |
| 1078 | **CLIN 0022AA - Achieve Corrective Measures Implementation – Operations (CMI-O) Option Year 1 for site RSA-308 - OPTIONAL (12 Months)** | **215 days** | **Mon 2/12/24** | **Tue 12/10/24** | | |
| 1079 | **RSA-308** | **215 days** | **Mon 2/12/24** | **Tue 12/10/24** | | |
| 1080 | Notice to Proceed | 1 day | Mon 2/12/24 | Mon 2/12/24 | 875FS+119 days | 1085,1111FS+365 e |
| 1081 | **CMI-O Field Work** | **214 days** | **Tue 2/13/24** | **Tue 12/10/24** | | |
| 1082 | **Semi-Annual Sampling and Reporting** | **122 days** | **Tue 2/13/24** | **Fri 8/2/24** | | |
| 1083 | **Semi-Annual Groundwater Sampling Event 1** | **29 days** | **Tue 2/13/24** | **Mon 3/25/24** | | |
| 1084 | **Field Work** | **29 days** | **Tue 2/13/24** | **Mon 3/25/24** | | |



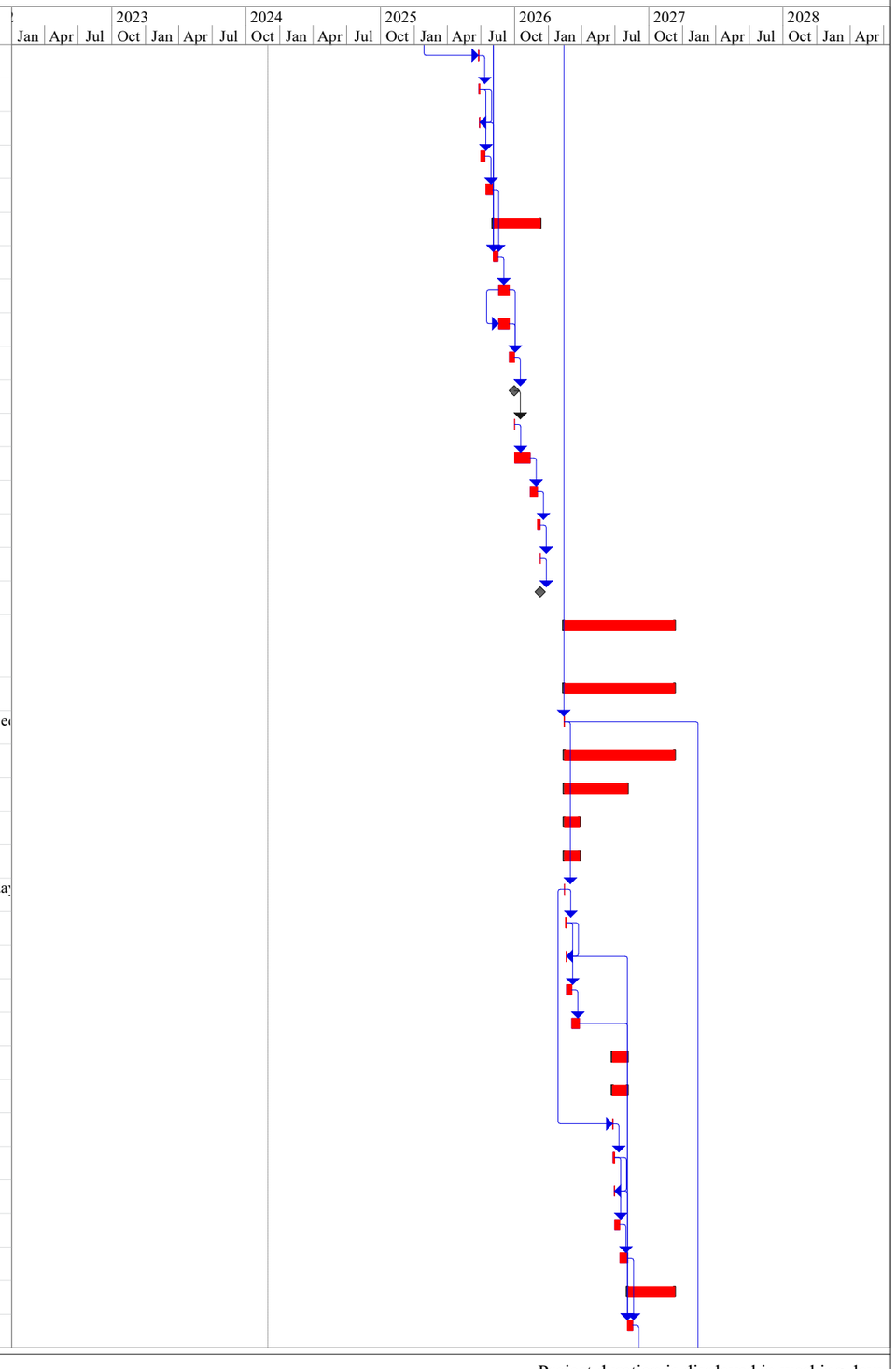

Project duration is displayed in working days
Critical path activities are displayed as red bars

| ID | Task Name | Duration | Start | Finish | Predecessors | Successors |
|---|---|---|---|---|---|---|
| 1085 | Mobilization | 1 day | Tue 2/13/24 | Tue 2/13/24 | 1080 | 1086,1092SS+93 da |
| 1086 | Groundwater Monitoring | 3 days | Wed 2/14/24 | Fri 2/16/24 | 1085 | 1088,1087FF |
| 1087 | Demobilization | 1 day | Fri 2/16/24 | Fri 2/16/24 | 1086FF | 1098 |
| 1088 | Laboratory Analysis | 10 days | Tue 2/20/24 | Mon 3/4/24 | 1086 | 1089 |
| 1089 | Data Validation | 15 days | Tue 3/5/24 | Mon 3/25/24 | 1088 | 1098 |
| 1090 | **Semi-Annual Sampling Event 2** | **29 days** | **Mon 6/24/24** | **Fri 8/2/24** | | |
| 1091 | **Field Work** | **29 days** | **Mon 6/24/24** | **Fri 8/2/24** | | |
| 1092 | Mobilization | 1 day | Mon 6/24/24 | Mon 6/24/24 | 1085SS+93 days | 1093 |
| 1093 | Groundwater Monitoring | 3 days | Tue 6/25/24 | Thu 6/27/24 | 1092 | 1095,1094FF |
| 1094 | Demobilization | 1 day | Thu 6/27/24 | Thu 6/27/24 | 1093FF | 1098 |
| 1095 | Laboratory Analysis | 10 days | Fri 6/28/24 | Fri 7/12/24 | 1093 | 1096 |
| 1096 | Data Validation | 15 days | Mon 7/15/24 | Fri 8/2/24 | 1095 | 1098 |
| 1097 | **Annual Corrective Measures Implementation Operations (CMI-O) Report** | **92 days** | **Mon 8/5/24** | **Tue 12/10/24** | | |
| 1098 | Prepare and Develop Draft Annual CMI-O Report | 10 days | Mon 8/5/24 | Fri 8/16/24 | 1096,1089,1087,109 | 1099 |
| 1099 | Army Review of Draft Annual CMI-O Report | 21 days | Mon 8/19/24 | Mon 9/16/24 | 1098 | 1100SS,1101 |
| 1100 | OPSEC Review of Draft Annual CMI-O Report | 21 days | Mon 8/19/24 | Mon 9/16/24 | 1099SS | 1101 |
| 1101 | Respond to Army Comments on Draft Annual CMI-O Report | 10 days | Tue 9/17/24 | Mon 9/30/24 | 1099,1100 | 1102 |
| 1102 | Army approval of Draft CMI-O Report | 0 days | Mon 9/30/24 | Mon 9/30/24 | 1101 | 1103 |
| 1103 | Submit Draft Final Annual CMI-O Report to ADEM / EPA | 1 day | Tue 10/1/24 | Tue 10/1/24 | 1102 | 1104 |
| 1104 | ADEM Review of Draft Final CMI-O Report | 30 days | Wed 10/2/24 | Tue 11/12/24 | 1103 | 1105 |
| 1105 | Prepare Responses to ADEM comments | 14 days | Wed 11/13/24 | Mon 12/2/24 | 1104 | 1106 |
| 1106 | Army review of RTCs | 5 days | Tue 12/3/24 | Mon 12/9/24 | 1105 | 1107 |
| 1107 | Submit Final CMI-O Report | 1 day | Tue 12/10/24 | Tue 12/10/24 | 1106 | 1108 |
| 1108 | ADEM approval of Final annual Report | 0 days | Tue 12/10/24 | Tue 12/10/24 | 1107 | 28 |
| 1109 | **CLIN 0022AB - Achieve Corrective Measures Implementation – Operations (CMI-O) Option Year 2 for site RSA-308 - OPTIONAL (12 Months)** | **215 days** | **Wed 2/12/25** | **Tue 12/9/25** | | |
| 1110 | **RSA-308** | **215 days** | **Wed 2/12/25** | **Tue 12/9/25** | | |
| 1111 | Notice to Proceed | 1 day | Wed 2/12/25 | Wed 2/12/25 | 1080FS+365 edays | 1116,1142FS+364 e |
| 1112 | **CMI-O Field Work** | **214 days** | **Thu 2/13/25** | **Tue 12/9/25** | | |
| 1113 | **Semi-Annual Sampling and Reporting** | **122 days** | **Thu 2/13/25** | **Fri 8/1/25** | | |
| 1114 | **Semi-Annual Groundwater Sampling Event 1** | **29 days** | **Thu 2/13/25** | **Tue 3/25/25** | | |
| 1115 | **Field Work** | **29 days** | **Thu 2/13/25** | **Tue 3/25/25** | | |
| 1116 | Mobilization | 1 day | Thu 2/13/25 | Thu 2/13/25 | 1111 | 1117,1123SS+93 da |
| 1117 | Groundwater Monitoring | 3 days | Fri 2/14/25 | Tue 2/18/25 | 1116 | 1119,1118FF |
| 1118 | Demobilization | 1 day | Tue 2/18/25 | Tue 2/18/25 | 1117FF | 1129 |
| 1119 | Laboratory Analysis | 10 days | Wed 2/19/25 | Tue 3/4/25 | 1117 | 1120 |
| 1120 | Data Validation | 15 days | Wed 3/5/25 | Tue 3/25/25 | 1119 | 1129 |
| 1121 | **Semi-Annual Sampling Event 2** | **29 days** | **Tue 6/24/25** | **Fri 8/1/25** | | |
| 1122 | **Field Work** | **29 days** | **Tue 6/24/25** | **Fri 8/1/25** | | |



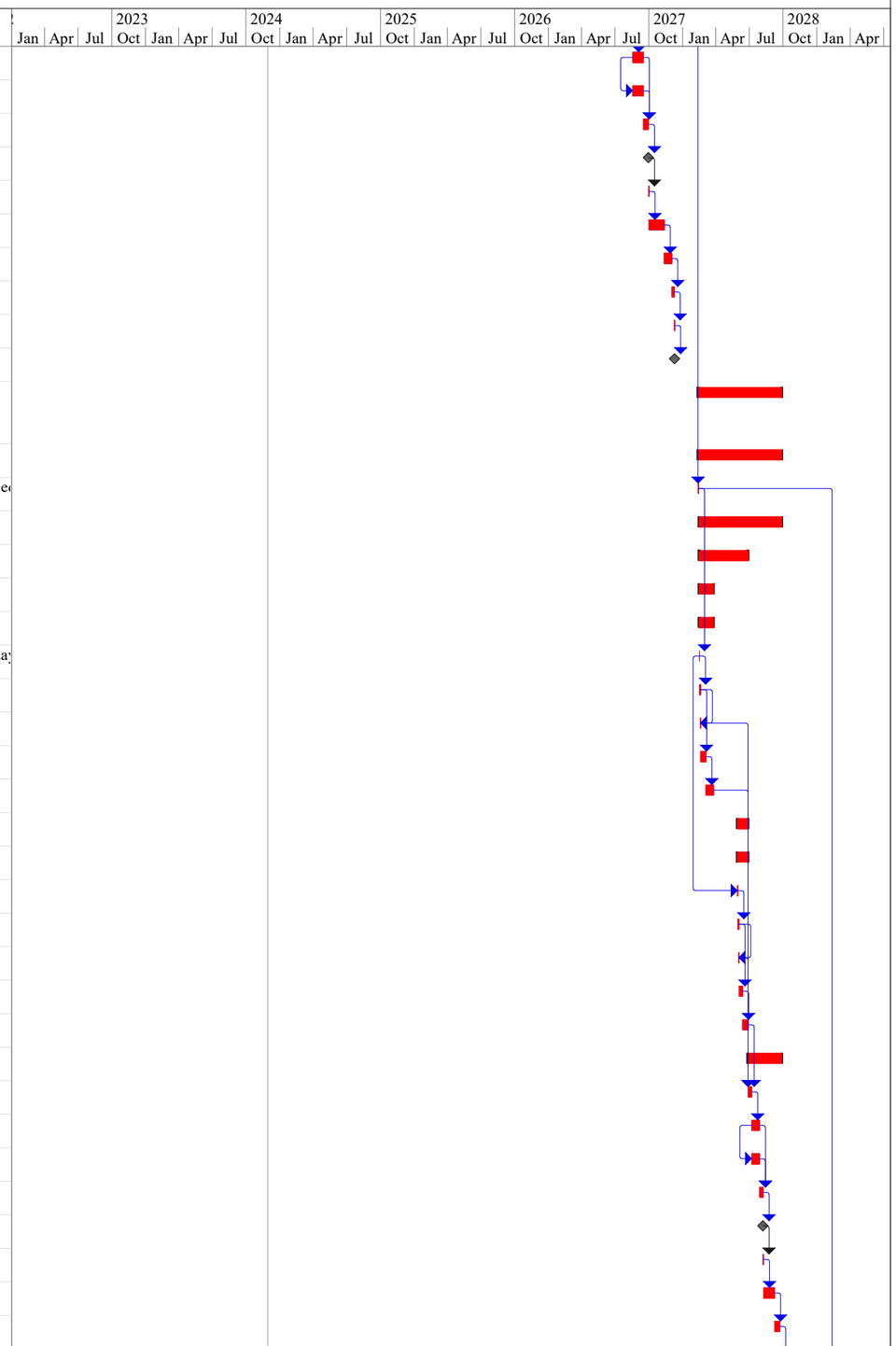

Project duration is displayed in working days
Critical path activities are displayed as red bars

| ID | Task Name | Duration | Start | Finish | Predecessors | Successors |
|---|---|---|---|---|---|---|
| 1123 | Mobilization | 1 day | Tue 6/24/25 | Tue 6/24/25 | 1116SS+93 days | 1124 |
| 1124 | Groundwater Monitoring | 3 days | Wed 6/25/25 | Fri 6/27/25 | 1123 | 1126,1125FF |
| 1125 | Demobilization | 1 day | Fri 6/27/25 | Fri 6/27/25 | 1124FF | 1129 |
| 1126 | Laboratory Analysis | 10 days | Mon 6/30/25 | Fri 7/11/25 | 1124 | 1127 |
| 1127 | Data Validation | 15 days | Mon 7/14/25 | Fri 8/1/25 | 1126 | 1129 |
| 1128 | **Annual Corrective Measures Implementation Operations (CMI-O) Report** | **92 days** | **Mon 8/4/25** | **Tue 12/9/25** | | |
| 1129 | Prepare and Develop Draft Annual CMI-O Report | 10 days | Mon 8/4/25 | Fri 8/15/25 | 1120,1127,1118,112 | 1130 |
| 1130 | Army Review of Draft Annual CMI-O Report | 21 days | Mon 8/18/25 | Mon 9/15/25 | 1129 | 1131SS,1132 |
| 1131 | OPSEC Review of Draft Annual CMI-O Report | 21 days | Mon 8/18/25 | Mon 9/15/25 | 1130SS | 1132 |
| 1132 | Respond to Army Comments on Draft Annual CMI-O Report | 10 days | Tue 9/16/25 | Mon 9/29/25 | 1130,1131 | 1133 |
| 1133 | Army approval of Draft CMI-O Report | 0 days | Mon 9/29/25 | Mon 9/29/25 | 1132 | 1134 |
| 1134 | Submit Draft Final Annual CMI-O Report to ADEM / EPA | 1 day | Tue 9/30/25 | Tue 9/30/25 | 1133 | 1135 |
| 1135 | ADEM Review of Draft Final CMI-O Report | 30 days | Wed 10/1/25 | Tue 11/11/25 | 1134 | 1136 |
| 1136 | Prepare Responses to ADEM comments | 14 days | Wed 11/12/25 | Mon 12/1/25 | 1135 | 1137 |
| 1137 | Army review of RTCs | 5 days | Tue 12/2/25 | Mon 12/8/25 | 1136 | 1138 |
| 1138 | Submit Final CMI-O Report | 1 day | Tue 12/9/25 | Tue 12/9/25 | 1137 | 1139 |
| 1139 | ADEM approval of Final annual Report | 0 days | Tue 12/9/25 | Tue 12/9/25 | 1138 | 28 |
| 1140 | **CLIN 0022AC - Achieve Corrective Measures Implementation – Operations (CMI-O) Option Year 3 for site RSA-308 - OPTIONAL (12 Months)** | **215 days** | **Thu 2/12/26** | **Wed 12/9/26** | | |
| 1141 | **RSA-308** | **215 days** | **Thu 2/12/26** | **Wed 12/9/26** | | |
| 1142 | Notice to Proceed | 1 day | Thu 2/12/26 | Thu 2/12/26 | 1111FS+364 edays | 1147,1173FS+364 e |
| 1143 | **CMI-O Field Work** | **214 days** | **Fri 2/13/26** | **Wed 12/9/26** | | |
| 1144 | **Semi-Annual Sampling and Reporting** | **122 days** | **Fri 2/13/26** | **Mon 8/3/26** | | |
| 1145 | **Semi-Annual Groundwater Sampling Event 1** | **29 days** | **Fri 2/13/26** | **Wed 3/25/26** | | |
| 1146 | **Field Work** | **29 days** | **Fri 2/13/26** | **Wed 3/25/26** | | |
| 1147 | Mobilization | 1 day | Fri 2/13/26 | Fri 2/13/26 | 1142 | 1148,1154SS+93 da |
| 1148 | Groundwater Monitoring | 3 days | Mon 2/16/26 | Wed 2/18/26 | 1147 | 1150,1149FF |
| 1149 | Demobilization | 1 day | Wed 2/18/26 | Wed 2/18/26 | 1148FF | 1160 |
| 1150 | Laboratory Analysis | 10 days | Thu 2/19/26 | Wed 3/4/26 | 1148 | 1151 |
| 1151 | Data Validation | 15 days | Thu 3/5/26 | Wed 3/25/26 | 1150 | 1160 |
| 1152 | **Semi-Annual Sampling Event 2** | **29 days** | **Wed 6/24/26** | **Mon 8/3/26** | | |
| 1153 | **Field Work** | **29 days** | **Wed 6/24/26** | **Mon 8/3/26** | | |
| 1154 | Mobilization | 1 day | Wed 6/24/26 | Wed 6/24/26 | 1147SS+93 days | 1155 |
| 1155 | Groundwater Monitoring | 3 days | Thu 6/25/26 | Mon 6/29/26 | 1154 | 1157,1156FF |
| 1156 | Demobilization | 1 day | Mon 6/29/26 | Mon 6/29/26 | 1155FF | 1160 |
| 1157 | Laboratory Analysis | 10 days | Tue 6/30/26 | Mon 7/13/26 | 1155 | 1158 |
| 1158 | Data Validation | 15 days | Tue 7/14/26 | Mon 8/3/26 | 1157 | 1160 |
| 1159 | **Annual Corrective Measures Implementation Operations (CMI-O) Report** | **92 days** | **Tue 8/4/26** | **Wed 12/9/26** | | |
| 1160 | Prepare and Develop Draft Annual CMI-O Report | 10 days | Tue 8/4/26 | Mon 8/17/26 | 1151,1158,1149,115 | 1161 |



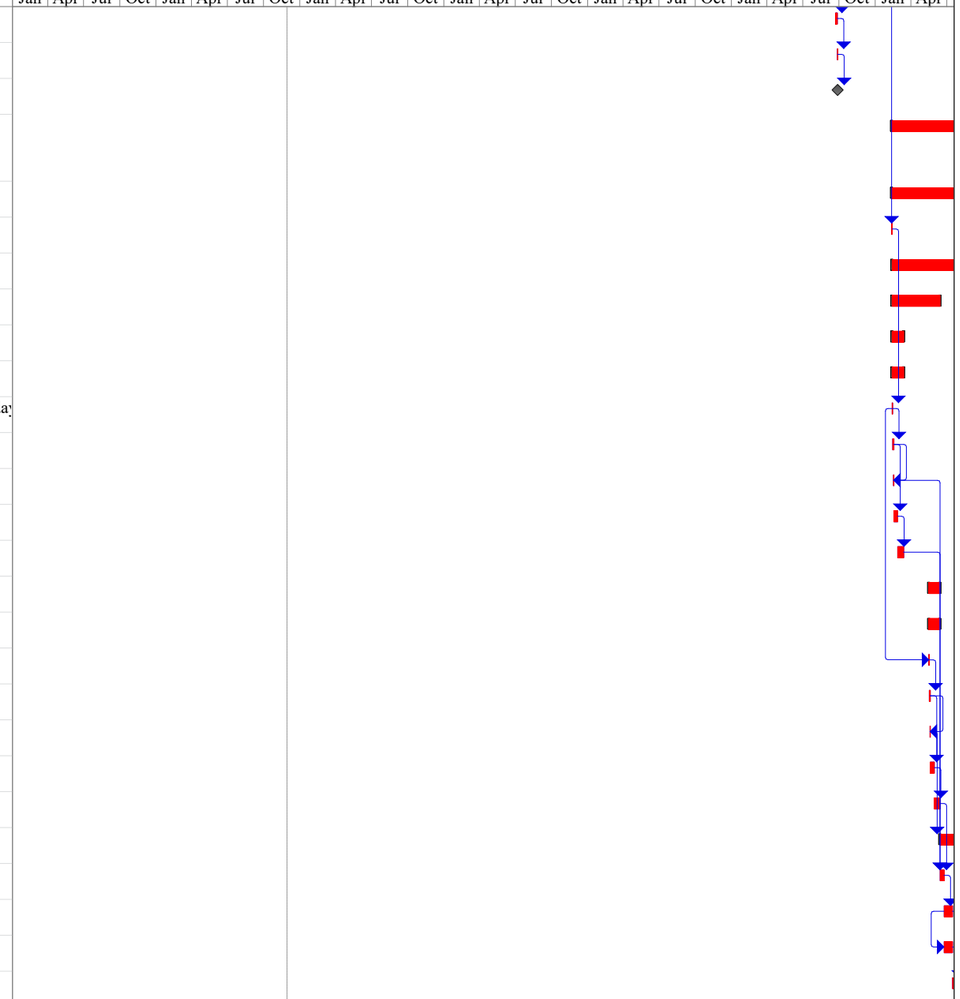

Project duration is displayed in working days
Critical path activities are displayed as red bars

| ID | Task Name | Duration | Start | Finish | Predecessors | Successors |
|---|---|---|---|---|---|---|
| 1161 | Army Review of Draft Annual CMI-O Report | 21 days | Tue 8/18/26 | Tue 9/15/26 | 1160 | 1162SS,1163 |
| 1162 | OPSEC Review of Draft Annual CMI-O Report | 21 days | Tue 8/18/26 | Tue 9/15/26 | 1161SS | 1163 |
| 1163 | Respond to Army Comments on Draft Annual CMI-O Report | 10 days | Wed 9/16/26 | Tue 9/29/26 | 1161,1162 | 1164 |
| 1164 | Army approval of Draft CMI-O Report | 0 days | Tue 9/29/26 | Tue 9/29/26 | 1163 | 1165 |
| 1165 | Submit Draft Final Annual CMI-O Report to ADEM / EPA | 1 day | Wed 9/30/26 | Wed 9/30/26 | 1164 | 1166 |
| 1166 | ADEM Review of Draft Final CMI-O Report | 30 days | Thu 10/1/26 | Wed 11/11/26 | 1165 | 1167 |
| 1167 | Prepare Responses to ADEM comments | 14 days | Thu 11/12/26 | Tue 12/1/26 | 1166 | 1168 |
| 1168 | Army review of RTCs | 5 days | Wed 12/2/26 | Tue 12/8/26 | 1167 | 1169 |
| 1169 | Submit Final CMI-O Report | 1 day | Wed 12/9/26 | Wed 12/9/26 | 1168 | 1170 |
| 1170 | ADEM approval of Final annual Report | 0 days | Wed 12/9/26 | Wed 12/9/26 | 1169 | 28 |
| 1171 | **CLIN 0022AD - Achieve Corrective Measures Implementation – Operations (CMI-O) Option Year 4 for site RSA-308 - OPTIONAL (12 Months)** | **215 days** | **Fri 2/12/27** | **Mon 9/27/27** | | |
| 1172 | **RSA-308** | **215 days** | **Fri 2/12/27** | **Mon 9/27/27** | | |
| 1173 | Notice to Proceed | 1 day | Fri 2/12/27 | Fri 2/12/27 | 1142FS+364 edays | 1178,1204FS+364 e |
| 1174 | **CMI-O Field Work** | **214 days** | **Mon 2/15/27** | **Mon 9/27/27** | | |
| 1175 | **Semi-Annual Sampling and Reporting** | **122 days** | **Mon 2/15/27** | **Sun 6/27/27** | | |
| 1176 | **Semi-Annual Groundwater Sampling Event 1** | **29 days** | **Mon 2/15/27** | **Thu 3/25/27** | | |
| 1177 | **Field Work** | **29 days** | **Mon 2/15/27** | **Thu 3/25/27** | | |
| 1178 | Mobilization | 1 day | Mon 2/15/27 | Mon 2/15/27 | 1173 | 1179,1185SS+93 da |
| 1179 | Groundwater Monitoring | 3 days | Tue 2/16/27 | Thu 2/18/27 | 1178 | 1181,1180FF |
| 1180 | Demobilization | 1 day | Thu 2/18/27 | Thu 2/18/27 | 1179FF | 1191 |
| 1181 | Laboratory Analysis | 10 days | Fri 2/19/27 | Thu 3/4/27 | 1179 | 1182 |
| 1182 | Data Validation | 15 days | Fri 3/5/27 | Thu 3/25/27 | 1181 | 1191 |
| 1183 | **Semi-Annual Sampling Event 2** | **29 days** | **Sun 5/30/27** | **Sun 6/27/27** | | |
| 1184 | **Field Work** | **29 days** | **Sun 5/30/27** | **Sun 6/27/27** | | |
| 1185 | Mobilization | 1 day | Sun 5/30/27 | Sun 5/30/27 | 1178SS+93 days | 1186 |
| 1186 | Groundwater Monitoring | 3 days | Mon 5/31/27 | Wed 6/2/27 | 1185 | 1188,1187FF |
| 1187 | Demobilization | 1 day | Wed 6/2/27 | Wed 6/2/27 | 1186FF | 1191 |
| 1188 | Laboratory Analysis | 10 days | Thu 6/3/27 | Sat 6/12/27 | 1186 | 1189 |
| 1189 | Data Validation | 15 days | Sun 6/13/27 | Sun 6/27/27 | 1188 | 1191 |
| 1190 | **Annual Corrective Measures Implementation Operations (CMI-O) Report** | **92 days** | **Mon 6/28/27** | **Mon 9/27/27** | | |
| 1191 | Prepare and Develop Draft Annual CMI-O Report | 10 days | Mon 6/28/27 | Wed 7/7/27 | 1182,1189,1180,118 | 1192 |
| 1192 | Army Review of Draft Annual CMI-O Report | 21 days | Thu 7/8/27 | Wed 7/28/27 | 1191 | 1193SS,1194 |
| 1193 | OPSEC Review of Draft Annual CMI-O Report | 21 days | Thu 7/8/27 | Wed 7/28/27 | 1192SS | 1194 |
| 1194 | Respond to Army Comments on Draft Annual CMI-O Report | 10 days | Thu 7/29/27 | Sat 8/7/27 | 1192,1193 | 1195 |
| 1195 | Army approval of Draft CMI-O Report | 0 days | Sat 8/7/27 | Sat 8/7/27 | 1194 | 1196 |
| 1196 | Submit Draft Final Annual CMI-O Report to ADEM / EPA | 1 day | Sun 8/8/27 | Sun 8/8/27 | 1195 | 1197 |
| 1197 | ADEM Review of Draft Final CMI-O Report | 30 days | Mon 8/9/27 | Tue 9/7/27 | 1196 | 1198 |
| 1198 | Prepare Responses to ADEM comments | 14 days | Wed 9/8/27 | Tue 9/21/27 | 1197 | 1199 |




Project duration is displayed in working days
Critical path activities are displayed as red bars

| ID | Task Name | Duration | Start | Finish | Predecessors | Successors |
|---|---|---|---|---|---|---|
| 1199 | Army review of RTCs | 5 days | Wed 9/22/27 | Sun 9/26/27 | 1198 | 1200 |
| 1200 | Submit Final CMI-O Report | 1 day | Mon 9/27/27 | Mon 9/27/27 | 1199 | 1201 |
| 1201 | ADEM approval of Final annual Report | 0 days | Mon 9/27/27 | Mon 9/27/27 | 1200 | 28 |
| 1202 | ***CLIN 0022AE - Achieve Corrective Measures Implementation – Operations (CMI-O) Option Years 5-19 for site RSA-308 (only dates for year 5, subsequent years will have same durations)*** | **215 days** | **Sat 2/12/28** | **Wed 9/13/28** | | |
| 1203 | **RSA-308** | **215 days** | **Sat 2/12/28** | **Wed 9/13/28** | | |
| 1204 | Notice to Proceed | 1 day | Sat 2/12/28 | Sat 2/12/28 | 1173FS+364 edays | 1209 |
| 1205 | **CMI-O Field Work** | **214 days** | **Sun 2/13/28** | **Wed 9/13/28** | | |
| 1206 | **Semi-Annual Sampling and Reporting** | **122 days** | **Sun 2/13/28** | **Tue 6/13/28** | | |
| 1207 | **Semi-Annual Groundwater Sampling Event 1** | **29 days** | **Sun 2/13/28** | **Sun 3/12/28** | | |
| 1208 | **Field Work** | **29 days** | **Sun 2/13/28** | **Sun 3/12/28** | | |
| 1209 | Mobilization | 1 day | Sun 2/13/28 | Sun 2/13/28 | 1204 | 1210,1216SS+93 da |
| 1210 | Groundwater Monitoring | 3 days | Mon 2/14/28 | Wed 2/16/28 | 1209 | 1212,1211FF |
| 1211 | Demobilization | 1 day | Wed 2/16/28 | Wed 2/16/28 | 1210FF | 1222 |
| 1212 | Laboratory Analysis | 10 days | Thu 2/17/28 | Sat 2/26/28 | 1210 | 1213 |
| 1213 | Data Validation | 15 days | Sun 2/27/28 | Sun 3/12/28 | 1212 | 1222 |
| 1214 | **Semi-Annual Groundwater Sampling Event 2** | **29 days** | **Tue 5/16/28** | **Tue 6/13/28** | | |
| 1215 | **Field Work** | **29 days** | **Tue 5/16/28** | **Tue 6/13/28** | | |
| 1216 | Mobilization | 1 day | Tue 5/16/28 | Tue 5/16/28 | 1209SS+93 days | 1217 |
| 1217 | Groundwater Monitoring | 3 days | Wed 5/17/28 | Fri 5/19/28 | 1216 | 1219,1218FF |
| 1218 | Demobilization | 1 day | Fri 5/19/28 | Fri 5/19/28 | 1217FF | 1221 |
| 1219 | Laboratory Analysis | 10 days | Sat 5/20/28 | Mon 5/29/28 | 1217 | 1220 |
| 1220 | Data Validation | 15 days | Tue 5/30/28 | Tue 6/13/28 | 1219 | 1222 |
| 1221 | **Annual Corrective Measures Implementation Operations (CMI-O) Report** | **92 days** | **Wed 6/14/28** | **Wed 9/13/28** | **1218** | |
| 1222 | Prepare and Develop Draft Annual CMI-O Report | 10 days | Wed 6/14/28 | Fri 6/23/28 | 1213,1211,1220 | 1223 |
| 1223 | Army Review of Draft Annual CMI-O Report | 21 days | Sat 6/24/28 | Fri 7/14/28 | 1222 | 1224SS,1225 |
| 1224 | OPSEC Review of Draft Annual CMI-O Report | 21 days | Sat 6/24/28 | Fri 7/14/28 | 1223SS | 1225 |
| 1225 | Respond to Army Comments on Draft Annual CMI-O Report | 10 days | Sat 7/15/28 | Mon 7/24/28 | 1223,1224 | 1226 |
| 1226 | Army approval of Draft CMI-O Report | 0 days | Mon 7/24/28 | Mon 7/24/28 | 1225 | 1227 |
| 1227 | Submit Draft Final Annual CMI-O Report to ADEM / EPA | 1 day | Tue 7/25/28 | Tue 7/25/28 | 1226 | 1228 |
| 1228 | ADEM Review of Draft Final CMI-O Report | 30 days | Wed 7/26/28 | Thu 8/24/28 | 1227 | 1229 |
| 1229 | Prepare Responses to ADEM comments | 14 days | Fri 8/25/28 | Thu 9/7/28 | 1228 | 1230 |
| 1230 | Army review of RTCs | 5 days | Fri 9/8/28 | Tue 9/12/28 | 1229 | 1231 |
| 1231 | Submit Final CMI-O Report | 1 day | Wed 9/13/28 | Wed 9/13/28 | 1230 | 1232 |
| 1232 | ADEM approval of Final annual Report | 0 days | Wed 9/13/28 | Wed 9/13/28 | 1231 | 28 |




Project duration is displayed in working days
Critical path activities are displayed as red bars

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# APPENDIX H

# QUALITY CONTROL PLAN

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# RSA-308 PROJECT QUALITY CONTROL PLAN

## ENVIRONMENTAL REMEDIATION SERVICES

## REDSTONE ARSENAL

**April 2022**

**Prepared for:**

**U.S. ARMY ENVIRONMENTAL COMMAND**
**Southeast-Environmental Service and Support Division**
**2450 Connell Road, Building 2264**
**Fort Sam Houston, TX 78234-7664**

**Contract No.: W9124J-18-D-0004, Delivery Order W9124J21F0020**

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# RSA-308 PROJECT QUALITY CONTROL PLAN

## ENVIRONMENTAL REMEDIATION SERVICES REDSTONE ARSENAL

**April 2022**

**Prepared for:**

**U.S. ARMY ENVIRONMENTAL COMMAND**
**Southeast-Environmental Service and Support Division**
**2450 Connell Road, Building 2264**
**Fort Sam Houston, TX 78234-7664**

Prepared by:

ECC
9200 Church St
Suite 305
Manassas, VA 20110

**Contract No.: W9124J-18-D-0004, Delivery Order W9124J21F0020**

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# QUALITY CONTROL PLAN

**ENVIRONMENTAL REMEDIATION SERVICES AT**

**REDSTONE ARSENAL**

**W9124J-18-D-0004**

I hereby certify that the enclosed Quality Control Plan (QCP) is in compliance with contract specifications and is submitted for Army approval. Once approved, the QCP will be implemented during the project W9124J-18-D-0004 execution of "*Environmental Remediation Services at Redstone Arsenal, Alabama".*

## Approvals

Date:

Deputy Program Manager,
Pam Foti, Certified Hazardous Materials Manager (CHMM), Project Management Professional (PMP)



Date: April 12, 2022

Quality Assurance/ Quality Control Manger.
Leili Arjomand, Professional Engineer (PE), Certified Quality Manager (CQM), PMP

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Figure 2-1 Project Quality Control Plan Organizational Structure


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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AHA | Activity Hazard Analysis |
| APP | Accident Prevention Plan |
| CHHM | Certified Hazardous Materials Manager |
| COC | Chain of Custody |
| COR | Contracting Officer's Representative |
| CMI | Corrective Measures Implementation |
| CQM | Certified Quality Manager |
| DoD | Department of Defense |
| DFW | Definable Feature of Work |
| DQCR | Daily Quality Control Report |
| ECC | Environmental Chemical Corporation |
| ERMA | Environmental Remediation Multiple Award |
| IDW | Investigative Derived Waste |
| LNAPL | Light Non-Aqueous Phase Liquid |
| LSP | Licensed Site Professional |
| LUC | Land Use Control |
| MEC | Munitions and Explosives of Concern |
| NCR | Nonconformance Report |
| PE | Professional Engineer |
| PG | Professional Geologist |
| PGM | Program Manager |
| PM | Project Manager |
| PMP | Project Management Professional |
| POD | Plan of the Day |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| QCM | Quality Control Manager |
| QCP | Quality Control Plan |
| QMS | Quality Management System |
| RSA | Redstone Arsenal |
| SSHP | Site Safety and Health Plan |
| SSHO | Site Safety and Health Officer |
| USAEC | United States Army Environmental Command |
| USEPA | United States Environmental Protection Agency |

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# 1.0 INTRODUCTION

Environmental Chemical Corporation (ECC) will implement a Quality Management System (QMS) to ensure all activities, products, information, data, and decisions resulting from quality-affecting activities are technically sound and defensible. The quality system and implementing procedures form the basis of ECC's QMS. The System was developed and is maintained per applicable State and Federal laws, rules, standards, guidance, contractual requirements and sound risk management practices.

The project consists of environmental services at Redstone Arsenal (RSA). The following are the definable features of work (DFWs) identified for RSA-308:

- Procurement and Subcontracting
- Mobilization/Demobilization
- Utility Marking / Dig Permits
- Vegetation Clearing
- Interface well installation (two wells)
- Groundwater Monitoring
- Record Keeping
- Decontamination
- Implementation of Land Use Controls (LUCs)
- Corrective Measures Implementation (CMI) Reporting

## 1.1 Quality Control Objectives

ECC's QMS consist of plans, procedures, and an organization that will produce an end product that complies with the requirements of the contract. The QMS covers all environmental operations, both on-site and off-site.

This Quality Control Plan (QCP) defines the procedures to manage and control activities of ECC personnel, subcontractors, and suppliers and to ensure that the completed project complies with all contract documents.

ECC will maintain responsibility for its work and the work of its subcontractors. To ensure compliance with contract requirements and maintain responsibility of all work performed under this deliverable, ECC will provide a continuous Three Phase Control inspection program to examine the quality of work, maintain standards of workmanship, ensure environmental quality standards of excellence, evaluate performances, identify and correct deficiencies, and provide finished work products which meet or exceed the requirements, while maintaining qualified personnel and equipment, and facilities which are necessary for the completion of the project.

The objective of this QCP is to ensure that the project activities are conducted and documented in an organized, efficient, and safe manner. This plan will define the management structure, organization, responsibilities, and authorities necessary for successful completion of the project. Performing quality work, implementing an effective quality control (QC) system and to ensure project compliance is the responsibility of all ECC staff members and subcontractors and can be achieved through a cooperative effort and commitment to quality by all program personnel.

All QC and quality assurance (QA) procedures related to sampling and analytical methods are included in the *Revision 4 Installation-Wide Quality Assurance Program Plan , U.S. Army Garrison Redstone, Madison*

*County, Alabama*, completed by HydroGeoLogic, Inc. in 2019, and the site-specific work plans being prepared by ECC, as needed.

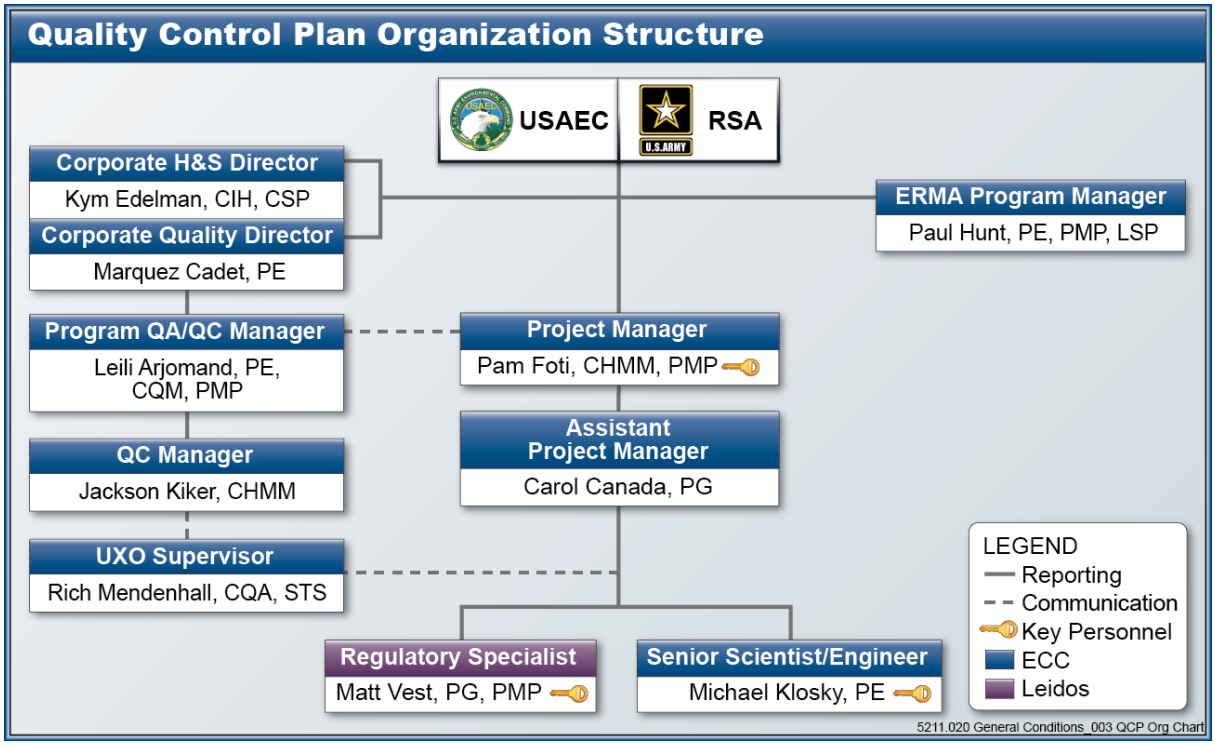
## 2.0 QUALITY CONTROL ORGANIZATION

The functions of the QC staff are to describe, integrate, monitor, evaluate, and document all QC practices of ECC and its subcontractors, and to ensure safety and contract compliance. The quality staff has the full support of management and has independent and delegated authority to accomplish assigned tasks, including stop work authority. The ECC quality control organizational structure, functional responsibilities, level of authority, lines of communication, and interfaces for activities affecting quality are identified and documented for assigned work tasks in the following sections.

Changes to ECC's QC staff organization requires the Army's Contracting Officer acceptance. Changes will be submitted in writing prior to the proposed change. Requests will include the names, qualifications, duties, and responsibilities of each proposed replacement.

**Figure 2-1** shows the project organization chart identifying key personnel, responsibilities, and lines of authority for the QC personnel.

**Figure 2-1: Quality Control Plan Organization Structure**




### 2.1 Program Manager

The Environmental Remediation Multiple Award (ERMA) Program Manager (PGM), Mr. Paul Hunt, Professional Engineer (PE), Project Management Professional (PMP), Licensed Site Professional (LSP), is responsible for the quality of work performed by the assigned project staff. He is responsible for all operations associated with the implementation of the project and will ensure quality and schedule compliance. He will also be responsible for addressing all customer complaints and/or feedback.

## 2.2 Project Manger

The Project Manager (PM), Ms. Pam Foti, Certified Hazardous Materials Manager (CHMM), PMP, controls the budget and schedule with the concurrence of the PGM, ensuring the contract requirements are met. The PM is responsible for all environmental services related to the requirements of the contract and specifications, including subcontractors. The PM reports directly to the PGM and is responsible for ensuring that all project activities conform to requirements and specifications. The PM's duties also include the assignment of responsibilities for the preparation of various reports and the review of each form/report for accuracy and content. In addition to monitoring and appraising performance of staff and subcontractors, the PM has the primary responsibility of tracking any proposed changes to the contract and for the overall project and will report any proposed changes to the PGM.

## 2.3 Program Quality Assurance/Quality Control Manager

The Program QA/QC Manager, Ms. Leili Arjomand, Professional Engineer (PE), Certified Quality Manager (CQM), PMP, will have overall responsibility for the control and implementation of the approved QC program. She will be responsible for the management, training, and performance of all QC personnel and will serve as a technical resource to the QC officer and QC staff. All project QC records and activities are subject to review by the QA/QC Manger.

## 2.4 Quality Control Manager

The QC Manager (QCM), Mr. Jackson Kiker, is responsible for supervising all QC aspects of the project to ensure compliance with contract plans and specifications. The QCM has indirect reporting responsibilities to the PM so that the required authority and organizational freedom is provided, including sufficient independence from cost and schedule implications. The QCM has the authority to act in all QC matters for ECC. The QCM has overall responsibility and authority for the administration of all QC Program-related activities. The QCM will conduct QC project surveillances throughout the life of the project and ensure that the reporting requirements as defined in this QCP are implemented.

## 2.5 Site Superintendent

The Site Superintendent, Mr. Aaron Glad, reports to the PM. He will manage field operations and monitor and oversee field personnel, subcontractors, QC, and safety activities to ensure compliant work. He will host the plan of the day (POD) meetings and participate in preconstruction meetings, preparatory meetings, initial inspections, final acceptance inspections, and ensure that substandard work is corrected as soon as possible.

## 2.6 Field Personnel and Subcontractor

All field personnel and subcontractors will be required to adhere to the procedures set forth in this QCP. The Site Superintendent will be responsible for overall management and coordination of field personnel and subcontractors and ensuring they perform all aspects of the work in accordance with the Work Plans, the Site Safety and Health Plan (SSHP), and this QCP. The QCM will be responsible for ensuring the field personnel and subcontractors perform all aspects of the work in accordance with this QCP. The Site Safety and Health Officer (SSHO) will be responsible for ensuring the field personnel and subcontractors perform all aspects of the work in compliance with the SSHP.

# 3.0 MEETINGS

While performing work, ECC will take part in various meetings during which they will update the client, and when applicable, other stakeholders, on the progress, results, deviations or modifications, and recommendations for the fulfillment of the scope of work.

## 3.1 Coordination and Mutual Understanding Meeting

If needed, and in addition to the meetings specified in the Project Management Plan, the QCM shall meet with the Contracting Officer's Representative (COR) and/or RSA Army Environmental Coordinator or designated representative prior to the start of the site work to discuss the QC Project Plan required by this project.

During the meeting, a mutual understanding of the system details will be developed, including the forms for recording the QC operations, administration of the system for both on-site and off-site work, coordination of ECC's management, and the interrelationship of ECC's management and control with the Army's QA, production, and the QCM's duties with the COR.

As a minimum, ECC's personnel required to attend will include the PM, Site Manager, and QCM.

## 3.2 On-site Meetings

When field activities are being performed, meetings may take place, whether planned or unplanned, at the site to discuss specific issues or concerns. The QCM or her designated representative will be responsible for documenting discussions and decisions made at the meeting on the Daily Quality Control Report (DQCR).

## 3.3 Meeting Minutes

Minutes of all meetings will be prepared describing the general discussion, decisions, changes in approach, and action items. If requested, ECC will submit the meeting minutes to participants.

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# 4.0 QUALITY CONTROL REQUIREMENTS

## 4.1 Definable Features of Work

To ensure quality, ECC will implement the QC program, including the Three Phase Control Process for each DFW. A DFW is any task, which is separate and distinct from other tasks, has separate control requirements, or is identified by different disciplines. There may be more than one DFW in each activity. The Three Phase Control Process is used to ensure that all project activities comply with the approved plans and procedures. The DFWs for this project are included in **Section 1**.

## 4.2 Three-Phase Control System

The Three Phases of Control process assures control of work at every stage of an activity, from planning through execution and completion. The process includes the preparatory, initial, and follow-up phases. Work will only begin on a DFW when successful preparatory and initial phases are completed.

Additional preparatory and/or initial phases may be conducted on the same DFW if new crews or subcontractors are added to a DFW, when acceptable levels of quality are not being met, if there are changes in the applicable QC organization, if work on a DFW is resumed after a substantial period of inactivity, or if other problems develop.

### *4.2.1 Preparatory Phase*

The preparatory phase will be performed prior to the beginning of work on each DFW after all required submittals have been approved and is typically conducted by the SSHO with other applicable site personnel in attendance (e.g., field personnel, subcontractors, etc.). The United States Army Environmental Command (USAEC) COR and Army Environmental Coordinator will also be invited to attend the meeting. Any subcontractors involved in the DFW will participate in this review as well. The QCM or designated representative will give the Army 48-hours' notice prior to the preparatory phase meeting. The results of the preparatory phase actions will be documented in the DQCR.

During this phase, it is imperative to review the specifications and drawings to ensure all preparatory steps have been taken, to verify that submittals have been prepared and reviewed, qualified manpower is assigned, and safety issues have been identified and addressed. Specifically, this phase will include, if applicable:

- Review each paragraph of applicable specifications and drawings
- Review of the applicable work plans, etc. including discussion of procedures for controlling quality of the work and how deficiencies are corrected
- Review provisions that have been made to provide required control testing and inspection
- Concurrence that required project training and qualifications are complete (QC, health and safety, technical, etc.)
- Review to ensure that all materials and/or equipment have been tested, submitted, and approved
- Review of applicable permit status and requirements
- Examine the work area to ensure that all required preliminary work has been completed and is in compliance with the contract
- Review the appropriate activity hazard analysis (AHA) to ensure safety requirements are met
- Discuss sampling methods, applicable standard operating procedures, and the testing facility

- Check to ensure the portion of the plan for the work to be performed has been accepted by the client
- Discuss the initial control phase

### *4.2.2 Initial Phase*

This phase of inspection will document the completeness and acceptability of the particular items at the beginning of the work activity after a representative portion of the items has been completed is typically conducted by the SSHO or Site Superintendent.

This is the time to ensure that ECC's and our subcontractor's personnel/workers understand, through immediate inspection, the contract standards, and the standards of workmanship desired. If there is a difference of opinion in the interpretation of contract requirements, this is the time to settle the issue. The initial inspection phase is a practical method of performing preventive inspection and resolving conflicts. The following will be accomplished during this phase, if applicable:

- Review minutes of the preparatory meeting for open items
- Check the work to ensure it is in full compliance with the project requirements
- Establish level of workmanship and verify it meets the desired acceptable workmanship standards.
- Resolve all differences between personnel and subcontractors
- Check safety to include compliance with and upgrading (if necessary) of the Accident Prevention Plan (APP)/SSHP and AHA. Review the AHA with each worker, if deemed necessary.
- Prepare documentation of the initial phase inspection, including a narrative description of detailed inspection procedures, minutes of meetings, inspection results, corrective measures, etc., using forms presented in **Appendix A** of this QCP or included in field book.
- The initial phase will be repeated for each new crew member arriving to work on-site or any time acceptable specified quality standards are not being met.

### *4.2.3 Follow-up Phase*

Follow-up inspection is geared toward a level of effort to verify the continuation of project compliance and standards of workmanship established during the previous two phases. This inspection is typically conducted periodically by the SSHO, or Site Superintendent to ensure a continuation of satisfactory quality standards. Follow-up inspections will be made a matter of record in the DQCR. The QCM will verify proper procedure technique, sample handling, and Chain of Custody (COC), if required. The SSHO or Site Superintendent will monitor testing results and compare them with the project requirements, and if acceptable, document the results and provide a timely authorization to proceed with subsequent work. If the QCM determines the work is otherwise, not acceptable, he will notify the PM for stopping work and initiating a conformance action. Final follow-up checks will be conducted, and all deficiencies will be corrected before the start of additional DFWs.

## 4.3 Additional Preparatory and Initial Phases

Additional preparatory and initial phases will be conducted on the same DFW if the quality of ongoing work is unacceptable; if there are changes in the applicable QC staff, on-site supervision, or work crew; if work on a DFW is resumed after a substantial period of inactivity; or if other problems develop.

## 4.4 Control for Off-Post Work

When necessary to complete the objectives required in the PWS and as acknowledged in Table 1-1 of the Project Management Plan, work may take place off-post (laboratory analysis). To the extent practicable, ECC will monitor the quality and workmanship of products developed off-site by implementing the same control measures as work that takes place at a project site to ensure the products and/or materials meet the overall quality and technical standards (i.e., Work Plans or equivalent documents with Quality Assurance Project Plan [QAPP]-like requirements). Should any off-Post work be of a complexity that would warrant an effort beyond these measures (and those referenced in **Section 5.1** below), it would be discussed and agreed to by the ECC PM and the Army COR.

## 4.5 Deficiency Management

The ECC quality program evaluates the effectiveness of our QC program and ensures continuous improvement in the quality of our work. The primary goals of our quality program are to prevent non-conformances and to facilitate continual process improvement. If the first goal is not achieved, the identified deficiencies or non-conformances will be corrected in a timely and cost-effective manner in order to prevent their recurrence. This QCP includes provisions for preventing quality issues, facilitating process improvements, as well as identifying, documenting, and tracking deficiencies until corrective actions have been verified.

### *4.5.1 Preventive Measures*

While the entire QC program is directed toward problem prevention, certain elements of the program have greater potential to be pro-active. The primary tools for preventing problems include:

- Employee qualification and training
- Preparatory, initial, and follow-up inspections
- Equipment calibration and maintenance.

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# 5.0 TESTING AND INSPECTION

## 5.1 Analytical Testing

ECC will procure the services of an independent analytical laboratory with DoD Environmental Laboratory Accreditation Program certification to perform analytical testing required by this project. The testing laboratory will have an established and documented quality system in compliance with the DoD Quality Systems Manual for Environmental Laboratories.

Laboratories must possess any required state or host nation certification and/or be accredited for each applicable method by a nationally recognized laboratory accreditation body.

Changes to the Laboratory Accreditation Status will be notified in writing to the Army within 30 calendar days of the change.

Chemical analysis will be performed using current USEPA procedures and in conformance with DoD Quality Systems Manual for Environmental Laboratories and State agency requirements unless otherwise specified in the project Performance Work Statement.

ECC will provide the analytical results citing applicable contract requirements or test procedures used. Analytical results will also provide a statement indicated if the analysis performed "conforms" or "does not conform" to the requirements.

## 5.2 Inspection

Inspection activities involve the evaluation of a characteristic as it relates to a specific requirement. ECC may perform the following inspections below, as appropriate to the DFW.

### *5.2.1 Punch-Out Inspection*

A "punch list" of items that do not conform to the approved work plan, specifications, etc. will be prepared and included in the QC documentation. The list of deficiencies will include the estimated date by which the deficiencies will be corrected. The QCM or staff will make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, ECC will notify the Army that the item(s) is ready for their pre-final inspection.

### *5.2.2 Pre-Final Inspection*

ECC will notify the Army when all of the items from the Punch-Out Inspection have been corrected and a Pre-Final Inspection will be scheduled. The Army will conduct the Pre-Final Inspection and a Pre-Final punch list may be developed if deficiencies are noted. The punch list will include estimated dates of completion that will ensure the deficiencies are completed timely and within the contract dates. When the punch list items are completed and verified by the QCM (or designee), the Army will be notified that a final inspection can be scheduled.

### *5.2.3 Final Acceptance Inspection*

ECC will notify the Army 14 days prior to the Final Acceptance Inspection and the Army will formally schedule this inspection. The notification will include assurance that all items previously identified as being unacceptable along with all remaining work performed under the project will be complete and acceptable by the date scheduled for the final acceptance inspection. The QCM, Site Manager, or other primary

management person will represent ECC at the final acceptance inspection. Army personnel will be present as required.

## 5.3 Instrumentation/Equipment Testing, Inspection, and Maintenance

All equipment used at a project site shall be manufacturer-calibrated to national standards. Each time the instrument is about to be used, the calibration shall be verified and tested for functionality in accordance with *Final Revision 1 Installation-Wide QAPP* completed by Shaw Environmental, Inc. in 2013. Equipment found to be damaged, inoperable, or out of calibration shall not be used until the discrepancy is corrected and verified by the QCM (or designated representative). As necessary, a detector sensitivity or test grid may be used to test the functionality prior to daily use and results documented in the field logbook. Once equipment has been used, it shall be maintained following manufacturer's recommendations. The QCM, SSHO or Site Manager will make periodic verification/audits of the logs and procedures and report the findings in the DQCR.

# 6.0 QUALITY CONTROL DOCUMENTATION

The QCM serves a critical role in documenting, reporting, and storing data in support of the QC process and its effectiveness in attaining a high-quality work product.

## 6.1 Reporting Requirements

The QCM will complete and maintain the QC records to provide factual evidence of compliance with project requirements and to document all QC activities, including maintaining a record of all tests and inspections performed. These records include all work performed by subcontractors and suppliers. The QCM will sign each report and provide copies to the PM and USAEC, if requested. The primary QC reports are listed below.

### *6.1.1 Daily Reports*

During field operations, DQCRs will be prepared describing QC and operations activities performed each day as well as the resources on-site and activities performed, including work performed by subcontractors. The reports will present an accurate and complete picture of QC and operations activities and site management. The report will include both conforming and deficient conditions in a precise, factual, legible, and objective manner. Copies of supporting documentation such as checklists and test reports will be attached as required, if requested. Work will be reported by terminology consistent with the work schedule.

The DQCR will be prepared, signed, and dated by the QCM (or her designated representative) and maintained on ECC's project SharePoint site. A copy of the DQCR will be submitted to RSA and the COR on a daily basis.

### *6.1.2 Monthly Summary Report*

When field activities are being performed, the PM will submit a monthly summary report electronically to the client.

### *6.1.3 Quality Control Meeting Minutes*

The QCM shall submit one copy of the meeting minutes within seven calendar days of the meeting.

### *6.1.4 Safety and Health Deficiency Tracking*

### *6.1.5 Field Logbook*

The QCM (or designee) shall be assigned a QC logbook for documenting details of field activities during QC monitoring activities. The logbook will be a bound manuscript with pre-printed page numbers. The QCM (or designated representative) will document his/her daily duties, summarize field activities, including arrival and departure time, note QC tests and results, depict the site layout, and other data. The information in the QC logbook will serve as a detailed description of events to aid in the preparation of the DQCR and in addressing follow-up questions that may arise.

All entries made in the QC logbook shall be made in ink. Any changes shall be made by a single strike through the error and initials. At the beginning of each day, notes will begin on the following page in the logbook. Descriptions shall be made in coherent English and in a manner, that would allow others to

recreate the daily events in the absence of the QCM. At the end of each day, the QCM (or designee) will mark the remainder of the page with a single line and sign across or under it.

## 6.2 Records Management

Records are considered completed documents, validated data, and other materials that provide objective evidence of the quality of items or activities. A document that contains objective information can become a record once it is complete and identified as a record. Records include, but are not limited to:

- Work plans, technical proposals, and other work assignment planning documents
- Field plans and procedures
- Training records
- Project reports, including letter reports
- Field logbooks and project notebooks
- Three phase inspection records
- DQCR and Production Reports
- COC records
- Audit, surveillance, and independent project self-assessment reports
- Field change notices
- Laboratory data

The PM will define work assignment documents that are expected to become records.

Records will be maintained in the project office in a manner that prevents deterioration and provides for the safeguarding of the records. A record indexing system that allows for easy retrieval and provides sufficient information to permit the correlation of records with the items or activities to which they apply will be used. Inactive records will be stored for the mutually agreed upon time after which they are either archived or properly disposed

Disposition of records is controlled and documented. Records are destroyed only after the proper notification to USAEC and the approval of the ERMA PGM.

# 7.0 SUBMITTALS

Preparation of submittals is the responsibility of the PM at the project level using project staff resources. For preparation of technical submittals, the appropriate staff will be chosen; those who have the background and knowledge required for assuring the technical submittal is complete and accurate. Additionally, the PM will perform a separate technical peer review for highly technical submittals.

The QCM will review submittals for acceptance with QC requirements before transmitting to the client or other required approval authorities. Submittals requiring modifications or changes will be returned to the originator, subcontractor, or vendor for correction and resubmission. Submittals from subcontractors and vendors will be reviewed for technical content and accepted as a part of this submittal preparation procedure.

## 7.1 Transmittal Form

Transmittals by ECC to the Army will be documented via email correspondence and/or Project Portal upload (with corresponding email to notify the parties of document availability). The transmittal and distribution of documents to Regulators will be managed directly by RSA and supported by ECC as discussed in Section 3.4.2.3 of the Project Management Plan.

## 7.2 Comment Response Matrix

Upon receiving comments from Army, regulatory, or other outside reviewers, ECC will prepare a comment response matrix to document each reviewer's comment along with a response describing how the comment will be resolved, incorporated, or addressed. To expedite reviews of the comment responses, ECC may request that the Army schedule a conference call or meeting with reviewers to discuss their comments. The completed comment response matrix will then be submitted to the client for review and approval prior to submitting elsewhere, as appropriate and applicable. At such a time when all responses are accepted, ECC will incorporate changes into the document.

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# 8.0 NONCONFORMANCE REPORTING

## 8.1 Nonconformance Definition

The definition of a nonconforming condition can be a deviation from product, process, procedure or compliance specifications. All items determined to be nonconforming must be corrected through systematic corrective actions. Any time a condition exists not in compliance with drawings, specifications, codes, workmanship standards, facility requirements, or Army requirements, the nonconformity must be documented, corrected, and closed-out through the following means. All personnel are responsible for identifying deficiencies and the QCM is responsible for ensuring the proper tracking and documentation of deficiencies, including those identified by the Army. ECC will implement the ECC Causal Analysis System (see **Appendix B**) to determine the root causes of quality related incidents and non-conformances. We will perform trend analyses at least annually by reviewing all incidents and identifying common basic causes that need to be addressed to prevent similar occurrences.

## 8.2 Deficiency Identification

The QCM (or designee) will be responsible for managing the nonconformance process. All nonconforming items must be reported to the QA/QC Manager. Anyone finding a deficient item is responsible for reporting it to the appropriate management staff.

## 8.3 Nonconformance Determination

During routine site activities, the majority of corrective actions can be implemented immediately (within 48 hours) by the field personnel and documented in field logbook. If the condition is not quickly corrected, the individual initiates a Nonconformance Report (NCR) as shown in **Appendix A** and submits it to the QCM (or designee). The QCM (or designee will notify the PM and identify the person responsible for implementing corrective action (often the Site Superintendent), sets a date on which the response is due, and distributes the NCR.

## 8.4 Planning and Implementing the Corrective Action

The responsible person to initiate corrective actions should identify the cause of the problem, if known or suspected, on the NCR. The responsible person will develop a Corrective Action Plan, identify the date the corrective action has been or will be accomplished, describe the action taken on the form, and return the form to QCM (or designee) by the response due date. If possible, objective evidence that the corrective action has been completed should be included with the NCR response. If this is not possible, the responsible person should return the NCR by the due date and provide the evidence as soon as possible.

## 8.5 Accepting Corrective Action

The QCM (or designee) will review the NCR response to determine the adequacy of the corrective action. If the stated corrective action is unacceptable, the NCR will be returned to the responsible person for further discussion and corrective action.

## 8.6 Verifying Corrective Action

If the evidence provided to the QCM (or designee) concerning completed corrective action is acceptable, the NCR will be signed and dated. If evidence is obtained through an audit, surveillance, or follow-up

review, the individual conducting the follow-up will sign and date the form once the corrective action has been verified.

A distribution list for NCRs will be determined at the initial project-planning meeting. At a minimum, distribution will include the USAEC Representative, QCM, PGM, QA/QC Manager, PM, Site Superintendent, and any other applicable client-related individuals.

# 9.0 AUDITS AND ASSESSMENTS

Assessments are a learning process intended to increase the user's understanding of the program or system being assessed and to provide a basis for improving such programs or systems. The purpose of assessments is to improve the quality of work by comparing the system or element to the specified requirements. Assessments are conducted at all levels: corporate, contract, project, and activity. Response refers to the actions taken by the assessed organization as a result of the assessment. Typically, responses involve corrective actions to rectify the deficiencies identified in the assessment.

