

Final

**Sampling and Analysis Plan Addendum
for Supplemental Sampling at RVAAP-38 NACA Test Area**

**Part I: Field Sampling Plan (FSP)
Part II: Quality Assurance Project Plan (QAPP)
Part III: Safety and Health Plan (SHP)**

**Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio**

Contract No. W912QR-15-C-0046

Prepared for:



**U.S. Army Corps of Engineers
Louisville District**

Prepared by:



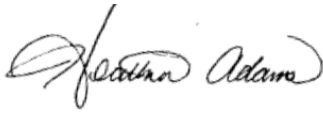
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8866 Commons Boulevard, Suite 201
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October 20, 2017

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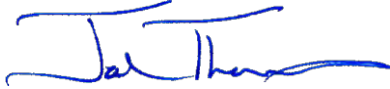
Leidos has completed the Sampling and Analysis Plan Addendum for Supplemental Sampling at RVAAP-38 NACA Test Area for the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing U.S. Army Corps of Engineers (USACE) policy.



Heather Adams, P.G.
Project Geologist

10/20/17

Date



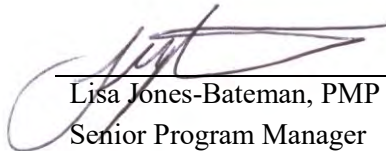
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Date

Significant concerns and the explanation of the resolution are as follows:

Internal Leidos Independent Technical Review comments are recorded on a Document Review Record per Leidos Quality Assurance Administrative Procedure QAAP 3.1. This Document Review Record is maintained in the project file. Changes to the report addressing the comments have been verified by the Study/Design Team Leader. As noted above, all concerns resulting from independent technical review of the project have been considered.



Lisa Jones-Bateman, PMP
Senior Program Manager

10/20/17

Date

Final

**Sampling and Analysis Plan Addendum
for Supplemental Sampling at RVAAP-38 NACA Test Area**

Part I: Field Sampling Plan (FSP)
Part II: Safety and Health Plan (SHP)
Part III: Quality Assurance Project Plan (QAPP)

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-15-C-0046

Prepared for:
U.S. Army Corps of Engineers
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Prepared by:
Leidos
8866 Commons Boulevard, Suite 201
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for Supplemental Sampling at RVAAP-38 NACA Test Area
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Final

**Sampling and Analysis Plan Addendum
for Supplemental Sampling at RVAAP-38 NACA Test Area**

Part I: Field Sampling Plan

**Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio**

Contract No. W912QR-15-C-0046

Prepared for:



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ACRONYMS AND ABBREVIATIONS

| | |
|----------|---|
| AHA | Activity Hazard Analysis |
| amsl | Above Mean Sea Level |
| AOC | Area of Concern |
| ARNG | Army National Guard |
| bgs | Below Ground Surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CIH | Certified Industrial Hygienist |
| COC | Chemical of Concern |
| COPC | Chemical of Potential Concern |
| DFFO | Director's Final Findings and Orders |
| DGPS | Differential Global Positioning System |
| DQO | Data Quality Objective |
| EM | Electromagnetic |
| ERA | Ecological Risk Assessment |
| FID | Flame Ionization Detector |
| FSP | Field Sampling Plan |
| FWFSP | Facility-Wide Field Sampling Plan |
| FWGWMP | Facility-Wide Groundwater Monitoring Program |
| FWQAPP | Facility-Wide Quality Assurance Project Plan |
| FWSAP | Facility-Wide Sampling and Analysis Plan |
| FWSHP | Facility-Wide Safety and Health Plan |
| GPR | Ground Penetrating Radar |
| HHRA | Human Health Risk Assessment |
| IDW | Investigation-Derived Waste |
| MEC | Munitions and Explosives of Concern |
| MRS | Munitions Response Site |
| NACA | National Advisory Committee on Aeronautics |
| NAD83 | North American Datum 1983 |
| NGVD | National Geodetic Vertical Datum |
| OHARNG | Ohio Army National Guard |
| Ohio EPA | Ohio Environmental Protection Agency |
| P.E. | Professional Engineer |
| P.G. | Professional Geologist |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PBA | Performance-Based Acquisition |
| PCB | Polychlorinated Biphenyl |
| PID | Photoionization Detector |
| PMP | Project Management Professional |
| PPE | Personal Protective Equipment |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |

ACRONYMS AND ABBREVIATIONS (Continued)

| | |
|--------|---|
| QC | Quality Control |
| REIMS | RVAAP Environmental Information Management System |
| RI | Remedial Investigation |
| RVAAP | Ravenna Army Ammunition Plant |
| SAP | Sampling and Analysis Plan |
| SHP | Safety and Health Plan |
| SVOC | Semi-Volatile Organic Compound |
| TCLP | Toxicity Characteristic Leaching Procedure |
| USACE | U.S. Army Corps of Engineers |
| USCS | Unified Soil Classification System |
| USP&FO | U.S. Property and Fiscal Officer |
| VOC | Volatile Organic Compound |
| XRF | X-Ray Fluorescence |

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1.0 INTRODUCTION

Leidos has been contracted by the U.S. Army Corps of Engineers (USACE), Louisville District to complete a Remedial Investigation (RI) Report for soil, sediment, and surface water at the National Advisory Committee on Aeronautics (NACA) Test Area. Upon receipt of concurrence from the Ohio Environmental Protection Agency (Ohio EPA), the RI Report will complete the RI phase of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

This work is being performed under a firm, fixed-price basis in accordance with USACE, Louisville District Contract No. W912QR-15-C-0046. Planning and performance of all elements will be in accordance with the requirements of the Ohio EPA Director's Final Findings and Orders (DFFO) for the Ravenna Army Ammunition Plant (RVAAP), dated June 10, 2004 (Ohio EPA 2004).

1.1 PURPOSE

NACA Test Area is area of concern (AOC) RVAAP-38 within Camp Ravenna, formerly RVAAP, in Portage and Trumbull counties, Ohio (Figure 1-1). On August 15, 2016, the Army submitted the *Revised Draft Phase II Remedial Investigation Report and Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area* (USACE 2016). Ohio EPA identified data gaps associated with the RI, and the Army and Ohio EPA resolved to conduct a geophysical investigation and additional sampling at NACA Test Area to address these data gaps. The Army submitted the sampling scheme in a memorandum dated June 8, 2017, and Ohio EPA concurred with the sampling scheme in a memorandum dated August 21, 2017.

The purpose of this Sampling and Analysis Plan (SAP) Addendum (herein referred to as the SAP Addendum) is to outline the scope, objectives, procedures, and methods associated with the geophysical investigation and sampling that will be conducted to address data gaps associated with NACA Test Area.

To supplement this SAP Addendum, the following attachments are included:

- Attachment A contains the *Update to Procedures to Follow as Related to the RVAAP Restoration Program due to the Accountability Transfer of the Remaining Property from BRACD to the ARNG/OHARNG* letter dated April 2, 2014.
- Attachment B contains applicable reporting forms for this investigation.
- Attachment C contains Safety Data Sheets.

1.2 FACILITY-WIDE PROCEDURES

The *Facility-Wide Sampling and Analysis Plan for Environmental Investigations* (USACE 2011a) (herein referred to as the FWSAP) establishes the methods and procedures for environmental investigations at the RVAAP AOCs. The FWSAP is composed of the following three parts:

- Facility-Wide Field Sampling Plan (FWFSP),
- Facility-Wide Quality Assurance Project Plan (FWQAPP), and
- Facility-Wide Safety and Health Plan (FWSHP) (USACE 2011b).

This SAP Addendum is developed to append the FWSAP for activities to be conducted at NACA Test Area that are either not included in or deviate from the FWSAP. Accordingly, the SAP Addendum contains Parts I, II, and III and is to be used in conjunction with the FWSAP. This SAP Addendum closely mirrors the format and outline of the FWSAP.

The three parts of this SAP Addendum for NACA Test Area are summarized below and include:

- Part I: The Field Sampling Plan (FSP) Addendum contains the project-specific scope and objectives, sampling rationale, and proposed sample locations.
- Part II: The Quality Assurance Project Plan (QAPP) Addendum presents the data quality objectives (DQOs) for field sampling, laboratory analysis, and reporting, which will provide results to be used in risk assessments presented in the revised Phase II RI Report.
- Part III: The Safety and Health Plan (SHP) Addendum presents the potential hazards, project-specific staff organization, qualifications, responsibilities, training requirements, activity hazard analyses (AHAs), and monitoring requirements that may be encountered during the implementation.

2.0 PROJECT DESCRIPTION

2.1 FACILITY HISTORY AND DESCRIPTION

The facility, consisting of 21,683 acres, is located in northeastern Ohio within Portage and Trumbull counties, approximately 4.8 kilometers (3 miles) east/northeast of the city of Ravenna and approximately 1.6 kilometers (1 mile) northwest of the city of Newton Falls (Figure 2-1). The facility, previously known as RVAAP, was formerly used as a load, assemble, and pack facility for munitions production. As of September 2013, administrative accountability for the entire acreage of the facility has been transferred to the U.S. Property and Fiscal Officer (USP&FO) for Ohio and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp Ravenna). References in this document to RVAAP relate to previous activities at the facility as related to former munitions production activities or to activities being conducted under the restoration/cleanup program.

2.2 NACA TEST AREA HISTORY AND DESCRIPTION

2.2.1 History

NACA Test Area was designed and used from 1947–1953. The site was used by NACA to conduct experimental crash tests of excess military aircraft in order to develop explosion-proof fuel tanks and fuel for aircraft (AGOH 1997, NACA 1953). Excess airplanes were flown to the former RVAAP under their own power, taxied along installation roads, and staged at NACA Test Area. Seventeen excess aircraft were used during NACA Test Area operations. The planes were fueled and then propelled under their own power on a guide monorail. The planes were crashed into a concrete barrier at speeds from 80–105 miles per hour. During the tests, high-speed films were made to study fuel spillage, generation of ignition sources, flame front progression, and toxic gas generation, among other parameters.

Combustible liquids involved in testing activities included 100/130 octane aviation fuels, low-volatility fuel, flame retardants, lubricating oil, coolant compounds, hydraulic fluids, alcohol, and brake fluid. Estimates of aviation fuel consumed are approximately 17,850 gallons. However, the amounts of other liquids potentially released are not known (AGOH 1997). Fluids from the burning airplanes were generally found in a fan-shaped area beginning at the crash barrier and extending out in front of the airplane up to 400 ft.

Some aircraft were completely consumed by fire. Aircraft that were significantly damaged during testing were stripped of instrumentation and salvageable parts, and the majority of the aircraft were removed from the site. However, some aircraft were reportedly bulldozed into an area at the northeast end of the AOC and buried. Debris protrudes from the soil at some locations within this former burial area (USACE 2001). Explosives were burned and demolished in the Open Demolition Area #1, immediately south of the crash strip (Shaw 2013).

2.2.2 Description

NACA Test Area is in the southwestern portion of RVAAP, at the southern end of Demolition Road, west of Greenleaf Road (Figure 2-2). No fences or perimeter boundaries exist at the AOC. Ground elevations within NACA Test Area range from approximately 1,070–1,094 ft above mean sea level (amsl) (Figure 2-3). Topographic relief at NACA Test Area is low, with most of the relief occurring at the east end of the AOC. The area of the crash strip is level. Hinkley Creek is south of the AOC and a tributary to Hinkley Creek runs through the center of the AOC, west of the crash barrier.

NACA Test Area is located on the eastern boundary of the Lavery Till and the western boundary of the younger Hiram Till glacial deposits (Figure 2-4). The primary soil types found at NACA Test Area are the Mahoning silt loam (2–6% slopes) in the eastern half of the AOC and the Fitchville silt loam series in the western half of the AOC. Mahoning silt loam is a gently sloping, poorly drained soil formed in silty clay loam or clay loam glacial till, generally where bedrock is greater than 6 ft below ground surface (bgs). The Mahoning silt loam has low permeability, with rapid runoff and seasonal wetness. The Fitchville silt loam series (0–2% and 2–6% slopes) is a somewhat poorly drained, gently sloping silt loam to silty clay loam formed from glaciolacustrine deposits (USDA 2010).

The bedrock formation at NACA Test Area is the Pennsylvanian age Pottsville Formation, Sharon Sandstone member, informally referred to as the Sharon Conglomerate (Figure 2-5) (Winslow and White 1966). The Sharon Sandstone Member, the lowest unit of the Pottsville Formation, is a highly porous, loosely cemented, permeable, cross-bedded, frequently fractured and weathered orthoquartzite sandstone, which is locally conglomeratic. The Sharon Conglomerate exhibits locally occurring thin shale lenses in the upper portion of the unit.

Twelve groundwater monitoring wells were installed in 2004 at NACA Test Area during the Characterization of 14 AOCs (MKM 2007) and were screened in the unconsolidated overburden. Initial depths to groundwater encountered during well installation varied from 5.5–23 ft bgs. Monitoring wells at the AOC ranged in completion from 18–27 ft bgs. One additional well (NTAmw-119) was installed in 2012 into the deeper unconsolidated aquifer zone, paired with well NTAmw-109 to assess the vertical extent of groundwater (EQM 2012). All monitoring wells have groundwater elevations collected under the Facility-Wide Groundwater Monitoring Program (FWGWMP).

The potentiometric surface of the AOC from the January 2010 monitoring event is shown in Figure 2-3. The estimated groundwater flow directions reflect the January 2010 facility-wide potentiometric data presented in the *Facility-Wide Groundwater Monitoring Program Report on the January 2010 Sampling Event* (EQM 2010). Water level elevations at the AOC had a range of 1,067.38–1,090.10 ft amsl (0.33–15.66 ft bgs). The potentiometric surface shows the groundwater flow pattern to the southwest toward Hinkley Creek. The hydraulic gradient ranges from 0.00278 ft/ft in the western portion of the AOC to 0.0297 ft/ft in the eastern portion of the AOC.

Several perennial surface water features are present within the AOC or in the immediate vicinity. The main surface water features include a large pond at the north-central portion of the AOC; a tributary

flowing north to south through the middle of the AOC to Hinkley Creek; and an approximate 40- by 45-ft reservoir located southeast of the former crash barrier that was excavated for water, presumably for fire control during NACA operations from 1947–1953. A water body west of the crash strip and concrete pad is a product of an Army excavation in 1969 to investigate the Suspected Mustard Agent Burial Site (USACE 2015).

Surface water is the primary migration pathway for contamination to exit the AOC, flowing through ditches or surface water drainage features toward Hinkley Creek. Most surface runoff flows overland to the center of the AOC into the tributary to Hinkley Creek.

2.2.3 Aggregates

The Phase I RI Report (USACE 2001) separated NACA Test Area into eight functional areas to organize and track sampling efforts. These functional areas were based on site characteristics, operational data, available maps, and historical aerial photographs. The Phase II RI Report (USACE 2016) incorporated new information and reassessed separating varying areas within the AOC. This new assessment accommodated for additional samples collected beyond the Phase I RI sampling footprint. Accordingly, NACA Test Area data were aggregated for evaluating contaminant nature and extent, human health, and the environment. Spatial aggregates established for this evaluation are discussed below and are presented in Table 2-1 and Figure 2-6.

Soil aggregates for NACA Test Area include the (1) Former Crash Area, (2) Former Plane Burial Area, and (3) Former Plane Refueling/Crash Strip Area. In addition to these aggregates, the Crash Area Well Pit was evaluated as a potential hot spot because of its isolated nature and historical function as part of the fire suppression infrastructure.

Sediment and surface water were subdivided into four spatial aggregates for this report: (1) Tributary to Hinkley Creek, (2) Wetland/Pond North of the Former Crash Area, (3) Former Crash Area Reservoir, and (4) Off-AOC.

Table 2-1. NACA Test Area Aggregate Names and Description

| Aggregate Name | Media | Description and Notes |
|---|-------------------------|--|
| Former Crash Area | Soil | Combination of Phase I RI Functional Area 1: Crash Area and Functional Area 4: Ditches Flowing from the Crash Strip. The samples identified as surface soil/dry sediment for the ditches flowing from the Crash Area in the Phase I RI Report have been incorporated into the surrounding Former Crash Area spatial aggregate. |
| Former Plane Burial Area | Soil | Same as Phase I RI Functional Area 2: Plane Burial Area. |
| Former Plane Refueling/Crash Strip Area | Soil | Same as Phase I RI Functional Area 3: Plane Refueling/Crash Strip Area. |
| Wetland/Pond North of Former Crash Area | Sediment, Surface Water | Wetland/pond north of NACA Test Area. |
| Tributary to Hinkley Creek | Sediment, Surface Water | Tributary traversing through the middle of NACA Test Area. |
| Former Crash Area Well Pit | Soil | Same as Phase I RI Functional Area 5: Crash Area Well Pit. Media reclassified as surface soil since this location is only intermittently wet. |
| Former Crash Area Reservoir | Sediment, Surface Water | Same as Phase I RI Functional Area 6: Crash Area Reservoir. |
| Off-AOC | Sediment, Surface Water | Evaluation of a drainage ditch sample collected during the Phase I RI upstream of NACA Test Area. |

AOC = Area of Concern.

NACA = National Advisory Committee on Aeronautics.

RI = Remedial Investigation.

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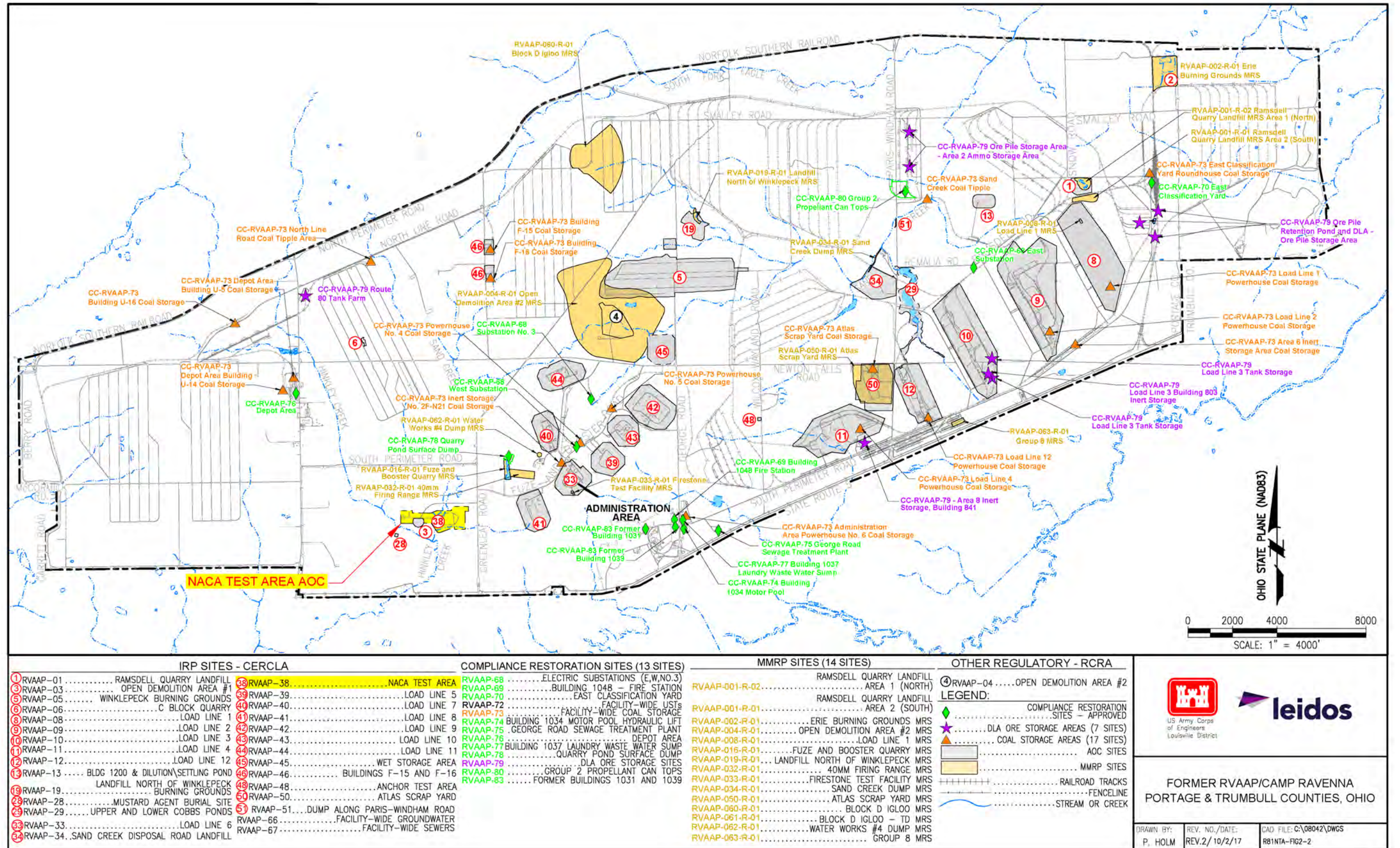


Figure 2-2. Location of NACA Test Area within Camp Ravenna

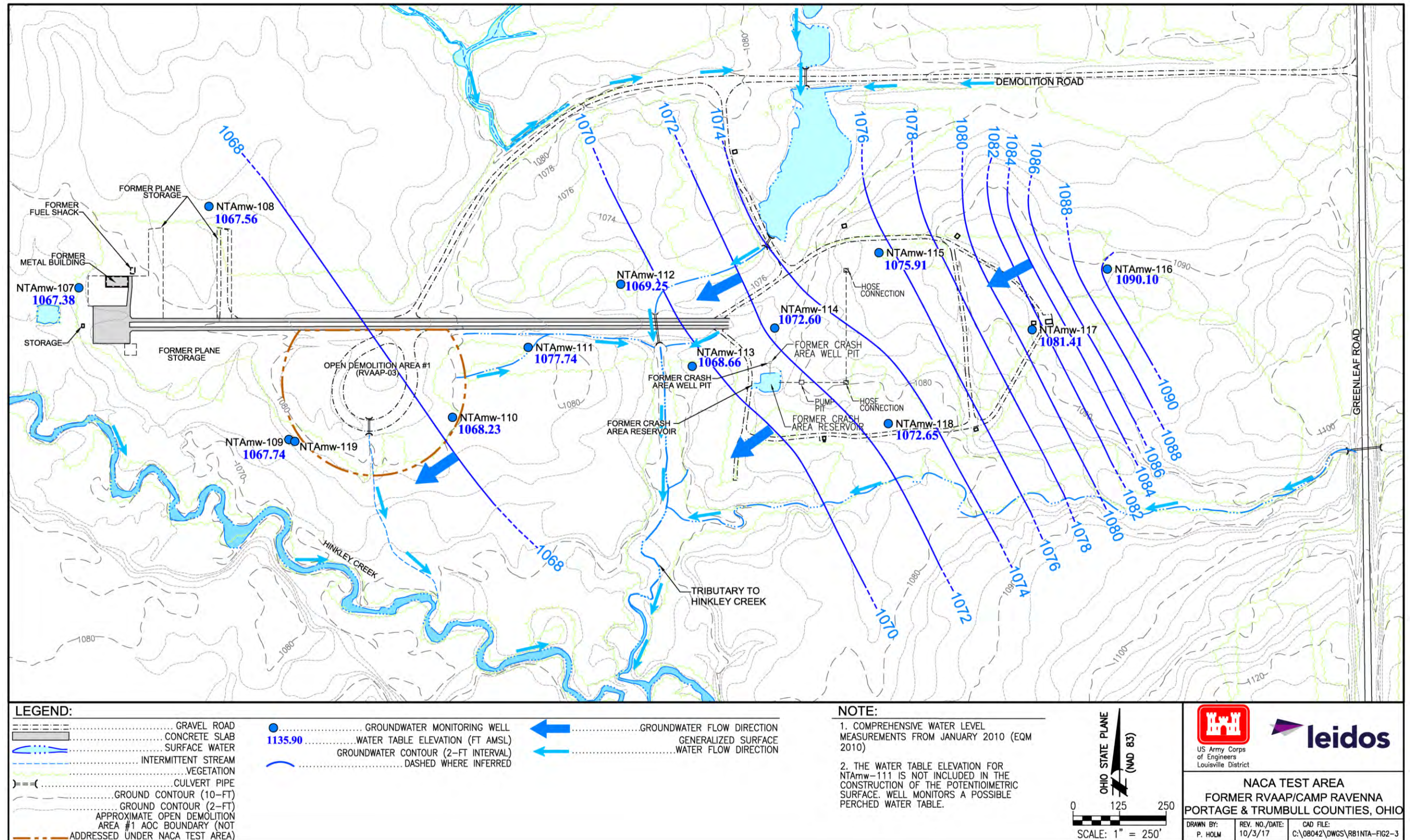


Figure 2-3. Site Features of NACA Test Area

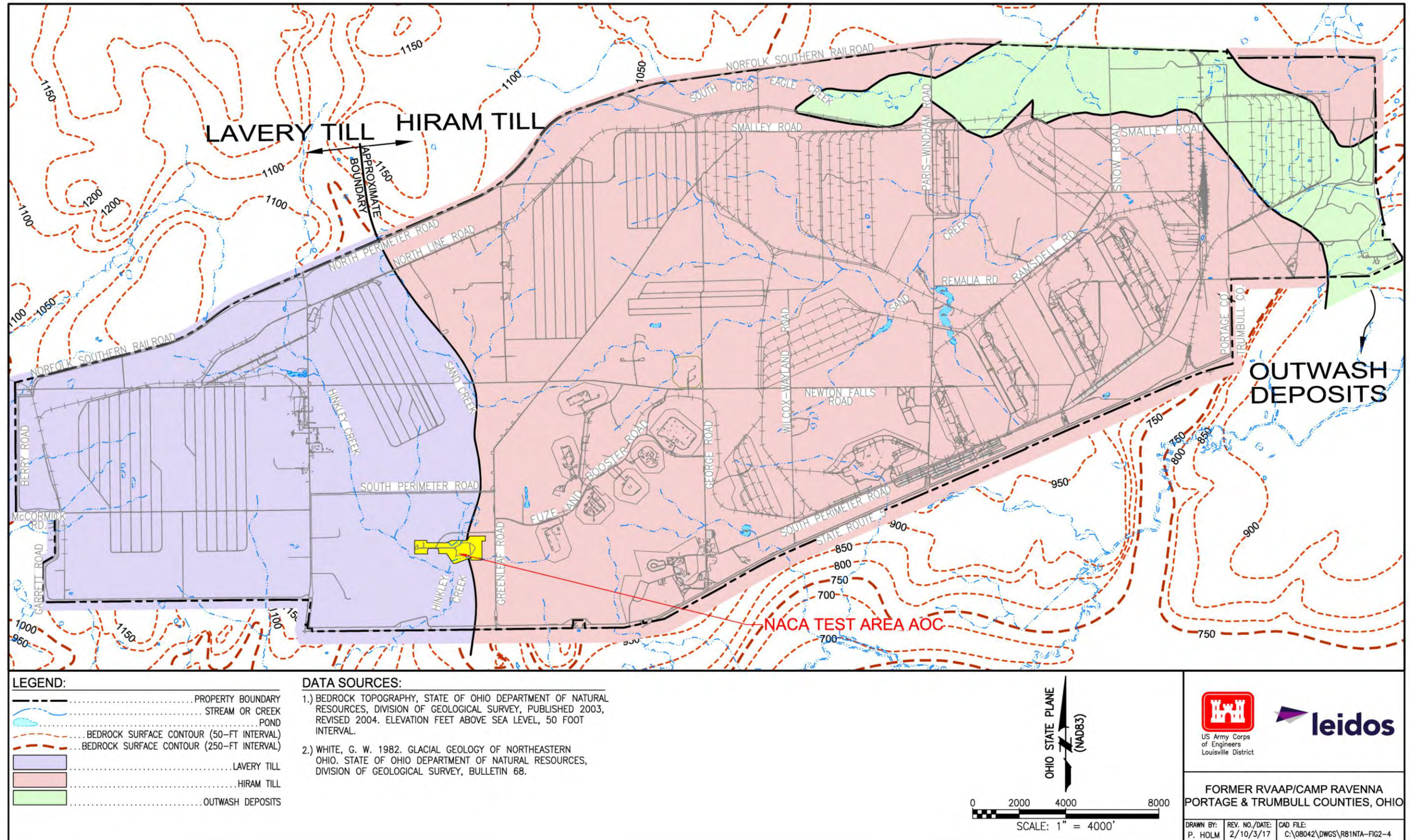


Figure 2-4. Geologic Map of Unconsolidated Deposits on Camp Ravenna

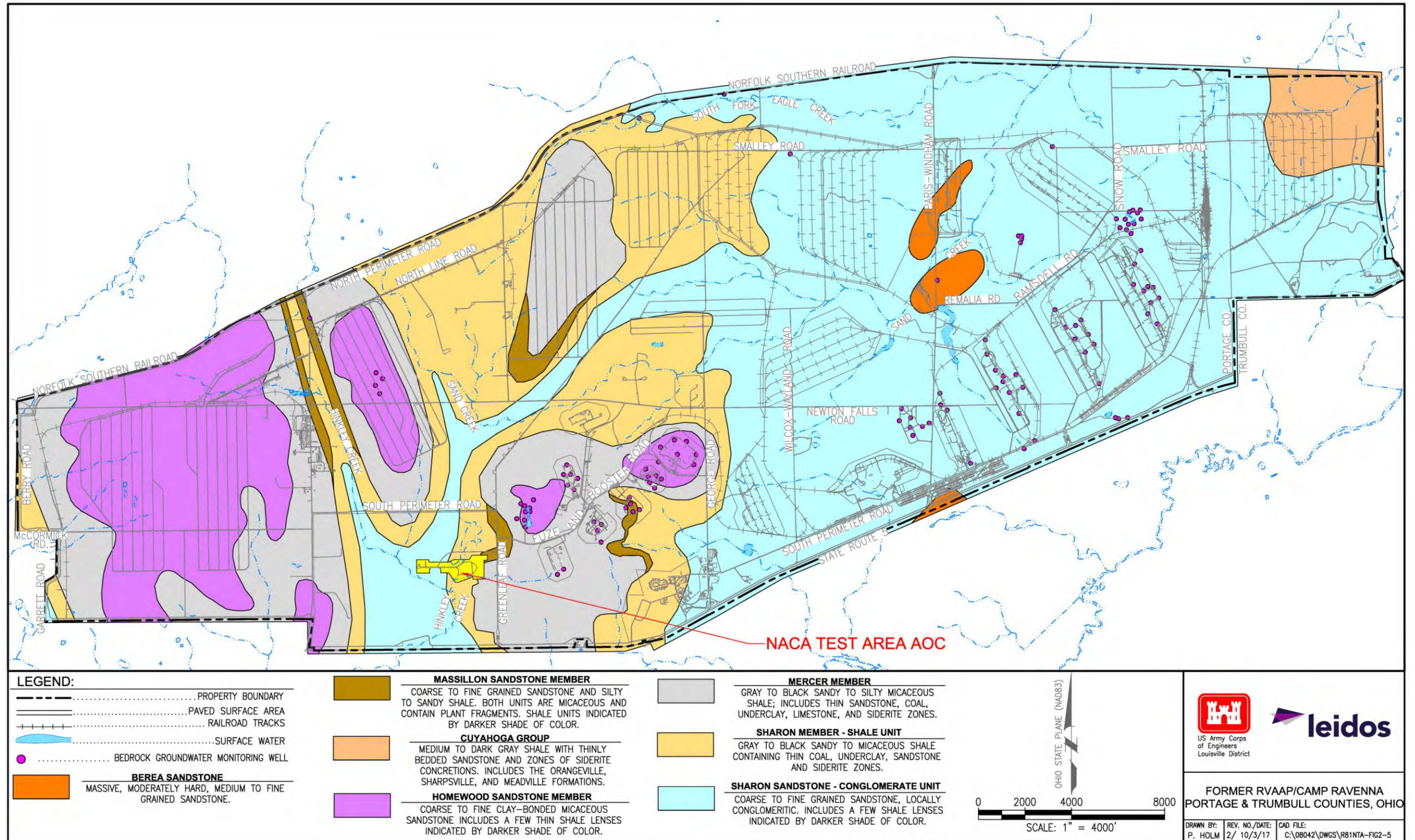


Figure 2-5. Geologic Bedrock Map and Stratigraphic Description of Units on Camp Ravenna

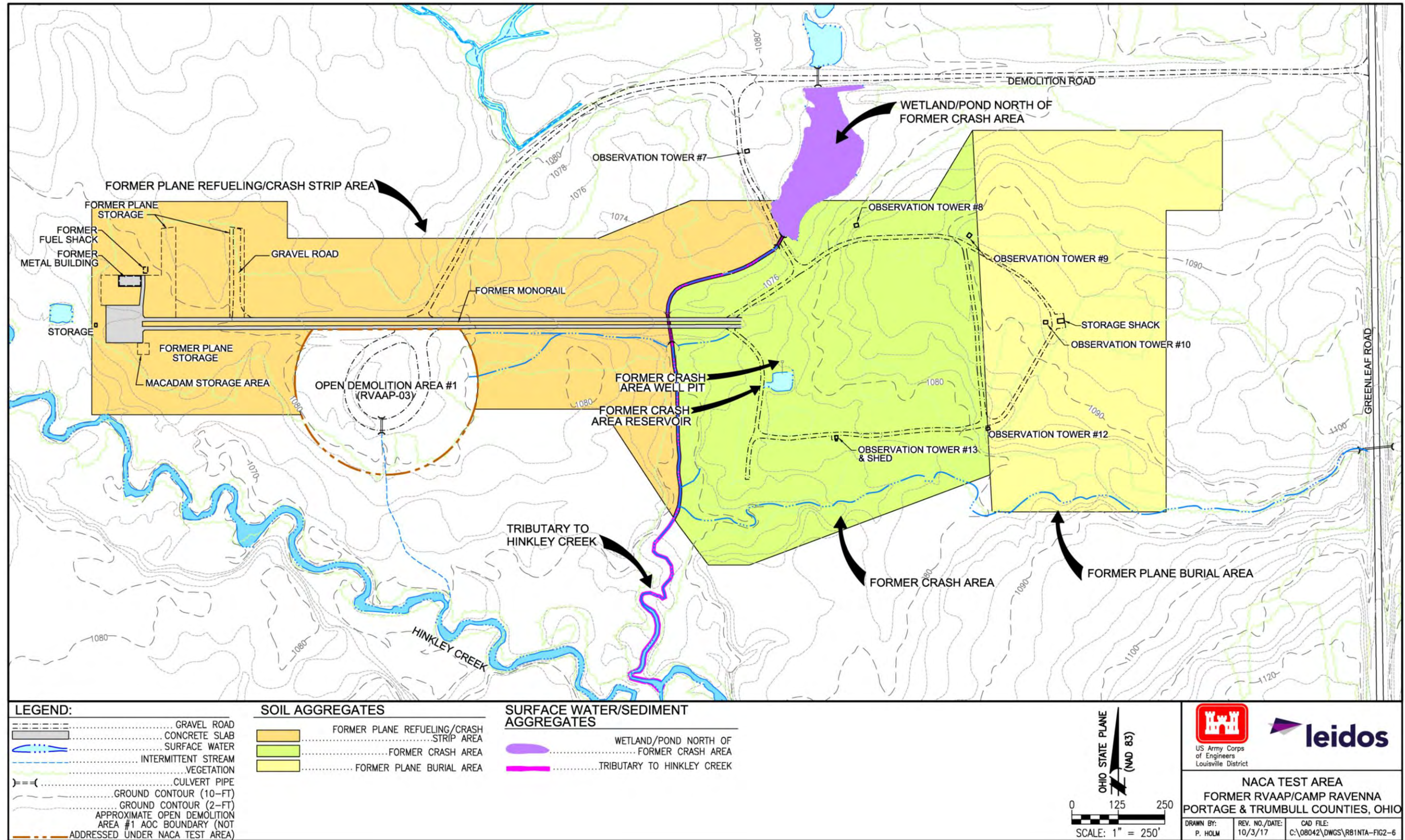


Figure 2-6. NACA Test Area Spatial Aggregates

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3.0 PROJECT ORGANIZATION

The overall project organization and responsibilities for implementation of the project are presented in the Project Management Plan (Leidos 2015). Key personnel and subcontractors implementing this SAP Addendum are listed in Table 3-1. The functional responsibilities of these key personnel are described in Section 3.0 of the FWFSP.