Project assignments will be monitored and assessed as deemed appropriate by the QCM (or designee) and QA/QC Manager. The following sections identify and describe many assessment types. Not all types may be applicable for this project. The requirement to conduct applicable assessment types may be further defined in the work plans and field plans. The ERMA PGM, PM, or the QA/QC Manager may specify additional assessments, as necessary, to ensure that the quality of work meets the Army and ECC's expectations. Assessment reports generated under this project will be made available to the Army, upon request.

## 9.1 Management System Reviews

Management systems reviews are self-assessments conducted annually, or as determined appropriate by the QA/QC Manager, to establish whether the quality management structure, policies, and procedures are adequate to ensure quality data. Management systems reviews may cover multiple contracts and quality plans. The primary focus of the management systems review is performance improvement through:

- Fostering individual ownership of the quality program by increasing employee involvement in quality
- Encouraging employees to routinely identify opportunities for quality improvement
- Meeting with management, technical, and QA staff to solicit specific suggestions to improve quality, such as more practical implementation methods, procedural modifications, etc.
- Training the management, technical, and QC staff on quality plan requirements
- Communicating lessons learned from other management systems reviews
- Checking on implementation and effectiveness of the quality program within the office.

## 9.2 Project Audits

Project audits may be conducted on ECC and subcontractor work activities by QC staff independent of the work activities or the appropriate staff appointed by RSA or the USAEC. The implementation and use of appropriate quality measures identified in this QCP, work plans, field plans, specifications, procedures, and any other applicable document specifying requirements can be used for checking during the audit. The auditor will also ensure that obsolete documentation has been removed from project work areas and check briefly on preparation of required deliverables and the condition of project files.

Project auditors will be trained in auditing procedures and authorized by the QA/QC Manager.

## 9.3 Project Self-Assessments

Project self-assessments are evaluations of work activities conducted by project personnel who are knowledgeable in the project requirements to determine if the technical requirements are being met. They are intended to provide rapid feedback to the project staff to facilitate timely corrective action.

The ERMA PGM makes the selection of project assignments or activities for project self-assessment and the personnel to conduct them with the assistance of the QA/QC Manger or QCM. Project self-assessments are conducted using a standardized or customized checklist.

# Appendix A

# QCP Forms

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# DAILY SITE REPORT

**Project Title:** Redstone Arsenal
**Date:** _____
**Activity Name:** _____
**Location:** _____
**Contract No.:** W9124J-18-D-0004, DO W9124J21F0020

| **Weather** | Sunny | Clear | Overcast | Rain | Snow |
|---|---|---|---|---|---|
| **Temperature** | < 32 | 32 – 50 | 50 – 70 | 70-85 | > 85 |
| **Wind** | Still | Moderate | High | | |
| **Humidity** | Dry | Moderate | Humid | | |

***Personnel On Site:***

| Name | Hrs. | Affiliation | Location/ Description of Work |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

***Field Changes:*** YES _____ NO _____

If yes, filed Nonconformance and Corrective Action Report number (NCR No.):_____

| | |
|---|---|
| **Work Performed:** | |
| **Equipment Used:** | |
| **Health & Safety (Briefing held, PPE, injuries, near misses, etc.):** | |
| **Samples Collected/ Shipped:** | |
| **IDW Generated and Disposition:** | |
| **Verbal Instructions Received/Given:** | |
| **Changed Conditions/ Delays/ Conflicts Encountered or Resolved:** | |
| **Other Comments or Additional Information:** | |
| **Next Day's Planned Activities:** | |

Contractor Verification: On behalf of the contractor, ECC, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

_____ _____ _____ _____
Signature Date Reviewer Signature Date

# INSTRUMENT CALIBRATION LOG

**Project**: Redstone Arsenal **Site:** **Date**

Calibrated By Instrument Serial Number

Weather:

| Parameters | Calibration | Calibration Temp | Post Calibration | Comments |
|---|---|---|---|---|
| Conductivity (mS/cm$^{c}$) | | | | |
| pH (7) | | | | |
| pH (4) | | | | |
| pH (10) | | | | |
| ORP (mV) | | | | |
| Dissolved Oxygen ( %) | | | | |
| Barometric Pressure (mmHg) | | | | |
| | | | | |
| **Turbidity** | **<0.10 NTU** | **15.0 NTU** | **100 NTU** | **750 NTU** |
| **PID** | | **Isobutylene / 100ppm** | | |

| | Environmental Chemical Corporation | EQUIPMENT DAILY CHECK LIST |
|---|---|---|

**Equipment Name /Number** _____ **Date** _____

**Engine Hrs/Mileage** _____ **Project Name** _____

| | |
|---|---|
| BRAKES | COOLING WATER |
| AIR SYSTEM | OPERATING CONTROLS |
| TIRES/TRACKS | LIGHTS/REFLECTORS |
| HORN | WINDSHIELD WIPERS |
| SAFETY DEVICES | FIRE EXTINGUISHER |
| GLASS | BACKUP ALARM |
| MIRRORS | ENGINE OIL Add/Check |
| DEFROSTER | EXHAUST SYSTEM |
| STEERING SYSTEM | FLUID LEVELS |
| WIRE ROPE | ELECTRICAL SYSTEM |
| APPEARANCE | BREATHING AIR BOTTLES |

These items are to be checked each shift before operating this piece of equipment.
Report ALL items requiring repair to supervisor prior to operation of equipment.

**Note:**

_____

_____

_____

_____

_____

_____

_____

_____

_____

| | |
|---|---|
| OPERATOR'S NAME | |

(Please Print Name)

| | Environmental Chemical Corporation | FIELD WORK VARIANCE |
|---|---|---|

Project Name _____ Variance No _____

Project No _____ Page ____ of ____

Contract No. _____ CTO No. _____ Date: _____

Variance (include justification and present requirements) Requested by: _____

Proposed Change

Technical Justification

Cost/Schedule Impact

Reason for Change ☐ Addition ☐ Deletion

Change Order Required ☐ No ☐ Yes Change Order No. _____

Applicable Document

| | | |
|---|---|---|
| **Approved By** | | |
| | **Project Manager** | **Date** |
| **Approved By** | | |
| | **CQC Manager** | **Date** |
| **Approved By** | | |
| | **Contracting Officer** | **Date** |

| | Environmental Chemical Corporation | MATERIALS DELIVERIES STORAGE CHECKLIST |
|---|---|---|

| Project Name: | Date: | Serial No. | |
|---|---|---|---|
| Building Name: | | Control # | |
| Specified Location: | | Reference # | |
| Drawing Reference: | | | |

| Description of Activities | Disposition | | | Inspection Date (Initials) |
|---|---|---|---|---|
| | ACCEPT | REJECT | HOLD | |
| 1 Material: | | | | |
| 2 Date of Delivery | | | | |
| 3 Handling method | | | | |
| 4 Storage method | | | | |
| 5 Protection | | | | |

Remarks:

| Checked By: | Inspected By: | Witnessed By: |
|---|---|---|
| Contractor Representative | Q.C. Inspector, Contractor | Prime Contractor Representative |
| Date: | Date: | Date: |

| | Environmental Chemical Corporation | NON-CONFORMANCE REPORT TRACKING |
|---|---|---|

**Contract** _____ **Project No** _____

**CTO No** _____ **NCR Number** _____

| Nonconformance Description (include specific requirement violated): | |
|---|---|
| | |
| **Identified By** | **Date** |
| Root Cause of Nonconforming Action: | |
| Corrective Action(s) to be Taken (include date when action(s) will be complete): | |
| | |
| **To Be Performed By** | **Date** |
| Action(s) to be Taken to Preclude Recurrence: | |
| | |
| **To Be Performed By** | **Date** |

| **Acceptance By** | | |
|---|---|---|
| | | |
| | **Project Manager** | **Date** |
| | | |
| | **CQC Manager** | **Date** |

| Corrective Action(s) Completed by and Date: | Verification Completed by and Date: |
|---|---|
| | |

| | Environmental Chemical Corporation | NON-CONFORMANCE REPORT TRACKING LOG |
|---|---|---|

**Contract** _____ **Project Name** _____

**CTO No** _____ **Page** ____ **Of** ____

| NCR No. | Orig. Date | Initiated By | Nonconformance Description | | | Status | |
|---|---|---|---|---|---|---|---|
| Project No. | Close Date | Close By | | Resp. Party | C/A Due | C/A Recommended And Approved | Re-inspection Results |
| | | | | | | | |
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| | Environmental Chemical Corporation | RECORD OF TESTING ON -OR- OFF SITE |
|---|---|---|

**To:** _____

**Testing To Be Carried Out By:** _____

**Contract Number:** _____ **Contractor:** _____

**Item or Work for Test:** _____

_____

**Location of Test:** _____

**Proposed Date & Time of Test:** _____

**Specified Testing Requirements:** _____

_____

**Notified By:** _____ **Date:** _____

**To Be Inspected By:** _____ ☐ _____ ☐ _____ ☐

_____ ☐ _____ ☐ _____ ☐

## Test Record

**Date of Test:** _____ **Location or Grid Ref.** _____

**Type of Test:** _____

**Test Conditions Maintained:** **Start** ☐ **Finish** ☐

**Accepted** ☐ **Rejected** ☐

## Test Result

**Comments/Observations:** _____

_____

_____

_____

**Test Witnessed By:**

_____ _____

**QC Inspector (Signature)** **Supplier (Signature)**

_____ _____

**Contractor Repr (Signature)** **Prime Contractor Repr (Signature)**

| | Environmental Chemical Corporation | REWORK ITEMS LIST |
|---|---|---|

**Contract** _____ **Project No** _____

**CTO No** _____

| Item | Date Identified | Date Corrected |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |
| 5. | | |
| 6. | | |
| 7. | | |
| 8. | | |
| 9. | | |
| 10. | | |
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| 12. | | |
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| 14. | | |
| 15. | | |
| 16. | | |
| 17. | | |
| 18. | | |
| 20.<br>21. | | |
| 22. | | |
| 23. | | |
| 24. | | |

| | Environmental Chemical Corporation | STATUS SUMMARY ON NON-CONFORMANCE NOTICES |
|---|---|---|

PROJECT: _____ DATE: _____

| SEQUENTIAL SERIAL NO. | DATE OF ISSUE | DESCRIPTION | DATE RECEIVED BY CONTRACTOR | DATE RETURNED BY CONTRACTOR | Q.C. ENGINEER | | COMMENTS |
|---|---|---|---|---|---|---|---|
| | | | | | ACCEPTED DATE | REJECTED DATE | |
| | | | | | | | |
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| | Environmental Chemical Corporation | STOP WORK ORDER |
|---|---|---|

| | | | |
|---|---|---|---|
| **Project Name** | | **Date** | |
| **SWO No.** | | **Page** | |
| **Contract No.** | | **CTO Number** | |

| **1. Written Notice** | | | |
|---|---|---|---|
| Issued to: | | P.O. # or Activity: | |
| Name: | | Location: | |
| Title: | | Issued by (name): | |
| Origination: | | Issued by (title): | |
| **2. Verbal Notice** | | | |
| Issued to: | | Date: | |
| Title: | | Time | |

| **3. Associated NCR No.** | **4. Associated CAR No.** |
|---|---|
| | |

| **5. Stop Work Order Condition Description** |
|---|
| |

| **6. Remedial Action Required:** | | | |
|---|---|---|---|
| By Whom | | By When | |

| **7. Required Remedial Action Determined by:** | |
|---|---|
| | |
| Project Manager | Date |
| | |
| | |
| CQC Manager | Date |

**8. Follow-up of Remedial Action Taken:**

Verbal Notice to Resume Operations Given to:

| Name | Title | Date | Time |
|---|---|---|---|
| | | | |

Stop Work Order Cancellation Authorized by:

| Program CQC Manager: | Date |
|---|---|
| | |

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# Appendix B

# ECC Causal Analysis System

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# ECC CAUSAL ANALYSIS SYSTEM

## Step 1. Incident Description

### Type of incident:

- Quality
- Vehicle/property loss >$500
- Environmental release or permit exceedance
- Injury or illness
- UXO-related
- Security
- High loss potential (HiPo)

### Describe what happened:

_____

### Evaluation of future risk if not controlled:

| Probability of Recurrence | Severity of Loss Potential: Minor | Serious | Major |
|---|---|---|---|
| Will probably occur soon | Medium | High | High |
| Reasonable likelihood in future | Low | Medium | High |
| Unlikely | Low | Low | Medium |

## Step 2. Select Event Type

- Fall from elevation
- Fall on same level
- Struck by vehicle, equipment, load or moving object
- Struck against or bump into
- Caught in, between or under
- Caught on, snagged or hung
- Contact with harmful agent (chemical, biological, radiological, noise, temperature extreme, vibration)
- Ergonomic, overexertion, stress, strain, sprain
- Overpressurization, excessive temperature
- Equipment failure
- Environmental release
- Permit exceedence
- Product or process non-conformity
- Customer/stakeholder complaint, poor project performance rating
- Cost/schedule overrun

## ECC Core Values

Service
Prosperity
People
Friendship
Safety

## Step 3. Identify the Immediate Cause(s)

**Identify those behaviors or conditions that directly resulted in the event or loss.**

### Substandard Acts or Behaviors

- Failure to follow established procedure
- Operating equipment without authority
- Exceeding the boundaries of the task envelope
- Operating at improper speed
- Failure to warn or secure
- Failure to control hazardous energy (de-energize, secure, lockout)
- Making safety devices inoperable (including jumpering interlocks)
- Using wrong or defective tools or equipment
- Poor lifting, pulling, turning technique
- Poor body positioning
- Using tools or equipment improperly
- Substance abuse or working under influence of prescription medication
- Inappropriate behavior
- Failure to check/monitor
- Failure to coordinate work activity
- Failure to identify customer/stakeholder expectations
- Failure to identify and reject non-conforming parts, materials or workmanship

### Substandard Conditions

- Exposure to chemical, physical or biological agents
- Inadequate engineering controls
- Inadequate administrative controls
- Inadequate PPE
- Inadequate warning system or barricade
- Inadequate site layout or design
- Defective tools or equipment
- Congestion/restricted action
- Housekeeping/disorder
- Fire or explosion hazard
- Hazardous weather conditions
- Improper maintenance of infrastructure or plant facilities
- Failure to comply with designs, stakeholder expectations
- Inadequate resources on project
- Inadequate identification of regulations, codes, standards, specifications, permits to operate
- Inadequate communications equipment, software or process controls

## Step 4. Identification of Root Cause(s)

**Identify the system or personal factors that caused or permitted the immediate causes to be present.**

### System Factors

#### 1. Leadership and Management

- Management commitment
  - to processes, policies and procedures
  - lead by example
- Management involvement
  - in ESQ activities (meetings, inspections, audits)
  - visible leadership
- Supervision
  - employee tasking, direction, follow-up
  - subcontractor oversight
- Line management accountability
- Adequate budgeting
- Assessment of risks and hazards
- Qualifications of supervisors and managers
- Performance evaluations and feedback
- Reporting relationships
- Employee involvement/inclusion in hazard evaluation and decision making

#### 2. Communications and Training

- Training
  - Formal
  - OJT
- Evaluation of training effectiveness
  - Testing
  - Demonstration
  - OJE
- Competency determination
- Communications with client
- Communications with stakeholders
- Communications with employees
- Communications between organizations
- Communications between work groups or shifts
- Communications between individuals
- Communications with subcontractors

#### 3. Project Development and Planning *(Plan)*

- Project Development
  - Understand SOW
  - Understand contract
  - Understand client and stakeholder relationships
  - Understand client and stakeholder expectations
- Risk analysis and management plan
  - PIP
  - Bid analysis
  - Process Safety Reviews
- Identification of codes, standards, specifications, SOPs
- Engineering and task planning
  - Multi-disciplinary, SME involvement
  - Review procedures
  - Value engineering
  - Site layout
  - Work task planning
- Project plans
- AHAs/JSAs
- Submittal process
- Hazardous work permits
- Regulatory permits
- Procurement
  - Subcontractor evaluation and selection
  - Requirements in RFP/SOW
  - Material specifications

#### 4. Project or Work Task Execution *(Do)*

- Implementation of plan/procedure
- Schedule/work sequence
- Tools/equipment/PPE
  - Tools
  - Construction equipment
  - Infrastructure
  - Facilities
  - Process equipment
- Qualified personnel
- Compliance with codes/standards
- Documentation
- Document control
- Incident identification, notification, investigation and reporting

#### 5. Measuring and Monitoring of Work Activities and Products *(Check)*

- Document reviews
- Design reviews
- Readiness reviews
- Four phase process
- Subcontractor oversight
- Exposure monitoring procedures
- Testing
  - Materials
  - Process equipment
  - Alarms and interlocks
  - Commissioning
  - Pilot and bench scale
  - Weights and measures
  - Calibration
- Inspections
  - Tools
  - Equipment
  - PPE
  - Competent person
  - Hazardous work activities
  - Materials receipt
  - Workmanship
  - Superintendent weekly safety
  - PM monthly safety
- Audits
- Customer feedback solicitation
- Employee feedback solicitation
- Internal Project Management Reviews
- Change identification, notification and impact assessment

#### 6. Follow Through and Improvement *(Act/React)*

- Corrective action follow up
- Lessons learned
  - Develop
  - Communicate
  - Consult
  - Implement
- Response to client, user and employee feedback
- Emergency response
- Change management/risk management

### Personal Factors

#### 7. Capabilities

- Size, strength, reach
- Pre-existing physical limitations or medical conditions
- Sensory deficiency
- Intelligence
- Aptitude
- Memory
- Emotional disturbance
- Mental illness
- Fears/phobias

#### 8. Stress

- Fatigue due to task load, duration or repetition
- Fatigue due to extended work schedule/ lack of rest
- Boredom
- Sensory overload
- Emotional overload
- Conflicting demands/confusion
- Frustration

#### 9. Knowledge or Skills

- Experience
- Training
- Orientation
- Infrequent activity/lack of practice
- Coaching, evaluation and feedback

#### 10. Motivation

- Convenience – save time or effort
- Improper behavior is approved, allowed, condoned or rewarded
- Proper behavior is ignored or punished by intended or unintended consequences
- Inadequate reinforcement of proper behavior
- Peer pressure
- Inadequate discipline
- Resistance to change

#### 11. Abuse or Misuse

- Intended
- Unintended

## Step 5. Corrective Action Plan

**Development of an Action Plan to correct the root cause(s). Consider various systems, and whether or not 1) we have a process [P]; 2) our process consists of adequate standards [S]; and 3) whether we have sufficient compliance with our standards [C].**

### Improvement Action Guide

#### 1. Leadership

P S C

Core values
Mission
Policies
Balanced score card
Client alignment
Business processes
Visible leadership
Lead by example

#### 2. Management, Supervision, and Employee Involvement

P S C

Operations management responsibilities and accountability
Project management procedures
Qualified supervision
Adequate resources
Involvement of SMEs
Employee involvement activities
Standard operating procedures

#### 3. Risk Evaluation

P S C

PIP
Incorporation of PIP/RMP into project plans
Hazard identification and evaluation
Environmental impact assessment
Customers and stakeholders expectations and change probability
Process risk or hazard analysis
Activity hazard analysis

#### 4. Project Development

P S C

Understanding requirements
Understanding the contract
Estimating procedures
Bid/proposal review procedures
Inclusion of SMEs

#### 5. Planning

P S C

Understanding requirements
Understanding the contract
Handoff and tasking
Integration of risk management plans
Identification of requirements
Project plans and plan reviews
Client alignment meetings
Kickoff, MUM, pre-construction meetings
Schedule procedures
Engineering design and review procedures
Submittal development and review
Site layout, facility arrangement and task design
Means and methods
Communication of plans and procedures

#### 6. Procurement and Subcontractor Management

P S C

Subcontractor pre-qualification
RFP/SOW
Materials and equipment specifications
Selection
Integration
Oversight
Evaluation

#### 7. Risk Controls

P S C

Risk management plans
Standard operating procedures
Quality control system
Engineering controls
Administrative controls
PPE procedures
Permit procedures
Environmental policies, procedures and controls
Process controls
Accident prevention signs, tags and barricades
Hazardous work permits
Preventive maintenance
Rules
Security controls

#### 8. Human Resources

P S C

Hiring
Placement/assignment
Training
Competency
Evaluation and feedback
Incentive plans
Level of effort requirements and resource allocation

#### 9. Emergency Procedures

P S C

Analysis
Plans
Communication and training
Drills and tests
Critique and follow-up
Dedicated supplies
Warnings and alarm systems

#### 10. Communications and Promotions

P S C

ECCONET postings
Meetings
Tailgates
Orientation, new employee and site-specific
Postings
Promotion campaigns

#### 11. Monitoring and Measuring

P S C

Progress meetings and reporting
Four-phase process
Inspections
Audits and surveillances
Testing
Exposure monitoring
BSC progress reporting
Client feedback solicitation
Employee perception surveys
Hotline and reporting mechanisms
ECCOSLIPS
PMRs

#### 12. Continuous Improvement

P S C

Incident reporting
Lessons learned
Action item tracking
Client and stakeholder feedback and follow-through
Employee feedback system
Consultation of LL and incident databases
Change management procedures

#### 13. Management Reviews

P S C

PMR process
Audit tracking
BSC progress monitoring
Client reporting

*Never Compromising Safety*

*Never Compromising Quality*

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# APPENDIX I

# ACCIDENT PREVENTION PLAN

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# ACCIDENT PREVENTION PLAN

## ENVIRONMENTAL REMEDIATION SERVICES
## U.S. ARMY GARRISON-REDSTONE ARSENAL

**June 2021**

**Prepared for:**

**U.S. ARMY ENVIRONMENTAL COMMAND**
**Southeast-Environmental Service and Support Division**
**2450 Connell Road, Building 2264**
**Fort Sam Houston, TX 78234-7664**

**Contract No.: W9124J-18-D-0004, Delivery Order W9124J21F0020**

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# ACCIDENT PREVENTION PLAN

## ENVIRONMENTAL REMEDIATION SERVICES
## U.S. ARMY GARRISON- REDSTONE ARSENAL, REDSTONE ARSENAL, ALABAMA

**June 2021**

**Prepared for:**

**U.S. ARMY ENVIRONMENTAL COMMAND**
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**Contract No.: W9124J-18-D-0004, Delivery Order W9124J21F0020**

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **ºF** | degrees Fahrenheit |
| **ºC** | degrees Celsius |
| < | less than |
| > | greater than |
| **%** | percent |
| **µg/L** | micrograms per liter |
| **µg/m$^3$** | micrograms per cubic meter |
| **Abs** | skin absorption |
| **ACGIH** | American Conference of Governmental Industrial Hygienists |
| **ADEM** | Alabama Department of Environmental Management |
| **AED** | Automated External Defibrillator |
| **Ag** | Silver |
| **AHA** | Activity Hazard Analysis |
| **ANSI** | American National Standards Institute |
| **APP** | Accident Prevention Plan |
| **ASTM** | American Society for Testing Materials |
| **BBP** | Bloodborne Pathogen |
| **Beta-BHC** | Beta-hexachlorocyclohexane |
| **BLS** | Bureau of Labor Statistics |
| **bpm** | beats per minute |
| **C** | Ceiling limit value which should not be exceeded at any time |
| **Ca** | carcinogen |
| **Cd** | Cadmium |
| **CFR** | Code of Federal Regulations |
| **CHHM** | Certified Hazardous Materials Manager |
| **CIH** | Certified Industrial Hygienist |
| **CMDS** | Corrective Measures Design Study |
| **CMI-O** | Corrective Measures Implementation - Operations |
| **CMIP** | Corrective Measures Implementation Plan |
| **CMIR** | Corrective Measures Implementation Report |
| **CMS** | Corrective Measures Study |
| **Co** | cobalt |
| **CO** | carbon monoxide |
| **Con** | skin and/or eye contact |
| **COC** | contaminant of concern |
| **COR** | Contracting Officer's Representative |
| **CP** | Competent Person |
| **CPR** | Cardiopulmonary Resuscitation |
| **CSP** | Certified Safety Professional |
| **CWM** | chemical warfare materiel |
| **Cr** | Chromium |
| **CRC** | Contamination Reduction Corridor |
| **CRZ** | Contamination Reduction Zone |
| **DA** | Department of the Army |
| **DART** | Days Away, Restricted, or Transferred |
| **dB** | decibel |
| **dBA** | decibels adjusted |
| **DCE** | Dichloroethene |
| **DD** | Decision Document |
| **DDT** | Dichlorodiphenyltrichloroethane |
| **DFOW** | Definable Feature of Work |

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **DIA** | Defense Intelligence Agency |
| **DNT** | dinitrotoluene |
| **DoD** | Department of Defense |
| **DPT** | Direct Push Technology |
| **ECC** | Environmental Chemical Corporation |
| **EDGN** | ethylene glycol dinitrate |
| **EMR** | Experience Modification Rate |
| **ESQ** | Environment, Safety, and Quality |
| **EU** | European Union |
| **EZ** | Exclusion Zone |
| **GCWD** | Gulf Chemical Warfare Depot |
| **GDA** | Government Designated Authority |
| **HAZWOPER** | Hazardous Waste Operations and Emergency Response |
| **HBV** | Hepatitis B Virus |
| **HEPA** | high-efficiency particulate air |
| **Hg** | mercury |
| **HIV** | Human Immunodeficiency Virus |
| **HAS** | Hollow Stem Auger |
| **HTRW** | Hazardous, Toxic and Radioactive Waste |
| **Hz** | Hertz |
| **I/C** | Impact/Compression |
| **IDLH** | Immediately Dangerous to Life and Health |
| **IDW** | Investigation Derived Waste |
| **Inh** | inhalation |
| **Ing** | ingestion |
| **ISEA** | Industrial Safety Equipment Association |
| **ISEB** | In-Situ Enhanced Bioremediation |
| **LEL** | lower explosive limit |
| **LUC** | Land Use Control |
| **MEC** | munitions and explosives of concern |
| **mg/kg** | milligrams per kilogram |
| **mg/m$^3$** | milligrams per cubic meter |
| **MIP** | Membrane-Interface Probe |
| **Mn** | manganese |
| **MNA** | Monitored Natural Attenuation |
| **NA** | Not applicable |
| **NAICS** | North American Industrial Classification System |
| **ND** | Not determined |
| **NFPA** | National Fire Protection Association |
| **NIOSH** | National Institute for Occupational Safety and Health |
| **O&M** | Operations and Maintenance |
| **OEL** | Occupational Exposure Limit |
| **OSHA** | Occupational Safety and Health Administration |
| **OWS** | oil/water separator |
| **PAH** | polycyclic aromatic hydrocarbon |
| **Pb** | Lead |
| **PCE** | tetrachloroethene |
| **PEL** | Permissible Exposure Limit |
| **PG** | Professional Geologist |
| **PID** | Photoionization detector |
| **PM** | Program/Project Manager |

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| **PMP** | Project Management Professional |
| **PPE** | Personal Protective Equipment |
| **ppm** | parts per million |
| **PWS** | Performance Work Statement |
| **QC** | Quality Control |
| **QCM** | Quality Control Manager |
| **QCP** | Quality Control Plan |
| **QP** | Qualified Person |
| **RAC** | Risk Assessment Code |
| **RDX** | 1,3,5-trinitro-1,3,5-triazine |
| **REL** | NIOSH Recommended Exposure Limit |
| **RIR** | Recordable Injury Rate |
| **RSA** | Redstone Arsenal |
| **SAMHSA** | Substance Abuse and Mental Health Services Administration |
| **SDS** | Safety Data Sheet |
| **SHM** | Safety and Health Manager |
| **SOH** | Safety and Occupational Health |
| **SOP** | Standard Operating Procedure |
| **SOW** | Scope of Work |
| **SSHO** | Site Safety and Health Officer |
| **SSHP** | Site Safety and Health Plan |
| **STEL** | Short term exposure limit |
| **SVOC** | semivolatile organic compounds |
| **SZ** | Support Zone |
| **TBD** | To Be Determined |
| **TCE** | Trichloroethene |
| **TCRA** | time-critical removal action |
| **TLV** | Threshold Limit Value |
| **TSCA** | Toxic Substances Control Act |
| **TWA** | Time-weighted Average |
| **UL** | Underwriters Laboratories |
| **USACE** | United States Army Corps of Engineers |
| **USAEC** | United States Army Environmental Command |
| **UST** | underground storage tank |
| **UXO** | unexploded ordnance |
| **VC** | vinyl chloride |
| **VOC** | volatile organic compound |
| **WBGT** | Wet Bulb – Globe Temperature |
| **WWII** | World War II |

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## WORKER ACKNOWLEDGEMENT OF THE ACCIDENT PREVENTION PLAN/SITE SAFETY AND HEALTH PLAN AND SITE ORIENTATION

I have read or been trained to the contents of this Accident Prevention Plan (APP). I understand the contents, and I agree to abide by its requirements. I understand that failure to comply with the provisions of this plan can lead to disciplinary action and possible termination from the project. Documentation of worker acknowledgment will be placed in the Project Records.

**APP/Site Safety and Health Plan (SSHP)/Site Orientation Acknowledgment Form**

| Printed Name | Signature | Date |
|---|---|---|
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## 1.0 INTRODUCTION AND SIGNATURES

This Accident Prevention Plan (APP) has been prepared by Environmental Chemical Corporation (ECC) to describe how ECC's Safety and Occupational Health (SOH) Program is tailored to the processes, hazards and requirements for environmental remediation services at Redstone Arsenal (RSA), Alabama. Work conducted under this contract will be performed in accordance with applicable Federal, State, and local SOH laws and regulations including: Occupational Safety and Health Administration (OSHA) standards (including 29 Code of Federal Regulations [CFR] 1910 and 29 CFR 1926) and the United States Army Corps of Engineers (USACE) Safety and Health Requirements Manual (EM 385-1-1, 15 November 2014). The contents of the APP are subject to review and revision as new information becomes available.

**Plan Preparer:**

Lauren Sparkman Digitally signed by Lauren Sparkman DN: cn=Lauren Sparkman, o=ECC, ou, email=lsparkman@ecc.net, c=US Date: 2021.06.08 16:06:58 -05'00'

| 8 June 2021 | (808) 479-0668 |
|---|---|
| Lauren Sparkman<br>Environmental Engineer | Date | Phone Number |

**Plan Concurrence:**

Kym Edelman

| 8 June 2021 | (757) 435-5384 |
|---|---|
| Kym Edelman, Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP)<br>Safety and Health Manager (SHM) | Date | Phone Number |

**Plan Approval:**

Pamela Foti

| 8 June 2021 | (508) 274-3084 |
|---|---|
| Pam Foti, Certified Hazardous Material Manager (CHMM), Project Management Professional (PMP)<br>Project Manager (PM) | Date | Phone Number |

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# 2.0 BACKGROUND INFORMATION

This section presents a brief description of the project including site descriptions, Scope Of Work (SOW), and key personnel.

| | |
|---|---|
| Contractor: | ECC |
| Contract number: | W9124J-18-D-0004 |
| Delivery Order: | W9124J-21F0020 |
| Project Name: | Environmental Remediation Services, RSA, Alabama |

## 2.1 RSA History and Description

The RSA occupies approximately 38,300 acres in Madison County, Alabama (**Figure 2-1**). The RSA is bounded on the north and east by the city of Huntsville, on the west by the city of Madison, on the west and southwest by Wheeler National Wildlife Refuge, and on the south by the Tennessee River. Huntsville has a population of nearly 165,000; Madison County population is about 320,000. Approximately 330 military families reside in government quarters on RSA and approximately 40,000 government employees and contractors work at the facility. The primary mission of RSA is the development, acquisition, testing, fielding, and sustainment of aviation and missile weapon systems. Most of the installation tenants support this effort; however, RSA is also home to such diverse activities as training for handling explosives and ordnance devices, Defense Intelligence Agency (DIA) activities, and the production of iron carbonyl. The RSA is home to over 70 different tenant organizations.

## 2.2 Site Descriptions and Scope of Work

The SOW under Contract W9124J-18-D-0004 is to perform environmental remediation services at RSA. Site descriptions and their associated SOWs are discussed below.

***RSA-156 Groundwater Site, Groundwater Unit #13 and RSA-157 Groundwater Site, Groundwater Unit #14***

RSA-156 is a 1,400-acre groundwater unit that includes the RSA-116 surface media site and hundreds of igloo-style magazines used for storage of explosives, conventional munitions, and chemical munitions (historically), as well as various small-scale testing and conditioning facilities. The SOW includes the following:

- Respond to Alabama Department of Environmental Management (ADEM) comments and finalize Corrective Measures Study (CMS).
- Prepare Corrective Measures Implementation Plan (CMIP) and Decision Document (DD)/Statement of Basis and permit modification for the implementation of the groundwater corrective measures.
- Implementation of Corrective Measures (Monitored Natural Attenuation [MNA] and Land Use Controls [LUCs]) including installation up to three bedrock wells, installation of LUC signs, and preform groundwater and spring sampling.
- Prepare Corrective Measures Implementation Report (CMIR).

***RSA-262, CSW Warehouse Area***

RSA-262 is the former Gulf Chemical Warfare Depot (GCWD) area. Five of seven warehouses originally located at RSA-262 remain and are used for storage/administrative purposes. Two buildings were demolished in 2004. The warehouses were constructed in October 1942 and historically used for storage

of inert materials, such as spare parts and shipping crates, and for rehabilitation of unserviceable munitions/equipment. The SOW includes the following:

- Respond to United States Army Environmental Command (USAEC)/RSA comments and finalize CMS.
- Develop CMIP with a permit modification.
- Finalize DD/Statement of Basis.
- Implement CMIP including excavation and transport and disposal of polycyclic aromatic hydrocarbon (PAH)-impacted soil, confirmation sampling, and site restoration. Additionally, install monitoring wells, perform groundwater sampling, and perform groundwater injection event.
- Prepare CMIR.

***RSA-263 CWS Depot Motor Pool (Building 8017)/Change House (Building 8020)***

RSA-263 is a 3.3-acre site located within the RSA-154 groundwater site. Building 8017 was used as a motor repair shop to support chemical warfare materiel (CWM) operations until 1957, when it was converted to storage, repair shop, and dry boat storage. Building 8020 was originally used as a change house for CWM Services personnel and later converted to a laboratory/equipment testing mission. Buildings 8015 and 8016 existed on the same foundation and were comprised of a gasoline pump station and a motor greasing and wash stall. A gasoline UST was located at the east side of the building and was removed in the 1980s. The four former buildings B-8015, B-8016, B-8020, and B-8017 have been demolished. The SOW includes the following:

- Prepare CMIP, DD/Statement of Basis and permit for modification for the implementation of groundwater corrective measures (MNA).
- Implement MNA including sampling monitoring wells.

***CCSWMU-306, Steam Heating Plant, Building 7291***

RSA-306 is comprised of Building 07291. The facility is an active steam heating plant which includes an oil/water separator (OWS) and concrete sump to the northwest, two former underground storage tanks (USTs) to the northeast, and a water conditioning vault with steam pipelines to the southwest. The SOW includes the following:

- Prepare Corrective Measures Design Study (CMDS) including Membrane-Interface Probe (MIP) survey and groundwater sampling.
- Prepare CMIP.
- Prepare DD/Statement of Basis.
- Implement remedy, which is unknown as this time.
- Prepare CMIR.
- Perform one year of quarterly Corrective Measures Implementation- Operations (CMI-O) sampling with reporting.

***RSA-308, Exterior Sump at Building 7120***

RSA-308 is a 0.01-acre site located in the southeastern portion of RSA. The exterior sump and drainage channel associated with Building 7120 collected propellant wastes from floor drains located within the test bays. The SOW includes the following:

- Prepare CMIP, permit modification, and DD.
- Install interface wells and perform sampling motoring wells.

- Prepare CMIR
- Perform one year of semiannual groundwater sampling and reporting

***MSFC-033A, Surface Soils East of Building 4816; RSA-056, Closed Arsenic Waste Ponds (South) Area U; RSA-139, Closed Arsenic Waste Ponds (North) Area U; RSA-282/ RSA-072-R-01, Former Mortar Test Site***

MSFC-033A was the result of the inadvertent placement of PAH-contaminated surface soil to the east side of Building 4816. The contaminated soils were partially covered with a new foundation for building expansion and a concrete pad for an electrical generator. RSA-056 and RSA-139 are located adjacent to each other and both were unlined surface impoundments that received arsenic-contaminated sludge/wastewater in the early-1940s. The sites are fenced and overlain by a compacted clay cap. RSA-282 was part of the RSA-072 mortar-tube proofing range. Munitions and explosives of concern (MEC) were found and removed prior to and during a time-critical removal action (TCRA) in 2008 and 2009. The probability of encountering unexploded ordnance (UXO) has been determined to be low; however, since the site was once part of an active range and MEC was historically detected, the site is not eligible for unrestricted use as defined in Alabama Administrative Code r. 335-5. The SOW includes the following:

- Implement corrective measures at all sites including a version of LUCs with fencing and groundwater monitoring at RSA-056/RSA-139.
- Prepare CMIRs.

***RSA-009, Inactive Sewage Treatment Plan #3 and RSA-140, Inactive Disposal Area Near T/S Tower***

RSA-009 is an inactive sewage treatment plant located on 3.4 acres that was constructed in 1942. It is not in use but is fully operational. The site includes both Toxic Substances Control Act (TSCA)-regulated and non-hazardous solid waste streams. RSA-140 is an inactive disposal area located on three acres that consists of two disposal mound areas comprised of construction materials that cover an area of 320 square feet. The SOW includes the following:

- Perform excavation, confirmations sampling, site restoration, groundwater sampling (RSA-009 only), and well abandonment (RSA-009 only).
- Prepare CMIRs.

***RSA-058, Inactive Rubble Fill/Waste Pile Area W***

RSA-058 is a historical rubble fill area. It was reportedly used for disposal of ash from ordnance demolition in the 1940s/1950s and for rubble and other fill during the 1960s/1970s. The SOW includes the following:

- Perform geophysical survey, delineation sampling, excavation, confirmation sampling, and site restoration.
- Update wetlands delineation.
- Prepare Construction Best Management Practices Plan, Well Closure Plan, CMIR, and Survey Plat.

***RSA-083 Inactive Spray Booth Sump***

RSA-083 occupies approximately 5.9 acres within Test Area 10, along Eagle Road. Building 7344 was used for large rocket motor preparation/assembly and painting of missile casings. Trichloroethene (TCE), the primary contaminant of concern (COC), has been steadily decreasing in groundwater, accompanied by increases in TCE degradation products (cis-1,2-dichloroethene [DCE]/vinyl chloride [VC]), suggesting that natural attenuation is reducing COCs in site groundwater. The SOW includes the following:

- Perform well inspection, groundwater sampling, and reporting

***CCSWMU-003 (RSA-003), In-Ground Oil/Water Separator, Building 3617***

Building 3617 was constructed during World War II (WWII) as a warehouse/shipping facility. During the 1960s, it became the Auto Skills Center, where military personnel performed maintenance on personal vehicles. RSA-003 is the location of a former in-ground OWS. The former OWS (removed in 2000) received waste lubricant oils, grease, solvents, and detergents until 1997 and when it was replaced by a new in-ground OWS. Historical spills/leaks resulted in groundwater contamination. The SOW includes the following:

- Perform dye tracer study.
- Prepare Design Optimization Summary Report
- Perform In-Situ Enhanced Bioremediation (ISEB) injections.
- Perform two years of quarterly performance monitoring and reporting.

***RSA-048, Inactive Closed sanitary Landfill and RSA-059 Inactive Construction Rubble Fill***

Sites RSA-048 and RSA-059 are surface disposal areas/landfills. RSA-048 is a 5.5-acre site that was active from 1947 through the early 1950s and received construction rubble. Limited previous sampling indicates the presence of industrial waste constituents such as metals, semivolatile organic compounds (SVOCs) (including PAHs), and volatile organic compounds (VOCs) in soil, sediment and groundwater. The nature/extent of these waste materials is unknown. The disposal area was not formally capped but has a thin layer of soil covering the waste piles/trenches. Environmental concerns are driven by the potential of contaminant release to the wetland. Current land usage is for non-intrusive surface use only.

RSA-059 is an approximately 11.8-acre site located in the central portion of RSA that is bounded on the north, east, and south sides by wetlands and the southern and eastern portions of the site are within the 100-year flood zone. A major sewage lift station is located in the western portion of this site. The site was active from the late-1940s to the mid-1970s and was used for disposal of rubble, construction debris (primarily railroad ties), sanitary and industrial waste. The SOW includes the following:

- Finalize CMIPs.
- Perform geophysical survey, test pits and sampling of all media.
- Prepare CMS, CMIP, and DD/Statement of Basis for each site.

***RSA-255 Former Manganese Ore Storage Area***

RSA-255 is an 8.3-acre site located within the former GCWD Area in the south-central portion of RSA; was used for the stockpiling of strategic minerals (i.e., manganese ore). The SOW includes the following:

- Perform mechanically disc plow and rake the soil to remove and collect visible manganese ore, transportation and disposal, and site restoration.
- Perform soil sampling if necessary.

### 2.2.1 Anticipated High Risk Activities

Anticipated high risk activities for this project include excavation and trenching. Competent persons (CPs) will be designated on the Activity Hazard Analysis (AHA) for this respective activity, and will be present on site, as required by USACE EM 385 1-1 during the activity.

## 2.3 Major Phases of Work Anticipated

To achieve the aforementioned SOWs, this project will include the following anticipated definable features of work (DFOW) listed in **Table 2-1** below.

**Table 2-1: Hazardous Activities Anticipated in the Scope of Work**

| Hazardous Activities (Require Activity Hazard Analyses) |
|---|
| Mobilization, Site Inspection and Site Preparation[(a)] |
| Environmental Sampling[(a)] |
| Well Installation, Maintenance, and Abandonment[(a)] |
| Landfill Repair and Maintenance[(a)] |
| Land Use Control (LUC) Inspections and Geophysical Survey[(a)] |
| Direct Push Technology (DPT)/ Hollow Stem Auger (HSA)/Air Rotary/ Interface Probe (MIP) Survey[(a)] |
| Excavation, Transportation, and Disposal[(a)] |
| In-Situ Enhanced Bioremediation (ISEB) injection |
| Disc and Raking Contaminated Soil[(a)] |
| Equipment Decontamination, Demobilization and Site Restoration[(a)] |

**Notes:**
(a) Activity Hazard Analyses is included as **Appendix A**.

The APP was prepared to address the complete range of activities to be conducted per the Performance Work Statement (PWS). Hazards associated with the work that will be addressed in the AHAs, some of which have been completed and are included in **Appendix A**. Other AHAs will be developed during the course of the project prior to the preparatory meeting associated with each DFOW as the work develops.

Work conducted under this contract will be performed in accordance with USACE Health and Safety Requirements Manual, EM 385-1-1 (30 November 2014), National Fire Protection Association (NFPA) 101 Life Safety Code (2006) and ECC Standard Operating Procedures (SOPs) addressing safety work practices.

## 2.4 Contractor Accident Experience

As shown in **Table 2-2**, ECC has an excellent safety record. ECC's Experience Modification Rate (EMR) is less than 1.0, indicative of fewer injuries and claims compared to other construction companies. The OSHA Recordable Injury Rate (RIR) is also less than the industry averages 2014 Bureau of Labor Statistics (BLS) data in North American Industrial Classification System (NAICS) Code 236, Building Construction.

**Table 2-2: ECC OSHA Recordable Injuries and Illnesses through Quarter 2 2020**

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | National Avg Remediation 56291 (2018) | Nat Av Non-Res Bldg 2362 (2018) |
|---|---|---|---|---|---|---|---|---|
| **Work Hours** | 783,714 | 650,615 | 533,274 | 523,449 | 772,677 | 399,171 | | |
| **Total Recordable Cases** | 5 | 2 | 2 | 0 | 1 | 1 | | |
| **Total Recordable Rate** | 1.27 | 0.61 | 0.75 | 0.0 | 0.28 | 0.5 | 2.9 | 2.5 |
| **DART Cases** | 2 | 2 | 2 | 0 | 0 | 0 | | |
| **DART Rate** | 0.51 | 0.61 | 0.75 | 0.00 | 0.0 | 0.5 | 1.7 | 1.4 |

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | National Avg Remediation 56291 (2018) | Nat Av Non-Res Bldg 2362 (2018) |
|---|---|---|---|---|---|---|---|---|
| **Days Away Cases** | 2 | 2 | 2 | 0 | 0 | 0 | | |
| **Days Away Rate** | 0.51 | 0.61 | 0.75 | 0.00 | 0.0 | 0.0 | 0.9 | 0.8 |
| **Interstate EMR** | 0.63 | 0.65 | 0.70 | 0.74 | 0.7 | 0.73 | | |

**Notes:**
DART = Days Away, Restricted, or Transferred
EMR – Experience Modification Rate

Copies of ECC's OSHA Form 300 for the above-referenced years are available on request.

## 2.5 Key Field Personnel

**Table 2-3** lists key field personnel for this project. Resumes of the Site Safety and Health Officer (SSHO) and SHM are included in **Appendix B**.

**Table 2-3: Key Personnel**

| Name | Organization | Role | Contact (phone) |
|---|---|---|---|
| Jennifer Graham | USAEC | COR | Office: (210) 466-1406 |
| Clint Howard | U.S. Army – RSA | Branch Chief – Environmental Restoration | Office: (256) 842-3702 |
| Pam Foti, CHMM, PMP | ECC | PM | Mobile (508) 274-3084 |
| Carol Canada, PG | ECC | Assistant PM | Mobile: (615) 693-9915 |
| Kym Edelman, CIH, CSP | ECC | SHM | Mobile: (757) 496-5622 |
| Brian Kateley | ECC | SSHO | Mobile: (410) 671-2970 |
| Aaron Glad | ECC | Site Superintendent | Mobile: (508) 229-2270 |

**Notes:**
CHMM – Certified Hazardous Materials Manager
CIH – Certified Industrial Hygienist
COR – Contracting Officer's Representative
CSP – Certified Safety Professional
ECC – Environmental Chemical Corporation
PG – Professional Geologist
PM – Project Manager
PMP – Project Management Professional
SHM – Safety and Health Manager
SSHO – Site Safety and Health Officer
USAEC – United States Army Environmental Command

## 3.0 STATEMENT OF SAFETY AND HEALTH POLICY

The ECC Corporate Environment, Safety and Quality (ESQ) statement is presented in **Figure 3-1**. The statement will be posted at the job site on the safety and health bulletin board and in other applicable locations.

The safety goal for this project is zero loss incidents, and zero incidents with a high potential for loss. ECC will strive to complete the project without any injuries, significant property damage incidents, reportable environmental releases, or quality defects requiring re-work.

Objectives to meet this goal include:

- Conduct client kickoff meeting before the start of the project
- Hold subcontractor pre-construction meetings before work begins
- Implement the three-phase quality control (QC) system
- Conduct site orientation, including review of this APP with all project participants
- Use only trained and qualified workers
- Generate AHAs for all major DFOWs and train workers in AHA content
- Perform daily work-site inspections
- Conduct daily Plan-of-the-Day and Safety Tailgate Meetings
- Hold workers accountable for following hazard controls listed in the AHA
- Hold monthly project ECC and Subcontractor management safety meetings
- Conduct inspections by qualified Safety and Health personnel
- Employee participation activities such as milestone recognition and establishing a safety committee by the on-site team.

**Figure 3-1: ECC Corporate Environment, Safety, and Quality Statement**

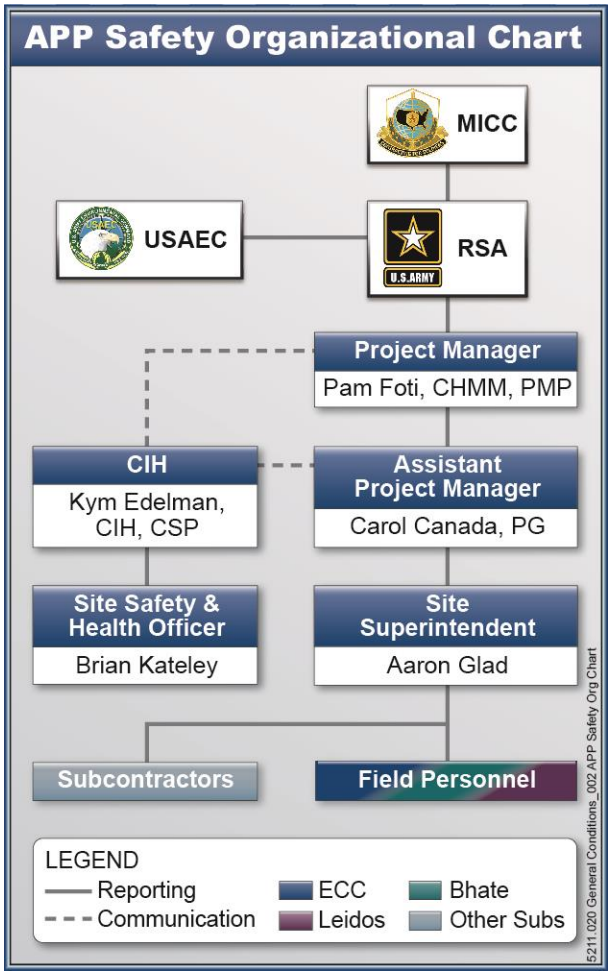


## 4.0 ORGANIZATION, RESPONSIBILITIES, AND LINES OF AUTHORITY

ECC and its subcontractors are responsible for implementing this APP. Personnel responsibilities for project safety and the lines of authority of these safety personnel are described below. Refer to **Figure 4-1** for the project safety organization. Resumes of the SHM and SSHO are provided in **Appendix B.**

ECC, as the prime contractor, is the "controlling authority" for all work site safety and health of the subcontractors. ECC is responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

**Figure 4-1: Safety Organization**




### 4.1 Health and Safety Responsibilities

The following sections describe the key personnel involved in this project and their responsibilities. To achieve the goals of the APP, each individual must fulfill their responsibilities and comply with the health and safety requirements. Failure to do so could result in removal from the site.

No work will be conducted on the site without the presence of the Site Safety and Health Officer (SSHO) or designated CP. Pre-task analysis (AHA, daily tailgate, Job Safety Analysis) will be conducted prior to doing work.

### 4.1.1 ECC Project Manager

Reports through Program Director to the Chief Operating Officer.

The PM, Ms. Pam Foti, CHMM, PMP, represents ECC in all aspects of work under the contract and is responsible for the following:

- Providing leadership by setting an example for all site personnel through actions and words regarding the importance of proper health and safety practices and holding project staff accountable for safety performance.
- Ensuring adequate resources are available to implement the APP.
- Ensuring that subcontractor Statements of Work include appropriate safety provisions and expectations.
- Ensuring that mishaps are properly reported to the Army and ECC's ESQ reporting network.
- Notifying the SHM of any changes in the SOW or site conditions.
- Ensuring that the APP is updated to address new hazards.

### 4.1.2 ECC Safety and Health manager

Reports to the Vice President of ESQ.

The SHM, Ms. Kym Edelman, CIH, CSP will oversee the overall project health and safety structure and implementation.

The SHM is responsible for the following:

- Reviewing and signing the APP prior to submittal and approving any modifications.
- Developing and/or reviewing AHAs prepared for the project.
- Approving the appointment of the SSHO and ensuring that the SSHO has the appropriate training and competencies to perform all expected duties.
- Being available on a 24-hour basis for consultation with the SSHO during on-site emergencies or as needed.
- Providing on-site consultation as needed to ensure the APP is fully implemented.
- Conducting general safety inspections during site visits and at least once per quarter.
- Participating in the investigation of mishaps.
- Evaluating air monitoring data and recommending changes to engineering controls, work practices, and personal protective equipment (PPE).
- Assisting in development of on-site training, which will be provided by the SSHO.

### 4.1.3 Site Safety and Health Officer

Reports to the PM and SHM.

The SSHO, Mr. Brian Kateley, implements the task-specific APP. In accordance with USACE EM 385-1-1, the SSHO must have completed the 30-hour OSHA Construction Safety course, the 30-hour General Industry Safety course, or an equivalent course meeting the 30-hour training objectives; eight hours of safety and health coursework every year; and at least five years' experience in construction or general industry safety or four years' experience plus a third party, nationally accredited SOH certification.

The SSHO will be responsible for:

- Serving as the general site CP for safety and health (EM 385-1-1 01.A.17 and 29 CFR 1926.20(b)(2)). No work will be done unless the SSHO or a suitable CP is on site.
- Overseeing compliance with the APP procedures and OSHA regulations through informal daily inspections.
- Developing (or assisting subcontractors with the development of) project-specific AHAs before work begins.
- Reporting to the site on a full-time basis for the duration of field activities.
- Serving as a member of the QC staff on matters relating to safety and health.
- Stopping work if unacceptable safety and health conditions exist and taking necessary action to re-establish and maintain safe working conditions.
- Consulting and coordinating modifications to the APP with the SHM, ECC PM, and designated U.S. Army representative.
- Ensuring all site personnel and visitors are properly trained in site hazards.
- Ensuring all employees and subcontractors are properly trained on the APP/AHAs and implement the APP.
- Conducting air monitoring and preparing air monitoring reports.
- Conducting site safety surveys and maintaining deficiency logs.
- Ensuring accidents are reported, investigated, and corrective actions are implemented.
- Monitoring decontamination methods to determine effectiveness.
- Ensuring proper training on PPE usage and monitoring the effectiveness of the PPE program.
- Maintaining all required safety and health records (e.g., OSHA 300 Logs, incident/accident reports, training certificates and qualifications, equipment checklists, safety plans, air monitoring data and reports) throughout the life of the project.

### 4.1.4 Site Superintendent

Reports to the PM.

The Site Superintendent, Mr. Aaron Glad**,** is responsible for:

- Setting an example for all site personnel through actions and words regarding the importance of proper health and safety practices on the job.
- Assisting in the development of AHAs before beginning work.
- Communicating daily work plans and schedules with the SSHO.
- Monitoring overall safety performance of field personnel.
- Conducting a weekly general safety inspection of the site, when needed.
- Enforcing safety rules and correcting work practices or conditions that may result in injury or hazard exposure.

- Immediately stopping site operations in emergencies or serious hazard exposure.
- Participating in mishap investigations.
- Ensuring proper equipment is provided, utilized, and maintained in accordance with manufacturer recommendations.

### 4.1.5 Field Personnel

Report to the SSHO, Site Superintendent, or CP.

Field personnel are responsible for understanding and abiding by the APP and performing work in a safe and responsible manner. Specific responsibilities include the following:

- Acting in a responsible manner at all times in order to prevent incidents, injury, and exposure to themselves and co-workers.
- Reporting all incidents, including near misses, and hazards to the SSHO.
- Attending and participating in all health and safety tailgate meetings.
- Following the instructions and directions of the SSHO, Site Superintendent, and/or CP.
- Utilizing the PPE provided.
- Following all field safety procedures for safe work practices.
- Performing tasks as instructed (unless the individual feels unqualified to perform the tasks safely).
- Conducting work in a manner compliant with the APP and AHAs.
- Reporting any personal condition that could affect their safety and/or the safety of coworkers (e.g., fatigue, drowsiness, illness, impairment by medications, influence by drugs or alcohol, emotional stress).

### 4.1.6 Subcontractors

Report to the SSHO or CP.

Subcontractors who perform work for ECC under this APP are responsible for the health and safety of their employees. The presence of an SSHO and the implementation of the APP do not relieve subcontractors of their responsibilities as employers. Specific responsibilities of subcontractors include:

- Complying with the requirements of their SOW.
- Development of AHAs for their work activities.
- Maintaining a safe and healthy work environment.
- Complying with contract requirements, laws, regulations, and EM 385-1-1.
- Reviewing the APP to ensure that the health and safety requirements of their specific tasks are satisfied.
- Performing all work in accordance with the APP requirements.
- Providing trained and experienced workers for the specific work activities.
- Participating in the Safety Tailgate Meetings.
- Identifying additional training needs for unique tasks.
- Reporting all incidents and participating in the investigations.
- Participating in routine site inspection activities.

- Ensuring all equipment brought to the site is in a "new or like new" condition, routinely inspected, and maintained in safe working order.
- Setting a positive safety example for all project staff.

#### 4.1.7 Site Visitors

Site visitors will be responsible for the following:

- Participating in a site briefing before leaving the administrative office or site entry point.
- Following all site rules and instructions.
- Being escorted at all times unless otherwise approved by the SSHO.
- Wearing appropriate PPE.

### 4.2 Lines of Authority

ECC as the prime contractor is responsible for the implementation of the SOH Program as described in this APP and attachments. ECC will enforce compliance with the program requirements among our own employees, subcontractors and all others on the worksite.

The SSHO has a technical and administrative reporting relationship to the SHM who reports directly to ECC's President and Chief and Executive Officer. The reporting relationship provides for access to safety and health expertise as well as an independent reporting and line of communication. The SSHO has a functional reporting relationship to the PM, providing the PM and team with a resource for safety and health support for the project.

During field event, an SSHO or CP will perform daily and weekly health and safety inspections and provide general support to the PM for health and safety issues.

### 4.3 Competent Persons

The SSHO serves as the general CP, per EM 385-1-1 01.A.17 and 29 CFR 1926.20(b)(2). The qualifications of the SSHOs are included in **Appendix B**.

CPs for specific activities will be designated in the AHAs for those activities, and their qualifications will be submitted and accepted with the AHA at the Preparatory Meeting.

No work will be performed unless a designated CP/SSHO is present at the job site.

### 4.4 Disciplinary Procedures

All employees are required to comply with APP policies and procedures. Discipline will be in accordance with the Disciplinary Procedure described in the ECC Employee Handbook, which allows for immediate termination for serious infractions. ECC expects that all subcontractors will exercise proper discipline or terminate its employees at its sole discretion when justified. ECC retains the right to deny access to the site to any individual not compliant with safety requirements, in accordance with our subcontract agreement.

### 4.5 Manager and Supervisor Accountability

ECC managers and supervisors are accountable for providing a safe work environment through proper staffing, training, equipment availability, and by setting a leadership example for safety. Annual

performance reviews for managers and supervisors include assessments of project safety performance as well as the individual's demonstrated attitude toward safety.

# 5.0 SUBCONTRACTORS AND SUPPLIERS

ECC will use the subcontractors listed in **Table 5-1** for the execution of this Task Order. As stated in **Section 4.1.6**, subcontractors that perform work for ECC under this APP are responsible for the health and safety of their employees. The presence of an SSHO and the implementation of the APP do not relieve subcontractors of their responsibilities as employers. However, ECC is ultimately responsible for the safety performance during project execution including any work being performed by ECC subcontractors.

## 5.1 Identification of Subcontractors and Suppliers

Subcontractors expected to participate in this project are described in **Table 5-1**.

**Table 5-1: Subcontractors**

| Subcontractor | Scope of Services |
|---|---|
| TBD | MIP Survey |
| TBD | Geophysical survey |
| TBD | ISEB injections - sub |
| TBD | Soil discing |
| TBD | Analytical Chemistry Support |
| TBD | Excavation and Drilling |
| TBD | Monitoring well installation/abandonment |

**Notes:**
ISEB – In-situ enhanced bioremediation
MIP – Membrane-Interface Probe
TBD – to be determined

## 5.2 Managing Subcontractors

Subcontractor safety is critical to successful project performance. Subcontractors are expected to comply with the provisions of this APP and the AHAs. Subcontractor safety performance on the job will be monitored and substandard practices and conditions will be addressed immediately. Furthermore, subcontractor safety performance will be evaluated in the ECC procurement system where the information can be used for future subcontracting decisions.

Subcontractors will provide lists of hazardous materials and copies of Safety Data Sheets (SDS) to the SSHO prior to bringing the materials on-site. The SSHO will submit the SDS to the Contracting Officer's Representative (COR), if requested, and will maintain an active file in the project office.

## 5.3 Supplier Control

All suppliers of safety-related items are required to provide approved and appropriate safety and health materials for the project. The material supplied must meet the specifications, testing criteria or third-party certifications. These criteria are identified in the SOW, Quality Control Plan (QCP), or APP or as recommended by the SSHO. For safety-critical items, specifications will be identified, and receipt inspections will be conducted and documented. Health and safety related supplies will be obtained from recognized safety supply vendors and will meet specified OSHA, European Union (EU) or consensus standards. These items will be inspected upon receipt by the SSHO or the project Quality Control Manager (QCM).

All SDSs for materials brought on-site will be maintained by the SSHO. The QCM may request SDSs as part of the product information submittal process. Each subcontractor is responsible for maintaining their

own SDSs. Refer to **Attachment 9** of the APP for further detail on the project Hazard Communication Program.

## 6.0 MEETINGS AND TRAINING REQUIREMENTS

All ECC and subcontractor project personnel will have the training and certifications required to complete environmental remediation at RSA.

### 6.1 Project Meetings and Training Requirements

The training listed in **Table 6-1** will be provided to project personnel as noted. In addition to the topics listed below, the SSHO (in cooperation with the assistant SSHO), may identify additional topics and work tasks to be included in the training requirements. These special requirements may be noted on Project AHAs requiring additional training. All required training will be documented, and this documentation will be maintained on site.

**Table 6-1: Project Meetings and Training Requirements**

| Topic | Description | Trainer | When Conducted | Personnel |
|---|---|---|---|---|
| ***General Training*** | | | | |
| New Employee Indoctrination | Responsibilities for accident prevention; general SOH policies and procedures; reporting of mishaps; medical facilities and emergency response procedures; reporting of unsafe conditions and practices; job hazards and controls; other specific training as required. | SHM, SSHO, or other authorized by SHM | Before beginning field work | All new hires, and employees new to the project site. |
| APP | Review of APP requirements during site orientation. | SSHO | Before beginning field work | All project personnel |
| AHAs | Activity-specific hazards, controls, and training requirements for a specific phase or activity. | SSHO or designated CP | Before beginning specific tasks | Workers, supervisors, and oversight personnel engaged in the activity |
| HAZWOPER – General Training | 40-Hour OSHA HAZWOPER initial training for general site employees, and three days of supervised on-the-job training for site workers. | HAZWOPER sites | Before beginning field work | Workers, supervisors, and oversight personnel working on-site who must enter the exclusion zone or whose work exposes them to health or safety hazards related to hazardous waste or contaminated media. |
| HAZWOPER Supervisor Training | 8-Hours of training for supervising activities on hazardous waste sites. | HAZWOPER sites | Before beginning field work | Supervisors at HAZWOPER sites |
| Respiratory Protection | In accordance with 29 CFR 1910.134 | SHM, SSHO, or other authorized by SHM; by Subcontractor CP | Before use of respiratory protection | Employees engaged in operations requiring use of respirators |

| Topic | Description | Trainer | When Conducted | Personnel |
|---|---|---|---|---|
| HAZWOPER Refresher | Eight-Hours of annual refresher training for workers on hazardous waste sites. | HAZWOPER sites or SHM | Before beginning field work | Workers, supervisors, and oversight personnel working on-site who must enter the exclusion zone or whose work exposes them to health or safety hazards related to hazardous waste or contaminated media. |
| Emergency Action Plan | Roles, responsibilities, recognition of emergency conditions, reporting and notification, evacuation, and other procedures. | SSHO | Before beginning field work | All project personnel, with detailed information on procedures for workers with special responsibilities |
| Hazard Communication | Requirements for SDSs and labels; hazards of site materials and controls; signs and symptoms of exposure; location of and access to Hazardous Materials and their SDSs. | SSHO | Before beginning field work | All project personnel potentially exposed to hazardous materials |
| Fire Protection and Prevention | Requirements of the Fire Protection and Prevention Plan, general education on selection, distribution, and proper use of fire extinguishers. | SSHO | Before beginning field work; as necessary to document extinguisher training | All project personnel. Fire extinguisher use for personnel designated as Fire Watch (other personnel as deemed necessary) |
| OSHA 30-hour construction or equivalent | Common hazards, controls, and OSHA requirements for construction activities. | Authorized OSHA Trainer | Prior to beginning field work | SSHO |
| Daily Safety Briefing | Review of Plan-of-the-Day and daily hazards; presentation of a specific topic; refresher training on various issues; and changes in hazards, controls, or procedures. | SSHO, Site Superintendent, CP | Daily, prior to work | All field workers, and field oversight personnel |
| Weekly safety Meeting | Incidents, modification to APP, upcoming work, new hazards, etc. | SSHO, CP | Weekly | All field personnel and field oversight personnel |
| ***Special Training*** | | | | |
| **Topic** | **Description** | **Trainer** | **When Conducted** | **Personnel** |
| First Aid/CPR | Principles and techniques for First Aid and CPR. | Red Cross, American Heart Association, or other authorized provider | Prior to beginning field work | At least two project personnel (SSHO, and other field personnel) |
| Fall protection | Fall (from elevation) hazards, fall protection techniques, proper use of personal fall arrest systems and rescue procedures. | SSHO, other qualified instructors | Prior to work at elevation | Task-specific, workers exposed to fall hazards |

| Topic | Description | Trainer | When Conducted | Personnel |
|---|---|---|---|---|
| Lockout/tagout | Site-specific energy control and verification procedures. | SSHO, other qualified instructors | Prior to utilization of Lockout/tag out procedures | Authorized personnel engaged in lockout/ tagout, and affected employees whose work may be impacted by a lockout/tagout situation |
| Forklifts | Hazards and operation procedures, including machine-specific safe operating procedures. | SSHO | Prior to operation of forklift; every three years | Forklift/powered industrial truck operators |
| Other heavy equipment operations | Qualified by SSHO, Site Superintendent or Equipment Supervisor as documented on ECC Equipment Operator Qualifications Form. | SSHO, Equipment Supervisor | Prior to heavy equipment operations on site | Equipment operators |
| Power tools (e.g., chain saws, chippers, powder-actuated tools, compressed air systems) | Hazards; proper use and maintenance of tools as described in operations manual. Powder-operated tool users certified by manufacturer. | SSHO, or a trainer authorized by the manufacturer (explosive-actuated tools) | As part of general site orientation; prior to use of specific tools | Project personnel using power tools |
| UXO Awareness Training | Recognition of munitions and explosives of concern that may be encountered during site activities | UXO Qualified Personnel | Prior to beginning site operations | All site personnel |

**Notes:**
AHA – Activity Hazard Analysis
APP – Accident Prevention Plan
CFR – Code of Federal Regulations
CP – Competent Person
CPR – Cardiopulmonary Resuscitation
HAZWOPER – Hazardous Waste Operations and Emergency Response
OSHA – Occupational Safety and Health Administration
SDS – Safety Data Sheet
SHM – Safety and Health Manager
SOH – Safety and Occupational Health
SSHO – Site Safety and Health Officer
UXO- Unexploded Ordnance

## 6.2 Safety Indoctrination Training for New Employees

New employees to ECC receive indoctrination training before they are allowed to participate in field work. The indoctrination training consists of the following:

- ECC COVID-19 Prevention Program (**Appendix C**)
- Review requirements and responsibilities for accident prevention and maintaining a safe and healthy workplace.
- Review ECC's general safety and health policies and procedures.
- Review ECC's incident reporting system and procedures.
- Identify employees' responsibilities for reporting incidents (safety, health and quality).
- Review medical treatment facilities of the employee's assigned office.
- Review safety, emergency, and evacuation procedures for the employee's assigned office.

### 6.3 Periodic Safety and Health Training for Supervisors and Employees

All project personnel will participate in training/refresher topics throughout the project. These topics may be presented as part of the daily tailgate meetings, or as separate classes established for specific project work activities and procedures. All supervisors, managers, and employees are encouraged to participate in other seminars or courses provided by outside vendors as necessary to increase knowledge and to maintain currency with construction topics, hazards, and controls.

### 6.4 Visitor Indoctrination Policy

All site visitors will be required to review the daily tailgate safety issues and sign the visitor's log. At a minimum, all visitors must be informed of the anticipated hazards, PPE requirements, designated work zones, escort procedures, and emergency procedures.

### 6.5 Site Orientation

All site personnel will be required to attend an initial site orientation prior to the start of field work. This training will be specific to the project and will include a detailed review of this APP, any AHAs applicable to mobilization and site setup, and key general safety requirements as outlined in **Table 6-1** above.

### 6.6 Emergency Response Training

As part of the initial orientation and ongoing refresher meetings, all employees shall be trained in the project-specific emergency response procedures detailed in **Attachments 1** through **3** of this APP. Retraining will occur whenever a drill or actual event identifies deficiencies in performance or when emergency plans change.

### 6.7 Personal Protective Equipment and Safety Equipment Training

Workers will be trained in the proper use of and be able to demonstrate their understanding of proper PPE regarding the selection, donning, doffing and adjustment, limitations and useful life, inspection and testing, proper care including maintenance, storage and disposal.

Retraining of workers shall be conducted whenever it is believed that the worker does not have the understanding or skill required for the use of the PPE.

## 7.0 SAFETY AND HEALTH INSPECTIONS

ECC and its subcontractors will perform periodic health and safety inspections in accordance with **Table 7-1** throughout the duration of the environmental remediation field activities at RSA. Results of all health and safety compliance review audits or inspections will become part of the project file.

### 7.1 General Inspection Procedures

**Table 7-1** lists the general inspection requirements for this project.

Daily site-wide inspections will be conducted by the SSHO. Other CPs identified in specific AHAs will also conduct daily inspections of the work activities within their responsibility, as deemed necessary. Findings that represent deficiencies in the implementation of the APP or EM 385-1-1 will be added to the Tracking Log. Actions, timetable, and responsibility for correcting the deficiencies shall be recorded in the Deficiency Tracking Log. Follow-up inspections to ensure correction of any identified deficiencies will also be conducted and documented in the Deficiency Tracking Log. The Deficiency Tracking Log will be posted in the administrative area and updated on a daily basis. A monthly evaluation of the data should be discussed in the QC or SOH meeting with everyone on the project.

**Table 7-1: General Inspection Requirements**

| What | Who | When | Documentation |
|---|---|---|---|
| General site conditions | SSHO | Daily | Logbook |
| | SSHO | Weekly or as needed | Site Health and Safety Inspection Checklist and Action Item Report, cc: SSHO, PM, Program/SHM |
| | PM | As needed | |
| | Program SHM | As needed | |
| Mobile construction equipment | Operators | Initial and Daily | Inspection checklist, cc: Construction/Equipment Supervisor (Note: Notify Army before initial to coordinate joint inspection) |
| Construction tools and equipment | Users | Daily | None. Tag defective items "out of service" |
| Lock out/Tag Out | SSHO | Prior to working on machinery, equipment, or process units where employees may be exposed to hazardous energy sources. | Lockout/Tagout Permit |
| Rigging | CP | Daily | None. Rigging items must be tagged with load capacities. |
| Ladders | SSHO | Weekly | Logbook, tag or inspection log form |
| Emergency supplies and equipment (fire extinguishers, spill response, PPE, First Aid, etc.) | SSHO | Weekly | Logbook, tag or inspection log form |
| PPE | SSHO | Initial, Periodic | None |
| | Users | Daily | None |

| What | Who | When | Documentation |
|---|---|---|---|
| Hazardous energy sources and processes (electrical systems, pneumatic equipment, etc.) | CP or QP | Initial | Per operating instructions, QCP, O&M procedures |
| | User/Operator | Daily | TBD |

**Notes:**
CP – Competent Person
O&M – Operations and Maintenance
PPE – Personal Protective Equipment
PM –Project Manager
QCP – Quality Control Plan
QP – Qualified Person
SHM – Safety and Health Manager
SSHO – Site Safety and Health Officer
TBD – To be Determined

## 7.2 External Inspections and Certifications

If regulatory agency personnel arrive on site to conduct an inspection, the ECC PM and the following individuals will be contacted immediately:

- COR
- Subcontractor's site representative
- ECC SHM
- ECC General Counsel

If a citation is issued to ECC or its subcontractors, a copy of the citation will be submitted to the COR along with a Corrective Action Plan.

## 7.3 Follow-up Procedures for Inspection Deficiencies

All deficiencies identified during project or equipment inspections are noted and tracked through closure. Deficiencies identified by operators during equipment inspections are noted on the equipment inspection form. Any deficiency noted must be reviewed by the SSHO or site supervisor/foreman prior to the equipment being allowed to operate. Any deficiency that affects safe work performance must be corrected before the equipment is put back into operation. Minor deficiencies that do not affect safe performance will be corrected as soon as practical. Following correction of the deficiency, the noted item is initialed by the SSHO on the inspection form as corrected.

Deficiencies identified during the weekly formal site inspections are noted on the inspection form (with a due date and responsible individual) as well as on the SOH Deficiency Tracking Log posted on the project Safety and Health Bulletin Board. These deficiencies are also tracked to closure and verified upon completion. Deficiencies corrected immediately will be noted on the weekly inspection form.

# 8.0 MISHAP REPORTING AND INVESTIGATION

This section describes the project mishap reporting and investigation procedures. Other Army procedures may be utilized if there is a significant safety issue that occurs during this project.

## 8.1 Mishap Investigation, Reports, Logs

A mishap is any unplanned, undesired event that occurs during the course of work being performed. The term "mishap" includes accidents, incidents and near misses.

Project personnel are required to report all mishaps to their immediate supervisor. The SSHO will immediately arrange appropriate medical care as required. Once immediate medical care for the injured personnel or other critical emergency procedures has been accomplished, the SSHO will follow the Incident Notification, Reporting, and Management Procedure. In the event that an accident results in an employee being sent to a doctor, the Return-to-Work Examination Form will be completed by the attending physician on the date of treatment and will state one of the following conditions:

- Employee may return to full duty.
- Employee may return to limited duty (with type of limitations).
- Employee is unable to return to work.

A copy of this release will accompany the accident report.

For injuries and vehicle accidents, the scene will be secured to prevent additional injury/incident and to administer on-site First Aid Emergency assistance will be arranged prior to making any other notifications. After immediate emergency attention has been given, all incidents will be reported to the PM and SHM.

All recordable mishaps will be reported to the COR by the PM or SSHO as soon as possible, but no later than 24 hours after the incident. These include:

- OSHA Recordable injuries
- Property damage (exceeding $5,000)
- Days Away Injuries
- Days Away Illnesses
- Restricted/Transfer Injuries

Corrective actions will be determined and implemented to prevent the recurrence of the accident; responsibility for implementation of corrective actions will be assigned. Investigation findings and corrective actions will be reported within five days following an accident. A log of OSHA-recordable injuries/illnesses will be maintained.

A project-specific OSHA 300 Log (Log of Work-Related Injuries and Illnesses) will be kept at the job site or maintained by the SSHO. Minor injuries requiring only First Aid will be recorded on a project-specific First Aid log. A copy of the First Aid log will be submitted upon request to the COR. From 1 February through 30 April of each year, OSHA Form 300A (Summary of Work-Related Injuries and Illnesses) will be posted on the project safety and health bulletin board, if available; if not, the SSHO will have a copy available.

## 8.2 Immediate Notification of Major Mishaps

The COR will be verbally notified immediately by the PM or SSHO of any incidents that involve, or appear to involve:

- A fatal injury/illness (Report to OSHA within eight hours)
- Amputation, Loss of an Eye (report to OSHA within 24 hours)
- A permanent total disabling injury/illness
- A permanent partial disabling injury/illness
- In-patient hospitalization (Report to OSHA within 24 hours)
- Property damage of $500,000 or more
- Three or more illnesses suspected of being related to a site condition, or a hazardous or toxic agent on the site
- USACE aircraft destroyed or missing
- An electrical incident including arc-flash, shock, etc.
- Uncontrolled Release of Hazardous Energy (includes electrical and non-electrical)
- A load-handling equipment or rigging mishap
- Fall-from-Height (any level other than same surface)
- Underwater diving mishap

The PM will contact Ms. Kym Edelman immediately if a major incident occurs, as it may require immediate reporting to OSHA or State agencies.

At the time of any major incident, project site conditions will be preserved until released by the Government Investigation Team.

The written report will be submitted to the COR on the appropriate form no later than five working days after the accident. Corrective actions will be implemented as soon as possible. The COR will be notified when the corrective actions are completed.

## 9.0 PLANS, PROGRAMS, AND PROCEDURES

**Table 9-1** lists the plans, programs, and procedures required by EM 385-1-1.

**Table 9-1: Plans, Programs, and Procedures**

| Plans (Programs, Procedures) required by the Safety and Health Manual) | EM 385 Reference | Applicable to this Project? Y | N | If Required, Location or Reference |
|---|---|---|---|---|
| Fatigue Management Plan | 01.A.20 | | X | Work hour criteria will not be exceeded. |
| Emergency Plans: | 01.E | | | |
| Procedures and Test | 01.E.01 | X | | **Attachment 1** |
| Spill Plans | 01.E.01, 06.A.02 | X | | **Attachment 1** |
| Fire Fighting Plan | 01.E.01, 19.A | X | | **Attachment 2** |
| Posting Emergency Telephone Numbers | 01.E.05 | X | | **Attachment 1** |
| Man overboard/abandon ship | 19.A.04 | | X | No boating. |
| Medical Support | 03.A, 03.D | X | | **Attachment 3** |
| Alcohol and Drug Abuse Prevention Plan | 01.C.02 | X | | **Attachment 4** |
| Site Sanitation/Housekeeping Plan | 02.B | X | | **Attachment 5** |
| Medical Support Agreement | 03.A.01, 03.A.03 | X | | **Attachment 3** |
| Bloodborne Pathogen Plan | 03.A.05 | X | | **Attachment 6** |
| Exposure Control Plan | 03.A.05 | X | | **Attachment 6** |
| Automatic External Defibrillator (AED) Program | 03.B.04 | | X | No AEDs on this project |
| Site Layout Plans | 04.A | | X | Will be included in the future in in applicable Work Plans **Attachment 7** |
| Access and Haul Road Plan | 4.B | X | X | If/when subsurface activities are required, this plan will be provided. **Attachment 8** |
| Hearing Conservation Program | 05.C | X | | **Attachment 9** |
| Respiratory Protection Plan | 05.G | | X | Respiratory protection is not anticipated. |
| Health Hazard Control Plan | 06.A | X | | **Attachment 10** |
| Hazard Communication Program | 06.B.01 | X | | **Attachment 11** |
| Process Safety Management Plan | 06.B.04 | | X | No process meeting criteria |
| Lead Compliance Plan | 06.C and specs | | X | No lead abatement |
| Asbestos Abatement Plan | 06.C and specs | | X | No asbestos abatement |
| Radiation Safety Program | 06.F | | X | No radiological hazards |
| Abrasive Blasting Plan | 06.I | | X | No abrasive blasting |
| Heat Stress Monitoring Plan | 06.J.02 | X | | **Attachment 12A** |
| Cold Stress Monitoring Plan | 06.J.04 | X | | **Attachment 12B** |
| Indoor Air Quality Management Plan | 06.L | | X | No Indoor Air Quality issues expected |
| Mold Remediation Plan | 06.L.04 | | X | No mold remediation |
| Chromium VI Exposure Evaluation | 06.M | | X | No exposures to Chromium VI |
| Crystalline Silica Assessment | 06.N.02 | X | | **Attachment 13** |
| Lighting Plan for Night Operations | 07.A.06 | | X | Daylight hour work |
| Traffic Control Plan | 08.C.05 | | X | No work on or near roadways |
| Fire Prevention Plan | 09.A.01 | X | | **Attachment 3** |
| Wild Land Fire Management Plan | 09.L | | X | No wildland work |

| Plans (Programs, Procedures) required by the Safety and Health Manual) | EM 385 Reference | Applicable to this Project? Y | N | If Required, Location or Reference |
|---|---|---|---|---|
| Arc Flash Hazard Analysis | 11.B | | X | No live electrical work |
| Assured Equipment Grounding Control Program | 11.D.05, App E | | X | Ground fault circuit interrupters used. |
| Hazardous Energy Control Program and Procedures | 12.A.01 | X | | **Attachment 14** |
| Standard Pre-Lift Plan - LHE | 16.A.03 | | X | No crane activity |
| Critical Lift Plan - LHE | 16.H | | X | No crane activity |
| Naval Architectural Analysis | 16.L | | X | No marine activities |
| Floating Plant Inspection and Certification | 19.A.01 | | X | No marine activities |
| Severe Weather Plan for Marine Activities | 19.A.03 | | X | No marine activities |
| Emergency Plan for Marine Activities | 19.A.04 | | X | No marine activities |
| Man Overboard/Abandon Ship Procedures | 19.A.04 | | X | No marine activities |
| Float Plan for Launches, Motorboats, Skiffs | 19.F.04 | | X | No marine activities |
| Fall Protection and Prevention Plan | 21.D | | X | No activities that require fall protection |
| Demolition/Renovation Plan (to include engineering survey) | 23.A | | X | No demolition |
| Rope Access Plan | 24.H | | X | No rope access |
| Excavation/Trenching Plan | 25.A.01 | X | | **Attachment 15** |
| Underground construction fire prevention and protection Plan | 26.D.01 | | X | No underground work |
| Compressed Air Work Plan for Underground Construction | 26.I.01 | | X | No underground work |
| Formwork and Shoring Erection and Removal Plan | 27.C | | X | No formwork and shoring erection |
| Precast Concrete Plan | 27.D | | X | No precast operations |
| Lift Slab Plans | 27.E | | X | No lift slab operations |
| Masonry Bracing Plan | 27.F.01 | | X | No masonry wall construction |
| Steel Erection Plan | 28.B | | X | No Steel Erection |
| Explosives Safety Site Plan | 29.A | | X | No explosives work |
| Blasting Plan | 29.A, 26.J | | X | No blasting operations |
| Underwater Dive Operations Plan | 30.A.14, 16 | | X | Do dive operations |
| Safe Practices Manual for Diving Activities | 30.A.15 | | X | Do dive operations |
| Emergency Management Plan for Diving | 30.A.18 | | X | Do dive operations |
| Tree Felling/Maintenance Program | 31.A.01 | | X | No tree felling |
| Aircraft/Airfield Construction Safety & Phasing Plan | 32.A.02 | | X | No airfield construction |
| Aircraft/Airfield Safety Plan Compliance Document | 32.A.02 | | X | No airfield construction |
| Site Safety and Health Plan (Hazardous, Toxic, and Radioactive Waste [HTRW]) | 33.B | X | | **Attachment 16** |
| Confined Space Entry Procedures | 34.A.05 | | X | No confined space activities |
| Confined Space Entry Program | 34.A.06 | | X | No confined space activities |

## 10.0 RISK MANAGEMENT PROCESSES

ECC's Corporate ESQ SOPs will be utilized to assist in the identification and implementation of appropriate hazard control measures. The Table of Contents for these SOPs is presented in **Appendix D**. SOPs may be referenced throughout the APP and its attachments, appendices and supplemental plans.

### 10.1 Activity Hazard Analyses – Policy and Procedure

Activities, tasks and each DFOW to be performed will be covered in an AHA. Craft labor involvement in AHA development will be encouraged. All personnel involved in a task will review the AHA before performing the task. This review will be appropriately documented. Upon commencement and throughout the activity, the AHA will be used to verify compliance with the prescribed hazard controls and to note any potential changes in process and, therefore, potential hazards. An initial list of AHAs anticipated for this project includes:

- Mobilization, Site Inspection and Site Preparation
- Environmental Sampling
- Well Installation, Maintenance, and Abandonment
- Landfill Repair and Maintenance
- LUC Inspections and Geophysical Survey
- Direct Push Technology (DPT)/ Hollow Stem Auger (HSA)/Air Rotary/ Interface Probe (MIP) Survey
- Excavation, Transportation, and Disposal
- ISEB injection
- Disc and Raking Contaminated Soil
- Equipment Decontamination, Demobilization and Site Restoration

Some initial AHAs are included in **Appendix A**. Additional AHAs will be submitted for review and acceptance by the COR prior to the preparatory phase meeting for the subject activity.

Work shall not begin until the AHA with Risk Assessment Code (RAC) for the work activity has been accepted by the COR and discussed with all engaged in the activity, including the ECC personnel, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of CP(s)/Qualified Persons (QP[s]).

If a new CP/QP (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new CP/QP shall acknowledge in writing that they have reviewed the AHA and is familiar with current site safety issues.

If the initial RAC increases due to a change made to the AHA by the workers, the AHA shall be resubmitted to Government Designated Authority (GDA) for acceptance prior to work proceeding.

Changes to or updates to an AHA that do not increase the RAC are not required to be resubmitted for acceptance by the GDA.

Workers/crews shall have in their possession the current AHA that reflects current site conditions, personnel, equipment, control measures, etc. while the work is being performed.

The AHA shall be used to assure work is being performed consistent with the AHA. In the event that the work is not being conducted in a safe manner, ECC and/or the client representative shall immediately stop the unsafe work being conducted until it is in compliance with this manual, APP and the AHA or the APP/ AHA is revised and accepted by the GDA, if necessary.

AHAs for completed work for the same contract or project work shall be readily available and maintained by the SSHO and accessible on-site by all workers, for a period of 12 months or, for contract work, the length of the contract.

Unless otherwise noted on the AHA, the minimum work clothing and PPE for this project includes:

- Shirts with sleeves
- Long pants
- American National Standards Institute (ANSI)-approved hard hat
- ANSI Z87+ safety glasses with side protection
- ANSI approved safety toe footwear, meeting American Society for Testing Materials (ASTM) Impact/Compression (I/C) 75 standards
- ANSI/Industrial Safety Equipment Association (ISEA) Class 2 High visibility garment while working around vehicles or mobile construction equipment
- Work gloves suitable to the task and hazards

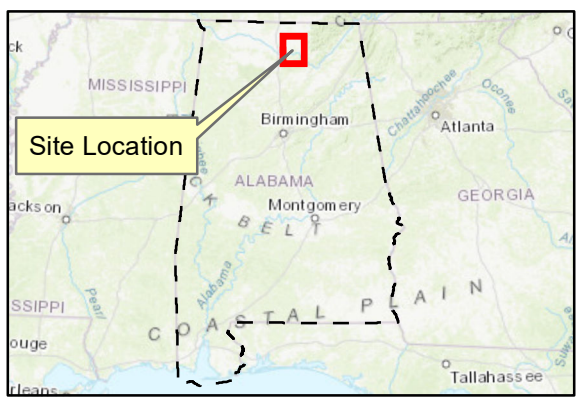
Other PPE specific to the hazards of the tasks or DFOW are listed in the appropriate AHA. Workers will be trained in the proper selection, use, care and maintenance of all PPE and will be responsible for proper use, fit, cleaning and daily inspections. Damaged or worn PPE shall not be used. Employees noting problems with PPE will report immediately to their supervisor for replacement or refitting.

# FIGURES

Redstone Arsenal
Madison
Huntsville
Alabama A&M University
Oakwood University
Links at Redstone Golf Course
Brahan Spring Park
Monte Sano State Park
1584 ft
1644 ft
MONTE SANO MOUNTAIN
HUNTSVILLE MOUNTAIN
Valley Hill Country Club
GREEN MOUNTAIN
WALLACE MOUNTAIN
Huntsville Int'l Airport
Redstone Arsenal
Triana
Wheeler National Wildlife Refuge
Laceys Spring
Valhermoso Springs
1321 ft
Somerville
Knox Creek
Mill Creek
Bradford Creek
Indian Creek
Barren Fork Creek
Cotaco Creek
Woodland Mills Creek
Dry Creek
Guyer Branch
Town Creek
Coppercum Branch
Chase Creek
Aldridge Creek
Big Cove Creek
MORGAN
72
53
231
255
565
431
1

## LEGEND

- Redstone Arsenal
- Roads




NOTES
1. Coordinate System: NAD83 State Plane Alabama East, US Feet (FIPS 0101)
2. Basemap data from IGI&S Office at Redstone Arsenal
3. Map Size: B-size (17" x11")
4. Revision Date: 2/8/2021

**Figure 2-1**

**Installation Location Map**
**Redstone Arsenal**
**Madison County, Alabama**

0 4,800 9,600 Feet
1 inch = 10,000 feet

**Mission & Installation Contracting Command (MICC)**
**U.S. Army Garrison-Redstone**

DISCLAIMER- The data represent the results of data collection/processing for a specific Redstone Arsenal activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time, and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

ECC GIS Server: E:\Projects\Redstone\MapDocument\APP\Fig2-1_RSA_APP_BaseMap.mxd

# APPENDICES

# APPENDIX A
# Activity Hazard Analyses

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | |
|---|---|---|
| Activity/Work Task: **Mobilization, Site Inspection, and Site Preparation Activities** | Overall Risk Assessment Code (RAC) (Use highest code) | **L** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | | |
| Date Prepared / Revised: **4 February 2021** | | |
| Prepared by (Name/Title): **Lauren Sparkman, Environmental Engineer** | | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | | |
| Notes: (Field Notes, Review Comments, etc.) | | |

**Risk Assessment Code (RAC) Matrix**

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>Consider People, Equipment, Materials and Environment<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHO in accordance with WE SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Underground utility survey<br><br>Identify all overhead utilities | Contact with Overhead Utility Lines – Electrocution, Fires/underground utilities | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines.<br>• If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted.<br>• An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Underground utility survey<br><br>Identify all overhead utilities<br>(Continued) | Contact with Overhead Utility Lines – Electrocution, Fires/underground utilities<br>(Continued) | • Keep all personnel well away from the equipment whenever it is close to power lines.<br>• If intrusive activities, Louisiana 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking.<br>— Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start.<br>• ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking.<br>• Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling.<br>• If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified.<br>• Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code. | **L** |
| | Back Strain or Sprain | • Use proper lifting techniques, move heavy objects with wheelbarrow/carts, seek assistance if items weigh over 50 pounds. | **L** |
| Receipt and placement of equipment vehicle:<br>Spotting of equipment vehicle | Struck-by moving truck | • Always ensure a spotter for delivery truck stays in line-of-sight of driver at all times. | **L** |
| | Caught in or under equipment vehicle | • Use a spotter to coordinate activities of driver and person setting cribbing, tie-downs, chains.<br>• Keep hands out of pinch points.<br>• Wear leather work gloves. | **L** |
| | Contact with Overhead Utility Lines – Electrocution, Fires | • Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required.<br>• Keep all personnel well away from the equipment whenever it is close to power lines. | **L** |
| Installation of temporary work zones construction fencing | Struck-by hand tools | • Wear leather gloves, safety-glasses, hard hats, safety-toe footwear. Keep hands out of pinch points.<br>• Use post driver, not sledgehammer, for placing fence posts. Tape top of fence post or install mushroom caps to reduce potential for scrapes. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Installation of erosion controls | Sprains/strains<br>Struck-By (hand tools) | • Use two people to carry heavy loads of fencing/posts. Do not lift and carry more than comfortable weight for individual; 50 lbs. maximum. | **L** |
| Establishment of work zones, decontamination stations for personnel and equipment | Slips/trips/falls | • Wear high traction safety-toe footwear.<br>• Keep loads manageable to not obstruct vision. | **L** |
| | Scrapes and cuts | • Wear safety glasses, gloves and long sleeves. | **L** |
| | Contact with poisonous plants (e.g. poison ivy) | • Inspect area before starting.<br>• Wear long sleeve shirts, tuck sleeves and pant legs. If there is heavy growth, wear disposable coveralls and use barrier cream (e.g. Ivy Block).<br>• Have Tecnu or other poison ivy cleanser on-hand, and wash immediately after contact. | **L** |
| | Stung by bees/hornets, bit by ticks or snakes | • Inspect areas for hives.<br>• Ensure allergic individuals have emergency medical kit and are committed to using it.<br>• Use insect repellant containing DEET on exposed skin and Permethrin on clothing.<br>• Do not approach snakes. If bitten, seek medical attention. | **L** |
| | Struck by moving equipment | • Personnel will stay out of equipment swing areas and pinch-points. | **L** |
| | Fire/explosion of gasoline | • Allow equipment to cool before refueling and eliminate other sources of ignition.<br>• Use only approved NFPA safety cans for gasoline.<br>• Cleanup spills immediately. | **L** |
| | Heat Stress/Cold Stress (applies to all job steps) | • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO.<br>• Report all signs and symptoms of heat strain immediately to SSHO. | **L** |
| | Severe Weather (applies to all job steps) | • Shut down operations during severe electrical storms, heavy rain, high wind and evacuate site/take cover.<br>• Train personnel on Emergencies Response.<br>• Monitor weather systems. | **L** |
| | Eye injuries | • Safety glasses with side shields (impact resistant). | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** |
|---|---|---|
| **Equipment to be Used** | **Training Requirements** | **Inspection Requirements** |
| 1. Support Vehicles<br>2. Skid steer/forklift<br><br><u>Support Zone</u><br>• Cell phone or Radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• Drinking water<br>• 911 Air horn<br>• Spill containment supplies<br>• Air Monitoring equipment, if needed<br>• Emergency decontamination supplies<br><br>**PPE: Level D (hardhat, steel toe boots, work gloves, orange safety vest, safety glasses, and hearing protection, as needed)** | • Only qualified operators permitted to operate mobile equipment<br>• Operators of forklifts will have recent certification / training in safe forklift operation (20 CFR 1910, Subpart N – Powered Industrial Trucks)<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan/Procedures<br>• Fire extinguishers.<br><br>**Competent Person: Site Superintendent and/or SSHO** | • SSHO daily site inspection<br>• Equipment - Receipt and inspected by SSHO<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Complete ECC daily equipment inspection form<br>• Weekly inspection of first aid kits<br>• Monthly inspection of fire extinguishers<br>• GFCIs (at least monthly). |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | |
|---|---|
| Activity/Work Task: **Environmental Sampling** | Overall Risk Assessment Code (RAC) (Use highest code) **L** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | |
| Date Prepared / Revised: **4 February 2021** | |
| Prepared by (Name/Title): **Lauren Sparkman, Environmental Engineer** | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | |
| Notes: (Field Notes, Review Comments, etc.) | |

**Risk Assessment Code (RAC) Matrix**

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

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- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>Consider People, Equipment, Materials and Environment<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Labeling sample containers<br><br>Handling sample containers w/ preservation / adding preservation to containers<br><br>Purging monitoring wells<br><br>Filling sample containers from soil borings or well sample pump<br><br>Cleaning outer surface of sample containers | • Personal injury<br>• Slips & Trips<br>• Lifting Strains & Sprains<br>• Heat Stress/Cold Stress<br>• Splash hazard<br>• Handling Materials Containing Hazardous Materials<br>• Proper Material Handling<br>• Biohazard and Controls | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Tailgate meeting. Review JSA to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & heavy equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment/vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit w/ eye wash. Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br><br>**Stay on established pathways and ensure tools, cords, other objects are removed from walk areas to prevent trips and falls.**<br><br>**Be cautious of muddy, wet, icy, or other slippery surfaces. Ensure surfaces are cleared and proper footwear is utilized to prevent slips/falls.** | **L** |

| | | | |
|---|---|---|---|
| Labeling sample containers<br><br>Handling sample containers w/ preservation / adding preservation to containers<br><br>Purging monitoring wells<br><br>Filling sample containers from soil borings or well sample pump<br><br>Cleaning outer surface of sample containers<br><br>(CONTINUED) | • Personal injury<br>• Slips & Trips<br>• Lifting Strains & Sprains<br>• Heat Stress/Cold Stress<br>• Splash hazard<br>• Handling Materials Containing Hazardous Materials<br>• Proper Material Handling<br>• Biohazard and Controls<br><br>(CONTINUED) | **Hand & Power Tool Use:**<br>Prior to use all tools must be inspected. Any damaged or defective tools will be tagged and removed from service for repair and/or discarded.<br><br>Ensure all guards are in place on tools. Wear protective gloves based on hazard associated with tool.<br><br>Cutting devices must have blade protection. Fixed blade utility knives that cannot be retracted are prohibited.<br><br>Ensure electrical tools are double insulated or properly grounded. Extension cords shall be connected to a GFCI.<br><br>**Working with Hazardous Materials:**<br>Employees will be provided with an overview of the hazards associated with the chemicals that will be used. A copy of the SDS will be available for review and proper PPE will be provided. | **L** |
| | | **Heat Stress/Cold Stress:**<br>• Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO.<br>• Report all signs and symptoms of heat strain immediately to SSHO.<br><br>**PPE:**<br>Modified Level-D PPE will be worn inside posted areas. Any PPE upgrade will be in accordance with the SSHP action level guidelines. A face shield or goggles shall be used during activities where a splash hazard exists. Use of chemical resistant gloves shall be worn when there is potential skin contact with contaminated fluids. Hearing protection shall be worn if noise survey results above TWA of 85dBA. Wear Permethrin treated gaiters.<br><br>**Material Handling & Storage:**<br>No individual employee is permitted to lift any object that weights over 50-pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pounds limit.<br><br>Know the weight of the load and ensure loads are stable and secure before transporting. Ensure stages materials are properly stacked and secured to prevent sliding/falling.<br><br>**Biohazard Controls:**<br>• Inspect area before starting.<br>• Wear long sleeve shirts, tuck sleeves and pant legs. If there is heavy growth, wear disposable coveralls and use barrier cream (e.g. Ivy Block). Wear Permethrin treated gaiters.<br>• Have Tecnu or other poison ivy cleanser on-hand and wash immediately after contact.<br>• Do not approach any wild animals. If bitten seek medical attention. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Use of Generator | • Lift and carrying generator<br>• Fire hazard while refueling | **Back Injury:**<br>• Do not lift awkward sized items use proper lifting techniques<br>• Do not use equipment to lift and move drums, equipment and supplies. Lift with your legs not with your back.<br>• Additional personnel will be used to lift items weighing over 60 pounds. If possible, use mechanical movement aids (i.e., hand truck or wheelbarrow).<br>• A fire extinguisher and spill containment supplies should be readily available. Ensure generator is on the ground while refueling.<br>• Fuel generator only after engine has been shut down and cooled | **L** |

| ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** |
|---|---|---|
| **Equipment to be Used** | **Training Requirements** | **Inspection Requirements** |
| • Hand Sampling Tools<br>• Generator<br><br><u>Support Zone</u><br>• Cell phone or Radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• Drinking water<br>• 911 Air horn<br>• Spill containment supplies<br>• Air Monitoring equipment, if needed<br>• Emergency decontamination supplies<br><br>**PPE: Modified Level D (hardhat, steel toe boots, nitrile gloves when sampling/leather gloves when cutting plastic tubes, gaiters, orange safety vest, safety glasses, and hearing protection, as needed). A face shield or goggles shall be used during activities where a splash hazard exists. Wear Permethrin treated gaiters.** | • Only qualified operators permitted to operate First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan/Procedures<br>• Fire extinguishers<br><br>**Competent Person: Site Superintendent and/or SSHO** | • Daily inspection of hand and power tools with replacement of damaged items.<br>• Annual and monthly inspection of fire extinguishers<br>• Weekly inspection of first aid kits/eyewash |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | |
|---|---|
| Activity/Work Task: **Well Installation, Maintenance and Abandonment** | Overall Risk Assessment Code (RAC) (Use highest code) **L** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | |
| Date Prepared / Revised: **4 February 2021** | |
| Prepared by (Name/Title): **Lauren Sparkman/ Environmental Engineer** | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | |
| **Notes:** (Field Notes, Review Comments, etc.) | |

**Risk Assessment Code (RAC) Matrix**

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>**Consider People, Equipment, Materials and Environment**<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Mobilization | | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Level D PPE will be worn inside the designated EZ. Any PPE upgrade will be in accordance with APP guidelines. Hearing protection shall be worn if noise survey results above TWA of 85 dBA | L |

| | | | |
|---|---|---|---|
| Direct Push Technology (DPT), Hollow Stem Auger (HSA), Air Rotary Activities | Contact with Underground and Overhead Utility Lines – Electrocutions, Fires/underground utilities | • Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines.<br>• If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted.<br>• An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required.<br>• Keep all personnel well away from the equipment whenever it is close to power lines.<br>• If intrusive activities, Alabama 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking.<br>— Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA DPW. Alabama 811 is contacted 48 hours prior to activity start.<br>• ECC personnel will “white-line” or otherwise mark the area where the wells are to be installed, prior to utility marking.<br>• Intrusive soil activities conducted within a five foot “Buffer Zone” (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling.<br>• If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified. Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code.<br><br>Before derrick is raised a thorough walkthrough of surrounding area is required to ensure there are no overhead utilities within 100 feet horizontally. If overhead utilities are within 100 ft horizontally of the derrick, consult local utility company and refer to EM 385-1-1 Table 11-1 before commencing operations. | **L** |
| | Equipment Malfunction | • Rig operators must be qualified and designated.<br>• All operations must be conducted in accordance with manufacturer’s operations manual. Ensure equipment manual is on site at all times and contents of the manual, specifically related to safe operations, have been reviewed will all employees engaged in activities. Ensure this review is documented.<br>• Complete inspections and maintenance of the rig in accordance with the manufacturer’s operations manual. | **L** |

| | | | |
|---|---|---|---|
| DPT, HSA, Air Rotary Activities<br><br>(CONTINUED) | Cuts/Lacerations | • A cutting device designed for cutting acetate liners (procured through Geoprobe) shall be used. If a safety utility knife is used, snubbed nose blades are required and the user must wear Kevlar gloves under leather gloves. Non-retractable utility knives are prohibited. Blades must be secured when not in use.<br>• Utilize proper cutting technique and ensure cuts are made away from the body, keep hands clear.<br>• Utilize leather work gloves or other cut resistant work gloves at all times when handling equipment. Ensure gloves are appropriate for potential laceration hazard if sharp edges are encountered. | **L** |
| | Lifting Strains/Sprains | • No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pound limit. Materials shall be inspected for sharp edges prior to being handled and avoid pinch point hazards.<br>• While handling direct push rods and filled acetate liners, make sure proper lifting techniques are used. | **L** |
| | Struck by or caught in drill rig equipment | • Only qualified personnel shall be permitted to operate equipment. The equipment shall be inspected daily using an ECC inspection form specific for the equipment in use. Equipment must have functioning safety devices as installed by the manufacturer. Deficiencies in equipment shall be corrected prior to operating. Equipment found to be unsafe shall not be used. Fire extinguishers of the appropriate size will be available on the equipment. All equipment shall have back up enunciators.<br>• Only personnel essential to drill rig operation will be permitted in area directly surrounding drill rig. All personnel not directly contributing to drill rig operations will be required to stay a minimum of 25' away.<br>• Check all safety devices, emergency shut-down switches daily or at the start of drilling shift. Drilling will not be permitted until all emergency shut-down switches and warning systems are working properly.<br>• Drill rig operator is required to do a daily equipment checklist to ensure equipment is in safe working condition.<br>  ○ Personnel need to be cognizant of surroundings and keep clear of cuttings discharge point. Eye protection will be worn at all times.<br>  ○ Personnel need to remain away from air compressor and air hose unless a specific task requires work in close proximity.<br>  ○ Do not operate compressed air system with broken or inoperable safety controls.<br>  ○ Inspect airline safety cables to verify they are in good working condition.<br>• If augers are used during drilling operations, auger guards will be required.<br>• All work areas on and around the drill rig operation will be required to be kept clear of unnecessary equipment and materials. Ongoing housekeeping throughout the day will keep work areas free of slip, trip and fall hazards. | **L** |
| | Struck by Traffic | When working adjacent to or on active roadways adequate traffic control devices must be installed to establish a safe work zone. Adequate signage must be established to identify the work zone. All personnel entering and working in an established work zone must wear the classification of reflective vests (appropriate based on speed of vehicles). | **L** |

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|---|---|---|---|
| DPT, HSA, Air Rotary Activities<br><br>(CONTINUED) | Struck-By / Pinch Points | • All personnel will wear ANSI Type 2 high-visibility traffic safety vests. Operators shall maintain a constant awareness of personnel and equipment in the work areas.<br>• Moving heavy equipment must have properly functioning back-up alarms.<br>• Spotters on the ground will assist operators in manipulating vehicles and equipment into tight or confined spaces.<br>• Getting off or on any equipment while it is in motion is prohibited.<br>• Three points of contact shall be maintained when getting on or off equipment.<br>• Seats will be provided for each occupant of the equipment.<br>• The operator shall use safety belts while equipment is in use.<br>• All original manufacturer-installed safety equipment such as lights, guards, brakes, horn, etc. must be functional at all times.<br>• Whenever equipment is parked, the parking brake shall be set, and wheels chocked when on an incline<br>• Heavy equipment operators shall inform their Supervisor(s) of any prescribed medication that they are taking that would impair their judgment and/or vision<br>• Never walk or work directly in back of or to the side of heavy equipment without the operator's knowledge and approval. | **L** |
| | | • Personnel will stay out of equipment swing areas and pinch-points. When dumping a load from a bed equipped with a tailgate, a spotter must be positioned a safe distance from the vehicle, such that they can observe the bed to notify the operator if an obstruction occurs | **L** |
| | Excessive Noise Exposure | • Wear hearing protective devices (Ear muffs/plugs) when working, when using or near high noise producing equipment, or when directed by ECC SSHO in response to noise monitoring.<br>• Ensure adequate maintenance on equipment.<br>• Conduct periodic sound level surveys. | **L** |
| | Inhalation of materials containing crystalline silica | • Review SDS for grout/concrete and other materials utilized to install wells to determine silica content. If silica is present, adhere to controls in APP. Work upwind, avoid dust clouds, keep materials wet, avoid dry sweeping | **L** |
| | Heat/Cold Stress (applies to all steps in this AHA) | • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO.<br>— Report all signs and symptoms of heat strain immediately to SSHO. | **L** |
| | Severe weather (applies to all steps in this AHA) | • Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location.<br>• All personnel shall be trained on the project Emergencies Response procedures. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

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|---|---|---|---|
| Welding/Cutting | Fire | • Personnel that weld or cut will be required to wear proper PPE including flame resistant gloves, aprons, safety shoes, welding helmets, goggles, and shaded glasses.<br>• Fire extinguisher must be present.<br>• Hot work permit must be obtained before any welding or cutting begins.<br>• Verify that no combustible materials are within work area.<br>• Fire watch must continue for 30 minutes after any welding or cutting concludes.<br>• Protective caps must be used when moving cylinders.<br>• Cylinders must be stored properly. | **L** |
| Equipment Decontamination | Chemical Contamination Exposure | • All personnel assigned to drilling operations will operate inside a designated EZ.<br>• All PPE will be removed properly prior to exiting the CRZ.<br>• Air monitoring will be performed. All equipment and hand tools will be decontaminated in accordance with the established procedure.<br>• Air monitoring will be conducted for combustible gas, oxygen levels, and toxic gas exposure during drilling and well abandonment. | **L** |

| ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** |
|---|---|---|
| **Equipment to be Used** | **Training Requirements** | **Inspection Requirements** |
| 1. Support Vehicles<br>2. Drill Rig<br>3. Hand Tools<br>4. Air Monitoring Equipment (Multi-RAE Plus or equivalent)<br><br><u>Support Zone</u><br>• Cell phone or radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• Drinking water<br>• 911 air horn<br>• Spill containment supplies<br>• Air monitoring equipment, if needed<br>• Emergency decontamination supplies<br>• GFCI<br>• Hand and power tools.<br><br>**PPE: Level D (hardhat, steel toe boots, work gloves, Class 2 hi-viz safety garment, safety glasses, and hearing protection as needed), unless noted otherwise in this AHA** | • Only qualified operators permitted to operate mobile equipment<br>• Operators of DPT and HSA rig will be a licensed driller.<br>• Operators of forklifts will have recent certification / training in safe forklift operation (20 CFR 1910, Subpart N – Powered Industrial Trucks)<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan/Procedures<br>• Fire extinguishers.<br><br>**Competent Person: Site Superintendent and/or SSHO**<br>**Designated Drill Rig Operator:** | • SSHO daily site inspection<br>• Equipment – Receipt and inspected by SSHO<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Complete daily equipment inspection form will be completed by the operator<br>• Weekly inspection of first aid kits<br>• Monthly inspection of fire extinguishers<br>• GFCIs (at least monthly)<br>• Air monitoring equipment will be calibrated at least monthly and bump tested daily before each shift and as often as necessary. Equipment that cannot pass bump test criteria will be recalibrated or replaced.<br>• Drill rig and associated equipment in accordance with manufacturer's requirements. |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | |
|---|---|---|
| Activity/Work Task: **Landfill Repair & Maintenance** | Overall Risk Assessment Code (RAC) (Use highest code) | **M** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | **Risk Assessment Code (RAC) Matrix** | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | **Severity** / **Probability** | |
| Date Prepared / Revised: **4 February 2021** | | |
| Prepared by (Name/Title): **Lauren Sparkman/ Environmental Engineer** | | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | | |
| **Notes: (**Field Notes, Review Comments, etc.) | | |

| Severity | Frequent | Likely | Occasional | Seldom | Unlikely |
|---|---|---|---|---|---|
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>Consider People, Equipment, Materials and Environment<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Landfill Repair and Maintenance | Contact with Overhead Utility Lines – Electrocution, Fires / Underground utilities | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & heavy equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines.<br>• If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted.<br>• An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required.<br>• Keep all personnel well away from the equipment whenever it is close to power lines. | L |

| | | | |
|---|---|---|---|
| Landfill Repair and Maintenance<br><br>(CONTINUED) | Contact with Overhead Utility Lines – Electrocution, Fires / Underground utilities<br><br>(CONTINUED) | • If intrusive activities, Louisiana 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking.<br>— Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start.<br>• ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking.<br>• Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling.<br>• If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified.<br>• Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code. | **L** |
| | Struck-By (heavy equipment) | • All personnel will wear ANSI Type 2 high-visibility traffic safety vests. Operators shall maintain a constant awareness of personnel and equipment in the work areas.<br>• Equipment operators must be qualified and designated<br>• Moving heavy equipment must have properly functioning back-up alarms.<br>• Spotters on the ground will assist operators in manipulating vehicles and equipment into tight or confined spaces.<br>• Moving heavy equipment must have properly functioning back-up alarms.<br>• Getting off or on any equipment while it is in motion is prohibited.<br>• Three points of contact shall be maintained when getting on or off equipment.<br>• Seats will be provided for each occupant of the equipment.<br>• The operator shall use safety belts while equipment is in use.<br>• All original manufacturer-installed safety equipment such as lights, guards, brakes, horn, etc. must be functional at all times.<br>• Whenever equipment is parked, the parking brake shall be set, and wheels chocked when on an incline.<br>• Heavy equipment operators shall inform their Supervisor(s) of any prescribed medication that they are taking that would impair their judgment and/or vision.<br>• Never walk or work directly behind or to the side of heavy equipment without the operator's knowledge and approval.<br>• Personnel will stay out of equipment swing areas and pinch-points.<br>• When dumping a load from a bed equipped with a tailgate, a spotter must be positioned a safe distance from the vehicle, such that they can observe the bed to notify the operator if an obstruction occurs. | **M** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Landfill Repair and Maintenance<br><br>(CONTINUED) | Heat/Cold Stress (applies to all steps in this AHA) | • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO.<br>• Report all signs and symptoms of heat strain immediately to SSHO. | **L** |
| | Severe weather (applies to all steps in this AHA) | • Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location.<br>• All personnel shall be trained on the project Emergencies Response procedures. | **L** |

| ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** |
|---|---|---|
| **Equipment to be Used** | **Training Requirements/Competent or Qualified Personnel name(s)** | **Inspection Requirements** |
| Earth moving equipment (i.e., excavators, articulated dump trucks, bulldozer)<br><br><u>Support Zone</u><br>• Cell phone or Radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• drinking water<br>• 911 Air horn<br>• Spill containment supplies<br>• PDR and PID air monitors<br>• Emergency decontamination supplies<br>• Hand tools<br><br>**PPE: Level D (hardhat, steel toe boots, work gloves, orange safety vest, safety glasses and hearing protection, as needed)** | • HEAVY EXCAVATING, EARTHMOVING, AND TRANSPORT EQUIPMENT OPERATIONS: Equipment to be operated and inspected only by qualified, trained operators who have had a practical competency evaluation performed by a qualified supervisor.<br>• UNDERGROUND UTILITIES: Utility color coding; excavation procedures within buffer zones; emergency procedures in the event of utility contact.<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br><br>**Competent Person: Site Superintendent and/or SSHO**<br><br>**Designated Equipment Operators:** | • Documented daily equipment inspections by operator are to be conducted and recorded on ECC inspection checklist form.<br>• Daily inspections of excavation to be documented by Competent Person.<br>• Equipment - Receipt and inspected by SSHO<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Weekly inspection of first aid kits<br>• Annual and Monthly inspection of fire extinguishers |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | |
|---|---|
| Activity/Work Task: **Land Use Control (LUC) Inspection and Geophysical Survey** | Overall Risk Assessment Code (RAC) (Use highest code) **L** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | |
| Date Prepared: **4 February 2021** | |
| Prepared by (Name/Title): **Lauren Sparkman/ Environmental Engineer** | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | |
| **Notes:** (Field Notes, Review Comments, etc.) | |

**Risk Assessment Code (RAC) Matrix**

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>**Consider People, Equipment, Materials and Environment**<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| LUC Inspection | Slips & Trips | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & heavy equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Wear high traction safety-toe footwear.<br>• Keep loads manageable to not obstruct vision. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| LUC Inspection<br><br>(CONTINUED) | Lifting Strains & Sprains | • No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pound limit. Materials shall be inspected for sharp edges prior to being handled, and avoid pinch point hazards. | **L** |
| | Exposure to excessive Noise levels | • Hearing protection shall be worn around heavy equipment of other noise generating equipment or when noise levels exceed TWA of 85 dBA. | **L** |
| | Using damaged / malfunctioning power tools | • Prior to use all tools must be inspected. Any damaged or defective tools will tagged and removed from service for repair and/or discarded.<br>• Proper PPE shall be worn when operating power tools. At a minimum, Level "D" will be required. | **L** |
| | Caught in or between equipment | • Only qualified personnel shall be permitted to operate equipment. Operators will have constant communication with ground support crews and will be aware of activities around their piece of equipment during operation.<br>• Mobile equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used.<br>• Fire extinguishers of the appropriate size will be available in the operators of all heavy equipment.<br>• All equipment shall have backing alarms.<br>• All equipment will be properly secured / rigged prior to transportation off site. All rigging equipment shall be inspected prior to use. | **L** |
| | Contact with stinging or biting insects | • Personnel shall wear light colored clothing and apply insect repellent (i.e., DEET) to outer pants legs; Body checks should be performed at the end of the workday.<br>• Any individual who has a known or has a potential for allergic reaction to insect stings shall notify the SSHS and an Epi-Pen shall be readily available. | **L** |
| | Contact with poisonous plants (e.g. poison ivy) | • Inspect area for known plants before starting field activities<br>• Wear long sleeve shirts, tuck sleeves and pant legs. If there is heavy growth, wear disposable coveralls and use barrier cream, e.g. Ivy Block.<br>• Have TecNu or other poison ivy cleanser on hand and wash immediately after contact. | **L** |
| | Scrapes and cuts | • Wear safety glasses, gloves and long sleeves. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| LUC Inspection<br><br>(CONTINUED) | Heat/Cold Stress (applies to all steps in this AHA) | • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO.<br>• Report all signs and symptoms of heat strain immediately to SSHO. | **L** |
| | Severe weather (applies to all steps in this AHA) | • Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location.<br>• All personnel shall be trained on the project Emergencies Response procedures. | **L** |
| ***Stop work and notify your supervisor if you are not sure how to perform your task safely!*** | ***Stop work and notify your supervisor if you are not sure how to perform your task safely!*** | ***Stop work and notify your supervisor if you are not sure how to perform your task safely!*** | |

| Equipment to be Used | Training Requirements/Competent or Qualified Personnel name(s) | Inspection Requirements |
|---|---|---|
| • Hand and Portable power tools<br><br><u>Support Zone</u><br>• Cell phone or Radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• drinking water<br>• 911 Air horn<br>• Spill containment supplies<br>• PDR and PID air monitors<br>• Emergency decontamination supplies<br>• Hand tools<br><br>**PPE: Level D (hardhat, steel toe boots, work gloves, orange safety vest, safety glasses, and hearing protection as needed)** | • Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br><br>**Competent Person: Site Superintendent and/or SSHO** | • Documented daily equipment inspections by operator are to be conducted and recorded on ECC inspection checklist form.<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Weekly inspection of first aid kits<br>• Monthly inspection of fire extinguishers |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | |
|---|---|---|
| Activity/Work Task: **Drilling: Direct Push Technology (DPT)/ Hollow Stem Auger (HAS)/ Air Rotary/ Membrane Interface Probe (MIP)** | Overall Risk Assessment Code (RAC) (Use highest code) | **M** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | **Risk Assessment Code (RAC) Matrix** | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | | |
| Date Prepared / Revised: **4 February 2021** | | |
| Prepared by (Name/Title): **Lauren Sparkman/ Environmental Engineer** | | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | | |
| Competent Person (Name/Title): **Master Driller** | | |
| **Notes:** (Field Notes, Review Comments, etc.) | | |

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>Consider People, Equipment, Materials and Environment<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Location of Underground and Above ground Utilities | Hitting Utilities | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines.<br>• If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted. | L |

| | | | |
|---|---|---|---|
| Location of Underground Utilities<br><br>(CONTINUED) | Hitting Utilities<br><br>(CONTINUED) | • An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required.<br>• Keep all personnel well away from the equipment whenever it is close to power lines.<br>• If intrusive activities, Alabama 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking. Additionally, private locating services will be contacted for locations on base.<br>— Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start.<br>• ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking.<br>• Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling.<br>• If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified.<br>• Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code | **L** |
| Drill Rig Operations | Cuts/Lacerations | • A cutting device designed for cutting acetate liners (procured through Geoprobe) shall be used. If a safety utility knife is used, snubbed nose blades are required, and the user must wear Kevlar gloves under leather gloves. | **L** |
| | Lifting Strains/Sprains | • No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting are for lifting objects over the 50-pound limit. Materials shall be inspected for sharp edges prior to being handled, and avoid pinch point hazards.<br>• While handling direct push rods and filled acetate liners, make sure proper lifting techniques are used. | **L** |
| | Struck by or caught in drill rig equipment | Only qualified and designated personnel shall be permitted to operate equipment. The equipment shall be inspected daily using an ECC inspection form specific for the equipment in use. Equipment must have functioning safety devices as installed by the manufacturer. Deficiencies in equipment shall be corrected prior to operating. Equipment found to be unsafe shall not be used. Fire extinguishers of the appropriate size will be available on the equipment. All equipment shall have back up enunciators.<br>• Only personnel essential to drill rig operation will be permitted in area directly surrounding drill rig. All personnel not directly contributing to drill rig operations will be required to stay a minimum of 25' away. | **L** |

| | | | |
|---|---|---|---|
| Drill Rig Operations<br><br>(CONTINUED) | Struck by or caught in drill rig equipment<br><br>(CONTINUED) | • Check all safety devices, emergency shut-down switches daily or at the start of drilling shift. Drilling will not be permitted until all emergency shut-down switches and warning systems are working properly.<br>• Drill rig operator is required to do a daily equipment checklist to ensure equipment is in safe working condition.<br>• If augers are used during drilling operations, auger guards will be required.<br>• All work areas on and around the drill rig operation will be required to be kept clear of unnecessary equipment and materials. Ongoing housekeeping throughout the day will keep work areas free of slip, trip and fall hazards. | **L** |
| | Struck by Traffic | • When working adjacent to or on active roadways adequate traffic control devices must be installed to establish a safe work zone. Adequate signage must be established to identify the work zone. All personnel entering and working in an established work zone must wear the classification of reflective vests (appropriate based on speed of vehicles). | **L** |
| | Struck-By / Pinch Points | • All personnel will wear ANSI Type 2 high-visibility traffic safety vests. Operators shall maintain a constant awareness of personnel and equipment in the work areas.<br>• Moving heavy equipment must have properly functioning back-up alarms.<br>• Spotters on the ground will assist operators in manipulating vehicles and equipment into tight or confined spaces.<br>• Getting off or on any equipment while it is in motion is prohibited.<br>• Three points of contact shall be maintained when getting on or off equipment.<br>• Seats will be provided for each occupant of the equipment.<br>• The operator shall use safety belts while equipment is in use.<br>• All original manufacturer-installed safety equipment such as lights, guards, brakes, horn, etc. must be functional at all times.<br>• Whenever equipment is parked, the parking brake shall be set, and wheels chocked when on an incline<br>• Heavy equipment operators shall inform their Supervisor(s) of any prescribed medication that they are taking that would impair their judgment and/or vision<br>• Never walk or work directly in back of or to the side of heavy equipment without the operator's knowledge and approval. | **L** |
| | Severe weather (applies to all job steps) | • Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location.<br>• All personnel shall be trained on the project Emergencies Response procedures. | **L** |
| | Excessive Noise Exposure | • Wear hearing protective devices (Ear muffs/plugs) when working, when using or near high noise producing equipment, or when directed by ECC SSHO in response to noise monitoring.<br>• Ensure adequate maintenance on equipment.<br>• Conduct periodic sound level surveys | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Drill Rig Operations<br><br>(CONTINUED) | Exposure to dust | • Dust control measures will be implemented, as needed, and include some or all of the following:<br>— Visual monitoring for fugitive dust.<br>— Covering soil stockpiles with plastic sheeting or tarps.<br>— Covering loaded dump truck beds with tarps.<br>— Applying magnesium chloride, or similar dust-suppressing agent, for stockpiles and roads to reduce dust emissions.<br>— Spraying potable water on dirt roadways outside the work zone and along dirt access roads.<br>— Spraying the surface of the area to be excavated with water or a dust-suppressing agent, if required.<br>— Work stoppage during wind speed in excess of 25 miles per hour.<br>• Proper PPE | **L** |

| ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** |
|---|---|---|
| **Equipment to be Used** | **Training Requirements** | **Inspection Requirements** |
| 1. Heavy equipment<br>2. Dust suppressant<br><br><u>Support Zone</u><br>• Cell phone or radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• Drinking water<br>• 911 air horn<br>• Spill containment supplies<br>• Air monitoring equipment<br>• Emergency decontamination supplies<br>• GFCI<br>• Hand and power tools<br><br>**PPE: Modified Level D (hardhat, steel toe boots, work gloves, Class 2 high-visibility garment, hearing protection, and safety glasses). If direct contact with soils, boot covers/over boots and Tyvek may be required (SSHO will determine when boot covers and Tyvek are needed).** | • Only qualified operators permitted to operate mobile equipment<br>• Review of Excavation Plan<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan/Procedures<br>• Fire extinguishers<br><br>**Competent Person: Site Superintendent and/or SSHO**<br><br>Designated Equipment Operators: | • SSHO daily site inspection<br>• Equipment – Receipt and inspected by SSHO<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Complete ECC daily equipment inspection form<br>• Weekly inspection of first aid kits<br>• Monthly and annual inspection of fire extinguishers<br>• GFCIs (at least monthly). |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | |
|---|---|
| Activity/Work Task: **Excavation, Transportation, and Disposal** | Overall Risk Assessment Code (RAC) (Use highest code) **M** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | |
| Date Prepared / Revised: **4 February 2021** | |
| Prepared by (Name/Title): **Lauren Sparkman/ Environmental Engineer** | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | |
| **Notes:** (Field Notes, Review Comments, etc.) | |

**Risk Assessment Code (RAC) Matrix**

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- E = Extremely High Risk
- H = High Risk
- M = Moderate Risk
- L = Low Risk

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>Consider People, Equipment, Materials and Environment<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Location of Underground and Above ground Utilities | Hitting Utilities | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines.<br>• If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted. | L |

| | | | |
|---|---|---|---|
| Location of Underground Utilities<br><br>(CONTINUED) | Hitting Utilities<br><br>(CONTINUED) | • An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required.<br>• Keep all personnel well away from the equipment whenever it is close to power lines.<br>• If intrusive activities, Alabama 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking. Additionally, private locating services will be contacted for locations on base.<br>— Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start.<br>• ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking.<br>• Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling.<br>• If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified.<br>• Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code | **L** |
| Heavy Equipment Activities (trenching, moving earthwork, T&D) | Struck by equipment and loads | • Only qualified and designated operators will be authorized to operate mobile construction equipment.<br>• Inspect equipment daily before use.<br>• All mobile equipment will have working back up alarms, tested each day.<br>• Stay outside the working radius of the machine. If you need to speak to operator, make eye contact first, use hand signal, and wait until operator stops the machine, grounds the bucket, and takes hands off controls before approaching cab.<br>• Operators will not lift buckets, booms or loads over people.<br>• Operator will immediately stop whenever ground personnel encroach on the working radius. | **L** |
| | Roll over into excavation | • There will be no vehicles in the vicinity of the excavations. The only equipment in the area will the equipment directly involved in excavation activities including an excavator and either a front end loader or a dump truck to move the excavated materials from the excavation to the staging area. Areas where the transfer equipment enters or approaches the excavation will be sloped to avoid sharp edges/drops.<br>• Excavators will be positioned at one end of the trench with tracks parallel to the trench and the operator will not undermine the machine. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Heavy Equipment Activities (trenching, moving earthwork, T&D)<br><br>(CONTINUED) | Exposure to Noise | • Operators and workers in the vicinity shall wear hearing protection or when instructed by the SSHO.<br>• Reference USACE EM 385-1-1 Section 5. | **L** |
| | Fire and hydraulic fuel spill from heavy equipment | • Daily inspection of all heavy equipment. A fire extinguisher will be located in each piece of equipment.<br>• Spill containment supplies will be readily available at the fueling area. NO SMOKING allowed in the operating equipment or fueling area.<br>• See Fire Protection Plan and Emergency Response Plan in APP. | **L** |
| | Heat/Cold Stress (applies to all job steps) | • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO.<br>• Report all signs and symptoms of heat strain immediately to SSHO | **L** |
| | Severe weather (applies to all job steps) | • Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location.<br>• All personnel shall be trained on the project Emergencies Response procedures. | **L** |
| Entering/ exiting excavation | Excavation collapse<br><br>Unauthorized personnel<br><br>Excavated soils near the excavation | • Entry into excavations only after inspection by a competent person determines there are no cave-in hazards to employees.<br>• Excavation faces will be sloped as determined by competent person. A restricted access zone will established.<br>• Appropriate fencing and warning signs will be implemented on site.<br>• Excavated soil shall be a minimum of 2 ft from the excavation.<br>• Reference Excavation Plan in the APP and SOP ESQ 7.7 | **M** |
| General Earthwork | Exposure to dust | • Dust control measures will be implemented, as needed, and include some or all of the following:<br>— Visual monitoring for fugitive dust.<br>— Covering soil stockpiles with plastic sheeting or tarps.<br>— Covering loaded dump truck beds with tarps.<br>— Applying magnesium chloride, or similar dust-suppressing agent, for stockpiles and roads to reduce dust emissions.<br>— Spraying potable water on dirt roadways outside the work zone and along dirt access roads.<br>— Spraying the surface of the area to be excavated with water or a dust-suppressing agent, if required.<br>— Work stoppage during wind speed in excess of 25 miles per hour.<br>— Proper PPE | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| *Stop work and notify the Team Leader if you are not sure how to perform your task safely!* | *Stop work and notify the Team Leader if you are not sure how to perform your task safely!* | *Stop work and notify the Team Leader if you are not sure how to perform your task safely!* |
|---|---|---|
| **Equipment to be Used** | **Training Requirements** | **Inspection Requirements** |
| 1. Heavy equipment<br>2. Dust suppressant<br><br><u>Support Zone</u><br>• Cell phone or radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• Drinking water<br>• 911 air horn<br>• Spill containment supplies<br>• Air monitoring equipment<br>• Emergency decontamination supplies<br>• GFCI<br>• Hand and power tools<br><br>**PPE: Modified Level D (hardhat, steel toe boots, work gloves, Class 2 high-visibility garment, hearing protection, and safety glasses). If direct contact with soils, boot covers/over boots and Tyvek may be required (SSHO will determine when boot covers and Tyvek are needed).** | • Only qualified operators permitted to operate mobile equipment<br>• Review of Excavation Plan<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan/Procedures<br>• Fire extinguishers<br><br>**Competent Person: Site Superintendent and/or SSHO**<br><br>Designated Equipment Operators: | • SSHO daily site inspection<br>• Equipment – Receipt and inspected by SSHO<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Complete ECC daily equipment inspection form<br>• Weekly inspection of first aid kits<br>• Monthly and annual inspection of fire extinguishers<br>• GFCIs (at least monthly). |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | |
|---|---|---|
| Activity/Work Task: **Equipment Decontamination, Demobilization, and Site Restoration** | Overall Risk Assessment Code (RAC) (Use highest code) | **L** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | **Risk Assessment Code (RAC) Matrix** | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | | |
| Date Prepared / Revised: **4 February 2021** | | |
| Prepared by (Name/Title): **Brian Kateley, SSHO** | | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | | |
| **Notes: (**Field Notes, Review Comments, etc.) | | |