Table 3-1. Project Organization for SAP Addendum

| Position | Personnel |
|----------------------------------|--|
| Leidos Project Manager | Jed Thomas, P.E., PMP |
| Leidos QA/QC Officer | Kimberly Murphree |
| Leidos Health and Safety Officer | Steve Lowery, CIH |
| Leidos Laboratory Coordinator | Rita Schmon-Stasik |
| Leidos Field Operations Manager | Amanda Sprinzl, P.G. |
| Leidos Field Personnel | Jeffrey Warren Heather Adams, P.G. Richard Sprinzl, P.E. Ryan Laurich Elias Rogatz |
| Analytical Laboratory Services | CT Laboratories |
| Drilling Services | Frontz Drilling, Inc. |
| Waste Disposal Services | EQ |

CIH = Certified Industrial Hygienist.

P.E. = Professional Engineer.

P.G. = Professional Geologist.

PMP = Project Management Professional.

QA/QC = Quality Assurance/Quality Control.

SAP = Sampling and Analysis Plan.

TBD = To Be Determined.

Note: Subcontractors are subject to change if delays occur prior to field mobilization

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4.0 SCOPE AND OBJECTIVES

This SAP Addendum has been developed to provide the detailed procedures and sampling plan to be completed at NACA Test Area to supplement the Phase II RI and address Ohio EPA's data gap concerns.

4.1 PROJECT SCOPE AND OBJECTIVES

The primary scope and objectives of this supplemental investigation are to:

- Further investigate the area within NACA Test Area that potentially was used for plane burial,
- Evaluate polycyclic aromatic hydrocarbon (PAH) chemicals of concern (COCs) beneath the concrete in the crash strip,
- Evaluate potential lead contamination in groundwater associated with the production well,
- Evaluate sediment in the Former Crash Area Reservoir, and
- Collect samples to define the extent of PAH contamination around historical sample locations NTA-083 and NTA-120.

Data generated from this supplemental investigation will be incorporated into the next version of the Phase II RI Report that will be submitted to Ohio EPA for review.

4.2 PROPOSED SAMPLING SUMMARY

A summary of the proposed sampling is provided in Table 4-1 and the subsections below.

4.2.1 Former Plane Burial Area Investigation

Unsubstantiated historical records indicate that planes were bulldozed and buried at the eastern end of the AOC within the aggregate identified at the Former Plane Burial Area. As resolved with Ohio EPA, additional subsurface investigation will be performed to further assess the potential buried debris and collect chemical data to determine if CERCLA risk resulted from this potential former burial.

Figure 4-1 presents an aerial photograph from 1950, which is during NACA Test Area operations, and the targeted area to perform a geophysical investigation. Figure 4-2 presents an aerial photograph from 2012 to provide context of what will be surveyed relative to current site conditions.

The geophysical investigation will be conducted to determine if and where materials may have been buried. Results of the geophysical investigation will be used to determine the location of soil sampling and analysis to conservatively assess chemical contamination and potential risk. The steps to conduct this assessment are listed below and include:

- Step 1: Perform geophysical investigation
 - Perform a geophysical investigation targeting the area identified as the “Target Geophysical Investigation Area” in Figure 4-2 to determine if buried material is present.
 - Move identified surface debris to a location specified by the Army within NACA Test Area.
- Step 2: Install six soil borings using a Geoprobe® to determine if chemical contamination is present.
 - The boring locations shown in Figure 4-2 are located at potential target areas where debris is observed on the surface. Boring locations may be moved if the geophysical investigation suggests a different sample location to conservatively assess risk within this area.
 - Additional locations may be selected if there are indications of potential burial and/or to further assess sampled locations to a greater depth.
- Step 3: Collect samples and conduct laboratory analysis.
 - Collect samples from 0–1, 1–4, 4–7, and 7–13 ft bgs per sampling scheme approved in the Performance-Based Acquisition (PBA)08 SAP (USACE 2009). Field decisions will be made if additional samples within a boring should be collected if there is noticeable difference in soil (i.e., staining).
 - Analyze samples for metals, semi-volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs) (potential component of hydraulic fluid).

4.2.2 Crash Strip Concrete Subsurface

Based on the results presented in the Phase II RI, contamination was identified in the Former Plane Refueling/Crash Strip Area requiring remediation. Activities in this area (i.e., crashing and burning planes and fuel) are a potential source of the PAH contamination in this area. To address Ohio EPA’s concerns about the extent of contamination beneath the concrete crash strip that was not previously sampled and to help refine the extents of contamination requiring remediation, the following supplemental investigation activities will be completed:

- Core eight holes into the concrete crash strip. These six cores are adjacent to target areas recommended for removal at the locations presented in Figure 4-3.
- Collect samples from 0–1 and 1–4 ft intervals below bottom of concrete. After sample collection, the sample locations will be backfilled with bentonite and the cored holes will be repaired with concrete.
- Analyze the samples for benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These chemicals are the target COCs for the Crash Strip Area.

4.2.3 Groundwater in Production Well

The Former Production Well aggregate contains a production well approximately 35 ft north of the Former Crash Area Reservoir, shown in Figure 4-4. The production well is 6 inches in diameter and approximately 78 ft deep and is located within an approximately 3.5-ft high by 3.8-ft wide by 3.8-ft wide well pit, shown in Photographs 4-1 and 4-2.



Photograph 4-1. Well Pit (Covered)



Photograph 4-2. Well Pit (Internal)

A sediment sample was collected from the well pit during the 1999 Phase I RI. The Phase II RI identified the sediment as requiring remediation due to the high concentration of lead (13,200 mg/kg) within the well pit. To address Ohio EPA's concerns that the sediment may have impacted the groundwater at this single location, the following supplemental investigation will be completed to determine the lead concentration in groundwater:

- Collect one groundwater sample (filtered and unfiltered) from the production well following the micro-purging procedures presented in Section 5.4.4.2 of the FWFSP (Figure 3-3), and
- Analyze the groundwater sample for lead.

4.2.4 Sediment in Former Crash Area Reservoir

Ohio EPA requested sediment samples be collected from the Former Crash Area Reservoir (as shown in Figure 3-3). Three samples will be collected from a boat using a Ponar/Ekman Sampler, as presented in Section 5.6.2.2.2 of the FWFSP. The sediment samples will be analyzed for metals, SVOCs, explosives, propellants, volatile organic compounds (VOCs), PCBs, and pesticides. These chemicals are identified as primary chemicals of potential concern (COPCs) at NACA Test Area per the Phase I RI.

4.2.5 Surface Soil at Previous Locations NTA-083 and NTA-120

The Phase II RI Report (USACE 2016) provided results from surface soil (0–1 ft bgs) samples at locations NTA-083 and NTA-102 with PAH concentrations exceeding the screening levels. To further evaluate these historical surface soil sample results and determine if a remedial action is warranted for the area north of the former fuel shack, the following additional investigation will be conducted:

- Collect 11 discrete surface soil samples (0–1 ft bgs) from a sampling grid at and around historical samples NTA-083 and NTA-120. This includes a re-collection of surface soil at

locations NTA-083 and NTA-120. The sampling grid is presented in Figure 4-4. Samples will be collected in accordance with the PBA08 SAP and Section 5.6.2.1.1 of the FWFSP.

- Analyze the samples for benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These chemicals are the target COCs for the Former Crash Strip Area.

4.3 PHASE II RI ASSESSMENT OF RESULTS

A sampling summary and results of the sampling conducted will be incorporated into the revised Phase II RI Report. The following subsections discuss how the results will be assessed within the human health risk assessment (HHRA), ecological risk assessment (ERA), and contaminant fate and transport assessment.

4.3.1 Human Health Risk Assessment

The HHRA will be updated to address each aggregate and the new samples collected. The new sample results will be evaluated on a sample by sample basis to assess potential risk.

4.3.2 Ecological Risk Assessment

No changes are expected for the ERA associated with the Former Plane Burial Area, as samples from 0–1 ft bgs were previously assessed in this aggregate, or the area associated with the Crash Strip, as the samples collected in this area are below the 0–1 ft bgs exposure evaluated for ecological risk.

For the sediment in the Former Crash Area Reservoir and soil at the previous locations NTA-083 and NTA-120, an initial qualitative assessment will be performed on the results to assess if impacts or further work in the ERA is warranted.

4.3.3 Contaminant Fate and Transport

An initial assessment of results will be performed. This initial assessment will compare newly acquired data with data previously used in the fate and transport assessment of the Phase II RI Report. If the new data have a significantly higher concentration than what were used in the Phase II RI Report, the fate and transport analysis will be revised to conservatively assess the sample's potential impact to groundwater.

Table 4-1. Proposed Sampling Locations at NACA Test Area

| Sample Location | Easting | Northing | Sample Type (ft bgs) | Analytes |
|--|----------------|-----------------|---|--|
| <i>Former Plane Burial Area Investigation</i> | | | | |
| NTA-150 | 2348007.85 | 551799.84 | Discrete Soil Composite Intervals: 0-1, 1-4, 4-7, and 7-13 | metals, SVOCs, PCBs |
| NTA-151 | 2348067.62 | 551820.09 | | |
| NTA-152 | 2348234.32 | 551847.21 | | |
| NTA-153 | 2348272.53 | 551855.19 | | |
| NTA-154 | 2348279.82 | 551770.17 | | |
| NTA-155 | 2348281.94 | 551698.82 | | |
| <i>Crash Strip Concrete Subsurface</i> | | | | |
| NTA-156 | 2345589.97 | 551620.73 | Discrete Soil Composite Intervals: 0-1 and 1-4 | PAHs [benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene] |
| NTA-157 | 2345589.97 | 551596.10 | | |
| NTA-158 | 2345921.29 | 551621.71 | | |
| NTA-159 | 2345921.29 | 551597.23 | | |
| NTA-160 | 2346220.11 | 551621.35 | | |
| NTA-161 | 2346220.11 | 551596.90 | | |
| NTA-162 | 2346420.56 | 551621.35 | | |
| NTA-163 | 2346420.56 | 551596.90 | | |
| <i>Groundwater in Production Well</i> | | | | |
| Production Well | 2347290.26 | 551498.48 | Groundwater | Lead (filtered and unfiltered) |
| <i>Sediment in Former Crash Area Reservoir</i> | | | | |
| NTA-173 | 2347276.46 | 551457.00 | Sediment Grab 0-0.5 | metals, SVOCs, explosives, propellants, VOCs, PCBs, pesticides |
| NTA-174 | 2347306.15 | 551449.00 | | |
| NTA-175 | 2347281.93 | 551433.00 | | |
| <i>Surface Soil at Previous Locations NTA-083 and NTA-120</i> | | | | |
| NTA-083 | 2345603.00 | 551801.00 | Discrete Soil Composite Interval: 0-1 | PAHs [benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene] |
| NTA-120 | 2345594.00 | 551802.76 | | |
| NTA-164 | 2345575.39 | 551813.78 | | |
| NTA-165 | 2345595.39 | 551813.78 | | |
| NTA-166 | 2345575.39 | 551793.78 | | |
| NTA-167 | 2345615.39 | 551813.78 | | |
| NTA-168 | 2345575.39 | 551793.78 | | |
| NTA-169 | 2345595.39 | 551793.78 | | |
| NTA-170 | 2345615.39 | 551793.78 | | |
| NTA-171 | 2345575.39 | 551773.78 | | |
| NTA-172 | 2345595.39 | 551773.78 | | |

bgs = Below Ground Surface.

ft = Feet.

NACA = National Advisory Committee on Aeronautics.

PAH = Polycyclic Aromatic Hydrocarbon.

PCB = Polychlorinated Biphenyl.

SVOC = Semi-Volatile Organic Compound.

VOC = Volatile Organic Compound.

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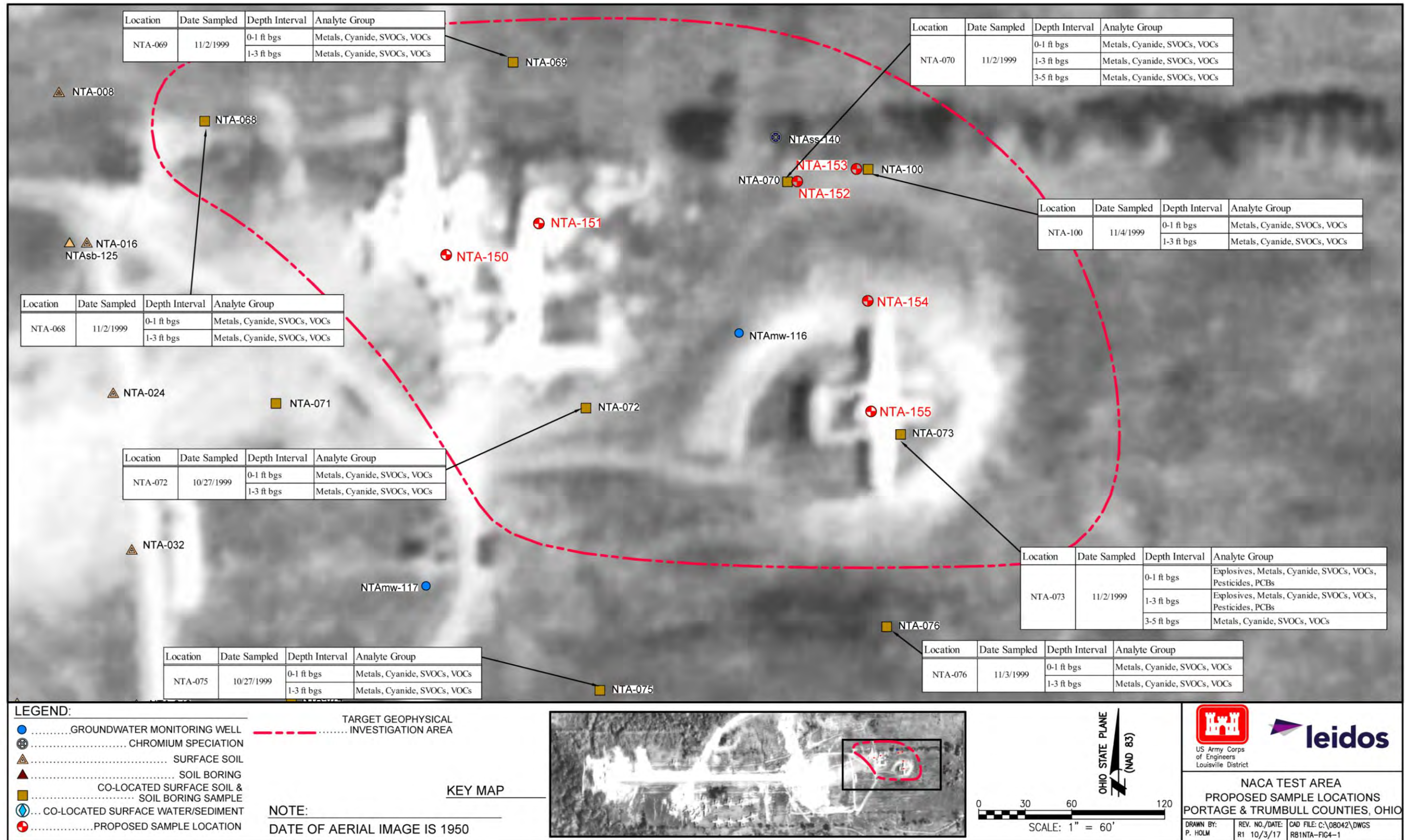


Figure 4-1. Proposed Sample Locations and Geophysical Area for the Suspected Plane Burial Area (1950 Aerial Photograph)

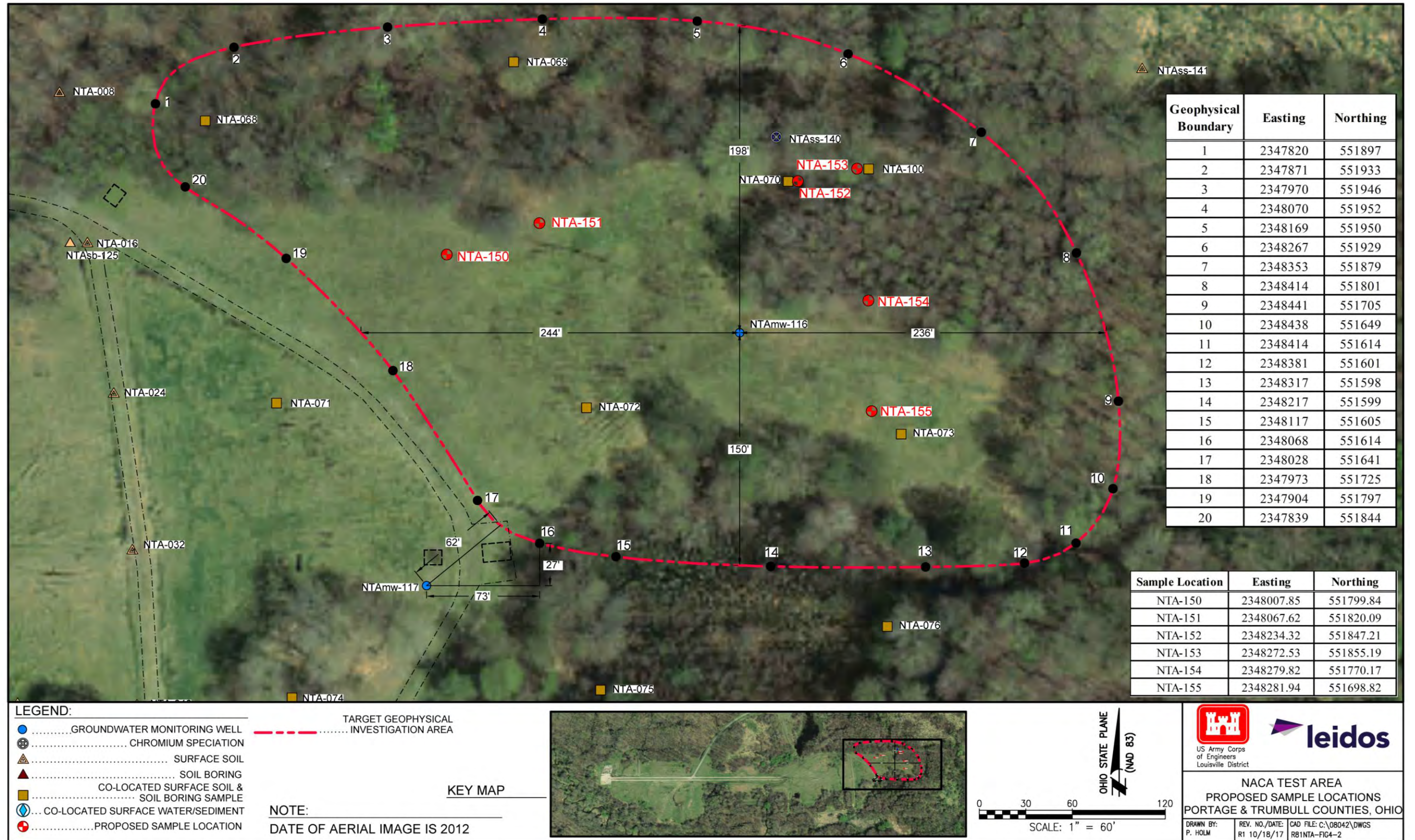


Figure 4-2. Proposed Sample Locations and Geophysical Area for the Suspected Plane Burial Area (2012 Aerial Photograph)

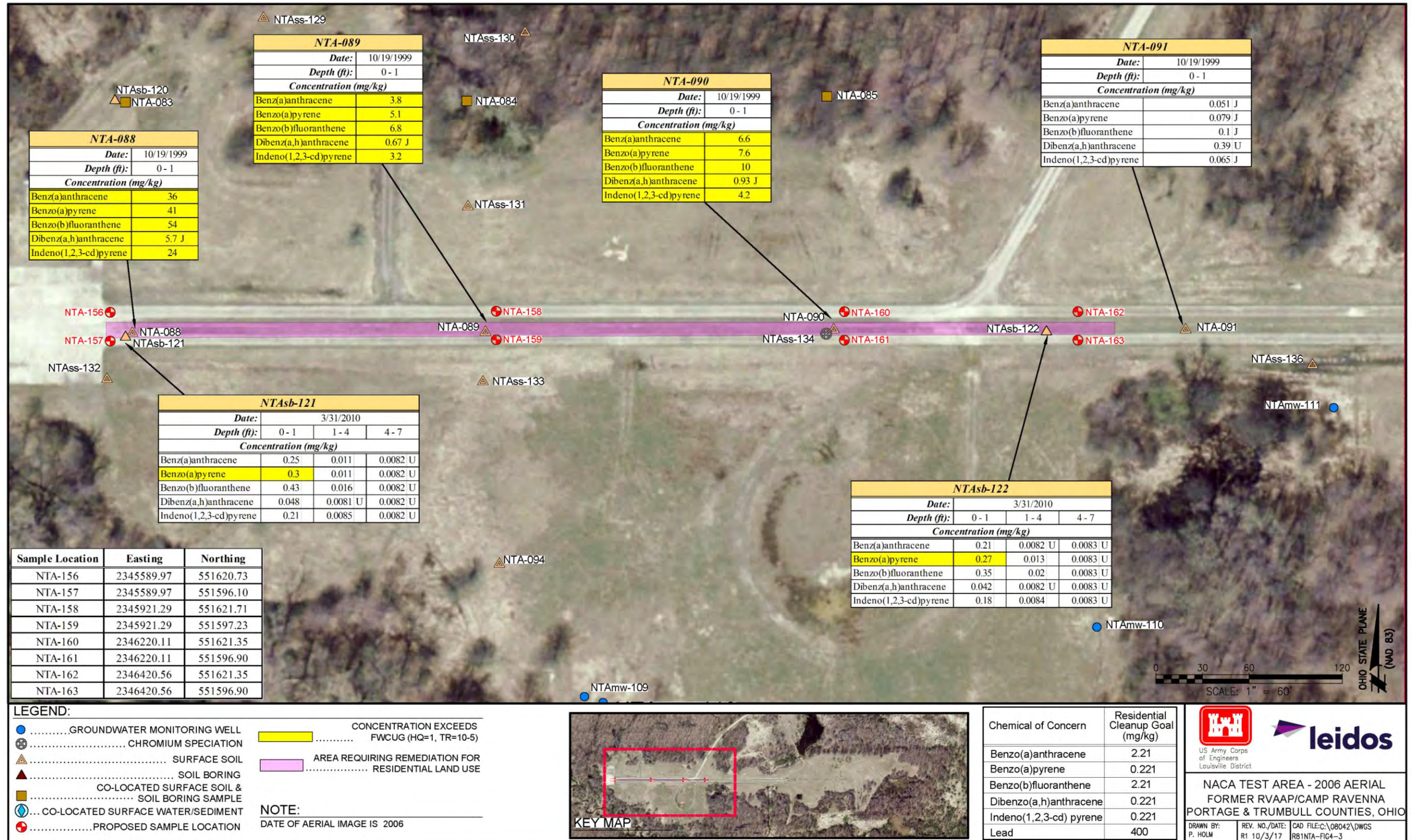


Figure 4-3. Proposed Sample Locations for the Runway Subsurface

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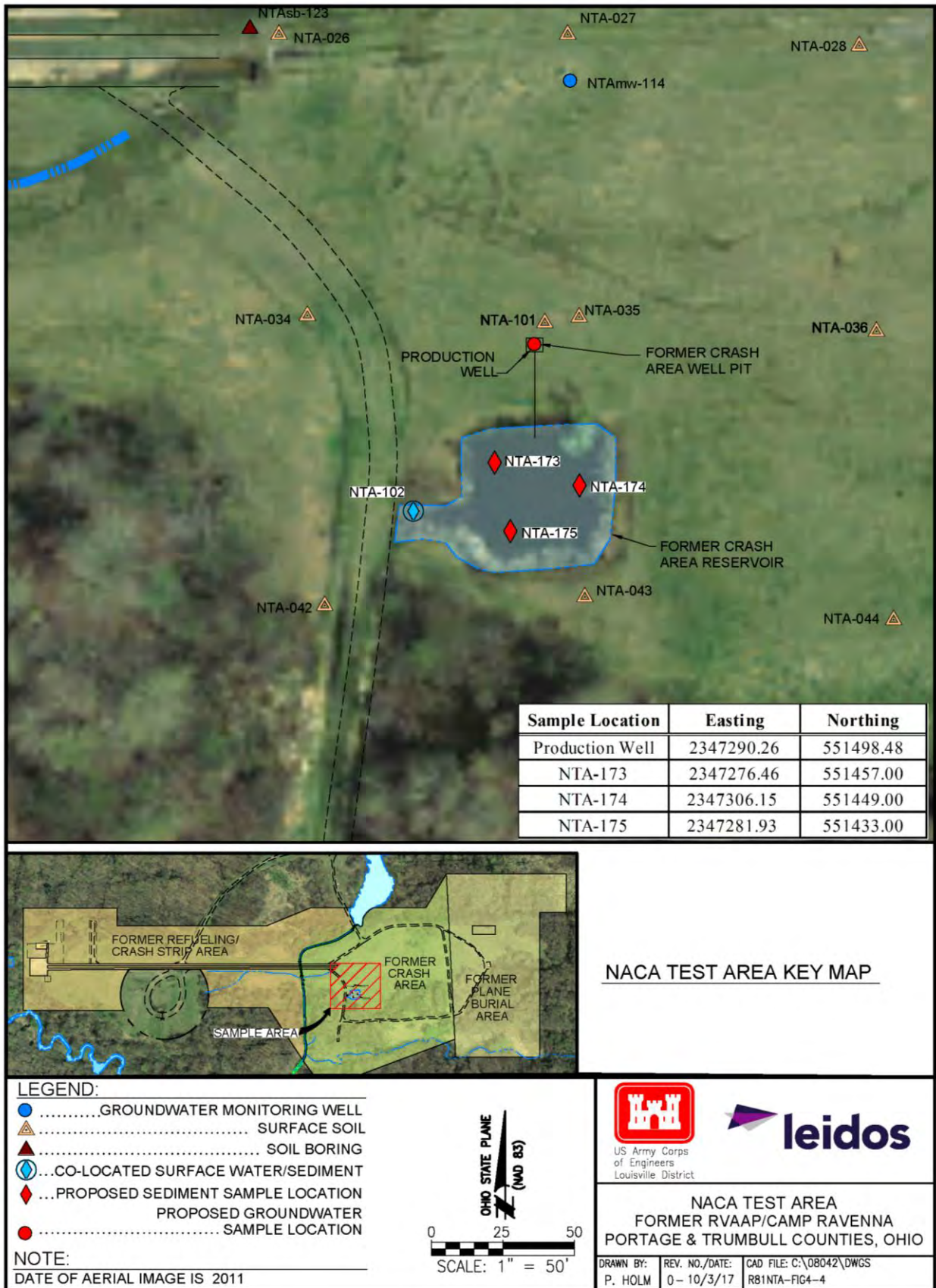


Figure 4-4. Proposed Sample Locations for the Crash Area Reservoir and Production Well

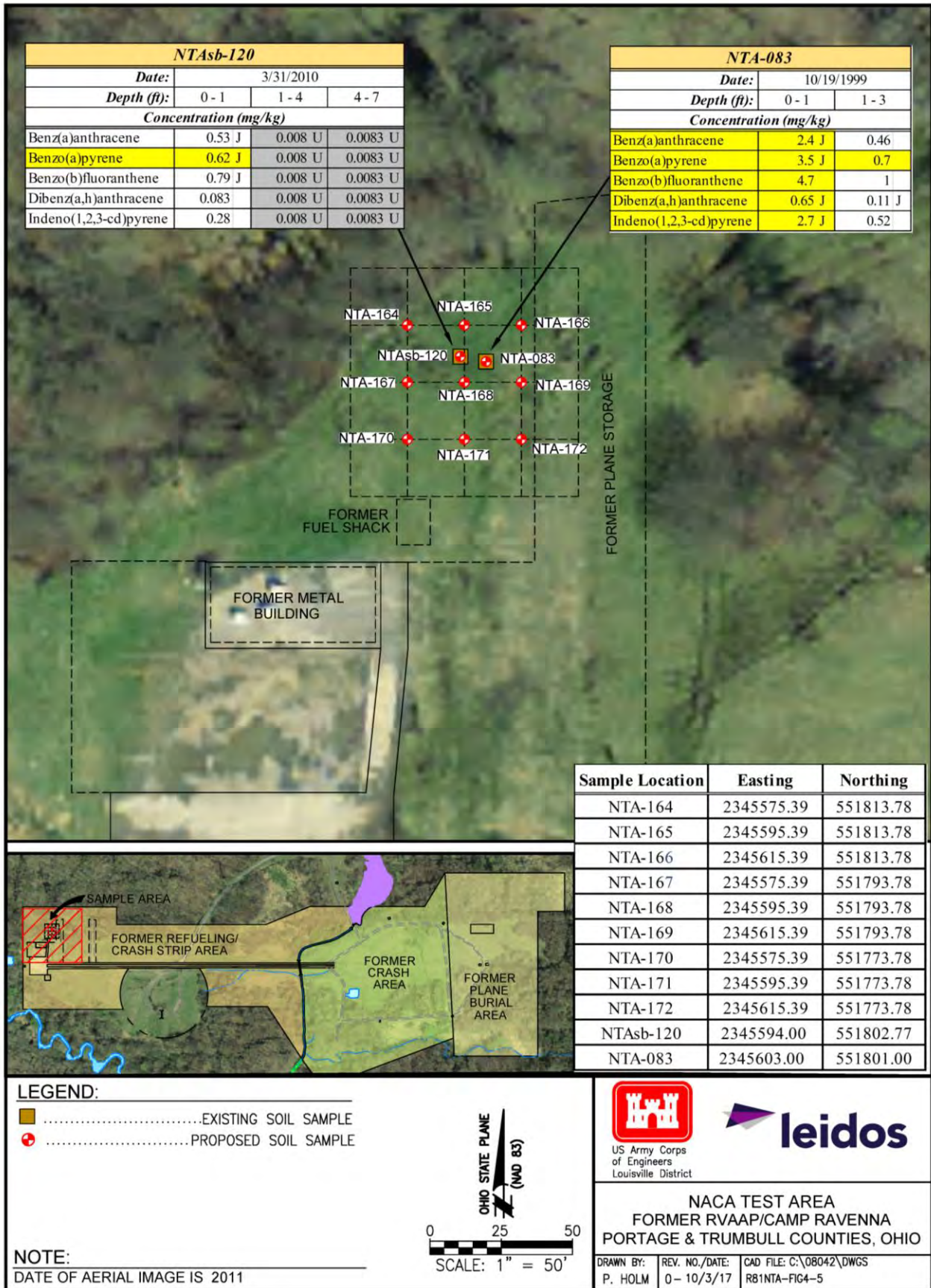


Figure 4-5. Proposed Sample Locations for Previous Locations NTA-083 and NTA-120

5.0 FIELD ACTIVITIES

All field activities and sampling procedures will be accomplished in accordance with Section 5.0 of the FWFSP. Where changes or unique elements not addressed in the FWFSP have been identified, they are provided in this FSP Addendum. The general rationale for sample types, depths, quantities, locations, and parameters to be analyzed is provided in Section 4.2.