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | **E** | **E** | **H** | **H** | **M** |
| Critical | **E** | **H** | **H** | **M** | **L** |
| Marginal | **H** | **M** | **M** | **L** | **L** |
| Negligible | **M** | **L** | **L** | **L** | **L** |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>Consider People, Equipment, Materials and Environment<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHO in accordance with WE SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Decontamination of equipment<br><br>Dry Decontamination with hand tools<br>• Use hand tools to remove excess soil or debris from equipment<br><br>Site Restoration/Demob | Slip and Trip Hazards | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures and equipment, operational aspects & equipment use, and change(s) in site/work conditions. Daily housekeeping will be implemented at the end of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit w/ eye wash). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Practice good housekeeping.<br>• Use care when walking on surface tarp, especially when wet.<br>• Clean all spills immediately.<br>• Proper PPE to include shoes which allow for good footing.<br>• Be aware of physical hazards – watch for uneven ground, rocks, dirt clods, etc. | **L** |
| | Overhead Hazards | • Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines. | **L** |

| | | | |
|---|---|---|---|
| Decontamination of equipment<br><br>Dry Decontamination with hand tools<br>• Use hand tools to remove excess soil or debris from equipment<br><br>Site Restoration/Demob<br><br>(CONTINUED) | Manual Lifting/Backs/Ergonomic | • Train/Utilize correct lift techniques.<br>• Personnel will not lift more than 50 lb.<br>• Use Buddy System.<br>• Position equipment as to eliminate over stretching/ergonomic concerns. | **L** |
| | Splash hazards (skin/eyes / face) | • Avoid direct exposure to potential eye hazards.<br>• Wear ANSI approved safety glasses at all times.<br>• Utilize face shield/goggles if potential for flying debris/splash hazards.<br>• Wear rain suit or poly coated Tyvek, waterproof boots or boot covers | **L** |
| | Severe Weather | • Shut down operations during severe electrical storms, heavy rain, high wind and evacuate site/take cover.<br>• Train employees on Emergencies Response.<br>• Monitor weather systems. | **L** |
| | Noise | • Wear hearing protective devices (earmuffs/plugs) inside the exclusion zone, when using or near high noise producing equipment, or when directed by ECC's SSHS in response to noise monitoring.<br>• Ensure adequate maintenance on thermal/heavy equipment. | **L** |
| | Struck By/Against Heavy Equipment | • Maintain radio/verbal communication.<br>• Eye contact with operators will be made before approaching trucks.<br>• Equipment will not be approached on blind sides.<br>• Personnel will understand and review hand signals.<br>• All machines will be equipped with backup alarms and lighting.<br>• Always set emergency brake on equipment.<br>• Equipment will properly Locked Out prior to decontamination (i.e., key removed from ignition)<br>• Engage all equipment-supplied safety equipment (i.e., locking arms, chocks) on equipment parts that are suspended. DO NOT place yourself between unprotected/unsecured parts of the equipment. | **L** |
| | Chemical Exposure | • Protective clothing/PPE (steel toe boots, ANSI approved safety glasses, chemical gloves).<br>• Decontaminate equipment away from intrusive activities and upwind. | **L** |
| | Scrapes and cuts | • Wear safety glasses, gloves and long sleeves. | **L** |
| | Heat/Cold Stress | • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur, when instructed by SSHO.<br>• Report all signs and symptoms of heat strain immediately to SSHO. | **L** |
| Wet Decontamination with use of water<br>• Use hose or pressure washer to remove soil or debris from equipment | High pressure washer operation | • The lance must always be pointed at the work area and away from other site personnel. Non-operators must remain a safe distance from the operator. The distance must be a minimum of 25 feet in every direction<br>• Only trained authorized personnel will be allowed to use the equipment.<br>• The operating pressure should never exceed what is necessary to complete the job.<br>• **The trigger should never be tied down.** | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Wet Decontamination with use of water<br>• Use hose or pressure washer to remove soil or debris from equipment<br><br>(CONTINUED) | Equipment malfunction | • No unauthorized attachment may be connected to the unit.<br>• Equipment should be cleaned after every use to avoid oil or dirt build-up especially around the trigger and guard area.<br>• **Do not modify the lance.** The lance barrel, from trigger block to the tip, should not be less than 48 inches as recommended by manufacturers of hydroblasting equipment.<br>• All users and assistants must be trained in emergency shut down procedures and general equipment maintenance. | **L** |
| | Slips, trips, and falls | • Proper PPE to include shoes which allow for good footing. | **L** |

| ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** | ***Stop work and notify the Team Leader if you are not sure how to perform your task safely!*** |
|---|---|---|
| **Equipment to be Used** | **Training Requirements/Competent or Qualified Personnel name(s)** | **Inspection Requirements** |
| 1. Hand Tools<br>2. Skid Steer<br>3. Pressure washer unit and hoses<br>4. Support Vehicles<br><br><u>Support Zone</u><br>• Cell phone or Radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• Drinking water<br>• 911 Air horn<br>• Spill containment supplies<br>• Air Monitoring equipment, if needed<br>• Emergency decontamination supplies<br>• GFCI<br>• Hand and Power Tools<br><br>**PPE: Modified Level D (Face shield, hardhat, steel toe boots, chemical gloves, orange safety vest, safety glasses (face shield if needed) and hearing protection, as needed)** | • Only qualified operators permitted to operate mobile equipment<br>• Operators of forklifts will have recent certification / training in safe forklift operation (20 CFR 1910, Subpart N – Powered Industrial Trucks)<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan/Procedures<br>• Fire extinguishers.<br><br>**Competent Person: Site Superintendent and/or SSHO** | • SSHO daily site inspection<br>• Equipment – Receipt and inspected by SSHO<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Complete daily equipment inspection form will be completed by the operator<br>• Weekly inspection of first aid kits<br>• Monthly and annual inspection of fire extinguishers<br>• GFCIs (at least monthly). |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | |
|---|---|---|
| Activity/Work Task: **Disc and Raking Contaminated Soil** | Overall Risk Assessment Code (RAC) (Use highest code) | **L** |
| Project Location: **Redstone Arsenal (RSA), Alabama (AL)** | | |
| Contract Number: **W9124J-18-D-0004/ W9124J-20-F-0020** | | |
| Date Prepared / Revised: **4 February 2021** | | |
| Prepared by (Name/Title): **Lauren Sparkman/ Environmental Engineer** | | |
| Reviewed by (Name/Title): **Kym Edelman, CIH, CSP / Site and Health Manager** | | |
| Competent Person (Name/Title): **Aaron Glad, Site Superintendent** | | |
| **Notes: (**Field Notes, Review Comments, etc.) | | |

**Risk Assessment Code (RAC) Matrix**

| Severity | Probability | | | | |
|---|---|---|---|---|---|
| | Frequent | Likely | Occasional | Seldom | Unlikely |
| Catastrophic | E | E | H | H | M |
| Critical | E | H | H | M | L |
| Marginal | H | M | M | L | L |
| Negligible | M | L | L | L | L |

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

**"Probability"** is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

**"Severity"** is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

**RAC Chart**

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

| JOB STEPS | POTENTIAL SAFETY / HEALTH HAZARDS | RECOMMENDED CONTROLS<br>Consider People, Equipment, Materials and Environment<br>*(Note: Standard PPE required for this activity includes Hard Hat, Safety glasses with side protection, and safety-toe footwear. Additional PPE requirements are listed in this column depending on the hazard. This constitutes the Workplace Hazard Assessment per 29 CFR 1910.132. Additional assessments and PPE selection when needed will be documented on a daily briefing sign-in form and signed by the SSHS in accordance with ECC SOP ESQ 6.1. Hazard assessment and respirator selection for inhalation hazards are documented in the site Respiratory Protection Plan if respirators are part of PPE.)* | RAC |
|---|---|---|---|
| Location of Underground Utilities | Hitting Utilities | General Safety - To minimize potential hazards all personnel shall attend site orientation prior to start of work activities in addition to daily Safety Tailgate meetings to familiarize themselves to hazards, emergency procedures, operational aspects & heavy equipment use, and change(s) in site work conditions. Daily housekeeping will be implemented during and at the ends of each workday. Equipment vehicles must be set up with a fire extinguisher (min 10:BC & a FA Kit). Drinking water must be stored in a cooler clearly marked "Food & Drink Only – No Samples".<br>• Before work begins, survey the site for overhead power lines. LOOK UP! Equipment will not be used that is able to reach overhead power lines.<br>• If work must be conducted closer to utilities than guidelines allow, the utility company must be contacted. | **L** |

| | | | |
|---|---|---|---|
| Location of Underground Utilities<br><br>(CONTINUED) | Hitting Utilities<br><br>(CONTINUED) | • An observer/spotter shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means. This shall be the ONLY job the observer is performing when an observer is required.<br>• Keep all personnel well away from the equipment whenever it is close to power lines.<br>• If intrusive activities, Louisiana 811 shall be notified prior to with sufficient time allowed for white-lining and utility marking.<br>— Excavation Permit Procedure: Mark the area for the requested clearance and then submit an excavation permit with RSA. Alabama 811 is contacted 48 hours prior to activity start.<br>• ECC personnel will "white-line" or otherwise mark the area where the wells are to be installed, prior to utility marking.<br>• Intrusive soil activities conducted within a five foot "Buffer Zone" (horizontal or vertical, as measured from the outside edge of the utility) of any utility (electric, gas, high pressure, chemical storage tanks, pipelines, sewers, etc.) may require the use of non-aggressive excavation methods such as hand excavation using non-conductive hand tools, use of an air spade, hydro-excavation, or similar means (some jurisdictions require more stringent buffer zones). Spotter will assist the operator/workers to identify unknown conditions during drilling.<br>• If a previously unknown utility line is identified, uncovered, or disturbed during intrusive activities, stop immediately and project management notified. Intrusive operations shall not recommence until the line has been evaluated, identified, and the appropriate utility notified.<br>• Most utilities and marking services utilize the American Public Works Association Uniform Color Code for marking out utilities. All personnel involved in excavation projects will be familiar with this code | **L** |
| Disc and Raking soil | Struck by equipment | • Operators will be qualified and designated.<br>• All personnel will wear ANSI Type 2 high-visibility traffic safety vests. Operators shall maintain a constant awareness of personnel and equipment in the work areas.<br>• Spotters on the ground will assist operators in manipulating vehicles and equipment into tight or confined spaces.<br>• Getting off or on any equipment while it is in motion is prohibited.<br>• Three points of contact shall be maintained when getting on or off equipment.<br>• Seats will be provided for each occupant of the equipment.<br>• The operator shall use safety belts while equipment is in use.<br>• All original manufacturer-installed safety equipment such as lights, guards, brakes, horn, etc. must be functional at all times.<br>• Whenever equipment is parked, the parking brake shall be set, and wheels chocked when on an incline<br>• Mobile equipment operators shall inform their Supervisor(s) of any prescribed medication that they are taking that would impair their judgment and/or vision<br>• Never walk or work directly in back of or to the side of mobile equipment without the operator's knowledge and approval. | **L** |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| | | | |
|---|---|---|---|
| Disc and Raking soil<br><br>(CONTINUED) | Excessive Noise Exposure | • Wear hearing protective devices (Ear muffs/plugs) when working, when using or near high noise producing equipment, or when directed by ECC SSHO in response to noise monitoring.<br>• Ensure adequate maintenance on equipment.<br>• Conduct periodic sound level surveys. | L |
| | Fire and hydraulic fuel spill from tractor | • Daily inspection of all heavy equipment. A fire extinguisher will be located in each piece of equipment.<br>• Spill containment supplies will be readily available at the fueling area. NO SMOKING allowed in the operating equipment or fueling area.<br>• See Fire Protection Plan and Emergency Response Plan in APP. | L |
| | Heat/Cold Stress (applies to all job steps) | • Monitor weather conditions and implement controls in accordance with Heat/Cold Stress Prevention Plan in APP.<br>• Stay hydrated.<br>• Stop and rest in cool shaded area if heat strain symptoms occur and when instructed by SSHO.<br>• Report all signs and symptoms of heat strain immediately to SSHO | L |
| | Severe weather (applies to all job steps) | • Shut down operations during severe storms, heavy rain, high wind, and lightning episodes. Evacuate the project site and take shelter at the designated shelter location.<br>• All personnel shall be trained on the project Emergencies Response procedures. | L |
| General Earthwork | Exposure to dust | • Dust control measures will be implemented, as needed, and include some or all of the following:<br>— Visual monitoring for fugitive dust.<br>— Covering soil stockpiles with plastic sheeting or tarps.<br>— Covering loaded dump truck beds with tarps.<br>— Applying magnesium chloride, or similar dust-suppressing agent, for stockpiles and roads to reduce dust emissions.<br>— Spraying potable water on dirt roadways outside the work zone and along dirt access roads.<br>— Spraying the surface of the area to be excavated with water or a dust-suppressing agent, if required.<br>— Work stoppage during wind speed in excess of 25 miles per hour.<br>— Proper PPE | L |

# Environmental Chemical Corporation
# Activity Hazard Analysis (AHA)

| *Stop work and notify the Team Leader if you are not sure how to perform your task safely!* | *Stop work and notify the Team Leader if you are not sure how to perform your task safely!* | *Stop work and notify the Team Leader if you are not sure how to perform your task safely!* |
|---|---|---|
| **Equipment to be Used** | **Training Requirements** | **Inspection Requirements** |
| 1. Tractor with disc<br>2. Dust suppressant<br><br><u>Support Zone</u><br>• Cell phone or radio communication<br>• Eyewash station<br>• Fire extinguishers<br>• First aid kit<br>• Drinking water<br>• 911 air horn<br>• Spill containment supplies<br>• Air monitoring equipment<br>• Emergency decontamination supplies<br>• GFCI<br>• Hand and power tools<br><br>**PPE: Modified Level D (hardhat, steel toe boots, work gloves, Class 2 high-visibility garment, hearing protection, and safety glasses). If direct contact with soils, boot covers/over boots and Tyvek may be required (SSHO will determine when boot covers and Tyvek are needed).** | • Only qualified operators permitted to operate mobile equipment<br>• Review of Excavation Plan<br>• First Aid/Cardiopulmonary Resuscitation training (at least two individuals onsite)<br>• Initial Safety Orientation<br>• Daily Safety Tailgate Meetings<br>• Emergency Response Plan/Procedures<br>• Fire extinguishers<br><br>**Competent Person: Site Superintendent and/or SSHO**<br><br>Designated Operator: | • SSHO daily site inspection<br>• Equipment – Receipt and inspected by SSHO<br>• Competent person will inspect equipment daily prior to each use. No equipment will be placed in service until all deficiencies are corrected<br>• Complete ECC daily equipment inspection form<br>• Weekly inspection of first aid kits<br>• Monthly inspection of fire extinguishers<br>• GFCIs (at least monthly). |

# APPENDIX B
# Resumes of Key Safety and Health Personnel and Competent Persons

**Kym Edelman, CIH, CSP** *757-435-5384*
**EHS Manager**

## Experience Summary

Highly accomplished Certified Industrial Hygienist and Certified Safety Professional with over 27 years of on-site and project management expertise to provide oversight, review, reporting, training, and control of employee H&S processes on multiple construction/environmental sites.
Comprehensive knowledge of regulatory compliance requirements under OSHA, DOE, CERCLA, RCRA, USACE, EPA, and other federal/state regulatory programs.
Hands-on experience in compliance monitoring, development and implementation of policies and procedures, accident investigation, and worker's compensation issues.
Proven record of retaining minute detail with excellent recall regarding safety regulations and contractual language to make on-the-spot independent decisions.
Well respected with reputation for using excellent interpersonal communication skills to collaborate with staff, all levels of management, and clients.
Consistently commended for outstanding leadership skills, producing quality work product, developing proactive initiatives, and commitment to achieving optimum project safety expectations to ensure client satisfaction while adhering to corporate policy and procedures.

## Education

BS (Bachelor of Science), Environmental Health, Industrial Hygiene Concentration, Old Dominion University, Norfolk, VA

## Registrations/Certifications

Certified Industrial Hygienist
Certified Safety Professional

## Training

40-Hour OSHA Hazardous Waste Health and Safety Training – 1989
40-Hour EM 385 1-1 Awareness Course- 2018
30-Hour OSHA Construction Safety Course- 2004
Shipyard Competent Person- 2019

## Experience

### Program Health and Safety Manager, April 2020-Present
### ECC, Jacksonville, NC

Responsible for assisting in overall management of the safety programs for ECC.

- Monitor overall safety compliance, assistance, and oversight of multiple task orders for Federal as well as commercial client project sites:
- Assist in preparation and review of project work plans in relation to site specific safety program documents.
- Assist in implementation of safety processes on active project sites.
- Provided technical guidance to project and program employees as well as clients.
- Revise and develop programs and procedures

**Kym Edelman, CIH, CSP** *757-435-5384*
**EHS Manager**

**EHS Manager, September 2018-April 2020**
**APTIM, Norfolk, VA**
Responsible for assisting the EHS Lead in overall management of safety programs for APTIM's Government operations.

- Monitor overall safety compliance, assistance, and oversight of multiple task orders for Federal as well as commercial client project sites:
- Assist in preparation and review of project work plans in relation to site specific safety program documents.
- Assist in implementation of safety processes and manage safety staffing on active project sites.
- Provided technical guidance to project and program employees as well as clients.
- Manage injuries and illnesses, and related worker's compensation claims.
- Assist in safety council, award programs, and employee involvement initiatives.
- Conduct periodic reviews and audits of project sites to determine compliance with applicable regulations, standards, and internal procedures.

**Director, EHS June 2018-September 2018**
**Tetra Tech EC, Inc., Virginia Beach, VA**
Responsible for overall management of environmental health and safety programs and employees for Tt EC operations.

- Serves as program Certified Industrial Hygienist for the Atlantic Division Remedial Activities Contract, Naval Facilities Engineering Command.
- Provides technical support for programs and projects, including proposal review and support.
- Manages site safety and health professionals on projects and ensures safety staff assignments to meet project and client needs.
- Injury case management and worker's compensation claim management.
- Writes or reviews and approves site-specific health and safety plans.
- Conduct program reviews and audits for compliance and continual improvement.

**EHS Manager of Eastern Operations, September 2015-June 2018**
**Tetra Tech EC, Inc., Virginia Beach, Virginia**
Responsible for assisting the Tetra Tech EC Director in overall management of safety programs for Tt EC's operations.

- Monitor overall safety compliance, assistance, and oversight of multiple task orders for Federal as well as commercial client project sites:
- Assist in preparation and review of project work plans in relation to site specific safety program documents.
- Assist in implementation of safety processes and manage safety staffing on active project sites.
- Provided technical guidance to project and program employees as well as clients.
- Manage injuries and illnesses, and related worker's compensation claims.
- Facilitated implementation of LANT RAC program safety council, award programs, and employee involvement initiatives.
- Conduct periodic reviews and audits of project sites to determine compliance with applicable regulations, standards, and internal procedures.

- Program CIH for LANT RAC VI Navy contract.

**ES&H Manager, August 2012 – September 2015**
**CB&I AREVA MOX Project, DOE, CB&I (formerly Shaw) Project Services Group, Aiken, SC**
Manage all safety aspects of the project, including sub-contractors. The project has exceeded 21 million man-hours without a lost work day case.
Responsible for management of the on-site medical clinic, fitness center, production facility safety staff, and all field safety engineers.
Interface between high level construction management, client, and filed construction employees, to ensure clear communication of expectations to continue to promote a positive safety environment that has yielded exemplary employee safety performance.
Technical resource for all project staff, as well as client.

**August 2002 – August 2012, SHAW E&I, Norfolk, VA**
*Ten years of progressive experience and achievement as safety project management/ site safety coordinator*

**Program Safety Manger, May 2008 – August 2011**
**IHNC, USACE, New Orleans,**
Accountable for establishment and initial/continued implementation of project safety programs for this high profile $1.1B project involving design and construction of the New Orleans Hurricane and Storm Damage Risk Reduction System.
Successfully managed the safety program for the largest civil works design-build project ever undertaken by the USACE. The project, during this timeframe, concluded with "no lost work days" for Shaw.
Staffed project, developed project safety initiatives, organized the Accident Prevention and Hurricane Preparedness Plans, coordinated training, conducted subcontractor reviews, and acted as overall technical consultant regarding project safety issues, and compliance monitoring of the safety process.

**Program Safety Manager, November 2007 – August 2012**
**Global Contingency and Construction Contract (GCCC), NAVFAC (Naval Facilities) Worldwide**
Serves as Health and Safety Manager for this $335M US Navy contract. Directed safety programs for all construction projects under the GCCC contract. Implemented safety processes, managed staffing, developed H&S and Accident Prevention Plans, managed worker's compensation claims, and provided technical oversight to staff and management on all projects.Developed documents and programs to ensure training, programs, and procedures were translated into local languages and worked with third country nationals to establish safety cultures where previously non-existent.Monitored and ensured the implementation of corporate policies and procedures, conducted incident investigations, and maintained proactive safety programs.Ensured compliance with applicable laws/regulations, and provided safety support/consultation to Shaw management, as well as client companies and governmental entities.

**Program Safety Manager, May 2008 – 2012**
**LANTDIV RAC V Program, NAVFAC Atlantic Division, Norfolk, VA**
Directed overall program safety on this $150M Navy contract, including safety program implementation and oversight of multiple task orders under the contract.

- Instrumental in team accomplishing 4,000 days with a record of "no lost work days."
- Implemented safety processes, managed staffing, developed health and safety, and accident prevention plans.
- Provided technical guidance to project and program employees as well as clients.
- Managed injuries and illnesses, and related worker's compensation claims.
- Facilitated program safety council, award programs, and employee involvement initiatives.

**Program Safety Manager, December 2002 – August 2012**
Served as Program Safety Manager leading a staff of field safety professionals in the development and implementation of safe work practices on multiple individual task orders. Also, functioned as Site Safety Coordinator for several individual projects at multiple locations conducted under the LANTDIV RAC IV program.

These projects included UXO demilling activities, active range clearance activities, "Clean" site closures, installation of treatment systems, storage tank removals, bio-remediation, landfill excavation/repairs/capping, soils excavation and removal of hazardous materials.

- 2000 Day President's Award for no lost work days on one project.
- Target Zero achieved for 2 Project Sites.
- RAC Program achieved Zero Lost Work Days, Recordable Incidents or Chargeable Vehicle Incidents within Fiscal Year 2008.
- Successfully adapted to EHS organizational changes, and positioned to advance within group.

**Environmental Health and Safety Manager, October 2000 – April 2002**
**Flextronics Enclosures, Kingston, PA**
Responsible for the development, implementation, and monitoring of Flextronics Enclosures, Inc. Environmental Health and Safety program.

- Conducted initial audits, assessments, and industrial hygiene sampling, to determine environmental, safety, and industrial hygiene compliance issues.
- Developed plans and procedures necessary to attain compliance with water permitting, waste disposal, safety and industrial hygiene issues.
- Developed programs to decrease employee injuries as well as reduce incident rates and worker's compensation costs.
- Worked with local occupational health clinic to better manage accidents and injuries, to keep employees at work, and ensure best care possible.
- Responsible for maintaining OSHA 200 logs.
- Conducted and facilitated training sessions for managers and technicians to ensure understand and compliance with new company safety programs.
- Monitored effectiveness of new EHS Program and continually improved upon programs implemented.
- Developed and implemented an Environmental Management System to be compliant with ISO-14001.

**Environmental Scientist, January 1996 – April 1997**
**Maxim Technologies (formerly Huntingdon Chen-Northern), Denver, CO**
Assigned to USEPA Superfund Technical Assistance and Response Team, sub-contracted to the primary USEPA contractor.

- Conducted hazardous waste and emergency response operations, including delineation of contamination, site control, and contamination monitoring and reporting.
- Provided on-site technical support to EPA and oversight of contractors for EPA.
- Provided assistance to EPA regarding sampling, management, and disposal of hazardous and mixed wastes.
- Conducted preliminary site investigations to determine presence and extent of contamination on sites.

- Assisted in development of work plans and provided assistance to EPA for subsequent remediation of contaminated sites and abandoned industrial facilities.
- Conducted hazardous materials training as required by OSHA for hazardous waste site work and emergency response, as well as the hazard communication standard.
- Assisted EPA in conducting public information meetings pertaining to remedial sites.

**Health and Safety Manager, August 1994 – January 1996**
**Maxim Technologies (formerly Huntingdon Chen-Northern), Denver, CO**
Responsible for the overall management of Maxim's regional health and safety program.

- Developed and implemented corporate health and safety procedures throughout the Northwest Region.
- Managed accidents and injuries as well as required documentation on OSHA 200 logs.
- Responsible for compliance, documentation, and disposal of hazardous materials generated by the regional offices.
- Assisted environmental groups in conducting Phase I site assessments.
- Conducted training for Hazardous Waste Site Work, Hazard Communication, Asbestos Awareness, Instrumentation, and Air Monitoring.
- Conducted accident investigations and management of workers' compensation claims.
- Developed site specific health and safety plans for hazardous waste site work.
- Provided technical support in the areas of industrial hygiene and health and safety.

**Site Safety Supervisor, October 1992 – June 1994**
**OHM Corporation, Findlay, OH**
Responsible for the implementation, and management of site specific environmental, industrial hygiene, health, and safety programs, in accordance with site specific health and safety plans.

- Conducted initial site hazard assessments.
- Assisted in completing and maintaining documentation related to hazardous waste storage and disposal.
- Monitored compliance of site operations with respect to OSHA, EPA, and state regulations, such as, RCRA, TSCA, AHERA, HAZWOPER, and HAZCOM.
- Implemented appropriate means to control hazardous materials exposure.
- Monitored the effectiveness of on-site industrial hygiene and safety programs.
- Initiated safety awareness programs.
- Conducted training as required by 29 CFR 1910.120 and the Hazard Communication Standard.
- Liaison between client representatives and OHM in regard to environmental, industrial hygiene, and health and safety issues.

**Division Safety Coordinator, October 1989 – October 1992**
**MAECORP Inc., Columbus, OH**
Responsible for the implementation and compliance monitoring of company safety policies in addition to Federal and State OSHA and EPA regulations, on hazardous waste project sites in USEPA Region V.

- Conducted site safety audits and prepared appropriate reports.
- Conducted air monitoring for personal exposures in addition to environmental air sampling.
- Conducted annual refresher training for hazardous waste site operation.
- Developed site specific health and safety plans in accordance with the requirements 29 CFR 1910.120.

- Conducted building inspections for asbestos.
- Maintained appropriate documentation in regard to medical monitoring requirements, training certificates, and hazard communication.
- Conducted accident investigations.
- Managed work related injuries.

References available upon request



HST

# CERTIFICATE OF TRAINING

THIS CERTIFIES THAT

Kym Mohrman

has successfully completed 40 hours of instruction in

## WASTE SITE WORKER PROTECTION

Prepared and conducted by
Hygiene, Safety and Training Inc.
to comply with OSHA 1910.120(e)(2)

Jack M. Peterson

Jack M. Peterson
CSP, CIH

November 10, 1989

Date of Completion

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OSHA 000266501

U.S. Department of Labor
Occupational Safety and Health Administration

Kym Edelman

has successfully completed a 10-hour Occupational Safety and Health Training Course in

Construction Safety & Health

John H. DeBruyn 11/30/04
(Trainer) (Date)

OSHA 600047764

U.S. Department of Labor
Occupational Safety and Health Administration

Kym Edelman

has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety & Health

John H. DeBruyn 11/15/04
(Trainer) (Date)

OSHA Occupational Safety and Health Administration WK 0007986

This acknowledges that

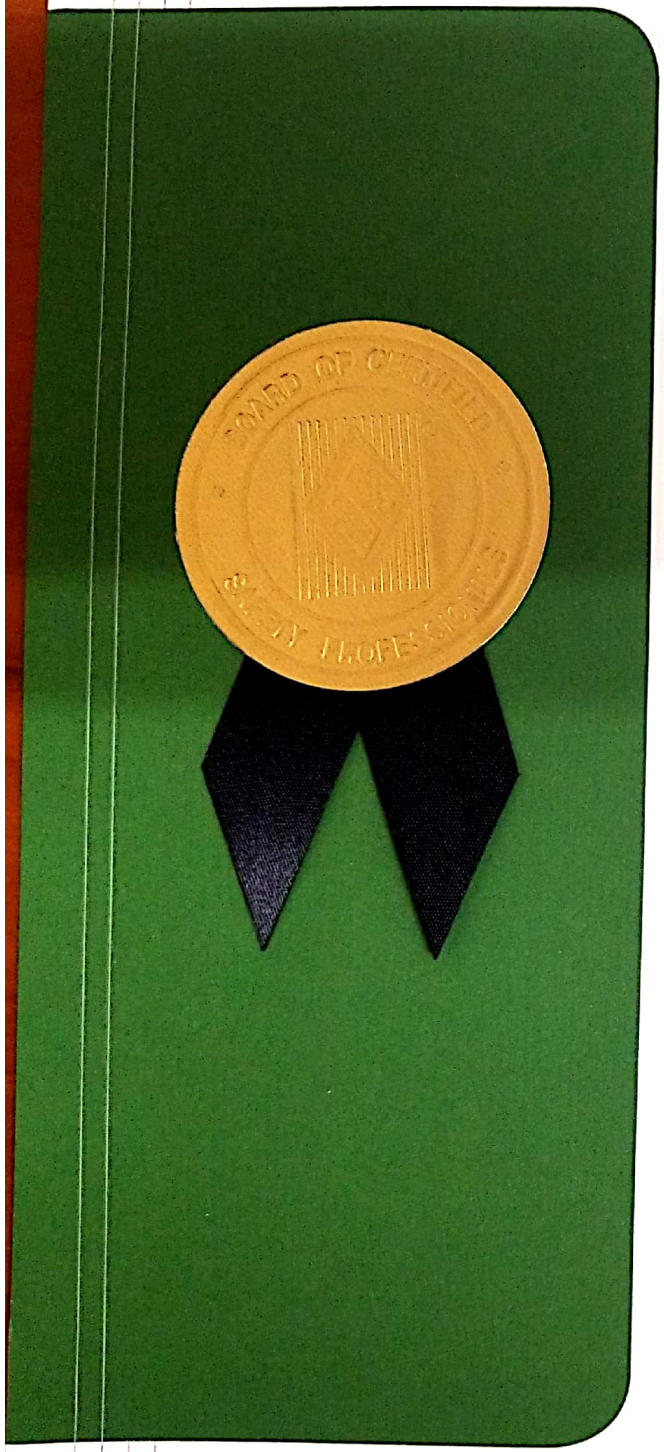
KYM EDELMAN

has successfully completed

Course # 7600 - Disaster Site Worker (16- Hour)

This course emphasizes awareness of the safety and health hazards that may be encountered at natural or man-made disaster sites, as well as the importance of personal protective equipment, decontamination, and incident command organization.

Dominic R. Cinquepalmi June 29, 2006
Trainer Completion Date



# BOARD OF CERTIFIED SAFETY PROFESSIONALS

affirms that

## Kym Y Edelman

Has applied for, met qualifications, and passed required examination(s) and is hereby authorized to use the designation

### Certified Safety Professional®

in Comprehensive Practice

So long as this certificate is not suspended or revoked and the certificant renews this authorization annually and meets Continuance of Certification requirements.

Board of Examiners in witness whereof we have here unto set our hands and affixed the Seal of the Board this 21st Day of December, 2006

President

Secretary

19423 CSP No.

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ABIH
american board of industrial hygiene®

6015 West St. Joseph, Suite 102 Lansing, Michigan 48917 **P:** (517) 321-2638 **F:** (517) 321-4624 **E:** abih@abih.org

November 02, 2016

Kym Y. Edelman, CIH
4900 Fennell Lane
Suffolk VA 23435

Dear Ms. Edelman,

It is my pleasure to congratulate you. With the combination of education, experience and your performance on the CIH® examination, the American Board of Industrial Hygiene® finds you qualified for professional certification in the Comprehensive Practice of Industrial Hygiene. You may now use the designation "Certified Industrial Hygienist®" and the corresponding "CIH®".

This is a significant career milestone. Many industrial hygienists strive for the CIH® certification but it's attained by only a few. Your certification says a lot about you as a professional. It is a mark of distinction that indicates not only your knowledge and skills but also your personal motivation to successfully undertake the challenge. This is recognized by peers, employers and clients.

We will be publishing your name on the ABIH® website so that everyone may see this great accomplishment.

Now that you've attained the CIH®, you'll want to make every effort to retain it. The best place to start is with the CM Primer which is available in the Documents Library section of the ABIH website. It provides an easy-to-read summary of the basic program along with some useful tips. As you review the CM Primer, note that you are on a 60 month CM Cycle that runs from January 1, 2017 to December 31, 2021.

Please use the ID Number listed below to access the My Account section of the ABIH website where you can update your contact information, pay fees and locate other CIHs in the private roster.

ID Number: **11689**

On behalf of ABIH®, I personally congratulate you on your achievement. Welcome to an elite group of professionals!

Ron Drafta

Ron Drafta, CIH
Certification Program Manager, ABIH
rdrafta@abih.org

Enclosure

# Certificate Of Completion

American Safety Council

KYM EDELMAN

Has diligently and with merit completed the

40-Hour EM 385-1-1 on 7/6/2018



Director: **Jeff Pairan**

# ABIH®

## american board of industrial hygiene®

organized to improve the practice of industrial hygiene
proclaims that

# *Kym Y. Edelman*

having met all requirements of
education, experience and examination,
is hereby certified in the

**COMPREHENSIVE PRACTICE**
**of**
**INDUSTRIAL HYGIENE**

and has the right to use the designations

**CERTIFIED INDUSTRIAL HYGIENIST**

**CIH**

| | |
|---|---|
| **Certificate Number** | **11090 CP** |
| **Awarded:** | **October 26, 2016** |
| **Expiration Date:** | **June 1, 2022** |




**Chair, ABIH**

**Chief Executive Officer, ABIH**

The Compliance Edge Online Institute

# Certificate of Completion

**Kym Edelman**

has met the online course completion requirements for

**HAZWOPER 8-Hour Refresher**

in accordance with 29 CFR 1910.120 and 1926.65

**Certificate ID** 1724619-328
**Continuing Education Units** 0.8
AdvanceOnline Solutions, Inc. offers 0.8 CEUs for this program.

*AdvanceOnline, Inc. is authorized to issue the ICSR CEU.*

ICSR CEU

**Date** 7/28/2020 8:09:00 AM
**Time Online** 08:38:52
**AdvanceOnline Solutions, Inc.**
1811 Bering Drive, Suite 430
Houston, Texas 77057
www.advanceonline.com
(713) 621-1100

AdvanceOnline SOLUTIONS

BRIAN KATELEY

**Years' Experience:** 17

**With Current Firm:** 9.5

**Current Professional Registration:**

**Security Clearance:**

Aberdeen Proving Ground

**Education:**

- BS, Environmental Science & Policy Program, University of Maryland, 2003
- Environmental Technology Certificate, Harford Community College, 1999

**Other Professional Qualifications/Training:**

- OSHA 40-hour HAZWOPER, 1999 and 2006; 8-hr HAZWOPER Refresher, 2021
- OSHA 8-hour Excavation Safety; 2006
- OSHA 8-hr Supervisor, 2008
- OSHA 30-hour Construction Safety and Health, 2011 – renewal in progress
- First Aid/CPR/AED/BBP, 2017 – renewal in progress

## Summary of Experience:

Mr. Kateley is experienced in environmental characterization techniques such as groundwater sampling, soil sampling, lithologic characterization, surface media sampling, direct-push technology, investigations, and monitoring well installation. He is also skilled in groundwater remediation system implementation and operation and maintenance, including monitored natural attenuation, pump and treat systems, in situ bioremediation, and product recovery systems.

Mr. Kateley has been in a Site Supervisor and SSHO role since March of 2014. His responsibilities have included assisting with managing project safety and health programs. Providing safety consultation to the project management team in the planning and execution of project tasks. Providing site orientation for new employees, subcontractors, vendors, and visitors. Performing multi-media sampling to determine appropriate levels of PPE and assigning PPE to team members. Conducting daily safety and workplan tailgate meetings. Conducting daily, weekly, monthly, and annual site inspections. Ensured all employees, including subcontractors, performed daily activities safely and assured compliance with APP/SSHP, AHAs, and workplans while enforcing all site safety and health procedures.

**Roles & Responsibilities:** Environmental Scientist, Site Supervisor and SSHO since 03/14.

## *ECC Project Experience*

**Project Title and Location:** Aberdeen Proving Ground Remedial Action (Optimization), Maryland

**Dates on Project Start/End:** 11/11 to present

**Project Start/End Dates:** 06/11 to present

**Roles & Responsibilities:** Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley currently serves as the Site Supervisor and SSHO for the operations, maintenance, and performance monitoring of enhanced in-situ bioremediation systems for the remediation of chlorinated solvents in groundwater at six sites within the Aberdeen Area of APG, Buildings 3327, 525, M600, 361, 507 and Defense Reutilization and Marketing Office Metal Scrap Yard. Systems include active groundwater recirculation systems for the addition of groundwater amendments and passive biobarriers for the treatment of downgradient areas. He is responsible for operations and technical support, including:

tracking weekly groundwater elevation data to determine the status of hydraulic containment; scheduling and overseeing long-term monitoring (LTM) groundwater sampling on a semi-annual schedule; maintaining the project groundwater analytical database; managing and interpreting all of the groundwater elevation and chemical sampling data; and, preparation of quarterly performance and annual operations and performance monitoring technical reports. Mr. Kateley also assists the Project Manager in the oversight of field lab pack technicians and the inventory, tracking, and disposal of solid and liquids wastes generated from the project activities.

Mr. Kateley also supports operations at the Canal Creek and O-Field Groundwater Treatment Facilities under this project and has held an Operator in Training Industrial Wastewater License with the Maryland Department of the Environment (MDE).

**Project Title and Location:** Site Delineation and Characterization of Phillips Landfill, Western Boundary OU2, Ecological Soil Removal at Fire Training Area, and Achieve Site Closure at CCAPG04031, Aberdeen Proving Ground, Maryland

**Dates on Project Start/End:** 09/14 to 09/19

**Project Start/End Dates:** 09/14 to 09/19

**Roles & Responsibilities:** Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley directed environmental sampling in support of a data-gap investigation at six landfill areas identified within the Phillips Army Airfield Landfill (PAALF) to evaluate potential Feasibility Study response actions for the areas under CERCLA. Specific tasks included the delineation of the presence/absence and horizontal extent of fill material within each landfill area through the use of 171 test pits; existing soil cover thickness assessments of each area, soil and solid waste sampling to characterization of contaminates and waste streams; groundwater sampling of the entire PAALF monitoring well network. Mr. Kateley assisted the Project Manager in the implementation of a non-time-critical removal action (NTCRA) at the Aberdeen Fire Training Area (AFTA), located in the Western Boundary Study Area (WBSA) of the Aberdeen Area of APG involving shallow soil excavation/removal of polycyclic aromatic hydrocarbons (PAHs) and metals-contaminated soil; achieving negotiated cleanup levels. He also supported the implementation of the Closure Plan for the former Aberdeen Area Building 4031 Underground Storage Tank (UST) Site regulated under the State of Marylandôs Oil Control Program. Mr. Kateley was responsible for the oversight of well abandonments, decommissioning of the in-active SVE system, construction and operation of an on-site treatment cell for DRO/GRO contaminated soils, excavation and treatment of DRO/GRO contaminated soil from the footprint of the former 4031 Building, liquid phase hydrocarbons (LPH) recovery and groundwater treatment, confirmation sampling and analysis, excavation backfilling, and site restoration. He also supervised lab pack technicians in the performance of post-closure monthly gauging of water levels and removal of free-product from two wells, as well as quarterly groundwater sampling of the well field at the former Building 4031 UST site. Supported preparation of the site project workplans, health safety plans, and closure documentation and coordinated with the DPW Environmental Division Hazardous Waste Branch to provide all documentation necessary to remove waste and IDW from APG. Responsibilities for all project work included oversight of the field sampling teams; inventory and tracking of chemical data and waste generated from investigation and remediation activities; data reporting; and maintaining strict adherence to the health and safety plans and compliance with associated federal, state, local, and APG regulations and guidance governing all CERCLA and RCRA work at APG.

**Project Title and Location:** Canal Creek Study Area Sites RI/FS PBA, Aberdeen Proving Ground, Maryland

**Dates on Project Start/End:** 03/14 to 09/17

**Project Start/End Dates:** 03/14 to 09/19

**Role & Responsibilities:** Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley supported the environmental sampling tasks associated with the RI work at the Canal Creek Study Area (CCSA) at APG as part of the Installation Restoration Program under CERCLA. This contract covered the completion of the remedial investigations (RIs) (including risk assessments and final RI Reports) for 10 East and 12 West CCSA sites, plus an investigation of the Buried Legacy Chemical Sewer Lines throughout the CCSA. The remedial investigations include site inspections, test digs, and media sampling (i.e., soil, sediment, sludge, and groundwater). Responsibilities included development and production of RI Work Plans, field activity reports, and final RI Reports, overseeing team subcontractors, field sampling events, evaluation of analytical data, inventory and tracking of waste generated from RI activities, and maintaining strict adherence to the health and safety plans and standard operating procedures (SOPs) governing all CERCLA work at APG.

**Project Title and Location:** Other Miscellaneous DoD and Former DoD Sites in the United States Mid-Atlantic area.

**Dates on Project Start/End:** 01/12 to present

**Role & Responsibilities:** Environmental Scientist, Site Supervisor and SSHO

Mr. Kateley has supported other similar projects in the Mid-Atlantic on shorter terms including:

- Joint Base McGuire-Dix-Lakehurst ï Burlington County, NJ
- Atlantic City Air National Guard Site ï Atlantic County, NJ
- Fort Meade ï Anne Arundel County, MD
- Picatinny Arsenal ï Morris County, NJ
- Former Griffiss Air Force Base ï Oneida County, NY

## *Work Prior to ECC*

**Scientist II, EA Engineering, Science, and Technology, Inc. (01/06-10/11).**
***Project Manager, Aberdeen Proving Ground Edgewood Area Munitions Response Site Remedial Investigation, Aberdeen Proving Ground; Army Environmental Command (2011).*** Fixed price remedial investigation assessment for munitions and explosives of concern and munitions constituents for 12 Munitions Response Sites at Aberdeen Proving Ground, which total 3,500 acres. Responsible for Technical Project Planning and Restoration Advisory Board support, munitions constituents assessments, providing Unexploded Ordnance Quality Control Officer and Unexploded Ordnance Safety Officer support, Geographic Information System database management, DGM support to include brush clearing, ERIS uploads, and document support. Project includes the re-acquirement and evaluation of over 20 years of Installation Restoration Program data (including geophysics and Installation Restoration Program chemical sampling) to support the Military Munitions Response Site remedial investigation efforts.

**Environmental Scientist, Suburban Propane, Reisterstown, Maryland (2010).** Responsible for field activities during DPT chemical-oxidation injections including assurance of proper injection depths, volumes, and geochemical sampling from surrounding monitoring wells.

**Environmental Scientist, Department of Public Works Parcel B, C, D Remedial Action Plan, National Aquarium of Baltimore, Baltimore, Maryland (2010).** Responsible for construction quality assurance and air monitoring of perimeter and work zone at site utilizing dust and mercury vapor meters. Also responsible for the creation of an environmental monitoring plan for environmental hazards during the voluntary cleanup program remedial action plan implementation.

**Environmental Scientist, New O-Field Groundwater Remediation; Aberdeen Proving Ground (2009-2010).** Performed field activities required to determine contaminant distribution and hydraulic properties for the remedial system design. Responsible for design, installation, and implementation of a bio-barrier injection and monitoring well network to treat chlorinated solvents and metals in groundwater at the site.

**Environmental Scientist, Constellation Power Generation Oil Control Program Compliance Support, Perryman and C. P. Crane Generating Stations (2008).** Responsible for coordination and performance of field activities including site wide groundwater gauging and sampling events and light non-aqueous phase liquid recovery.

**Environmental Scientist, Site 2 Old Dump at Swan Creek Soil, Aberdeen Proving Ground, Aberdeen, Maryland (2009).** Conducted site clearing activities and the installation of geotextile for the reestablishment of landfill cap.

**Environmental Scientist, Compliance Cleanup of 13 Sites, Aberdeen, Maryland; Aberdeen Proving Ground; Environmental Scientist (2008).** Tasks include operation and maintenance of product recovery systems, groundwater monitoring, and reporting.

**Environmental Scientist, Enhanced In Situ Bioremediation Systems, Buildings 3327, 525, M600, 361, 507 and Defense Reutilization and Marketing Office Metal Scrap Yard, Aberdeen Proving Ground, Maryland, Aberdeen Proving Ground (2006).** Involved in the installation and responsible for the operation, maintenance, and performance monitoring for enhanced bioremediation systems for the remediation of chlorinated solvents in groundwater at six sites in the Aberdeen Area. Systems include active groundwater recirculation systems for the addition of groundwater amendments and passive biobarriers for the treatment of down gradient areas.

**Environmental Scientist, Operations and Maintenance Soil Vapor Extraction/Free Product Recovery System, Building 4025, Aberdeen Proving Ground, Maryland (2006-2007).** Responsible for operations and maintenance of the Building 4025 soil vapor extraction remediation system, which consists of a soil vapor extraction system that is designed to enhance the recovery of light non-aqueous phase liquids and biodegrade residual hydrocarbons. Also responsible for collection of monthly air sample for submission to laboratory for benzene, toluene, ethylbenzene, and xylene analysis, to ensure that air emissions for the system are in compliance with the Maryland Department of the Environment regulations. Additional responsibilities include preparation of comprehensive monthly progress reports for the system.

**Environmental Scientist, Operation and Maintenance Soil Vapor Extraction System, Building 4031, Aberdeen Proving Ground, Maryland (2006-2007).** Responsible for operations and maintenance of the Building 4031 soil vapor extraction/free product recovery system. Also responsible for collection of monthly air sample, for submission to laboratory for benzene, toluene, ethylbenzene, and xylene analysis, to ensure that air emissions for the system are in compliance with the Maryland Department of the

Environment regulations. Additional responsibilities include preparation of comprehensive monthly progress reports for the system.

**Inspector/Technician, Monitoring and Maintenance 5 Installation Restoration Program Sites; Edgewood Area, Aberdeen Proving Ground, Maryland (2006).** Responsible for quarterly inspections and subsequent maintenance of 5 Installation Restoration Program sites; Nike SW landfill, Cluster 5 test area, Old Bush River Road Dump, Graces Quarters, and Carroll Island. Monitoring tasks include sampling of monitoring wells and surface media (soil and sediment), maintenance inspection of landfill sites to ensure site stability and inspection of shoreline stabilization measures with unexploded ordnance sweeps at Graceôs Quarters and Carroll Island. Maintenance tasks involve removal of unwanted vegetation, fence repair, and carbon filter replacements.

**Environmental Scientist, Millsboro Groundwater Investigation (Trichloroethene); Millsboro, Delaware; Department of Natural Resources and Environmental Control (2006).** Collected groundwater samples using direct-push technology in order to delineate the plume size of known trichloroethene contamination. Also collected soil, soil gas vapor, and air samples to define possible volatile organic compound occurrences outside of the groundwater.

**Environmental Scientist, Uncle Ted's Trading Post, Millsboro, Delaware, Department of Natural Resources and Environmental Control (2006).** Performed operations and maintenance on soil vapor extraction system. Installed upgraded aquifer air sparge and soil vapor extraction system. Sampled monitoring wells and potable wells surrounding the site.

**Scientist, Absecon Island Shore Protection Project, Atlantic City, New Jersey; US Army Corps of Engineers (01/04-11/04).** Employed on the dune restoration phase of the US Army Corp of Engineers Absecon Island Shore Protection Project. Project focus included sand fence and dune grass installation from Atlantic City to Ventnor City, New Jersey. Responsibilities included fence and planting layout, material storage, equipment maintenance, and communication with contractors. Gained experience in coastal ecology, winter field conditions and operating light machinery. Other projects with this firm included native species reforestation jobs for the Maryland State Highway Administration.

**Carpenter's Assistant, Potts & Callahan Inc., Baltimore, Maryland (06/99-09/00).** Assisted carpenters in the layout, building, and setting of concrete forms for stormwater management structures. Gained experience in reading blueprints and using instrument levels for grading and excavation. Learned heavy equipment safety procedures and the use of industrial power tools.

**Intern/Scientist, Radford Army Ammunition Plant, Radford, Virginia (07/98-04/99).** Worked on the environmental remedial investigation. Responsibilities included air, soil, surface water, and sediment sampling along with sampling documentation and transportation. Assisted in the compilation of the collective measures study by processing sampling results, preparing data spreadsheets and producing sampling maps from Global Positioning System data. Team involvement included site management during remediation phases.



# ALL AMERICAN ENVIRONMENTAL SERVICES, INC.

## This is to certify that

**BRIAN D. KATELEY**

## has successfully completed

**"HAZARDOUS WASTE SITE WORKER" 40-HOUR COURSE**
**SATISFYING OSHA 29 CFR 1910.120 (e) (3) (i)**

## at

**ALL AMERICAN SCHOOL OF OCCUPATIONAL SAFETY AND HEALTH**
**COLUMBIA, MARYLAND**

**January 9-13, 2006**
**40S-0601A**

School Director

EA Engineering, Science,
And Technology, Inc.

# Certificate of Training

PRESENTED TO

## Brian Kateley

FOR COMPLETION OF

**8-Hour HAZWOPER**
**Supervisor Training**
**Per 29 CFR 1910.120**

**25 April 2008**

Peter Garger, CIH

OSHA Occupational Safety and Health Administration

14-600541403

This card acknowledges that the recipient has successfully completed a 30-hour Occupational Safety and Health Training Course in

**Construction Safety and Health**

Brian Kateley

Peter Garger CIH, CSP (Trainer name – print or type)

5/24/2011 (Course end date)

**OSHA recommends Outreach Training Courses as an orientation to occupational safety and health for workers. Participation is voluntary. Workers must receive additional training on specific hazards of their job. This course completion card does not expire.**

**Use or distribution of this card for fraudulent purposes, including false claims of having received training, may result in prosecution under 18 U.S.C. 1001. Potential penalties include substantial criminal fines, imprisonment up to five years, or both.**

For OSHA Outreach Training Program go to "Training" at www.osha.gov

Rev. 12/2009

CLICKSAFETY®

certifies that

# BRIAN KATELEY

has successfully completed ClickSafety's web-based training course:

## HAZWOPER 2021 Refresher (8-Hour)

In accordance with the requirements of 29 CFR 1910.120(e)

This course was developed and presented by ClickSafety.com, Inc.




I confirm that I personally took the course listed above.

| 31533408 | 1/27/2021 | 8 HOURS | |
|---|---|---|---|
| SERIAL NUMBER | COMPLETION DATE | COURSE DURATION | STUDENT SIGNATURE |

# APPENDIX C
# ECC COVID-19 PREVENTION PROGRAM

**ECC COVID-19 Prevention Program (CPP)**

**December 21, 2020**

## 1.0 INTRODUCTION

ECCôs work is considered ñessentialò in support of the Critical Infrastructure. Prevention of all cases of COVID-19 infections among essential workers during a pandemic, as in general society, may not be possible. The following procedures are intended to minimize the spread and impacts of COVID-19 pandemic to protect workers and support the mission. The procedures are based on various state regulations and guidance provided by the US Centers for Disease Control and Prevention (CDC); USDOL Occupational Safety and Health Administration (OSHA), and NAVADMIN Memorandum 173/20: U.S. NAVY COVID-19 STANDARDIZED OPERATIONAL GUIDANCE VERSION 3.1.

This program applies to all ECC employees and invitees, guests, or visitors to our facility as applicable. Subcontractors are expected to have and follow their own protection program that is compliant with Federal, State and Local workplace regulations and public health guidance.

Each Office and Worksite must enter the following information. Site-specific changes to this program should be made in consultation with Health and Safety and Human Resources.

**Office/Project Site Name/Location:**

Redstone Arsenal, Alabama

**Local Health Department Contact Information:**

Alabama Public Health (alabamapublichealth.gov/covid19/). General COVID-19 questions (800) 270-7268 or email covid19info@adph.state.al.us

## 2.0 AUTHORITY AND RESPONSIBILITY

The Corporate Health and Safety Manager has overall authority and responsibility for implementing the provisions of this CPP. In addition, all managers and supervisors are responsible for implementing and maintaining the CPP in their assigned work areas and for ensuring employees receive answers to questions about the program, in a language they understand.

All employees are responsible for using safe work practices, following all directives, policies and procedures, and assisting in maintaining a safe work environment.

## 3.0 IDENTIFICATION AND EVALUATION OF COVID-19 HAZARDS

ECC has identified and evaluated the hazards of COVID-19 in our workplace, using **Attachment B: Identification of COVID-19 Hazards** form, attached.

People with COVID-19 have had a wide range of symptoms reported ï ranging from mild symptoms to severe illness. Symptoms may appear 2-14 days after exposure to the virus. People with these symptoms may have COVID-19:

1) Fever or chills
2) Cough
3) Shortness of breath or difficulty breathing
4) Fatigue

5) Muscle or body aches
6) Headache
7) New loss of taste or smell
8) Sore throat
9) Congestion or runny nose
10) Nausea or vomiting
11) Diarrhea

In offices and job sites, exposure to the virus may occur due to close contact with others that are currently infected, and through contact with surfaces contaminated with respiratory droplets from infected people.

Because ECC offices and job site operations do not involve contact with the general public, providing health care or work in active health care facilities and/or institutional residential facilities, USDOL OSHA considers the workplace to be in the Lower to Medium Risk Categories.

Workplace protection procedures contained in this SOP will minimize the risk of transmission within the workplace.

## 4.0 EMPLOYEE PARTICIPATION

Employees are encouraged to participate in the identification and evaluation of COVID-19 hazards by:

1) Identifying specific situations where person-to-person contact cannot be avoided and reporting situations to their Supervisor or Health and Safety representative
2) Conducting or participating in frequent inspections of the workplace
3) Ensuring adequate disinfection and sanitizing materials are available at all times and reporting reordering needs
4) Contacting the Supervisor or Health and Safety representative with questions and suggestions for improvement
5) Coaching and encouraging co-workers regarding safe work practices for COVID-19 prevention

## 5.0 CORRECTION OF COVID-19 HAZARDS

All supervisors and Health and Safety Representatives are responsible for frequent inspections and observations of the working conditions and practices in the workplace. Unsafe or unhealthy work conditions, practices or procedures may be documented on **Attachment C: COVID-19 Inspections** form, and corrected in a timely manner based on the severity of the hazards, as follows:

1) Failure to maintain proper distancing or face covering use will be addressed with the individuals immediately
2) Cleaning and disinfection procedures will be updated as soon as practical where found to be deficient
3) Failure to follow screening protocols will result in disciplinary action as described in the ECC employee handbook
4) Workplace configuration and ventilation deficiencies will be corrected as soon as practical.

## 6.0 CONTROL OF COVID-19 HAZARDS

### Personnel screening

***Self screening:***

Employees are encouraged to have a thermometer and to self-monitor their temperature daily before coming to work and determine if they have developed one or more other symptoms of COVID-19. Employees should use the **Self-Checker on the CDC website**. They can also use the Apple CDC Screening app if they have an iPhone or iPad **https://apps.apple.com/us/app/apple-covid-19/id1504132184.**

Employees experiencing a fever or other symptoms of COVID-19 should not come to work, and immediately contact their Supervisor.

***Offices:***

Office doors remain closed, with signs for visitors to ring bell or call a number for access. Signs will also announce a need for screening. Employees and visitors will be screened daily when they first arrive at an ECC office. An iPad, thermometer and disinfecting wipes are stationed at the Reception area or immediately adjacent to the entry door. Signs are posted with instructions to activate the app on the ipad, complete the symptom and travel questionnaire and take their temperature. Each person should disinfect the thermometer and iPad screen when finished. The screening will indicate whether entry is permitted or denied. A limited number of personnel will receive an email notification for follow up if entry is denied. Screening applies to all personnel requiring entry to an office including employees, clients, subcontractors, building maintenance and custodial services workers.

***Job sites:***

At the daily tailgate meeting, each person is to certify the that they have no significant risk factors including symptoms, recent close contact with sick individuals, etc. The Screening Questionnaire in Attachment A will be used to question each worker.

Responses can be documented in a variety of methods best suited to the project that help maintain social distancing and infection control. The method implemented will prevent physical sign-offs by individual crew members on a common sheet of paper. Options that may be implemented include:

a) One person checks off a list of workers questioned

b) Tailgate is photographed or video recorded indicating who was present

c) Electronic database input, such as the ECC Screening Mobile App. (Contact Ivan Leung or Olivia Su to set up an account.)

Project sites should have a no-touch medical thermometer. Thermometers designed for industrial use are not acceptable for this application. Temperatures can be taken in either of these situations:

a) For an individual having close contact with sick individual who has not been diagnosed with COVID-19, or

b) As part of the daily general screening of all employees entering the worksite. In this case, check-in station(s) will be established to complete the temperature and questionnaire screening.

Individuals with temperatures that are found to be above 99.5$^{o}$F will require additional screening or isolation.

Individuals taking temperatures of other employees must be properly protected. Wear the following:

a) Double nitrile gloves, and change the outer glove often, or sanitize hands between readings

b) Face coverings. Face coverings must also be worn by personnel being screened to help protect the screener.

Cloth face covering, surgical mask or N95 are acceptable face coverings. Note: Respirators with exhalation valves are not permitted for this purpose. Also, bandannas should be discouraged, but where allowed should drape down to the chest.

Disinfect thermometer after use.

See Sections 10 through 12 when employees do not pass the temperature and symptoms screening criteria.

### 6.1 Physical Distancing

Where possible, ECC will ensure at least six feet of physical distancing at all times in our workplace by implementing these procedures:

1) Permit and facilitate employees working remotely where possible
2) Eliminate person-to-person meetings when possible, with site workers and clients. Meet virtually on Microsoft Teams, use social media apps to distribute safety messages, photograph and distribute AHAs on cell phone text, etc. Physical group meetings will be limited to 10 persons and held outdoors in spaces that can accommodate 6 ft. separation of attendees.
3) Do not allow people to congregate in enclosed spaces including job site trailers, tool rooms, shipping containers, buildings under construction/renovation, etc.
4) Hold tailgate meetings outside if e-meetings are not possible. Make sure personnel respect the recommended 6 ft. social distancing rule at a minimum. Use a battery powered megaphone if necessary. Have one person record attendance, or use photographs as your attendance record, so people donôt need to sign a common sheet (often with a passed around pen). At large sites, split the meetings up into crew meetings.
5) Trades and technical workers will be assigned in a manner that facilitates social distancing whenever possible. Staggered shifts, multiple shifts and phased construction approaches will be used to avoid congestion.
6) Have vendors drop supplies at the entrance gate or an established outside drop point in the Support Zone.
7) Have fuel vendors wear gloves and avoid close contact with operators.
8) Have fuel and other vendors submit invoices electronically. Avoid signing delivery slips.
9) Stagger breaks and do not permit congregating indoors for breaks.
10) Carpooling should be discouraged. Where it occurs employees should be educated and encouraged to follow the procedures below.
11) If ECC employees must share rides in site vehicles, the following rules will apply:

a) Maintain at least 3 ft. distance in all directions from other passengers and the driver, e.g. only 2 people per seating level (front and back)
b) All drivers and riders must wear face coverings
c) Keep windows open to extant feasible (whenever outdoor temperatures are between 60- and 90-degrees F)
d) Clean and disinfect the vehicle high touch surfaces at least twice per day

### 6.2 Face Coverings

ECC will provide clean, undamaged face coverings to ECC employees and visitors, when needed, and ensure they are properly worn over the nose and mouth. Subcontractors are responsible for ensuring their

own employees have suitable face coverings.

Face coverings must be worn:

1) when indoors, and
2) when outdoors and less than six feet away from another person, including non-employees, and where required by orders from the California Department of Public Health (CDPH) or other state and local health departments. **(Note: some localities have rules or orders that require mask wearing outdoors at all times regardless of distancing.)**

The following are exceptions to the use of face coverings in our workplace:

1) When an employee is alone in a room.
2) While eating and drinking at the workplace, provided employees are at least six feet apart and outside air supply to the area, if indoors, has been maximized to the extent possible.
3) Employees wearing respiratory protection in accordance with CCR Title 8 section 5144 or other safety orders.
4) Employees who cannot wear face coverings due to a medical or mental health condition or disability, or who are hearing-impaired or communicating with a hearing-impaired person. Alternatives will be considered on a case-by-case basis.
5) Specific tasks that cannot feasibly be performed with a face covering, where employees will be kept at least six feet apart.

Any employee not wearing a face covering, face shield with a drape or other effective alternative, or respiratory protection, for any reason, shall be at least six feet apart from all other persons.

### 6.3 Engineering controls

Each office is responsible for contacting their building owner, facility manager, HVAC vendor or HVAC service contractor to determine the maximum level of filtration and the maximum level of fresh outside supply air are possible with their current HVAC system. Typically, HEPA filtration is not feasible with systems that have not been designed for special occupancies, such as biomedical laboratories or infectious control health care facilities. MERV 10 have been found to reduce the amount of virus in the supply air by 70% in one study, but further filtration up to MERV 15 did not appear to further reduce the amount of virus passing the through. However an evaluation of system performance will have to be made to see if filters of that efficiency are compatible, especially with older systems.

Outside supply air may be maximized where it does not present other hazards, such as poor air quality due to wildfire smoke or local pollution levels, and where heating/cooling efficiency is not compromised to an unacceptable level.

### 6.4 Cleaning and disinfecting

At ECC offices adequate cleaning and disinfection supplies will be available and employees will regularly clean and disinfect high touch surfaces such as doorknobs and handles, desks and tabletops, and keyboards. Disinfection supplies will include disinfecting wipes, and solutions containing bleach, hydrogen peroxide or quaternary ammonium will be used. Items with these constituents will usually have an EPA Reg Number as an approved biocide. Solutions can be made by mixing one-third cup of household bleach with 1 gallon of water.

Custodial services will include regular disinfection of high touch services as part of their cleaning contracts.

If an employee becomes a confirmed COVID-19 case in our workplace, cleaning and disinfection will be

done of areas, materials, and equipment used by a COVID-19 case during the high-risk exposure period, using the materials described above, by employees wearing proper PPE including disposable gloves, eye protection and face coverings. If necessary, a specialized disinfection service will be engaged to perform this service.

### 6.5 Shared tools, equipment and personal protective equipment (PPE)

PPE will not be shared, e.g., gloves, goggles and face shields.

Items that employees regularly physically contact, such as phones, headsets, desks, keyboards, writing materials, instruments and tools will also not be shared, to the extent feasible. Where there must be sharing, the items will be disinfected between uses by the users.

Sharing of vehicles and mobile construction equipment will be minimized to the extent feasible, and high-touch points (for example, steering wheel, control knobs, door handles, seatbelt buckles, armrests, shifter, etc.) will be disinfected between users.

Disinfect shared resources like radios, power tools, etc. daily.

### 6.6 Hand sanitizing

Supplies of hand soap and water, hand sanitizer, disinfecting wipes and disinfecting solution will be available on site. Encourage all site personnel to use these often and to wash hands for at least 20 seconds each time. Hand sanitizer must be:

1) kept in travel vehicles used for passenger transport,

2) used before entering office or project site or having temperature checked,

3) used after exiting office or project site or having temperature checked.