Samples will be analyzed only for those chemicals presented in Table 4-1 and the QAPP Addendum. Samples will not be analyzed for the RVAAP full suite of parameters, as NACA Test Area has previously undergone full suite analyses under other investigations. The QAPP Addendum also identifies required quality assurance (QA)/quality control (QC) samples to be collected and sample container preservation requirements.

Equipment decontamination will be conducted prior to use in accordance with the FWFSP. All non-dedicated equipment will be decontaminated at the completion of sampling activities at each sampling location. A final decontamination inspection of any equipment leaving Camp Ravenna at the end of field activities will be conducted to ensure proper decontamination.

5.1 GEOPHYSICS

The primary objective of the geophysical survey is to determine the presence and location of buried debris within the Former Plane Burial Area aggregate, if present. Since it is unknown if plane material is buried, a multi-phase geophysical investigation will be conducted. Geophysical technologies will include electromagnetic (EM) metal detection using EM31 and EM61, as described in the following subsections.

Prior to initiating the geophysical survey, a local grid will be prepared using measuring tapes and/or differential global positioning system (DGPS) based on the investigation area established in Figure 4-2. Geophysical survey traverses will be identified with temporary markings as appropriate. There may be limitations of the extent of the geophysical investigation due to the wooded area and brush in the “Target Geophysical Investigation Area”; however, reasonable attempts will be made to conduct the investigation in this entire area. The goal of identifying sample locations to conservatively assess risk in the Former Plane Burial Area aggregate should be met even if the geophysical location only extends to within the tree lines.

All geophysical instruments and equipment used to gather and generate field data will be calibration-checked with sufficient frequency and in such a manner that accuracy and reproducibility of the results are consistent with the manufacturer’s specifications. Calibration, repair, or replacement records will be filed and maintained by the Geophysical Survey Team Leader. Testing records of the field instrumentation will be archived with the project folder after the fieldwork has been completed.

5.1.1 EM61-MK2 Survey

The EM61-MK2 (high-sensitivity metal detector) uses time domain theory to search for both ferrous and non-ferrous buried metal objects. The EM61 instrument consists of a 3- by 1.5-ft EM transmitter and receiver coil on a wheel-mounted assembly. The EM61-MK2 generates 150 EM pulses per second and measures during the off-time between each pulse. During each EM pulse, secondary EM fields are induced in earth materials and in any buried metallic objects that are present. In general, the EM61-MK2 allows for the response from the earth materials to dissipate and subsequently measures the prolonged buried metal response.

The EM61-MK2 has a focused footprint of measurement that provides high-resolution data to an effective depth of 10 ft below grade level depending on the size of the metal mass. This unit is well-suited to detect metallic utilities and buried metallic debris in the near subsurface. Data are typically collected along traverses nominally spaced 3 ft apart and will be integrated with DGPS for position correlated data.

5.1.2 EM31-MK2 Survey

Due to the concern that there is the potential for features of interest at depths greater than 10 ft bgs, A EM31-MK2 terrain conductivity meter survey will be used to compliment the EM61-MK2 survey.

The EM31-MK2 (terrain conductivity meter) consists of a 12-ft-long boom configured with a transmitter and receiver coil and uses frequency domain theory to measure the apparent conductivity of subsurface material. An audio frequency alternating current is applied to the transmitter coil, causing the coil to radiate an alternating primary EM field. The receiver coil measures the resultant effect of both primary and secondary fields. By comparing the signal at the receiver to that at the transmitter, the instrument records the components of the secondary field in-phase, which is a gross measure of the presence of buried ferrous metal debris. It also measures the components of the 90 degrees out of phase (quadrature) with the primary field, which translates to terrain conductivity. By comparing the two response measurements, a qualitative assessment of subsurface materials can be made.

The EM31-MK2 has an effective depth of investigation of 18 ft bgs; however, the data resolution is not as refined as the EM61MK2. These data would be effective in identifying large metal masses at greater depths than the EM61MK2 or other non-native fill materials, if present.

EM31-MK2 data will be collected at a nominal traverse spacing of 10 ft apart and will be integrated with a DGPS to result in position correlated data.

Data will be gridded and contoured using the Golden Software Surfer contouring package and presented as color-enhanced EM contour maps to evaluate anomalous trends. These data will be presented with a site feature map to provide a more accurate data interpretation. Suspected anomalies will be highlighted with recommendations of refined ground-penetrating radar (GPR) methods, as

appropriate. EM61 EM surveys will be conducted in accordance with Leidos' Geophysical Procedure GP-002, "Electromagnetic Survey."

5.1.3 Geophysical Reporting

The proposed investigation includes standard and/or routinely accepted practices of the geophysical surveying industry. Geophysical surveying uses physical principles; however, by nature, no subsurface survey can be considered completely accurate, and Leidos cannot accept responsibility for inherent survey limitations and/or unforeseen, site-specific conditions. The interpretations of detected subsurface features may differ from interpretations based on other methods.

Preliminary geophysical survey results will be reviewed in the field prior to intrusive activities to identify anomalies and determine optimal locations to collect soil samples. The sample locations will be selected to conservatively assess potential risk within the Former Plane Burial Area aggregate. A summary of the geophysical findings will be included in the results section of the Phase II RI Report.

5.2 SOIL GAS SURVEY

Soil gas surveys are not performed as part of this SAP Addendum.

5.3 UTILITY CLEARANCE

Leidos will request a utility clearance from the Camp Ravenna Environmental Manager and in accordance with Section 5.3 of the FWFSP.

5.4 GROUNDWATER

The single groundwater sample will be collected from the existing production well in accordance with Section 5.4.4.2 of the FWFSP using low-flow sampling techniques. No additional monitoring wells will be installed as part of this field investigation, and the production well will not be developed prior to sampling. The sample will be analyzed for lead (filtered and unfiltered).

Field measurements will be performed in accordance with Section 5.4.3 of the FWFSP and will include the determination of pH, conductivity, dissolved oxygen, turbidity, and temperature.

5.5 SUBSURFACE SOIL

Surface and subsurface soil sampling will be completed under this investigation following the procedures presented below. QA/QC samples will be collected from the sample areas at the frequency listed in the QAPP Addendum. VOC analyses are not required as part of the sampling scheme per this SAP Addendum; therefore, for soil, no special sample procedures for collecting VOCs apply to this investigation. Field instruments (e.g., photoionization detector [PID], flame ionization detector [FID], or X-ray fluorescence [XRF]) will not be used for the measurement of chemical concentrations or biased sample collection during the implementation of this SAP Addendum.

At the Former Plane Burial Area aggregate and Crash Strip concrete subsurface, subsurface soil borings will be completed with Geoprobe® direct-push sampling equipment using a dual-tube sampler with a disposable acetate liner with a diameter of 1.5 inches until groundwater and/or refusal are encountered to a maximum sampling depth of 13 ft below grade. The use of disposable acetate core liners will allow for retrieval and visual observation of undisturbed soil cores during sampling activities. In the event that a sample location cannot be accessed with the Geoprobe®, subsurface soil will be collected using a bucket hand auger. The procedures for bucket hand auger and hydraulic direct-push sampling are discussed in Sections 5.5.2.1.4 and 5.5.2.5.3, respectively, of the FWFSP.

Discrete subsurface samples, from designated intervals provided in Table 4-1, are defined as one boring installed at a discrete location that is sampled at designated depth intervals that are composited prior to containerization for laboratory analysis. The entire sample interval will be placed into a decontaminated stainless steel bowl to be composited or homogenized. The soil placed into the bowl will initially be split into quarters, and each quarter will be mixed thoroughly in the center in the bowl using a stainless steel spoon. All four quarters will be mixed together until the single composite sample has a consistent physical appearance. Upon completion of the compositing process, the sample will be divided in half and containers filled by scooping sample material alternately from each half. Excess soil will be containerized as IDW and boreholes will be abandoned in accordance with Section 5.5.2.9 of the FWFSP.

Downhole drilling equipment will be decontaminated in the field using a phosphate-free detergent wash and potable water rinse between sample locations.

5.6 SURFACE SOIL AND SEDIMENT SAMPLING PROCEDURES

5.6.1 Surface Soil Sampling

Surface soil samples will be collected from a depth of 0–1 ft BGS using discrete sample methods. Parameters to be analyzed and sampling techniques vary by investigation area and the specifics for each are presented in Table 4-1. QA/QC samples will be collected from the sample areas at the frequency listed in the QAPP Addendum.

Surface soil samples collected from 0–to 1 ft BGS will be collected using the bucket hand auger method procedure presented in Section 5.6.2.1.1 of the FWFSP.

5.6.2 Sediment

The samples proposed for the Former Crash Area Reservoir will be collected as single discrete grab samples using a Ponar/Ekman Sampler from a boat, as presented in Section 5.6.2.2.2 of the FWFSP. Parameters to be analyzed are presented in Table 4-1. QA/QC samples will be collected from the sample areas at the frequency listed in the QAPP Addendum. VOC analyses are required, so sediment samples for VOC analyses will be collected as a single grab sample without homogenization.

5.7 SURFACE WATER

No surface water samples will be collected as part of this SAP Addendum.

5.8 OTHER MATRICES

No different matrices other than those presented previously in this section will be sampled.

5.9 MUNITIONS AND EXPLOSIVES OF CONCERN CLEARANCE

Proposed sampling activities at NACA Test Area are not located within munitions response sites (MRSs). However, in the event that MEC is encountered, field staff will follow the “3Rs” for explosives safety (i.e., Recognize, Retreat, Report). If MEC or suspected MEC is encountered, the field staff will not approach, touch, move, or disturb MEC. The field staff will carefully leave the area and immediately report the finding to Range Control at 614-336-6041.

5.10 SAMPLE COLLECTION FOR FIELD AND LABORATORY ANALYSIS

Soil and sediment samples will be logged using the Unified Soil Classification System (USCS) classification.

Sample container and preservation technique requirements will follow those prescribed in Tables 5-1 and 5-2 of the QAPP Addendum.

5.11 FIELD QUALITY CONTROL SAMPLING PROCEDURES

The Field QC Sampling Procedures will follow Section 5.4.7 of the FWFSP and the QAPP Addendum.

5.12 SITE SURVEY

Following sampling activities, the horizontal coordinates of all sampling locations will be determined to within 0.3 meters (1 ft). The ground elevations will be determined at the point of collection to within 0.06 meters (0.2 ft). The coordinates and ground elevation for composited sediment sample areas will be determined from one point within the area.

All locations will be conveyed in Ohio State Plane Coordinates (North American Datum 1983 [NAD83]). The vertical datum for all elevations will be 1929 National Geodetic Vertical Datum (NGVD). All coordinates and elevations will be recorded on the boring logs upon receipt of QA survey results. In addition, electronic results will be provided to USACE and Camp Ravenna in ASCII format.

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6.0 SAMPLE CHAIN OF CUSTODY/DOCUMENTATION

6.1 FIELD LOGBOOK

All field logbook information will follow structures identified in Section 6.1 of the FWFSP. Applicable reporting forms for this investigation are included in Attachment B.

6.2 PHOTOGRAPHS

Information regarding the documentation of photographs is presented in Section 6.2 of the FWFSP. Representative photographs will be taken of the investigative measures during the fieldwork and any significant observations that are made during the field effort. Photographs will be suitable for presentation in a public forum, as well as for documenting scientific information. Attempts will be made when taking photographs to document sampling points to include two or more permanent reference points to facilitate relocating.

6.3 SAMPLE NUMBERING SYSTEM

The sample numbering system that will be used to identify samples collected during the implementation of this FSP Addendum is outlined in Section 6.3 and Figure 6-3 of the FWFSP. Specific sample identifying information that will be used to implement the sampling scheme for this FSP Addendum is presented in Figure 6-1. Samples will be identified sequentially using the identification number system consistent with the RIs. If a sample is not collected or is reassigned to a different location, a specific reason and notation will be noted in the project field books.

6.4 SAMPLE DOCUMENTATION

All sample label, logbook, field record, and field form information will follow structures identified in Section 6.0 of the FWFSP.

6.5 DOCUMENTATION PROCEDURES

Documentation and tracking of samples and field information will follow the series of steps identified in Section 6.5 of the FWFSP.

6.6 CORRECTIONS TO DOCUMENTATION

Any corrections to documentation will follow guidance established in Section 6.6 of the FWFSP.

6.7 MONTHLY REPORTS

Monthly reports are submitted by the Leidos Project Manager for this contract. The monthly reports will discuss progress to date of the field activities, difficulties encountered (if any), corrective actions (if any), and planned activities. The monthly reports will also provide a summary of investigation-

derived waste (IDW) collected and staged at Camp Ravenna until the IDW has been removed from the facility.

6.8 SUBMITTAL OF INFORMATION

All sample numbers, collection time and date, borehole depths, water levels, and water quality measurements will be submitted in electronic format for entry into the RVAAP Environmental Information Management System (REIMS) per Section 10.3 of the FWQAPP.

Sample Station Location Identification: XXXmm-NNN(n)-####-tt

XXX = Area Designator

NTA NACA Test Area

mm = Sample Location Type

gw = Groundwater

sb = Soil Boring/Subsurface Soil

sd = Sediment

ss = Surface Soil Sample Location

NNN = Sequential Sample Location Number

Unique, sequential number for each sample location beginning with the following number from the last number used from previous investigation stations and extending into any subsequent investigative phases (i.e., 001-999)

(n) = Special Identifier

Optional use (as needed) to identify special sample matrices or sample location characteristics

= Sequential Sample Identification Number

Unique, sequential number for each sample at a sampling location (i.e., 0001-9999)

tt = Sample Type

SO = Soil Sample

GW = Groundwater

TB = Trip Blank

SD = Sediment

FB = Field Blank

ER = Equipment Rinsate

Figure 6-1. Sample Identification System

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7.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

Sample packaging and shipping shall generally follow Section 7.0 of the FWFSF.

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8.0 INVESTIGATION-DERIVED WASTE

All IDW, including personal protective equipment (PPE), disposable sampling equipment, and decontamination fluids, will be properly handled, labeled, characterized, and managed in accordance with Section 8.0 of the FWFSP and waste guidance provided in the *Update to Procedures to Follow as Related to the RVAAP Restoration Program due to the Accountability Transfer of the Remaining Property from BRACD to the ARNG/OHARNG* letter dated April 2, 2014, which is included as Attachment A.

Table 8-1 presents the three types and estimated quantities of IDW anticipated for this investigation.

Table 8-1. Summary of Anticipated IDW

| IDW | Source and Description | Estimated Quantity and Container |
|-------------------|--|---|
| Soil and Sediment | Unconsolidated surficial and subsurface material derived during soil boring and sediment sampling activities | One 55-gallon drum. |
| Liquid | Liquids resulting from decontaminated sampling equipment | One 55-gallon drum and two small containers of spent chemical rinse agents. |
| Sanitary Waste | PPE and disposable sampling equipment | Not applicable. Sanitary waste will be disposed of in a sanitary waste container. |

IDW = Investigation-Derived Waste
PPE = Personal Protective Equipment

Each of the types of IDW will be contained separately. Liquid IDW will be placed in drums and staged at the identified location within secondary containment structures. To avoid potential drum rupture due to freezing conditions, drums containing liquid will be filled only to 75% capacity.

Expendable sanitary waste will be not sampled for characterization purposes and will be disposed of as sanitary waste. Characterization and classification of the soil and liquid IDW will be based on the IDW sample collection and analysis per the toxicity characteristic leaching procedure (TCLP).

At the conclusion of field activities for the project, a letter report will be submitted to USACE and the Army National Guard (ARNG)/OHARNG documenting the characterization and classification of the wastes. Upon approval of the IDW classification report, all solid and liquid IDW will be removed from the site and disposed of by a licensed waste disposal contractor. All shipments of IDW off-site will be coordinated through the OHARNG restoration representative.

Information regarding IDW will be included in the Monthly Report until all IDW is removed from the facility.

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9.0 CONTRACTOR CHEMICAL QUALITY CONTROL

The Contractor Chemical QC will follow Section 9.0 of the FWFSP. This SAP Addendum does not include USACE QA split samples; therefore, there is no requirement to contact the USACE QA laboratory.

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10.0 DAILY CHEMICAL QUALITY CONTROL REPORTS

Daily Chemical QC Reports will be submitted in accordance with Section 10.0 of the FWFSP.

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11.0 FIELD VARIANCES AND CORRECTIVE ACTIONS

Field variances and corrective actions will be conducted in accordance with Section 11.0 of the FWSP.

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Final

**Sampling and Analysis Plan Addendum
for Supplemental Sampling at RVAAP-38 NACA Test Area**

Part II: Quality Assurance Project Plan

**Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio**

Contract No. W912QR-15-C-0046

Prepared for:



**U.S. Army Corps of Engineers
Louisville District**

Prepared by:



**Leidos
8866 Commons Boulevard, Suite 201
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October 20, 2017

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ACRONYMS AND ABBREVIATIONS

| | |
|------------------|--|
| ADR | Automated Data Review |
| A-E | Architect-Engineer |
| ASTM | American Society for Testing and Materials |
| COC | Chain of Custody |
| DoD | U.S. Department of Defense |
| DQO | Data Quality Objective |
| EDD | Electronic Data Deliverable |
| EDMS | Environmental Data Management System |
| ELAP | Environmental Laboratory Accreditation Program |
| FSP | Field Sampling Plan |
| FWQAPP | Facility-Wide Quality Assurance Project Plan |
| GPS | Global Positioning System |
| HNO ₃ | Nitric Acid |
| ICP | Inductively Coupled Plasma |
| IDW | Investigation-Derived Waste |
| LCQ | Louisville Chemistry Guideline |
| LCS | Laboratory Control Sample |
| LOQ | Limit of Quantitation |
| MRL | Method Reporting Level |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| NACA | National Advisory Committee on Aeronautics |
| NaOH | Sodium Hydroxide |
| Ohio EPA | Ohio Environmental Protection Agency |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PCB | Polychlorinated Biphenyl |
| QA | Quality Assurance |
| QAAP | Quality Assurance Administrative Procedure |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| QSM | Quality Systems Manual |
| RI | Remedial Investigation |
| RVAAP | Ravenna Army Ammunition Plant |
| SAP | Sampling and Analysis Plan |
| SIM | Selected Ion Monitoring |
| SOP | Standard Operating Procedure |
| SVOC | Semi-Volatile Organic Compound |
| TCLP | Toxicity Characteristic Leaching Procedure |
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| VOC | Volatile Organic Compound |

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) Addendum is Part II of the overall Sampling and Analysis Plan (SAP) for Supplemental Sampling at the National Advisory Committee on Aeronautics (NACA) Test Area (herein referred to as this SAP Addendum). This investigation will follow the Facility-Wide QAPP (FWQAPP) for the Ravenna Army Ammunition Plant (RVAAP) (USACE 2011). Each section of this QAPP Addendum documents adherence to the FWQAPP or stipulates project-specific addendum requirements.

The overall quality assurance (QA) objective for this investigation is to develop and implement procedures for field sampling, chain of custody (COC), laboratory analysis, and reporting, which will provide results to be used in the Phase II Remedial Investigation (RI) Report for soil, sediment, and surface water at NACA Test Area that are technically and legally defensible.

Primary analytical direction for these projects will be obtained from the identified U.S. Environmental Protection Agency (USEPA) SW-846 Methods; the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories (DoD 2013); and the Louisville QSM Supplement.

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2.0 PROJECT DESCRIPTION

This QAPP Addendum addresses project-specific information and tiers under the FWQAPP (USACE 2011). Each section documents adherence to the FWQAPP or stipulates project-specific requirements.

Primary analytical direction for these projects will be obtained from the identified USEPA SW-846 Methods; the DoD QSM for Environmental Laboratories (DoD 2013); and the Louisville QSM Supplement.

2.1 SITE HISTORY/BACKGROUND INFORMATION

Facility-wide information and NACA Test Area history and background are contained in Section 2.0 of the Field Sampling Plan (FSP) Addendum.

2.2 PROJECT OBJECTIVES AND SCOPE

This information is contained in Section 4.0 of the FSP Addendum.

2.3 SAMPLE NETWORK DESIGN AND RATIONALE

General information regarding the sample network design and rationale is provided in Section 4.0 of the FSP Addendum.

2.4 PARAMETERS TO BE TESTED AND FREQUENCY

Table 2-1 summarizes the sample matrix types, analytical parameters, and analytical methods associated with the investigative samples, field duplicates, matrix spike/matrix spike duplicate (MS/MSD) samples, equipment rinsates, and trip blanks. Table 2-2 summarizes the sample matrix types, analytical parameters, and analytical methods associated with source water blank samples and investigation-derived waste (IDW) samples.

Table 2-1. Sampling and Analytical Requirements

| Parameter | Methods ^a | Field Samples | | | Field Duplicate Samples ^c | MS ^b | MSD ^b | Total A-E Samples | Equipment Rinsate ^d | QA Trip Blank ^e |
|---|---|---------------|-----|----|--------------------------------------|-----------------|------------------|-------------------|--------------------------------|----------------------------|
| | | Soil | Sed | GW | | | | | | |
| <i>Former Plane Burial Area Investigation</i> | | | | | | | | | | |
| Metals | SW-846, 3050B/6010C/7471 | 24 | 0 | 0 | 3 | 2 | 2 | 31 | 1 | 0 |
| SVOCs (PAHs at low level) | SW-846, 3540C/8270D SIM ^f or 8270D low level | 24 | 0 | 0 | 3 | 2 | 2 | 31 | 1 | 0 |
| PCBs | SW-846, 3540C/8082A | 24 | 0 | 0 | 3 | 2 | 2 | 31 | 1 | 0 |
| <i>Crash Strip Subsurface Investigation Area</i> | | | | | | | | | | |
| Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-d)pyrene | SW-846, 3540C/8270D SIM ^f or 8270D low level | 16 | 0 | 0 | 2 | 1 | 1 | 20 | 0 | 0 |
| <i>Groundwater in Production Well</i> | | | | | | | | | | |
| Lead – filtered | SW-846, 3005A/6010C | 0 | 0 | 1 | 1 | 1 | 1 | 4 | 0 | 0 |
| Lead – unfiltered | SW-846, 3005A/6010C | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| <i>Sediment in Former Crash Area Reservoir</i> | | | | | | | | | | |
| Metals | SW-846, 3050B/6010C/7471 | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 0 |
| SVOCs (PAHs at low level) | SW-846, 3540C/8270D SIM ^f or 8270D low level | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 0 |
| Explosives | SW-846, 8330B | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 0 |
| Nitroguanidine | SW-846 8330 modified | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 0 |
| Nitrocellulose | Colorimetric, Cadmium Reduction | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 0 |

Table 2-1. Sampling and Analytical Requirements (Continued)

| Parameter | Methods ^a | Field Samples | | | Field Duplicate Samples ^c | MS ^b | MSD ^b | Total A-E Samples | Equipment Rinsate ^d | QA Trip Blank ^e |
|---|---|---------------|-----|----|--------------------------------------|-----------------|------------------|-------------------|--------------------------------|----------------------------|
| | | Soil | Sed | GW | | | | | | |
| VOCs | SW-846, 5035/8260C | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 1 |
| Pesticides | SW-846, 3540C/8081B | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 0 |
| PCBs | SW-846, 3540C /8082A | 0 | 3 | 0 | 1 | 1 | 1 | 6 | 1 | 0 |
| <i>Surface Soil at Previous Locations NTA-083 and NTA-120</i> | | | | | | | | | | |
| Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-d)pyrene | SW-846, 3540C/8270D SIM ^f or 8270D low level | 11 | 0 | 0 | 2 | 1 | 1 | 15 | 0 | 0 |

^aThe analytical methods listed or more current versions may be used.

^bMS/MSD samples will be collected at a frequency of 5% (1 per 20) of total samples per media.

^cDuplicate samples are collected at a frequency of 10% for this investigation.

^dEquipment rinsate samples will be collected from the soil sampling investigation pertaining to the “Former Plane Burial Area Investigation,” which also will be representative of soil sampling conducted at the “Crash Strip Subsurface Investigation Area” and “Surface Soil at Previous Locations NTA-083 and NTA-120.” One separate equipment rinsate sample will be collected as part of the “Sediment in Former Crash Area Reservoir” investigation.

^eOne trip blank will be collected for each shipping container (e.g., cooler) that contains water samples for VOC analysis. The trip blank is associated with the VOC analysis for the equipment rinsate for the Sediment in Former Crash Area Reservoir investigation and source water blank presented in Table 2-2.

^fSW-846 8270C SIM is a previously accepted method for PAHs but is not listed in the Facility-Wide QAPP. The method meets the project quantitation levels in Table 4-7 of the Facility-Wide QAPP.

A-E = Architect-Engineer.

GW = Groundwater.

MS = Matrix Spike.

MSD = Matrix Spike Duplicate.

PAH = Polycyclic Aromatic Hydrocarbon.

PCB = Polychlorinated Biphenyl.

QA = Quality Assurance.

QAPP = Quality Assurance Project Plan.

SIM = Selected Ion Monitoring.

SVOC = Semi-Volatile Organic Compound.

VOC = Volatile Organic Compound.

Table 2-2. Source Water Blank and IDW Sampling and Analysis Requirements

| Parameter | Methods* | Sample Matrix | |
|---|--------------------------|---------------|--------|
| | | Soil | Liquid |
| Source Water Blank (from Potable Source Water) | | | |
| Metals | SW-846, 3050B/6010C/7471 | - | 1 |
| SVOCs | SW-846, 3540C/8270D | - | 1 |
| Explosives | SW-846, 8330B | - | 1 |
| Propellants | SW-846 8330 modified | - | 1 |
| VOCs | SW-846, 5035/8260C | - | 1 |
| Pesticides | SW-846, 3540C/8081B | - | 1 |
| PCBs | SW-846, 3540C /8082A | - | 1 |
| Soil IDW | | | |
| TCLP VOC | SW-846, 1311, 8260 | 1 | - |
| TCLP SVOCs | SW-846, 1311, 8270 | 1 | - |
| TCLP Pesticides | SW-846, 1311, 8081 | 1 | - |
| TCLP Herbicides | SW-846, 1311, 8151 | 1 | - |
| TCLP Metals | SW-846, 1311, 6010, 7470 | 1 | - |
| Total Sulfide | SM 4500 S2-F | 1 | - |
| Total Cyanide | SW-846, 9012A | 1 | - |
| Reactive Sulfide | EPA SW 846 Ch. 7 | 1 | - |
| Reactive Cyanide | EPA SW 846 Ch. 7 | 1 | - |
| pH | EPA 150.1 or SM 4500 H-B | 1 | - |
| Ignitability | SW-846, 1010 | 1 | - |
| Liquid IDW | | | |
| TCLP VOC | SW-846, 1311, 8260 | - | 1 |
| TCLP SVOCs | SW-846, 1311, 8270 | - | 1 |
| TCLP Pesticides | SW-846, 1311, 8081 | - | 1 |
| TCLP Herbicides | SW-846, 1311, 8151 | - | 1 |
| TCLP Metals | SW-846, 1311, 6010, 7470 | - | 1 |
| Total Sulfide | SM 4500 S2-F | - | 1 |
| Total Cyanide | SW-846, 9012A | - | 1 |
| Reactive Sulfide | EPA SW 846 Ch. 7 | - | 1 |
| Reactive Cyanide | EPA SW 846 Ch. 7 | - | 1 |
| pH | EPA 150.1 or SM 4500 H-B | - | 1 |
| Ignitability | SW-846, 1010 | - | 1 |

*The analytical methods listed or more current versions may be used.

EPA = U.S. Environmental Protection Agency.

IDW = Investigation-Derived Waste.

PCB = Polychlorinated Biphenyl.

TCLP = Toxicity Characteristic Leaching Procedure.

SVOC = Semi-Volatile Organic Compound.

VOC = Volatile Organic Compound.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization and responsibilities are presented in Section 3.0 of the FSP Addendum.

Analytical support for this work will be provided by CT Laboratories, a woman-owned, small business laboratory. The laboratory standard operating procedures (SOPs) are available upon request.

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4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

4.1 DATA QUALITY OBJECTIVES

Data quality objective (DQO) summaries for this investigation will generally follow Tables 4-1 and 4-2 of the FWQAPP. These tables reference the accuracy limits in Appendix G of the DoD QSM Version 4.2. The revised accuracy limits in Appendix C of the DoD QSM Version 5 will be used for this project. All quality control (QC) parameters stated in the specific USEPA SW-846 methods will be adhered to for each chemical listed. The SW-846 method references found in the FWQAPP have been revised within this QAPP Addendum to reflect the Update III methods, as appropriate. For this data gap investigation, the laboratory will use these versions or later versions. Laboratories are required to comply with all methods as written; recommendations are considered requirements. Concurrence with the DoD QSM for Environmental Laboratories (DoD 2013) and the Louisville QSM Supplement is expected.

CT Laboratories will deliver an electronic data deliverable (EDD) that is automated data review (ADR) compatible. CT Laboratories must identify variances to the established library prior to any analysis being performed. No variances to the DoD QSM for Environmental Laboratories (DoD 2013) and the Louisville QSM Supplement are anticipated.

4.2 LEVEL OF QUALITY CONTROL EFFORT

QC efforts will follow Section 4.2 of the FWQAPP. Field QC measurements will include field duplicates, equipment rinsates, and a source water blank (potable source water). The field duplicate samples are to be submitted as “blind” to the laboratory and are used to determine whether the field sampling technique is reproducible and as an indicator of sample heterogeneity. The duplicate samples will be collected from the same sampling station that equally represent the medium at a given time and location, selected on a random basis, and submitted for the same analyses as the environmental samples.

Equipment rinsate blank samples will be collected as part of the soil sampling (from a hand auger bucket) and sediment sampling (from a decontaminated Ponar/Ekman Sampler) and will be analyzed for the media-specific chemicals that are being investigated. One trip blank will accompany the equipment rinsate blank sample, as that sample will be analyzed for volatile organic compounds (VOCs).

One source water blank will be collected from only the potable water source, which will be used for all potable wash and rinse water for equipment decontamination during the implementation of this SAP Addendum. Deionized/distilled (American Society for Testing and Materials [ASTM] Type I) water used for decontamination will not be sampled. The source water blank will be analyzed for the chemicals that are being investigated.

Laboratory QC measurements will include laboratory method blanks, laboratory control samples (LCSs), laboratory duplicate samples, and MS/MSDs. LCS measurements will include the standard mid-level analyte concentration, plus a QC/method reporting level (MRL) low-level concentration. It is recognized that the laboratory will routinely perform and monitor the QC/MRL; however, guidance check limits will be utilized, as advisory and corrective action will not be required for individual analyte variances. The QC/MRL will be successfully analyzed at the beginning of the analytical sequences. In addition, the laboratory will analyze the QC/MRL sample at the close of the analytical sequence. MS/MSDs will be used to verify the accuracy of the laboratory results. Split samples will not be collected during this supplemental investigation.

4.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS

Accuracy, precision, and sensitivity goals identified in Section 4.3; Tables 4-1 and 4-2 (using updated QSM Version 5 limits, as noted above); and Tables 4-4, 4-5, 4-7, and 4-8 of the FWQAPP will be imposed for this investigation. As stated above, some of the analytical methods numbers have been updated (refer to Table 2-1 of this QAPP Addendum). Quality objectives related to individual method QC protocol also will follow requirements given in the DoD QSM for Environmental Laboratories (DoD 2013) and the Louisville QSM Supplement.

Laboratories will make all reasonable attempts to meet the program and project reporting levels in the applicable Tables 4-3 through 4-9 of the FWQAPP for each individual sample analysis. When samples require dilution, both the minimum dilution and quantified dilution must be reported. Samples may be screened to determine optimum dilution ranges. Dilution runs will be performed to quantify high target analyte concentrations within the upper half of the calibration range, thus reducing the degree of dilution as much as possible. In addition, runs will then be performed at the lowest feasible dilution to report other target analyte reporting levels as low as possible without destroying analytical detectors and instrumentation. If there are matrix interferences, non-target analytes, or high target analyte concentrations that preclude analysis of an undiluted sample, the laboratory project manager will contact Leidos, forward analytical and chromatographic information from diluted runs, and obtain direction on how to proceed.

4.4 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Completeness, representativeness, and comparability goals identified in Section 4.4 and Tables 4-1 and 4-2 of the FWQAPP will be imposed for this investigation.

5.0 SAMPLING PROCEDURES

Sampling procedures are described in Section 5.0 of the FSP Addendum.

Tables 5-1 through 5-4 of this QAPP Addendum summarize sample container, preservation, and holding time requirements for the soil, sediment and water matrices, and IDW for this investigation.

As noted in the FWQAPP, additional sample volumes will be provided, when necessary, for the express purpose of performing associated laboratory QC (MS/MSD). These laboratory QC samples will be designated by the field and identified for the laboratory on respective COC documentation.

Table 5-1. Container Requirements for Soil and Sediment Samples

| Analyte Group | Container* | Minimum Sample Size | Preservative | Holding Time |
|---------------------|--|---------------------|-----------------------------|--|
| Metals | One 4-oz glass jar with Teflon [®] -lined cap | 50 g | Cool, 4°C | 180 days (28 days for mercury) |
| SVOCs | One 8-oz glass jar with Teflon [®] -lined cap | 60 g | Cool, 4°C | 14 days (extraction) 40 days (analysis) |
| PAH Compounds | One 8-oz glass jar with Teflon [®] -lined cap | 60 g | Cool, 4°C | 14 days (extraction) 40 days (analysis) |
| Explosive Compounds | One 4-oz glass jar with Teflon [®] -lined cap | 60 g | Cool, 4°C | 14 days (extraction) 40 days (analysis) |
| Propellants | One 4-oz glass jar with Teflon [®] -lined cap | 60 g | Cool, 4°C | 14 days (extraction) 40 days (analysis) |
| VOCs | TBD | TBD | Zero headspace Cool, 4°C | 14 days |
| PCBs | One 8-oz glass jar with Teflon [®] -lined cap | 60 g | Cool, 4°C | 14 days (extraction) 40 days (analysis) |
| Pesticide Compounds | One 8-oz glass jar with Teflon [®] -lined cap | 60 g | Cool, 4°C | 14 days (extraction) 40 days (analysis) |

Note: Sample container requirements are subject to change. When all fractions are being collected and shipped to the same analytical facility, one 16-oz jar should cover all requirements. If analytical groups are sent to separate facilities, then individual containers will be required.

*Container sizes may vary due to the laboratory preferences.

PAH = Polycyclic Aromatic Hydrocarbon.

PCB = Polychlorinated Biphenyl.

SVOC = Semi-Volatile Organic Compound.

TBD = To Be Determined.

VOC = Volatile Organic Compound.

Table 5-2. Container Requirements for Water Samples

| Analyte Group | Container* | Minimum Sample Size | Preservative | Holding Time |
|---|--|----------------------------|--|---|
| Metals (Lead only) | One 1-L poly bottle | 500 mL | HNO ₃ to pH <2 Cool, 4°C | 180 days |
| VOC | Three 40-mL glass vials with Teflon®-lined septum (no headspace) | 80 mL | HCL and Cool, 4°C | 14 days preserved/7 days unpreserved (analysis) |
| SVOCs (PAHs at low level) | Two 1-L amber glass bottle with Teflon®-lined lid | 1,000 mL | Cool, 4°C | 7 days (extraction) 40 days (analysis) |
| Pesticides | Two 1-L amber glass bottle with Teflon®-lined lid | 1,000 mL | Cool, 4°C | 7 days (extraction) 40 days (analysis) |
| Metals | One 1-L poly bottle | 500 mL | HNO ₃ to pH <2 Cool, 4°C | 180 days (analysis) Mercury: 28 days (analysis) |
| PCBs | Two 1-L amber glass bottle with Teflon®-lined lid | 1,000 mL | Cool, 4°C | 7 days (extraction) 40 days (analysis) |
| Explosive Compounds (including nitroguanidine and nitrocellulose) | Two 1-L amber glass bottle with Teflon®-lined lid | 1,000 mL | Cool, 4°C | 7 days (extraction) 40 days (analysis) |

*Container size may vary due to laboratory preferences.

HCL = Hydrogen chloride.

HNO₃ = Nitric Acid.

L = Liter.

mL = Milliliter.

PAH = Polycyclic aromatic hydrocarbon.

PCB = Polychlorinated biphenyl.

pH = Potential of hydrogen.

SVOC = Semi-volatile organic compound.

VOC = Volatile organic compound.

< = Less than.

Table 5-3. Container Requirements for IDW Liquid Samples

| Analyte Group | Container* | Minimum Sample Size | Preservative | Holding Time |
|----------------------|---|----------------------------|---|---|
| TCLP VOC | Three 40-mL glass vials with Teflon [®] -lined septum (no headspace) | 80 mL | Cool, 4°C | 14 days (TCLP extraction) 14 days preserved/7 days unpreserved (analysis) |
| TCLP SVOCs | Two 1-L amber glass bottle with Teflon [®] -lined lid | 1,000 mL | Cool, 4°C | 14 days (TCLP extraction) 7 days (extraction) 40 days (analysis) |
| TCLP Pesticides | Two 1-L amber glass bottle with Teflon [®] -lined lid | 1,000 mL | Cool, 4°C | 14 days (TCLP extraction) 7 days (extraction) 40 days (analysis) |
| TCLP Herbicides | Two 1-L amber glass bottle with Teflon [®] -lined lid | 1,000 mL | Cool, 4°C | 14 days (TCLP extraction) 7 days (extraction) 40 days (analysis) |
| TCLP Metals | One 1-L poly bottle | 500 mL | Cool, 4°C | <u>Metals:</u> 180 days (TCLP extraction) 180 days (analysis) <u>Mercury:</u> 28 days (TCLP extraction) 28 days (analysis) |
| PCBs | Two 1-L amber glass bottle with Teflon [®] -lined lid | 1,000 mL | Cool, 4°C | 7 days (extraction) 40 days (analysis) |
| Explosive Compounds | Two 1-L amber glass bottle with Teflon [®] -lined lid | 1,000 mL | Cool, 4°C | 7 days (extraction) 40 days (analysis) |
| Sulfide | 500-mL glass with no headspace | 500 mL | Zinc acetate + NaOH to pH >9 Cool, 4°C | 7 days |
| pH | 100-mL poly bottle | 100 mL | Cool, 4°C | Immediate |
| Ignitability | 500-mL poly bottle | 200 mL | Cool, 4°C | 14 days |

*Container size may vary due to laboratory preferences.

IDW = Investigation-Derived Waste.

NaOH = Sodium Hydroxide.

PCB = Polychlorinated Biphenyl.

SVOC = Semi-Volatile Organic Compound.

TCLP = Toxicity Characteristic Leaching Procedure.

VOC = Volatile Organic Compound.

Table 5-4. Container Requirements for IDW Soil Samples

| Analyte Group | Container* | Minimum Sample Size | Preservative | Holding Time |
|--|---|---------------------|------------------------------|--|
| TCLP VOC | 1 4-oz glass jar with Teflon [®] -septa cap (no headspace) | 20 g | Cool, 4°C | 14 days (TCLP extraction) 14 days preserved |
| TCLP SVOCs, Pesticides, Herbicides, Metals | One 16-oz glass jar with Teflon [®] -lined cap | 200 g | Cool, 4°C | 14 days (TCLP extraction) 7 days (extraction) 40 days (analysis) metals 180 days/ Hg 28 days |
| pH | 100-mL poly bottle | 50 g | Cool, 4°C | Immediate |
| Ignitability | 250-mL glass with Teflon [®] -lined cap | 100 g | Cool, 4°C | Immediate |
| Cyanide | 100-mL poly bottle | 10 g | Cool, 4°C | 14 days |
| Sulfide | 100-mL glass | 50 g | 2N Zinc Acetate Cool, 4°C | 7 days |

*Container size may vary due to laboratory preferences.

Hg = Mercury.

IDW = Investigation-Derived Waste.

SVOC = Semi-Volatile Organic Compound.

TCLP = Toxicity Characteristic Leaching Procedure.

VOC = Volatile Organic Compound.

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6.0 SAMPLE CUSTODY

Sample custody procedures will follow those identified in Section 6.0 of the FWQAPP.

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7.0 CALIBRATION PROCEDURES AND FREQUENCY

7.1 FIELD INSTRUMENTS/EQUIPMENT

Field instruments and equipment calibrations will follow procedures described in Section 7.1 of the FWQAPP. Only water quality meters for groundwater sampling will be used during this investigation.

7.2 LABORATORY INSTRUMENTS

Calibration of laboratory equipment will follow procedures identified in Section 7.2 of the FWQAPP, CT Laboratories' QA plan, laboratory-specific SOPs, and corporate and facility-specific operating procedures.

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8.0 ANALYTICAL PROCEDURES

8.1 LABORATORY ANALYSIS

Analytical methods, parameters, and quantitation or detection limits are those listed in Tables 4-3 through 4-9 of the FWQAPP with the exception of polycyclic aromatic hydrocarbons (PAHs), which will be analyzed using low level SW-846 method 8270D or 8270 selected ion monitoring (SIM) (i.e., to ensure reporting limits are below the screening criteria). The SW-846 method references in the FWQAPP have been revised within this QAPP Addendum to reflect the Update III methods, as appropriate. The laboratory will use these versions or later versions. Concurrence with the DoD QSM for Environmental Laboratories (DoD 2013) and the Louisville QSM Supplement is expected. Laboratory analysis procedures are provided in Section 8.1 of the FWQAPP.

CT Laboratories will at all times maintain a safe and contaminant free environment for the analysis of samples. The laboratory will demonstrate, through instrument blanks, holding blanks, and analytical method blanks, that the laboratory environment and procedures will not and do not impact analytical results.

CT Laboratories also will implement all reasonable procedures to maintain project reporting levels for all sample analyses. Where contaminant and sample matrix analytical interferences impact the laboratory's ability to obtain project reporting levels, the laboratory will institute sample cleanup processes, minimize dilutions, adjust instrument operational parameters, or propose alternative analytical methods or procedures. Elevated reporting levels will be kept to a minimum throughout the execution of this work. When samples require dilution, both the minimum dilution and quantified dilution must be reported. CT Laboratories may screen samples to determine optimum dilution ranges. Dilution runs will be performed to quantify high target analyte concentrations within the upper half of the calibration range, thus reducing the degree of dilution as much as possible. In addition, less diluted runs at the lowest feasible dilution will then be performed to report other target analyte reporting levels as low as possible without destroying analytical detectors and instrumentation. If there are matrix interferences, non-target analytes, or high target analyte concentrations that preclude analysis of an undiluted sample, the laboratory project manager will contact Leidos, forward analytical and chromatographic information from diluted runs, and obtain direction on how to proceed.

8.2 FIELD SCREENING ANALYTICAL PROTOCOLS

Procedures for instrument calibration, calibration frequency, and field analysis are identified in Section 7.0 of the FWQAPP. The only field screening anticipated for the field investigation is water quality meters for groundwater sampling, geophysical equipment, and global positioning system (GPS) units.

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9.0 INTERNAL QUALITY CONTROL CHECK

9.1 FIELD SAMPLE COLLECTION

Field QC sample types, numbers, and frequencies are identified in Table 2-1. In general, field duplicates will be collected at a frequency of 10%.

Field equipment rinsate blanks will be collected to check for the effectiveness of the decontamination procedure. Equipment rinsate blanks pertain only to samples collected using reusable, decontaminated equipment. Two equipment rinsate blank samples will be collected, one as part of the soil sampling (from a hand auger bucket) and one as part of the sediment sampling (from a decontaminated Ponar/Ekman Sampler).

One source water blank (from the potable water source) will be collected for the combined field effort, as presented in Table 2-2. Analysis of the laboratory-grade deionized water is not warranted. QA split samples will not be collected during this investigation.

9.2 FIELD MEASUREMENT

Section 7.0 of the FWQAPP provides details regarding field measurements.

9.3 LABORATORY ANALYSIS

Analytical QC procedures will follow those identified in the referenced USEPA methodologies. These will include method blanks, LCSs, MSs, MSDs, laboratory duplicate analysis, calibration standards, internal standards, surrogate standards, and calibration check standards.

CT Laboratories will conform to their QAPP and implement their established SOPs to perform the various analytical methods required by the project. QC frequencies will follow those identified in Section 9.3 of the FWQAPP.

Analyses also will be consistent with direction provided by the analytical method, the most recent DoD QSM for Environmental Laboratories (DoD 2013), and the Louisville QSM Supplement. The following are clarifications to this guidance relative to this project:

- The QC/MRL will be successfully analyzed at the beginning of the analytical sequences. In addition, the laboratory will analyze the QC/MRL sample at the close of the analytical sequence.
- Analytical method blanks will be considered clean as long as analyte concentrations are below one-half of the limit of quantitation (LOQ). Corrective actions will be performed for any analyte detected above the established criteria. Any analytes detected between the method detection limit and the LOQ will be flagged appropriately.

- LCSs will contain all project target compounds. The marginal exceedances should not exceed the number allowed by the QSM.
- For methods that have multi-responders (i.e., Aroclors and pesticides) within the same analytical process, the laboratory will not include all analytes within the matrix spiking mixture. A representative analyte will be employed for the MS evaluation.
- Inductively coupled plasma (ICP) initial calibration curves will be confirmed through the analysis of a blank and three standards, and this documentation will be reported as part of the analytical data package.
- ICP serial dilution will be performed on a per batch basis. If the serial dilution falls outside acceptance criteria, a post-digestion spike analyses will be performed.
- Sediment samples having moisture levels that preclude soxhlet extraction processes will be extracted by sonication methods.

10.0 DATA REDUCTION, VALIDATION, AND REPORTING

10.1 DATA REDUCTION

Data reduction will follow the established protocols defined in Section 10.1 in the FWQAPP. Sample collection and field measurements will follow the established protocols defined in the FWQAPP, Facility-Wide SAP, and this SAP Addendum. Laboratory data reduction will follow CT Laboratories' QA plan guidance and will conform to general direction provided by the FWQAPP, the DoD QSM for Environmental Laboratories (DoD 2013), and the Louisville QSM Supplement.

10.2 DATA VERIFICATION/VALIDATION

Project data verification and validation will follow direction provided in Figure 10-1 of the FWQAPP. Protocol for analytical data verification and validation has been updated to the following references:

- DoD QSM for Environmental Laboratories, July 2013;
- Louisville QSM Supplement;
- USEPA National Functional Guidelines for Organic Data Review, EPA-540/R-99/008, October 1999 (USEPA 1999); and
- USEPA National Functional Guidelines for Inorganic Data Review, EPA-540-R-04-004, October 2004 (USEPA 2004).

Leidos will perform data verification and a Level III review in accordance with the FWQAPP.

Validation of 10% of the data will follow the direction provided in the FWQAPP, the DoD QSM for Environmental Laboratories (DoD 2013), and the Louisville QSM Supplement. A data validator qualified by the U.S. Army Corps of Engineers (USACE), Louisville District will perform this data validation. The validator shall document the findings of the review using the checklists in Attachment B of the Louisville Chemistry Guideline (LCG) (USACE 2002). These checklists may be modified to implement QSM criteria.

10.3 DATA REPORTING

Data reports will follow the established protocols defined in Section 10.3 in the FWQAPP. CT Laboratories will deliver an EDD that is ADR compatible. All data will be processed by ADR/Environmental Data Management System (EDMS) software using the Ravenna library. All errors in the ADR/EDD found by CHECKER must be corrected by the laboratory prior to transmittal. EDDs with errors will not be accepted.

10.4 DATA QUALITY ASSESSMENT

Data quality will be assessed using the procedures provided in Section 10.4 of the FWQAPP.

11.0 PERFORMANCE AND SYSTEM AUDITS

11.1 FIELD AUDITS

The Leidos QA/QC Officer, the Leidos Field Operations Manager, or another properly trained Leidos surveillance leader will perform one internal surveillance of field activities for the investigation. This surveillance will encompass the performance of sampling of any environmental medium. The surveillance will follow Leidos Quality Assurance Administrative Procedure (QAAP) 18.3.

USACE, USEPA Region 5, or Ohio Environmental Protection Agency (Ohio EPA) audits may be conducted at the discretion of the respective agency.

11.2 LABORATORY AUDITS

CT Laboratories is accredited under the DoD Environmental Laboratory Accreditation Program (ELAP). This accreditation is based in part on an on-site audit of the laboratory. Internal performance and systems audits will be conducted by CT Laboratories' QA staff, as defined in their QAPP. USACE, USEPA Region 5, or Ohio EPA audits may be conducted at the discretion of the respective agency. More information regarding laboratory audits is provided in Section 11.2 of the FWQAPP.

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12.0 PREVENTIVE MAINTENANCE PROCEDURES

Maintenance of all field and laboratory sampling and analytical equipment will follow direction provided in Section 12.0 of the FWQAPP. Routine and preventive maintenance for all laboratory instruments and equipment will follow the direction of the contract laboratory QA plan.

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13.0 SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

Field and laboratory data will be assessed as outlined in Sections 13.1 and 13.2, respectively, of the FWQAPP.

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14.0 CORRECTIVE ACTIONS

Field and laboratory activity corrective action protocol will follow directions provided in Sections 14.1 and 14.2, respectively, of the FWQAPP. Laboratory corrective actions also will follow the procedures in CT Laboratories' QA plan.

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15.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Procedures and reports will follow the protocol identified in Section 15.0 of the FWQAPP and those directed by CT Laboratories' QA plan.

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16.0 REFERENCES

- DoD (U.S. Department of Defense) 2013. *Quality Systems Manual for Environmental Laboratories*, Environmental Data Quality Workgroup, Final Version 5. July 2013.
- USACE (U.S. Army Corps of Engineers) 2002. *Louisville Chemistry Guideline*, Samir A. Mansey, Environmental Chemistry Branch, Rev. 5. June 2002.
- USACE 2011. *Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*, W912QR-08-D-0008, Delivery Order 0016. February 2011.
- USEPA (U.S. Environmental Protection Agency) 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA-540/R-99/008. October 1999.
- USEPA 2004. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA-540-R-04-004. October 2004.

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Final

**Sampling and Analysis Plan Addendum
for Supplemental Sampling at RVAAP-38 NACA Test Area**

Part III: Safety and Health Plan

**Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio**

Contract No. W912QR-15-C-0046

Prepared for:



**U.S. Army Corps of Engineers
Louisville District**

Prepared by:

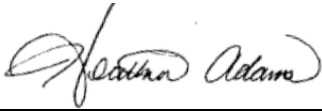


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October 20, 2017

APPROVALS

Safety and Health Plan
Sampling and Analysis Plan Addendum
for Supplemental Sampling at RVAAP-38 NACA Test Area
Former Ravenna Army Ammunition Plant, Ravenna, Ohio



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October 20, 2017

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ACRONYMS AND ABBREVIATIONS

| | |
|--------------|---|
| A2 | Suspected Human Carcinogen |
| A3 | Not Classifiable as Human Carcinogen |
| ACM | Asbestos-containing Material |
| AHA | Activity Hazard Analysis |
| AOC | Area of Concern |
| ARNG | Army National Guard |
| Ca | Potential Occupational Carcinogen |
| Camp Ravenna | Camp Ravenna Joint Military Training Center |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CIH | Certified Industrial Hygienist |
| COC | Chemical of Concern |
| COR | Contracting Officer's Representative |
| CPR | Cardiopulmonary Resuscitation |
| CRJMTC | Camp Ravenna Joint Military Training Center |
| CSP | Certified Safety Professional |
| dB | Decibel |
| DOT | U.S. Department of Transportation |
| DPT | Direct-Push Technology |
| EH&S | Environmental Health and Safety |
| EM | Engineer Manual |
| EMS | Emergency Medical Services |
| ER | Engineer Regulation |
| eV | Electron Volt |
| FM | Field Manager |
| FP | Flash Point |
| FWFSP | Facility-Wide Field Sampling Plan |
| FWSHP | Facility-Wide Safety and Health Plan |
| GFCI | Ground Fault Circuit Interrupter |
| HAZWOPER | Hazardous Waste Operations |
| IATA | International Air Transport Association |
| IDLH | Immediately Dangerous to Life and Health |
| IDW | Investigation-Derived Waste |
| IP | Ionization Potential |
| MEC | Munitions and Explosives of Concern |
| mg/kg | Milligrams per Kilogram |
| mm | Millimeters |
| NA | Not Applicable |
| NACA | National Advisory Committee on Aeronautics |
| NIOSH | National Institute for Occupational Safety and Health |

ACRONYMS AND ABBREVIATIONS (Continued)

| | |
|--------|---|
| OHARNG | Ohio Army National Guard |
| OSHA | Occupational Safety and Health Administration |
| P.E. | Professional Engineer |
| P.G. | Professional Geologist |
| PAH | Polycyclic Aromatic Hydrocarbon |
| PBA | Performance-Based Acquisition |
| PEL | Permissible Exposure Limit |
| PFD | Personal Flotation Device |
| PID | Photoionization Detector |
| POC | Point of Contact |
| PPE | Personal Protective Equipment |
| ppm | Parts per Million |
| RAC | Risk Assessment Code |
| REL | Recommended Exposure Limit |
| RI | Remedial Investigation |
| RVAAP | Ravenna Army Ammunition Plant |
| SAP | Sampling and Analysis Plan |
| SDS | Safety Data Sheet |
| SHP | Safety and Health Plan |
| SOP | Standard Operating Procedure |
| SSHO | Site Safety and Health Officer |
| STEL | Short-Term Exposure Limit |
| TBD | To Be Determined |
| TLV | Threshold Limit Value |
| TWA | Time-Weighted Average |
| USACE | U. S. Army Corps of Engineers |
| USCG | U.S. Coast Guard |
| USP&FO | United States Property and Fiscal Officer |
| UXO | Unexploded Ordnance |
| VP | Vapor Pressure |

1.0 INTRODUCTION

Leidos has been contracted by the U.S. Army Corps of Engineers (USACE), Louisville District to complete a Remedial Investigation (RI) Report as part of the RI phase of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for soil, sediment, and surface water at the National Advisory Committee on Aeronautics (NACA) Test Area within the former Ravenna Army Ammunition Plant (RVAAP) (now known as Camp Ravenna Joint Military Training Center [Camp Ravenna]) in Portage and Trumbull counties, Ohio (Figure 16-1).

Field work was initially completed under the Performance-Based Acquisition (PBA) 2008 Supplemental Investigation Sampling and Analysis Plan Addendum No. 1 (herein referred to as the PBA08 SAP) in 2009. Since then, data gaps were identified in the Phase II RI Report that require additional field investigations at NACA Test Area.

1.1 PURPOSE

The purpose of this Safety and Health Plan (SHP) Addendum is to describe potential hazards that may be encountered during the implementation of the supplemental field investigation at NACA Test Area and provide a hazard risk analysis. This SHP is an addendum to the *Facility-Wide Safety and Health Plan for Environmental Investigations* (USACE 2011a) (herein referred to as the FWSHP) and will also outline staff organization, qualifications, responsibilities, and training requirements; identify required personal protective equipment (PPE); and present monitoring and standard operating procedures (SOPs) needed to implement the supplemental field investigation at NACA Test Area.

1.2 SCOPE

The SHP Addendum covers all health and safety components of the SAP Addendum sampling activities. The following elements are covered under this SHP Addendum:

- Pre-mobilization activities for environmental media sampling (e.g., land survey, utility clearance);
- Mobilization and site setup (e.g., clearing and grubbing);
- Complete geophysical survey;
- Sediment sampling from a boat;
- Surface and subsurface soil sampling (hand auger and direct-push technology [DPT]);
- Investigation-derived waste (IDW) handling;
- Equipment decontamination; and
- Demobilization.

Sampling activities will be overseen by USACE and implemented by Leidos and the Leidos drilling subcontractor (herein referred to as “Subcontractor”). Leidos (under contract with USACE) is responsible for investigating and characterizing sediment, surface soil, and subsurface soil and

completing a geophysical survey at NACA Test Area. Implementation of these activities will meet the requirements of the Facility-Wide Field Sampling Plan for Environmental Investigations (USACE 2011b) (herein referred to as the FWFSP), the FWSHP (USACE 2011a), and this Sampling and Analysis Plan (herein referred to as the SAP Addendum).

1.3 POTENTIAL HAZARDS AND EXPOSURE

Potential hazards posed by the planned tasks include injury from lifting, heavy equipment, noise, fuel fires, chemical exposure, temperature extremes, stinging/biting insects, poisonous plants, drowning, and snakes.

The potential for chemical overexposure appears to be very low, based on the nature of planned tasks and review of available data. The Leidos Site Safety and Health Officer (SSHO) will observe all site tasks during daily safety inspections and will use professional judgment and appropriate monitoring results to determine if upgrading PPE is required. A detailed analysis of these hazards and specific appropriate controls is presented in Table 3-3.

Activities performed during the sampling will be performed in Level D PPE, and personnel will use chemical-resistant gloves when handling potentially contaminated materials. If one of several action levels is exceeded or the potential for increased risk becomes apparent during field activities, the SSHO will upgrade protective procedures and protective clothing as necessary.

1.4 HEALTH AND SAFETY PROGRAM

Leidos' formal policy, stated on the Leidos Intranet page, takes every reasonable precaution to protect the health and safety of our employees, the public, and the environment. To this end, the FWSHP (USACE 2011a) and this SHP Addendum collectively set forth the specific procedures required to protect Leidos personnel involved in field activities. These plans are driven by requirements contained in the most current revisions of the USACE *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste, Engineer Regulation (ER)-385-1-92* (USACE 2007a), *Safety and Health Requirements for Munitions and Explosives of Concern (MEC) Operations, ER-385-1-95* (USACE 2007b), and the USACE *Safety and Health Manual, Engineer Manual (EM)-385-1-1* (USACE 2008), which are available online via the USACE web site. Leidos' activities are also subject to the requirements of the Leidos Corporate Environmental Health and Safety (EH&S) Program and associated procedures. All field personnel are required to comply with the requirements of these programs and plans.

Leidos' project personnel and Subcontractors are required to review this plan prior to on-site project participation. In addition, Subcontractors are responsible for providing their employees with a safe work place, and these plans do not relieve Subcontractors of this responsibility. Subcontractors must have and use their own safety programs and plans in compliance with applicable regulations. This SHP Addendum was developed in accordance with Ohio Administrative Code 3745-20-01 and 3745-20-05, 40 Code of Federal Regulations (CFR) Part 763, and USACE Safety and Health Requirements

Manual EM-385-1-1. In addition, Subcontractor personnel are required to submit to Leidos certifications relating to their training and medical monitoring to ensure compliance with these requirements, as detailed in the SHP Addendum. Standard procedures will be used to minimize the potential for personnel injury or illness. These procedures include site-specific training, routine inspections, visual and instrument surveillance for hazards, and enforcement of health and safety requirements by project management. Leidos' policy takes every reasonable precaution to protect the health and safety of project personnel, the public, and the environment. Any person found to have intentionally or negligently violated this policy will be subject to disciplinary action, which may include dismissal. The goal is zero accidents.

The FWSHP addresses program issues and hazards and hazard controls common to the entire facility for environmental investigations. This SHP Addendum addresses the hazards and controls specific to implementation of the SAP Addendum for NACA Test Area. Copies of the FWSHP and this SHP Addendum will be present at the work site during all fieldwork.

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2.0 SITE DESCRIPTION AND CONTAMINATION CHARACTERIZATION

2.1 FACILITY DESCRIPTION

The facility, consisting of 21,683 acres, is located in northeastern Ohio within Portage and Trumbull Counties, approximately 4.8 kilometers (3 miles) east/northeast of the city of Ravenna and approximately 1.6 kilometers (1 mile) northwest of the city of Newton Falls. The facility, previously known as RVAAP, was formerly used as a load, assemble, and pack facility for munitions production. As of September 2013, administrative accountability for the entire acreage of the facility has been transferred to the United States Property and Fiscal Officer (USP&FO) for Ohio and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp Ravenna). References in this document to RVAAP relate to previous activities at the facility as related to former munitions production activities or to activities being conducted under the restoration/cleanup program.

2.2 SITE DESCRIPTION

NACA Test Area is located west of Greenleaf Road at the southern end of Demolition Road in the southwestern portion of Camp Ravenna. The site was used to conduct experimental crash tests of excess military aircraft in order to develop explosion-proof fuel tanks and fuel for aircraft. Currently, the site is forested around the perimeter. The interior of the site, which includes the crash strip and burial area, is relatively open and occasionally mowed. Hinkley Creek is located south/southwest of the site. A tributary to Hinkley Creek is located in the center of the site near the eastern end of the crash strip.

2.3 CONTAMINANTS

Table 2-1 presents chemicals of concern (COCs) identified in soil. Sediment has not been sampled at NACA Test Area, but it is anticipated that COCs (if any) would be similar in sediment as it is in soil. A contaminant's inclusion in this table indicates the potential to encounter a contaminant during sampling activities, but it does not necessarily indicate that the contaminant is present in sufficient quantity to pose a health risk to workers.

Table 2-1. Maximum Concentrations of COCs at NACA Test Area

| Analyte | Maximum Detected Concentration |
|------------------------|--------------------------------|
| | Soil (mg/kg) |
| Lead | 13,200 |
| Benz(a)anthracene | 36 |
| Benzo(a)pyrene | 41 |
| Benzo(b)fluoranthene | 54 |
| Dibenz(a,h)anthracene | 5.7 |
| Indeno(1,2,3-cd)pyrene | 3.2 |

COC = Chemical of Concern.

mg/kg = Milligrams per Kilogram.

NACA = National Advisory Committee on Aeronautics.

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3.0 HAZARD/RISK ANALYSIS

The purpose of the task hazard/risk analysis is to identify and assess potential hazards that may be encountered by personnel and prescribe required controls. Table 3-1 presents a general checklist of hazards that may be posed by this project and indicates whether a particular major type of hazard is present. If additional tasks or significant hazards are identified during the fieldwork, this document will be modified by addendum or field change order to include the additional information.

Table 3-1. Hazards Inventory

| Yes | No | Hazard |
|-----|----|--|
| | X | Confined space entry |
| | X | Excavation entry |
| X | | Heavy equipment (drill rig, Geoprobe®, skidsteer) |
| X | | Fire and explosion (fuels) |
| X | | Electrical shock (utilities and tools) |
| X | | Exposure to chemicals (contaminants and chemical tools) |
| X | | Temperature extremes |
| X | | Biological hazards (poison ivy, Lyme disease, West Nile disease) |
| | X | Radiation or radioactive contamination |
| X | | Noise (drill rig, chain saw, pressure washer) |
| X | | Drowning |
| | X | ACM |
| X | | MEC (potential to encounter UXO) |

ACM = Asbestos Containing Material.
 MEC = Munitions and Explosives of Concern.
 UXO = Unexploded Ordnance.

Specific tasks are as follows:

- Site mobilization and demobilization;
- Site walk, civil survey, and geophysical survey;
- Soil or sediment sampling using hand augers, scoops, or sediment sampler on foot and from a boat;
- Subsurface soil sampling using DPT (Geoprobe®);
- Vegetation clearing with machetes and loppers, as required;
- IDW handling and disposition; and
- Equipment decontamination.