### 6.7 Personal protective equipment (PPE) used to control employees' exposure to COVID-19

ECC provides disposable gloves and eye protection for employees to perform cleaning and disinfection activities, and while taking screening temperatures of other employees using non-contact thermometers. Face coverings are provided for general work where 6 ft. distance cannot be maintained. Subcontractors are expected to provide their employeesô PPE.

ECC has no operations where aerosolized respiratory droplets and particles are a risk requiring respiratory protection.

Employees providing first aid to others on the job site will follow the precautions in the Bloodborne Pathogens Standard Operating Procedure HS SOP 8.3.

## 7.0 INVESTIGATING AND RESPONDING TO COVID-19 CASES

**Appendix C: Investigating COVID-19 Cases form** will be used as a guide in investigating COVID-19 cases in the workplace. Where workplace transmission is a concern, testing may be required and will be provided by ECC for their employees and subcontractors for their employees.

Contact the Health and Safety Manager and Human Resources for assistance in investigating such incidents.

## 8.0 SYSTEM FOR COMMUNICATING

ECCôs goal is to ensure effective two-way communication with our employees, in a form they can readily understand, while minimizing contact and potential spread of COVID-19 by implementing the following or similar methods:

1) ECC all-hands messages will be forwarded to all ECC personnel, ECC subcontractor managers and client contacts using cell phone group texts, email distribution lists and/or social media apps.
2) A central area will be established to display posters and messages related to COVID-19 prevention. Informational posters will also be distributed throughout the workspaces as feasible. Contact the Health and Safety Manager for posters or visit the CDC and state Health Department websites for information and to download postings.
3) OSHA 3990, Guidance on Preparing Workplaces for COVID-19 may be shared with all ECC personnel, ECC subcontractor managers and client contacts.
4) Site orientations and tailgate meetings will be used to provide training on signs, symptoms and protective measures incorporated in this plan
5) Employees should report COVID-19 symptoms and possible hazards to their direct Supervisor and/or Health and Safety representative:
    a) By phone before coming to work when symptoms first develop
    b) Directly if symptom onset occurs during the workday
6) Employees can report symptoms and hazards without fear of reprisal.
7) Employees with medical or other conditions that put them at increased risk of severe COVID-19 illness must make this situation known to their supervisor or HR. ECC will provide accommodation, to the extent possible. by allowing remote work, modifying workstations, providing extra PPE, or other measures as appropriate.
8) Where testing is not required, ECC employees may access testing through our health insurance plan or through public testing stations established by local health departments or health care facilities.
9) In the event we are required to provide testing because of a workplace exposure or outbreak, we will communicate the plan for providing testing and inform affected employees of the reason for the testing and the possible consequences of a positive test. ECC will cooperate with testing orders by state and local health departments. In California, ECC is required to provide testing if a local health department identifies the workplace as the location of a COVID-19 outbreak, or when there are 3 or more cases in an exposed workplace within a 14-day period. In these cases, employees in the workplace will be given one test immediately and a second test a week later. After the first two tests, weekly tests will be provided for as long as the outbreak persists.
10) Information about COVID-19 hazards employees (including other employers and individuals in contact with our workplace) may be exposed to, what is being done to control those hazards, and our COVID-19 policies and procedures, will be provided to employees.

## 9.0 TRAINING AND INSTRUCTION

Training and instruction will include:

1) Our COVID-19 policies and procedures to protect employees from COVID-19 hazards.
2) Information regarding COVID-19-related benefits to which the employee may be entitled under applicable federal, state, or local laws.
3) The fact that:
    a) COVID-19 is an infectious disease that can be spread through the air.
    b) COVID-19 may be transmitted when a person touches a contaminated object and then touches their eyes, nose, or mouth.

c) An infectious person may have no symptoms.

4) Methods of physical distancing of at least six feet and the importance of combining physical distancing with the wearing of face coverings.

5) The fact that particles containing the virus can travel more than six feet, especially indoors, so physical distancing must be combined with other controls, including face coverings and hand hygiene, to be effective.

6) The importance of frequent hand washing with soap and water for at least 20 seconds and using hand sanitizer when employees do not have immediate access to a sink or hand washing facility, and that hand sanitizer does not work if the hands are soiled.

7) Proper use of face coverings and the fact that face coverings are not respiratory protective equipment - face coverings are intended to primarily protect other individuals from the wearer of the face covering.

8) COVID-19 symptoms, and the importance of obtaining a COVID-19 test and not coming to work if the employee has COVID-19 symptoms.

9) This training will be provided by a combination of project site orientations, daily tailgates, and all-hands messages for employees.

## 10.0 EXCLUSION OF COVID-19 CASES

Where we have a COVID-19 case in our workplace, we will limit transmission by:

1) Ensuring that COVID-19 cases are excluded from the workplace until our return-to-work requirements are met.

2) Excluding employees with COVID-19 exposure from the workplace for the time recommended by the CDC for quarantine or required by state or local authorities if more restrictive.

3) California requires continuing and maintaining an employeeôs earnings, seniority, and all other employee rights and benefits whenever weôve demonstrated that the COVID-19 exposure is work related. Human Resources will determine how this will be accomplished.

4) Providing employees at the time of exclusion with information on available benefits.

### 10.1 COVID-19 Cases

For the purposes of this procedure, a COVID-19 Case is an individual who 1) tests positive or 2) has symptoms consistent with COVID-19 until a physician or public health authority determines that their symptoms were not caused by COVID-19 and documentation of this determination is presented to the Supervisor or Health and Safety Representative. Personnel who meet the Return to Work criteria in Section 12 will no longer be considered a COVID-19 Case.

If an employee reports symptoms of COVID-19 during the daily screening, ECC will ask them to leave the site and to self-isolate at home or their temporary living quarters. ECC will request that they contact their personal medical provider or the state or local public health agency.

If an employee does not self-report symptoms, but symptoms are observed, ECC will ask them to leave the work site until released by a physician or the state or local public health agency.

Immediately notify ECC Human Resources (Tiffany Giglio tgiglio@ecc.net 508-340-9317), ECC local Health and Safety representative, and your Contracting Officer if any of your jobsite personnel test positive or are presumed positive for COVID-19. In accordance with medical privacy requirements, do not

provide the name of the individual to the Contracting Officer; **only disclose the name of a confirmed or presumptively infected employee to ECC Human Resources.** In your notification, please include the following details:

1) Worksite where the employee was working prior to the positive test result;
2) Names of people in the workplace the individual had contact with in the two days preceding the positive test result and/or symptom onset (if known); and,
3) Any known facilities (include description, name of building, building number, or any additional details that may assist us in identifying the facility) the individual visited up to 3-days before the positive test result and/or symptom onset (if known).
    a. Human Resources will contact the local health department regarding non-workplace facilities visited. Jobsite personnel are to notify other personnel contacted by the infected employee as well as all site personnel regarding the infected individual.

If the individual has symptoms or tests positive, they are to follow their physicianôs and the CDCôs guidance on home isolation until they meet the Return to Work criteria in Section 12.0.

### 10.2 COVID-19 Exposed Personnel

COVID-19 exposure includes close contact with infected individuals, i.e. being within 6 ft. for a total of 15 minutes during a 24-hour period, whether wearing masks or not, or being coughed on, sneezed on, or kissed by a COVID-19 case. Employees who share a household with a COVID-19 case are presumed to be in close contact, and therefore an exposed person.

COVID-19 Exposed Personnel will be excluded from the workplace and advised to quarantine at home.

## 11.0 REPORTING, RECORDKEEPING, AND ACCESS

It is ECCôs policy to:

1) Report information about COVID-19 cases at our workplace to the local health department whenever required by law, and provide any related information requested by the local health department.
2) Report immediately to OSHA any COVID-19-related serious illnesses resulting in hospitalization or death of an employee occurring in a place of employment or in connection with any employment.
3) Maintain records of the steps taken to implement our written COVID-19 Prevention Program.
4) Make our written COVID-19 Prevention Program available at the workplace to employees, authorized employee representatives, and to representatives of OSHA immediately upon request.
5) The manager investigating COVID-19 cases may use the **Attachment D: Investigating COVID-19 Cases** form to keep a record of the investigation. The information will be made available to employees, authorized employee representatives, or as otherwise required by law, with personal identifying information removed.

## 12.0 RETURN-TO-WORK CRITERIA

COVID-19 cases with COVID-19 symptoms will not return to work until all the following have occurred:

1) At least 24 hours have passed since a fever of 100.4 or higher has resolved without the use of fever-reducing medications, and
2) COVID-19 symptoms have improved, and.
3) At least 10 days have passed since COVID-19 symptoms first appeared.

COVID-19 cases who tested positive but never developed COVID-19 symptoms will not return to work until a minimum of 10 days have passed since the date of specimen collection of their first positive COVID-19 test.

A negative COVID-19 test will not be required for an employee to return to work.

COVID-19 exposed personnel (close contact) may return to work 14 days after the last close contact in California locations. All other locations may follow the latest CDC Guidelines for release from quarantine ï

1) 10 days since the last close contact, or

2) 7 days after the last close contact and a negative test no earlier than 5 days after the last close contact

If an order to isolate or quarantine an employee is issued by a local or state health official, the employee will not return to work until the period of isolation or quarantine is completed or the order is lifted. If no period was specified, then the period will be 10 days from the time the order to isolate was effective, or 14 days from the time the order to quarantine was effective.

Program Approved by (Signature): Date

# ATTACHMENT A
# DAILY TAILGATE QUESTIONNAIRE

Each Site worker must answer the following questions at the tailgate meeting or upon arriving at the site. Responses must be documented by the ECC SSHO or other management representative.

A. Is this your first day on the project?

B. Did you just return from international travel? If yes, leave site, you must quarantine for 14 days.

C. Did you travel here from within the US by airplane, train or bus? Indicate locations traveled from and through.

D. Are you experiencing any of the following symptoms? If yes, leave the site immediately. Isolate and contact your medical provider.

- Fever[1] or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

E. Have you had close personal contact[2] with anyone who has been diagnosed with COVID-19? Tested positive? Or is presumed to have COVID-19? If yes, leave the site immediately. You must quarantine for 14 days.

F. Have you had close personal contact with anyone who has experienced those symptoms (identified in Question D) in the past 14 days?ò ï If yes, daily temperature monitoring is required along with questionnaire.

If any of the responses are YES, report the case to the ECC Site Safety and Health Officer and Project Manager immediately for follow up. If any of the responses are YES, or thermometer readings exceed the threshold, please conduct any further additional screenings or discussions outside the presence or earshot of other persons not involved in the screening for the privacy of the employee.

[1] Fever for the purposes of this procedure is defined as a temperature greater than 99.5°F confirmed with a second reading at least 30 minutes apart.

[2] Close personal contact means living with, caring for, or had contact with respiratory secretions, being within 6 ft in an enclosed space for more than 10 minutes, or being coughed on or sneezed on by a confirmed COVID-19 patient.

**Attachment B: Identification of COVID-19 Hazards**

All persons, regardless of symptoms or negative COVID-19 test results, will be considered potentially infectious. Particular attention will be paid to areas where people may congregate or come in contact with one another, regardless of whether employees are performing an assigned work task or not. For example: meetings, entrances, bathrooms, hallways, aisles, walkways, elevators, break or eating areas, cool-down areas, and waiting areas.

Evaluation of potential workplace exposure will be to all persons at the workplace or who may enter the workplace, including coworkers, employees of other entities, members of the public, customers or clients, and independent contractors. We will consider how employees and other persons enter, leave, and travel through the workplace, in addition to addressing fixed work locations.

**Person conducting the evaluation**: **[enter name(s)]**

**Date**: **[enter date]**

**Name(s) of employee and authorized employee representative that participated**: **[enter name(s)]**

| **Interaction, area, activity, work task, process, equipment and material that potentially exposes employees to COVID-19 hazards** | **Places and times** | **Potential for COVID-19 exposures and employees affected, including members of the public and employees of other employers** | **Existing and/or additional COVID-19 prevention controls, including barriers, partitions and ventilation** |
|---|---|---|---|
| General office areas during general office work and cleaning. This applies to fixed facilities and temporary job site offices, including trailers and modular units. | Common areas including:<br>• Reception area/lobby<br>• Hallways – both in-suite and common hallways<br>• Rest rooms<br>• Kitchens<br>• Conference rooms<br>• Open office areas, e.g. bull pens<br>• Copy and production rooms<br>• Storage rooms and storage pods | Potential exposures include working within 6 ft. of others and touching contaminated surfaces.<br><br>Client and subcontractor interactions<br><br>Rendering first aid to co-workers | • Work from home policies<br>• Many employees have individual enclosed offices<br>• Entry screening including temperature screening and symptom and travel questionnaire<br>• Video conferencing and IM communications<br>• Travel limitations – must be approved by CEO<br>• Face coverings in common areas and when 6 ft. cannot be maintained<br>• Distancing, e.g. spacing in conference rooms and bull pens<br>• No public access<br>• Limitations on visitors<br>• Traffic flow signs to prevent crossing paths where feasible |

| **Interaction, area, activity, work task, process, equipment and material that potentially exposes employees to COVID-19 hazards** | **Places and times** | **Potential for COVID-19 exposures and employees affected, including members of the public and employees of other employers** | **Existing and/or additional COVID-19 prevention controls, including barriers, partitions and ventilation** |
|---|---|---|---|
| | | | • Limits on # persons to one at a time in rest rooms, kitchen, copy/production rooms and storage rooms and pods<br>• Sanitizer stations<br>• Regular cleaning and disinfection of high touch surfaces<br>(Need to check on ventilation systems with building managers) |
| Job sites - Various types of construction and environmental work including but not limited to:<br>• Site inspections and assessments<br>• Excavation, grading and utility work<br>• Drilling and environmental sampling<br>• Concrete forming, pouring and finishing<br>• Structural steel and concrete construction<br>• Plumbing, electrical and mechanical system installations<br>• Roofing<br>• Exterior architectural work and finishing<br>• Fencing<br>• Paving<br>• Waste loading<br>• Debris removal<br>• Landscaping and forestry work<br>• Interior finishing, Remodeling and repairs<br>• Water treatment | • Access control points at start and end of shift<br>• Pre-shift tailgate meetings<br>• Working in building interiors<br>• Performing construction work that requires more than one person is required to perform a task | • Screening employee IDs, temperatures and questionnaires<br>• Working indoors with others<br>• Working outdoors with others where 6 ft. cannot be maintained<br>• Sharing tools<br>• Sharing mobile construction equipment<br>• Signing common paperwork and sharing writing tools<br>• Rendering First aid to co-workers | • PPE is individually assigned<br>• Education and information on maintaining distance<br>• Face coverings indoors and when tasks require close contact with others<br>• Minimizing signing of documents<br>• Outdoor meetings – with social distancing<br>• Cleaning and disinfection protocols<br>• Sanitizing solution availability<br>• Bloodborne Pathogens program |

| **Interaction, area, activity, work task, process, equipment and material that potentially exposes employees to COVID-19 hazards** | **Places and times** | **Potential for COVID-19 exposures and employees affected, including members of the public and employees of other employers** | **Existing and/or additional COVID-19 prevention controls, including barriers, partitions and ventilation** |
|---|---|---|---|
| Transportation<br>• Air Travel<br>• Job-site vehicles<br>• Van/shuttle and car pools | • Airports<br>• Air planes<br>• Driving or riding in shared vehicles and vehicles with passengers | • Close contact with others within small enclosed spaces<br>• Exposure to contaminated surfaces | • Limit travel to business essential with approval of CEO<br>• Follow rules of terminal and carriers while using public transportation<br>• Minimize ride-sharing<br>• Rules for job-site ride sharing and car pools<br>• Disinfection of shared equipment and vehicles<br>• Ventilation in vehicle<br>• Face coverings in vehicles |

## Attachment C: COVID-19 Inspections

**Date:**

**Name of person conducting the inspection**:

**Work location evaluated**:

| Exposure Controls | Status | Person Assigned to Correct | Date Corrected |
|---|---|---|---|
| **Engineering** | | | |
| Barriers/partitions | | | |
| Ventilation (amount of fresh air and filtration maximized) | | | |
| Additional room air filtration | | | |
| **[add any additional controls]** | | | |
| **[add any additional controls]** | | | |
| **Administrative** | | | |
| Physical distancing | | | |
| Surface cleaning and disinfection (frequently enough and adequate supplies) | | | |
| Hand washing facilities (adequate numbers and supplies) | | | |
| Disinfecting and hand sanitizing solutions being used according to manufacturer instructions | | | |
| **[add any additional controls your workplace is using]** | | | |
| **[add any additional controls your workplace is using]** | | | |
| **PPE** (not shared, available and being worn) | | | |
| Face coverings (cleaned sufficiently often) | | | |
| Gloves | | | |
| Face shields/goggles | | | |
| Respiratory protection | | | |
| **[add any additional controls]** | | | |

**Attachment D: Investigating COVID-19 Cases**

All personal identifying information of COVID-19 cases or symptoms will be kept confidential. All COVID-19 testing or related medical services provided by us will be provided in a manner that ensures the confidentiality of employees, with the exception of unredacted information on COVID-19 cases that will be provided immediately upon request to the state or local health department, OSHA, the National Institute for Occupational Safety and Health (NIOSH), or as otherwise required by law.

All employeesô medical records will also be kept confidential and not disclosed or reported without the employeeôs express written consent to any person within or outside the workplace, with the following exceptions: (1) Unredacted medical records provided to the state or local health department, OSHA, NIOSH, or as otherwise required by law immediately upon request; and (2) Records that do not contain individually identifiable medical information or from which individually identifiable medical information has been removed.

**Date: [enter date]**

**Name of person conducting the investigation**: **[enter name(s)]**

| | | | |
|---|---|---|---|
| **Employee (or non-employee*) name:** | | **Occupation (if non-employee, why they were in the workplace):** | |
| **Location where employee worked (or non-employee was present in the workplace):** | | **Date investigation was initiated:** | |
| **Was COVID-19 test offered?** | | **Name(s) of staff involved in the investigation:** | |
| **Date and time the COVID-19 case was last present in the workplace:** | | **Date of the positive or negative test and/or diagnosis:** | |
| **Date the case first had one or more COVID-19 symptoms:** | | **Information received regarding COVID-19 test results and onset of symptoms (attach documentation):** | |
| **Results of the evaluation of the COVID-19 case and all locations at the workplace that may have been visited by the COVID-19 case during the high-risk exposure period, and who may have been exposed (attach additional information):** | | | |

<table>
<tr><td colspan="4">Notice given (within one business day, in a way that does not reveal any personal identifying information of the COVID-19 case) of the potential COVID-19 exposure to:</td></tr>
<tr><td rowspan="2">All employees who may have had COVID-19 exposure and their authorized representatives.</td><td>Date:</td><td colspan="2"></td></tr>
<tr><td>Names of employees that were notified:</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Independent contractors and other employers present at the workplace during the high-risk exposure period.</td><td>Date:</td><td colspan="2"></td></tr>
<tr><td>Names of individuals that were notified:</td><td colspan="2"></td></tr>
<tr><td>What were the workplace conditions that could have contributed to the risk of COVID-19 exposure?</td><td></td><td>What could be done to reduce exposure to COVID-19?</td><td></td></tr>
<tr><td>Was local health department notified?</td><td></td><td>Date:</td><td></td></tr>
</table>

*Should an employer be made aware of a non-employee infection source COVID-19 status.

# APPENDIX D
# ECC Corporate Environment, Safety, and Quality Standard Operating Procedures (Table of Contents)

**ECC CORPORATE ENVIRONMENT, SAFETY, AND QUALITY PROGRAM STANDARD OPERATING PROCEDURES TABLE OF CONTENTS**


1.0 General Administration

- 1.2 ESQ Organization and Responsibilities
- 1.4 Subcontractor Management
- 1.5 Office Injury and Illness Prevention Plans
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2.0 Continuous Improvement

- 2.1 ESQ Audits and Surveillances
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- 2.3 Lessons Learned
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- 5.1 Site Control
- 5.3 Mobile Construction Equipment
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- 5.6 Stairways and Ladders
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- 5.9 Fire Protection
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- 6.1 Personal Protective Equipment
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7.0 Permit-Required High Loss Potential Activities

- 7.1 Confined Space Entry
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7.3 Control of Hazardous Energy (Lockout/Tagout)
7.4 Line Breaking
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7.6 Underground Utilities
7.7 Excavation
7.10 Diving Management Plan

8.0 Occupational Health

8.2 Medical Surveillance
8.3 Bloodborne Pathogens
8.4 Cold Stress Prevention
8.5 Heat Stress Prevention
8.6 Hearing Conservation
8.7 Air Monitoring
8.8 Biological Hazards
8.9 Asbestos Abatement
8.10 Lead Remediation

9.0 Environmental Protection

9.4 Spill and Discharge Control

# ATTACHMENTS

**ATTACHMENT 1**

**EMERGENCY ACTION PLAN**

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 PRE-EMERGENCY PLANNING

This section includes information needed for pre-planning for emergencies.

### 2.1 Emergency Contact List

**Table A1-1 EMERGENCY CALL LIST AND PROJECT ORGANIZATION**

| Name or Organization | Title | Phone number(s) |
|---|---|---|
| Fire/Ambulance/Police/ Emergency Redstone Arsenal (RSA) | | For all emergencies: 911<br>For non-emergency RSA police/fire: (256) 876-2222 |
| Hospital | Huntsville Hospital | (256) 265-1000 |
| Clinic | Huntsville Hospital Urgent Care | (256) 539-0781 |
| Occupational Medicine | Peter Greaney, MD / WorkCare, or US HealthWorks | (800) 455-6155<br>(714) 288-8303 |
| Poison Control | Poison Control | (800) 256-9822 |
| Jennifer Graham | Contracting Officerôs Representative (COR) | Office: (210) 466-1406 |
| Clint Howard | Army ï RSA Branch Chief-Environmental Restoration | Office (256) 8423702 |
| Pam Foti, Certified Hazardous Materials Manager (CHMM) Project Management Professional (PMP) | Project Manager (PM) | Mobile: (508) 274-3084 |
| Carol Canada, Professional Geologist (PG) | Assistant PM | Mobile: (615) 693-9915 |
| Kym Edelman, Certified Safety Professional (CSP), Certified Industrial Hygienist (CIH) | Safety and Health Manager (SHM) | Mobile: (757) 496-5622 |
| Brian Kateley | Site Safety and Health Officer (SSHO) (Primary) (first aid/ Cardiopulmonary Resuscitation [CPR] provider) | Mobile: (410) 671-2970 |
| Aaron Glad | Site Superintendent ï alternate (first aid/ CPR provider) | Mobile: (508) 229-2270 |
| First Aid/CPR providers | SSHOs | See above |
| ECC HOTLINE | ECC | 650-347-7512 Ext 111 |

**KEY PROJECT PERSONNEL ARE TO HAVE A COPY OF THIS LIST READILY AVAILABLE AT ALL TIMES**

### 2.2 Coordination with local Emergency Agencies

Local authorities and emergency services will be contacted prior to initiation of work. The work objectives and on-site capabilities will be explained, as well as the most likely emergencies. Preferred contact procedures will be established and the response capabilities of local responders will be determined. Environmental Chemical Corporation (ECC) will ensure there is good coordination between our emergency plan and local requirements. The Site Safety and Health Officer (SSHO) will document this meeting in the project files.

## 3.0 PERSONNEL ROLES AND LINES OF AUTHORITY

During all emergencies, the SSHO will serve as the SSHO. He will work to abate and/or contain the emergency.

## 4.0 EMERGENCY RECOGNITION AND PREVENTION

Conditions that may lead to an emergency situation during field activities will be addressed in specific Activity Hazard Analyses (AHAs) as tasks are identified or the Accident Protection Plan (APP) attachments. These conditions include:

- Incident involving a serious injury
- Fire
- Environmental release
- Severe weather

Before daily work assignments, regular ñtailgate/toolboxò safety meetings should be held. Discussions should include, but not limited to:

- Specific task to be performed (Plan of the Day)
- Weather conditions (if severe weather is anticipated, evacuation routes/rally points will be discussed)
- Time Constraints (e.g. rest breaks, tide restrictions, 24-hour operations)
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals
- Near misses from the previous dayôs work
- Emergency Procedures

## 5.0 SAFE DISTANCES AND SAFE ZONES

If severe weather is anticipated, places of refuge and rally points will be discussed at the daily tailgate meeting.

For releases of hazardous material, the SSHO will monitor the rally point to ensure exposure to hazardous materials is not likely to occur. The evacuation routes and rally points during a fire or environmental release may be modified during the response due to wind direction and potential exposure situations. Personnel must remain alert for changes to alternate routes and rally locations.

## 6.0 SITE SECURITY AND CONTROL

Site control procedures for this project will include the establishment of Work Zones in order to provide site security by avoiding unauthorized access and to secure work locations between shifts. On this project, work zones may be established by using appropriate work area signage in combination with warning or danger tape, barricades, or other measures selected for the sites, if deemed necessary.

The SSHO, as well as employees, will stay alert for any unauthorized entry and take necessary actions to control the work area.

Authorized site visitors may visit the site upon meeting the following conditions:

- Receiving site hazard and safety instructions from the SSHO; to include Emergency Response procedures briefing

- Reviewing and complying with the essential elements of the APP
- Using their own, or provided Personal Protective Equipment (PPE), to enter regulated work areas per the APP
- Reporting any observed unsafe act and/or condition at, or affecting, the work site

Visitors will be evacuated from the incident location, or from the site, during emergency activities.

## 7.0 EVACUATION ROUTES AND PROCEDURES

Evacuation routes and procedures will be reviewed and discussed regularly during tailgate meetings.

## 8.0 EMERGENCY MEDICAL TREATMENT (FIRST AID/CPR/AED)

At least two employees certified in both First Aid, Cardiopulmonary Resuscitation (CPR), and Automated External Defibrillator (AED) use be on the project at all times. A First Aid kit must be maintained on site and checked weekly (EM 385-1-1 section 03.B.02). First aid kit will be maintained by the SSHO. A log of First Aid treatment and materials used will also be maintained by SSHO.

If an injury or illness requires more than First Aid, but is not an emergency, the employee will be taken to Huntsville Hospital Urgent Care for examination or observation, after contacting the ECC Corporate Medical Provider, Dr. Greaney, or his alternate at WorkCare (1-800-455-6155). The Huntsville Hospital Urgent Care route can be found in **Figure A3-1**.

If the injury or illness is considered an emergency, call 911 and an installation ambulance service will be contacted to transport the victim to the Huntsville Hospital. The route can be found in **Figure A3-2**.

## 9.0 RESCUE OPERATIONS

Where employees are engaged in one of the following activities or environments, a rescue plan will be incorporated into the AHA or appropriate site-specific plan:

- Working at elevations ï not anticipated
- Using personal fall arrest systems ï not anticipated
- Working alone ï not anticipated
- Confined spaces, or potentially immediately dangerous to life and health atmospheres ï not anticipated

## 10.0 EMERGENCY ALERTING AND RESPONSE NOTIFICATION

An employee alarm system will consist of the use of verbal instructions, either directly or via radio.

Cellphone of telephones will be used to contact emergency responders. **Table A1-1** of this Plan will be kept in site vehicles. The following information will be communicated:

- Name of the person reporting the emergency
- Telephone number at the location of the person making the call
- Name of the injured person, if known
- Description of the emergency
- Exact location of the emergency
- Actions already taken
- What assistance is needed

Although not anticipated, if an employee is working alone in remote area, he/she will have either two-way radios or cell phones. The employee will be required to check in/check out with the SSHO with an agreed upon frequency before employee leaves for the remote work.

## 11.0 PERSONAL PROTECTIVE EQUIPMENT AND EMERGENCY EQUIPMENT

Each field team will have quick access to a First Aid kit, cell phone, bloodborne pathogen prevention PPE, and fire extinguisher.

## 12.0 SITE LAYOUT AND PREVAILING WEATHER CONDITIONS

See **Attachment 3** for hospital and clinic routes; due to the numerous sites for this project, the rally points and procedures will be discussed regularly during the daily tailgate meetings.

## 13.0 REPORTING PROCEDURES

All emergencies will be immediately communicated to the SSHO who will initiate emergency response procedures and notify the Contracting Officerôs Representative (COR) and appropriate response personnel.

After the response, ECC will prepare an Incident Report. It will include such things as a chronological history of the emergency facts, actions taken, personnel present, sample results (if taken), summary of injuries, and possible exposures. For spills and releases it will also include:

- Description of material spilled, including identity, quantity, and a copy of the Safety Data Sheet (SDS) or waste disposal manifest
- Exact time and location of the spill, and the description of the area involved
- Containment procedures utilized
- Description of the cleanup procedure employed at the site, including disposal of spill residue
- Summary of the communications ECC had with other agencies.

This report will be given to the Army within 24 hours of the incident along with immediate verbal notification.

The report will also contain a critique of the response and modifications to this plan will be made if necessary, to adequately address subsequent emergencies.

## 14.0 TRAINING

The Emergency Response Plan will be discussed during initial site training and discussed regularly during the Daily Tailgate Safety Meetings. Due to the short timeframes of field events drill test will not be necessary.

## 15.0 PROCEDURES

**Emergency Action Procedures - Injury and Medical Emergency**

***Prevention:***

Wear proper PPE at all times. Implement precautions in AHA. Follow standard operating procedures. Avoid pinch points, struck by hazards and exposures to falls from elevation. Report all hazards, injuries and illnesses to your supervisor SSHO immediately. Follow instructions on all prescription medications. Stay hydrated.

***Recognition and Reporting:***

If an injury, illness or medical condition arises, notify your nearest co-worker immediately. Have them call the SSHO or your supervisor.

All First Aid Providers will be contacted immediately and will report to location of the injured person. See **Table A1-1** contact list.

***Actions:***

1. First Aid Providers will do an immediate area and victim assessment in accordance with their training.
2. Call 911 or local emergency notification number immediately if any of the following situations exist:
    a. Unconscious
    b. Severe bleeding
    c. Head or spine injury is suspected
    d. Seizures
    e. No pulse
    f. No breathing
    g. Overdose situation possible
    h. Situation requires rescue/medical evacuation (fire, airborne release, workplace violence, trapped)
    i. Any other situation where the condition of the patient is in question. If in doubt contact 911.
3. Establish clear area or have ambulatory patient move to a safe location.
4. Apply Universal Precautions per Bloodborne Pathogens Exposure Control Plan (**Attachment 6** of APP) and training, and don PPE (disposable gloves, CPR mask, etc.).
5. Provide appropriate First Aid/CPR/AED consistent with training and certification.
6. Provide complete information to emergency medical technicians, if necessary.
7. Clean area and contain potentially contaminated materials and articles in labeled bag per Bloodborne Pathogens Exposure Control Plan (**Attachment 6** of APP).
8. Participate in incident investigation, provide for and monitor medical follow up if necessary.

**Emergency Action Procedures - Fire**

***Prevention:***

See Fire Prevention and Protection Plan, **Attachment 2** to APP.

***Recognition and Reporting:***

Call designated base emergency services number upon observation of any uncontrolled fire or smoke.

***Actions:***

1. Always alert the emergency management system first, regardless of the size of the fire
2. Use fire extinguisher if:
    a. You have been trained
    b. You have an escape route behind you
    c. The fire is small (incipient stage) and can likely be put out with one extinguisher in about 10 seconds.

3. If the fire cannot be controlled with a fire extinguisher:
    a. Notify Site Superintendent or SSHO and initiate evacuation procedure immediately.
    b. The SSHO will notify site personnel and client representatives of evacuation order.
    c. The SSHO will ensure evacuation alarms are sounded, and evacuation proceeds in accordance with Evacuation Plan.
4. If the fire is controlled by a fire extinguisher:
    a. Call for another fire extinguisher for stand by
    b. Remove potential sources of fuel and ignition
    c. Stay at the location until relieved by the SSHO or Fire Department to watch for re-ignition.
5. Participate in incident investigation.

**Emergency Action Procedures - Evacuation**

***Prevention:***

Most emergency evacuations can be prevented by following the APP and by practicing safe behaviors. Report all hazards and suspicious activities immediately.

***Recognition and Reporting:***

Emergency evacuation of the site may be prompted by various situations, including but not limited to the following:

- Fires
- Hazardous material releases
- Sudden severe weather events
- Workplace violence or terrorism
- Utility damage
- Off-site emergency that may impact site operations.

Report potential emergency conditions immediately to your Supervisor or the SSHO. Call 911. See **Table A1-1** contact list.

***Actions:***

1. In the event of an emergency, the SSHO may initiate evacuation of the site by sounding the evacuation alert - one long blast on the air horn or make verbal contact
2. Call local 911 or emergency notification number
3. The SSHO will notify and coordinate with client representatives, RSA personnel, and emergency responders
4. Upon arrival of emergency response personnel, the SSHO will report to and assist the Incident Commander (lead from local emergency response team)
5. The SSHO will retrieve the daily sign in logs and proceed to the rally point
6. All personnel, upon hearing the evacuation alert, or receiving verbal instructions to evacuate will immediately proceed along the designated route to the rally point which will be discussed at each daily tailgate meeting
7. In the event of a fire or release of airborne toxic chemical, check local wind indicators. Evacuate in a direction perpendicular to the wind direction if possible
8. Be attentive for instructions on changes in rally location based on site conditions

9. In some cases, a shelter-in-place order may be given. In that case, close doors and windows and shut off ventilation system
10. Report to your Supervisor at the rally point
11. Supervisors will report on the presence of crew members to SSHO for accountability purposes.
12. Look around for friends and co-workers. Report anyone missing to the SSHO
13. Critical plant operations ï there are no critical plant operations on this project. Upon hearing the evacuation alert, all personnel will shut off power tools and equipment and proceed immediately to the rally point
14. Rescue procedures are included in the Fall Prevention and Protection Plan or Confined Space Entry Plan, if applicable. Once an evacuation order is given, rescue activities will be turned over to off-site emergency responders
15. Site First Aid Providers will render First Aid and support to injured personnel at the rally point. In an evacuation, the local Emergency Medical Service will be notified and will take charge of medical support
16. The SSHO will report the status of evacuated personnel to the Incident Commander, including the name, description and last known location of any unaccounted for individuals
17. Site(s) may be re-entered when the SSHO gives the ñall clearò order. An incident investigation will begin immediately, led by the SSHO.

**Emergency Action Procedures - Severe Weather**

***Prevention:***

The SSHO will monitor the weather at least twice daily. Weather monitoring will become continuous when the National Weather Service issues a severe weather Watch or Warning.

***Recognition and Reporting:***

A Watch means that a weather emergency is possible. It means Be Prepared. On issuance of a Watch, the SSHO will determine what site preparations will be made to secure the site, shut down, evacuate or call off a scheduled work shift.

A Warning means that a weather emergency is in the area. It means Take Action. Upon issuance of a Warning, the SSHO will implement emergency shut down procedures.

***Actions:***

1. Thunderstorm, Lightning, Tornado
    a. Remove loose or stacked materials from roofs, or open floor decks
    b. Remove from site or secure stacks of materials at ground level
    c. Lightning - Stop outdoor activities involving load handling equipment, roofing, working on elevating platforms and scaffolds, tree trimming, or work in open areas upon hearing thunder or seeing lightning. Seek indoor shelter. Stay indoors for 30 minutes after the last audible thunder or visible flash of light
    d. Proceed to pre-determined tornado shelter upon issuance of a Warning. The SSHO will work with RSA personnel or local emergency agencies to identify shelters during mobilization.

## Emergency Action Procedures - Spills and Releases of Hazardous Materials

***Prevention:***

Supervisors will review the hazards of chemicals with their work crews, and SDS and labels will be maintained in accordance with the Hazard Communication Program.

- **Avoid mixing chemicals**, even common household products. Some combinations, such as ammonia and bleach, can create toxic gases. When in doubt, consult the SDS or the SSHO.
- **Always read and follow the directions** when using a new product. Some products should not be used in small, confined spaces to avoid inhaling dangerous vapors. Other products should not be used without gloves and eye protection to help prevent the chemical from touching your body.
- **Store chemical products properly.** Non-food products should be stored tightly closed in their original containers so you can always identify the contents of each container and how to properly use the product. Containers of flammable and combustible liquids will be stored in flammable liquid storage cabinets or removed from the site at the end of the day. Bulk storage of fuels or other hazardous materials will have secondary containment, and containment around transfer valves, spigots and hoses.
- **Report and Clean up any spills immediately** with some rags, being careful to protect your eyes and skin.
- **Follow operating procedures**. Implement procedures designed to limit open containers, excess pressure, surface area of contaminated environmental media, drum and container handling, etc.
- **Implement the Storm Water Pollution Prevention Plan** if one is required on the site, or general good chemical handling practices to keep materials from flowing off-site with stormwater.

***Recognition and Reporting:***

Notify your Supervisor or the SSHO of any spill or airborne release of hazardous materials. The SSHO will investigate and determine if an emergency should be declared and will issue an alert to evacuate or shelter-in-place if necessary. The SSHO will call the RSA emergency services if an emergency is declared.

The SSHO will notify the client representative immediately of any spill or release. Where reporting to installation and regulatory agencies is required, the reporting will be done in accordance with the communications plan approved by the Contracting Officer. See Contact List **Table A1-1**.

***Actions:***

The actions to be taken will depend on the nature and extent of the release. Only personnel trained in the procedures and PPE required to handle the spill or release should be involved in containing, stabilizing, and cleaning up the material.

1. If a release from an on-site or off-site source results in a shelter-in-place order:
    a. Proceed to the nearest designated shelter
    b. Shut doors and windows
    c. Turn off ventilation system.
    d. If possible, seal gaps around doors and window with tape, wet towels or other items
2. Take immediate measures to control and contain the release (e.g. shut off pumps, close valves).
3. Contact local emergency service providers.
4. Don protective equipment as specified by the SSHO.

5. If exposure to individuals causes injury/health effects, make sure the area is safe before attempting rescue or First Aid. If safe to do so, move them to fresh air and apply appropriate First Aid. Notify the Emergency Medical Service of the nature of injury.
6. Isolate and contain hazardous release areas.
7. Deny entry to the spill area to unauthorized personnel.
8. Do not allow anyone to touch spilled material.
9. Stay upwind, keep out of low areas.
10. Keep combustible materials away from the spilled material.
11. Use water spray or foam to reduce dust or vapors as needed.
12. Collect samples for analysis to determine that cleanup is adequate.
13. If the release is from tanks, prevent the discharge from traveling beyond site boundaries.
14. Containerize materials and arrange for proper disposal.
15. Take caution when handling drums and containers (opening, sampling, and over packing).

**ATTACHMENT 2**

**FIRE PREVENTION AND PROTECTION PLAN**

**Attachment 2**
**FIRE PREVENTION AND PROTECTION PLAN**

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 SCOPE

This Plan applies to all activities, including subcontractor activities for the project identified above.

## 3.0 LIST OF MAJOR WORKPLACE FIRE HAZARDS

On this project, the major workplace fire hazards will include:

- Normal combustibles including transmitter building, trash, construction materials, vegetation and waste piles. Good housekeeping will be maintained. Trash will be collected daily and placed in a designated receptacle.
- Combustible and flammable liquids used as fuels in site vehicles, mobile construction equipment and power tools.
    - Gasoline will be kept in labeled five-gallon metal safety cans with flame arrestor and spring-loaded lid, or in Underwriters Laboratories (UL) approved one to two-gallon plastic cans.
    - Diesel fuel will be kept in labeled UL approved containers.
    - A temporary Diesel fuel tank will be protected with barriers and secondary containment.
    - The refueling area is shown on the Site Layout.

## 4.0 CONTROL OF IGNITION SOURCES

- Smoking is prohibited inside vehicles and buildings. A designated smoking area will be established during mobilization and supplied with a self-extinguishing ash tray stand.
- Temporary fuel storage tanks will be protected from accidental impact by vehicles and equipment.
- Storage tanks will be double-walled or have other secondary containment measures which will have a capacity of at least the tank volume +10 percent (%). Secondary containment will be inspected regularly and kept free of accumulation of liquids, including rainwater to ensure sufficient free board at all times.
- Tanks, pumps and hoses will be rated/approved and listed for the service and will include appropriate bonding to control static sparks.
- Hose nozzles used to fill equipment from the temporary tank will be automatic closing and will not be equipped with a latch-open device. All filling and transfer operations will be attended.
- Normal combustibles, including high vegetation will be kept at least 25 feet from the refueling area.
- Sources of ignition will be prohibited within 25 feet of the refueling area.
- Equipment with small engines will not be fueled while hot.
- The refueling area will be posted with signs, including ñNo Smokingò, ñNo Hot Workò, and ñDo not fuel hot equipment.ò
- A Fire Extinguisher rated at least 40 B:C will be placed in a fixed and visibly labeled location within 100 feet of the refueling area.
- Tanks will have appropriate hazard warning labels.
- A spill kit suitable for minor spills and leaks of petroleum products will be stationed at the refueling area.

- The refueling area, equipment, and emergency supplies will be inspected as needed.
- Small portable containers of flammable liquids will be stored out of direct sunlight and in a designated location. A Flammable liquid storage cabinet will be used if more than two containers of flammable liquids are stored on site. The cabinet will include a ñNo Smokingò label.
- See **Section 9** for Hot Work requirements.

## 5.0 TYPES OF FIRE SUPPRESSION EQUIPMENT

Portable fire extinguishers will be selected and distributed as follows:

- Fire extinguishers rated to 1-A:10-B:C or higher, will be in all work vehicles, mobile construction equipment, and in the immediate vicinity of stored flammable materials.
- 40-B:C extinguisher in the refueling area.
- 4-A: 60-B:C (10-pound agent minimum) at each hot work location.
- Not anticipated, but if in buildings under construction, alteration or demolition, at least one 4-A:6-0B:C extinguisher will be located per every 6,000 square feet of floor space, on each floor. Extinguishers shall not require a travel distance of more than 75 feet, and one extinguisher on each floor should be placed close to the stairways. Note: If unusual fire hazards exist, consult National Fire Protection Association (NFPA) 10 for additional selection and distribution information.
- The equipment will not be removed except for inspection and/or use in an emergency.
- The Site Safety and Health Officer (SSHO) will provide training on the use of the fire extinguisher during the pre-entry briefing.
- Fire extinguishers will be visually inspected monthly.

## 6.0 RESPONSIBILITIES FOR MAINTAINING EQUIPMENT AND SYSTEMS

The SSHO will be responsible for inspection of work areas on a daily basis, and inspection of fire extinguishers on a monthly basis.

Fixed systems in buildings under construction, alteration or demolition will be inspected by, or under the direction of the Authority Having Jurisdiction.

## 7.0 PERSONNEL RESPONSIBLE FOR CONTROLLING FUEL SOURCE HAZARDS

The SSHO is responsible for controlling fuel source hazards, in accordance with this Plan. This includes regular inspections of areas and equipment, maintaining adequate freeboard in secondary containment, limiting combustibles around fuel storage and dispensing operations, and ensuring control of ignition sources in these areas.

## 8.0 HOUSEKEEPING PROCEDURES

Trash will not be permitted to accumulate. Receptacles with lids or roll off boxes will be used to contain trash. Work areas will be cleaned up each day, as often as necessary to maintain a safe job site.

Waste piles will be limited in size, segregated and removed from site as soon as possible.

Spills of flammable and combustible materials will be contained and cleaned up as soon as possible. See Emergency Action Plan, **Attachment 1** to the APP.

## 9.0 HOT WORK PERMITS

Hot work is defined as any process that produces open flames, heat or sparks, including, but not limited to: burning, cutting, welding, soldering, brazing, torch applied roofing, and the use of temporary heating devices involving an open flame or exposed heating elements.

Before any hot work is performed, ECC personnel shall obtain a Hot Work Permit from the U.S. Army local authority. A hot work site will have a designated fire watch. This personôs sole responsibility shall be to monitor the hot work and have immediate access to the fire extinguisher located at each hot work site (a portable fire extinguisher (A:B:C) will be readily available). The fire watch shall remain at his/her designated watch for 30 minutes from the conclusion of hot work activities.

It is the responsibility of the SSHO to work with the Army or local authority/permit issuing group to establish the requirements, definitions, and regulations. In general, a hot work permit is required from the local hosting facility when the hot work is being performed on a pre-existing building/structure or new attachment to an existing structure. If the hot work is solely on a new building/structure not connected to a preexisting structure and has not been handed over to client or end user, then an ECC Hot Work permit can be used. This should be communicated prior to the start of any hot work activities.

**ATTACHMENT 3**

**MEDICAL SUPPORT PLAN**

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 SCOPE

This plan provides information for medical support for all operations at the project identified above.

## 3.0 COMMUNICATION

The site will have ready communications to medical support facilities via cell phone. Phone numbers are listed on the Emergency Contact List (Emergency Action Plan, **Attachment 1** to the APP, **Table A1-1**) and the list will be kept in all site vehicles.

## 4.0 FIRST AID AND MEDICAL FACILITIES

Minor injuries will be treated on-site by certified First Aid Providers (see Emergency Contact List). If additional care is needed, the local facility, Huntsville Hospital Urgent Care**,** will be used. **Figure A3-1** shows the route map to the facility.

If an incident results in a major injury, call 911 for ambulance. Environmental Chemical Corporation (ECC) will not transport non-ambulatory, unconscious or shock risk patients. **Figure A3-2** is the route map to Huntsville Hospital. Copies of the route maps will be kept in all site vehicles.

Medical consultation can be obtained from ECCôs occupational medical consultant, Dr. Greaney or his associates at WorkCare, Inc. WorkCare should be called before transporting any minor injury to the local clinic or emergency room.

At least one First Aid kit for every 25 employees will be kept on-site. The First Aid kits will comply with American National Standards Institute (ANSI) Z308.1. All kits will contain bloodborne pathogen prevention personal protective equipment (PPE) including surgical gloves and resuscitator mask or shield.

At least two individuals with current certification in First Aid and Cardiopulmonary Resuscitation (CPR) will available on each shift.

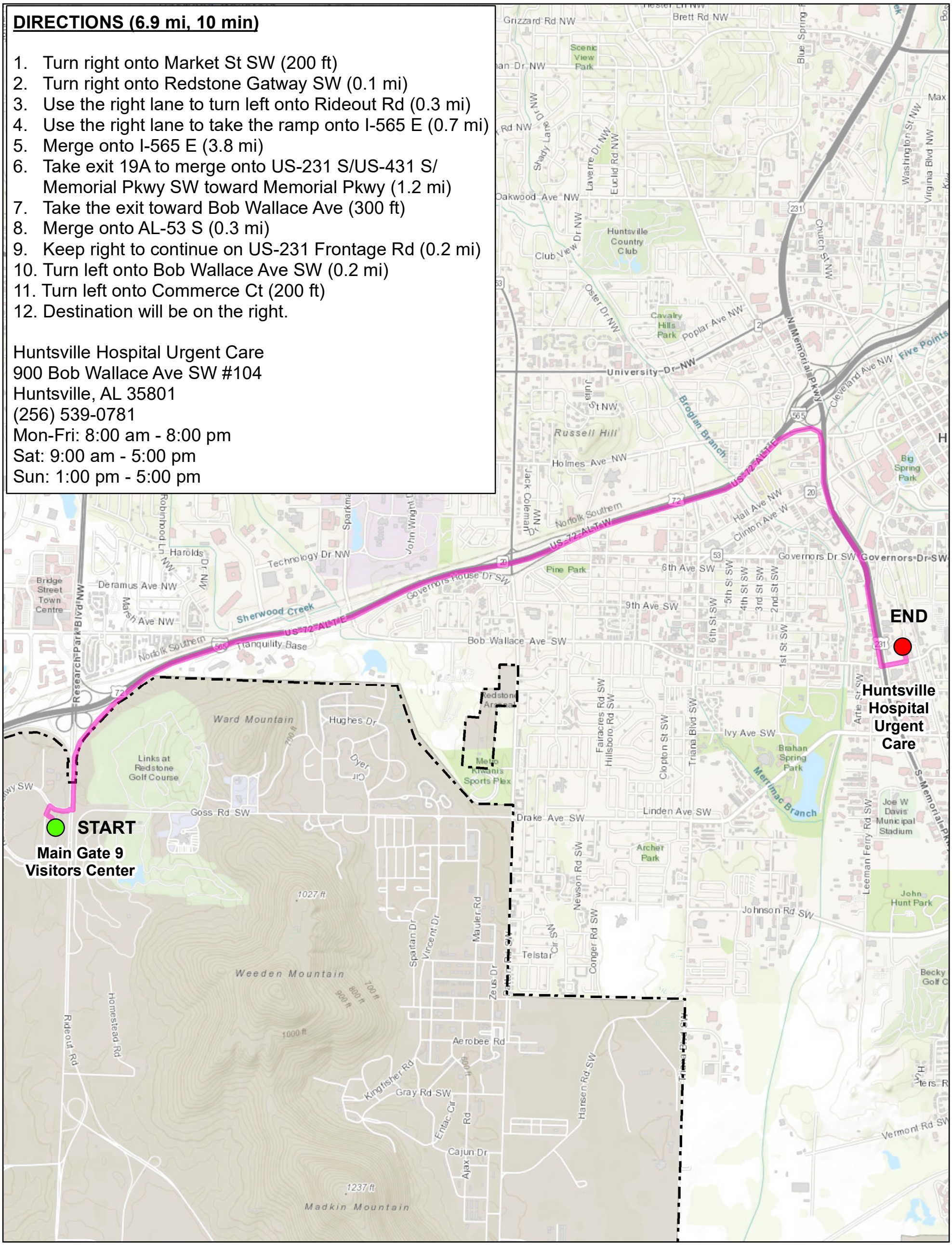
Each will have current certification in First Aid and CPR from the American Red Cross, the American Heart Association, or from an organization whose training adheres to the standards of the International Liaison Committee on Resuscitation (as stated in writing), or from a Licensed Physician. Certification courses will have hands-on component that cannot be taken on-line. Retraining will occur every two years.

First Aid Providers on this project include the Site Safety and Health Officers (SSHOs) Mr. Brian Kateley and Mr. Aaron Glad. They are First Aid and CPR trained; are qualified to administer First Aid and CPR; and have completed Bloodborne Pathogen training in accordance with 29 Code of Federal Regulations (CFR) 1910.1030. Their duties are to provide First Aid/CPR in accordance with their training.

**DIRECTIONS (6.9 mi, 10 min)**

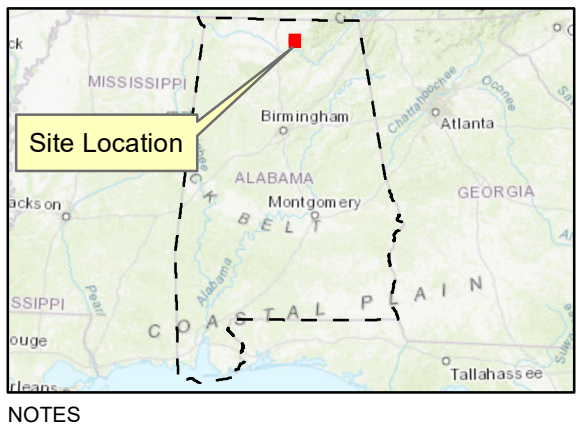
1. Turn right onto Market St SW (200 ft)
2. Turn right onto Redstone Gatway SW (0.1 mi)
3. Use the right lane to turn left onto Rideout Rd (0.3 mi)
4. Use the right lane to take the ramp onto I-565 E (0.7 mi)
5. Merge onto I-565 E (3.8 mi)
6. Take exit 19A to merge onto US-231 S/US-431 S/ Memorial Pkwy SW toward Memorial Pkwy (1.2 mi)
7. Take the exit toward Bob Wallace Ave (300 ft)
8. Merge onto AL-53 S (0.3 mi)
9. Keep right to continue on US-231 Frontage Rd (0.2 mi)
10. Turn left onto Bob Wallace Ave SW (0.2 mi)
11. Turn left onto Commerce Ct (200 ft)
12. Destination will be on the right.

Huntsville Hospital Urgent Care
900 Bob Wallace Ave SW #104
Huntsville, AL 35801
(256) 539-0781
Mon-Fri: 8:00 am - 8:00 pm
Sat: 9:00 am - 5:00 pm
Sun: 1:00 pm - 5:00 pm




**LEGEND**

- Clinic Route
- Redstone Arsenal




NOTES
1. Coordinate System: NAD83 State Plane Alabama East, US Feet (FIPS 0101)
2. Basemap data from IGI&S Office at Redstone Arsenal
3. Map Size: B-size (17" x11")
4. Revision Date: 2/8/2021

**Figure A3-1**

**Clinic Route Map**
**Redstone Arsenal**
**Madison County, Alabama**

0 3,500 7,000 Feet

1 inch = 2,778 feet

**Mission & Installation Contracting Command (MICC)**
**U.S. Army Garrison-Redstone**

DISCLAIMER- The data represent the results of data collection/processing for a specific Redstone Arsenal activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time, and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

ECC GIS Server: E:\Projects\Redstone\MapDocument\APP\FigA3-1_RSA_APP_ClinicMap.mxd

**DIRECTIONS (7.4 mi, 12 min)**

1. Turn right onto Market St SW (200 ft)
2. Turn right onto Redstone Gateway SW (0.1 mi)
3. Use the right lane to turn left onto Rideout Rd (0.3 mi)
4. Use the right lane to take the ramp onto I-565 E (0.7 mi)
5. Merge onto I-565 E (4.4 mi)
6. Use the right lane to take exit 19C for Jefferson St toward Downtown (0.3 mi)
7. Continue onto Jefferson St N (0.2 mi)
8. Turn right onto Monroe St NW (0.5 mi)
9. Turn left onto Church St NW (0.5 mi)
10. Turn left onto Williams Ave SW (0.2 mi)
11. Turn right onto Madison St SE (0.5 mi)
12. Turn right (70 ft)
13. Destination will be on the right

Huntsville Hospital
101 Sivley Rd SW
Huntsville, AL 35801
(256) 265-1000

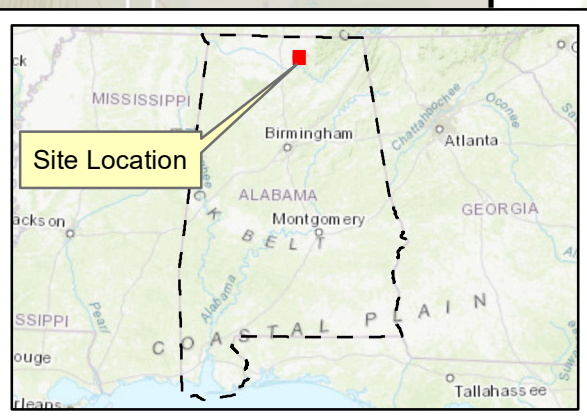
START
Main Gate 9
Visitors Center

END
Huntsville
Hospital

**LEGEND**

Hospital Route

Redstone Arsenal




NOTES
1. Coordinate System: NAD83 State Plane Alabama East, US Feet (FIPS 0101)
2. Basemap data from IGI&S Office at Redstone Arsenal
3. Map Size: B-size (17" x11")
4. Revision Date: 2/8/2021

**Figure A3-2**

**Hospital Route Map**
**Redstone Arsenal**
**Madison County, Alabama**

0 4,000 8,000 Feet

1 inch = 3,045 feet

**Mission & Installation Contracting Command (MICC)**
**U.S. Army Garrison-Redstone**

DISCLAIMER- The data represent the results of data collection/processing for a specific Redstone Arsenal activity and indicates the general existing conditions. As such, it is only valid for its intended use, content, time, and accuracy specifications. The user is responsible for the results of any application of the data for other than its intended purpose.

ECC GIS Server: E:\Projects\Redstone\MapDocument\APP\FigA3-2_RSA_APP_HospitalMap.mxd

**ATTACHMENT 4**

**DRUG AND ALCOHOL ABUSE PREVENTION**

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to a) meet the requirements of applicable laws and regulations to ensure that the workplace is free of illegal drugs; b) establish restrictions on the workplace-related use of legal substances, such as alcohol and prescription drugs; c) address other behaviors and practices that can be related to the abuse of drugs and other substances; and d) enable Environmental Chemical Corporation (ECC) to comply with client Drug Free Workplace policies.

## 3.0 SCOPE AND APPLICATION

This SOP includes requirements for the control of the use of alcohol, illegal drugs and legally prescribed drugs that may impact an employeeôs ability to work safely. This SOP applies to all ECC employees, as well as to all subcontractors who work on ECC project sites. For the purposes of this procedure, the term ñemployeeò includes subcontractor employees.

## 4.0 PROCEDURES

This section includes the Drug Free Workplace Policy and implementation procedures.

### 4.1 Drug Free Workplace Policy

ECC prohibits the use, sale, dispersal, possession, or manufacture of illegal drugs, narcotics or alcoholic beverages on its premises. This prohibition also covers all legal or prescription drugs that impair an employeeôs ability to perform his/her job safely or properly. Employees will be subjected to disciplinary action, up to and including dismissal, for bringing illegal, non-prescribed drugs and narcotics or alcoholic beverages to work; being under the influence of such substances while working; using such substances while working; or dispensing, distributing, or illegally manufacturing or selling such substances on ECC premises or work sites.

Employees, their possessions, and ECC issued equipment and containers under their control are subject to search and surveillance at all times while on ECC premises or while conducting ECC business.

Employees may be required to take a test at any time to determine the presence of drugs, narcotics, or alcohol, unless such tests are prohibited by law. Employees convicted of any criminal drug violation occurring in the workplace must report such conviction to Human Resources within five days, who will then take appropriate actions as required by law.

Employees judged to be under the influence of drugs, narcotics, or alcohol will be required to leave the premises. Employees who must use prescribed drugs or narcotics during work should report this fact to their supervisor and provide acceptable medical documentation. A determination will then be made as to whether the employee should be able to perform his/her job safely and properly.

Employees experiencing problems resulting from drug, narcotic, or alcohol abuse or dependency are encouraged to seek rehabilitation, counseling, and/or other help.

### 4.2 Drug and Alcohol Testing

For the purposes of this SOP, the terms "drug screening" or "drug testing" includes testing for alcohol, in either blood, urine, or breath.

#### 4.2.1 Pre-employment Drug Screening

Pre-employment drug screening shall be required for all ECC full-time and project employees. ECC shall test for the following drugs: ethanol (alcohol), amphetamines, barbiturates, benzodiazepines, cocaine metabolites, methadone, opiates, phencyclidine, and marijuana metabolites. The list and cutoffs may be modified by the Corporate Medical Consultant, who also serves as the Medical Review Officer, in accordance with rules and guidelines established by the Substance Abuse and Mental Health Services Administration (SAMHSA). This testing may also be required before a new assignment, such as a promotion or assignment to a particular job site. All positive tests results are kept confidential at all times by the Human Resource Department.

Subcontractors must provide a statement or certification that their employees have had pre-employment screening with negative results.

#### 4.2.2 Periodic Drug Screening

Annual or biennial drug screening shall be required for all operational department personnel conducting work activities at ECC project sites. Periodic drug tests will measure the same substances as the pre-employment tests. All positive results are kept confidential at all times by the Human Resource Department.

#### 4.2.3 Post Accident Testing

Employees who are involved in an incident that results in an employee injury requiring medical treatment beyond First Aid, equipment or property damage above $500, a serious environmental release, or who have been observed committing a substandard practice that could result in the above, will be required to submit to drug and alcohol testing as soon as possible. Operators of vehicles or construction equipment involved in a collision with a person or another object or contact with overhead power lines are included in this testing requirement.

#### 4.2.4 Test Sample Validity

Employees will be retested if the test results are deemed invalid or too dilute to detect levels at or below the cutoff values. Evidence of sample tampering will be grounds for immediate discharge or revocation of offer of employment.

#### 4.2.5 Refusal of Testing

Refusals to submit valid samples for testing in accordance with this SOP will be treated as positive results.

## 5.0 MONITORING

Monitoring conformance with this SOP will be the responsibility of the Human Resources Department, with the assistance of Environment, Safety and Quality and the Medical Review Officer.

## 6.0 TRAINING

Employees will be trained on this SOP during their new-hire orientation. Subcontractor employees will be trained on the SOP during site-orientation.

## 7.0 DOCUMENTATION

ECC employees will be required to pass a quiz after reviewing a power point presentation on their Training Matrix.

Project employees including site subcontractors will sign an Orientation sign-in sheet which will be maintained in the site files.

## 8.0 REFERENCES

SAMHSA Drug Free Workplace Kit http://store.samhsa.gov/product/Making-Your-Workplace-Drug-Free/SMA07-4230

Title 48-Federal Acquisition Regulations System; Chapter 1-Federal Acquisition Regulation; Part 52_Solicitation Provisions and Contract Clauses- Subpart 52.2_Text of Provisions and Clauses; Sec. 52.223-6 Drug-Free-Workplace http://www.gpo.gov/fdsys/pkg/CFR-2011-title48-vol2/pdf/CFR-2011-title48-vol2-sec52-223-6.pdf

# ATTACHMENT 5

# SITE SANITATION PLAN

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 SCOPE

This Plan is applicable to work being performed by Environmental Chemical Corporation (ECC), their subcontractors and their employees on the project identified above.

## 3.0 HOUSEKEEPING

The sites will be kept as clean as possible, taking into consideration the nature of the work. Regular cleaning shall be conducted to ensure safe and sanitary conditions in the workplace.

Waste materials will be properly disposed of, and routinely removed from the site.

Vegetation will not be allowed to grow around storage and dispensing containers containing flammable liquids and gases.

## 4.0 DRINKING WATER

An adequate supply of potable water (cool drinking water when weather is hot) shall be provided for both drinking and personal cleansing. Bottled water is acceptable. Empty bottles will be deposited into a designated recycling (or trash if recycling is not available) receptacle immediately to maintain good housekeeping.

## 5.0 NON-POTABLE WATER

Non-potable water will be used on this project

## 6.0 TOILETS

The project site will have sufficient toilet facilities for each sex in accordance with the **Table A5-1** below:

**Table A5-1**

| Number of Employees | Minimum Number of Toilets[1] |
|---|---|
| 20 or fewer | One |
| 20 or greater | One toilet seat and<br>One urinal per 40 workers |
| 200 or greater | One toilet seat and<br>One urinal per 50 workers |

NOTE: [1]Where toilet facilities will not be used by women, urinals may be provided instead of commodes, except that the number of commodes in such cases shall not be reduced to fewer than 2/3 of the minimum number specified.

All shall be provided with adequate light and ventilation. Toilet paper shall be provided and when water is not present, hand sanitizer. Facilities shall be constructed so that occupants are protected against the weather and falling objects; all cracks shall be sealed and the door self-closing, tight fitting and capable of being latched.

The toilet facilities will be kept clean and orderly in between servicing. Graffiti on toilet facilities is forbidden.

## 7.0 WASHING FACILITIES

Washing facilities shall be provided at toilet facilities and as needed to maintain healthful and sanitary conditions. If it is not practical to provide running water and soap, hand sanitizers may be used as a substitute.

## 8.0 WASTE DISPOSAL

Field team will be responsible for waste, refuse, and garbage. All waste, refuse, and garbage shall be removed in a manner which avoids creating a menace to health and should be properly disposed of on a daily basis.

# ATTACHMENT 6

# BLOODBORNE PATHOGENS PROGRAM AND EXPOSURE CONTROL PLAN

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 SCOPE AND APPLICATION

This Plan applies to Environmental Chemical Corporation (ECC) and subcontractor employees who may be exposed to another individualôs blood or other bodily fluids during the course of the project identified above. Specifically, this includes individuals who have current First Aid training and may provide First Aid on the job (e.g., Site Safety and Health Officers [SSHOs]), as these are the only project members who may have exposure to bloodborne pathogens (BBP) and providing First Aid is the only activity where such exposure is anticipated. It includes the site-specific Exposure Control Plan for the project. For the purposes of this Plan, First Aid refers to administration of cardiopulmonary resuscitation (CPR) as well as other common First Aid procedures.

## 3.0 EXPOSURE CONTROL PLAN

### 3.1 Definitions

***Bloodborne Pathogens*** means pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B virus (HBV) and Human Immunodeficiency Virus (HIV).