3.1 POTENTIAL EXPOSURES

Prior sampling results indicate that the COCs at NACA Test Area are as follows:

- Lead; and
- Polycyclic aromatic hydrocarbons (PAHs) [such as benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene].

Table 3-2 contains information on the potential contaminants, as well as chemicals that will be used for the project. It is important to note that the contaminants listed in Table 3-2 have been detected in a number of locations at the former RVAAP and might be expected to occur at any former operations area. Exposure to chemical tools, such as corrosive sample preservatives, or flammable fuels is a possibility and will be controlled through standard safe handling practices.

3.2 TASK-SPECIFIC HAZARD ANALYSIS

Table 3-3 presents task-specific hazards, relevant hazard controls, and required monitoring, if appropriate, for all of the planned tasks.

Table 3-2. Potential Exposures

| Chemical | TLV/PEL/STEL/IDLH^a | Health Effects/ Potential Hazards^b | Chemical and Physical Properties^b | Exposure Route(s)^b |
|--|---|---|--|--|
| Hydrochloric acid (potentially used to preserve water samples or for equipment decontamination) | TLV: 2 ppm ceiling IDLH: 50 ppm | Irritation of respiratory system; eye and skin burns; pulmonary edema | Liquid; VP: fuming; IP: 12.74 eV; FP: none | Inhalation Ingestion Contact |
| Nitric acid (potentially used to preserve water samples) | TLV/TWA: 2 ppm STEL: 4 ppm IDLH: 25 ppm | Irritation of eyes, skin, respiratory system; delayed pulmonary edema; dental erosion | Colorless, yellow, or red, fuming liquid with an acrid, suffocating odor; IP: 11.95 eV; VP: 48 mm | Inhalation Ingestion Contact |
| Sulfuric acid (potentially used to preserve water samples) | TLV/TWA: 1 mg/m ³ STEL: 3 mg/m ³ IDLH: 15 mg/m ³ | Irritation of eyes, skin, nose, throat, respiratory system; pulmonary edema; dental erosion; eye, skin burn; dermatitis | Colorless to dark brown, oily, odorless liquid; VP: 0.001 mm; FP: none; IP: none | Inhalation Ingestion Contact |
| Sodium hydroxide (potentially used to preserve water samples) | TLV: 2 mg/m ³ ceiling IDLH: 10 mg/m ³ | Irritation of eyes, skin, respiratory system; pneumonia; eye and skin burns | Colorless to white, odorless solid. VP: 0 mm; VP: NA | Inhalation Ingestion Contact |
| Isopropyl alcohol (potentially used for equipment decontamination) | TLV/TWA: 200 ppm STEL: 500 ppm IDLH: 2,000 ppm | Irritation of eyes, skin, respiratory system; drowsiness; headache | Colorless liquid with alcohol odor; VP: 33 mm; IP: 10.10 eV; FP: 53°F | Inhalation Ingestion Contact |
| Diesel (used for fuel for heavy equipment) ^c | TLV/TWA: 100 ppm, A3 | Irritation of eyes, skin, respiratory system; dizziness; headache; nausea; central nervous system | Brown slightly viscous liquid, with characteristic odor; FP: 125.6°F | Inhalation Ingestion Contact |
| Diesel exhaust | NA | Irritation of eyes and respiratory system; potential occupational carcinogen | Appearance odor and properties vary depending upon the specific diesel exhaust component | Inhalation Contact |
| Gasoline (used for fuel) | TLV/TWA: 300 ppm, A2 IDLH: Ca | Potential carcinogen per NIOSH, dizziness, eye irritation, dermatitis | Liquid with aromatic odor FP: -45°F; VP: 38-300 mm | Inhalation Ingestion Absorption Contact |
| Liquinox (used for decontamination) | TLV/TWA: None | Inhalation may cause local irritation to mucus membranes | Yellow odorless liquid (biodegradable cleaner); FP: NA | Inhalation Ingestion |

Table 3-2. Potential Exposures (Continued)

| Chemical | TLV/PEL/STEL/IDLH^a | Health Effects/ Potential Hazards^b | Chemical and Physical Properties^b | Exposure Route(s)^b |
|---------------------------------|---|---|--|--|
| Lead (potential contaminant) | NIOSH REL: TWA (8-hour) 0.050 mg/m ³ PEL: (1910.1025) TWA 0.050 mg/m ³ | Weakness, exhaustion; insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain; anemia; tremor; paralysis wrist, ankles; kidney disease; irritation eyes; main target is the nervous system | A heavy, ductile, soft, gray solid | Ingestion Inhalation Contact |
| PAHs (potential contaminant) | Benzo(a)pyrene : OSHA PEL: 0.2 mg/m ³ | Suspected human carcinogen | PAHs are typically colorless, white, or pale yellow-green solid | Inhalation Ingestion Contact |

^aFrom 2014 Threshold Limit Values, *American Conference of Governmental Industrial Hygienists*.

^bFrom *NIOSH Guide to Chemical Hazards* web site.

A2 = Suspected Human Carcinogen.

A3 = Not Classifiable as a Human Carcinogen.

Ca = Potential Occupational Carcinogen.

eV = Electron Volt.

FP = Flash Point.

IDLH = Immediately Dangerous to Life and Health.

IP = Ionization Potential.

mg/m³ = Milligrams per Square Meter.

mm = Millimeters.

NA = Not Applicable.

NIOSH = National Institute for Occupational Safety and Health.

OSHA = Occupational Safety and Health Administration.

PAH = Polycyclic Aromatic Hydrocarbon.

PEL = Permissible Exposure Limit.

ppm = Parts per Million.

REL = Recommended Exposure Limit.

STEL = Short-Term Exposure Limit.

TLV = Threshold Limit Value.

TWA = Time-Weighted Average.

VP = Vapor Pressure.

Table 3-3. Activity Hazard Analysis

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Site Mobilization and Demobilization

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP Leidos

Risk Assessment Code (RAC):

| |
|---|
| M |
|---|

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

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

| |
|--|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – Hard hat (during drilling activities), safety glasses, safety shoes, reflective/high-visibility safety vest, and long pants. |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|---|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Contact with MEC | Follow the 3Rs for explosives safety. Recognize Retreat and Report to Range Control at 614-336-6041 . If MEC or suspected MEC is encountered, do not approach, touch, move, or disturb MEC, but carefully leave the area and report the finding to Range Control immediately. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks, if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Site Mobilization and Demobilization

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|----------------------------------|-----------------------------------|--|---|
| General (Continued) | Exposure to chemicals | Wash face and hands and any other exposed areas prior to taking anything by mouth. HAZWOPER training and medical clearance. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | L |
| | Lifting injuries | Compliance with Leidos EH&S Procedure 50 "Manual Lifting" to limiting individual lifts by Leidos personnel to 50 pounds. Verification/observation of lifting by Leidos personnel by FM. | L |
| | Slips, trips, and falls | Clean and organize work areas, keeping walkways and working areas clear, including snow, ice, and standing water. | L |
| | Struck by moving/mobile equipment | Workers will maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times. | L |
| Vehicle Operation | Vehicle accidents | Compliance with Leidos EH&S Procedure 32, Vehicle Operations (valid driver's license, seat belt use, routine vehicle inspections, no cell phone use while driving, compliance with applicable laws and regulations, and defensive driving). Visual inspection includes the vehicle and any associated items such as trailers or external cargo carriers. The operator verifies that the following items are present and functional: seatbelt(s), lights, turn signals, operating brakes, speedometer, fuel gauge, horn, windshield, windshield wiper, defrosting/defogging system, rear view mirror, cab, non-slip surfaces on steps, and tires (approximately proper inflation). While driving on Camp Ravenna, facility personnel shall take necessary precautions to avoid hitting deer. Observe and maintain posted speed limits for both day and night driving conditions. | L |
| Equipment to be Used | | Inspection Requirements | Training Requirements |
| Vehicles | | Daily safety inspections of operations; initial and at least weekly inspections of equipment | Properly trained personnel to operate equipment |
| General hand tools, if necessary | | All tools must be inspected daily and taken out of service if damaged Daily vehicle inspection | Valid driver's licenses Site-specific training, including site hazard communication training CPR and first aid training for at least two on-site personnel and at least one person per field team |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Risk Assessment Code (RAC):

| |
|---|
| M |
|---|

Project: Supplemental Sampling at NACA Test Area Activities Job: Site Walk, Visual Survey and Geophysical Survey

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP Leidos

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

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

| |
|--|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – Hard hat (during drilling activities), safety glasses, safety shoes, nitrile or similar gloves to handle potentially contaminated material, reflective/high-visibility safety vest, and long pants. Tyvek can be used in tall grassy or brush areas. |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|--|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |
| | Contact with MEC | Follow the 3Rs for explosives safety. Recognize Retreat and Report to Range Control at 614-336-6041. If MEC or suspected MEC is encountered, do not approach, touch, move, or disturb MEC, but carefully leave the area and report the finding to Range Control immediately. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Site Walk, Visual Survey and Geophysical Survey

Job: Site Walk and/or Visual Survey

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------------------------|-----------------------------------|--|---|
| General (Continued) | Exposure to chemicals | Wash face and hands and any other exposed areas prior to taking anything by mouth. HAZWOPER training and medical clearance. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | L |
| | Struck by moving/mobile equipment | Workers will maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times. | L |
| | Slips, trips, and falls | Clean and organize work areas, keeping walkways and working areas clear, including snow, ice, and standing water. | L |
| Vehicle Operation | Vehicle accidents | Compliance with Leidos EH&S Procedure 32, Vehicle Operation. Vehicle operation (valid driver's license, seat belt use, routine vehicle inspections, no cell phone use while driving, compliance with applicable laws and regulations, and defensive driving). The visual inspection includes the vehicle and any associated items such as trailers or external cargo carriers. The operator verifies that the following items are present and functional: seatbelt(s), lights, turn signals, operating brakes, speedometer, fuel gauge, horn, windshield, windshield wiper, defrosting/defogging system, rear view mirror, cab, non-slip surfaces on steps, and tires (approximately proper inflation). While driving on Camp Ravenna, facility personnel shall take necessary precautions to avoid hitting wildlife. Observe and maintain posted speed limits for both day and night driving conditions. | L |
| Equipment to be Used | | Inspection Requirements | Training Requirements |
| Vehicles EM31 and EM61 | | Daily safety inspections of operations; initial and at least weekly inspections of equipment Daily vehicle inspection | HAZWOPER 40-hr training and current refresher training Medical clearance Properly trained personnel to operate equipment Valid driver's licenses Site-specific training including site hazard communication training CPR and first aid training for at least two on-site personnel |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Risk Assessment Code (RAC):

| |
|---|
| M |
|---|

Project: Supplemental Sampling at NACA Test Area Activities

Job: Soil or Sediment Sampling Using Hand Augers, Scoops, or Sediment Sampler on Foot

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP Leidos

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

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

| |
|---|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – Hard hat (during drilling activities), safety glasses, safety shoes, nitrile or similar gloves to handle potentially contaminated material, reflective/high-visibility safety vest, and long pants. |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|--|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |
| | Contact with MEC | Follow the 3Rs for explosives safety. Recognize Retreat and Report to Range Control at 614-336-6041. If MEC or suspected MEC is encountered, do not approach, touch, move, or disturb MEC, but carefully leave the area and report the finding to Range Control immediately. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Soil or Sediment Sampling Using Hand Augers, Scoops, or Sediment Sampler on Foot

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|---------------------------------|---|---|--|
| General (Continued) | Exposure to chemicals | Wash face and hands and any other exposed areas prior to taking anything by mouth. HAZWOPER training and medical clearance. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | L |
| | Struck by moving/mobile equipment | Workers will maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times. | L |
| | Lifting injuries | Compliance with Leidos EH&S Procedure 50 "Manual Lifting" to limiting individual lifts by Leidos personnel to 50 pounds. Verification/observation of lifting by Leidos personnel by FM. | L |
| | Slips, trips, and falls | Clean and organize work areas, keeping walkways and working areas clear, including snow, ice, and standing water. | L |
| Soil and Sediment Sampling | Exposure to chemicals | PPE (Level D) plus nitrile or equivalent gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Use water spray to prevent visible airborne dust generation during soil sampling activities where necessary. Stay upwind of any dust-generating activities. Minimize contact. Hazard communication training. SDS for chemical tools on-site included as Attachment C to the SAP Addendum. Chemical containers labeled to indicate contents and hazard. HAZWOPER training and medical clearance for hazardous waste work. Decontamination of potentially contaminated equipment prior to servicing. Monitoring – PID or other sampling as appropriate. | L |
| Shipping and Packing Samples | Hazardous material shipping/transportation regulatory violation or spill (soil and water samples) | Ensure DOT/IATA compliance if shipping chemicals or other hazardous materials or samples. Hazardous materials shippers must be trained and certified. | L |
| Equipment to be Used | | Inspection Requirements | Training Requirements |
| Sampling equipment if necessary | | All tools must be inspected daily and taken out of service if damaged | HAZWOPER 40-hr training and current refresher training Medical clearance Site-specific training including site hazard communication training CPR and first aid training for at least two on-site personnel and at least one person per field team |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Sediment Collection from a Boat

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP Leidos

Risk Assessment Code (RAC):

| |
|---|
| M |
|---|

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

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

| |
|--|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – Personal flotation devices, safety glasses, safety shoes, nitrile or similar gloves to handle potentially contaminated material, reflective/high-visibility safety vest, and long pants. |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|--|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |
| | Contact with MEC | Follow the 3Rs for explosives safety. Recognize Retreat and Report to Range Control at 614-336-6041. If MEC or suspected MEC is encountered, do not approach, touch, move, or disturb MEC, but carefully leave the area and report the finding to Range Control immediately. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Sediment Collection from a Boat

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|------------------------|-------------------------|--|------------|
| General (Continued) | Exposure to chemicals | Wash face and hands and any other exposed areas prior to taking anything by mouth. HAZWOPER training and medical clearance. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | L |
| | Lifting injuries | Compliance with Engineering Solutions EH&S Procedure 150 "Manual Lifting" to limiting individual lifts by Leidos personnel to 50 pounds. Verification/observation of lifting by Leidos personnel by FM. | L |
| | Slips, trips, and falls | Clean and organize work areas, keeping walkways and working areas clear, including snow, ice, and standing water. | L |
| Operating Boat | General safety hazards | Boat operator must be trained and experienced. Daylight operations only. | L |
| | Drowning | Operations between sunrise and sunset only. Check weather prior to each day of operations and stop work if a chance of small boat warning conditions or lightning. If you notice darkening clouds, volatile and rough changing winds or sudden drops in temperature, get off the water. Trip plan and POC ashore familiar with plan and return time if out of site of POC. 100% communications capability with ashore POC and hourly safety checks (radio, cell, or satellite telephone) if out of site of POC. Throw ring or throw bag with line. USCG III PFD must be worn by each person in boat. Ring buoys must be provided with at least 90 feet of line and shall be thrown to person in water and they shall be drawn alongside the boat and assisted into the boat. Caution must be taken to prevent tipping of the boat. | L |
| | Hypothermia | Each person aboard will have a change of clothes in waterproof container ashore. Rescue blanket ashore. Personnel will not wear cotton clothing aboard boat. Boats will not be used if there is a chance of rain and air temps are below 35°F. Boats will not be used if combined air and water temps equal to or above 100 unless waterproof suits are used. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Sediment Collection from a Boat

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-------------------|--------------------------------|--|------------|
| Operating Boat | Slips, trips, and falls aboard | Footwear will have suitable soles for boat use (no lugged soles). All equipment and gear shall be stowed in an orderly manner and out of the way of foot traffic. Each person shall have a secure seat. No standing while boat is traveling. | L |
| | Capsize | No standing or walking upright until boat is secured. Check weather prior to each day of operations and stop work if a chance of small boat warning conditions. If you notice rough changing winds, get off the water. | M |
| Sediment Sampling | Exposure to chemicals | PPE (Level D) plus nitrile or equivalent gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Staying upwind of any dust-generating activities. Minimal contact. Hazard communication training. SDS for chemical tools on-site included as Attachment C to the SAP Addendum. Chemical containers labeled to indicate contents and hazard. Medical clearance for hazardous waste work. Decontamination of potentially contaminated equipment prior to servicing. Monitoring – PID or other monitoring as appropriate. | L |
| | Operating hand tools | Clean and organize work areas, keeping walkways and working areas clear. | L |
| | Drowning | Operations between sunrise and sunset only. Check weather prior to each day of operations and stop work if a chance of small boat warning conditions or lightning. If you notice darkening clouds, volatile and rough changing winds or sudden drops in temperature, get off the water. Trip plan and POC ashore familiar with plan and return time if out of site of POC. 100% communications capability with ashore POC and hourly safety checks (radio, cell, or satellite telephone) if out of site of POC. USCG III PFD must be worn by each person on boat. Ring buoys must be provided with at least 90 feet of line and shall be thrown to person in water and they shall be drawn alongside the boat and assisted into the boat. Caution must be taken to prevent tipping of the boat. | M |
| | Hypothermia | Each person aboard will have a change of clothes in waterproof container ashore. Rescue blanket ashore. Personnel will not wear cotton clothing aboard boat. Boats will not be used if there is a chance of rain and air temps are below 35°F. Boats will not be used if combined air and water temps equal to or above 100 unless waterproof suits are used. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Sediment Collection from a Boat

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|---------------------------------------|--------------------------------|---|--|
| Sediment Sampling (Continued) | Slips, trips, and falls aboard | Footwear will have suitable soles for boat use (no lugged soles). All equipment and gear shall be stowed in an orderly manner and out of the way of foot traffic. Each person shall have a secure seat. No standing while boat is traveling. | L |
| | Capsize | No standing to sample. Stay low at all times unless boat is stable enough to walk without rocking. Check weather prior to each day of operations and stop work if a chance of small boat warning conditions. If you notice rough changing winds, get off the water. | L |
| Equipment to be Used | | Inspection Requirements | Training Requirements |
| Paddle boat Sampling equipment | | Daily safety inspections of operations; initial and at least weekly inspections of boat All tools must be inspected daily and taken out of service if damaged | HAZWOPER 40-hr training and current refresher training Medical clearance Properly trained personnel to operate boat Site-specific training including site hazard communication training CPR and first aid training for at least two on-site personnel and at least one person per field team |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Risk Assessment Code (RAC):

| |
|---|
| M |
|---|

Project: Supplemental Sampling at NACA Test Area Activities

Job: Soil Boring and Soil Sampling Using DPT and Concrete Core Drill

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP, Leidos

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

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

| |
|---|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – Hard hat (during drilling activities), safety glasses, safety shoes, nitrile or similar gloves to handle potentially contaminated material, reflective/high-visibility safety vest, and long pants. |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|--|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |
| | Contact with MEC | Follow the 3Rs for explosives safety. Recognize Retreat and Report to Range Control at 614-336-6041. If MEC or suspected MEC is encountered, do not approach, touch, move, or disturb MEC, but carefully leave the area and report the finding to Range Control immediately. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Soil Boring and Soil Sampling Using DPT and Concrete Core Drill

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|------------------------|--|---|------------|
| General (Continued) | Exposure to chemicals | Wash face and hands and any other exposed areas prior to taking anything by mouth. Keep upwind at all times. HAZWOPER training and medical clearance. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | M |
| | Struck by moving/mobile equipment | Workers will maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times. | L |
| | Lifting injuries | Compliance with Leidos EH&S Procedure 50 "Manual Lifting" to limiting individual lifts by Leidos personnel to 50 pounds. Verification/observation of lifting by Leidos personnel by FM. | L |
| | Slips, trips, and falls | Clean and organize work areas, keeping walkways and working areas clear, including snow, ice, and standing water. | L |
| Drilling | General safety hazards (rotating machinery, suspended loads, moving equipment, slips, and falls) | Level D PPE (see Section 6.0) plus hard hat. No employees under lifted loads. At least two functional kill switches or switches (tested daily) that require continuous force to activate. Functional back-up alarm. Drill rig manual on-site. Only experienced operators. Exclusion zone at least equal to mast height. HAZWOPER safety training. Monitoring – daily site safety inspections. Weekly drill rig inspections. | L |
| | Noise | Leidos personnel will stay outside of high noise areas. Hearing protection within 7.6 meters (25 ft) of rig unless rig-specific monitoring indicates noise exposure of less than 90 dB. Monitoring – daily safety inspections. | L |
| | Fire (vehicle fuels or subsurface contaminants) | Fuels stored in safety containers labeled/listed by nationally recognized testing laboratory. Bonding and grounding during fuel transfers. Fuel storage areas marked with "No Smoking" or "Open Flame" signs. No ignition sources within 50 ft of fuel storage areas. Fire extinguishers in all fuel use areas and inspected monthly. Monitoring – combustible gas indicator if buried organic material or other source of flammable gas is suspected. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Soil Boring and Soil Sampling Using DPT and Concrete Core Drill

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|------------------------------|---|--|------------|
| Drilling (Continued) | Electric shock | Identification and clearance of overhead and underground utilities. Monitoring – visual of all work areas. 110-V electrical tools connected through GFCI. | L |
| | Operating hand tools or power tools | Clean and organize work areas, keeping walkways and working areas clear. 110-V portable tools will be connected through GFCI. | L |
| Soil Sampling | Exposure to chemicals | PPE (Level D) plus nitrile or equivalent gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Staying upwind of any dust-generating activities. Minimal contact. Hazard communication training. SDS for chemical tools on-site included as Attachment C to the SAP Addendum. Chemical containers labeled to indicate contents and hazard. Medical clearance for hazardous waste work. Decontamination of potentially contaminated equipment prior to servicing. Monitoring – PID or other monitoring as appropriate. HAZWOPER training and medical clearance. | L |
| | Cuts or other injuries from opening sampling tubes | Use dedicated tube cutter or hooked safety blades when using polymer sample tubes. Wear heavy cut-resistant gloves when opening polymer sample tubes. Keep fingers from between split spoon halves. | L |
| Shipping and Packing Samples | Hazardous material shipping/transportation regulatory violation or spill (soil and water samples) | Ensure DOT/IATA compliance if shipping chemicals or other hazardous materials or samples. Hazardous materials shippers must be trained and certified. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Soil Boring and Soil Sampling Using DPT and Concrete Core Drill

| Equipment to be Used | Inspection Requirements | Training Requirements |
|--|---|---|
| Vehicles GeoProbe® Concrete Core Drill | Daily safety inspections of operation; initial and at least weekly inspections of equipment Daily vehicle inspection | HAZWOPER 40-hr training and current refresher training Medical clearance Properly trained personnel to operate equipment Valid driver's licenses Site-specific training including site hazard communication training CPR and first aid training for at least two on-site personnel |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Risk Assessment Code (RAC):

M

Project: Supplemental Sampling at NACA Test Area Activities

Job: Vegetation Clearing with Machetes, and Loppers

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP, Leidos

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

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

| |
|--|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – safety glasses, safety shoes, leather/cut-resistant gloves over nitrile or similar gloves to handle vegetation, reflective/high-visibility safety vest, and long pants |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|--|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |
| | Contact with MEC | Follow the 3Rs for explosives safety. Recognize Retreat and Report to Range Control at 614-336-6041. If MEC or suspected MEC is encountered, do not approach, touch, move, or disturb MEC, but carefully leave the area and report the finding to Range Control immediately. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Vegetation Clearing with Machetes, and Loppers

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------------------------|--------------------|--|---|
| General (Continued) | Cuts and abrasions | Before using brush-chopping tools, thoroughly train employees. This involves instruction in tool inspection, proper gripping methods, proper swinging clearances, and methods of holding and cutting various sized limbs. Keep machetes, axes, and other chopping tools sharp and sheathed at all times when not in use. When carrying unsheathed chopping tools, grasp the handle close to the head. Wear leather/cut-resistant gloves with grips for gripping cutting tool. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | L |
| | Lifting injuries | Compliance with Leidos EH&S Procedure 50 "Manual Lifting" to limiting individual lifts by Leidos personnel to 50 pounds. Verification/observation of lifting by Leidos personnel by FM. | L |
| Equipment to be Used | | Inspection Requirements | Training Requirements |
| Machetes and loppers | | Daily safety inspections of operations All tools must be inspected daily and taken out of service if damaged | HAZWOPER 40-hr training and current refresher training Medical clearance Properly trained personnel to operate tools Site-specific training including site hazard communication training CPR and first aid training for at least two on-site personnel and at least one person per field team |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Risk Assessment Code (RAC):

M

Project: Supplemental Sampling at NACA Test Area Activities

Job: IDW Handling

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP, Leidos

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

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

| |
|---|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – Hard hat (during drilling activities), safety glasses, safety shoes, nitrile or similar gloves to handle potentially contaminated material, reflective/high-visibility safety vest, and long pants. |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|--|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: IDW Handling

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|--|-----------------------------------|--|---|
| General (Continued) | Exposure to chemicals | Wash face and hands and any other exposed areas prior to taking anything by mouth. HAZWOPER training and medical clearance. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | L |
| | Struck by moving/mobile equipment | Workers will maintain a safe distance equivalent to the full, extended reach of all moving/mobile equipment. Approach mobile/moving equipment only after getting permission of the operator. Maintain visual contact with equipment operators at all times. | L |
| | Lifting injuries | Compliance with Leidos EH&S Procedure 50 "Manual Lifting" to limiting individual lifts by Leidos personnel to 50 pounds. Verification/observation of lifting by Leidos personnel by FM. | L |
| | Slips, trips, and falls | Clean and organize work areas, keeping walkways and working areas clear, including snow, ice, and standing water. | L |
| Equipment to be Used | | Inspection Requirements | Training Requirements |
| Vehicles Fork trucks, bobcats, and trucks, if necessary Hand tools | | Daily vehicle inspection Daily safety inspections of operation; initial and at least weekly inspections of equipment All tools must be inspected daily and taken out of service if damaged | HAZWOPER 40-hr training and current refresher training Medical clearance Properly trained personnel to operate equipment Valid driver's licenses Site-specific training including site hazard communication training CPR and first aid training for at least two on-site personnel |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Risk Assessment Code (RAC):

| |
|---|
| M |
|---|

Project: Supplemental Sampling at NACA Test Area Activities Job:

Equipment Decontamination (Soap and Water Washing, HCl, and Isopropanol Rinse)

Prepared By: Heather Adams, P.G., Leidos

Reviewed By: Stephen Lowery, CIH, CSP, Leidos

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

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

| |
|---|
| Recommended Protective Clothing & Equipment: |
| Level D PPE – Hard hat (during drilling activities), safety glasses, safety shoes, nitrile or similar gloves to handle potentially contaminated material, and long pants. |

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|-----------|---|--|-----|
| General | Biological hazards (bees, mosquitoes, ticks, Lyme disease, poisonous plants, wasps, and snakes) | Level D PPE. Use insect repellent and permethrin clothing treatment. Pant legs closed with tape to minimize tick entry or contact with harmful plants. Inspect for ticks during the day and at the end of each work day (see FWSHP Section 10.18). Protective ointments like Ivy Block and/or specialized cleaners like Technu if working in areas with poisonous plants. Site-specific instruction to recognize and avoid harmful plants and/or animals. | L |
| | Temperature extremes | Administrative controls (see FWSHP Section 9.0). Heat stress controls at 80°F. Cooled (shaded) or warmed break area depending on the season. Routine breaks in established break area and unscheduled breaks if needed (see FWSHP Section 9.0). Chilled water if temperature exceeds 70°F. Monitoring – ambient temperature measurements at least twice daily. Temperatures greater than 85°F, temperatures less than 30°F, and the use of impermeable clothing require additional controls (see FWSHP Section 9.0). Site- and season-specific instruction in weather hazards and hazard controls. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Equipment Decontamination (Soap and Water Washing, HCl, and Isopropanol Rinse)

| Job Steps | Hazards | Actions to Eliminate or Minimize Hazards | RAC |
|---------------------------|---|---|------------|
| General | Exposure to chemicals | Wash face and hands and any other exposed areas prior to taking anything by mouth. HAZWOPER training and medical clearance. | L |
| | Electric shock | GFCIs for electrical equipment/tools used in decontamination. Inspect electrical equipment for damaged or missing insulation and remove unsafe equipment from use. | L |
| | Severe weather | Check weather prior to departure and reschedule if severe weather is forecasted. In case of severe weather, all personnel will move to a designated safe location if time permits. Suspend fieldwork if tornado warning issued. Suspend work from first evidence of lightning at least 30 minutes after the last sighting of lightning and/or last sound of thunder. Do not work in areas subject to flash flooding. | L |
| | Lifting injuries | Compliance with Leidos EH&S Procedure 50 "Manual Lifting" to limiting individual lifts by Leidos personnel to 50 pounds. Verification/observation of lifting by Leidos personnel by FM. | L |
| | Slips, trips, and falls | Clean and organize work areas, keeping walkways and working areas clear, including snow, ice, and standing water. | L |
| Equipment Decontamination | Hot water, slips, falls, and equipment handling | Level D PPE (see Section 6.0) plus nitrile gloves. | L |
| | Fire (decontamination solvents and gasoline) | Flammable material stored in original containers or in safety containers labeled/listed by a nationally recognized testing laboratory. Fuel storage areas marked with "No Smoking" or "Open Flame" signs. Fire extinguisher kept near decontamination area and inspected monthly. No ignition sources within 50 ft of areas where flammable materials are stored or used for decontamination. | L |
| | Exposure to chemicals | PPE (Level D) plus nitrile or equivalent gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Minimal contact. When using volatile chemicals, work should be performed under conditions of adequate ventilation. Hazard communication training for chemical tools. SDS on-site included as Attachment C to the SAP Addendum. All chemical containers labeled to indicate contents and hazard. Suitable facilities/equipment for flushing eyes of harmful chemicals. | L |

Table 3-3. Activity Hazard Analysis (Continued)

Date Prepared: September 11, 2017

Project: Supplemental Sampling at NACA Test Area Activities

Job: Equipment Decontamination (Soap and Water Washing, HCl, and Isopropanol Rinse)

| Equipment to be Used | Inspection Requirements | Training Requirements |
|----------------------|---|---|
| Hand tools | <p>Daily safety inspections of operations; initial and at least weekly inspections of equipment</p> <p>Daily test of GFCIs</p> <p>All tools must be inspected daily and taken out of service if damaged</p> | <p>HAZWOPER 40-hr training and current refresher training</p> <p>Medical clearance</p> <p>Site-specific training including site hazard communication training</p> <p>CPR and first aid training for at least two on-site personnel and at least one person per field team</p> |

Camp Ravenna = Camp Ravenna Joint Military Training Center.

CIH = Certified Industrial Hygienist.

CPR = Cardiopulmonary Resuscitation.

CSP = Certified Safety Professional.

dB = Decibel.

DOT = U.S. Department of Transportation.

EH&S = Environmental Health and Safety.

EM = Electromagnetic.

FM = Field Manager.

FWSHP = Facility-Wide Safety and Health Plan.

GFCI = Ground Fault Circuit Interrupter.

HAZWOPER = Hazardous Waste Operations.

HCl = Hydrochloric Acid.

IATA = International Air Transport Association.

SDS = Safety Data Sheet.

NACA = National Advisory Committee on Aeronautics.

P.G. = Professional Geologist.

PFD = Personal Flotation Device.

PID = Photoionization Detector.

POC = Point of Contact.

PPE = Personal Protective Equipment.

RAC = Risk Assessment Code.

USCG = U.S. Coast Guard.

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4.0 STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

This section presents the personnel (and their associated telephone numbers) responsible for site safety and health and emergency response. Table 4-1 identifies Leidos and Subcontractor staff who will fill key roles. See the FWSHP for information on the roles and responsibilities of key positions.

Table 4-1. Staff Organization

| Position | Name | Telephone |
|---------------------------------------|--------------------------------|-------------------------------------|
| Leidos Health and Safety Officer | Stephen H. Lowery, CIH, CSP | (571) 526-6659 C: (405) 919-4176 |
| Leidos Project Manager | Jed Thomas, P.E. | (330) 405-5802 C: (216) 214-2599 |
| Leidos Field Operations Manager | Amanda Sprinzl, P.G. | (330) 405-5822 C: (614) 330-9857 |
| Leidos Site Safety and Health Officer | Heather Adams, P.G. | (330) 405-5814 C: (330) 573-8571 |
| Subcontractor Supervisor (Driller) | TBD | TBD |

The Leidos SSHO may designate SSHO duties to appropriately trained personnel based on staff availability.

CIH = Certified Industrial Hygienist.

CSP = Certified Safety Professional.

FM = Field Manager.

P.E. = Professional Engineer.

P.G. = Professional Geologist.

TBD = To Be Determined.

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5.0 TRAINING

Training requirements, from Section 5.0 of the FWSHP, are summarized in Tables 3-3 and 5-1.

Table 5-1. Training Requirements

| Training | Worker | Leidos FM and SSHO | Site Visitor |
|--|---------------|---------------------------|---------------------|
| HAZWOPER (40-hr, 3-day on-the-job training) | √ | √ | — |
| HAZWOPER Annual Refresher (8 hr) | √ | √ | — |
| HAZWOPER Supervisors Training (8 hr) | — | √ | — |
| CPR and First Aid Training (required for two personnel and a minimum of one person per field team) | √ | √ | — |
| General Hazard Communication Training | √ | √ | √ |
| Respiratory Protection Training (required only if respirators are worn) | — | — | — |
| Hearing Conservation Training (for workers in hearing conservation program) | √ | √ | — |
| Pre-entry Briefing | √ | √ | √ |
| Site-specific Hazard Communication (contained in pre-entry briefing) | √ | √ | √ |
| Safety Briefing (daily and whenever conditions or tasks change) | √ | √ | √ |
| Equipment-specific Training (Equipment Operators) | √ | — | — |

— = Not required.

√ = Required.

CPR = Cardiopulmonary Resuscitation.

FM = Field Manager.

HAZWOPER = Hazardous Waste Operations.

SSHO = Site Safety and Health Officer.

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6.0 PERSONAL PROTECTIVE EQUIPMENT

General guidelines for selection and use of PPE are presented in Section 6.0 of the FWSHP. Specific PPE requirements for this work are presented in Table 3-3, Activity Hazard Analyses (AHAs). Subcontractor-specific PPE for drilling activities will be included in Subcontractor AHAs.

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7.0 MEDICAL SURVEILLANCE

Medical surveillance requirements, as presented in Section 7.0 of the FWSHP, are summarized in Table 7-1. The Leidos SSHO will verify that on-site Subcontractor employees have the required medical clearances for their respective medical surveillance programs.

Table 7-1. Medical Surveillance Requirements

| Baseline | Routine | Overexposure | Termination |
|--------------------------|---|---|-----------------------------------|
| Prior to work assessment | Every 12 months, unless greater frequency is deemed appropriate by attending physician; not to exceed 2-year interval | Upon developing symptoms or where exposure limits have been exceeded or suspected to have been exceeded | Upon termination or re-assignment |

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8.0 EXPOSURE MONITORING/AIR SAMPLING PROGRAM

The minimum monitoring requirements and action levels are presented in Table 8-1.

Most of the field activities are not expected to pose airborne exposure hazards for the following reasons:

- Work will be performed in open areas with natural ventilation.
- Wet methods shall be used to prevent visible airborne dust.
- Prior site sampling indicated that contaminant concentrations are unlikely to pose an airborne hazard. If a general evaluation of site is being conducted, where the COCs have not been previously identified, then monitoring based on previous site usage will be performed during the sampling activities.
- The most probable contaminants are lead and PAHs. Exposure to these chemicals can be controlled through dust suppression techniques.

Air monitoring of the breathing zone using a photoionization detector (PID) or equivalent is not anticipated. However, the SSHO will examine site conditions and contact the Leidos Field Manager (FM) and initiate monitoring if there is any indication of potential airborne exposure.

Table 8-1. Monitoring Requirements and Action Limits

| Hazard or Measured Parameter | Area | Interval | Limit | Action | Tasks |
|---|---|---|---------------------------------------|--|--|
| Noise | All areas perceived as noisy when heavy equipment or other motorized equipment in use | Any area where there is some doubt about noise levels | 85 dB and any area perceived as noisy | Require the use of hearing protection | Hearing protection will be worn within the exclusion zone, around power augers, or other motorized equipment |
| Visible airborne dust potentially containing COCs or concrete from drilling | All | Continuously | Visible dust generation | Stop work; use dust suppression techniques such as wetting surface | All including concrete coring |

COC = Chemical of Concern (e.g., lead and PAHs).
 dB = Decibel.
 PAH = Polycyclic Aromatic Hydrocarbon.

9.0 HEAT/COLD STRESS MONITORING

General requirements for heat/cold stress monitoring are contained in Section 9.0 of the FWSHP.

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10.0 STANDARD OPERATING SAFETY PROCEDURES

Standard operating safety procedures are described in Section 10.7 of the FWSHP. Dust generation may occur during drilling, clearing, and grubbing, but is unlikely. The area will be misted with water to prevent dust generation during ground/soil disturbance and concrete coring activities (e.g., drilling, clearing, and grubbing), if necessary. The Leidos SSHO and Leidos FM will monitor ground disturbance activities to verify that visible dust is not being generated. During instances of high winds resulting in excessive dust, when dust control measures are determined ineffective, work stoppage and/or additional PPE may be required. Water used for dust control will be clean (e.g., potable water obtained from an off-site source with approval of the Army National Guard [ARNG]/OHARNG Representative).

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11.0 SITE CONTROL MEASURES

Site control measures are described in Section 11.0 of the FWSHP. No formal site control is expected to be necessary for this work, as the work areas are somewhat remote and bystanders are not anticipated. The facility has controlled access and only authorized personnel will be allowed to access the area of concern (AOC). If the SSHO determines that a potential exists for unauthorized personnel to approach within 25 ft of a work zone or otherwise be at risk due to proximity, then additional site controls will be established, as described in Section 11.0 of the FWSHP.

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12.0 PERSONNEL HYGIENE AND DECONTAMINATION

It is the SSHO's responsibility to verify that personnel hygiene and decontamination processes are adequate to protect personnel and meet the requirements of Sections 06.M and 28 of the *Safety and Health Requirements Manual* (USACE 2008). Personnel hygiene and decontamination requirements also are described in Section 11.0 of the FWSHP and in Section 3.0 of this SHP Addendum.

All personnel will remove gloves and any other protective clothing once tasks are complete or when breaks are taken. Personnel also will wash hands and face prior to eating, drinking, or smoking. This step may be accomplished with soap and water or disposable disinfectant wipes. Specially formulated soap to cut oils from poisonous plants will be available for all site personnel to use as directed by the manufacturer.

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13.0 EMERGENCY PROCEDURES AND EQUIPMENT

Emergency contacts, telephone numbers, directions to the nearest medical facility (Figures 16-2 and 16-3), and general procedures are provided in Section 13.0 of the FWSHP. Table 13-1 presents emergency telephone numbers used during normal working hours (Monday through Friday, 0800 to 1600). All on-site emergencies must be coordinated through **Camp Ravenna Range Control (614-336-6041)**, who will coordinate the response. If the injured worker can be moved, transporting the worker to the nearest Medical Transfer Point (Figure 16-4), or emergency medical services (EMS) entrance gate (Main Gate) (Figure 16-2) will expedite the medical evacuation process. If the injured person cannot be moved, Leidos or the Subcontractor will post a signal person (time and resource permitting) at the nearest major intersection/road/medical transfer point to help guide emergency vehicles. The Leidos FM will remain in charge of all Leidos and Subcontractor personnel during emergency activities. Building 1036 will serve as the assembly point if it becomes necessary to evacuate the project sites (Figure 16-2). During mobilization, the Leidos FM will verify that the emergency information in this SHP Addendum is correct.

Each field team will have a cellular telephone and/or a two-way radio capable of contacting Camp Ravenna Range Control and/or Main Gate for communications purposes.

During field operations, at least two on-site personnel will have cardiopulmonary resuscitation (CPR)/first aid training.

In the event of a spill, the procedures presented in the *Update to Procedures to Follow as Related to the RVAAP Restoration Program due to the Accountability Transfer of the Remaining Property from the Base Realignment and Closure Division to the ARNG/OHARNG* letter, dated April 2, 2014 and included as Attachment A of this SAP Addendum, will be followed and the Camp Ravenna First Responder form (included in Attachment B of this SAP Addendum) will be completed.

Table 13-1. Emergency Telephone Numbers

| Position | Telephone Number |
|--|---|
| Camp Ravenna Range Control (Police, Fire, Emergency Medical) | (614) 336-6041 |
| Camp Ravenna Main Gate (outside CRJMTC duty hours) | (614) 336-6003 |
| Hospital (University Hospitals Portage Medical Center, Ravenna formerly Robinson Memorial) | (330) 297-2850 |
| WorkCare Clinic (University Hospitals Urgent Care, Streetsboro) | (330) 558-1432 |
| WorkCare (for Leidos non-emergency care) | (888) 449-7787 |
| U.S. Army Representative Kevin Sedlak | Office: (614) 336-6000 x2053 |
| USACE COR Nathaniel Peters, II | Office: (502) 315-2624 Cell: (502) 939-5210 |
| Leidos Project Manager Jed Thomas, P.E. | Office: (330) 405-5802 Cell: (216) 214-2599 |
| Leidos Health and Safety Officer Steve Lowery, CIH, CSP | Office: (405) 701-3158 Cell: (405) 919-4176 |
| Leidos Site Safety and Health Officer Heather Adams, P.G. | Office: (330) 405-5814 Cell: (330) 573-8571 |
| Leidos Field Operations Manager Amanda Sprinzl, P.G. | Office: (330) 405-5822 Cell: (614) 330-9857 |
| Other (non-Emergency contact) | |
| Camp Ravenna Operation and Maintenance Contractor for site access requests Becky Shreffler, VISTA Sciences | Office: (330) 358-7311 |

CIH = Certified Industrial Hygienist.
 COR = Contracting Officer's Representative.
 CRJMTC = Camp Ravenna Joint Military Training Center.
 CSP = Certified Safety Professional.
 P.E. = Professional Engineer.
 P.G. Professional Geologist.
 USACE = U.S. Army Corps of Engineers.

14.0 LOGS, REPORTS, AND RECORD KEEPING

Daily Safety Inspection, Daily Health and Safety Summary, Tailgate Safety Meeting Log, and USACE Accident Investigation Report forms are included in Attachment B of this SAP Addendum. The Leidos FM (or SSHO) is responsible for completing these forms in accordance with the record keeping requirements listed in Section 14.0 of the FWSHP.

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15.0 REFERENCES

USACE (U.S. Army Corps of Engineers) 2007a. *Safety and Occupational Health Requirements for Hazardous, Toxic, and Radioactive Waste*, Engineer Regulation (ER)-385-1-92. May 2007.

USACE 2007b. *Safety and Health Requirements for Munitions and Explosives of Concern (MEC) Operations*, ER-385-1-95. March 2007.

USACE 2008. *Safety and Health Requirements Manual*, Engineer Manual (EM)-385-1-1. November 2008.

USACE 2011a. *Facility-Wide Safety and Health Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. February 2011.

USACE 2011b. *Facility-Wide Field Sampling Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. February 2011.

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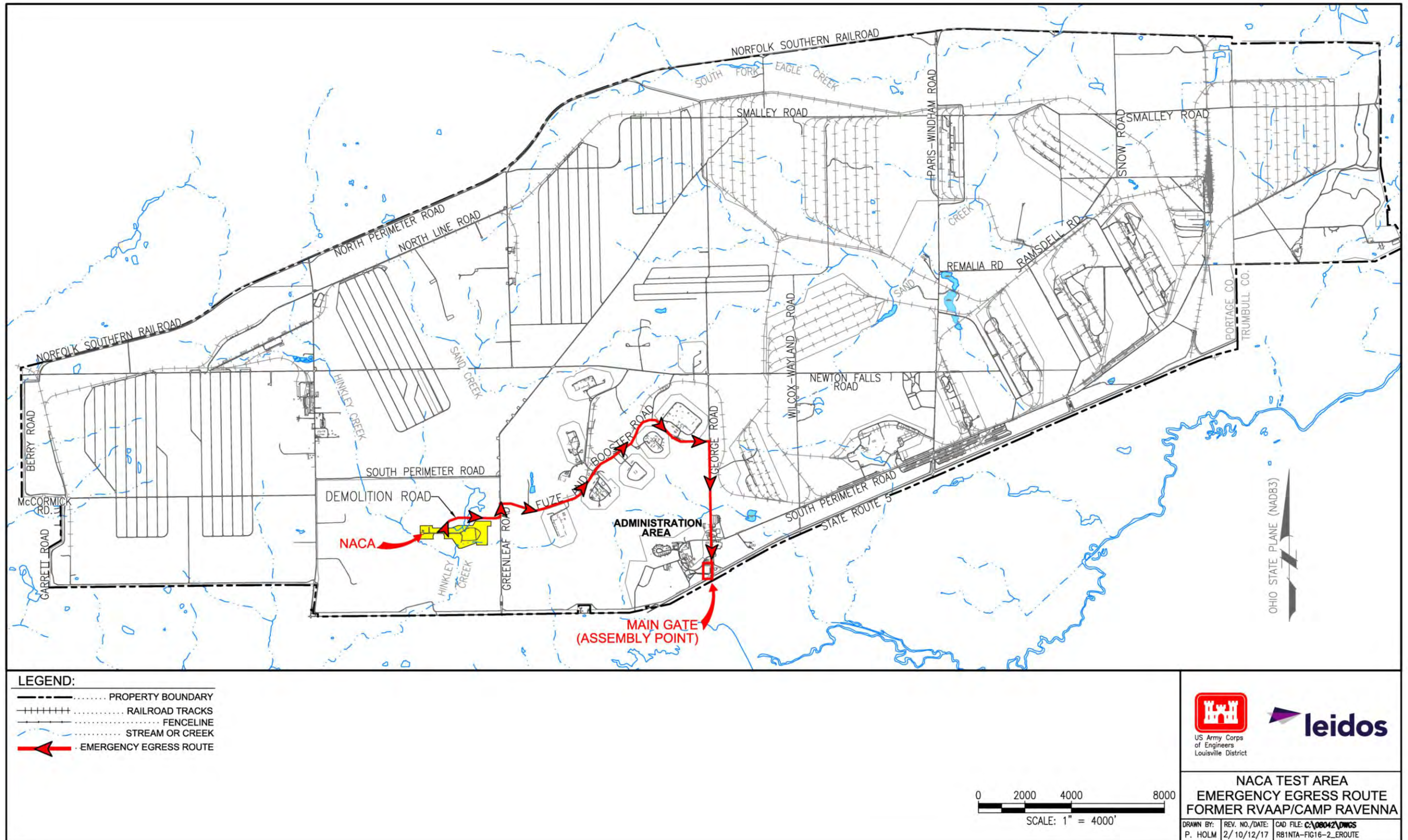


Figure 16-2. Camp Ravenna Site Map and Egress Route

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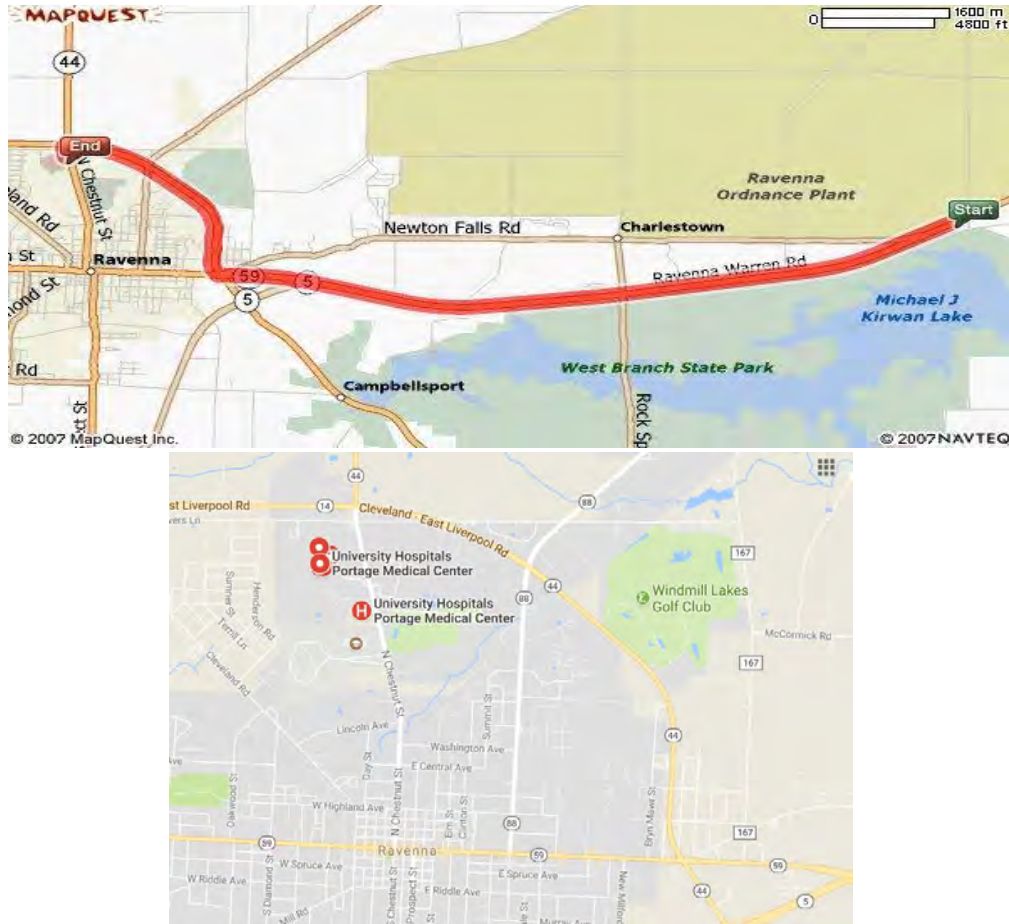


Figure 16-3. Route Map to Pre-Notified Medical Facility

**University Hospitals Portage Medical Center
6847 N. Chestnut Street
Ravenna, Ohio
(330) 297-2850**

**Directions: West on State Route 5. Stay straight onto OH-59 West.
Turn Right onto OH-14/OH-44. Turn Left onto North Chestnut St.**

WorkCare Facility Information

This facility will be used for Leidos employee non-emergency care. Remember to contact WorkCare for medical advice at (888) 449-7787 per Leidos policy following any non-emergency work-related injury or illness.

**University Hospitals Streetsboro Urgent Care
9318 State Route 14
Streetsboro, Ohio 44241
(330) 558-1432**

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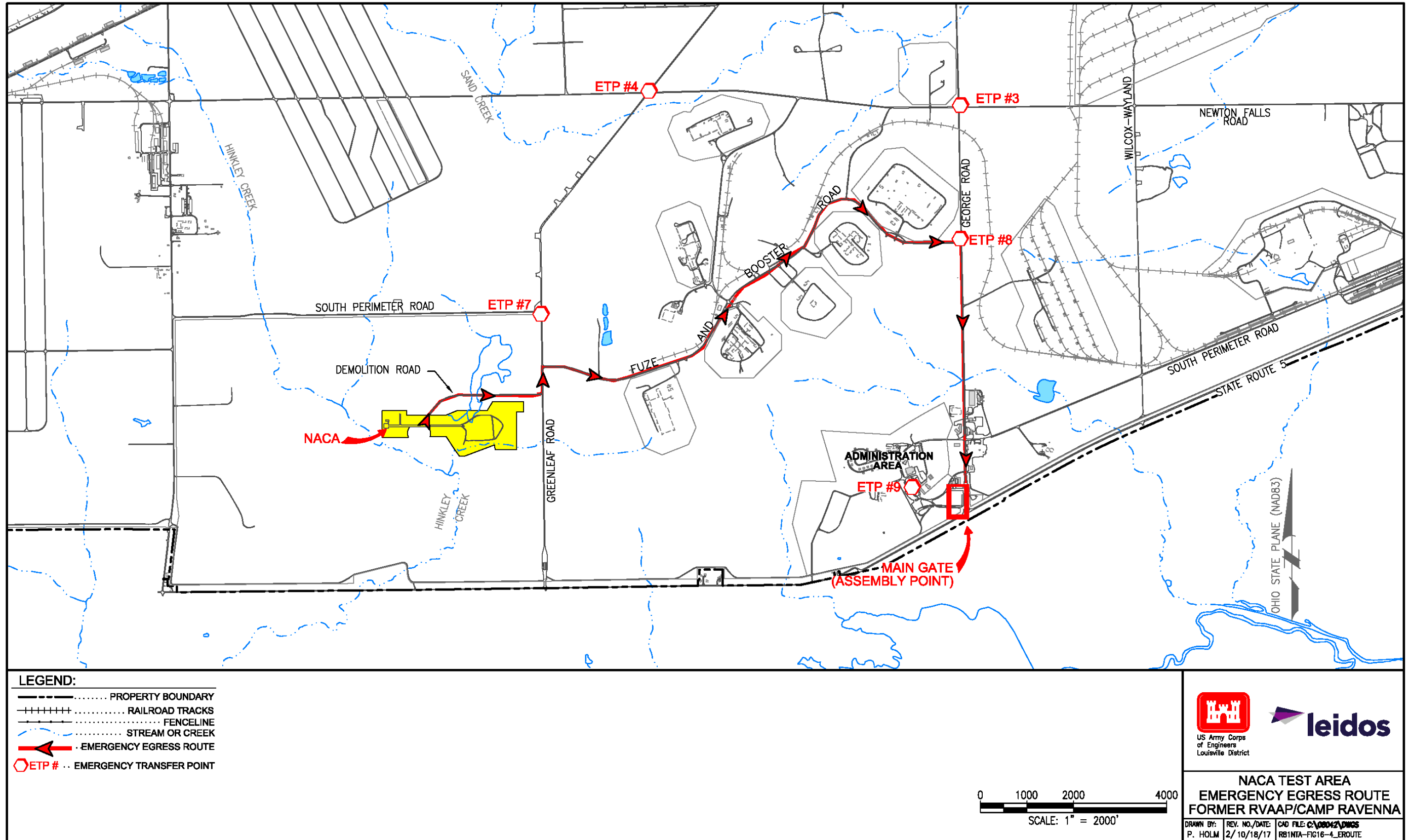


Figure 16-4. Nearby Medical Transfer Points

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ATTACHMENT A

**CAMP RAVENNA JOINT MILITARY TRAINING CENTER (CRJMTC)
RESTORATION CONTRACTOR INFORMATION**

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**THE ADJUTANT GENERAL'S DEPARTMENT
CAMP RAVENNA JOINT MILITARY TRAINING CENTER**

1438 State Route 534 SW
Newton Falls, OH 44444

2 April 2014

RE: Camp Ravenna/Former Ravenna Army Ammunition Plant (RVAAP)
Portage and Trumbull Counties, Ohio
Update to Procedures to Follow as Related to the RVAAP Restoration Program due to the
Accountability Transfer of the Remaining Property from BRACD to the ARNG/OHARNG

To: RVAAP Restoration Program Stakeholders and Contractors

Accountability for the remaining acreage of the former RVAAP has been transferred from the Base Realignment and Closure Division (BRACD) to the United States Property and Fiscal Office (USP&FO) for Ohio. The entire facility (all acreage) is now part of Camp Ravenna and licensed to the Ohio Army National Guard (OHARNG) for use as a military training site. With this transition, the OHARNG/Army National Guard (ARNG) has assumed responsibility for management of the RVAAP restoration program. The RVAAP restoration program is now part of the larger OHARNG environmental program, and as such, needs to be synchronized with the OHARNG environmental program requirements and Camp Ravenna operational policies and procedures. This letter is to advise you of the environmental program and operational policies and procedures applicable to you as an Army stakeholder and/or contractor involved in the RVAAP restoration program. Our hope is to facilitate a smooth transition. Items addressed in this letter include the following:

- Access procedures to Camp Ravenna/former RVAAP;
- Emergency/Spill procedure for Camp Ravenna/former RVAAP;
- Waste management procedures at Camp Ravenna/former RVAAP;
- Hazardous materials management procedures at Camp Ravenna/former RVAAP;
- Use of Building 1036 and job trailers at Camp Ravenna/former RVAAP;
- Revision to the general facility description in restoration documents; and
- Revisions to shipping address and document distribution.

1. Access Procedures for Camp Ravenna/Former RVAAP

The protocol for access is developed and implemented by the Camp Ravenna headquarters staff and may change depending upon the security level. The current procedure for restoration Army stakeholders, contractors, the Ohio Environmental Protection Agency (Ohio EPA), and any other restoration related visitors to Camp Ravenna is provided in Attachment A and summarized below.

- Request access to Camp Ravenna through Vista Sciences (Rebecca Haney, cc Gail Harris, Al Brillinger) at least 48 hours in advance on the access request form.
- Vista Sciences will confer with the Camp Ravenna Environmental Office (CR-ENV) to confirm the access request is valid.
- Vista Sciences will forward the access request form to the appropriate Camp Ravenna military security staff for approval.

- Camp Ravenna military security staff will approve or deny the request and forward it back to Vista Sciences. If approved, the Camp Ravenna military security staff will send the access form to the applicable gate at Camp Ravenna.
- Vista Sciences will inform access request submitter that the request has been approved.

At no time will contractors be granted access without prior approval by the Camp Ravenna Operations Office. Contractor work schedules must coincide with Camp Ravenna duty days and hours (Monday through Friday, 7:30AM-4:30PM). Extended work schedules must be approved by the Camp Ravenna Environmental Office (Restoration Program and/or Environmental Supervisor) and coordinated and approved by Operations, at least 48 hours prior to the intended start date. Federal holidays will not be approved as a normal work days. Please note: Any work outside of normal duty hours, weekends or holidays must be preapproved by Camp Ravenna.

2. Emergency/Spill Procedure for Camp Ravenna/Former RVAAP

The protocol for emergency procedures is developed and implemented by the Camp Ravenna headquarters staff. The procedure for spills at Camp Ravenna is developed and implemented by the Camp Ravenna Environmental Office in coordination with the Camp Ravenna headquarters staff and in accordance with latest version of the Camp Ravenna Integrated Contingency Plan (ICP or Spill Plan). Please note that the Camp Ravenna ICP/Spill Plan was updated and finalized in January 2014. The current procedure for Army stakeholders, contractors, the Ohio EPA, and any other restoration related visitors to Camp Ravenna is summarized below.

- In the event of an emergency or spill, contact Camp Ravenna Range Control at (614)336-6041.
- Range Control will contact the applicable emergency services which will be dispatched from Trumbull or Portage County depending on the location of the emergency.
- For spills (any time), follow the procedure and telephone notification on the Camp Ravenna First Responder form provided in Attachment B.
- For non-spill emergencies outside Camp Ravenna regular duty hours, dial 911 and ask for the Ravenna, Ohio emergency dispatch.

3. Waste Management Procedures for Camp Ravenna/Former RVAAP

All waste generated by the restoration program will now be managed by the OHARNG (Camp Ravenna Environmental Office). Katie Tait, with support from Vista Sciences (Brad Kline), will be the main contacts for the waste program at Camp Ravenna. Due to the transition from BRACD to OHARNG, procedures for waste management at the facility have changed. Changes are summarized below.

- All waste must be managed in accordance with the Camp Ravenna Waste Management Guidelines- Restoration Waste (see Attachment C)
- All waste must be inspected by the contractor who generated the waste on a weekly basis using the Camp Ravenna Waste Inspection form. Inspection forms must be submitted to Brad Kline (with cc to Katie Tait) on a weekly basis. If the contractor chooses to use Vista for weekly waste inspections, the contractor must work out the logistics and details with Vista including payment for services. Weekly waste inspections for contractor waste is not a government funded task under the Vista support contract.
- All waste profiles must be reviewed and signed by Katie Tait. The alternate for signature (in Katie Tait's absence) is Tim Morgan.
- All manifests must be reviewed and signed by Katie Tait prior to any waste leaving the facility. The alternate for signature is Tim Morgan or Kevin Sedlak (nonhazardous waste only).

- A waste sample must be collected within 10 days of generation of any waste. Analytical results for all waste must be submitted to the OHARNG/ARNG (Katie Tait, Kevin Sedlak) and Vista Sciences (Brad Kline) as soon as received by the contractor. Waiting to submit the analytical results with the IDW report is not acceptable (too much time elapses between sampling and IDW report generation and we must be expedient if the waste is determined to be hazardous).
- All hazardous waste must be removed from the facility within 90 days of generation and all nonhazardous waste must be removed from the facility within 120 days of generation. Any other disposal timeframes must be discussed and approved by the Camp Ravenna Environmental Office.
- A drum label in accordance with the Facility-wide Sampling and Analysis Plan (FWSAP) must be used to label the drum/container prior to sampling and as soon as waste is added to the drum/container. A Pending Analysis label may be used after a waste sample is collected. Use of a Pending Analysis label shall not exceed 20 days. An applicable waste label must be placed on waste containers within 7 days (1 week) of receiving the analytical results determining the waste type.
- All contractor waste must be staged at Building 1036 (nonhazardous) or Building 1047 (hazardous). All other waste storage locations must be approved by the Camp Ravenna Environmental Office prior to use.
- All empty drums that are not in use must be properly labeled as 'Empty'.
- Contractor waste stored onsite is to be tracked and logged in the Waste Binder on the appropriate Container Log within Building 1036 and 1047. When restoration waste is added to the storage area, Vista Sciences (Brad Kline) must be contacted and made aware of the newly added waste.
- The contractor is responsible for ensuring that all waste is ready for transport (proper containerization, labeling, paperwork, etc.) offsite prior to waste transport.

4. Hazardous Materials Management Procedures for Camp Ravenna/Former RVAAP

Hazardous materials may be brought onsite for applicable restoration purposes during the duration of the field work. Any hazardous materials brought onsite must be identified in the contractor's project work plan and on an inventory prior to work. The contractor is required to properly manage all hazardous materials while onsite, including but not limited to, having an inventory and Safety Data Sheets (SDSs) of materials, properly inspecting materials, properly storing on secondary containment, having spill supplies and the first responder form on hand, and having properly labeled materials. Hazardous materials must be removed and taken offsite by the contractor at the end of each field work episode. The OHARNG/ARNG is not responsible for disposing of or managing contractor hazardous materials. The Camp Ravenna Environmental Office must approve any long term storage of hazardous materials. All hazardous materials utilized during field work in Building 1036 are to be stored in the hazardous material lockers offered by OHARNG in Building 1036. All hazardous materials approved by Camp Ravenna Environmental Office for long term storage and the hazardous materials lockers are strictly managed (compatibility, SDS, containers labeled, shelves numbered, inventoried, inspected, etc.) in accordance with the OHARNG requirements. The contractor is required to comply with these requirements.

5. Use of Building 1036 and Work Trailers at Camp Ravenna/Former RVAAP

- If a contractor would like to use Building 1036, the contractor must contact Vista Sciences in the Camp Ravenna Environmental Office for building keys and access.
- All work trailer locations must be approved by Camp Ravenna prior to staging onsite.

6. Revision to General Facility Description in Restoration Documents

The following is a revision to the general facility description as it pertains to the restoration program. Please use this description as applicable in all restoration documents.

The former Ravenna Army Ammunition Plant (RVAAP), now known as the Camp Ravenna Joint Military Training Center (Camp Ravenna), located in northeastern Ohio within Portage and Trumbull counties, is approximately three (3) miles east/northeast of the City of Ravenna and one (1) mile north/northwest of the City of Newton Falls. The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garret, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland.

Administrative accountability for the entire 21,683-acre facility has been transferred to the United States Property and Fiscal Office (USP&FO) for Ohio and the property subsequently licensed to the OHARNG for use as a military training site, Camp Ravenna. The RVAAP restoration program involves cleanup of former production/operational areas throughout the facility related to former activities conducted under the RVAAP.

7. Revisions to Document Shipping Addresses and Document Distribution

For Preliminary Draft, Draft and Final Documents – OHARNG/ARNG

Send one (1) electronic copy of report to:

Army National Guard
Attn: Brett Merkel
ARNG-ILE Cleanup
111 South George Mason Drive
Arlington VA 22203

Send one (1) hardcopy and one (1) electronic copy of report to:

Camp Ravenna Environmental Office
Attn: Katie Tait/Kevin Sedlak
1438 State Route 534 SW
Newton Falls OH 44444

Send two (2) electronic copies and two (2) hardcopies of report to:

Camp Ravenna Environmental Office
Attn: RVAAP Administrative Records Manager (Gail Harris)
1438 State Route 534 SW
Newton Falls OH 44444

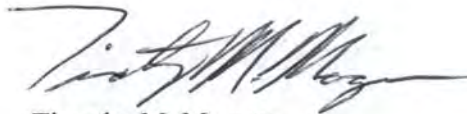
For Draft and Final Documents – Ohio EPA

Vista Sciences will send an email to the Ohio EPA Project Manager with the cover letter and attached document (not to include appendices for size purposes) with a cc to Nancy Zikmanis, Justin Burke, and Rod Beals.

One (1) hardcopy and three (3) electronic copies of the report (with all appendices included) will be sent to the Ohio EPA Project Manager at the Ohio EPA NEDO office along with the cover letter. If the document is too large for email submittal, then one (1) additional electronic copy will be sent to Justin Burke at the Ohio EPA Columbus office.