***Occupational Exposure*** means reasonably anticipated skin, eye, mucous membrane, or other non-oral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

***Personal Protective Equipment (PPE)*** is specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts, or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

***Universal Precautions*** is an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HBV, HIV, and other BBP.

### 3.2 EXPOSURE DETERMINATION

#### 3.2.1 Job Classifications in which All Employees have Occupational Exposure

ECC has no job classifications in which all employees have occupational exposure.

#### 3.2.2 Job Classifications in which Some Employees have Occupational Exposure

The potential for occupational exposure exists for individuals who have current First Aid training and may provide First Aid on the job, including project SSHOs, and designated First Aid Providers for this project.

### 3.3 HEPATITIS B VACCINATION

A Hepatitis B vaccination will be made available at no charge to First Aid Providers immediately following an occupational exposure, unless the employee has previously received the complete Hepatitis B vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is

contraindicated for medical reasons. If an employee desires a Hepatitis B vaccination after the initial BBP training, but prior to an occupational exposure, they should contact the Safety and Health Manager (SHM).

## 3.4 EXPOSURE PREVENTION

*Engineering Controls* - The only foreseeable exposure potential on this project is through application of First Aid, which requires direct contact with the injured party. Engineering controls are not feasible for this activity.

*Administrative Controls* ï Only personnel trained in First Aid/CPR and Universal Precautions will attend to individuals injured or ill on the project. First Aid Providers will keep other personnel out of the immediate First Aid area where contact with bodily fluids may occur by the use of caution tape barricades or posting a spotter to keep other employees away. Spilled bodily fluids will be demarcated and barricaded with caution tape until the First Aid Providers clean the area as described below.

*PPE and Clean up Materials* - This project will have available on site a bloodborne pathogen kit, with appropriate PPE. The kit includes but is not limited to:

- Gloves
- Eyewear (goggles or glasses)
- Face shields
- Resuscitation barrier
- Bleach and water (or 10 percent [%] bleach solution in labeled container)
- Paper towels
- Disposal bag for contaminated materials

These materials will be maintained with the First Aid kit in the SSHOôs site vehicle.

*Universal Precautions* - Universal precautions include wearing gloves when contact with blood or other bodily fluids is possible and wearing eye protection. Face shields must be worn when there is danger of blood splashing on mucous membranes.

In providing First Aid, where exposure to bodily fluids is possible, the First Aid Provider shall:

- Try to isolate the area, and limit approach by other people
- Don protective gear including surgical gloves and eye protection, and a face shield if splashing is possible
- Collect all wastes such as gauze pads, gloves and resuscitation barriers and place in a red bag (or other properly labeled container)
- Clean any spillage and disinfect potentially contaminated surfaces in accordance with **Section 3.6** below, disposing of the cleaning materials also in red bag
- Carefully remove gloves inside-out, placing them in the disposal bag
- Call the SHM to report a potential exposure event

## 3.5 POST-EXPOSURE ACTIONS

Following an occupational exposure incident, the affected party shall **IMMEDIATELY** inform the SSHO or other management personnel, who in turn must **IMMEDIATELY NOTIFY THE SHM (Ms. Kym Edelman)** by telephone. In no case shall the report be made later than the end of the work shift during

which the incident occurred. Immediate notification is essential to allow proper consultation with the WorkCare Occupational Physician in order to ensure that the proper post-exposure evaluation, prophylaxis (initiation of Hepatitis B vaccination), and follow-up procedures are made available immediately.

This notification must include:

- A description of the First Aid incident including time and date
- The potential routes of exposure
- The names of all First Aid Providers who rendered assistance
- Type of personal protective equipment used, or if none used
- The identity of the source individual where feasible

A confidential post-exposure medical evaluation and follow-up must be immediately made available to the employee after the report of an occupational exposure, along with the opportunity for Hepatitis B vaccination. The medical evaluation is offered at no cost to the employee.

If the Hepatitis B vaccination is provided, a copy of the employee's Hepatitis B vaccination status including the dates of all the Hepatitis B vaccinations and any other relevant medical record required by 29 Code of Federal Regulations (CFR) 1910.1030(f)(2) shall be forwarded to WorkCare for retention and maintenance in the employeeôs medical file.

If the employee declines to accept a recommended Hepatitis B vaccination following an occupational exposure, the employee shall complete and sign the Declination Form and return it to the SHM. The form can be obtained from the SHM. The SHM shall forward the form to Corporate Records Administrator for retention as an employee Medical Surveillance document.

Although the BBP standard excludes employees who perform unanticipated Good Samaritan acts from coverage (as this is does not constitute "occupational exposure"), ECC shall offer follow-up medical evaluations and Hepatitis B vaccinations to ECC employees who experience a work-related exposure incident as the result of performing a Good Samaritan act at work.

## 3.6 DECONTAMINATION, STERILIZATION, AND DISPOSAL

All surfaces that come in contact with blood or potentially infectious materials must be decontaminated as soon as possible. Decontamination should be accomplished by using a solution of household bleach (5.25% sodium hypochlorite) diluted about 1:10 with water.

> *When diluting bleach, always carefully add bleach to water to avoid a hazardous exothermic reaction. NEVER pour water directly into bleach.*

When cleaning up a spill of blood, carefully cover the spill with paper towels or rags, and then gently pour the 10% solution of bleach over the towels or rags. This will decrease the chances of causing a splash when you pour the bleach on it. ***Leave it in place for at least 10 minutes.*** This will help ensure that the bloodborne pathogens are killed before beginning to clean or wipe up the material.

When decontaminating equipment or other objects (knives, tweezers, mechanical equipment upon which someone has been cut, First Aid boxes, etc.), leave the disinfectant in place for *at least 10 minutes* before continuing the cleaning process. Any materials used to clean up a spill must also be decontaminated or disposed immediately, including mops, sponges, buckets, towels, and rags.

Materials for disposal shall be placed in a strong, plastic garbage bag, sealed, and labeled. Contact your local health agency/hospital and waste company for additional information on appropriate or required disposal methods.

## 4.0 TRAINING

Three elements are part of the required training: 1) First Aid/CPR, 2) BBP, and 3) this Plan.

### 4.1 First Aid/CPR

SSHOs, as well as individuals designated as First Aid Providers, shall (at time of assignment) hold current certification in First Aid and CPR from the American Red Cross, National Safety Council, American Heart Association, or another qualified provider.

### 4.2 Bloodborne Pathogens

SSHOs, as well as individuals designated as First Aid Providers, shall (at time of assignment) hold current BBP training. When BBP training has not been received as part of a First Aid/CPR class, individuals must complete the on-line training. Contact the Environment, Safety and Quality (ESQ) Administrative Assistant in the ECC Lakewood, Colorado office.

BBP training is required at least annually thereafter.

### 4.3 ECC Bloodborne Pathogen Plan

The contents of this Plan will be reviewed with designated First Aid Providers by the SSHO at the initial assignment to the project. This training will be documented by having the First Aid Providers sign the plan review, below.

## 5.0 DOCUMENTATION

Copies of all records and certificates related to completion of First Aid, CPR, and/or BBP training shall be submitted to the Contracting OfficersôRepresentative and maintained on site for the duration of the project.

**Bloodborne Pathogen Plan Review**

I certify that I have been informed of the potential for exposure to bloodborne pathogens on this project, and this BBP Plan, including the Exposure Control Plan. I agree to use Universal Precautions in applying First Aid procedures. I also understand my rights to prophylactic or post-exposure Hepatitis B vaccination, and the availability of Medical consultation. I agree to immediately report any potential exposure to bloodborne pathogens that occur on this project site.

| First Aid Provider (PRINT) | Signature | Date |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

# ATTACHMENT 7

# SITE LAYOUT PLANS

**(Will be included in the future or in applicable Work Plans)**

**ATTACHMENT 8**

**ACCESS AND HAUL ROAD PLAN**

**(If/when an Access and Haul Road Plan is required, this plan will be provided)**

# ATTACHMENT 9

# HEARING CONSERVATION PROGRAM

## 1.0 PROJECT

| | |
|---|---|
| Contract Number: | W9124J-18-D-0004 |
| Delivery Order | W9124J21F0020 |
| Project Name: | Environmental Remediation Services |
| Location: | Redstone Arsenal (RSA), Alabama |

## 2.0 PURPOSE

Environmental Chemical Corporationôs (ECCôs) Hearing Protection Program is prepared in accordance with 29 Code of Federal Regulations (CFR) 1910.95 and 29 CFR 1926.

## 3.0 OBJECTIVE

The objective of this Standard Operating Procedure (SOP) is to protect the hearing of employees who may be exposed to noise levels exceeding the permissible exposure levels set by the Occupational Safety and Health Administration (OSHA).

## 4.0 HEARING CONSERVATION PROGRAM REQUIREMENTS

ECC shall administer a continuing, effective Hearing Conservation Program whenever employee noise exposures equal or exceed an eight-hour time-weighted average sound level (TWA) of 85 decibels (dB) measured on the A scale (slow response) or equivalently, a dose of 50 percent (%).

### 4.1 Action Level

An 8-hour TWA of 85 dB or a dose of 50% shall also be referred to as the action level.

## 5.0 MONITORING

When information indicates that any employee's exposure may equal or exceed an eight-hour TWA of 85 dB, ECC shall develop and implement a monitoring program.

Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, ECC shall use representative personal sampling to comply with the monitoring requirements of this paragraph, unless ECC can show that area sampling produces equivalent results.

All continuous, intermittent, and impulsive sound levels from 80 dB to 130 dB shall be integrated into the noise measurements. Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy. Monitoring shall be repeated whenever a change in production, process, equipment, or controls increases noise exposures to the extent that:

- Additional employees may be exposed at or above the action level or
- The attenuation provided by hearing protectors being used by employees might be rendered inadequate to meet the requirements of paragraph (j) of 29 CFR 1910.95 (Occupational Noise Exposure).

The protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in **Table A9-1** when measured on the A scale of a standard sound level meter at slow response. When employees are subjected to sound exceeding those listed in **Table A9-1**, feasible administrative and/or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels

of **Table A9-1**, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table. If the variations in noise level involve maxim at intervals of one second or less, it is to be considered continuous.

**Table A9-1 Permissible Noise Exposures**

| Duration Per Day, Hours | Sound Level (Decibels adjusted [dBA] Slow Response |
|---|---|
| 8 | 90 |
| 6 | 92 |
| 4 | 95 |
| 3 | 97 |
| 2 | 100 |
| 1 İ | 102 |
| 1 | 105 |
| 2 | 110 |
| ı or less | 115 |

**Notes:**
Footnote (1) when the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed **140 dB** peak sound pressure level.

## 6.0 EMPLOYEE NOTIFICATION

ECC shall notify each employee exposed at or above an eight-hour TWA of 85 dB of the results of the monitoring.

## 7.0 AUDIOMETRIC TESTING PROGRAM

ECC shall establish and maintain an audiometric testing program as provided in this paragraph by making audiometric testing available to all employees whose exposures equal or exceed an eight-hour TWA of 85 dBA. The program shall be provided at no cost to employees.

Hearing measurements (audiograms) made periodically are the best way to determine whether a Hearing Conservation Program is preventing noise-induced hearing loss. Hearing measurements are made at least annually. For very high noise exposures, measurements shall be made more often, until the noise exposure is reduced to safe levels.

Hearing measurements also help to accomplish the following:

- Document hearing-threshold changes that may occur during employment
- Determine the ability to hear (communicate) effectively at work, (i.e., direction, warning signals)
- Assist in proper job placement
- Diagnose pre-existing hearing loss prior to employment and establish a baseline hearing ability

Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining, and checking calibration and

proper functioning of the audiometers being used. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist, or physician.

### 7.1 Baseline Audiogram

Within six months of an employee's first exposure at or above the action level, ECC shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

### 7.2 Annual Audiogram

At least annually after obtaining the baseline audiogram, ECC shall obtain a new audiogram for each employee exposed at or above an eight-hour TWA of 85 dB.

### 7.3 Evaluation of Audiogram

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine whether the audiogram is valid and if a standard threshold shift has occurred. A technician may do this comparison. If the annual audiogram shows that an employee has suffered a standard threshold shift, ECC may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

The audiologist, otolaryngologist, or physician shall review problem audiograms and determine whether there is a need for further evaluation. ECC shall provide the following information to the person performing this evaluation:

- A copy of the requirements for hearing conservation
- The baseline audiogram and most recent audiogram of the employee to be evaluated
- Measurements of background sound pressure levels in the audiometric test room
- Records of audiometer calibrations required by paragraph (h)(5) of this section

### 7.4 Follow-up Procedures

If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employee shall be informed of this fact in writing, within 21 days of the determination.

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, ECC shall ensure that the following steps are taken when a standard threshold shift occurs:

- Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.
- Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.
- The employee shall be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if ECC suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.
- The employee shall be informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protectors is suspected.

If subsequent audiometric testing of an employee whose exposure to noise is less than an eight-hour TWA of 90 dB indicates that a standard threshold shift is not persistent, ECC:

- Shall inform the employee of the new audiometric interpretation
- May discontinue the required use of hearing protectors for that employee

### 7.5 Standard Threshold Shift

As used in this section, a standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2,000, 3,000, and 4,000 Hertz (Hz) in either ear.

In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram.

### 7.6 Audiometric Test Requirements

Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including as a minimum 500, 1,000, 2,000, 3,000, 4,000, and 6,000 Hz. Tests at each frequency shall be taken separately for each ear.

Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969, which is incorporated by reference as specified in Sec. 1910.6.

### 7.7 Audiometer Calibration

The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to ensure that the output is free from distorted or unwanted sounds. Deviations of 10 dB or greater require an acoustic calibration. Audiometer calibration shall be checked acoustically at least annually. Test frequencies below 500 Hz and above 6,000 Hz may be omitted from this check. Deviations of 15 dB or greater require an exhaustive calibration.

## 8.0 HEARING PROTECTORS

ECC shall make hearing protectors available to all employees exposed to an eight-hour TWA of 85 dB or greater at no cost to the employees. Hearing protectors shall be replaced as necessary. ECC shall ensure that hearing protectors are worn:

- For all explosive blasts. Due to the potential of blasts exceeding 115 decibels adjusted (dBA), personal ear protection equivalent to the combination of earplugs and earmuffs shall be required.
- By an employee who is required to wear personal protective equipment.
- By any employee who is exposed to an 8hr TWA of 85 dB or greater.
- Has not yet had a baseline audiogram established pursuant to 29 CFR 1910.95 paragraph (g)(5)ii.
- Has experienced a standard threshold shift.

Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by ECC.

ECC shall provide training in the use and care of all hearing protectors provided to employees. ECC shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

## 9.0 HEARING PROTECTOR ATTENUATION

ECC shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used.

Hearing protectors must attenuate employee exposure at least to an eight-hour TWA of 90 dB.

For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an eight-hour TWA of 85 dB or below.

The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. ECC shall provide more effective hearing protectors where necessary.

## 10.0 TRAINING PROGRAMS

ECC shall institute a Training Program for all employees who are exposed to noise at or above an eight-hour TWA of 85 dB and shall ensure employee participation in such program.

The Training Program shall be repeated annually for each employee included in the Hearing Conservation Program. Information provided in the Training Program shall be updated to be consistent with changes in protective equipment and work processes.

ECC shall ensure that each employee is informed of the following:

- The effects of noise on hearing
- The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care
- The purpose of audiometric testing, and an explanation of the test procedures

## 11.0 ACCESS TO INFORMATION AND TRAINING MATERIALS

**ECC shall make copies of this standard available to affected employees** or their representatives and shall also post a copy in the workplace.

ECC shall provide any informational materials pertaining to the standard that are supplied to ECC by the Assistant Secretary of Labor ï OSHA to affected employees.

ECC shall provide, upon request, all materials related to ECC's training and education program pertaining to this standard to the Assistant Secretary of Labor ï OSHA and the Director ï National Institute for Occupational Safety and Health (NIOSH).

## 12.0 RECORDKEEPING

ECC shall maintain an accurate record of all employee exposure measurements required by 29 CFR 1910.95.

### 11.1 Audiometric Tests

ECC shall retain all employee audiometric test records. These records shall include:

- Name and job classification of the employee

- Date of the audiogram
- The examiner's name
- Date of the last acoustic or exhaustive calibration of the audiometer
- Employee's most recent noise exposure assessment
- Accurate records of the measurements of the background sound pressure levels in audiometric test rooms

### 11.2 Record Retention

ECC shall retain records required by the Hearing Conservation Standard for at least the following periods:

- Noise exposure measurement records shall be retained for two years.
- Audiometric test records shall be retained for the duration of the affected employee's employment at ECC.

### 11.3 Access to Records

All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the Assistant Secretary of Labor - OSHA. The provisions of 29 CFR 1910.20.

### 11.4 Transfer of Records

If ECC ceases to do business, ECC shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period as required by this Program.

**ATTACHMENT 10**

**HEALTH HAZARD CONTROL PLAN**

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 INTRODUCTION

This Plan addresses the requirements of EM 385-1-1 06.A. It describes the general approach to Health Hazard Control and references other portions of the Accident Prevention Plan (APP) where more site-specific information is found.

## 3.0 EXPOSURE STANDARDS

Exposures to harmful chemicals or biological agent will be controlled to levels as low as reasonably achievable through the use of combinations of control methods. Uncontrolled inhalation exposures above the Occupational Exposure Limits (OELs) are not permitted.

The OELs for chemical substances for this project will be the most stringent from among those specified in the current American Conference of Governmental Industrial Hygienists (ACGIH) guideline, "Threshold Limit Values and Biological Exposure Indicesò, published by Department of the Army (DA) or Department of Defense (DoD) Exposure Limits, or by Occupational Safety and Health Administration (OSHA) in 29 Code of Federal Regulations [CFR] 1910.1000 (Permissible Exposure Limits [PELs]) or appropriate construction standards in 29 CFR 1926. Activities where occupational exposure to explosive constituents or chemical or biological warfare agents will comply with current DA safety and occupational health (SOH) requirements.

OELs for substances that may create an inhalation hazard due to construction materials and processes are listed in the Activity Hazard Analysis (AHA) for the activities for which the hazard is present.

## 4.0 HAZARD EVALUATION

Where hazardous or toxic agents may be used or produced in an activity, a qualified industrial hygienist will evaluate the hazards, considering the following information:

- Toxicity of the material, likely routes of exposure
- Physical and chemical properties (e.g. physical state, vapor pressure, particle size distribution, pH, flammability, reactivity, solubility, concentration in the material or product)
- Conditions of use, including approximate amount, surface area, usage rates, etc.
- Work operations that may impact exposures, such as drilling, grinding, application methods, proximity, duration, etc.
- Likely environmental conditions, such as location (outdoor, indoor, enclosed or confined space), natural ventilation, temperature, etc.

The results of this evaluation will be incorporated into the AHA for the activity, in the form of listing exposure in the Hazards section of appropriate steps and the exposure controls to be used in the Controls column.

## 5.0 TESTING AND MONITORING

The need for other Real Time or Personal exposure monitoring will be determined by the Safety and Health Manager (SHM) (or a Certified Industrial Hygienist [CIH]) during the hazard evaluation for specific features of work. This determination will be based on the substances used or generated; the likelihood of significant exposure considering frequency, duration and proximity; OSHA requirements in expanded health standards; employee concerns or complaints; and other factors as necessary. If such testing or monitoring is determined to be necessary, it will be listed in the Controls section of the AHA at the appropriate job step. Monitoring requirements will include the instrumentation, selection of personnel or area for monitoring, frequency and duration of monitoring, action levels and required actions.

Based information available regarding levels of contaminants in soils, air monitoring is not anticipated to be necessary. Controlling visible dust will maintain levels of contaminants in air, in the breathing zone of employees, well below PELs. As work progresses, evaluations will continue to be made, to determine if air monitoring is necessary. In the event it becomes necessary, all air monitoring instrumentation will be maintained and calibrated by trained personnel according to the applicable National Institute for Occupational Safety and Health (NIOSH)/OSHA analytical methods and the manufacturerôs recommendations. Where samples are collected for laboratory analysis, ECC will utilize the services of a laboratory accredited by the American Industrial Hygiene Association to analyze the samples in accordance with standard NIOSH or OSHA methods.

Records will include the date, time, substances or hazards monitored, person conducting monitoring, calibration date and method, operations and location of monitoring, and results. An air monitoring data sheet will be completed for each day of operations at the site when monitoring is conducted. Results will be provided to employees. Records are available to employees, their representatives and to the Government Designated Authority.

## 6.0 HEALTH HAZARD CONTROLS

ECC will prioritize the following control hierarchy for health hazards on this project:

- ***Elimination of the hazard*** ï substitute the process or materials
- ***Engineering controls*** ï wet methods for concrete cutting, concrete surface grinding, dusty earth moving operations; general or local exhaust ventilation for welding; mechanical ventilation for confined spaces
- ***Work Practice controls*** ï limiting or modifying the time of exposure to maintain cumulative exposures below health hazard concerns. Limiting the duration of exposure to noisy operations or radiation sources are examples. Performing work in high levels of personal protection during night shift or early morning hours is another example
- ***Personal Protective Equipment (PPE)*** ï generally a last resort, to be used in combination with other controls.
- ***Housecleaning and contaminant control*** ï decontamination areas and measures used to control the spread of contamination, regular cleaning of support facilities and if required by SHM, testing of contact surfaces to ensure proper cleaning/contamination control.

The specific control measures to be used for an anticipated exposure will be identified in the Controls column of the AHA for the activity where exposure may occur.

# ATTACHMENT 11

# HAZARD COMMUNICATION PROGRAM

## 1.0 PROJECT

| | |
|---|---|
| Contract Number: | W9124J-18-D-0004 |
| Delivery Order | W9124J20F0020 |
| Project Name: | Environmental Remediation Services |
| Location: | Redstone Arsenal (RSA), Alabama |

## 2.0 SCOPE

The Environmental Chemical Corporation (ECC) Hazard Communication Program applies to all known hazardous substances in the workplace that ECC employees and their subcontractors may be exposed to under normal conditions of use or in a foreseeable emergency, such as equipment failure or rupture of containers, resulting from workplace operations.

Each hazardous material will be documented before being brought onto the job site. The Safety Data Sheets (SDSs) and proposed use and storage locations will be reviewed by the ECC Site Safety and Health Officer (SSHO) for approval. Site personnel will have access to the hazardous material inventory and SDS file upon request.

ECC will communicate this hazard communication program to project employees and subcontractors and provide information about chemical hazards and controls through SDSs, chemical inventory, chemical labeling, and chemical storage. ECC will communicate employee information and training programs as detailed in this written hazard communication program.

## 3.0 SAFETY DATA SHEETS

A SDS will be available for each chemical in the Chemical Inventory List. A copy of the SDS supplied by the manufacturer or distributor of the chemical(s) will be kept with the SSHO in a folder or binder. The SSHO will be responsible for obtaining SDSs for all hazardous chemicals or materials present at the project site.

The SSHO will review incoming SDSs for new and important health and safety information. The SSHO is responsible for disseminating the SDS information to the appropriate workers at the appropriate preliminary, initial and follow-up inspections of the Definable Features of Work (DFOW) where the hazardous chemical or material is to be utilized for which the SDS was written. Supervisors and employees will be informed of all new SDSs as soon as possible. If an SDS is missing, a new SDS will be requested from the manufacturer within seven days.

SDSs will be kept conspicuous location (i.e., office trailer, SSHO vehicle, etc.) at all times.

Employees and/or subcontractors are responsible for reading the SDSs for substances they use.

## 4.0 CHEMICAL INVENTORY

The project site must have a Chemical Inventory List. The inventory will be placed with the SDS binder in a conspicuous location at all times. The SSHO is responsible for updating the Chemical Inventory List and adding the appropriate SDS whenever a new chemical is brought on-site.

## 5.0 CHEMICAL LABELING

ECC will not accept or release hazardous chemicals or materials for use unless the original container is clearly labeled with at least the following information: product identifier; hazard statement(s); pictogram(s);

precautionary statement(s); the name, address and telephone number of the manufacturer, importer or other responsible party. If the hazardous chemical(s) or material(s) is transferred to a secondary container, the secondary container must be clearly labeled with at least the following information: product identifier and words, pictures, symbols, or combination thereof.

All labels must be legible, in English, and prominently displayed on the container. Labels will not be defaced or removed unless the container is immediately marked with the required information. Unlabeled containers should be immediately reported to the SSHO. The name of the material that appears on the manufacturer's label will be the same as the name that appears in the chemical area or Chemical Inventory List as well as the SDS.

## 6.0 CHEMICAL STORAGE

Hazardous chemicals or materials will be properly stored in approved flammable storage lockers, corrosive storage lockers, shelves or cabinets.

All incompatible chemicals or materials will be properly separated and stored by hazard classes.

No open flames, heat sources or smoking will be allowed in the vicinity of flammable liquids or materials.

## 7.0 EMPLOYEE INFORMATION AND TRAINING

Project employees and subcontractors will be trained on the hazards and proper uses of all hazardous chemical(s) or materials in their work area:

- At the time of their initial assignment;
- Whenever a new hazardous chemical(s) or material(s) is introduced into their area; and
- Whenever ECC or the subcontractor receives updated SDSs containing new information indicating significant increased risk or changes in the use of personal protective equipment.

Project employees and subcontractors will be trained in the following:

- Overview of the Hazard Communication Regulation (29 Code of Federal Regulations [CFR] 1910.1200) and the elements of ECC's Hazard Communication Program;
- Operations involving hazardous chemicals or materials in their work area and methods of detecting and identifying them;
- Location and availability of the SDSs and a written hazard communication program;
- How to read an SDS and container labels;
- Physical properties and health effects of hazardous chemicals and materials and measures to be taken by the employee to protect themselves;
- Use of engineering controls, personal protective equipment (PPE) and work practices to prevent or lessen exposure to hazardous chemicals or materials;
- Emergency and first aid procedures to follow in case of exposure to hazardous chemicals or materials.

Activity Hazard Analyses (AHA) will be developed for each DFOW with hazardous activities, and employees and/or subcontractor will be trained in the hazardous chemicals or materials to be used or encountered in that activity when the AHA is discussed.

# ATTACHMENT 12A AND 12B

# HEAT AND COLD STRESS MONITORING PLAN

**Attachment 12A**
**HEAT STRESS MONITORING PLAN**

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 SCOPE

This Plan applies to the project identified above and will be incorporated into the Accident Prevention Plan (APP). Subcontractors are required to comply with this program by virtual of their coverage under the APP.

## 3.0 PROCEDURES

### 3.1 HEAT STRESS AND HEAT STRAIN

Heat stress is the net heat load to which a worker may be exposed from the combined contributions of metabolic cost of work, environmental factors and clothing requirements. Heat stress is a hazard during warm weather or when personnel are wearing personal protective equipment (PPE) that aggravates the heat stress hazard. Heat stress can occur even when temperatures are moderate if the bodyôs physiological processes fail to maintain a normal body temperature.

Heat strain is the overall physiological response resulting from heat stress. The resulting physical reactions that occur are fatigue, irritability, anxiety, and a decrease in concentration, dexterity, and/or movement. Onset of signs and symptoms of exposure can occur rapidly, and may progress to a medical emergency (i.e., heat stroke) without intervention. In extreme cases, death can result if the patient is not given immediate treatment.

#### 3.1.1 Symptoms of Heat Exhaustion

Heat exhaustion occurs when your body cannot sweat enough to cool you off. It generally happens when you are working or exercising in hot weather. Symptoms include:

- Fatigue, weakness, dizziness, or nausea
- Cool, clammy, pale, red, or flushed skin
- Heavy sweating

**First Aid for Heat Exhaustion**

- Get the person out of the sun and into a shady or air-conditioned location
- Lay the person down and elevate the legs and feet slightly
- Loosen or remove the person's clothing
- Have the person drink cool water, not iced, or a sports drink containing electrolytes
- Cool the person by spraying or sponging him or her with cool water and fanning
- Monitor the person carefully. Heat exhaustion can quickly become heatstroke. If fever greater than 102 degrees Fahrenheit (ÜF), fainting, confusion or seizures occur, call for emergency medical assistance.

### 3.1.2 Symptoms of Heat Stoke

Heat exhaustion can sometimes lead to a heat stroke. Heat stoke requires emergency treatment. It happens when your body stops sweating but the body temperature continues to rise, often to 105ÁF or higher. Symptoms include the following:

- Cessation of sweating
- Confusion, delirium, or unconsciousness
- Hot, dry, red or flushed skin, even under the arm pits
- Rapid and shallow breathing
- Chills
- Irritability
- Malaise
- Disorientation or confusion

**First Aid for Heat Stroke**

- It is vital to lower a heat stroke victimôs body temperature. Seconds count.
- Call emergency medical assistance and get an ambulance on the way as soon as possible.
- Move the person out of the sun and into a shady or air-conditioned space.
- Pour water on them, fan them, apply cold packs.

### 3.2 CONTROL MEASURES

Where monitoring indicates a possible heat stress hazard the following safety procedures shall be implemented:

**General Controls**

- Review signs and symptoms of heat strain, as well as controls and First Aid measures with site personnel.
- Encourage employees to eat a normal diet and get proper rest.
- Encourage employees to refrain from consuming diuretics, including caffeine from coffee and tea beverages, or any form of alcohol. (Note: Consumption of alcohol is prohibited during working hours). Counsel and monitor workers on medications that may affect blood pressure, sweating, body temperature regulation, or kidney function.
- Adjust expectations of those returning to work after absence from heat exposure situations and encourage them to eat salty foods (with approval of physician for those on salt-restricted diets).
- Provide potable drinking water and encourage workers to about one cup every 20 minutes.
- Permit self-limitation of exposures and plan frequent rest breaks.
- Encourage workers to report signs and symptoms of heat strain and not to try to work through it.
- Encourage the buddy system to detect signs and symptoms in co-workers.
- Provide shade (i.e., fixed or portable canopy) and/or cool rest areas.

**Job-Specific Controls**

Where the screening or physiological monitoring discussed below exceed the criteria, the job-specific controls for this project will include the following:

- Engineering controls to reduce workload, (e.g., mechanical vs. manual material handling where possible).
- Mobile construction equipment will have functioning air conditions and be operated with the doors/windows closed.
- Office trailer and vehicles will have functional air conditioning to provide cool rest locations during breaks.
- Wear breathable polypropylene disposable coveralls over modesty clothing for activities requiring Modified Level C.
- Use heat reducing PPE, such as cool vests, head bands, wrist bands, etc.
- Modify work schedule to take advantage of the cooler parts of the day.
- Establish work/rest regimens to reduce exposure times, when physiological monitoring indicates heat strain conditions.

### 3.3 Heat Stress and Heat Strain Monitoring

Heat stress and heat strain monitoring shall begin when ambient conditions exceed 85ÁF when working in Level D and 70ÁF when working in Modified Level C and above. For clear weather conditions (i.e., 100 percent [%] sunshine) ambient temperatures shall be decreased by 5ÁF (i.e., 65ÁF and 80ÁF, respectively) to determine when to begin monitoring. Ambient conditions shall be determined by maintaining a properly calibrated outdoor thermometer in the shade at each workstation, or by monitoring local weather reports throughout each work shift.

#### 3.3.1 Environmental Monitoring

Use a Wet Bulb ï Globe Temperature (WBGT) monitor to perform heat stress screening in accordance with the **Tables A12-1** (Acclimatized Workers) and **Table A12-2** (Unacclimatized Workers) below. Clothing adjustment factors are included in **Table A12-3**.

If the WBGT levels (corrected for clothing ensemble) for the particular workload and work/rest cycle are exceeded, then implement the General Controls and either perform physiological monitoring as described below or implement Job Specific Controls such as those listed in **Section 3.2**.

**Table A12-1 - WBGT Screening Criteria for Acclimatized Workers**

| Allocation of Work in a Cycle of Work and Recovery | Light | Moderate | Heavy | Very Heavy |
|---|---|---|---|---|
| 75% - 100% | 88ÁF<br>31ÁC | 82.5ÁF<br>28ÁC | - | - |
| 50% - 75% | 88ÁF<br>31ÁC | 84ÁF<br>29ÁC | 81.5ÁF<br>27.5ÁC | - |
| 25% - 50% | 89.5ÁF<br>32ÁC | 86ÁF<br>30ÁC | 84ÁF<br>29ÁC | 82.5ÁF<br>28ÁC |
| 0%-25% | 90.5ÁF<br>32.5ÁC | 88.5ÁF<br>31.5ÁC | 87ÁF<br>30.5ÁC | 86ÁF<br>30ÁC |

From ACGIH Threshold Limit Values (TLVs)È and BEIsÈ 2014.
Note: Light moderate work includes operating heavy equipment. Heavy work includes hand shoveling or other manual labor activities.
ÁC ï degrees Celsius ÁF ï degrees Fahrenheit

**Table A12-2 - WBGT Screening Criteria for Unacclimatized Workers**

| Allocation of Work in a Cycle of Work and Recovery | Light | Moderate | Heavy | Very Heavy |
|---|---|---|---|---|
| 75% - 100% | 86ÁF<br>28ÁC | 77ÁF<br>25ÁC | - | - |
| 50% - 75% | 83.5ÁF<br>28.5ÁC | 79ÁF<br>26ÁC | 75ÁF<br>24ÁC | - |
| 25% - 50% | 85ÁF<br>29.5ÁC | 80.5ÁF<br>27ÁC | 78ÁF<br>25.5ÁC | 76.1ÁF<br>24.5ÁC |
| 0%-25% | 86ÁF<br>30ÁC | 84ÁF<br>29ÁC | 82ÁF<br>28ÁC | 80.5ÁF<br>27ÁC |

From ACGIH TLVsÈ and BEIsÈ 2015.
ÁC ï degrees Celsius ÁF ï degrees Fahrenheit

**Table A12-3 – Clothing-Adjustment Factors for Some Clothing Ensembles***

| Clothing Type | Addition to WBGT (°C) |
|---|---|
| Work clothes (long sleeve shirt and pants) | 0 |
| Cloth (woven material) coveralls | 0 |
| Double-layer woven clothing | 3 |
| SMS polypropylene coveralls | 0.5 |
| Polyolefin coveralls | 1 |
| Limited-use vapor barrier coveralls | 11 |

*These values must not be used for completely encapsulating suits, often called Level A. Clothing Adjustment Factors cannot be added for multiple layers. The coveralls assume that only modesty clothing is worn underneath, not a second layer of clothing.
From ACGIH TLVsÈ and BEIsÈ 2014.
ÁC ï degrees Celsius

### 3.3.2 Alternate Environmental Monitoring Procedures

Where permitted by the client, ECC may use the Occupational Safety and Health Administration (OSHA) Heat Tool mobile app for monitoring environmental conditions based on the HEAT INDEX. Precautions recommended for the different Heat Index levels should be followed and are consistent with the General Controls and Job Specific Controls listed above. Where the HEAT INDEX level falls in the High or Very High to Extreme categories, implement physiological monitoring in addition to Job Specific Controls. The Heat Tool app can be accessed in OSHAôs Heat Stress prevention topic section at https://www.osha.gov/SLTC/heatillness/heat_index/heat_app.html

### 3.3.3 Physiological Monitoring

For site personnel wearing vapor barrier clothing and for site personnel where Job-Specific Controls may not be sufficient to control heat strain, physiological monitoring will be performed. Physiological monitoring will also be performed when workers report signs and symptoms of heat strain.

Select workers whose exposure is most extreme or who are probably the least heat tolerant. Heat tolerance may be affected by acclimatization, body size, general health and physical fitness, medications, and age.

Heat strain should be evaluated by monitoring the heart rate and temperature.

Where an individualôs pulse rate or temperature exceeds the criteria below, action should be taken to limit the individualôs heat exposure. However, where a pattern develops among workers of exceeding the criteria, then additional Job-Specific Controls shall be implemented for the work group.

**Pulse Rate**

The radial pulse should be taken for 30 seconds one minute after beginning to rest (i.e., at the beginning of a rest break). This rate is multiplied by two to determine the heart rate at initial rest. This rest should not exceed 110 beats per minute (bpm). If the resting heart rate exceeds 110 bpm, then modify the work rest schedule for the individual by decreasing the work period and increasing the rest period.

Heart rate monitoring should be recorded on an Exposure Monitoring Log. Monitoring should begin at the first break. The first rest break should be taken within the first hour of work when ambient conditions exceed the screening criteria of **Table A10-1** if working in Level D, and within the first 30 minutes if ambient conditions exceed 70ÁF if working in Modified Level C.

**Oral Temperature**

Use a digital oral thermometer with disposal plastic sleeves or similar device (e.g. aural thermometer) to measure the oral temperature at the end of the work period (before drinking).

If an individualôs temperature exceeds 99.6ÁF (or 37.6 degrees Celsius [ÁC]), adjust the work rest cycle.

Do not permit a worker to wear semipermeable or impermeable clothing when his/her oral temperature exceeds 100.6 ÁF (or 38.1 ÁC).

**- Never ignore signs and symptoms of heat-related disorders -**

## 4.0 TRAINING

Workers on project sites will be trained by the SSHO at site orientation, or during special tailgate meetings. The training will include the elements of this program, and in particular:

- Heat related disorders and First Aid measures
- Environmental factors and workload impacts on heat strain
- Personal factors impacting heat strain including health status, caffeine, alcohol and drugs
- Reporting Signs and Symptoms of exposure
- Monitoring measures to be employed on the project
- General and Job-Specific Controls to reduce exposure
- Emergency Response

## 5.0 DOCUMENTATION

The SSHO will record periodic environmental monitoring results in the Logbook, if needed. Physiological monitoring will be recorded on the Physiological Monitoring Form, if needed. Records will be maintained on the job site and will be archived with the project files at the end of the job.

## 1.0 PROJECT

| | |
|---|---|
| Contract Number: | W9124J-18-D-0004 |
| Delivery Order | W9124J21F0020 |
| Project Name: | Environmental Remediation Services |
| Location: | Redstone Arsenal (RSA), Alabama |

## 2.0 COLD STRESS

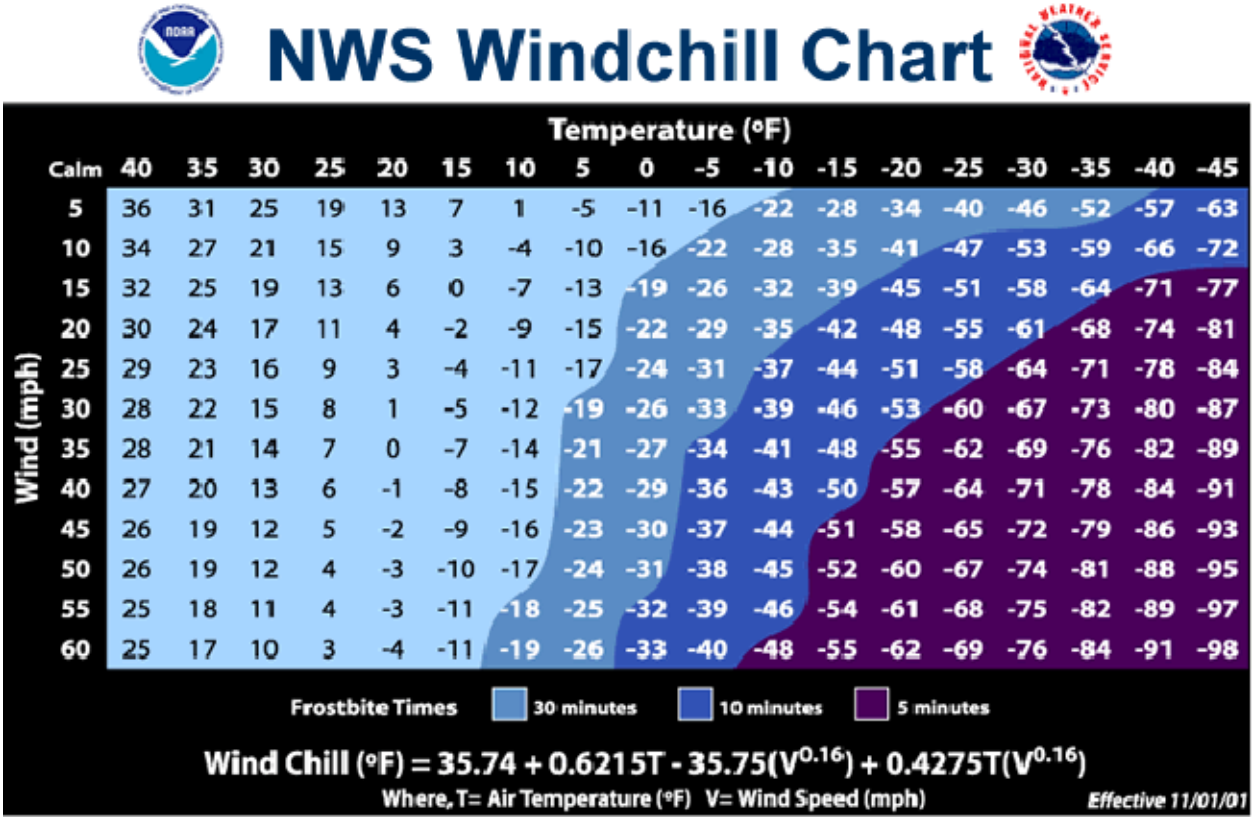
Cold stress hazards are most likely to occur at low temperatures or low wind chill factors, with wet, windy conditions contributing to risk. Where cold stress is a potential hazard (temperatures less than 40 degrees Fahrenheit [ÜF]) workers will be trained on the information in the attached Cold Weather Fact Sheet.

As a precautionary measure, employees will wear layers of loose-fitting clothing including insulated coveralls, head cover (perhaps a liner beneath a hard hat), and boots when temperatures fall below 40°F, including wind chill. Protection of the hands, feet, and head is particularly important because these are likely to be injured first by cold. However, actual injury to hands, feet, and head is not likely to occur without prior development of early signs of hypothermia, such as numbing and shivering. Bare skin contact with cold surfaces (below 32°F) will be avoided.

The wind chill factor is the cooling effect of any combination of temperature and wind velocity or air movement. An anemometer can be used to measure wind velocity. The wind chill index (below) should be consulted when planning for exposure to low temperatures and wind. The Site Safety and Health Officer (SSHO) will monitor weather forecasts and determine wind chills at least every four hours when the temperature drops below 20ÜF. The wind chill index does not take into account the specific part of the body exposed to cold, the level of activity that affects body heat production, or the amount of clothing being worn.

Like with heat strain, employees are permitted and encouraged to self-limit outdoor work activities when symptoms of cold stress are experienced. The buddy system is also encouraged to ensure that employees frequently check on co-workers in temperature extremes. A temperature-dependent work regimen limiting lengthy periods of outdoor activity may be necessary. If required, this will be developed by the SSHO in coordination with the Project Safety and Health Manager (SHM).

**Wind Chill Index**




## 3.0 REFERENCES

National Weather Service http://www.nws.noaa.gov/om/winter/windchill.shtml

OSHAâs Campaign to Prevent Heat Illness in Outdoor Workers.
https://www.osha.gov/SLTC/heatillness/index.html

*Injury Prevention: Fact vs Fiction*

# Cold Weather Injuries

FACT SHEET 12-004-0415

## What causes Cold Weather Injuries?

Cold weather injuries (CWIs) can occur due to an imbalance of body temperature regulation, where heat loss is greater in an area of the body (or the body core) than heat production. There are 4 primary types of cold injuries: hypothermia, frostbite, non-freezing cold injuries, and injuries related to cold exposure. **Tables 1-4** provide details on these injuries.[1]

## Why are CWIs a concern to the Army?



CWIs are preventable, yet if early signs and symptoms go unrecognized or preventive measures are not taken, these injuries may result in permanent injury and even death. A typical CWI casualty is a 20 year-old male at the rank of E-4 and below and often from a warm climate. However, anyone can become a CWI casualty.[2]

## How can Soldiers protect themselves from a CWI?

Soldiers should be aware of risk factors and increase resilience by consuming a healthy diet with plenty of fluids, maintaining fitness levels according to Army standards, and getting quality sleep each night. Dressing properly for the weather conditions in a way to easily adjust (layers), and balancing the time and amount of activity spent in cold weather conditions will reduce risks.[1,3,4,5]

**Prevention of Cold Weather Injuries**

**Clothing**
- ❖ Wear uniform properly (layers worn loosely).
- ❖ Keep socks & clothes dry (use sock liners and foot powder).
- ❖ Remember the acronym **C-O-L-D**
  - Keep it **CLEAN**
  - Avoid **OVERHEATING**
  - Wear clothing **LOOSE** and in **LAYERS**
  - Keep clothing **DRY**

**Eyes**
- ❖ Wear dark UV protective glasses
- ❖ If no sun glasses – improvise with cut slits in cardboard/cloth; or use tape over regular eyeglasses

**Skin**
- ❖ Keep your skin clean, covered, & dry
- ❖ Use sunscreen and lip balm
- ❖ Use gloves to handle all equipment and fuel products

**Hydration**
- ❖ Drink warm liquids
- ❖ Monitor urine color for dehydration

**Environment**
- ❖ Use warming tents when needed
- ❖ Monitor conditions, especially the wind chill index
- ❖ Use anti-slip shoe gear if outside extensively

**Other**
- Conduct NCO checks and look after your battle buddy

## What factors increase the risk of having a CWI?

All Soldiers regardless of rank are susceptible to a CWI in the right conditions. However, surveillance data from the Army and other Services indicate that rates of cold injuries appear higher among African Americans, women, Service members under 20 years old, and enlisted personnel.[2] Additional risk factors are discussed below[1-7]:

### ✚ *Prior cold injury or medical conditions*

Soldiers who have had a cold injury in the past are much more likely to develop a new cold injury sooner or one of more severe nature in the future. Existing medical conditions may predispose an individual to a CWI. For example, Raynaud's Disease is a disorder that causes blood vessel constriction in cold temperatures or during emotional distress, resulting in reduced blood flow to the extremities (e.g., fingers & toes).[6] Other conditions, such as anemia, diabetes, sickle cell disease, hypotension, and atherosclerosis, may also increase susceptibility to frostbite and injuries related to cold exposure.[1]

### ✚ *Dehydration*

Inadequate fluid intake affects the body's ability to sustain physical activity, which in turn affects thermoregulation (i.e., the balance between heat production and loss). In cold environments sensitivity to thirst declines, which can increase the risk of dehydration during strenuous activity, where fluid loss often exceeds intake.[1, 4, 5]

### ✚ *Over- and Under- Activity*

Vigorous exercise/activity induces sweating, which leads to wet clothing and subsequent increased heat loss. Conversely, under-activity results in low heat production, which may lower the body's core temperature.[1, 4, 5]

### ✚ *Tight clothing*

Close-fitting clothing reduces insulation and may restrict movement, resulting in heat loss. Clothing should be worn loosely and layered to allow adjustments as physical activity levels and environmental conditions change.[1, 4, 5]

### ✚ *Inadequate nutrition*

Underfeeding can cause low blood sugar (hypoglycemia) which impairs shivering, thereby making it difficult to generate body heat. Low carbohydrates stores also limit the ability to maintain physical activity.

### ✚ *Alcohol & nicotine*

Alcohol imparts a sense of warmth and causes dilation of skin blood vessels which increases heat loss to the environment. It may also impair the senses and judgment, making it difficult for a Soldier to detect signs and symptoms of a CWI. Tobacco use (smoking or chewing) causes increased constriction of skin blood vessels, which increases the risk for frostbite.[1, 4, 5]

### ✚ *Medications*

Some medications may affect thermoregulation by impairing vasoconstriction. These include benzodiazepines, tricyclic antidepressants, barbiturates, and general anesthetics.[1, 4, 5]

***U.S. Army Public Health Command - Injury Prevention Program***
usarmy.apg.medcom-phc.mbx.injuryprevention@mail.mil ***410-436-4655/DSN 584-4655***
***5158 Blackhawk Road, APG, MD 21010-5403***
***Approved for Public Release, Distribution Unlimited***

# ATTACHMENT 13

# CRYSTALLINE SILICA ASSESSMENT

## 1.0 PROJECT/ TASK ORDER DESCRIPTION

| | |
|---|---|
| Contract Number: | W9124J-18-D-0004 |
| Delivery Order | W9124J21F0020 |
| Project Name: | Environmental Remediation Services |
| Location: | Redstone Arsenal (RSA), Alabama |

## 2.0 SCOPE AND APPLICATION

There are operations that could present occupational exposures of personnel to respirable crystalline silica above the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 25 micrograms per cubic meter (Õg/m$^3$)$^3$ These operations include, but are not limited to the following:

- Mixing grouts and concrete for well installation

## 3.0 EXPOSURE CONTROL PLAN

Sub-contractors will be required to comply with Environmental Chemical Corporationôs (ECCôs) plan, or provide their own internal plan, for approval, prior to beginning activities that may generate crystalline silica.

Both the exposure control methods and alternative exposure control methods identified in 29 Code of Federal Regulations (CFR) 1926.1153 Table 1, will be used at the project, to control employee exposures to respirable crystalline silica.

## 4.0 ENGINEERING AND WORK PRACTICE CONTROL METHODS

Due to the limited nature of these tasks, employees will implement, at a minimum, the following controls to prevent exposure to crystalline silica found in grouts and concrete utilized for installing monitoring wells.

The engineering and work practice control methods identified for these tasks include:

- Use water spray/mist when feasible.
- Work from upwind direction.
- Preferentially use materials that contain lower percentages of silica and are formulated for reduced dusting.

## 5.0 HOUSEKEEPING

The housekeeping procedures to be used for reducing employee exposure to respirable crystalline silica include:

- Dry sweeping or dry brushing is not allowed when respirable crystalline silica is present. Use wet sweeping and high-efficiency particulate air (HEPA)-filtered vacuuming when feasible.
- Do not use compressed air to clean clothing or surfaces when respirable crystalline silica is present.

## 6.0 WORK AREA ACCESS CONTROL

Work will be isolated to control access.

## 7.0 COMPETENT PERSON

The Site Safety and Health Officer (SSHO) is the designated competent person. The competent person is responsible for making frequent and regular inspections of job sites, materials, and equipment to implement the written exposure control plan.

## 8.0 COMMUNICATION OF RESPIRABLE CRYSTALLINE SILICA HAZARDS TO EMPLOYEES

ECC addresses respirable crystalline silica in the Hazard Communication Program. Each employee must have access to labels on containers of crystalline silica and the safety data sheets. At a minimum, the following respirable crystalline silica hazards are to be communicated to employees:

- Cancer
- Lung effects
- Immune system effects
- Kidney effects

## 9.0 EMPLOYEE INFORMATION AND TRAINING

All workers potentially exposed to silica will be trained. The training shall include the following information:

- The health hazards associated with exposure to respirable crystalline silica.
- Specific work tasks that could result in exposure to respirable crystalline silica.
- Specific measures ECC has implemented to protect employees from exposure to respirable crystalline silica, including engineering controls, work practices, and respirators to be used.
- The contents of the Occupational Safety and Health Administration (OSHA) respirable crystalline silica standard (29 CFR 1926.1153).
- Methods for limiting silica exposure.
- The identity of the competent person.

All workers who will be wearing respirators will be trained in accordance with ECC Standard Operating Procedure (SOP) Environment, Safety, and Quality (ESQ) 6.2 ôRespiratory Protectionô.

## 10.0 RECORDKEEPING

An accurate record of all exposure measurements taken to assess employee exposure to respirable crystalline silica will be made and maintained as required by OSHA.

## 11.0 MEDICAL SURVEILLANCE

Personnel using a respirator for 30 or more days per year shall participate in a medical surveillance program as required by 29 CFR 1926.1153.

# ATTACHMENT 14

# HAZARDOUS ENERGY CONTROL PLAN

## 1.0 PROJECT/ TASK ORDER DESCRIPTION

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 SCOPE AND APPLICATION

The requirements in this procedure applies to the activities associated with this Plan applies to all activities, including subcontractor activities, for the project identified above involving cleaning, maintenance, adjustment and repairs of tools, machinery and equipment where hazardous energy may be present.

## 3.0 PROCEDURES

### 3.1 General Procedures

Before working on machinery, equipment, or process units where employees may be exposed to hazardous energy sources, a lockout/tagout procedure will be implemented.

1. Notify affected employees of the shut down and lockout.
2. Issue a lockout permit. See *Form ESQ-7.3.01 Lockout Permit*.
   *Note: For fixed plant equipment, an equipment-specific procedure may be developed and used in lieu of a permit.*
3. Shut down the system by shutting off the generator.
4. Isolate the energy sources, vent the vapor lines, drain the liquid lines.
5. Lock out the generator start switch and place a tag on it. The system will be locked out by each employee working on the equipment (authorized employees). If it is not feasible to place a lock on the system, tags alone may be used.
   *Note: All employees working on the equipment and potentially exposed to the hazardous energy must have control over the system. Each one must place a lock on the isolation device, or on a lockbox under a group lockout procedure. See TI ESQ-7.3.03 Group Lockout Procedures.*
6. Block or release any stored energy. (Examples: vent vapor line, drain liquid lines)
7. Verify the de-energization. In mechanical system cases, this is accomplished by trying to start the equipment. However, the specific verification procedure should be documented on the permit.
   *Note: If the work is to be done on or near current carrying electrical equipment, verification must be done by a qualified electrical worker using test equipment.*
8. Perform work.
9. Clear work area of personnel, tools and material. Replace all parts and guards.
10. Notify affected employees.
11. Remove locks.
    *Note: If an employee leaves the site with his lock on equipment to be returned to operation, the Supervisor must contact the employee and verify their whereabouts. If still on site, the employee must return to remove their lock. If they have left the site, and it is verified, the lock may be cut.*
12. Re-energize the system or equipment.
13. Follow normal start-up procedure.

### 3.2 Exceptions

Lockout permits and lockout devices are not required by this Plan for the following equipment:

1. Equipment that is provided with a cord and plug need not comply with the permit and lockout procedures in this Plan, provided the equipment is unplugged and the plug is under the direct control of the person performing the servicing.
2. Mobile Equipment using an ignition key is considered locked out if the service mechanic removes the key from the ignition and keeps it in his/her pocket and places a ñDo Not Operateò tag on the steering wheel or operating levers. Mobile equipment tools (blades, buckets, booms etc.) must be lowered or blocked and the equipment must be properly blocked or chocked to prevent unintentional movement.
3. Other small equipment that is operated on hydrocarbon fuel that does not have a keyed ignition switch can be de-energized by disconnecting the starter battery or the fuel line. The disconnected items must be under the direct control of the person performing the servicing.

## 4.0 MONITORING

The Site Safety and Health Officer (SSHO) will monitor the implementation of the energy control procedures.

## 5.0 TRAINING

Each employee engaged in lockout/tagout must be trained in this procedure, appropriate Task Instructions, and any site-specific or equipment-specific procedures. See *TI ESQ-7.3.05 Energy Control Procedure Training Outline.*

## 6.0 DOCUMENTATION

Training in this procedure shall be documented using a training sign-in sheet, a Daily Tailgate sign-in sheet, or a copy of the *TI ESQ-7.3.05 Energy Control Procedure Training Outline.*

Lockout/tagout activities are documented using the permit, *Form ESQ-7.3.01 Lockout Permit.* Where a specific written procedure is applicable, it should be documented using *Form ESQ-7.3.02 Equipment-Specific Written Lockout Procedure.*

## 7.0 REFERENCES

29 Code of Federal Regulations (CFR) 1910.147 The Control of Hazardous Energy The control of hazardous energy (lockout/tagout). - 1910.147

United States Army Corps of Engineers (USACE) EM 385-1-1. Section 12. Control of Hazardous Energy (Lockout/Tagout) http://www.hq.usace.army.mil/soh/em385/current/SECTION12-V2-final.pdf

# LOCKOUT/TAGOUT PERMIT

Fill out Completely

Project Name: _____ Location: _____

DATE:_____ SHIFT:_____PERMIT #:

EQUIPMENT/SYSTEM IDENTIFICATION:_____

REASON FOR LOCKOUT/TAGOUT:_____

## ISOLATION INFORMATION

| Device Description | Location | Isolation Position | Lockout Device |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
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| | | | |

## SPECIAL INSTRUCTIONS FOR REMOVAL OR RELEASING STORED ENERGY

## SIGNATURES

| | | |
|---|---|---|
| **Supervisor:** | | |
| **Authorized Employee** | | **Lock #:** |
| **Authorized Employee** | | **Lock #:** |
| **Authorized Employee** | | **Lock #:** |

# TI ESQ-7.3.03
# GROUP LOCKOUT PROCEDURES

## 1.0 GENERAL

The purpose of this Task Instruction is to provide guidance on the implementation of a Group Lockout Procedure. It is ECCôs policy that each employee who may be involved in servicing equipment while it is de-energized and locked out (authorized employee), have control over the hazardous energy source(s) through the use of personally assigned padlock(s). This policy is summarized by the phrase ñOne employee ï One lock ï One Keyò.

However, there are occasions when multiple energy sources must be locked by a group of employees. It may not be feasible or practical for each employee to physically place a lock on each source. An example is during an outage on a thermal desorption unit. In such instances, the Group Lockout Procedure described below maintains the control of each authorized person over each energy isolation device and may be implemented.

## 2.0 PROCEDURE

1. The Supervisor (or Lead Operator) Completes the Lock Out / Tag Out Permit listing items to be locked out.
2. Notify personnel (authorized and affected employees) of what is being locked out and why.
3. Shut down the system using normal shutdown procedures
4. Isolate the energy source (e.g. open circuit breaker, valve, etc.)
5. Release stored energy (drain, vent, block/crib, ground, etc.)
6. The Supervisor (or Lead Operator) applies a set of **keyed-alike** locks on each energy isolation device. These locks should be a different color than those **keyed-differently** locks issued to the authorized employees.
7. In the case of electrical sources, the Supervisor (or Lead Operator) opens the appropriate circuit breakers in the main circuit panels. Prior to shutting and locking the cabinet door, authorized employees assigned to work on the isolated systems visually observe that the correct breakers are open. They also observe the correct position and Supervisor (or Lead Operator) locks on other energy isolation devices. Each of these authorized employees then initials the Lock Out / Tag Out Permit.
8. After the authorized employees initial the Lock Out / Tag Out Form, the Supervisor (or Lead Operator) puts his/her key for the **keyed-alike** set of locks into the group lockbox. This should be the only key for this set of locks. Each authorized employee then applies his/her individually assigned lock, which is uniquely keyed to the lockbox. The Supervisor (or Lead Operator) cannot retrieve the key for the set of keyed-alike locks, until each authorized employee removes his/her lock from the lockbox.
9. The authorized employees then perform or witness the ñtryò or isolation verification step. (Note: For work on or near current carrying parts of electrical equipment, this step is done by a Qualified Electrical Worker using electrical test equipment. See *SOP ESQ-5.7 Electrical Safety*.)
10. If a different employee needs to work on the system, that employee must review the Lock Out / Tag Out Form, noting the authorized employees initials verifying that the correct isolation devices

have been locked out, and then places his/her lock on the lockbox. If the new authorized employee has any doubt as to the whether the appropriate devices are isolated and locked out, he/she may request a first-hand observation.

11. After the work is performed, follow normal procedures for removal of locks and restarting the system.

# TI ESQ-7.3.05
# CONTROL OF HAZARDOUS ENERGY – TRAINING OUTLINE

## 1.0 GENERAL

The purpose of this Task Instruction is to provide guidance on training of employees in ECC SOP ESQ-7.3 Control of Hazardous Energy and associated Task Instructions and equipment specific equipment.

Each employee involved in servicing equipment that must be shut down and locked out is considered an authorized employee. Affected employees are those not directly involved in the servicing or maintenance equipment but may use the equipment or be exposed to a hazard from inadvertent starting of the shutdown equipment. This training must be provided to authorized employees. Affected employees must be trained in items 1 through 4 below. Training is to be documented with sign-in sheets, and the records must be maintained in the project files.

## TRAINING OUTLINE

1. Energy Source Hazards ï General
   a. Electrocution
   b. Struck-by falling/flying objects, pressure release, compressed gas
   c. Caught in or between mechanical parts
   d. Contact with chemicals, steam, hot surfaces
   e. Spills, fires and explosions
2. Energy Source Hazards ï Site Specific
3. Hazardous energy sources on this site (or with this system or equipment). (List)

   _____

   _____

   _____

   _____
4. ECC Policies:
   a. One employee ï one lock ï one key
   b. Locks used whenever feasible. When infeasible to use locks, standard, durable tags used.
5. Assignment and description of Locks and Tags (show samples)
6. Lockout Permit (go over permit requirements)
7. General Procedures:

   Before working on machinery, equipment or process units where employees may be exposed to hazardous energy sources a lockout/tagout procedure will be implemented.
   Notify Affected employees of the shut down and lockout.
   a. Issue a lockout permit. See *Form ESQ-7.3.01 Lockout Permit*.
      *Note: For fixed plant equipment, an equipment-specific procedure may be developed and used in lieu of a permit.*
   b. Shut down the equipment following normal shutdown procedures.
   c. Isolate the energy sources.

d. Lock out the energy source isolation device and place a tag on it. The system will be locked out by each employee working on the equipment (authorized employees). If it is not feasible to place a lock on the system, tags alone may be used.
*Note: All employees working on the equipment and potentially exposed to the hazardous energy must have control over the system. Each one must place a lock on the isolation device, or on a lockbox under a group lockout procedure. See TI ESQ-7.3.03 Group Lockout Procedures.*

e. Block or release any stored energy. (Examples: detach springs; discharge capacitors; use cribbing or secured blocking under raised items; vent pressure and check gauge; drain fluids; check temperatures)

f. Verify the de-energization. In mechanical system cases, this is accomplished by trying to start the equipment. However, the specific verification procedure should be documented on the permit.
*Note: If the work is to be done on or near current carrying electrical equipment, verification must be done by a qualified electrical worker using test equipment.*

g. Perform work.

h. Clear work area of personnel, tools and material. Replace all parts and guards.

i. Notify affected employees.

j. Remove locks.
*Note: If an employee leaves the site with his lock on equipment to be returned to operation, the Supervisor will contact employee, verify they left the site, then authorize cutting the lock.*

k. Re-energize the system or equipment.

l. Follow normal start-up procedure.

8. Job or Equipment-specific procedures (List procedures discussed)

_____

_____

_____

9. Group Lockout Procedures (if used). See *TI ESQ-7.3.03*

| INSTRUCTOR | COMPANY | DATE |
|---|---|---|
| | | |
| **ATTENDEE (Print)** | **COMPANY** | **SIGNATURE** |
| | | |
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# ATTACHMENT 15

# EXCAVATION AND TRENCHING PLAN

## 1.0 PROJECT/ TASK ORDER DESCRIPTION

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

## 2.0 SCOPE AND APPLICATION

The Activity Hazard Analysis (AHA) for excavation related activities is included in Appendix A of the Accident Prevention Plan (APP).

(a) Excavations that may exceed 4 feet in depth, and therefore, Environmental Chemical Corporation (ECC) and sub-contractor personnel will adhere to the requirements of EM 385 1-1 and 29 Code of Federal Regulations (CFR) 1926. Additionally, prior to conducting any excavation activities, utility locates must be conducted.

(b) Ramps or ladders will be placed to allow access/egress of employees if working in excavations is necessary. Egress points must be within 25 feet of personnel, so at least every 50 feet. Ladders must extend from bottom of excavation to three feet above surface. Ramps for personnel access must be a minimum of four feet wide and have standard guardrails ï see Section 21.F.01 of EM 385-1-1. Ramps for equipment must be at least 12 feet wide and curbs of not less than eight by eight-inch timbers. Equipment ramps must be designed and constructed in accordance with accepted engineering practice. In addition to the access/egress the AHA must provide the proper Perimeter Protection Class per definitions in Appendix Q of EM 385-1-1 and provide the acceptable controls according to Section 25.B of EM 385-1-1]

(c) Competent Person (CP) must be able to demonstrate:
  (1) Training, experience, and knowledge of soil analysis, use of protective systems, and requirements of this Section and 29 CFR 1926 Subpart P;
  (2) Ability to detect conditions that could result in cave-ins, failures in protective systems, hazardous atmospheres, and other hazards including those associated with confined spaces; and
  (3) The authority to take prompt corrective measures to eliminate existing and predictable hazards and stop work when required.

(d) The CP will conduct inspections daily, and as conditions change, and provide documentation that examination of the ground by the CP provides no indication of a potential cave-in. Daily inspections by CP will be recorded on ECC Form Environment, Safety and Quality (ESQ)-7.7.01.

## 3.0 RESCUE PLAN

A rescue plan will be provided, as applicable, for each separate location.

### 3.1 Diagram of Excavation Area

As applicable diagrams will be provided (at later date or in an applicable work plan), for each location, and will provide the following:

- Location and extent of excavation
- Structures or trees within excavation to be removed
- Structures, trees or other features adjacent to excavation to be protected and preserved
- Expected Underground utility locations and locations of shut offs
- Nearby Overhead power lines

- Access to excavation area, and protective systems around perimeter of excavation
- Access/egress points to excavation
- Expected depths of excavation

### 3.2 Projected Maximum Depth(s)

If depths exceed that 4 feet, additional measures will be implemented in accordance with EM 385 1-1.

## 4.0 PROJECTED SOIL TYPE AND METHOD OF TESTING TO DETERMINE SOIL TYPE

Soil shall be evaluated and classified by the CP. The classifications will in accordance with Occupational Safety and Health Administration (OSHA) 1926 Subpart P, App. A as stable rock, type A, B, or C soil. Classifications shall be made using at least one visual and one manual analysis identified in 1926 Subpart P, App. A.

It is anticipated all soil will be classified as Type C.

In layered soil systems, the system shall be classified according to its weakest layer. However, each layer may be classified individually where a more stable layer exists under a weaker layer.

In the event the properties, factors, or conditions affecting classification change, the system shall be reevaluated by the CP. Reclassify as necessary to reflect the changed circumstances.

Soil Classification will be documented using the Soil Classification Form.

## 5.0 PROTECTIVE SYSTEMS

It is anticipated excavations will be sloped. In the event sloping is not possible, alternate methods including shoring or trench boxes, will be utilized.

## 6.0 PLANNED METHOD FOR CONFINED SPACE ENTRY, TRENCH ACCESS AND EGRESS AND ATMOSPHERIC MONITORING PROCESSES

### 6.1 Entry into Excavations

Each excavation will be evaluated by the Safety and Health Manager (SHM) to determine the anticipated potential hazards and if confined space regulations apply. In the event it is necessary to treat an excavation as a confined space, this plan will be updated accordingly.

### 6.2 Trench Access and Egress

Trenches in excess of four feet deep require a minimum of two means of egress. The AHA and drawing for each location, where applicable, will address locations.

### 6.3 Atmospheric Monitoring

In the event there is potential for sources of toxic gases, such as exhaust from nearby combustion engines, to the enter the excavation, monitoring will be conducted. Monitoring in general would consist of a multi-gas detector, to check for oxygen, Carbon monoxide (CO), and explosive gases. Action levels are as follows:

- Oxygen: less than (<) 20.8 or greater than (>) 21.0 percent (%) = stop work, contact SHM for evaluation
- Lower explosive limit (LEL): > 10% = stop work, ventilate, and contact SHM

- CO: > 25 ppm, stop work, ventilate, and contact SHM

## 7.0 LOCATION OF UTILITY SHUT OFFS

Utilities connected to drainage lines will be blocked and locked out. Other utilities that may affect work will be evaluated at each location and measures will be taken to control associated hazardous energy.

## 8.0 DAMAGE PREVENTION

For all adjacent structures that pose a hazard to workers or potential damage incidents, precautions shall be established per OSHA 29 CFR 1926.651(i). Sidewalks, pavements and appurtenant structure 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.

## 9.0 MANAGEMENT OF EXCAVATED SOIL

Excavated materials will be kept a minimum of two feet from the edge of all excavations to avoid falling into excavation or creating a hazardous surcharge on excavation faces.

## 10.0 TRAFFIC CONTROL PLAN

In areas where activities are adjacent to roadways, traffic controls will be implemented accordingly, based on the requirements of EM 385 1-1. Additionally, traffic control is addressed in the work plan.

## 11.0 DIGGING PERMITS

Prior to excavation work being performed, utilities must be located in accordance with Standard Operating Procedure ESQ-7.6 ï Underground Utilities. All utility locates shall be performed a minimum of two days in advance of any excavation work being performed. Private locating services will be utilized as well.

A ñDigging Permitò processed through the Contracting Officerôs Representative must be obtained from the base authority having jurisdiction.

**ATTACHMENT 16**

**SITE SAFETY AND HEALTH PLAN (HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE [HTRW])**

## 1.0 PROJECT

Contract Number: W9124J-18-D-0004
Delivery Order W9124J21F0020
Project Name: Environmental Remediation Services
Location: Redstone Arsenal (RSA), Alabama

This SSHP supplements the Accident Prevention Plan (APP) and contains project-specific information for environmental remediation services at RSA. Additional safety and health requirements are found in the Activity Hazard Analyses (AHAs), supplemental plans, and Environmental Chemical Corporation (ECC) Safety and Health Standard Operating Procedures (SOPs).

If hazards or conditions are identified that are not covered by this Site Safety and Health Plan (SSHP), ECC staff must contact the project manager or the Site Safety and Health Officer (SSHO).

### 1.1 Redstone Arsenal History and Description

See Section 2.1 of the APP.

### 1.2 Scope of Work

See Section 2.2 of the APP.

## 2.0 ACTIVITY HAZARD ANALYSIS

Section 2.3 of the APP lists the definable features of work for this project. The AHAs will be reviewed with the field team prior to commencing a new activity.

**Tables A16-1** and **A16-2** list maximum concentrations, exposure limits, and health hazards for the chemicals of concern. The contaminant concentrations in groundwater and soil, together with the nature of operations, are such that the potential of hazardous exposures to site workers is low.

**Table A16-1: Site Contaminants**

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| ***RSA-156/157*** | | | | | | |
| Cobalt | 0.1 mg/m$^3$<br>0.02 mg/m$^3$<br>0.05 mg/m$^3$ | NA | PEL TLV REL | 20 mg/m$^3$ (as Co) | Inh, Ing, Con | Cough, dyspnea, wheezing, weight loss; dermatitis; diffuse nodular fibrosis; asthma |
| Iron | 10 mg/m$^3$<br>5 mg/m$^3$<br>5 mg/m$^3$ | NA | PEL TLV REL | 2500 mg/m$^3$ (as Fe) | Inh | Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis) |
| Manganese | 0.02 mg/m$^3$<br>1 mg/m$^3$ | C 5 mg/m$^3$<br>3 mg/m$^3$ | PEL TLV REL | 500 mg/m$^3$ (as Mn) | Inh, Ing | Manganism; mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea, flu-like fever; low-back pain; vomiting; malaise; lassitude; kidney damage |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| TCE | 100 ppm<br>50 ppm<br>25 ppm | 100 ppm | PEL TLV<br>REL | Ca (1,000 ppm) | Inh, Abs, Ing, Con | Irritation of eyes, skin; headache, vertigo; visual disturbances, fatigue, tremor, nausea, vomiting; dermatitis. |
| 2-hexanone | 5 ppm<br>5 ppm<br>1 ppm | NA | PEL TLV<br>REL | 1600 ppm | Inh, Abs, Ing | irritation eyes, nose; peripheral neuropathy: lassitude, paresthesia; dermatitis; headache, drowsiness |
| Vinyl chloride | 1 ppm | NA | PEL TLV<br>REL | Ca<br>ND | Inh, Con | Lassitude; abdominal pain, gastrointestinal bleeding; liquid: frostbite; [potential occupational carcinogen].. |
| 1,1- dimethyl-hydrazine | 0.5 ppm<br>0.01 ppm<br>NA | (Ca C) 0.06 ppm | PEL TLV<br>REL | Ca (15 ppm) | Inh, Abs Ing | irritation eyes, skin; choking, chest pain, dyspnea; drowsiness; nausea; anoxia; convulsions; [potential occupational carcinogen]. |
| 2-nitrotoluene | 5 ppm<br>2 pm<br>2 ppm | NA | PEL TLV<br>REL | 200 ppm | Inh, Abs, Ing, Con | Anoxia, cyanosis; headache, lassitude, dizziness; ataxia; dyspnea; tachycardia; nausea, vomiting. |
| Nitrobenzene | 1 ppm<br>1 ppm<br>1 ppm | NA | PEL TLV<br>REL | 200 ppm | Inh, Abs, Ing, Con | irritation eyes, skin; anoxia; dermatitis; anemia; methemoglobinemia. |
| 2,6- DNT | 1.5 $mg/m^3$<br>1.5 $mg/m^3$<br>1.5 $mg/m^3$ | NA | PEL TLV<br>REL | 200 $mg/m^3$ | Con | headache, irritability, dizziness, weakness, nausea, vomiting, dyspnea, drowsiness, unconsciousness, and possibly death. Repeated or prolonged exposure may cause anemia [potential occupational carcinogen]. |
| Nitroglycerin | 0.05 ppm | (C) 0.2 ppm<br>0.1 | PEL TLV<br>REL | 200 $mg/m^3$ [e] | Inh, Abs, Ing, Con | throbbing headache; dizziness; nausea, vomiting, abdominal pain; flush; palpitations; delirium; angina; skin irritation. |
| 1,3-dinitrobenzene | 1 $mg/m^3$<br>1 $mg/m^3$<br>1 $mg/m^3$ | NA | PEL TLV<br>REL | 50 $mg/m^3$ [f] | Inh, Abs, Ing, Con | Anoxia, cyanosis; visual disturbance, central scotomas; bad taste, burning mouth, dry throat, thirst; yellowing hair, eyes, skin; anemia; liver damage. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| 2,4-DNT | 1.5 mg/m$^3$<br>1.5 mg/m$^3$<br>1.5 mg/m$^3$ | NA | PEL TLV REL | 200 mg/m$^3$ | Con | headache, irritability, dizziness, weakness, nausea, vomiting, dyspnea, drowsiness, unconsciousness, and possibly death. Repeated or prolonged exposure may cause anemia [potential occupational carcinogen]. |
| Perchlorate | 10 mg/m$^3$ Inhalable particles<br>3.0 mg/m$^3$ Respirable Particles | NA | PEL TLV REL | NA | Inh, Ing, Con, Abs | Local irritation or stinging effect. Chronic ingestion of sufficient quantities may interfere with uptake of iodine by the thyroid which may cause hypothyroidism. Irritation of the eyes will cause stinging effect. |
| ***RSA-262*** | | | | | | |
| Benzo[a] anthracene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV REL | Ca (80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Benzo[a] pyrene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV REL | Ca (80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Benzo[b] fluoranthene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV REL | Ca (80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Dibenz[a,h] anthracene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV REL | Ca (80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| 2-nitrotoluene | 5 ppm<br>2 ppm<br>2 ppm | NA | PEL TLV REL | 200 ppm | Inh, Abs, Ing, Con | Anoxia, cyanosis; headache, lassitude, dizziness; ataxia; dyspnea; tachycardia; nausea, vomiting. |
| 1,1,2-trichloroethane | 10 ppm<br>10 ppm<br>10 ppm | NA | PEL TLV REL | Ca (100 ppm) | Inh, Abs, Ing, Con | Irritation eyes, nose; liver, kidney damage; dermatitis; [potential occupational carcinogen]. |
| CT | 10 ppm<br>5 ppm-skin | (C) 25 ppm<br>10 ppm-skin<br>2 ppm (60-min) | PEL TLV REL | Ca (200 ppm) | Inh, Abs, Ing, Con | Irritation eyes, skin; nausea, vomiting; drowsiness, dizziness, incoordination; (potential occupational carcinogen). |
| PCE | 100 ppm<br>25 ppm (minimize workplace exposure concentrations) | (C)200 ppm<br>100 ppm | PEL TLV REL | Ca (150 ppm) | Inh, Abs, Ing, Con | irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, headache, drowsiness; [potential occupational carcinogen]. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| TCE | 100 ppm<br>50 ppm<br>25 ppm | 100 ppm | PEL TLV<br>REL | Ca (1,000 ppm) | Inh, Abs, Ing, Con | Irritation of eyes, skin; headache, vertigo; visual disturbances, fatigue, tremor, nausea, vomiting; dermatitis. |
| 1,1,2,2-tetrachloro-ethane | 5 ppm<br>1 ppm<br>1 ppm | NA | PEL TLV<br>REL | Ca (100 ppm) | Inh, Abs, Ing, Con | Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, dermatitis; kidney damage; [potential occupational carcinogen]. |
| ***CCSWMU-306*** | | | | | | |
| Benzene | 1 ppm<br>0.5 ppm<br>0.1 ppm | 4 ppm<br>2.5 ppm<br>1 ppm | PEL TLV<br>REL | Ca<br>(500 ppm) | Inh, Abs, Ing, Con | Irritated eyes, skin, nose, respiratory system, giddiness, headache, nausea, dermatitis, bone marrow depression. |
| 1-methyl-naphthalene | 0.5 ppm | NA | PEL TLV<br>REL | NA | Inh, Abs, Ing, Con | Lower Respiratory Tract irritation Lung damage Danger of cutaneous absorption. |
| Iron | 10 $mg/m^3$<br>5 $mg/m^3$<br>5 $mg/m^3$ | NA | PEL TLV<br>REL | 2500 $mg/m^3$<br>(as Fe) | Inh | Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis). |
| ***RSA-308*** | | | | | | |
| Perchlorate | 10 $mg/m^3$<br>Inhalable particles<br>3.0 $mg/m^3$<br>Respirable Particles | NA | PEL TLV<br>REL | NA | Inh, Abs, Ing, Con | Local irritation or stinging effect. Chronic ingestion of sufficient quantities may interfere with uptake of iodine by the thyroid which may cause hypothyroidism. Irritation of the eyes will cause stinging effect. |
| RDX | 0.5 $mg/m^3$ | NA | PEL TLV<br>REL | NA | Inh, Abs, Ing, Con | Irritation eyes, skin; headache, irritability, lassitude, tremor, nausea, dizziness, vomiting, insomnia, convulsions. |
| ***RSA-056/RSA-139*** | | | | | | |
| Arsenic | 0.01 $mg/m^3$<br>0.01 $mg/m^3$ | Ca<br>0.002 $mg/m^3$ | PEL<br>TLV REL | 5 $mg/m^3$ | Inh, Ing, Con | Cough, diarrhea, shortness of breath, vomiting, grey skin. Redness. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| ***RSA-009*** | | | | | | |
| Arsenic | 0.01 mg/m$^3$<br>0.01 mg/m$^3$ | Ca<br>0.002 mg/m$^3$ | PEL<br>TLV REL | 5 mg/m$^3$ | Inh, Ing, Con | Cough, diarrhea, shortness of breath, vomiting, grey skin. Redness. |
| Mercury | 0.05 mg/m$^3$<br>(vapor)(skin) | C 0.1 mg/m$^3$ | PEL<br>TLV REL | 10 mg/m$^3$<br>(as Hg) | Inh, Ing, Con, Abs | Irritation of eyes, skin; cough, chest pain, dyspnea, bronchitis, pneumonitis, tremor, insomnia, irritability, headache, weakness, stomatitis, salivation, GI disturbance, low-weight, proteinuria. |
| Aroclor-1248 | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.001 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(5 mg/m$^3$) | Inh, Ing, Con, Abs | irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]. |
| Aroclor-1254 | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.001 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(5 mg/m$^3$) | Inh, Ing, Con, Abs | irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]. |
| Aroclor-1260 | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.001 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(5 mg/m$^3$) | Inh, Ing, Con, Abs | irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]. |
| ***RSA-140*** | | | | | | |
| Cadmium | 0.005 mg/m$^3$<br>0.01mg/m$^3$<br>0.002 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(9 mg/m$^3$)<br>(as Cd) | Inh, Ing | Pulmonary edema, dyspnea, cough, chest tightness, substernal pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia, emphysema, proteinuria, mild anemia; [potential occupational carcinogen]. |
| Lead | 0.05 mg/m$^3$<br>0.05 mg/m$^3$<br>0.05 mg/m$^3$ | NA | PEL<br>TLV REL | 100 mg/m$^3$<br>(as Pb) | Ihh Ing, Con | lassitude, insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; tremor; paralysis wrist, ankles; kidney disease; irritation eyesô hypertension. |
| Dieldrin | 0.25 mg/m$^3$<br>0.1 mg/m$^3$<br>Ca 0.25 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(50 mg/m$^3$) | Inh, Ing, Con, Abs | headache, dizziness; nausea, vomiting, malaise, sweating; In Animals: liver, kidney damage [potential occupational carcinogen]. |
| Aroclor-1254 | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.001 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(5 mg/m$^3$) | Inh, Ing, Con, Abs | irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| ***RSA-058*** | | | | | | |
| Arsenic | 0.01 mg/m$^3$<br>0.01 mg/m$^3$ | Ca<br>0.002 mg/m$^3$ | PEL<br>TLV REL | 5 mg/m$^3$ | Inh, Ing<br>Con | Cough, diarrhea, shortness of breath, vomiting, grey skin. Redness. |
| DDT | 1 mg/m$^3$<br>1 mg/m$^3$<br>0.5 mg/m$^3$ | NA | PEL TLV<br>REL | 500 mg/m3 | Inh, Ing,<br>Con, Abs | Irritation eyes, skin; anxiety, dizziness, confusion, malaise headache, lassitude; convulsions; vomiting; (potential occupational carcinogen). |
| Benzo[a] pyrene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Dibenz(a,h) anthracene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | Ca<br>(80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Benzo[a] anthracene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | Ca<br>(80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Benzo[b] fluoranthene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | Ca<br>(80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Endrin | 0.1 mg/m$^3$<br>0.1 mg/m$^3$<br>0.1 mg/m$^3$ | NA | PEL TLV<br>REL | 2 mg/m$^3$ | Inh, Ing,<br>Con, Abs | Stupor, headache, dizziness; abdominal discomfort, nausea, vomiting; insomnia; aggressiveness, confusion; drowsiness, lassitude; anorexia. |
| Chlorobenzene | 75 ppm<br>10 ppm | NA | PEL TLV<br>REL | 1,00 ppm | Ing, Inh,<br>Con | Irritation eyes, skin, nose; drowsiness, incoordination. |
| Nitroglycerine | 0.05 ppm | (C) 0.2 ppm<br>0.1 | PEL TLV<br>REL | 200 mg/m$^3$<br>[e] | Inh, Abs,<br>Ing, Con | throbbing headache; dizziness; nausea, vomiting, abdominal pain; flush; palpitations; delirium; angina; skin irritation. |
| Beta-BHC | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.5 mg/m$^3$ | NA | PEL TLV<br>REL | 50 mg/m$^3$ | Inh, Abs,<br>Ing, Con | Irritation eyes, skin, nose, throat; headache; nausea; resp difficulty; cyanosis; muscle spasm. |
| ***RSA-083*** | | | | | | |
| TCE | 100 ppm<br>50 ppm<br>25 ppm | 100 ppm | PEL TLV<br>REL | Ca (1,000 ppm) | Inh, Abs,<br>Ing, Con | Irritation of eyes, skin; headache, vertigo; visual disturbances, fatigue, tremor, nausea, vomiting; dermatitis. |
| Cis-1,2-DCE | 200 ppm<br>200 ppm<br>200 ppm | NA | PEL TLV<br>RE | 1,000 ppm | Inh, Ing,<br>Con | Irritation eyes, respiratory system; central nervous system depression. |
| Vinyl chloride | 1 ppm | NA | PEL TLV<br>REL | Ca<br>ND | Inh, Con | Lassitude; abdominal pain, gastrointestinal bleeding; liquid: frostbite; [potential occupational carcinogen]. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| 1,1-DCE (vinylidene chloride) | NA | NA | NA | NA | Inh, Abs, Ing, Con | Irritation of eyes, skin; throat, dizziness, headache, nausea, dyspnea, liver injury, kidney disturbance. |
| Chlorobenzene | 75 ppm<br>10 ppm | NA | PEL TLV<br>REL | 1,00 ppm | Ing, Inh, Con | Irritation eyes, skin, nose; drowsiness, incoordination. |
| 2,4-DNT | 1.5 mg/m$^3$ | NA | PEL TLV<br>REL | NA | NA | Headaches; fatigue, nausea, vomiting, chest pain, and weight loss. |
| ***CCSWMU-003*** | | | | | | |
| TCE | 100 ppm<br>50 ppm<br>25 ppm | 100 ppm | PEL TLV<br>REL | Ca (1,000 ppm) | Inh, Abs, Ing, Con | Irritation of eyes, skin; headache, vertigo; visual disturbances, fatigue, tremor, nausea, vomiting; dermatitis. |
| Cis-1,2-DCE | 200 ppm<br>200 ppm<br>200 ppm | NA | PEL TLV<br>RE | 1,000 ppm | Inh, Ing, Con | Irritation eyes, respiratory system; central nervous system depression. |
| Vinyl chloride | 1 ppm | NA | PEL TLV<br>REL | Ca<br>ND | Inh, Con | Lassitude; abdominal pain, gastrointestinal bleeding; liquid: frostbite; [potential occupational carcinogen]. |
| 1,1-DCE | NA | NA | PEL TLV<br>REL | NA | Inh, Abs, Ing, Con | Irritation of eyes, skin; throat, dizziness, headache, nausea, dyspnea, liver injury, kidney disturbance, pneumonitis. |
| 1,2-dichloroethane | 50 ppm<br>10 ppm<br>Ca 1 pp | C 100 ppm<br>2ppm | PEL TLV<br>REL | Ca (50 ppm) | Inh, Abs, Ing, Con | Irritation eyes, corneal opacity; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]. |
| 2-nitrotoluene | 5 ppm<br>2 pm<br>2 ppm | NA | PEL TLV<br>REL | 200 ppm | Inh, Abs, Ing, Con | Anoxia, cyanosis; headache, lassitude, dizziness; ataxia; dyspnea; tachycardia; nausea, vomiting. |
| ***RSA-048*** | | | | | | |
| TCE | 100 ppm<br>50 ppm<br>25 ppm | 100 ppm | PEL TLV<br>REL | Ca (1,000 ppm) | Inh, Abs, Ing, Con | Irritation of eyes, skin; headache, vertigo; visual disturbances, fatigue, tremor, nausea, vomiting; dermatitis. |
| 1,1,2-trichloroethane | 10 ppm<br>10 ppm<br>10 ppm | NA | PEL TLV<br>REL | Ca (100 ppm) | Inh, Abs, Ing, Con | Irritation eyes, nose; liver, kidney damage; dermatitis; [potential occupational carcinogen]. |
| 1,1,2,2-tetrachloro-ethane | 5 ppm<br>1 ppm<br>1 ppm | NA | PEL TLV<br>REL | Ca (100 ppm) | Inh, Abs, Ing, Con | Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, dermatitis; kidney damage; [potential occupational carcinogen]. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| Dibromo-chloroethane | NA | NA | PEL TLV REL | NA | Inh, Abs, Ing, Con | Sleepiness or sedation liver and kidney injury; central nervous system depression and respiratory failure. |
| Benzo[a] anthracene[g] | 0.2 mg/m$^3$ Ca 0.1 mg/m$^3$ | NA | PEL TLV REL | Ca (80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Benzo[b] fluoranthene[g] | 0.2 mg/m$^3$ Ca 0.1 mg/m$^3$ | NA | PEL TLV REL | Ca (80mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Manganese | 0.02 mg/m$^3$ 1 mg/m$^3$ | C 5 mg/m$^3$ 3 mg/m$^3$ | PEL TLV REL | 500 mg/m$^3$ (as Mn) | Inh, Ing | Manganism; mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea, flu-like fever; low-back pain; vomiting; malaise; lassitude; kidney damage. |
| ***RSA-059*** | | | | | | |
| Arsenic | 0.01 mg/m$^3$ 0.01 mg/m$^3$ | Ca 0.002 mg/m$^3$ | PEL TLV REL | 5 mg/m$^3$ | Inh, Ing Con | Cough, diarrhea, shortness of breath, vomiting, grey skin. Redness. |
| Cadmium | 0.005 mg/m$^3$ 0.01mg/m$^3$ 0.002 mg/m$^3$ | NA | PEL TLV REL | Ca (9 mg/m$^3$) (as Cd) | Inh, Ing | Pulmonary edema, dyspnea, cough, chest tightness, substernal pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia, emphysema, proteinuria, mild anemia; [potential occupational carcinogen]. |
| Chromium | 1 mg/m$^3$ 0.5 mg/m$^3$ 0.5 mg/m$^3$ | NA | PEL TLV REL | 250 mg/m$^3$ (as Cr) | Inh Ing, Con | Irritation eyes, skin; lung fibrosis (histologic). |
| Silver | 0.01 mg/m$^3$ 0.1 mg/m$^3$ 0.01 mg/m$^3$ | NA | PEL TLV REL | 10 mg/m$^3$ (as Ag) | Inh Ing, Con | Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance. |
| Lead | 0.05 mg/m$^3$ 0.05 mg/m$^3$ 0.05 mg/m$^3$ | NA | PEL TLV REL | 100 mg/m$^3$ (as Pb) | Inh Ing, Con | lassitude, insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; tremor; paralysis wrist, ankles; kidney disease; irritation eyesǫ hypertension. |
| Chlorobenzene | 75 ppm 10 ppm | NA | PEL TLV REL | 1,00 ppm | Ing, Inh, Con | Irritation eyes, skin, nose; drowsiness, incoordination. |
| TCE | 100 ppm 50 ppm 25 ppm | 100 ppm | PEL TLV REL | Ca (1,000 ppm) | Inh, Abs, Ing, Con | Irritation of eyes, skin; headache, vertigo; visual disturbances, fatigue, tremor, nausea, vomiting; dermatitis. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| 1,2-DCE | 200 ppm<br>200 ppm<br>200 ppm | NA | PEL TLV<br>RE | 1,000 ppm | Inh, Ing, Con | Irritation eyes, respiratory system; central nervous system depression. |
| Pentachloro phenol | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.5 mg/m$^3$ | NA | PEL TLV<br>RE | 2.5 mg/m$^3$ | Inh, Abs, Ing, Con | Irritation eyes, nose, throat; sneezing, cough; lassitude, anorexia, weight loss; sweating; headache, dizziness; nausea, dyspnea, chest pain; high fever; dermatitis. |
| Benzo(a) anthracene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | Ca<br>(80 mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Benzo[b] fluoranthene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | Ca<br>(80 mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Dibenz(a,h) anthracene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | Ca<br>(80 mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Indeno(1,2,3-cd)pyrene[g] | 0.2 mg/m$^3$<br>Ca 0.1 mg/m$^3$ | NA | PEL TLV<br>REL | Ca<br>(80 mg/m$^3$) | Inh, Con | Dermatitis, bronchitis [potential occupational carcinogen]. |
| Bis(2-chloroethyl) ether | 5 ppm<br>5 ppm | C 15 ppm<br>10 ppm<br>10 ppm | PEL TLV<br>REL | Ca<br>(100 ppm) | Inh, Abs, Ing, Con | Irritation nose, throat, respiratory system; cough; nausea, vomiting; [potential occupational carcinogen]. |
| Alpha-BHC | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.5 mg/m$^3$ | NA | PEL TLV<br>REL | 50 mg/)m$^3$ | Inh, Abs, Ing, Con | Irritation eyes, skin, nose, throat; headache; nausea; resp difficulty; cyanosis; muscle spasm. |
| Beta-BHC | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.5 mg/m$^3$ | NA | PEL TLV<br>REL | 50 mg/m$^3$ | Inh, Abs, Ing, Con | Irritation eyes, skin, nose, throat; headache; nausea; resp difficulty; cyanosis; muscle spasm. |
| Aldrin | 0.25 mg/ m$^3$<br>0.05 mg/ m$^3$<br>0.25 mg/ m$^3$ | NA | PEL TLV<br>REL | Ca<br>(25 mg/m$^3$) | Inh, Abs, Ing, Con | Headache, dizziness; nausea, vomiting, malaise tonic convulsions; coma; hematuria; [potential occupational carcinogen]. |
| Dieldrin | 0.25 mg/m$^3$<br>0.1 mg/m$^3$<br>Ca 0.25 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(50 mg/m$^3$) | Inh, Ing, Con, Abs | headache, dizziness; nausea, vomiting, malaise, sweating; [potential occupational carcinogen]. |
| Aroclor 1254 | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.001 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(5 mg/m$^3$) | Inh, Ing, Con, Abs | irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]. |
| Aroclor 1016 | 0.5 mg/m$^3$<br>0.5 mg/m$^3$<br>0.001 mg/m$^3$ | NA | PEL<br>TLV REL | Ca<br>(5 mg/m$^3$) | Inh, Ing, Con, Abs | irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]. |

| Chemical | TWA[a] | STEL/ CEIL(C) [b] | Source [c] | IDLH (NIOSH) [d] | Route | Symptoms of Exposure |
|---|---|---|---|---|---|---|
| ***RSA-255*** | | | | | | |
| Manganese | 0.02 mg/m$^3$<br>1 mg/m$^3$ | C 5 mg/m$^3$<br>3 mg/m$^3$ | PEL TLV<br>REL | 500 mg/m$^3$<br>(as Mn) | Inh, Ing | Manganism; mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea, flu-like fever; low-back pain; vomiting; malaise; lassitude; kidney damage. |

**Notes:**

(a) The time-weighted average (TWA) concentration for a normal workday (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.

(b) Short-term exposure limit (STEL). A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.

(c) PEL - Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 Code of Federal Regulations [CFR] 1910.1000, Table Z). AEL - Airborne Exposure Limit. TLV - American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit valueð TWA. REL - National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.

(d) IDLH (NIOSH)ð Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

(e) No data on acute inhalation toxicity are available on which to base the IDLH for ethylene glycol dinitrate (EGDN) and/or nitroglycerin. The chosen Immediately Dangerous to Life and Health (IDLH), therefore is based on chronic toxicity data concerning the physiological response to animals to EGDN (NIOSH for Nitroglycerine, May 1994)

(f) No inhalation toxicity data are available on which to base an IDLH for dinitrobenzene. Therefore, the revised IDLH for dinitrobenzene is 50 mg/m3 based on acute oral toxicity data in humans [Deichmann and Gerarde 1969] (NIOSH for dinitrobenzene

(g) Exposure limits are based on coal tar pitch.

Õg/L ï micrograms per liter
Abs ï skin absorption
Ag ï Silver
Beta-BHC ï Beta-hexachlorocyclohexane
C = Ceiling limit value which should not be exceeded at any time.
Ca ï Carcinogen
Cd ï Cadmium
Co ï Cobalt
Con ï skin and/or eye contact
Cr - Chromium
CT ï carbon tetrachloride
DCE - dichloroethene
DDT ï Dichlorodiphenyltrichloroethane
DNT ï dinitrotoluene
Hg - mercury
Inh ï inhalation
Ing ï ingestion
mg/m$^3$ ï milligrams per cubic meter
Mn ï Manganese
NA ï Not applicable
ND ï Not determined
Pb - Lead
PCE - Tetrachloroethene
ppm ï parts per million
RDX ï 1,3,5-trinitro-1,3,5-triazine
TCE ï trichloroethene

## Table A16-2: Chemical Contaminants

| Chemical | Max (mg/kg) | PEL | TLV | Exposure Routes and Symptoms | Fire/ Reactivity Hazards |
|---|---|---|---|---|---|
| Gasoline | NA | 300 ppm STEL 500 ppm | 900 mg/m$^3$ | Routes of exposure: inhalation, ingestion, and skin contact<br>Symptoms: Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen] | Flammable; Flash Point = -45 ŒF |
| Diesel Fuel | NA | none | 100 mg/m$^3$ | Routes of exposure: inhalation, ingestion, and skin contact<br>Skin and upper respiratory irritation. May cause central nervous system effects, dizziness, nausea, etc. | Combustible ; Flash Point >100 ŒF |

**Notes:**

ŒF ï degrees Fahrenheit
> ï greater than
NA ï Not Applicable
PEL ï Permissible Exposure Limit
ppm ï parts per million
mg/kg ï milligrams per kilogram
mg/m$^3$ ï milligrams per cubic meter
STEL ï Short term exposure limit
TLV ï Threshold Limit Value

## 3.0 TRAINING

See Section 4 of the APP.

## 4.0 TRAINING

See Section 6 of the APP.

## 5.0 PERSONAL PROTECTIVE EQUIPMENT

### 5.1 Selection

Unless otherwise approved by the SSHO, all activities will include at least American National Standards Institute (ANSI)-approved hard hats, safety-toe footwear, safety glasses with side impact protection and high visibility garments. Other Personal Protective Equipment (PPE) requirements are listed below, and included in the AHAs for specific activities/tasks.

**Table A16-3. PPE Selection**

| Activity | Respiratory Protection | Body Protection* | Hand Protection | Eye/Face/Other Protection | Hearing Protection | Fall Protection |
|---|---|---|---|---|---|---|
| Mobilization, Site Inspection and Site Preparation | NA | Level D | Leather palm work gloves; cut resistant gloves if sharp objects, cutting devices, or sharp edges are present | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |
| Environmental Sampling | NA | Modified Level D[(a)] | Leather or cut resistant gloves when cutting plastic tubes/ nitrile gloves when sampling | Safety glasses; for splash hazards, face shield with safety glasses or goggles | Plugs or muffs if necessary, based on equipment use | NA |
| Well Installation, Maintenance, and Abandonment | NA | Level D | Nitrile or Leather palm work gloves | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |
| Landfill Repair and Maintenance | NA | Level D | Nitrile or Leather palm work gloves | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |
| LUC inspections and Geophysical Survey | NA | Level D | Nitrile or Leather palm work gloves | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |

| Activity | Respiratory Protection | Body Protection* | Hand Protection | Eye/Face/Other Protection | Hearing Protection | Fall Protection |
|---|---|---|---|---|---|---|
| MIP Survey | NA | Level D | Nitrile or Leather palm work gloves | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |
| Excavation, Transportation, and Disposal | NA | Modified Level D[(b)] | Nitrile or Leather palm work gloves | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |
| ISEB injection | NA | Level D | Nitrile or Leather palm work gloves | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |
| Disc and Raking Contaminated Soil | NA | Modified Level D[(b)] | Nitrile or Leather palm work gloves | Safety glasses | Plugs or muffs if necessary, based on equipment use | NA |
| Equipment Decontamination, Demobilization and Site Restoration[(a)] | NA | Level D | Nitrile or Leather palm work gloves | Safety glasses and face shield and apron (if necessary, for equipment decon) | Plugs or muffs if necessary, based on equipment use | NA |

**Notes:**
(a) ï A face shield with safety glasses or goggles shall be used during activities where a splash hazard exists. Wear permethrin treated gaiters when in grassy areas.
(b) ï If direct contact with soils, boot covers/ over boots and Tyvek È may be required. SSHO will determine when boot covers and Tyvek È are needed.
* - Level D body protection includes high visibility Class II garment.
ISEB ï In-Situ Enhanced Bioremediation
LUC ï Land Use Control
MIP ï Membrane Interface Probe
NA ï Not applicable

## 5.2 Use and Limitations

***Read and follow all manufacturer instructions regarding product use and limitations!!!***

***Body protection*** ï Wear normal work clothing including high visibility Class II garment. During soil disc and raking and excavation activities, boot covers /over boots and Tyvek ® may be required. The SSHO will determine when these over garments are required.

***Hand protection*** ï Use gloves described in **Table A16-3**. Chemical protective gloves are meant for incidental contact. Change gloves in the event of immersion unless specifically selected for that purpose. Inspect frequently and change gloves on signs of contamination, and when protection is compromised by wear and tear.

***Eye/face protection*** ï Wear protection prescribed in **Table A16-3**. Discard when protection is scratched or worn impacting visibility. If face shields are worn for chemical splash, also wear splash goggles underneath. Safety glasses will be worn under face shields for impact protection and under welding helmets. Lens shade will be selected based on hazard, following SOP Environment, Safety and Quality (ESQ)-6.1 (Task Instruction 6.1.02)

***Hearing Protection*** ï Wear hearing protective devices in accordance with manufacturersô instructions, including fitting and insertion. Use of specific devices will be limited to exposures within the noise reduction ratings.

***Fall Protection*** ï For the activities covered by this SSHP, fall protection is not anticipated; however, if it becomes necessary, the Safety and Health Manager (SHM) will prepare a site-specific fall protection plan and submit it to the Contracting Officerôs Representative (COR) for acceptance before proceeding.

### 5.3 Work Mission Duration

Work mission durations will be limited to accommodate acceptable service life of the PPE.

Where PPE may cause a hazard, such as heat stress, work mission duration will be determined in the AHA by the SSHO with the assistance of the SHM. Employees must exit the exclusion zone (EZ) for rest or monitoring in accordance with the established schedule.

### 5.4 PPE Maintenance and Storage

It is important that all PPE be kept clean and properly maintained. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision. Employees must inspect, clean, and maintain their PPE according to the manufacturersô instructions before and after each use. Supervisors are responsible for ensuring that users properly maintain their PPE in good condition.

Personal protective equipment must not be shared between employees until it has been properly cleaned and sanitized. PPE will be distributed for individual use whenever possible. Where employees provide their own protective equipment, ECC will be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

### 5.5 PPE Decontamination and Disposal

It is anticipated that most of the PPE utilized on the project, beyond the basic PPE elements (hard hat, safety glasses, steel-toed boots, leather gloves), will be of a disposable nature (nitrile or other chemical gloves, ear plugs, boot covers, and Tyvek ®). Contaminated PPE will be collected in a dedicated container and disposed of appropriately at a suitable facility. Based on the contaminants present and their concentrations it is anticipated that disposable PPE will be disposed of as non-hazardous waste.

Earmuffs, safety glasses, and other non-disposable forms of PPE will be routinely wiped clean of any visible contamination after each use.

### 5.6 PPE Training and Proper Fitting

Users will be trained on the selection, use and limitations of PPE. Each affected employee will demonstrate an understanding of the training specified in this section, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE.

Should ECC have reason to believe that any affected employee who has already been trained does not have the understanding and skill required of this section, the employer will retrain that employee.

Gloves, head gear, coveralls, and footwear must fit properly to avoid tripping and snagging hazards, or constriction and tearing. Hearing protection will be checked by the user and SSHO for proper fit and must be inserted/worn in accordance with manufacturer instructions.

### 5.7 PPE Donning and Doffing Procedures

The SSHO will train on and demonstrate proper donning and doffing procedures for PPE ensembles worn in EZs during site orientation.

### 5.8 PPE Inspection Procedures

Each person who is required to wear PPE will inspect their equipment prior to, during, and after each use. Defective or damaged equipment will not be used. Heavily contaminated PPE that cannot be adequately cleaned will be discarded. Stored PPE will be inspected every month to ensure that it has not been damaged and is suitable for use. Workers who wear PPE in the field will take note of the condition of the PPE worn by their co-workers and inform them of any apparent problems, such as missing equipment, tears in protective clothing, excessive contamination, improper use of PPE, inadequate PPE, etc.

### 5.9 Evaluation of Effectiveness of PPE Program

The SSHO will inspect the jobsite each day and as frequently as necessary to ensure that PPE has been properly selected and is being used as designed. The SSHO will also inspect PPE stored for emergency use every month. Similar PPE inspections will be conducted by ECCôs SHM during scheduled visits of the project site.

## 6.0 MEDICAL SURVEILLANCE

Employees on this project whose work involves potential exposure to site contaminants will be included in the medical surveillance program.

Personnel will have a current medical exam clearance (physicianôs written opinion) in accordance with Occupational Safety and Health Administration (OSHA) standards prior to entering regulated work areas in accordance with 29 Code of Federal Regulations (CFR) 1910.120. ECC uses the services of WorkCare, whose Principal is Dr. Peter Greaney, a Board-Certified Occupational Physician to review all exams and provide the clearances, which include an assessment of employee ability to wear respiratory protection and PPE safely. Complete results of each individualôs medical examination results are maintained by the medical provider and will not to be kept on-site. The SSHO will ensure appropriate subcontractorôs medical screenings are completed, documented, and the physicianôs written opinions are available at the work site.

## 7.0 EXPOSURE MONITORING AND AIR SAMPLING

Based on historical sampling analysis data (low-level concentrations of volatile organic compounds [VOCs]), elevated levels of VOCs in the breathing zone are not anticipated, air monitoring is not required during intrusive activities; however, air monitoring will be performed in the general work area and the breathing zone prior to starting intrusive activities to establish background concentrations. Personnel performing testing and monitoring will be trained in testing and monitoring procedures and hazards. Monitoring equipment will be used, inspected, maintained, and properly calibrated in accordance with the manufacturesô instructions and standard industrial hygiene practice.

**Table A16-4** below lists the monitoring requirements and response actions for this project. All direct and integrated air monitoring equipment will be properly calibrated before and after each period of use in accordance with the manufacturesô instructions and standard industrial hygiene practice.

**Table A16-4. Exposure Monitoring**

| *Real Time (air, noise, heat, radiation, light)* | | | |
|---|---|---|---|
| **Instrument / Contaminant** | **Frequency** | **Action Levels** | **Actions/Upgrade and Rationale** |
| Multi-RAE Plus or equivalent / VOCs | During any intrusive activities | Work Area: Sustained reading of 5 ppm in the breathing zone. | Stop activities, suspend work activities for 15 to 30 minutes; if readings are sustained then contact SHM(a). |
| OSHA/NIOSH HEAT Index App + Body Temp / Heart Rate Monitoring | Daily during work in hot conditions (> 85ÁF Level D, > 70ÁF when impervious coveralls worn) | Variable depending on the individual and work activity | Follow Precautions recommended by the HEAT Index app.<br>Implement physiological monitoring when Heat Index indicates Moderate Risk for employees in protective clothing working in sunlight; and for other workers when Heat Index indicates High Risk; and for any workers indicating signs and symptoms of heat stress. |

**Notes:**
(a) Contact with the SHM must be made prior to continuance of work. The SHM may then initiate perimeter/integrated air sampling along with additional engineering controls.
ÁF ï degrees Fahrenheit
> ï greater than
PID ï Photoionization detector
ppm ï parts per million
NIOSH ï National Institute for Occupational Safety and Heath
OSHA ï Occupational Safety and Health Administration
VOC ï Volatile organic compounds

Records will include the date, time, substances or hazards monitored, person conducting monitoring, calibration date and method, operations and location of monitoring, and results. Records are available to employees, their representatives, and to the Army.

## 8.0 HEAT STRESS/COLD STRESS

See Attachments 12A and 12B in the APP.

## 9.0 STANDARD OPERATING PROCEDURES

The following procedures will be employed on this project where appropriate.

### 9.1 Site Rules/Prohibitions

The following site rules are applicable to all ECC projects:

- Eat, drink, use gum or tobacco products, or apply cosmetics in designated areas only.
- Do not smoke within site areas or near flammable or combustible materials; areas shall be marked where smoking is permitted.
- Use the buddy system when working in EZ. Know who your buddy is, communicate regularly with each other, and be alert to signs of distress in your buddy.
- Wash hands, face, and any exposed skin during decontamination, before eating, drinking or using tobacco products, and at the end of each shift.
- Participate in Daily Safety Tailgate Meetings.
- Continually observe work location and be alert to changes that may affect safety.

- Avoid direct contact with contamination by not purposefully walking, touching, or contacting any obviously contaminated surfaces.
- Immediately report any mishaps, including near misses, or unusual situations to SSHO.
- Use PPE provided and as instructed by the SSHO.
- Avoid hand-to-mouth or hand-to-face activities.
- Testing and monitoring instruments, safety equipment, rigging, hand and power tools, vehicles and mobile construction equipment shall be inspected prior to use.
- Minimize the number of personnel in a work area to reduce potential exposures.
- Work within physical and mental limits.
- Take adequate rest breaks and replace body fluids (water and electrolyte) continuously.
- At all times follow the instructions of the SSHO or designee.
- Do not deviate from the APP or the instruction of the SSHO.
- Avoid rushing and/or taking short cuts.
- Handle and dispose all waste generated from decontamination procedures per contract requirements.
- Conduct visual checks on machinery and equipment prior to use, and complete the daily inspection form.
- Take precautions to prevent spillage and splashing; contain spilled liquid if possible.
- Alert your senses to potentially dangerous situations (e.g., strong, irritating, or nauseating odors).
- Familiarize yourself with the physical characteristics of the sites.
- Dispose of all wastes generated during activities as directed by the Supervisor, SSHO or designee.

Conformance with these site rules is mandatory for continued project participation.

### 9.2 Work Permit Requirements

***Excavation/Digging Permit***: Where required, ECC will obtain a dig permit from the authority having jurisdiction. The dig permit will be updated prior to expiration. Work will stay within the parameters on the permit. If excavation is extended in terms of area or time, a new/revised permit will be obtained.

***Control of Hazardous Energy Permits***: Where equipment or systems must be de-energized to safely work on them, and a specific written procedure does not exist for the equipment, a Lockout/Tagout permit will be completed in accordance with ECC SOP ESQ 7.3.

### 9.3 Material Handling Procedures

Contaminated groundwater and soil from sampling activities will be contained, labeled and disposed of properly in accordance with appropriate characterization.

### 9.4 Drum/Container/Tank Handling Procedures

Investigation Derived Waste (IDW) generated during the field activities will consist of soil, sediment, surface water, and groundwater. Field sampling team will ensure that the containers are labeled, handled, stored, and secured in accordance with applicable regulations. IDW will be characterized and disposed of at the proper facility.

## 10.0 CONTAMINATION CONTROL, SANITATION AND WASTE MANAGEMENT

The following sections describe the contamination control during the field activities.

### 10.1 Work Zones

Access to the sites are limited to authorized project personnel, approved subcontractors and their employees, and local/State/Federal agency staff escorted by site personnel.

For the purposes of Work Zone Delineation, the site perimeters will encompass an area slightly larger than the portion of the site identified for activities. The perimeter of the sites will be properly delineated (caution tape or high visibility fencing).

#### 10.1.1 Support Zone

The Support Zone (SZ) is located outside the Contamination Reduction Zone (CRZ) and within the site perimeter. The support zone is an uncontaminated (clean) area where personnel will not be exposed to hazardous materials or contaminants.

#### 10.1.2 Contamination Reduction Zone

The CRZ is located in between and serves as a buffer between the SZ and the EZ. The CRZ is intended to prevent the spread of contamination and is utilized for both personnel and equipment decontamination.

#### 10.1.3 Exclusion Zone

The EZ is the work area where, based on planned activities, there is potential for worker exposure to site contaminants. The EZ is bounded by the CRZ and accessed only through the Contamination Reduction Corridor (CRC). The EZ perimeter will be delineated with caution tape or high visibility fencing.

### 10.2 Access Controls

The SSHO and Site Superintendent will establish the physical boundaries of each zone and instruct all workers and visitors on the limits of the restricted areas. No one will be allowed to enter the restricted area without the required PPE for that area. The Site Superintendent will ensure compliance with all restricted area entry and exit procedures. The Site Superintendent will also designate a decontamination point for personnel to exit the contaminated area and to enter the clean area, which is where personnel may eat and rest.

All site personnel and/or visitors entering and exiting the EZ or the CRZ will be required to log-in/log-out from the site on a daily basis. The log will be maintained at the entrance.

### 10.3 Hazard Briefing

No person will be allowed on the site during site operations without first participating in a hazard briefing. In general, the briefing will consist of a review of the SSHP and the tailgate safety meeting. All persons on the site, including visitors, must sign the SSHP Acknowledgment Sheet and Tailgate Safety Meeting Form. Tailgate safety meetings will be held daily before site activities begin.

### 10.4 Visitor Access

The following section describes how to handle visitors to the site.

### 10.4.1 Approach

If unannounced visitors arrive at a site, ECC employees should approach them, introduce themselves, and respectfully ask the visitors to identify themselves and state their business. An effort should be made to distinguish between ECC workers and subcontractors and people for whom ECC is not responsible for enforcing health and safety rules on job sites, such as client representatives, agency representatives, and other visitors authorized by the client. For example, hardhats and safety glasses may be a requirement in the SZ or anywhere on the site for workers, but to enforce this requirement on all visitors may not be necessary. A respectful explanation of what areas to avoid may be all that is necessary.

### 10.4.2 Unauthorized Visitors

If visitors are unauthorized, ECC employees should explain to the visitors that entry to the site is restricted because the site contains hazards. The site boundaries and any other relevant restrictions should be pointed out to the visitors.

### 10.4.3 Visitors Authorized to View the Site from the SZ

If visitors are authorized by the client to see the site from the SZ, ECC employees should do the following:

- Review the tailgate safety meeting form with them and ask them to sign it;
- Provide the visitors with hardhats, safety glasses, and safety vests, if applicable; and,
- Prohibit entry to the EZ.

### 10.4.4 Visitors Authorized to Enter the EZ During Ongoing Work Activities

If the visitors are authorized by the client to enter the EZ, ECC employees should do the following:

- Verify that they have current Hazardous Waste Operations and Emergency Response (HAZWOPER) training;
- Verify that they had a current physical exam authorizing work on hazardous waste sites;
- Review the SSHP and the tailgate safety meeting form and have the visitors sign the acknowledgement forms of all documents;
- Provide the PPE required for the site; and,
- Escort the visitor while in the EZ.

### 10.4.5 Refusal

If visitors refuse to comply with any one of the requirements listed in the previous sections, and the **client authorizes** the visitor to enter the EZ anyway, ECC will **shut down** any potentially hazardous equipment and take all practicable steps to eliminate other hazards and exposures. The event will be thoroughly documented.

Visitors who refuse to comply and are not authorized by the client should be asked to leave. Contact the local police if problems occur with visitors who refuse to leave.

## 10.5 Emergency Entry and Exit

People who will enter the site on an emergency basis will be briefed by the Site Superintendent regarding the hazards. All hazardous activities will cease in the event of an emergency. Attachment 1, ñEmergency Action Plan,ò provides more information for emergency procedures.

### 10.6 Personal Hygiene and Decontamination Procedures

The importance of good hygiene practices will be emphasized with all site workers. Upon exiting the EZ and CRZ, workers and/or site visitors will enter the CRZ and carefully remove all designated PPE, wash their hands, face, and forearms prior to eating, drinking or smoking. Smoking, eating and drinking will only be allowed in clean work areas (i.e. SZ).

### 10.7 Equipment Decontamination Procedures

Heavy equipment will be decontaminated using dry methods, a pressure washer, and/or equivalent. Hand tools and smaller equipment will be decontaminated using a non-phosphate detergent scrub, followed by fresh water and distilled or deionized water rinses. Prior to removal from site, decontaminated equipment and material will be inspected and accepted by the SSHO and the Site Superintendent.

## 11.0 EMERGENCY PLANNING

See the Emergency Action Plan, Attachment 1 to the APP.

## 12.0 PRE-ENTRY BRIEFING

As discussed in Section 6 of the APP and above, all personnel entering the site will be provided with site-orientation training, and must be present at the daily tailgate meeting.

## 13.0 EFFECTIVENESS OF PLAN

The effectiveness of this SSHP will be determined by the inspections listed in Section 7 of the APP, as well as from incident investigations and input by site personnel including reports of hazards, safety observations, and suggestions for improvement

# APPENDIX J

# GROUNDWATER MONITORING PLAN

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# GROUNDWATER MONITORING PLAN
# RSA-308, EXTERIOR SUMP AT BUILDING 7120
# OPERABLE UNIT 25
# REVISION 2

## ENVIRONMENTAL REMEDIATION SERVICES
## U.S. ARMY GARRISON-REDSTONE ARSENAL

**December 2023**

**Prepared for:**

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# 1. INTRODUCTION

This groundwater monitoring plan has been developed in support of the Redstone Arsenal (RSA)-308 corrective measures implementation (CMI) work plan (CMIP). This document provides details for implementation of groundwater monitoring as a component of the corrective measures for RSA-308 contaminated subsurface soil and groundwater in order to achieve the cleanup goals (CGs). The plan will include identification of wells scheduled for monitoring, monitoring parameters, the monitoring period, analytical methods, reporting, and records maintenance. The corrective measures to be implemented at RSA-308 include groundwater monitoring to track progress of natural abiotic and biotic attenuation processes in reducing the concentrations of contaminants of concern (COC) to CGs.

## 1.1 Objective and Scope

The primary objective of the groundwater monitoring program for RSA-308 is to determine whether the corrective measures (monitored natural attenuation [MNA]) reduce concentrations of COCs (perchlorate and 1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive [RDX]) in subsurface soil and groundwater beneath the site to levels determined to be acceptable to human health (i.e., CGs). This plan is designed to be modified, if necessary, in response to new hydrologic or geochemical data or changes in remedial, hydrologic, technical, or land-use conditions. Recommendations for changes to the groundwater monitoring program will be documented in annual CMI effectiveness reports.

Groundwater contaminated with perchlorate and RDX will be monitored as part of the corrective measures for the site. This groundwater monitoring program is needed to track the progress of groundwater toward attaining the CGs so the site can be released for unrestricted use.

Corrective measures for soil were warranted at RSA-308 because active remediation of subsurface soil between the building and the fragmentation berm is considered impractical due to access restrictions in this area of the site, isolated vadose zone subsurface soil contamination, and local topography. With continued natural movement of precipitation through the subsurface soil column, perchlorate will be flushed from the deep subsurface soil in the small area around Sump 1 into the groundwater (Figure 2 of the CMIP). Through MNA (corrective measure - soil contamination monitoring through groundwater concentration reduction and MNA for soil and groundwater, for addressing the subsurface soil and groundwater contamination at this site), natural biotic and abiotic processes will act to reduce the perchlorate groundwater contamination to below the CG. Closure for soils will be achieved when the concentrations in groundwater reach the CG.

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# 2. DESCRIPTION OF RSA-308

## 2.1 Overview

RSA is located in the southwestern portion of Madison County, which is in the northern portion of Alabama (Figure 1 of the CMIP). RSA is a U.S. Army facility that encompasses approximately 38,300 acres and is approximately 10 miles long from north to south and 6 miles wide from east to west. The Army controls 36,459 acres of the total acreage, of which approximately 15,500 acres are woodlands, 5,360 acres are leased for agricultural use, and approximately 12,000 acres are managed as military test areas/ranges. Development within RSA has largely centered on the historical production (and later disposal) of conventional and chemical munitions and, more recently, development and testing of missiles and rockets. These processes have produced chemical wastes since operations began in the early 1940s.

RSA-308 is identified as the east-side exterior sump at Building 7120. Building 7120 is located north of the intersection of Redstone Road and West Line Road (Figure 1 of the CMIP). Building 7120 was originally built in 1945 to serve as the Ordnance Missile Laboratories propulsion laboratory. The building was expanded several times since the original construction and now includes office space, laboratories, an auditorium, and 28 test bays (Figure 2 of the CMIP). The site boundary for RSA-308 encompasses approximately 509 square feet.

The following investigations have been conducted at RSA-308:

- OU 10 field investigations (Shaw Environmental, Inc. [Shaw], 2007a,b; 2010)
- RSA-146 potential source area (PSA) investigation (Shaw, 2005)
- RSA-308 RCRA Facility Investigation (RFI) (Shaw, 2013 and CB&I Federal Services LLC [CB&I] 2017)
- 2021 Pre-Design Sampling Event

Available analytical results indicate historical activities have led to localized contamination of subsurface soil and groundwater by perchlorate and RDX.

The site falls geographically within the RSA-146 groundwater unit, which also encompasses other surface sites within the southeastern area of RSA; however, groundwater contamination at RSA-308 will be addressed in conjunction with the RSA-308 surface media site.

The evaluation of human health risk indicates that the future potable use of groundwater would potentially pose an unacceptable threat to human health due to the concentrations of perchlorate and RDX (see Table 3 of the CMIP). Perchlorate in subsurface soil and perchlorate and RDX in groundwater were identified as COCs requiring further action. For relevant COCs in groundwater with Maximum Contaminant Level (MCLs), MCLs are selected as the CGs. In the case of perchlorate, the Health Advisory Level (HAL) of 15 micrograms per liter (µg/L) (DoD, 2009) is used as the CG. For RDX, the other groundwater COC requiring action, the CG is based on risk, with the objective of achieving a cumulative cancer risk of 1E-05 and a cumulative HI of 1.0 or less. The derivation of the risk-based groundwater CGs is shown in Table 4 of the CMIP. The CG

for RDX is based on a target cancer risk of 1E-05 as it is the only COC with a CG based on risk. Note that the risk-based CG for RDX presented below, reflects updated toxicity criteria not included previously used in the Alabama Risk-Based Corrective Action (ARBCA) HHRA. The CGs for RSA-308 groundwater are summarized below.

**Summary of Cleanup Goals – RSA-308**

| Groundwater COCs | CG (µg/L) | Basis |
|---|---|---|
| Perchlorate | 15 | Health Advisory Level |
| RDX | 8.3 | Risk-based |

The corrective measure objective for RSA-308 is to prevent human exposure via any exposure route (ingestion, inhalation, or dermal contact) to groundwater contaminated with either of the COCs at concentrations that exceed the groundwater CGs. Further information on RSA-308 can be obtained from the RFI report (CB&I, 2017).

## 2.2 Site History

RSA-308 is exterior sump (Sump 1) on the east side of Building 7120 (Figure 2 of the CMIP). Building 7120 was built in 1945 to serve as the Ordnance Missile Laboratories propulsion laboratory. No written descriptions of historical Building 7120 activities are available, but activities were assumed to generally be related to physical testing of rocket and missile propellants. Floor trenches from select test bays in Building 7120 drained into Sump 1, which in turn drained into Sump 2. Overflow from Sump 2 drained into Sump 3, which would overflow into a concrete drainage channel. This concrete channel collected rain and other surface water run-off as well. The concrete drainage channel flowed into Sump 4, which precedes an outfall for a stormwater collection area north of the test bays. The smear zone subsurface soil around the sumps has residual perchlorate exceeding the leaching the groundwater criteria. The extent of perchlorate exceeding the 15 µg/L HAL criteria is located north of Sump 4 at Building 7120 (see Figure 6 of the CMIP).

## 2.3 Site Description and Topography

The administrative boundary of RSA-308 covers approximately 509 square feet. The area immediately surrounding Building 7120 is either paved, graveled, or grassed. Topography at the site is generally flat. However, a protective earthen berm is present along the eastern side of RSA-308 and Building 7120 Test Bays (Figure 2 of the CMIP). The berm is approximately 15 feet high. There are no wetlands or surface water in the vicinity of RSA-308. Drainage of the area is through a series of engineered ditches to collection points and infiltration areas.

## 2.4 Geology

General installation-wide (IW) environmental setting information is presented in the RSA IW Work Plan (IT, 2002), which includes discussions of regional stratigraphic and structural geology, surface and subsurface hydrology, and other physiographic and geographic topics. Logs of soil borings advanced at the site were used to interpret the site-specific geology, which consists of a soil cover overlying limestone bedrock.

### 2.4.1 Soil

Lithologic logs from soil and well borings completed at RSA-308 indicate that the native soils consist predominantly of medium- to high-plasticity silty clay, interbedded with lenses or thin layers of cherty limestone gravel. Chert and limestone fragments that originated from weathering of the cherty limestone bedrock matrix are found in the silty clay matrix. The amount of residual material increases with depth, and a zone containing abundant residual chert fragments is often found immediately above the limestone bedrock. Based on drilling, the thickness of the overburden soils in the vicinity of RSA-308 ranges from approximately 12 feet to approximately 38 feet below ground surface (bgs).

The overburden or unconsolidated soil layer across most of RSA is called residuum because it formed from in situ chemical weathering of the underlying karstic limestone bedrock. This overburden layer consists mainly of clay and silty clay and also includes varying amounts of residual chert fragments which were present within the parent limestone and have resisted chemical weathering because of their siliceous composition. The chert can be found scattered within the clay matrix as nodules or concentrated locally as near-horizontal layers within the soil. Although there is little compositional variation within the overburden, the residuum does not transmit groundwater uniformly. Groundwater infiltration follows preferred pathways because zones of higher hydraulic conductivity developed during soil-forming processes. Preferred pathways within the overburden directly affect contaminant migration and distribution within the soil column.

Residual clay generally has low horizontal and vertical hydraulic conductivities. At a given location, a layer of chert within the clay may decrease vertical hydraulic conductivity and increase horizontal conductivity, while isolated nodules of chert may increase the vertical conductivity. Preferred groundwater flow pathways in the overburden also include macropores caused by rotting tree roots and burrowing animals.

Additionally, microfractures may be created within the clay during raveling, a process in which the clay slowly subsides as it is eroded and carried away by groundwater in bedrock fractures and conduits. Vertical movement of the soil caused by raveling or sloughing into fractures and conduits results in the development of microfractures in the overlying material. The microfractured clay soils have higher hydraulic conductivities than undisturbed clay and also act as preferred groundwater flow pathways.

### 2.4.2 Surface Water Drainage

There are no surface water features in the vicinity of RSA-308 and the site is not within the 100-year floodplain. Stormwater drainage is directed away from the site by the concrete drainage channel on the eastern side of Building 7120. Building 7120 and surrounding areas are drained by a network of unlined, shallow, open drainage ditches surrounding the site (Figure 2 of the CMIP).

### 2.4.3 Bedrock

Depth to bedrock across this portion of RSA is variable over short distances due to solution weathering of the upper bedrock surface (epikarst). Lithologic data from bedrock wells installed across this portion of RSA indicate that the shallow bedrock first encountered correlates with middle to upper Tuscumbia Limestone and exhibits well-developed karst features. The Tuscumbia Limestone beneath this area is characterized by thinly bedded to massive, fine to medium crystalline, stylolitic limestone with numerous chert nodules and chert lenses. The Tuscumbia is underlain by the Fort Payne Chert, which consists of thinly bedded, fossiliferous limestones interbedded with chert. The Fort Payne is underlain by the Chattanooga Shale, a dark gray to black, fissile shale.

Based upon refusal depths from the monitoring well boreholes and soil borings in the vicinity of the site, depth to bedrock ranged from 10 feet bgs at 308-RS2349 to 39 feet bgs at 308-RS2346.

### 2.4.4 Hydrogeology

Groundwater beneath RSA-308 occurs in the unconsolidated overburden and the upper portion of the carbonate bedrock. The overburden and upper bedrock comprise a single interconnected, unconfined water table aquifer. At depth, groundwater occurs under semiconfined conditions, flowing along discrete joints and bedding-plane partings. The measured depth to the groundwater-surface from the most recent round of sampling (December 2021) ranged from approximately 4.45 feet bgs (308-RS2349) to 39.28 feet bgs (308-RS2346), with an average depth to groundwater of 26.34 feet bgs.

The potentiometric surface maps shown on Figures 3 through 5 of the CMIP are based on the groundwater elevations measured in February/March 2014 & May 2014, June 2015, and December 2021, respectively. The potentiometric surface elevation from the most recent round of sampling (December 2021) varies from just over 568 feet above mean sea level (amsl) to the north (308-RS2346) to approximately 610 feet amsl to the southeast (308-RS2349). Groundwater flow is to the northwest.

# 3. GROUNDWATER MONITORING PROGRAM

The groundwater monitoring program for RSA-308 includes wells proposed for monitoring, sampling frequency and sampling parameters, sampling and analytical protocol, and quality assurance (QA)/quality control (QC) requirements. The laboratory-specific reference limits and evaluation tables are presented in Table J2, Preliminary Screening Values (PSVs) and Laboratory Specific Limits. Well identifiers, sampling frequency and analytical parameters, sampling and analytical protocols, and quality assurance (QA)/quality control (QC) requirements are presented in Tables J-4 through and J-6. The selected wells, including six existing and one proposed for installation, are shown on Figure 7 of the CMIP. The duration of monitoring is estimated at 19 years for the RSA-308 site, or until CGs are achieved or confirmed. Subject to Alabama Department of Environmental Management (ADEM) approval, in the event that COC concentrations for action in all seven monitoring wells have reached CGs before that time, groundwater monitoring will be proposed for early termination. Changes in the groundwater monitoring program can be adjusted in the recommendations section of each annual groundwater monitoring report.

## 3.1 Scope and Implementation Strategy for the Groundwater Monitoring Program

Groundwater monitoring will be performed to evaluate the effectiveness and permanence of the RSA-308 corrective measure; subsurface soil contamination monitoring through groundwater concentration reduction and MNA for soil and groundwater.