As we work through this transition, there are likely to be additional updates and changes to programs and policies that impact the RVAAP Restoration Program. We will do our best to keep all stakeholders informed and appreciate your patience during this process. If you have any questions or need additional information, please do not hesitate to contact Ms. Kathryn Tait, OHARNG Environmental Specialist 2, at kathryn.s.tait.nfg@mail.mil or (614)336-6136 or Mr. Kevin Sedlak, ARNG Restoration Project Manager, at kevin.m.sedlak.ctr@mail.mil or (614)336-6000 ext 2053.

Sincerely,



Timothy M. Morgan
Fort Ohio Environmental Supervisor

Cc: Kathryn Tait, OHARNG
Kevin Sedlak, ARNG
Brett Merkel, ARNG
Glen Beckham, USACE
Allan Brillinger, Vista Sciences
Nancy Zikmanis/Rod Beals, Ohio EPA

Attachments

- Attachment A – Restoration Contractor Access Packet
- Attachment B – Camp Ravenna First Responder Form
- Attachment C – Camp Ravenna Waste Management Guidelines

Attachment A

**CAMP RAVENNA JOINT MILITARY
TRAINING CENTER (CRJMTC)
RESTORATION CONTRACTOR INFORMATION**



MARCH 2014

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INSTALLATION ACCESS

The Camp Ravenna Joint Military Training Center (CRJMTC) is a restricted access Ohio Army National Guard training installation. Due to the inherent risks involved with military training, access to the facility is controlled. All personnel enter and exit CRJMTC through either the Main or East entry gates (see attached map), and upon arrival, are required to present a valid, state-issued identification card to installation security officers.

Civilian personnel must be granted access, in writing, by the Camp Ravenna Operations office. For Restoration Contractors and non-OHARNG government personnel this approval will be coordinated by Vista Sciences Corporation (VSC) who will collect and submit access requests to Camp Ravenna Operations. VSC will confirm with the Camp Ravenna Environmental Office to ensure the access rosters are valid prior to submitting them to Operations for approval.

Requests for access must be submitted no later than 48 hours prior (two business days) to the desired arrival time. **At no time will contractors be granted access without prior approval by the Camp Ravenna Operations Office. Contractor work schedules must coincide with CRJMTC duty days and hours (Monday through Friday, 7:30AM-4:30PM).**

Extended work schedules must be approved by the Camp Ravenna Environmental Office (Restoration Program and/or Environmental Supervisor) and coordinated and approved by Operations, at least 48 hours prior to the intended start date. **Federal Holidays will not be approved as a normal work days.**

EMPLOYEE ROSTERS

Restoration contractors, subcontractors and non-OHARNG government personnel that require access to CRJMTC are required to submit employee rosters no later than one week prior to the scheduled project start date. Employee rosters, at a minimum, will include:

- a. The first and last names of all employees requiring access
- b. Site foreman's name and on-site phone number (for emergency notification)
- c. Contractor's business office address, phone number, and email address
- d. CRJMTC Project title, e.g. "WBG Remedial Investigation"
- e. Anticipated dates access will be required, e.g. "08/12/2010 – 10/11/2010"

Employee rosters, once approved by Camp Ravenna Operations, will be forwarded to the guard post at the appropriate entry gate. Contractors must maintain accurate employee rosters and forward all updated rosters to VSC as necessary. Each updated and approved employee roster supersedes all previously submitted rosters.

DELIVERIES

All material deliveries (including FedEx/UPS packages) for contractors or subcontractors must be approved by Camp Ravenna Operations. Access requests for deliveries will be submitted via VSC no later than 24 hours prior (one business day) to the anticipated delivery date and must include:

- a. The shipping company or supplier's name
- b. Driver's name
- c. CRJMTC Project title
- d. Date or dates of delivery
- e. Contractor or subcontractor on site point of contact, e.g. "XYZ Construction, Phil Hammer, (777) 888-9999

Depending on the location of the project site, contractors may be required to provide a vehicle escort to facilitate the movement of materials from the entry gate to the project site.

Contractors working on the **WEST** side (utilizing the State Route 5 **Main** entry gate) of the installation will provide delivery companies with the following address using the provided format:

Contractor/Subcontractor Name, Attn: Site Foreman's Name
CRJMTC Project Title
8451 State Route 5
Ravenna, Ohio 44266

Contractors working on the **EAST** side (utilizing the State Route 534 **East** entry gate) of the installation will provide delivery companies with the following address using the provided format:

Contractor/Subcontractor Name, Attn: Site Foreman's Name
CRJMTC Project Title
1438 State Route 534 Southwest
Newton Falls, Ohio 44444

CRJMTC employees and security personnel will at no time sign for or receive any packages addressed to contractors. Deliveries to CRJMTC during non-business hours or the weekend will not be granted access unless an extended work schedule has been approved and arrangement made for off-hour deliveries.

ACCESS CONTACT INFORMATION

All access related correspondence should be submitted on company letterhead or on the Camp Ravenna Contractor Access Form (see attached example). A confirmation email will be sent after the request has been processed.

Access Requests and Employee Rosters must be submitted by email to **each** the following VSC personnel:

| NAME | EMAIL | OFFICE PHONE |
|---------------|--|----------------|
| Becky Haney | rebecca.haney@vistasciences.com | (330) 872-8010 |
| Gail Harris | gail.harris3@us.army.mil | (330) 872-8003 |
| Al Brillinger | allan.brillinger@vistasciences.com | (330) 872-8009 |

In the event you need to contact the Camp Ravenna Environmental Office directly, the contacts are below. Do not submit restoration project access rosters directly to the Camp Ravenna Environmental Office unless you are directed to do so.

| NAME | EMAIL | OFFICE PHONE |
|--------------|--|----------------------------|
| Kevin Sedlak | kevin.m.sedlak.ctr@mail.mil | (614) 336-6000 ext 2053 |
| Katie Tait | kathryn.s.tait.nfg@mail.mil | (614) 336-6136 |
| Tim Morgan | timothy.m.morgan.nfg@mail.mil | (614) 336-6568 |

RESTRICTIONS

Contractors/non-OHARNG government personnel working on CRJMTC are responsible for ensuring all employees travel to and from the work site on the prescribed route (as briefed during the pre-construction meeting). Unlike some military installations, CRJMTC does not offer amenities such as fuel stations, convenience stores, public restrooms or restaurants. **Sightseeing, camping, hiking, fishing, trapping, hunting, ATV use and off-roading are strictly prohibited.**

Camp Ravenna is a “Forbidden Carry Zone” (as defined by Ohio’s Concealed Carry Laws) and contractors are strictly prohibited from bringing weapons onto the installation. All vehicles entering and exiting the installation are subject to search.

Security guards are not authorized to grant access to any unannounced visitors, subcontractors, contractors or service personnel without permission from Camp Ravenna Operations.

The use or possession of alcohol or other illegal substances (in accordance with state and federal laws) is strictly prohibited on Camp Ravenna.

Ohio is a “Smoke-free Workplace” state. Smoking is prohibited inside all CRJMTC buildings.

VEHICLE SAFETY

The speed limit on CRJMTC is 35 MPH (during daylight hours) & 25 MPH (during hours of darkness) on all roads unless otherwise posted and 10 MPH when passing military personnel traveling on foot. Everyone is required to wear seatbelts at all times when the manufacturer (according to State law) provides such equipment. Drivers must have a valid state issued driver’s license on their person while operating a vehicle on CRJMTC. The use of headphones or earphones, for the purpose of listening to music, is prohibited. This does not negate wearing hearing protection where conditions or vehicles require their use. Cell phone use, by the driver of a moving vehicle, is prohibited unless a “hands free” device is utilized. **Gross negligence with regard to vehicle safety will not be tolerated and may result in the loss of driving privileges on Camp Ravenna.**

UNEXPLODED ORDNANCE (UXO)

Camp Ravenna, formerly known as the Ravenna Army Ammunition Plant or “Ravenna Arsenal,” produced ammunition for the US military during World War II, the Korean War and the Vietnam War. As a result, some UXO has been discovered by contracted service personnel. Any individual who finds any item resembling artillery projectiles, fuses, casings or other ordnance on post must immediately consider it as unexploded ordnance (UXO). **Do not touch or move the suspected UXO.** Report the incident immediately to the CRJMTC Range Control by telephone at (614) 336-6041 or contact the Main Gate at (330) 358-2017. CRJMTC personnel will take immediate action to secure the area and ensure proper disposal of the suspected UXO.

ACTIONS IF UXO IS FOUND

- a. Seal off the area from other personnel
- b. Initiate necessary protective and evacuation measures
- c. Mark the entrance to the UXO area using easily identifiable markings (do not mark the ordnance).

- d. Notify CRJMTC Range Control or Gate Guards immediately by telephone with the description of item. **DO NOT touch the suspected UXO!**
- e. Show CRJMTC personnel the location of the item
- f. Render such assistance as may be required in support of EOD operations

INADVERTENT DISCOVERY **OF CULTURAL MATERIALS**

- Report any observations or discoveries of artifacts or human remains immediately to CRJMTC Range Control (614) 336-6041. Range Control will immediately notify the CRJMTC Environmental Office & OHARNG Cultural Resources Manager (CRM).
- CRJMTC Range Control or the CRM will secure the artifacts or discovery site, as appropriate. If human remains are suspected, they are not to be disturbed and Range Control will promptly notify Ohio State Highway Patrol or Federal Bureau of Investigation, as appropriate.
- The CRM and Range Control will take measures to protect the location from further disturbance until appropriate parties are notified.
- If a concentration of artifacts or a burial site is identified as the source of materials discovered, the CRM will make arrangements for site recordation and stabilization, in consultation with the Ohio Historic Preservation Office and any interested Native American tribes.
- Once the site has been cleared by the CRM and CRJMTC Range Control, the activity may resume. Depending on the findings, activities may be cleared to resume in 48 hours or up to 6 months.

FOR EMERGENCY RESPONSE ON THE **“WEST SIDE” (PORTAGE COUNTY):**

- **For a spill emergency implement the Camp Ravenna Emergency Spill Notification IAW the Camp Ravenna First Responder Form.**
- **For non-spill emergencies from 0730-1630, Monday through Friday, contact CRJMTC Range Control by telephone at (614) 336-6041**
- **For non-spill emergencies outside CRJMTC duty hours, dial 911 and ask for the Ravenna, Ohio emergency dispatch.**
- State your emergency and location.
- Outside of CRJTMTC duty hours, the Main Gate guard shack (330) 358-2017 should be notified so they can assist in the process (open the gate, direct vehicles).
- During CRJMTC duty hours, Range Control will contact the appropriate dispatch for emergency response and help guide units to your location.
- If the patient can be moved, transporting the patient to the nearest Medical Transfer Point, or EMS entrance gate (North Gate or Main Gate) will expedite the medical evacuation process.

- If the patient cannot be moved, post a signal person (time and resource permitting) at the nearest major intersection/road/medical transfer to help guide emergency vehicles.
- Medical Transfer Points are located throughout the installation. These predetermined points assist first responders in locating injured personnel.



DIRECTIONS TO ROBINSON MEMORIAL HOSPITAL:

- Exit the Main gate. Take State Route 5 west 7.2 miles to the junction of Routes 14 and 44 north. You will be at a stop light next to a McDonalds/BP.
- Turn right onto Routes 14/44 north.
- Go 2.4 miles to North Chestnut Street. You will pass a light at the intersection of Route 88 and will be at a second light at the intersection where Route 14 goes straight and Route 44 splits to the right and goes north, you need to be in the left lane at this intersection, to turn left (south) on North Chestnut Street.
- After turn, get into the right lane. The hospital entrance is 2/10ths of a mile on your right.
- Follow the signs to the Emergency Room.
- Robinson Memorial Patient Information (330) 297-2448

FOR EMERGENCY RESPONSE ON THE EAST SIDE (TRUMBULL COUNTY):

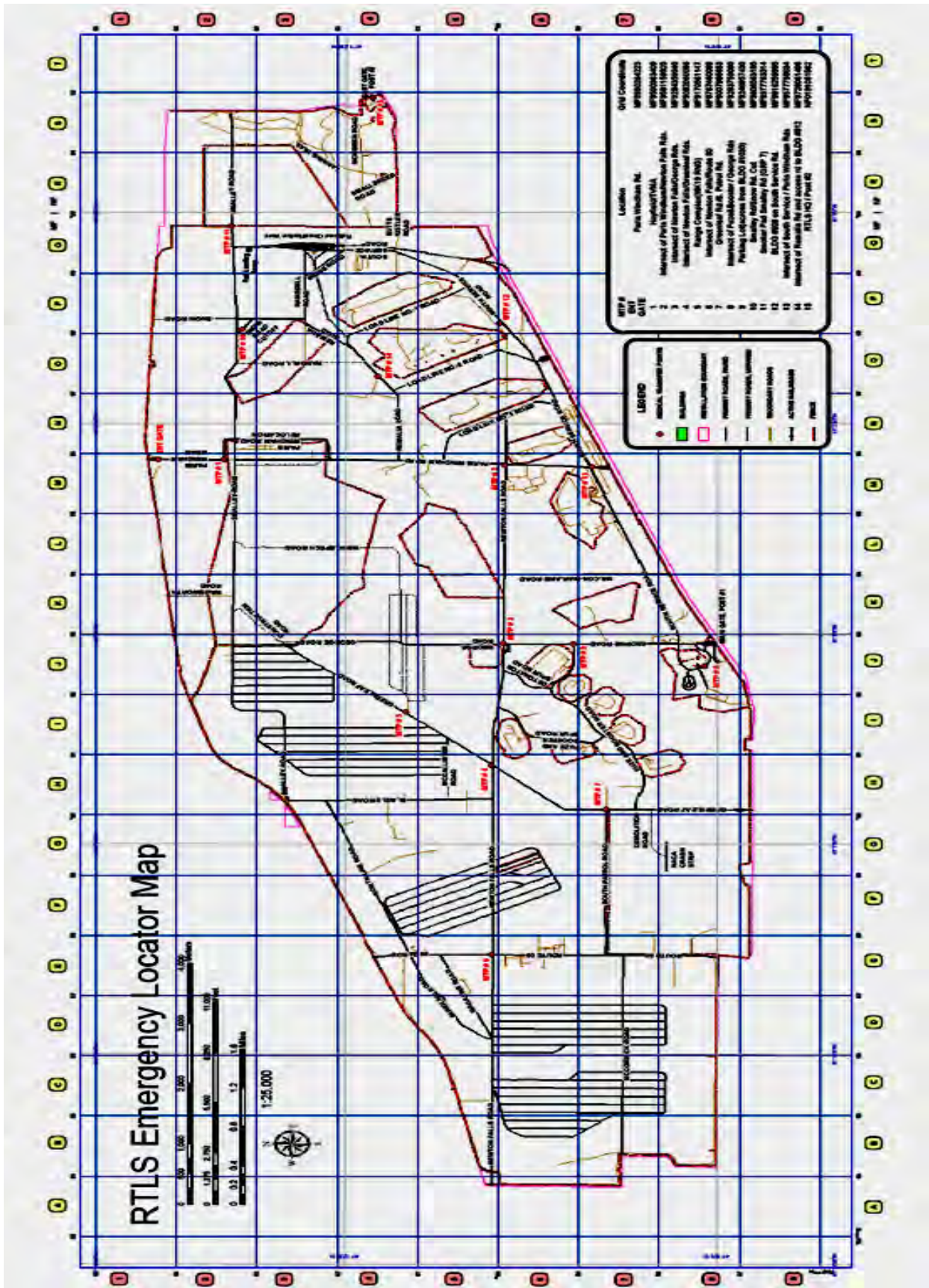
- **For a spill emergency implement the Camp Ravenna Emergency Spill Notification IAW the Camp Ravenna First Responder Form.**
- **For non-spill emergencies from 0730-1630, Monday through Friday, contact CRJMTC Range Control by telephone at (614) 336-6041**
- **For non-spill emergencies outside CRJMTC duty hours, call 911 and ask for the Trumbull County (Ohio) dispatch.**
- State your emergency and location.
- Outside of CRJMTC duty hours, the East Gate guard shack (614) 336-6399 should be notified so they can assist in the process (open the gate, direct vehicles).
- During CRJMTC duty hours, Range Control will contact the appropriate dispatch for emergency response and help guide units to your location.
- If the patient can be moved, transporting the patient to the nearest Medical Transfer Point, or EMS entrance gate (East Gate) will expedite the medical evacuation process.

- If the patient cannot be moved, post a signal person (time and resource permitting) at the nearest major intersection/road/medical transfer to help guide emergency vehicles.
- Medical Transfer Points are located throughout the installation. These predetermined points assist first responders in locating injured personnel.

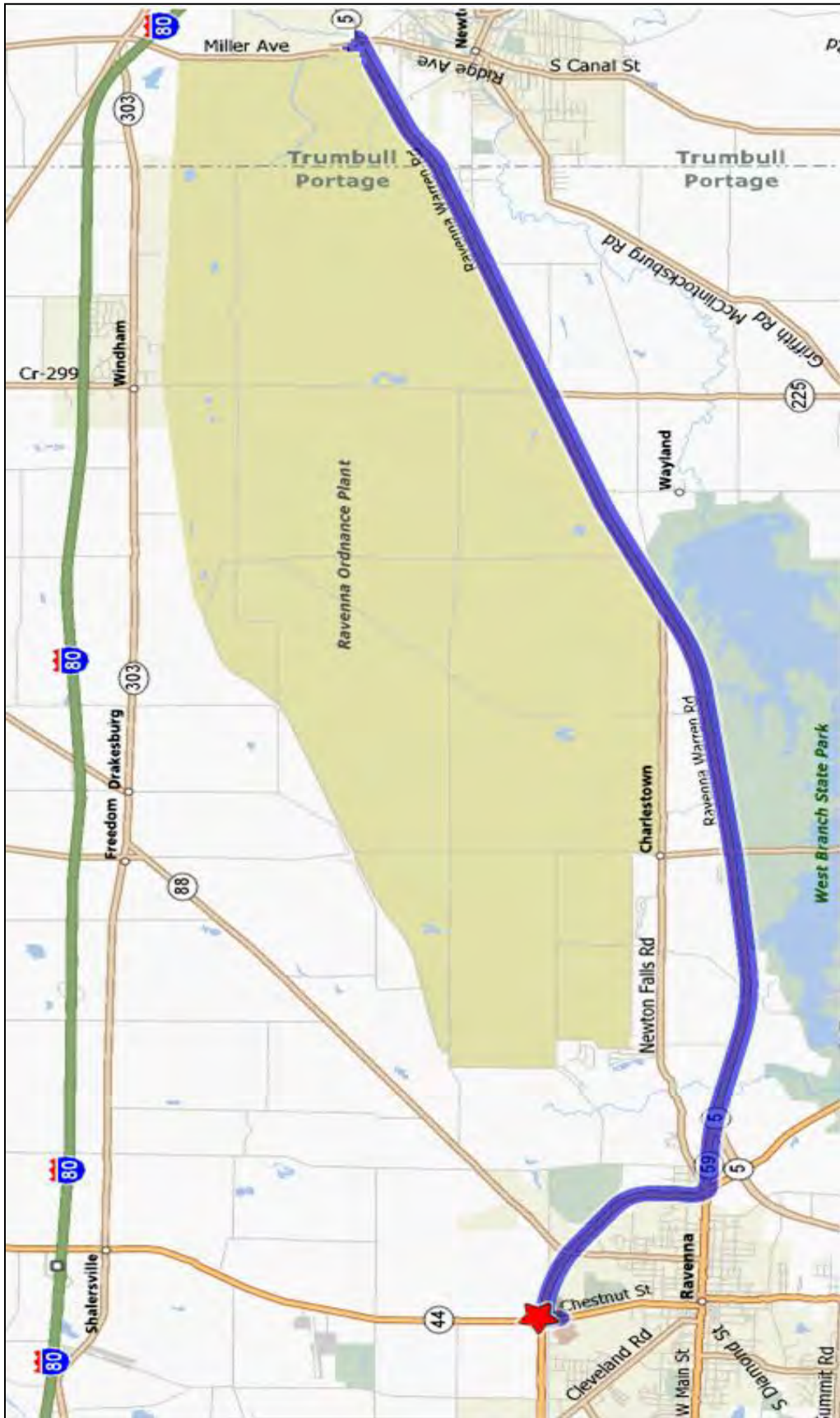


DIRECTIONS TO ROBINSON MEMORIAL HOSPITAL:

- Exit the East Gate. Turn right onto Route 534 and go 300 feet to the first stop light at the intersection of Route 534 and Route 5. Take State Route 5 west 12.4 miles to the junction of Routes 14 and 44 north. You will be at a stop light next to a McDonalds/BP.
- Turn right onto Routes 14/44 north.
- Go 2.4 miles to North Chestnut Street. You will pass a light at the intersection of Route 88 and will be at a second light at the intersection where Route 14 goes straight and Route 44 splits to the right and goes north, you need to be in the left lane at this intersection, to turn left or south on North Chestnut Street.
- After turning get into the right lane. The hospital entrance is 2/10ths of a mile on your right.
- Follow the signs to the Emergency Room.
- Robinson Memorial Patient Information (330) 297-2448



MAP TO ROBINSON MEMORIAL HOSPITAL



| <u>IMPORTANT TELEPHONE NUMBERS</u> | | |
|---|-------------|-------------------------|
| Range Control Desk (614) 336-6041 | | |
| Range Control Cell | | (614) 202-5783 |
| CRJMTC HQ Fax | | (614) 336-6796 |
| <u>Range and Operations</u> | | |
| CPT Yates | | (614) 336-6193 |
| SGM Finnegin | | (614) 336-8934 |
| SFC Fowler | | (614) 336-6133 |
| SFC Welker | | (614) 336-6793 |
| SFC Baucum | | (614) 336-6562 |
| <u>Engineer Section</u> | | |
| CPT Dunlap | | (614) 336-6567 |
| SGM Garloch | | (614) 336-6795 |
| <u>Logistics</u> | | |
| MAJ Saphore | | (614) 336-6790 |
| SFC Bosley | | (614) 336-6791 |
| <u>Security</u> | | |
| Main Gate | (West Side) | (330) 358-2017 |
| East Gate | | (614) 336-6399 |
| <u>Environmental Office</u> | | |
| Tim Morgan | | (614) 336-6568 |
| Katie Tait | | (614) 336-6136 |
| Kim Ludt | | (614) 336-6569 |
| Kevin Sedlak | | (614) 336-6000 ext 2053 |

DISCUSSION

Most contractor-related access issues are due to a failure to provide CRJMTC with the proper access requests or a failure to provide delivery/service personnel with the correct information.

Due to poor road conditions on Camp Ravenna, “carpooling” is encouraged, in order to prevent unnecessary damage to privately owned vehicles (POVs). Employees working on the West side of CRJMTC may park their POVs in the parking lot located outside the Main Gate.

Employee rosters and access requests have expiration dates, and any warranty work that occurs after the project has been completed requires the submission of a separate access request.

Please keep in mind, at any given time the installation may have several construction projects underway. Taking the necessary steps to avoid confusion will help alleviate congestion around the access gates and prevent delays.

Know your worksite surroundings. **Take note of the nearest road intersection, Medical Transfer Point, firing range or training area and ensure all site employees know where they are and what actions to take in the event of an emergency.** If you don’t know, ask someone from Environmental or Range Control for help.

Some CRJMTC worksites are co-located or near training areas/firing ranges and therefore require (daily) Range Control authorizations (via phone) prior to entry/occupation. Your CRJMTC point of contact will advise when these requirements exist.

Attachment B

FIRST RESPONDER REPORTING FORM

(Print all information)

*Collect as much of the information on the top half of this form as possible before making initial notification.
Complete the top and bottom of the form before turning in to Camp Ravenna.*

Name of individual reporting spill: _____

When did the spill occur (Date and Time)? _____

Spill Location (Building or area name / number, indoors or out; if vehicle involved, type and bumper number):

What was spilled? _____ How much was spilled? _____

Rate at which material is currently spilling. _____

Extent of spill travel? _____

Did the spill reach water (ditch, creek, stream, pond, well head) _____

Number of injured personnel and type injuries, if applicable. _____

Do you need the Fire Department to respond to protect life, property, and environment? _____

Unit: _____ State: _____ Report Date & Time: _____

On Scene Coordinator Name and Grade: _____ Phone: _____

How did the spill occur (be specific). _____

What remedial action was taken? _____

Was soil and absorbent material generated? _____ How much? _____

What is the location of the soil and absorbents? _____

Was the Environmental Office contacted (yes or No, date and time)? _____

Who did you talk to in the Environmental Office? _____

Was the site cleared by the Env. Office (Yes or No, date and time)? _____

Who cleared the site (name and grade, date and time)? _____

Initial information is critical. Get as much information as you can, but don't hesitate to make the initial notification if a spill is moving or worsening rapidly!

This form must be completed for all releases and turned-in to Camp Ravenna Range Control within 24 hours.

FIRST RESPONDER SPILL/RELEASE RESPONSE ACTIONS

Units or contractors performing training or other operations at Camp Ravenna shall be responsible for adhering to the provisions identified in the Camp Ravenna Integrated Contingency Plans (ICP). A copy of the ICP may be obtained from the Camp Ravenna Environmental Supervisor. Following discovery of a spill (any size), the procedures outlined below shall be executed where applicable:

1. **If necessary, initiate evacuation of the immediate area.**
2. **Notify Camp Ravenna Range Control via two-way radio or by calling (614) 336-6041, and report information contained on the “First Responder Reporting Form” if it is known or can reasonably be determined. This form has been copied on the opposite side of this page. If Range Control cannot be reached, contact a Camp Ravenna OSC (listed below).**
3. **Stop spill flow when possible without undue risk of personal injury.**
4. **If trained, contain the spill using available spill response equipment or techniques.**
5. **Make spill scene OFF LIMITS to unauthorized personnel.**
6. **Restrict all sources of ignition when flammable substances are involved.**
7. **Report to the OSC upon his/her arrival to the scene.**
8. **Turn in a completed copy of the Camp Ravenna First Responder Form to Camp Ravenna Range Control for ALL releases, even ones cleaned up by the reporter.**

TELEPHONE NUMBER

When Camp Ravenna Range Control is not available, the Camp Ravenna OSC must to be contacted by the discoverer/first responder following a release if it is in water, at or above a reportable quantity (25 gallons or more of POL), a hazardous or extremely hazardous substance, a hazardous waste, or involves fire, explosion, or is otherwise a major incident.

| NAME | JOB TITLE | OFFICE | 24 HOUR |
|--------------------------------------|--------------------------|---------------|-------------------|
| Camp Ravenna Range Control | Operations and Training | (614)336-6041 | (614) 202-5783 |
| Tim Morgan (Primary OSC) | Environmental Supervisor | (614)336-6568 | (330)322-7098 |
| Katie Tait | Environmental Specialist | (614)336-6136 | Contact Alternate |
| CPT Mike Yates | Range Operations | (614)336-6193 | (330) 819-5038 |
| MAJ Richard Saphore | Logistics Officer | (614)336-6790 | (614) 593-1654 |
| LTC Ed Meade | Garrison Commander | (614)336-6560 | (614)307-0493 |
| Joint Forces Command (Alternate POC) | OHARNG Emergency Center | (888)637-9053 | (888)637-9053 |

Off-site (from Camp Ravenna area code 614 phones)

Portage County Fire Department (Portage Dispatch) 9-1-330 296-6486
 Portage County Sheriff 9-1-330-296-5100
 Trumbull County Fire Department and Sheriff (Trumbull Dispatch) 9-1-330-675-2730

SEE REVERSE FOR FIRST RESPONDER REPORTING FORM

Attachment C

CAMP RAVENNA WASTE MANAGEMENT GUIDELINES – RESTORATION WASTE

PURPOSE: Guidelines to be followed by contractors working at Camp Ravenna Joint Military Training Center who are generating/shipping Hazardous or Nonhazardous Waste as part of the RVAAP Restoration Program

POLICY: The policy at Camp Ravenna is to comply with all local, state, federal and installation requirements.

Coordination:

- Coordinate all waste generation and shipments with Katie Tait, OHARNG Environmental Specialist, at (614) 336-6136 or the Environmental Supervisor in her absence at (614) 336-6568.
- Notify Katie Tait prior to waste sampling for characterization. Details about sampling activities must be included (i.e., number of sample, analyticals, etc.).
- All Hazardous and Non-Hazardous waste management storage locations must be pre-approved prior to generation.
- Ensure all labels include: Date, Generator Information, Contractor, and Waste Type. When waste is first generated, please label with a drum label in accordance with the FWSAP. A Pending Analysis label can only be used while the waste is awaiting analysis results. The appropriate waste label as related to the waste analytical results must be affixed to the waste container within 7 days of receiving the analytical results.
- When contractors have waste onsite, a weekly waste inspection form must be completed by the contractor who generated the waste and submitted to Katie Tait/Brad Kline at the Camp Ravenna Environmental Office (see Camp Ravenna Waste Inspection Form).

Hazardous Waste Treatment, Storage and Disposal Facilities and Waste Haulers: Contractors are required to utilize waste haulers and Treatment, Storage, and Disposal Facilities on the latest Defense Reutilization Marketing Office (DRMO) approved list for all hazardous waste. The current qualified waste hauler and TSDF list can be viewed by following the “Qualified Facilities” and “Qualified Transporters” links found on the DLA Hazardous Waste Disposal Homepage, <http://www.dispositionsservices.dla.mil/newenv/hwdisposal.shtml>.

Hazardous/Nonhazardous Manifest Information:

The following information must be included:

- Generator Information: Former Ravenna Army Ammunition Plant, 8451 State Route 5, Ravenna, Ohio 44266
- Mailing Address and Contact Name: Camp Ravenna, Attn: Environmental Office, 1438 State Route 534 SW, Newton Falls, Ohio 44444, Katie Tait (614) 336-6136, Emergency 24 hr contact #: 1-800-851-8061
- Ohio EPA Identification Number: OH5210020736.
- Contractor’s shipping Hazardous Waste must provide a Land Disposal Restriction (LDR) in accordance with 40 CFR Part 268.
- Profiling:
 - The required shipping documentation (i.e. waste profile, lab report, IDW Report) need to be submitted to Katie Tait, OHARNG Environmental Specialist, or designee(s) for approval and signature prior to shipping.
 - Results of characterization must be submitted to Katie Tait/Brad Kline within 15 days after collecting the sample. These must be submitted separately from the IDW report to expedite the labeling and disposal process.
- Manifests - Hazardous and Nonhazardous:
 - The waste carrier/transporter will provide the appropriate manifest to the contractor.
 - The contractor is required to:
 - Ensure that Katie Tait or designee(s) is available to sign the manifest on the scheduled day of shipment;
 - Verify that each manifest is properly completed and signed by Katie Tait or designee(s);
 - Provide the Generator copy of the manifest to Katie Tait or designee(s); and
 - Ensure that the original Generator copy of the manifest signed by the treatment storage disposal facility is returned to Camp Ravenna within 30 days of the shipping date.
 - The use of a Bill of Lading must be approved by the Camp Ravenna Environmental Office.

Waste Storage Sites:

- The use of a satellite accumulation area (SAA) must be coordinated/approved by the Camp Ravenna Environmental Office.
- All waste must be stored in appropriate containers in accordance with applicable federal, state and local regulations.
- All restoration waste must be stored at Building 1047 (Hazardous Waste) or Building 1036 (Nonhazardous Waste). Any other storage locations must be coordinated with and approved by the Camp Ravenna Environmental Office.
- All Hazardous Waste must be removed from the installation within 90 days of generation. All Nonhazardous Waste must be removed from the installation within 120 days of generation.

All Camp Ravenna Hazardous and Nonhazardous Waste records are maintained at the Camp Ravenna Environmental Office, point of contact is Katie Tait at (614)-336-6136.