The groundwater monitoring program is designed to maximize cost-effectiveness without compromising program and data quality using the following general strategies:

- Select and maintain an optimal number of sampling points and an appropriate analytical suite to evaluate the progress of MNA in groundwater;
- Select wells that act as indicators of contaminant concentration changes or expansion;
- Maintain surveillance for contaminant migration away from RSA-308;
- Maintain an adequate frequency of conventional and/or mainstream sampling;
- Where appropriate, utilize cost-effective analytical programs; and
- Initiate a streamlined data management and reporting information system.

## 3.2 Applicable Standard Operating Project Procedures

Copies of the following applicable Standard Operating Project Procedures (SOPPs) to be applied at RSA-308 are presented in Volume II of the IW-QAPP (HGL, 2019):

- SOPP 1.0, Field Documentation
- SOPP 3.0, Field Equipment Decontamination
- SOPP 4.0, Investigation-Derived Waste (IDW)
- SOPP 7.0, Groundwater Sampling
- SOPP 11.0, Field Generated Records Management

- SOPP 12.0, Field Measurable Physical Characteristics
- SOPP 15.0, Non-Hazardous Sample Handling, Packaging and Shipping
- SOPP 16.0, Groundwater Level Measurements
- SOPP 24.0, Field Equipment Calibration

### 3.3 RSA-308 Project Specific QAPP Worksheets

The IW-QAPP (HGL, 2019) requires project-specific worksheets that are not included in the generic IW-QAPP. **Tables J-1** through **J-12** provide the following RSA-308 project-specific QAPP worksheets:

- **Worksheet #12** Measurement of Performance Criteria
- **Worksheet #15** Preliminary Screening Values and Laboratory Specific Limits - Groundwater
- **Worksheet # 17** Sampling Design and Rationale
- **Worksheet #18** Sample Locations, Analytical, and SOPP Requirements
- **Worksheet # 19 & 30** Sample Containers, Preservation, and Hold Times
- **Worksheet # 20** Field Quality Control Sample Summary
- **Worksheet #23** Analytical Laboratory Standard Operating Procedures
- **Worksheet # 24** Analytical Instrument Calibration
- **Worksheet # 25** Analytical Instrument and Equipment Maintenance, Testing, and Inspection
- **Worksheet #26** Sample Handling, Custody, and Disposal
- **Worksheet #28** Analytical Quality Control and Corrective Action
- **Worksheet #36** Data Validation Procedures

Additional Site-specific information can be found in the Project Management Plan (ECC, 2021a) and the Quality Control Plan provided in Appendix H of the CMIP.

### 3.4 Monitoring Wells Proposed for Groundwater Monitoring

The following existing and newly proposed wells at RSA-308 are scheduled for groundwater monitoring:

| Location | Zone | Screen Intervals (feet bgs) | | Rationale |
|---|---|---|---|---|
| | | Top | Base | |
| 308-RS2345 | Overburden | 13.0 | 23.0 | Monitor MNA Effectiveness |
| 308-RS2346 | Interface | 34.0 | 44.0 | Monitor MNA Effectiveness |
| 308-RS2347 | Interface | 23.0 | 33.0 | Monitor MNA Effectiveness |
| 308-RS2348 | Interface | 19.0 | 29.0 | Monitor MNA Effectiveness |
| 308-RS2349 | Interface | 5.0 | 15.0 | Monitor MNA Effectiveness |
| 308-RS2712 | Interface | 21.9 | 31.9 | Monitor MNA Effectiveness |

| Location | Zone | Screen Intervals (feet bgs) | | Rationale |
|---|---|---|---|---|
| | | Top | Base | |
| 308-RS3012 | Interface | TBD | TBD | Monitor Northern Extent of Contamination |

**Notes:**
Bgs – below ground surface
MNA – Monitored Natural Attenuation
TBD – To be Determined

Well locations included in the groundwater monitoring program were selected based on their proximity to the COC plume area and upgradient and downgradient locations as shown on Figure 7 of the CMIP.

### 3.5 Constituent List and Sampling Frequency

Based on the human health risk assessment (HHRA) presented in the RFI (CB&I, 2017), only perchlorate and RDX will be monitored as part of the corrective measures. As discussed in Section 2.4 of the CMIP, dibenz(a,h)anthracene was originally identified as a groundwater COC in the HHRA based the exceedance of its method detection limit (MDL). However, subsequent revisions to the dibenz(a,h)anthracene toxicity values resulted in dibenz(a,h)anthracene no longer being identified as a groundwater COC requiring further action. In addition to the laboratory analytical parameters, water quality parameters including pH, temperature, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity will be collected in the field. Water levels will also be measured during each sampling event. This groundwater monitoring program will be used to evaluate progress towards meeting the corrective measure objectives (CMOs) for soil and groundwater and the CGs. The analytical program will monitor for COCs for action to track the progress of the MNA.

In order to meet the objectives of this groundwater monitoring program, groundwater sampling will be conducted semiannually from Years 1 through 19 following the baseline groundwater sampling in Year 0 to evaluate the effectiveness of MNA in the overburden and the interface. As determined by an evaluation of previous monitoring results, semiannual groundwater sampling will be performed in the season providing the most representative picture of groundwater quality for the site. The Army review of these data during this selection process will be completed in consultation with ADEM.

Groundwater monitoring will continue until it is demonstrated that the CGs have been achieved for COCs for action (e.g., approximately Year 19). A COC for action will be omitted from future monitoring after it has reached the CG for three consecutive years.

### 3.6 Sampling and Analytical Protocol

All data will be collected, stored, and managed in accordance with the requirements defined by the IW-QAPP (HydroGeoLogic, Inc. [HGL], 2019 or as updated based on submissions to ADEM) and the IW Accident Prevention Plan (APP) (Environmental Chemical Corporation [ECC], 2021b). Prior to sampling the wells, static water levels will be measured in all wells. Water level

measurements will be performed in accordance with Standard Operating Project Procedure (SOPP) No. 16.0, Groundwater Level Measurements. Groundwater sampling will be performed using a submersible pump for purging and low-flow sampling techniques in accordance with SOPP No. 7.0, Groundwater Sampling Rev. 4.

The sampling technician will measure and record physical parameters of the groundwater during well purging to help determine when the well is ready to be sampled. Complete and accurate records in the groundwater well development/purge log are necessary in order to ensure representative groundwater samples are being collected. Samples will be analyzed using EPA SW-846 methods as presented in the IW QAPP (HGL, 2019 or most recent submission to ADEM) including updates resulting from changes in EPA and ADEM guidance documents.

The analytical laboratory will provide sample containers. Sample containers are purchased precleaned and treated according to EPA specifications for the methods. Sample containers are not reused. Containers are stored in clean areas to prevent exposure to fuels, solvents, and other contaminants. The required sample containers for the analysis of constituents in groundwater at RSA-308 are provided in Table J-5, along with sample volumes, preservation requirements, and holding times for the analytical methods performed on the groundwater samples.

Sample preservation, packaging, and shipping will follow the procedures as specified in Standard Operating Project Procedure No. 15, Non-Hazardous Sampling Handling, Packaging, and Shipping, in the IW QAPP (HGL, 2019 or as updated based on submissions to ADEM).

Completed analysis request/chain-of-custody records will be secured and included with each shipment of coolers to the contracted laboratory.

Recommendations to modify the groundwater monitoring program will be made in the annual CMI effectiveness reports.

### 3.7 Quality Assurance/Quality Control

Groundwater media will be sampled and analyzed to meet the objectives of the groundwater monitoring program. QA/QC samples will be collected for all sampling events in accordance with requirements established in the IW QAPP (HGL, 2019 or as updated based on submissions to ADEM) to assure long-term comparability of data. Samples will be analyzed by EPA-approved SW-846 methods of analysis where applicable, comply with EPA definitive data requirements, and be reported using both hard copy and electronic data packages.

The chemical data will be reported via hard-copy packages by the laboratory using Contract Laboratory Program-like forms, in addition to electronic deliverables, and will include all raw analytical and QC data for each analysis.

All sample preparation and analysis shall be completed within the method-required holding times specified in **Table I-5**. The holding time of a sample begins at the time of sample collection. If holding times are exceeded and the analyses are performed, the results shall be flagged accordingly.

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# 4. DATA EVALUATION AND REPORTING

## 4.1 Data Evaluation and Interpretation

During the baseline sampling event, groundwater samples will be collected from the seven groundwater monitoring wells as shown on Figure 7 of the CMIP. The samples will be collected using low flow purging and sampling techniques. The samples will be analyzed for the same analytes and field parameters as the baseline sampling event. Semiannual sampling will be performed for years 1 through 19 (anticipated to be the end of the corrective measures), a permit modification will be submitted, if appropriate, to decrease the sampling frequency.

The primary objective of the groundwater monitoring program for RSA-308 is to determine whether the corrective measures (MNA) reduce concentrations of COCs in soil and groundwater beneath the site to levels determined to be acceptable to human health (i.e., CGs). This will be determined based on the results of a statistical test or other methods. Statistical analysis will follow Alabama Administrative Code 335-14-5-.06(8)(h) and EPA guidance for groundwater monitoring at RCRA facilities (EPA, 1989; 1992; 2009). Groundwater data collected during sampling events will be compared to the CGs. COCs that exceed these values may be subjected to additional analysis as allowed in Alabama Administrative Code 335-14-5-.06(8)(h). The additional analyses may include, for example, control charts, Wilcoxon rank sum tests, box plots, and/or temporal trend analysis, as appropriate. Specific evaluation techniques will depend upon detection frequencies and statistical distributions of each COC. For example, one COC concentration at a given well may exceed the site-specific upper tolerance limit (UTL) or upper prediction limit (UPL), and that could be either a random occurrence or indicative of an increasing trend. Trend analysis will indicate if a trend is present and whether it has statistical significance.

Well data sets that pass statistical comparison tests (i.e., wells that do not demonstrate statistically significant increases over baseline concentrations) for all COCs will be sampled in accordance with planned activities. Wells that fail statistical comparison tests for one or both COCs will be resampled. Following the collection of these additional data, statistical evaluation will again be performed and reported, along with recommendations for adjustment to sampling frequency, if appropriate.

The following non-statistical methods may also be used to characterize RSA-308 groundwater conditions:

- **Hydrographs:** Graph water levels versus time may be constructed to determine increases, decreases, seasonal, or man-made fluctuations in groundwater levels;
- **Potentiometric Surface Maps:** Depths to groundwater from multiple wells may be used to construct potentiometric surface contour maps to estimate flow directions;
- **Concentration-versus-Time Plots:** Graphs of COC concentration versus time at each well will be constructed for each data set subjected to trend analysis. This supports the identification of trends and helps determine if concentration changes are related to changes in water level, changes in groundwater flow directions, or natural attenuation.
- **Plume Maps:** Map depicting the physical distribution of chemical constituents will aid in determining movement of plumes.

COCs will be evaluated for compliance with the CMO by comparison of groundwater monitoring results with the established CGs. After an actionable COC is present in a concentration below the CG for three consecutive years, the Army will petition ADEM to eliminate that constituent from the groundwater monitoring program.

## 4.2 Reporting

Based on the proposed sampling schedule, an annual CMI effectiveness report will be prepared. Letter reports summarizing the activities and the analytical results for each semiannual sampling event will be issued upon receipt of the analytical data. The annual report will present and summarize the analytical data from all sampling events completed in that calendar year and will include well redevelopment records, completed well inspection checklist forms, well repair or closure records, and other pertinent information. The annual report will discuss the most recent sampling events and relate the findings as they pertain to the CGs for the groundwater contaminants. Recommendations for changes to the sampling frequency, wells sampled, and parameters for analysis, if appropriate, will be included in the reports. At a minimum, the annual report will include a discussion of sampling activities, tables and maps to document contaminant concentrations in groundwater, an evaluation of the groundwater contaminant data, and all activities completed as part of the Monitoring Well Maintenance Plan. Other recommendations may include installation of additional monitoring wells and resampling for verification of sampling results. Record keeping for data and reports is described in the IW QAPP (HGL, 2019 or most recent submission to ADEM).

# 5. MONITORING WELL MAINTENANCE PLAN

In order to maintain consistent data quality and track contaminant concentrations and migration, the groundwater monitoring wells at RSA-308 will be maintained and replaced, as necessary. Further details are presented in the IW QAPP (HGL, 2019 or as updated based on submissions to ADEM).

## 5.1 Well Redevelopment

A well may be redeveloped prior to sampling if any of the following conditions are exhibited:

- Sediment accumulation in the well covers more than 5 percent of the total length of the well screen.
- Turbidity of groundwater is greater than 20 nephelometric turbidity units after the well has been purged prior to sampling.
- Recharge rate to the well has declined through time (e.g., recharge rates have declined to less than 60 percent of the recharge rate recorded in the initial development).

## 5.2 Well Replacement or Closure

If the well still does not meet the above requirements after two episodes of redevelopment, the well may be deemed nonfunctional and scheduled for replacement or closure. Consultation with RSA personnel and ADEM staff will be made to determine whether closure or replacement is necessary. The procedures for well replacement or closure are outlined in the IW QAPP (HGL, 2019 or most recent submission to ADEM).

## 5.3 Well Inspections

Site inspections will be performed to help ascertain the condition of monitoring wells and confirm the integrity of the monitoring wells has not been compromised. Wells will be inspected during each sampling event. At a minimum, all monitoring wells in the groundwater monitoring program will be inspected annually. The groundwater monitoring wells at the site will be inspected for the integrity of the following:

- Locks
- Locking cap
- Protective casing
- Bollards (stick-up wells only)
- Concrete pad.

Well redevelopment, replacement, or closure will be documented in the annual report. In addition, well inspection checklist forms for all pertinent site wells will be included in the annual reports. Deficiencies will be documented and corrected as soon as practical, but not less than annually. If a well cannot be properly repaired, it should be replaced or closed.

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## 6. REFERENCES

ADEM. 2013. *Administrative Code r.335-5, Land Division – Uniform Environmental Covenants Program*. March

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HydroGeoLogic, Inc. (HGL). 2019. *Final Revision 4 Installation-Wide Quality Assurance Program Plan*, U.S. Army Garrison-Redstone, Madison County, Alabama. December.

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Shaw. 2010. *Rev 1, Site-Specific Field Sampling Plan, Supplemental Phase II RCRA Facility Investigation/Remedial Investigation, RSA-146, Groundwater Unit GW-02, Operable Unit 19*, U.S. Army Garrison-Redstone, Madison County, Alabama, December 2010.

Shaw. 2013. *Site-Specific Field Sampling Plan RCRA Facility Investigation at RSA-308, Exterior Sump at Building 7120, U.S. Army Garrison-Redstone, Madison County, Alabama*. March.

U.S. Department of Defense (DoD). 2009. *Memorandum from Wayne Army to Deputy Assistant Secretaries of the Army, Navy and Air Force, Perchlorate Release Management Policy*. April.

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# TABLES

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## Table I-1: Reference Limits and Evaluation
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #12 Measurement of Performance Criteria

**Analytical Group: Explosives and Perchlorate**
**Concentration Level: Low**

| Analytical Method & SOP | Data Quality Indicators (DQIs) | Measurement Performance Criteria | QC Sample and/or Activity Used to Assess Measurement Performance | QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A) |
|---|---|---|---|---|
| SW8330B & EXTNT01/HPLC02 | Precision | RPD from Worksheet #28 | Lab duplicates and/or LCS/LCSD, if MS/MSD not performed | A |
| | Precision | Sampling per QAPP/SOP | Field duplicates and MS/MSD | S&A |
| | Accuracy/Bias | % Rec. from Worksheet #28 | LCS | A |
| | Accuracy/Bias (contamination) | Acceptable Blanks Levels | MB | A |
| | Accuracy/Bias (contamination) | Sampling per QAPP/SOP | Equipment Blanks | S&A |
| | Completeness | Laboratory Analysis | > 90% | S&A |
| | Representativeness | Sampling per QAPP/SOP | Blank Samples and Data Usability Assessment | S |
| | Comparability | Use of promulgated Methodology | QAPP compliance, data review | A |
| | Sensitivity | LOQ or LOD to meet project objectives | ICAL level acceptable, MB acceptable | A |

**Notes:**
> – greater than
% – percent
ICAL – Initial Calibration
LCS – Laboratory Control Sample
LCD – Laboratory Control Sample Duplicate
LOD – Limit of Detection
LOQ – Limit of Quantitation
MB – Method Blank
MS – Matrix Spike
MSD – Matrix Spike Duplicate
QAPP – Quality Assurance Project Plan
RPD – Relative Percent Difference
SOP – Standard Operating Procedure

## Table J-2: Reference Limits and Evaluation,
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #15 Preliminary Screening Values and Laboratory Specific Limits – Groundwater

| Hazardous Constituent | CAS Number | PSV[a] | CMO CG [b] | Reference for CMO CG | Reference for PSV | Laboratory Specific LOQ | Laboratory Specific LOD | Laboratory Specific DL |
|---|---|---|---|---|---|---|---|---|
| ***Energetics (µg/L) by SW8330B*** | | | | | | | | |
| RDX | 121-82-4 | 0.97 | 8.3 | Risk | RSL | 0.25 | 0.16 | 0.08 |
| ***Perchlorates (µg/L) by 6850 Modified*** | | | | | | | | |
| Perchlorate | 14797-73-0 | 15 | 15 | HAL | MCL | 0.2 | 0.1 | 0.05 |

**Notes:**

µg/L – micrograms per Liter
CAS – Chemical Abstract System
CG – Cleanup Goal
CMO – Corrective Measures Objective
DL – Detection limit
HAL – Health Advisory Level
LOD – Limit of detection
LOQ – Limit of quantitation
MCL – Maximum Contaminant Level
PSV – Preliminary Screening Value
RDX – 1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive
RSL – Regional screening level
SW- Solid Waste 846

a) PSV for groundwater based on the following hierarchy if not specified in the Permit: 1) MCL (*2018 Edition of the Drinking Water Standards and Health Advisories*, United States Environmental Protection Agency (USEPA) 822-S-12-001, Office of Water, Washington, District of Columbia, March, 2) Site-specific background screening values (BSV), 3) Where BSVs do not exist, then the most recent USEPA Tap-water RSL Table (November 2021) using a Hazard Quotient of 0.1 shall be used (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables).

b) CMO CG - RDX based on the risk-based target level at a cancer risk of $1x10^{-5}$, Perchlorate based on HAL, *Perchlorate Release Management Policy, Memorandum from Wayne Army to Deputy Assistant Secretaries of the Army, Navy and Air Force*. (Department of Defense, 2009).

## Table I-3: Sampling Design and Rationale
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet # 17 Sampling Design and Rationale

| Sample Location | Sample Media | Sample Location Rationale[1] |
|---|---|---|
| **Overburden Well:**<br>308-RS2345<br><br>**Interface Wells:**<br>308-RS2346<br>308-RS2347<br>308-RS2348<br>308-RS2349<br>308-RS2712<br>308-RS3012 | Groundwater | Groundwater sampling events (Year 0 through 19) will be used to evaluate the effectiveness and permanence of the RSA-308 corrective measure; subsurface soil contamination monitoring through groundwater concentration reduction and MNA for groundwater. Results from sampling events will be used to evaluate progress towards meeting the CMOs and CGs. The analytical program will monitor for COCs for action (perchlorate and RDX) to track the progress of MNA. Groundwater samples are to be collected from these seven monitoring wells (as presented in Figure 7 of the CMI Work Plan) and each groundwater sample will be analyzed for RDX and perchlorate. |

**Notes:**

1) The frequency of sampling and/or analyte lists may be modified over the life of the project, based upon sampling results, if approved by ADEM. Permit modifications will be made in accordance with Permit Condition I.J.

COC – Contaminant of Concern
CG – Cleanup Goal
CMI – Corrective Measures Implementation
CMO – Corrective Measures Objective
MNA – Monitored Natural Attenuation
RDX – 1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive

## Table I-4: Sampling Locations, Analytical Parameters, and SOPP Requirements
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #18 Sample Locations, Analytical, and SOPP Requirements

| Sample Location | Sample Name[a] | Sample Depth (ft bgs) | QC Sample Designation | | Analytical Suite | Field SOPP |
|---|---|---|---|---|---|---|
| | | | FD | MS/MSD | | |
| ***RSA-308 Baseline Sample Locations – Year 0*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3029-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3030-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3031-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3032-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3033-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3034-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3034-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3035-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3036-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-AGE9025-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-AGE8025-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 1 Sample Locations – Semiannual 1*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3037-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3038-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3039-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3040-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3041-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3042-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3042-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3043-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3044-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9026-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8026-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 1 Sample Locations – Semiannual 2*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3045-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3046-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3047-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3048-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3049-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |

**Table I-4: Sampling Locations, Analytical Parameters, and SOPP Requirements**
**RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama**

**Worksheet #18 Sample Locations, Analytical, and SOPP Requirements**

| Sample Location | Sample Name[a] | Sample Depth (ft bgs) | QC Sample Designation | | Analytical Suite | Field SOPP |
|---|---|---|---|---|---|---|
| | | | FD | MS/MSD | | |
| 308-RS2349 | 308-RS2349-GW-AGE3050-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3050-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3051-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3052-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9027-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8027-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 2 Sample Locations – Semiannual 1*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3053-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3054-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3055-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3056-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3057-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3058-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3058-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3059-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3060-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9028-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8028-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 2 Sample Locations – Semiannual 2*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3061-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3062-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3063-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3064-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3065-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3066-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3066-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3067-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3068-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |

## Table I-4: Sampling Locations, Analytical Parameters, and SOPP Requirements
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #18 Sample Locations, Analytical, and SOPP Requirements

| Sample Location | Sample Name[a] | Sample Depth (ft bgs) | QC Sample Designation | | Analytical Suite | Field SOPP |
|---|---|---|---|---|---|---|
| | | | FD | MS/MSD | | |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9029-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8029-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 3 Sample Locations – Semiannual 1*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3069-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3070-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3071-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3072-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3073-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3074-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3074-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3075-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3076-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9030-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8030-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 3 Sample Locations – Semiannual 2*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3077-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3078-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3079-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3080-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3081-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3082-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3082-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3083-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3084-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9031-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8031-ER | NA | | | RDX, Perchlorate | See notes[d] |

## Table I-4: Sampling Locations, Analytical Parameters, and SOPP Requirements
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #18 Sample Locations, Analytical, and SOPP Requirements

| Sample Location | Sample Name[a] | Sample Depth (ft bgs) | QC Sample Designation | | Analytical Suite | Field SOPP |
|---|---|---|---|---|---|---|
| | | | FD | MS/MSD | | |
| ***RSA-308 Year 4 Sample Locations – Semiannual 1*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3085-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3086-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3087-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3088-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3089-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3090-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3090-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3091-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3092-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9032-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8032-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 4 Sample Locations – Semiannual 2*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3093-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3094-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3095-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE396-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3097-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3098-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3098-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3099-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3100-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9033-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8033-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 5 Sample Locations – Semiannual 1 (Template for Years 5 – 19)*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3101-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3102-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3103-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3104-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3105-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |

## Table I-4: Sampling Locations, Analytical Parameters, and SOPP Requirements
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #18 Sample Locations, Analytical, and SOPP Requirements

| Sample Location | Sample Name[a] | Sample Depth (ft bgs) | QC Sample Designation | | Analytical Suite | Field SOPP |
|---|---|---|---|---|---|---|
| | | | FD | MS/MSD | | |
| 308-RS2349 | 308-RS2349-GW-AGE3106-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3106-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3107-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3108-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9034-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8034-ER | NA | | | RDX, Perchlorate | See notes[d] |
| ***RSA-308 Year 5 Sample Locations – Semiannual 2 (Template for Years 5 – 19)*** | | | | | | |
| 308-RS2345 | 308-RS2345-GW-AGE3109-REG | 13.0 – 23.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2346 | 308-RS2346-GW-AGE3110-REG | 34.0 – 44.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3247 | 308-RS2347-GW-AGE3111-REG | 23.0 – 33.0 | 308-RS2347-GW-AGE3112-FD | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2348 | 308-RS2348-GW-AGE3113-REG | 19.0 – 29.0 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2349 | 308-RS2349-GW-AGE3114-REG | 5.0 – 15.0 | | 308-RS2349-GW-AGE3114-MS/MSD | RDX, Perchlorate | SOPP 7.0 |
| 308-RS2712 | 308-RS2712-GW-AGE3115-REG | 21.9 – 31.9 | | | RDX, Perchlorate | SOPP 7.0 |
| 308-RS3012 | 308-RS3012-GW-AGE3116-REG | TBD | | | RDX, Perchlorate | SOPP 7.0 |
| **IDW Water Sample** | | | | | | |
| 308-SITE | 308-SITE-WA-WA-AGE9035-REG | NA | | | RDX and Perchlorate or use groundwater results[c] | SOPP 4.0 |
| **Equipment Rinsate Sample** | | | | | | |
| 308-SITE | 308-SITE-BW-BA-AGE8035-ER | NA | | | RDX, Perchlorate | See notes[d] |

**Notes:**

bgs – below ground surface
ER – Equipment rinsate
FD – Field Duplicate
ft – Feet
IDW – Investigative Derived Waste
MS - Matrix spike
MSD - Matrix spike duplicate
QC - Quality control
RDX – cyclotrimethylenetrinitramine
REG - Regular sample

a) The last four digits in the sample name are sequential.
b) The MS/MSD and /FD locations are subject to change due to field conditions.
c) Optionally, groundwater sample results may be used instead of IDW sampling, which is contingent upon receiving facility.
d) ER are collected by pouring de-ionized water (obtained from the on-site deionized water treatment system) over non-dedicated decontaminated sampling equipment. One ER will be collected per sampling event.

## Table J-5: Sample Containers, Preservation, and Hold Times
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet # 19 & 30 Sample Containers, Preservation, and Hold Times

| Analyte/ Analyte Group | Matrix | Analytical Method | Accreditation Expiration Date | Sample Container/ Preservation Requirements | Preservation/ Analytical Holding Time | Total Number of Containers | Data Package Turnaround |
|---|---|---|---|---|---|---|---|
| ***Groundwater Samples/Event*** | | | | | | | |
| RDX | Water | SW8330B | 30 June 2023 | 2 – 1 Liter amber glass | 7 days extraction; 40 days analysis | 24 | 15 days |
| Perchlorate | | 6850 Modified | | 125 mL HDPE or PE (filter through 0.2-micron filter); headspace required | 28 days | 12 | 15 days |
| ***IDW Water/Event*** | | | | | | | |
| RDX | Water | SW8330B | 30 June 2023 | 2 – 1 Liter amber glass | 7 days extraction; 40 days analysis | 2 | 15 days |
| Perchlorate | | 6850 Modified | | 125 mL HDPE or PE (filter through 0.2-micron filter); headspace required | 28 days | 2 | 15 days |

**Notes:**
HDPE – high-density polyethylene
IDW - Investigative-derived waste
mL – milliliter
PE - polyethylene
RDX – 1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive
SW – Solid Waste
a) All samples should be cooled to 4 ± 2° Celsius in conjunction with preservation requirements noted prior to shipment to the laboratory.

## Contract Laboratory Information

| Laboratory | Shipping Address | Point of Contact |
|---|---|---|
| GEL Laboratories, LLC | Ship all RDX and Perchlorate samples to:<br>GEL Laboratories, LLC<br>2040 Savage Road<br>Charleston, South Carolina 29407<br>For Saturday shipments contact lab for further instructions to ensure sample receipt in custody and with proper preservation. | Brielle Luthman<br>Email: Brielle.Luthman@gel.com<br>Phone number: 843-556-8171 |

## Table J-6: Field Quality Control Sample Summary
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #20 Field Quality Control Sample Summary

| Parameters[a] | Analytical Method | Matrix | Total Number of Samples | FD | MS | MSD | Equip. Rinsate (1/event) | Trip Blank (1/cooler) | TAT Needed[a] | Sample Container/ Preservation Requirements | Holding Time | Total Number of Containers |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Groundwater Samples/Event*** | | | | | | | | | | | | |
| RDX | SW8330B | Water | 8 | 1 | 1 | 1 | 1 | 0 | Normal | 2 – 1 Liter amber glass | 7 days extraction; 40 days analysis | 24 |
| Perchlorate | 6850 Modified | Water | 8 | 1 | 1 | 1 | 1 | 0 | Normal | 125 mL HDPE or PE (filter through 0.2-micron filter); headspace required | 28 days | 12 |
| ***IDW Water/Event*** | | | | | | | | | | | | |
| RDX | SW8330B | Water | 1 | 0 | 0 | 0 | 0 | 0 | Normal | 2 – 1 Liter amber glass | 7 days extraction; 40 days analysis | 2 |
| Perchlorate | 6850 Modified | Water | 1 | 0 | 0 | 0 | 0 | 0 | Normal | 125 mL HDPE or PE (filter through 0.2-micron filter); headspace required | 28 days | 2 |

**Notes:**
FD – Field Duplicate
HDPE – high-density polyethylene
IDW – Investigation Derived Waste
mL – milliliter
MS – Matrix spike
MSD – Matrix spike duplicate
PE - polyethylene
RDX – 1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive
SW – Solid Waste
TAT – Turnaround Time
a) Sample deliverables should include a Department of Defense (DoD) Quality Systems Manual (QSM) Stage 3-4 data package and Environmental Chemical Corporation (ECC) Environmental Data Management System (EDMS) electronic data deliverable (EDD) for all groundwater samples. IDW samples require Level I/II data package and EDD.

## Table J-7: Analytical Laboratory Standard Operating Procedures
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #23 Analytical Laboratory Standard Operating Procedures

| SOP Reference Number | Title, Revision, Date | Definitive or Screening Data | Analytical Group | Matrix | Instrument | Organization Performing Analysis | Modified for Project Work (Yes/No)? |
|---|---|---|---|---|---|---|---|
| GL-OA-68 | Sample Processing and Analysis of Nitroaromatics, Nitroamines, and Nitrate Esters by SW-846. (Rev. 07 eff. October 2016) | Definitive | RDX | Water | LC/MS/MS | GEL Laboratory | No |
| GL-OE-E-067 | Definitive Low Level Perchlorate Analysis Utilizing LC/MS/MS By USEPA Method 6850 Modified | Definitive | Perchlorate | Water | | | No |

**Notes:**
Eff. – Effective
LC/MS/MS – Liquid Chromatography/ Mass spectrometry/ Mass spectrometry
RDX – 1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive
Rev – Revision
SW – Solid Waste
USEPA – United States Environmental Protection Agency

## Table J-8: Analytical Instrument Calibration
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #24 Analytical Instrument Calibration

| Instrument | Calibration Procedure | Calibration Range | Frequency of Calibration | Acceptance Criteria | CA | Person Responsible for CA | SOP Reference |
|---|---|---|---|---|---|---|---|
| Explosives LC/MS/MS | ICAL for all analytes (including surrogates) | 25-2500 µg/L | At instrument setup and after ICV or CCV failure, prior to sample analysis. | ICAL must meet one of the three options below: Option 1: RSD for each analyte ≤ 15%; Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$; Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$. | Correct problem, then repeat ICAL. | Analyst/ Supervisor | HPLC02 |
| | ICV | 1,000 µg/L or 100 µg/L | Once after each ICAL, analysis of a second source standard prior to sample analysis. | All reported analyte(s) and surrogates within ± 20% of true value. | Correct problem. Rerun ICV. If that fails, repeat ICAL. | | |
| | CCV | 500 µg/L | Before sample analysis, after every 10 field samples, and at the end of the analysis sequence. | All reported analytes and surrogates within ± 20% of the true value. | Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails or if two consecutive CCVs cannot be run, perform corrective action(s) and repeat CCV and all associated samples since last successful CCV. Alternately, recalibrate if necessary; then reanalyze all associated samples since the last acceptable CCV. | | |

## Table J-8: Analytical Instrument Calibration
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #24 Analytical Instrument Calibration

| Instrument | Calibration Procedure | Calibration Range | Frequency of Calibration | Acceptance Criteria | CA | Person Responsible for CA | SOP Reference |
|---|---|---|---|---|---|---|---|
| Perchlorate by HPLC/MS/MS | ICAL | 0.1-10 µg/L | At instrument setup or after ICV or CCV failure, prior to sample analysis. | ICAL must meet one of the two options below:<br>Option 1: RSD for each analyte ≤ 15%;<br>Option 2: linear least squares regression for each analyte: $r^2 \geq 0.995$. | Correct problem, then repeat ICAL. | Analyst/ Supervisor | HPLC06 |
| | ICV | 1.0 µg/L | Once after each ICAL. | Perchlorate concentration must be within ± 15% of its true value. | Correct problem. Rerun ICV. If that fails, repeat ICAL. | | |
| | CCV | 1.0 µg/L | On days an ICAL is performed, after every 10 field samples, and at the end of the analytical sequence.<br>On days an ICAL is not performed, at the beginning of the sequence, after every 10 field samples, and at the end of the analytical sequence. | Perchlorate concentration must be within ± 15% of its true value. | Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails or if two consecutive CCVs cannot be run, perform corrective action(s) and repeat CCV and all associated samples since last successful CCV. Alternately, recalibrate if necessary; then reanalyze all associated samples since the last acceptable CCV. | | |
| | Isotope Ratio $^{35}Cl/^{37}Cl$ | Not applicable | Every sample, batch QC sample, and standard. | Monitor for either the parent ion at masses 99/101 or the daughter ion at masses 83/85 depending on which ions are quantitated.<br>Must fall within 2.3 to 3.8. | If criteria are not met, the sample must be rerun. If the sample was not pretreated, the sample must be re-extracted using cleanup procedures.<br>If, after cleanup, the ratio still fails, use alternative techniques to confirm presence of perchlorate, e.g., a post spike sample or dilution to reduce any interference. | | |

## Table J-8: Analytical Instrument Calibration
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #24 Analytical Instrument Calibration

| Instrument | Calibration Procedure | Calibration Range | Frequency of Calibration | Acceptance Criteria | CA | Person Responsible for CA | SOP Reference |
|---|---|---|---|---|---|---|---|
| Perchlorate by HPLC/MS/MS | IS | 5 µg/L O18-Perchlorate | Addition of 18O-labeled perchlorate to every sample, batch QC sample, standard, instrument blank, and MB. | Addition of 18O-labeled perchlorate to every sample, batch QC sample, standard, instrument blank, and MB. | Rerun the sample at increasing dilutions until the ± 50% acceptance criteria are met. If criteria cannot be met with dilution, the interference is suspected and the sample must be re-prepped using additional pretreatment steps. | Analyst/ Supervisor | HPLC06 |
| | Interference Threshold Study | Not applicable | At initial setup and when major changes occur in the method's operating procedures (e.g., addition of cleanup procedures, column changes, mobile phase changes). | Measure the threshold of common suppressors (chloride, sulfate, carbonate, bicarbonate) that can be present in the system without affecting the quantitation of perchlorate. The threshold is the concentration of the common suppressors where perchlorate recovery falls outside an 80-120% window. | NA. | | |
| | Mass Calibration | Range must bracket ion masses of interest. | Instrument must have a valid mass calibration prior to any sample analysis. The mass calibration is updated on an as-needed basis (e.g., QC failures, ion masses show large deviations from known masses, major instrument maintenance is performed, or the instrument is moved). | Ions should be within ± 0.3 m/z of masses 83, 85 and 89. | If the mass calibration fails, recalibrate. If it still fails, consult manufacturer instructions on corrective maintenance. | | |

## Table J-8: Analytical Instrument Calibration
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #24 Analytical Instrument Calibration

| Instrument | Calibration Procedure | Calibration Range | Frequency of Calibration | Acceptance Criteria | CA | Person Responsible for CA | SOP Reference |
|---|---|---|---|---|---|---|---|
| Perchlorate by HPLC/MS/MS | Tune Check | Range must bracket ion masses of interest. | Prior to ICAL and after any mass calibration or maintenance is performed. | Tuning standards must span the mass range of the analytes of interest and meet acceptance criteria outlined in the laboratory SOP. | Retune instrument and verify. If the tune check will not meet acceptance criteria, an instrument mass calibration must be performed and the tuning redone. | Analyst/ Supervisor | HPLC06 |

**Notes:**

± – plus or minus
% – percent
≤ – less than or equal to
≥ – greater than or equal to
µg/L – micrograms per liter
CA – Corrective Action
CCV – Continuing Calibration Verification
HPLC – High-performance liquid chromatography
HPLC/MS/MS - High-performance liquid chromatography/ Mass Spectrometry/Mass Spectrometry
ICAL – Initial Calibration
ICV – Initial Calibration Verification
IS – Internal Standard
LC/MS/MS - Liquid Chromatography/Mass Spectrometry/Mass Spectrometry
m/z - mass-to-charge ratio
MB – Method Blank
NA – Not Applicable
QC – Quality Control
SOP – Standard Operating Procedure

**Table J-9: Analytical Instrument Calibration**
**RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama**
**Worksheet #25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection**

| Instrument/ Equipment | Maintenance Activity | Testing Activity | Inspection Activity/Preventive Maintenance | Frequency | Acceptance Criteria | Corrective Action (CA) | Title/ Position Responsible for CA | Reference |
|---|---|---|---|---|---|---|---|---|
| Agilent 1100 or 1200 High Performance Liquid Chromatography | Filter samples/ Guard column | Sample introduction | Replace filters/Guard column as needed to prevent flow restrictions | While in use | Acceptable calibration and ongoing verifications | Correct problems, reanalyze standard | Analyst/ Supervisor | HPLC02, HPLC03 |
| | Monitor pressure | Initial and Continuing Calibrations | Checked daily leaks, line restrictions, temperature and solvent fluctuation, and gas bubbles | Daily | | | | |
| High Performance Liquid Chromatography with Tandem Mass Spectrometry | Monitor pressure | Initial and Continuing Calibrations | Checked daily leaks, line restrictions, temperature and solvent fluctuation, and gas bubbles | Daily | | | | GL-OA-E_068 |
| | Monitor and clean curtain plate and nebulizer tip, clean source of Mass Spectrometry | | Curtain plate, nebulizer tip, Mass Spectrometry source | As needed | | | | HPLC06 |
| | Change oil in vacuum pump | | Vacuum pump oil | Every 6 Months | | | | |

## Table J-10: Sample Handing, Custody, and Disposal
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #26 Sample Handing, Custody, and Disposal

| SAMPLE COLLECTION, PACKAGING, AND SHIPMENT (FIELD) |
|---|
| Sample Collection (Personnel/Organization): ECC Personnel TBD |
| Sample Packaging (Personnel/Organization): ECC Personnel TBD |
| Coordination of Shipment (Personnel/Organization): ECC Personnel TBD |
| Type of Shipment/Carrier: Cooler/Lab Courier, UPS |
| **SAMPLE RECEIPT AND ANALYSIS** |
| Sample Receipt (Personnel/Organization): GEL Laboratories, LLC Personnel |
| Sample Custody and Storage (Personnel/Organization): GEL Laboratories, LLC Personnel |
| Sample Preparation (Personnel/Organization): GEL Laboratories, LLC Personnel |
| Sample Determinative Analysis (Personnel/Organization): GEL Laboratories, LLC Personnel |
| **SAMPLE ARCHIVING** |
| Field Sample Storage (number of days from sample collection): 60 days from receipt |
| Sample Extract/Digestate Storage (number of days from extraction/digestion): 3 months from sample extraction/digestion |
| Biological Sample Storage (number of days from sample collection): NA |
| **SAMPLE DISPOSAL** |
| Personnel/Organization: GEL Laboratories, LLC Personnel |
| Number of Days from Analysis: 30 days from submittal of Final report or 60 days from receipt, whichever is longer |

**Notes:**
ECC – Environmental Chemical Corporation
TBD – To be determined
Post sample collection in the field will be conducted in accordance with Standard Operating Projected Procedure (SOPP) 15.0 *Non-Hazardous Sample Handling, Packaging, and Shipping.* This procedure is located in the Installation-Wide – Quality Assurance Project Plan (IW-QAPP), Volume II (HGL, 2019).

Specific laboratory sample custody procedures (receipt of samples, archiving, and disposal) will be used for all post-sample handling. Coolers will be received and checked for proper temperature. A sample cooler receipt form will be filled out to note the conditions and any discrepancies. The chain of custody will be checked against the sample containers for correctness. Samples will be logged into the data base and given a unique log number, which can be tracked through processing. The Project Chemist will be notified of any problems.

**Table J-11, Sample Handing, Custody, and Disposal**
**RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama**

**Worksheet #28 Analytical Quality Control and Corrective Action**

**Analytical Group: Explosives**
**Analytical Method/SOP Reference: SW8330B by EXTNT01 & HPLC02**

| QC Sample: | Number / Frequency | Method / SOP QC Acceptance Limits | CA | Title of Person Responsible for CA | Project Specific MPC |
|---|---|---|---|---|---|
| MB | One per preparatory batch. | No analytes detected > 1/2 LOQ or > 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater. | Correct problem. If required, re-prep and reanalyze MB and all QC samples and field samples processed with the contaminated blank. | Analyst/Supervisor | MB detections used to qualify project samples per validation guidance |
| LCS | One per preparatory batch. | A laboratory must use the QSM 5.3 limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. | Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for the failed reported analytes if sufficient sample material is available. | | Same as Method/SOP |
| LCSD or lab duplicate | Alternative means of determining laboratory precision is MS/MSD no performed. Performed as needed. | RPD of all target compounds ≤ 30% | No specific corrective actions. Flag accordingly. | | |
| MS | One per preparatory batch. | A laboratory must use the QSM 5.3 limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. | Examine the project-specific requirements. Contact the client as to additional measures to be taken. | | |
| MSD | One per preparatory batch. | A laboratory must use the QSM 5.3 Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. RPD ≤ 30% (between MS and MSD or sample and MD). | Examine the project-specific requirements. Contact the client as to additional measures to be taken. | | |

**Table J-11, Sample Handing, Custody, and Disposal**
**RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama**

**Worksheet #28 Analytical Quality Control and Corrective Action**

| QC Sample: | Number / Frequency | Method / SOP QC Acceptance Limits | CA | Title of Person Responsible for CA | Project Specific MPC |
|---|---|---|---|---|---|
| Confirmation of positive results (second column) | All results > the DL must be confirmed. | Calibration and QC criteria for second column are the same as for initial or primary column analysis. Results between primary and secondary column/detector RPD ≤ 40%. | Not applicable | Analyst/Supervisor | Same as Method/SOP |
| Surrogate Spike (Surr) | All field and QC samples. | QC acceptance criteria specified by the project if available; otherwise use QSM 5.3 limits or in-house LCS limits if analyte(s) are not listed. | Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch if sufficient sample material is available. If obvious chromatographic interference is present, reanalysis may not be necessary, but the client must be notified prior to reporting data and the failures must be discussed in the Case Narrative. | | |

**Notes:**
% - percent
> - greater than
≤ - less than or equal to
CA – Corrective Action
DL – Detection Level
LCS – Laboratory Control Spike
LCSD – Laboratory Control Spike Duplicate
LOQ – Limit of Quantitation
MB – Method Blank
MS – Matrix Spike
MSD – Matrix Spike Duplicate
QC – Quality Control
QSM – Quality Systems Manual
RPD – Relative Percent Difference
SOP – Standard Operating Procedure

**Table J-11, Sample Handing, Custody, and Disposal**
**RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama**

**Worksheet #28 Analytical Quality Control and Corrective Action**

**Analytical Group: Perchlorate**
**Analytical Method/SOP Reference: SW6850 by HPLC06**

| QC Sample: | Number / Frequency | Method / SOP QC Acceptance Limits | CA | Title of Person Responsible for CA | Project Specific MPC |
|---|---|---|---|---|---|
| LRB | Prior to calibration and at the end of the analytical sequence. | No perchlorate detected > ½ LOQ. | Reanalyze Reagent Blank (until no carryover is observed) and all samples processed since the contaminated blank. | Analyst/ Supervisor | LRB detections used to qualify project samples per validation guidance |
| MB | One per preparatory batch. | No analytes detected > ½ LOQ or > 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater. | Correct problem. If required, reprep and reanalyze MB and all QC samples and field samples processed with the contaminated blank. | | MB detections used to qualify project samples per validation guidance |
| LCS | One per preparatory batch. | A laboratory must use the QSM 5.3 limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. | Correct problem. Reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes if sufficient sample material is available. | | Same as Method/SOP |
| MS | One per preparatory batch per matrix. | A laboratory must use the QSM 5.3 limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. | Examine the project specific requirements. Contact the client as to additional measures to be taken. | | |

## Table J-11, Sample Handing, Custody, and Disposal
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #28 Analytical Quality Control and Corrective Action

| QC Sample: | Number / Frequency | Method / SOP QC Acceptance Limits | CA | Title of Person Responsible for CA | Project Specific MPC |
|---|---|---|---|---|---|
| ICS | One ICS is prepared with every batch of 20 samples and must undergo the same preparation and pretreatment steps as the samples in the batch. It verifies the method performance at the MCT. At least one ICS must be analyzed daily. The ICS shall be prepared at the LOQ. | Perchlorate concentration must be within ± 20% of its true value. | Correct problem. Reanalyze all samples and QC samples in the batch. If poor recovery from the cleanup filters is suspected, a different lot of filters must be used to re-extract all samples in the batch. If column degradation is suspected, a new column must be calibrated before the samples can be reanalyzed. | | Same as Method/SOP |

**Notes:**

% - percent
± - plus or minus
> - greater than
≤ - less than or equal to
CA – Corrective Action
DL – Detection Level
ICS – Interference Check Sample
LCS – Laboratory Control Spike
LOQ – Limit of Quantitation
LRB – Laboratory Reagent Blank
MB – Method Blank
MCT – Matrix Conductivity Threshold
MS – Matrix Spike
MSD – Matrix Spike Duplicate
QC – Quality Control
QSM – Quality Systems Manual
RPD – Relative Percent Difference
SOP – Standard Operating Procedure

## Table J-12: Data Validation Procedures
## RSA-308 Groundwater Monitoring Plan, Redstone Arsenal, Madison County, Alabama
## Worksheet #36 Data Validation Procedures

Data validation is an analyte and sample-specific process for evaluating compliance with contract requirements, methods/Standard Operating Procedures (SOPs), and measurement performance criteria (MPC).

All project field samples will undergo a Tier 1 Plus (Department of Defense [DoD] Quality Systems Manual [QSM] Stage 2B) data validation using lab limits as the MPC. IDW samples will be reviewed for completeness only.

Data validation will be documented on ECC data validation worksheets (DVW). Project electronic data deliverables (EDDs) (ECC Environmental Data Management System [EDMS] EDD and Environmental Remediation Information System [ERIS]) will be updated with Installation-Wide Quality Assurance Project Plan (IW-QAPP data validation qualifiers and rationale for validation qualifications provided in the DVW.

- U – Not detected by the lab or as a result of qualifying data due to cross contamination as determined by blank evaluation less than five times blank level) during data validation.
- UJ – Not detected with estimated reporting limits. Assigned due to data validation exceedance.
- R – Rejected data. Data determined to be unusable during data validation.

| Step IIa/IIb | Matrix | Analytical Group | Concentration Level | Validation Criteria | Data Validator |
|---|---|---|---|---|---|
| IIa | Groundwater | RDX and Perchlorate | Low/Medium | Laboratory MPC evaluated in accordance with applicable USEPA National Functional Guidelines as applicable to analytical methods listed in this SAP. | ECC Project Chemist or designate |

**Notes:**
ECC – Environmental Chemical Corporation
MPC – Measurement Performance Criteria
RDX – 1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive
SAP – Sampling and Analysis Plan
USEPA – United States Environmental Protection Agency

# ATTACHMENT 1

# FIELD DOCUMENTATION

*This page intentionally left blank.*

# Water Level Survey Log
# RSA-308
# Redstone Arsenal, Madison County, Alabama

Date: _____

Personnel: _____

Weather: _____

Other Comments: _____

| Well ID | Headspace PID (ppm) | Time | Depth to Water (ft btoc) |
|---|---|---|---|
| 308-RS2345 | | | |
| 308-RS2346 | | | |
| 308-RS2347 | | | |
| 308-RS2348 | | | |
| 308-RS2349 | | | |
| 308-RS2712 | | | |

**Notes:**
ft btoc – feet below top of casing
PID – Photoionization detector
ppm – parts per million

# Monitoring Well Sampling Log
# RSA-308
# Redstone Arsenal, Madison County, Alabama

Date: _____

Personnel: _____

Weather: _____

Other Comments: _____

| Well ID | Top of Casing Elevation (ft amsl) | Ground Elevation (ft amsl) | Installed Well Depth (ft bgs) | Screened Interval (ft bgs) | Date Sampled | Time | Depth to Water (ft btoc) |
|---|---|---|---|---|---|---|---|
| 308-RS2345 | 604.73 | 602.78 | 23.0 | 13.0 – 23.0 | | | |
| 308-RS2346 | 607.96 | 603.33 | 44.0 | 34.0 – 44.0 | | | |
| 308-RS2347 | 607.21 | 604.53 | 33.0 | 23.0 – 33.0 | | | |
| 308-RS2348 | 610.14 | 607.50 | 29.0 | 19.0 – 29.0 | | | |
| 308-RS2349 | 614.14 | 614.30 | 15.0 | 5.0 – 15.0 | | | |
| 308-RS2712 | NA | NA | 32.3 | 21.9 – 31.9 | | | |

**Notes:**
amsl – above mean sea level
bgs – below ground surface
btoc – below top of casing
ft – feet
NA – Survey data not available

# GROUNDWATER PURGE FORM

**Redstone Arsenal, Madison County, Alabama**



Site ID:_____ Sampling location ID:_____

Weather:_____ Sample Number:_____

Purge Equipment:_____ Collection Date/Time:_____

## Pump Installation

Pump installation crew:_____ Installation date/beginning time:_____

PID/FID reading (well head/background):_____ Screen Interval (ft. bgs): _____ to _____

Casing diameter (inches):_____ Pump intake depth (ft btoc): _____

Measured Well Depth (ft. btoc):_____ Pre-installation DTW (ft btoc):_____

Discharge tube length (ft.):_____ Discharge tube diameter (3/8" or 1/4"):_____

**Pneumatic Controller Tuning:** Initial air pressure = H (ft.) X 0.43 = _____ psi

## Purging

Purging/sampling crew:_____ Purge date/beginning time:_____

$d_1$ = screen diameter (inches) $v_1$ = screen volume (gallons) $l_1$ - screen length (feet)

$d_2$ = borehole diameter (inches) $v_2$ = filter pack volume (gallons) $l_2$ = filter pack length (feet)

V = purge volume (gallons or liters) p&t = pump and tubing volume (liters) t = tubing length (feet)

$v_1 = [(d_1)^2 \times 0.041] \times l_1$ $v_1 = [(____)^2 \times 0.041] \times ____ = ____$gallons

$v_2 = [(d_2)^2 - (d_1)^2] \times 0.041 \times l_2 \times 0.3$ $v_2 = [(____)^2 - (____)^2] \times 0.041 \times ____ \times 0.3 = ____$gallons

$V = (v_1 + v_2) \times 3.79$ $V = (____ + ____) \times 3.79 = ____$ liters

p&t = {[t x (multiplier)] + 500} /1000 p&t = [(_____ x _____) + 500] / 1000 = _____ liters

TOTAL PURGE VOLUME = V + required number of p&t volumes = _____ liters.

| | Initial | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Final |
|---|---|---|---|---|---|---|---|---|---|
| Pressure (psi) | | | | | | | | | |
| Refill Setting | | | | | | | | | |
| Discharge Setting | | | | | | | | | |
| Flow rate (mL/min) | | | | | | | | | |

### Water Quality Parameter Measurements

| Time and Date | DTW (ft. BTOC) | Purge Rate (mL/min) | Cumulative Volume Purged (L) | Temp. (degree C) | Conductivity (mMhos/cm) | pH | Eh (mv) | DO (mg/L) | Turbidity (NTU) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
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**Comments**

Abbreviations: BTOC - Below top of casing; BGS - Below ground surface; DTW - Depth to water; H - head above pump intake; mL - milliliter; L - Liter; ft - feet; mL/min - milliliters per minute; degree C - degree Celsius; mMhos/cm - millimhos per centimeter; pH - hydrogen ion concentration; Eh - redox potential; mv - millivolts; DO - dissolved oxygen; mg/L - milligrams per liter; NTU - nephelometric turbidity unit; psi - pounds per square inch; PID/FID - photoionization detector/flame ionization detector

# GROUNDWATER PURGE FORM

## Continuation Sheet

## Redstone Arsenal, Madison County, Alabama



Sampling location ID:_____ Sample Number:_____

| Water Quality Parameter Measurements | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Time and Date | DTW (ft. BTOC) | Purge Rate (mL/min) | Cumulative Volume Purged (L) | Temp. (degree C) | Conductivity (mMhos/cm) | pH | Eh (mv) | DO (mg/L) | Turbidity (NTU) |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | |

# SAMPLE COLLECTION LOG

**Site** _____ **Project:** ___**Redstone Arsenal**_____

**Location Code:**_____ **Sample Date:** _____

**Sample Number:**_____ **Time:** _____

**Sample Name:** _____ **Sample Matrix:** _____

**Well Depth:**_____ **Depth to Water:** _____

**Sampling Equipment:** _____ **Sample Team (name/Company):** _____

**QC Partners:**

Trip Blanks: _____ Rinsate:_____ Field Blank _____

**Containers:**

| Analytical Suite | FLT | Quantity | Size | Units | Type |
|---|---|---|---|---|---|
| | | | | | |
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Flt- Filtered (Y/N)

**Purge Record (**Last 3 readings for groundwater, single set of readings for any other water)

| Date | Time | Depth to Water (ft) | Eh (mV) | pH (SU) | Conductivity (mS/cm) | DO (ppm) | Turbidity (NTU) | Temp (°C) | Purge Volume (gal) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

ft – feet
mV – millivolts
SU – standard unit
mS/cm – microsiemens per centimeter
ppm – parts per million
NTU – nephelometric turbidity units
°C – degrees Celsius
gal – gallons

**Logged By/Date**_____ **Reviewed by/Date** _____

# REDSTONE ARSENAL WELL INSPECTION CHECKLIST

| WELL LOCATION | | DATE INSPECTED | INSPECTION CREW |
|---|---|---|---|
| SITE # | | | |
| WELL # | | | |

| WELL TYPE | |
|---|---|
| WELL TYPE: (CIRCLE ONE) | OVERBURDEN BEDROCK PIEZOMETER EXTRACTION OTHER _____ |

| WELL CONSTRUCTION | | |
|---|---|---|
| (CIRCLE ONE) | FLUSH MOUNT | STICKUP |

| PHYSICAL APPEARANCE | |
|---|---|
| EXCELLENT | WELL INTEGRITY HAS NO DEFIENCIES |
| GOOD | MINOR DEFIENCIES - PAD CRACKED, NO LOCK, MISSING EXPANDABLE CAP |
| POOR | MAJOR DEFIENCIES - PAD DESTROYED, NO STENCILING, POST MISSING |

| | YES | NO | N/A | CONDITION | COMMENTS |
|---|---|---|---|---|---|
| CONCRETE PAD | | | | EXCELLENT<br>GOOD<br>POOR | |
| PROTECTIVE POST | | | | EXCELLENT<br>GOOD<br>POOR | |
| PROTECTIVE CASING | | | | EXCELLENT<br>GOOD<br>POOR | |
| STENCILING | | | | EXCELLENT<br>GOOD<br>POOR | |
| LOCK | | | | EXCELLENT<br>GOOD<br>POOR | |
| EXPANDABLE CAP | | | | EXCELLENT<br>GOOD<br>POOR | |
| ACCESSIBLE | | | | EXCELLENT<br>GOOD<br>POOR | |
| REPAIRS NEEDED | | | | | |

Notes: N/A - not applicable

# DAILY SITE REPORT

**Project Title:** Redstone
**Activity Name:**
**Location:** U.S Army Garrison - Redstone
**Contract No.:** W9124J-18-D-0004, DO W9124J18F0085

| **Weather** | Sunny | Clear | Overcast | Rain | Snow |
|---|---|---|---|---|---|
| **Temperature** | < 32 | 32 – 50 | 50 – 70 | 70-85 | > 85 |
| **Wind** | Still | Moderate | High | | |
| **Humidity** | Dry | Moderate | Humid | | |

***Personnel On Site:***

| Name | Hrs. | Affiliation | Location/ Description of Work |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

***Field Changes:*** YES _____ NO _____

If yes, filed Nonconformance and Corrective Action Report number (NCR No.):_____

| | |
|---|---|
| **Work Performed:** | |
| **Equipment Used:** | |
| **Health & Safety (Briefing held, PPE, injuries, near misses, etc.):** | |
| **Samples Collected/ Shipped:** | |
| **IDW Generated and Disposition:** | |
| **Verbal Instructions Received/Given:** | |
| **Changed Conditions/ Delays/ Conflicts Encountered or Resolved:** | |
| **Other Comments or Additional Information:** | |
| **Next Day's Planned Activities:** | |

Contractor Verification: On behalf of the contractor, ECC, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

_____ _____

Signature Date

Notes:

PPE - personal protective equipment

IDW - investigation derived waste

# INSTRUMENT CALIBRATION LOG

**Project:** Redstone 5211.014 **Site:** _____ **Date** _____

**Calibrated By** _____ **Instrument** _____ **Serial Number** _____

**Weather:** _____

| Parameters | Calibration | Calibration Temp | Post Calibration | Comments |
|---|---|---|---|---|
| Conductivity (mS/cm$^{c}$) | | | | |
| pH (7) | | | | |
| pH (4) | | | | |
| pH (10) | | | | |
| ORP (mV) | | | | |
| Dissolved Oxygen ( %) | | | | |
| Barometric Pressure (mmHg) | | | | |
| | | | | |
| **Turbidity** | **<0.10 NTU** | **15.0 NTU** | **100 NTU** | **750 NTU** |
| **PID** | | **Isobutylene / 100ppm** | | |

Notes: mS/cm - microsiemens per centimeter; pH - hydrogen ion concentration; ORP - oxidation-reduction potential; mV - millivolts; mmHg - millimeters of mercury; NTU - nephelometric turbidity unit; PID - photoionization detector; ppm - parts per million

# PHOTO IONIZATION DETECTOR
# INSTRUMENT CALIBRATION LOG

**Project/Site Name** Redstone Arsenal **Calibrated By**_____

| Instrument/Serial Number | Pre-calibration Reading | Post-calibration Reading | Calibration Gas/Concentration | Date |
|---|---|---|---|---|
| | | | Isobutylene / 100ppm | |
| | | | Isobutylene / 100ppm | |
| | | | Isobutylene / 100ppm | |
| | | | Isobutylene / 100ppm | |
| | | | Isobutylene / 100ppm | |
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| | | | Isobutylene / 100ppm | |
| | | | Isobutylene / 100ppm | |
| | | | Isobutylene / 100ppm | |
| | | | Isobutylene / 100ppm | |

Notes: ppm - parts per million

| | | |
|---|---|---|
| Vision Integrity Results | ECC | DAILY SAFETY MEETING SIGN-IN SHEET |

Date: _____ Project Name/Location: Redstone Arsenal

Company: ECC Person Conducting Briefing: _____

**1. AWARENESS (e.g., Hazards, special EHS concerns, pollution prevention, recent incidents, etc.):**

**2. OTHER ISSUES (HASP changes, new AHAs, attendee comments, etc.):**

**3. DISCUSSION OF DAILY ACTIVITIES/TASKS AND SAFETY (PPE) MEASURES TO BE USED:**

**4. Hospital Information**

**Name:**

**Address:**

**Phone:**

**Directions**

**5. ATTENDEES (Print Name):**

| | |
|---|---|
| 1. | 2. |
| 3. | 4. |
| 5. | 6. |
| 7. | 8. |
| 9. | 10. |

Notes:

EHS - Environment, Health, and Safety

HASP - Health and Safety Plan

AHA - Activity Hazard Analysis

PPE - Personal Protective Equipment

**Response to ADEM Comments**
**on the**
**Revision 1 Corrective Measures Implementation Work Plan RSA-308 Exterior Sump at Building 7120, Operable Unit 25**
**Submitted on July 20, 2023**

**ADEM, Ashley Mastin**

1. **Comment 1: Section 4.2.5 Monitoring to Evaluate MNA, Bullet Point 2:** This section states: "Semiannual groundwater sampling for performance monitoring of MNA [Monitored Natural Attenuation] processes would be conducted in Years 1 through 4." Reducing the frequency of monitoring should be results-based as opposed to following a set schedule. Data trends should demonstrate the need for less frequent monitoring. The Army may propose to alter the sampling schedule and monitoring well network at any time; however, changes to the sampling frequency and/or monitoring parameters would require Department approval prior to implementation. Please revise the CMI Work Plan accordingly.

   **Response:**
   **Section 4.2.5 Paragraph 2 and Bullets one and two have been revised and bullet three has been deleted. Text has been revised to read:**

   ***"Groundwater monitoring will be performed semiannually from Years 1 through 19 or until CGs are achieved and confirmed. …"***

   - ***One baseline groundwater sampling event would be conducted in Year 0. Groundwater samples would be collected from seven monitoring wells, which include the new interface well. Groundwater samples would be analyzed for COCs (perchlorate and RDX).***
   - ***Semiannual groundwater sampling for performance monitoring of MNA processes would be conducted in Years 1 through 19 or until CGs are achieved and confirmed. Groundwater samples would be collected from seven monitoring wells during each sampling event and analyzed for COCs (perchlorate and RDX, if applicable). If appropriate, a permit modification will be submitted to decrease sampling frequency from semiannual to annual.***

   **Appropriate changes for Years 5 – 19 semiannual sampling have also been made in Appendix F – Permit Modification, Appendix G – CMIP Schedule, and Appendix J – Monitoring Plan**

2. **Comment 2: Section 4.2.5 Monitoring to Evaluate MNA, Bullet Point 2:** This section states: "Based on concentrations of RDX [1,3,5-trinitro-1,3,5-triazine/Royal Demolition Explosive] falling below the CG [cleanup goal] in the last three sampling events (May 2014, June 2015, and December 2021), if RDX concentrations are below the CG during the baseline sampling event, RDX will be recommended for removal from the monitoring program." Per ADEM Admin. Code r. 335-14-5-.06(7)(c), sampling of RDX should

continue until concentrations are recorded below the CG for three consecutive years and not three consecutive events. Please address.

**Response:**
**See Response #1**

3. **Comment 3: Section 4.2.5 Monitoring to Evaluate MNA, Bullet Point 4:** This section states: "All groundwater monitoring for MNA will be discontinued if CGs are attained for all COCs [contaminant of concern] in each of the monitoring wells for two consecutive years (individual wells may be removed from the program sooner if this criteria is satisfied)." An individual monitoring well should only be removed from the network when contaminants of concern have not exceeded groundwater protection standards for three consecutive years per ADEM Admin. Code r. 335-14-5-.06(7)(c). Please address.

   **Response:**
   **Two years has been revised to three years and bullet point has been revised to read:**

   ***"At the end of Year 19, it is assumed that the CGs will be achieved, and site monitoring wells would be decommissioned. All groundwater monitoring for MNA will be discontinued if CGs are attained for all COCs in each of the monitoring wells for three consecutive years (individual wells may be removed from the program sooner if this criteria is satisfied)."***

4. **Comment 4: Section 5.1 MNA Contingencies:** Please see Comment 1 above.

   **Response:**
   **Text in this section has been revised to read:**

   ***"Following baseline sampling, analytical results will be collected from the seven monitoring wells semi-annually (Years 1 through 19) to determine the effectiveness of MNA. Permit modifications will be submitted, if appropriate, to decrease the frequency of sampling or remove COCs that have been below the CG for three consecutive years."***

5. **Comment 5:** Please include the ADEM comment letter dated March 13, 2023, as an attachment to this report.

   **Response:**
   **ADEM letter will be included in Appendix E.**

6. **Comment 6:** Please revise the title of this document to read *Corrective Measures Implementation Work Plan, RSA-308, Exterior Sump at Building 7120, Operable Unit 25, Revision 1*.

   **Response:**
   **Title and headers of document has been revised to read Revision 2 given this round of response to comments: "*Corrective Measures Implementation Work Plan, RSA-308,***

*Exterior Sump at Building 7120, Operable Unit 25, Revision 2”*