CAMP RAVENNA WEEKLY NON-HAZARDOUS & HAZARDOUS WASTE INSPECTION/INVENTORY SHEET

Contractor: _____ Month: _____ Year: _____ Waste Description: _____

Container Nos. _____

| | WEEK 1 | WEEK 2 | WEEK 3 | WEEK 4 |
|---|--------------|--------------|--------------|--------------|
| | Date: | Date: | Date: | Date: |
| | Time: | Time: | Time: | Time: |
| Point of Contact (Name / Number) | | | | |
| Project Name: | | | | |
| Contracting Agency and POC: | | | | |
| *Location on installation: | | | | |
| Date Generated: | | | | |
| Projected date of disposal: | | | | |
| Satellite or 90 day storage are: | | | | |
| Waste generation site: | | | | |
| Number of Containers (size / type): | | | | |
| Condition of Container: | | | | |
| Containers closed, no loose lids, no loose bungs? | yes / no | yes / no | yes / no | yes / no |
| Waste labeled properly and visible (40 CFR 262.34 (c) (1): | yes / no | yes / no | yes / no | yes / no |
| Secondary containment | yes / no | yes / no | yes / no | yes / no |
| Incompatibles stored together? | yes / no | yes / no | yes / no | yes / no |
| Any spills? | yes / no | yes / no | yes / no | yes / no |
| Spill kit available? | yes / no | yes / no | yes / no | yes / no |
| Fire extinguisher present and changed? | yes / no | yes / no | yes / no | yes / no |
| Containers grounded if ignitables? | yes / no | yes / no | yes / no | yes / no |
| Emergency notification form/info present? | yes / no | yes / no | yes / no | yes / no |
| Container log binder present? | yes / no | yes / no | yes / no | yes / no |
| Signs posted if required? | yes / no | yes / no | yes / no | yes / no |
| Photo's submitted | yes / no | yes / no | yes / no | yes / no |
| | | | | |
| Printed Name: | | | | |
| Signature: | | | | |

This form is required for Non-Hazardous and Hazardous waste including PCB and special waste.

CONTRACTORS ARE REQUIRED TO SUBMIT THIS FORM WEEKLY TO THE CAMP RAVENNA ENV OFFICE WHEN WASTE IS STORED ON SITE.

CONTRACTORS ARE ENCOURAGED TO INCLUDE PHOTOS WITH EACH WEEKLY INSPECTION SHEET WHEN WASTE IS STORED ON SITE.

*Draw detailed map showing location of waste within the site.

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ATTACHMENT B
REPORTING FORMS

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DAILY SAFETY INSPECTION

PROJECT: _____

Page 1 of 2

| N | Y | NA | Item |
|---|---|----|---|
| | | | Daily safety briefing conducted |
| | | | Emergency numbers and route to hospital posted |
| | | | FWSHP and project-specific Addenda on-site, available to employees, and complete |
| | | | Required exposure monitoring conducted and documented |
| | | | First aid kit available and inspected weekly |
| | | | Personnel wearing PPE required by SHP for fieldwork (at least safety shoes or boots, safety glasses with side shields, and nitrile or similar gloves to handle potentially contaminated material) |
| | | | Personnel using buddy system (maintain visual or verbal contact and able to render aid) |
| | | | If temperature >70°F: heat stress training conducted, cool fluids available, pulse rates of personnel wearing Tyvek [®] are being monitored, work/rest cycle in SHP being followed |
| | | | If temperature <40°F: cold stress training conducted, controls in SHP implemented |
| | | | Personnel using appropriate biological hazard controls (See SHP) |
| | | | Drill rig operating manual on-site |
| | | | Drill rigs inspected weekly and documented |
| | | | Personnel near drill rig or other overhead hazards wearing hardhats |
| | | | Each of two drill rig emergency shutdown devices tested daily |
| | | | Employees excluded from under lifted loads |
| | | | Unnecessary personnel excluded from hazardous areas, specifically near heavy equipment |
| | | | Radius of exclusion zone around drill rig at least equal to mast height |
| | | | Personnel wearing hearing protection when within 25 ft of drill rigs, generators, or other noisy equipment |
| | | | Containers of flammable liquids closed and labeled properly |
| | | | Fully charged fire extinguisher available 25 to 50 ft from flammables storage area and inspected monthly |
| | | | Personnel exiting potentially contaminated areas washing hands before eating |
| | | | Personnel using steam washer wearing faceshield, hearing protection, heavy-duty waterproof gloves, Saranax or rainsuit |

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2

1

DAILY SAFETY INSPECTION

PROJECT: _____ Page 2 of 2

| N | Y | NA | Item |
|--|-----------|------|--|
| | | | Portable electrical equipment plugged to a GFCI |
| | | | Electrical wiring covered by insulation or enclosure |
| | | | Three wire, UL approved, extension cords used |
| | | | Housekeeping adequate (walkways clear of loose, sharp or dangerous objects and trip hazards, work areas clear of objects that might fall on employees) |
| | | | Walking/working surfaces safe (not slippery, no unguarded holes, no trip hazards) |
| | | | Excavations deeper than 5 ft shored or sloped (if personnel will enter) and in compliance with SHP |
| | | | Moving (rotating) machinery guarded to prevent employee contact |
| | | | Fall protection provided for work at elevations greater than 4 ft |
| | | | All containers of hazardous material labeled to indicate contents and hazards |
| | | | MSDSs for hazardous materials on-site |
| | | | All vehicles equipped with two-way radios and cellular phones |
| | | | 15-min eyewash (accessible and full) within 100 ft of areas where corrosive sample preservatives are poured |
| | | | Potable and non-potable water labeled |
| | | | Chainsaws have anti kick-back protection, personnel wearing cut resistant gloves, protective chaps |
| | | | Visitor access controlled |
| | | | Site hazards and controls consistent with SHP |
| | | | Site hazard controls appropriate and sufficient |
| <p>Actions taken to correct or control any "N" responses</p> | | | |
| <hr/> | | | |
| Name | Signature | Date | |

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| | | | | | | | |
|---|--|---|---|---|---|--------------------------|---------------|
| <i>(For Safety Staff only)</i> | REPORT NO. | EROC CODE | UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT <i>(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)</i> | | REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2) | | |
| | ACCIDENT CLASSIFICATION | | | | | | |
| PERSONNEL CLASSIFICATION | | INJURY/ILLNESS/FATAL | PROPERTY DAMAGE | | MOTOR VEHICLE INVOLVED | DIVING | |
| GOVERNMENT <input type="checkbox"/> CIVILIAN <input type="checkbox"/> MILITARY | | <input type="checkbox"/> | <input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER | | <input type="checkbox"/> | <input type="checkbox"/> | |
| <input type="checkbox"/> CONTRACTOR | | <input type="checkbox"/> | <input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER | | <input type="checkbox"/> | <input type="checkbox"/> | |
| <input type="checkbox"/> PUBLIC | | <input type="checkbox"/> FATAL <input type="checkbox"/> OTHER | XXXXXXXXXX | | <input type="checkbox"/> | XXXXXXXXXX | |
| 2. PERSONAL DATA | | | | | | | |
| a. Name <i>(Last, First, MI)</i> | | b. AGE | c. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE | | d. SOCIAL SECURITY NUMBER | | e. GRADE |
| f. JOB SERIES/TITLE | | g. DUTY STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ON DUTY <input type="checkbox"/> TDY <input type="checkbox"/> OFF DUTY | | h. EMPLOYMENT STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ARMY ACTIVE <input type="checkbox"/> ARMY RESERVE <input type="checkbox"/> VOLUNTEER <input type="checkbox"/> PERMANENT <input type="checkbox"/> FOREIGN NATIONAL <input type="checkbox"/> SEASONAL <input type="checkbox"/> TEMPORARY <input type="checkbox"/> STUDENT <input type="checkbox"/> OTHER <i>(Specify)</i> _____ | | | |
| 3. GENERAL INFORMATION | | | | | | | |
| a. DATE OF ACCIDENT <i>(month/day/year)</i> | b. TIME OF ACCIDENT <i>(Military time)</i> hrs | c. EXACT LOCATION OF ACCIDENT | | | d. CONTRACTOR'S NAME | | |
| e. CONTRACT NUMBER <input type="checkbox"/> CIVIL WORKS <input type="checkbox"/> MILITARY <input type="checkbox"/> OTHER <i>(Specify)</i> _____ | f. TYPE OF CONTRACT <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> SERVICE <input type="checkbox"/> A/E <input type="checkbox"/> DREDGE <input type="checkbox"/> OTHER <i>(Specify)</i> _____ | | g. HAZARDOUS/TOXIC WASTE ACTIVITY <input type="checkbox"/> SUPERFUND <input type="checkbox"/> DERP <input type="checkbox"/> IRP <input type="checkbox"/> OTHER <i>(Specify)</i> _____ | | (1) PRIME: (2) SUBCONTRACTOR: | | |
| 4. CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see help menu) | | | | | | | |
| a. CONSTRUCTION ACTIVITY _____ (CODE) # _____ | | | | b. TYPE OF CONSTRUCTION EQUIPMENT _____ (CODE) # _____ | | | |
| 5. INJURY/ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see help menu) | | | | | | | |
| a. SEVERITY OF ILLNESS/INJURY _____ (CODE) # _____ | | b. ESTIMATED DAYS LOST | c. ESTIMATED DAYS HOSPITALIZED | d. ESTIMATED DAYS RESTRICTED DUTY | | | |
| e. BODY PART AFFECTED PRIMARY _____ (CODE) # _____ SECONDARY _____ (CODE) # _____ | | g. TYPE AND SOURCE OF INJURY/ILLNESS TYPE _____ (CODE) # _____ SOURCE _____ (CODE) # _____ | | | | | |
| f. NATURE OF ILLNESS/INJURY _____ (CODE) # _____ | | | | | | | |
| 6. PUBLIC FATALITY (Fill in line and correspondence code number in box - see help menu) | | | | | | | |
| a. ACTIVITY AT TIME OF ACCIDENT _____ (CODE) # _____ | | | | b. PERSONAL FLOATATION DEVICE USED? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A | | | |
| 7. MOTOR VEHICLE ACCIDENT | | | | | | | |
| a. TYPE OF VEHICLE <input type="checkbox"/> PICKUP/VAN <input type="checkbox"/> AUTOMOBILE <input type="checkbox"/> TRUCK <input type="checkbox"/> OTHER <i>(Specify)</i> _____ | | b. TYPE OF COLLISION <input type="checkbox"/> SIDE SWIPE <input type="checkbox"/> HEAD ON <input type="checkbox"/> REAR END <input type="checkbox"/> BROADSIDE <input type="checkbox"/> ROLL OVER <input type="checkbox"/> BACKING <input type="checkbox"/> OTHER <i>(Specify)</i> _____ | | c. SEAT BELTS | USED | NOT USED | NOT AVAILABLE |
| | | | | (1) FRONT SEAT | | | |
| | | | | (2) REAR SEAT | | | |
| 8. PROPERTY/MATERIAL INVOLVED | | | | | | | |
| a. NAME OF ITEM | | b. OWNERSHIP | | | c. \$ AMOUNT OF DAMAGE | | |
| (1) | | | | | | | |
| (2) | | | | | | | |
| (3) | | | | | | | |
| 9. VESSEL/FLOATING PLANT ACCIDENT (Fill in line and correspondence code number in box from list - see help menu) | | | | | | | |
| a. TYPE OF VESSEL/FLOATING PLANT _____ (CODE) # _____ | | | | b. TYPE OF COLLISION/MISHAP _____ (CODE) # _____ | | | |
| 10. ACCIDENT DESCRIPTION (Use additional paper, if necessary) | | | | | | | |
| | | | | | | | |

| | | | | | |
|---|--|--------------------|--|------------------|---|
| 11. CAUSAL FACTOR(S) (Read Instruction Before Completing) | | | | | |
| <p>a. (Explain YES answers in item 13)</p> <p>DESIGN: Was design of facility, workplace or equipment a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>OPERATING PROCEDURES: Were operating procedures a factor? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> | | | | | <p>a. (CONTINUED)</p> <p>CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> <p>b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT? <input type="checkbox"/> YES (If yes, attach a copy.) <input type="checkbox"/> NO</p> |
| 12. TRAINING | | | | | |
| <p>a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? <input type="checkbox"/> YES <input type="checkbox"/> NO</p> | <p>b. TYPE OF TRAINING. <input type="checkbox"/> CLASSROOM <input type="checkbox"/> ON JOB</p> | | | | <p>c. DATE OF MOST RECENT FORMAL TRAINING. (Month) (Day) (Year)</p> |
| 13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES (See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary) | | | | | |
| a. DIRECT CAUSE | | | | | |
| b. INDIRECT CAUSE(S) | | | | | |
| 14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S). | | | | | |
| DESCRIBE FULLY: | | | | | |
| 15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14. | | | | | |
| a. BEGINNING (Month/Day/Year) | | | b. ANTICIPATED COMPLETION (Month/Day/Year) | | |
| c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT | | d. DATE (Mo/Da/Yr) | e. ORGANIZATION IDENTIFIER (Div, Br, Sect) | f. OFFICE SYMBOL | |
| CORPS _____ | | | | | |
| CONTRACTOR _____ | | | | | |
| 16. MANAGEMENT REVIEW (1st) | | | | | |
| a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. COMMENTS | | | | | |
| SIGNATURE | | TITLE | | DATE | |
| 17. MANAGEMENT REVIEW (2nd - Chief Operations, Construction, Engineering, etc.) | | | | | |
| a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. COMMENTS | | | | | |
| SIGNATURE | | TITLE | | DATE | |
| 18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW | | | | | |
| a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS | | | | | |
| SIGNATURE | | TITLE | | DATE | |
| 19. COMMAND APPROVAL | | | | | |
| COMMENTS | | | | | |
| COMMANDER SIGNATURE | | | | DATE | |

10.

ACCIDENT DESCRIPTION *(Continuation)*

13a.

DIRECT CAUSE *(Continuation)*

FIRST RESPONDER REPORTING FORM
(Print all information)

Collect as much of the information on the top half of this form as possible before making initial notification. Complete the top and bottom of the form before turning in to Camp Ravenna.

Name of individual reporting spill: _____

When did the spill occur (Date and Time)? _____

Spill Location (Building or area name / number, indoors or out; if vehicle involved, type and bumper number): _____

What was spilled? _____ How much was spilled? _____

Rate at which material is currently spilling. _____

Extent of spill travel? _____

Did the spill reach water (ditch, creek, stream, pond, well head) _____

Number of injured personnel and type injuries, if applicable. _____

Do you need the Fire Department to respond to protect life, property, and environment? _____

Unit: _____ State: _____ Report Date & Time: _____

On Scene Coordinator Name and Grade: _____ Phone: _____

How did the spill occur (be specific). _____

What remedial action was taken? _____

Was soil and absorbent material generated? _____ How much? _____

What is the location of the soil and absorbents? _____

Was the Environmental Office contacted (yes or No, date and time)? _____

Who did you talk to in the Environmental Office? _____

Was the site cleared by the Env. Office (Yes or No, date and time)? _____

Who cleared the site (name and grade, date and time)? _____

Initial information is critical. Get as much information as you can, but don't hesitate to make the initial notification if a spill is moving or worsening rapidly!
This form must be completed for all releases and turned-in to Camp Ravenna Range Control within 24 hours.

FIRST RESPONDER SPILL/RELEASE RESPONSE ACTIONS

Units or contractors performing training or other operations at Camp Ravenna shall be responsible for adhering to the provisions identified in the Camp Ravenna Integrated Contingency Plans (ICP). A copy of the ICP may be obtained from the Camp Ravenna Environmental Supervisor. Following discovery of a spill (any size), the procedures outlined below shall be executed where applicable:

- 1. If necessary, initiate evacuation of the immediate area.**
- 2. Notify Camp Ravenna Range Control via two-way radio or by calling (614) 336-6041, and report information contained on the “First Responder Reporting Form” if it is known or can reasonably be determined. This form has been copied on the opposite side of this page. If Range Control cannot be reached, contact a Camp Ravenna OSC (listed below).**
- 3. Stop spill flow when possible without undue risk of personal injury.**
- 4. If trained, contain the spill using available spill response equipment or techniques.**
- 5. Make spill scene OFF LIMITS to unauthorized personnel.**
- 6. Restrict all sources of ignition when flammable substances are involved.**
- 7. Report to the OSC upon his/her arrival to the scene.**
- 8. Turn in a completed copy of the Camp Ravenna First Responder Form to Camp Ravenna Range Control for ALL releases, even ones cleaned up by the reporter.**

TELEPHONE NUMBER

When Camp Ravenna Range Control is not available, the Camp Ravenna OSC must be contacted by the discoverer/first responder following a release if it is in water, at or above a reportable quantity (25 gallons or more of POL), a hazardous or extremely hazardous substance, a hazardous waste, or involves fire, explosion, or is otherwise a major incident.

| NAME | JOB TITLE | OFFICE | 24 HOUR |
|----------------------------|--------------------------|---------------|-------------------|
| Camp Ravenna Range Control | Operations and Training | (614)336-6041 | Contact Alternate |
| Tim Morgan (Primary OSC) | Environmental Supervisor | (614)336-6568 | (330)322-7098 |
| Katie Tait | Environmental Specialist | (614)336-6136 | Contact Alternate |
| SFC Chad Baucum | Range Operations | (614)336-6562 | (330)575-6585 |
| MAJ Richard Saphore | Logistics Officer | (614)336-6790 | Contact Alternate |
| LTC Ed Meade | Garrison Commander | (614)336-6560 | (614)307-0493 |

Off-site (from Camp Ravenna area code 614 phones)

Windham Fire Department9-1-330-326-2222
 Portage County Sheriff 9-1-330-296-5100
 Trumbull County Police, Fire Department and Hazmat..... 911

SEE REVERSE FOR FIRST RESPONDER REPORTING FORM

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ATTACHMENT C
SAFETY DATA SHEETS

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Liquinox
Sulfuric Acid
Sodium Hydroxide
Silica Sand
Nitric Acid
Portland Cement
Permethrin Insect Repellent
Repel Insect Repellant Sportsmen Max Formula 40% DEET
Buffer Solution, pH = 10.00
Buffer Solution, pH = 7.00
Buffer Solution, pH = 4.0
Zobell Solution 061320, 061321, 061322
Florescent Orange Paint
Isopropyl Alcohol
Hydrochloric Acid
Petroleum No. 2 Ultra Low Sulfur Diesel
Deionized Water
Unleaded Gasoline
Holeplug

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017**Revision :** 05/17/2017**Trade Name:** Liquinox**I Identification of the substance/mixture and of the supplier****I.1 Product identifier****Trade Name:** Liquinox**Synonyms:****Product number:** Liquinox**I.2 Application of the substance / the mixture :** Cleaning material/Detergent**I.3 Details of the supplier of the Safety Data Sheet****Manufacturer**Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040**Supplier**

Not Applicable

Emergency telephone number:**ChemTel Inc**

North America: 1-800-255-3924

International: 01-813-248-0585

2 Hazards identification**2.1 Classification of the substance or mixture:**

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:Alcohol ethoxylate
Sodium alkylbenzene sulfonate
Sodium xylenesulphonate
Lauramine oxide**2.2 Label elements:**

Eye irritation, category 2A.

Skin irritation, category 2.

Hazard pictograms:**Signal word:** Warning**Hazard statements:**

H315 Causes skin irritation.

H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P302+P352 If on skin: Wash with soap and water.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P501 Dispose of contents and container as instructed in Section 13.

Additional information: None.**Hazard description**

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017**Revision :** 05/17/2017**Trade Name:** Liquinox**Hazards Not Otherwise Classified (HNOC):** None**Information concerning particular hazards for humans and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients**3.1 Chemical characterization :** None**3.2 Description :** None**3.3 Hazardous components (percentages by weight)**

| Identification | Chemical Name | Classification | Wt. % |
|----------------------------------|-------------------------------|---|--------|
| CAS number: 68081-81-2 | Sodium Alkylbenzene Sulfonate | Acute Tox. 4; H303 Skin Irrit. 2; H315 Eye Irrit. 2; H319 | 10-25 |
| CAS number: 1300-72-7 | Sodium Xylenesulphonate | Eye Irrit. 2; H319 | 2.5-10 |
| CAS number: 84133-50-6 | Alcohol Ethoxylate | Skin Irrit. 2; H315 Eye Dam. 1; H318 | 2.5-10 |
| CAS number: 1643-20-5 | Lauramine oxide | Skin Irrit. 2; H315 Eye Dam. 1; H318 | 1-2 |

3.4 Additional Information: None.**4 First aid measures****4.1 Description of first aid measures****General information:** None.**After inhalation:**

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017**Revision :** 05/17/2017**Trade Name:** Liquinox**4.3 Indication of any immediate medical attention and special treatment needed:**

No additional information.

5 Firefighting measures**5.1 Extinguishing media****Suitable extinguishing agents:**

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None**5.2 Special hazards arising from the substance or mixture :**

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters**Protective equipment:**

Wear protective eye wear, gloves and clothing.

Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.

Avoid contact with skin, eyes and clothing.

6 Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures :**

Ensure adequate ventilation.

Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.

Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None**7 Handling and storage****7.1 Precautions for safe handling :**

Avoid breathing mist or vapor.

Do not eat, drink, smoke or use personal products when handling chemical substances.

Conditions for safe storage, including any incompatibilities:

Store closed upright and in a cool dry place, should be 15 - 30 deg C or 60 - 90 deg F.

7.2 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017

Revision : 05/17/2017

Trade Name: Liquinox

8 Exposure controls/personal protection



8.1 Control parameters :

No applicable occupational exposure limits

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.

Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

| | | | |
|--|----------------------------------|--|--|
| Appearance (physical state, color): | Pale yellow liquid | Explosion limit lower: Explosion limit upper: | Not determined or not available. Not determined or not available. |
| Odor: | Not determined or not available. | Vapor pressure at 20°C: | Not determined or not available. |
| Odor threshold: | Not determined or not available. | Vapor density: | Not determined or not available. |
| pH-value: | 8.5 as is | Relative density: | Not determined or not available. |
| Melting/Freezing point: | Not determined or not available. | Solubilities: | Not determined or not available. |
| Boiling point/Boiling range: | Not determined or not available. | Partition coefficient (n-octanol/water): | Not determined or not available. |
| Flash point (closed cup): | Not determined or not available. | Auto/Self-ignition temperature: | Not determined or not available. |
| Evaporation rate: | Not determined or not available. | Decomposition temperature: | Not determined or not available. |
| Flammability (solid, gaseous): | Not determined or not available. | Viscosity: | a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available. |

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017**Revision :** 05/17/2017**Trade Name:** Liquinox**Density at 20°C:** Not determined or not available.**10 Stability and reactivity**

- 10.1 Reactivity :** None
- 10.2 Chemical stability :** None
- 10.3 Possibility hazardous reactions :** None
- 10.4 Conditions to avoid :** None
- 10.5 Incompatible materials :** None
- 10.6 Hazardous decomposition products :** None

11 Toxicological information**11.1 Information on toxicological effects :****Acute Toxicity:****Oral:**

: LD50 >5000 mg per kg Rat, Oral) - product .

Chronic Toxicity: No additional information.**Skin corrosion/irritation:**

Alcohol Ethoxylate: May cause mild to moderate skin irritation.

Sodium Alkylbenzene Sulfonate: Causes skin irritation.

Lauramine oxide: Causes skin irritation.

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation.

Alcohol Ethoxylate: Causes moderate to severe eye irritation and conjunctivitis.

Sodium xylenesulphonate: Rabbit: irritating to eyes.

Lauramine oxide: Causes serious eye damage.

Respiratory or skin sensitization: No additional information.**Carcinogenicity:** No additional information.**IARC (International Agency for Research on Cancer):** None of the ingredients are listed.**NTP (National Toxicology Program):** None of the ingredients are listed.**Germ cell mutagenicity:** No additional information.**Reproductive toxicity:** No additional information.**STOT-single and repeated exposure:** No additional information.**Additional toxicological information:** No additional information.**12 Ecological information****12.1 Toxicity:**

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017

Revision : 05/17/2017

Trade Name: Liquinox

Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.

Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.

Lauramine oxide: Fish, LC0 24.3 mg/l, 96h [Killifish (Cyprinodontidae)]

Lauramine oxide: Aquatic invertebrates, (LC50): 3.6 mg/l 96 hours [Daphnia (Daphnia)].

Lauramine oxide: Aquatic plants, EC50 Algae 0.31 mg/l 72 hours [Algae]

Alcohol Ethoxylate: Aquatic invertebrates, (LC50): 4.01 mg/l 48 hours [Daphnia (daphnia)].

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

| | |
|-----------------|------|
| Class: | None |
| Label: | None |
| LTD.QTY: | None |

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.
Comments: None

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.
Comments: None

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

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Revision : 05/17/2017

| | |
|---|------------------------------|
| Trade Name: Liquinox | |
| 14.4 Packing group: ADR, ADN, DOT, IMDG, IATA | None |
| 14.5 Environmental hazards : | None |
| 14.6 Special precautions for user: Danger code (Kemler): EMS number: Segregation groups: | None None None None |
| 14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code: Not applicable. | |
| 14.8 Transport/Additional information: Transport category: Tunnel restriction code: UN "Model Regulation": | None None None |

15 Regulatory information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.****North American**

| |
|---|
| SARA Section 313 (specific toxic chemical listings): None of the ingredients are listed. Section 302 (extremely hazardous substances): None of the ingredients are listed. |
| CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable Spill Quantity: None of the ingredients are listed. |
| TSCA (Toxic Substances Control Act): Inventory: All ingredients are listed. Rules and Orders: Not applicable. |
| Proposition 65 (California): Chemicals known to cause cancer: None of the ingredients are listed. Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed. Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed. Chemicals known to cause developmental toxicity: None of the ingredients are listed. |

Canadian**Canadian Domestic Substances List (DSL):**

All ingredients are listed.

EU**REACH Article 57 (SVHC):** None of the ingredients are listed.**Germany MAK:** Not classified.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 05/17/2017**Revision :** 05/17/2017**Trade Name:** Liquinox**Asia Pacific****Australia****Australian Inventory of Chemical Substances (AICS):** All ingredients are listed.**China****Inventory of Existing Chemical Substances in China (IECSC):** All ingredients are listed.**Japan****Inventory of Existing and New Chemical Substances (ENCS):** All ingredients are listed.**Korea****Existing Chemicals List (ECL):** All ingredients are listed.**New Zealand****New Zealand Inventory of Chemicals (NZOIC):** All ingredients are listed.**Philippines****Philippine Inventory of Chemicals and Chemical Substances (PICCS):** All ingredients are listed.**Taiwan****Taiwan Chemical Substance Inventory (TSCI):** All ingredients are listed.**16 Other information****Abbreviations and Acronyms:** None**Summary of Phrases****Hazard statements:**

H315 Causes skin irritation.

H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P302+P352 If on skin: Wash with soap and water.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.

P332+P313 If skin irritation occurs: Get medical advice/attention.

P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0**HMIS:** 1-0-0

SAFETY DATA SHEET

1. Identification

Product identifier: Sulfuric Acid

Other means of identification

Product No.: 9661, 3780, 9704, 9682, V648, V225, V186, V008, 6902, 2900, 2879, 2878, 2877, 2874, 6163, H996, H976, 5859, 2876, 5815, 5802, 9691, 9690, 9684, 9681, 9675, 9674, 9673, 9671, 5557, 5374, 21208, 21201

Recommended use and restriction on use

Recommended use: Not available.

Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor Information

Manufacturer

Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034

Telephone: Customer Service: 855-282-6867

Fax:
Contact Person: Environmental Health & Safety
e-mail: info@avantormaterials.com

Emergency telephone number:

24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metals Category 1

Health Hazards

Skin Corrosion/Irritation Category 1
Serious Eye Damage/Eye Irritation Category 1
Carcinogenicity Category 1A
Specific Target Organ Toxicity - Single Exposure Category 3

Environmental Hazards

Acute hazards to the aquatic environment Category 3

Label Elements

Hazard Symbol:



Signal Word: Danger

Hazard Statement: May be corrosive to metals.
Causes severe skin burns and eye damage.
May cause respiratory irritation.
May cause cancer if inhaled.
Harmful to aquatic life.

Precautionary Statement

Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep only in original container. Wash thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.

Response: IF exposed or concerned: Get medical advice/attention. Absorb spillage to prevent material damage. Immediately call a POISON CENTER or doctor/physician. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Storage: Store locked up. Store in corrosive resistant container with a resistant inner liner. Store in a well-ventilated place. Keep container tightly closed.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Substances

| Chemical Identity | Common name and synonyms | CAS number | Content in percent (%)* |
|-------------------|--------------------------|------------|-------------------------|
| SULFURIC ACID | | 7664-93-9 | 90 - 100% |

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing. If breathing is difficult, give oxygen.

Skin Contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Corrosive to skin and eyes.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: In case of fire and/or explosion do not breathe fumes.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Foam, carbon dioxide or dry powder.

Unsuitable extinguishing media: Do not use water as an extinguisher.

Specific hazards arising from the chemical: Fire may produce irritating, corrosive and/or toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Fight fire from a protected location. Use water SPRAY only to cool containers! Do not put water on leaked material. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Keep unauthorized personnel away. Keep upwind. Use personal protective equipment. See Section 8 of the SDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Neutralize spill area and washings with soda ash or lime. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling: Do not get in eyes, on skin, on clothing. Do not taste or swallow. Wash hands thoroughly after handling. Do not eat, drink or smoke when using the product. Use caution when adding this material to water. Add material slowly when mixing with water. Do not add water to the material; instead, add the material to the water. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. Use personal protective equipment as required.

Conditions for safe storage, including any incompatibilities: Do not store in metal containers. Keep in a cool, well-ventilated place. Keep container tightly closed. Store in a dry place.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

| Chemical Identity | Type | Exposure Limit Values | Source |
|------------------------------------|------|-----------------------|---|
| SULFURIC ACID - Thoracic fraction. | TWA | 0.2 mg/m ³ | US. ACGIH Threshold Limit Values (2011) |
| SULFURIC ACID | REL | 1 mg/m ³ | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | PEL | 1 mg/m ³ | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
| | TWA | 1 mg/m ³ | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |

Appropriate Engineering Controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing.

Respiratory Protection: In case of inadequate ventilation use suitable respirator. Chemical respirator with acid gas cartridge.

Hygiene measures: Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

9. Physical and chemical properties

Appearance

| | |
|--|----------------------------|
| Physical state: | Liquid |
| Form: | Liquid |
| Color: | Colorless |
| Odor: | Odorless |
| Odor threshold: | No data available. |
| pH: | 0.3 (1 N aqueous solution) |
| Melting point/freezing point: | 3 °C |
| Initial boiling point and boiling range: | 337 °C |
| Flash Point: | Not applicable |
| Evaporation rate: | No data available. |
| Flammability (solid, gas): | No data available. |
| Upper/lower limit on flammability or explosive limits | |
| Flammability limit - upper (%): | No data available. |
| Flammability limit - lower (%): | No data available. |
| Explosive limit - upper (%): | No data available. |
| Explosive limit - lower (%): | No data available. |
| Vapor pressure: | No data available. |
| Vapor density: | No data available. |
| Relative density: | 1.84 (20 °C) |
| Solubility(ies) | |
| Solubility in water: | Miscible with water. |
| Solubility (other): | No data available. |
| Partition coefficient (n-octanol/water): | No data available. |
| Auto-ignition temperature: | No data available. |
| Decomposition temperature: | No data available. |
| Viscosity: | No data available. |

10. Stability and reactivity

| | |
|--|---|
| Reactivity: | Reacts violently with strong alkaline substances. |
| Chemical Stability: | Material is stable under normal conditions. |
| Possibility of Hazardous Reactions: | Hazardous polymerization does not occur. Material reacts with water. |
| Conditions to Avoid: | Moisture. Heat. Contact with incompatible materials. |
| Incompatible Materials: | Water. Cyanides. Strong oxidizing agents. Strong reducing agents. Metals. Halogens. Organic compounds. Potassium. |
| Hazardous Decomposition Products: | Oxides of sulfur. |

11. Toxicological information

Information on likely routes of exposure

| | |
|----------------------|---|
| Ingestion: | May cause burns of the gastrointestinal tract if swallowed. |
| Inhalation: | May cause damage to mucous membranes in nose, throat, lungs and bronchial system. |
| Skin Contact: | Causes severe skin burns. |
| Eye contact: | Causes serious eye damage. |

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product: No data available.

Dermal

Product: No data available.

Inhalation

Product: No data available.

Specified substance(s):

SULFURIC ACID LC 50 (Guinea pig, 8 h): 0.03 mg/l
LC 50 (Rat, 4 h): 0.375 mg/l

Repeated Dose Toxicity

Product: No data available.

Skin Corrosion/Irritation

Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation

Product: Causes serious eye damage.

Respiratory or Skin Sensitization

Product: Not a skin sensitizer.

Carcinogenicity

Product: May cause cancer.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:

SULFURIC ACID Overall evaluation: 1. Carcinogenic to humans.

US. National Toxicology Program (NTP) Report on Carcinogens:

SULFURIC ACID Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):

No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No mutagenic components identified

In vivo

Product: No mutagenic components identified

Reproductive Toxicity

Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure

Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure

Product: None known.

Aspiration Hazard

Product: Not classified

Other Effects: No data available.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product: No data available.

Specified substance(s):

SULFURIC ACID
LC 50 (Starry, european flounder (*Platichthys flesus*), 48 h): 100 - 330 mg/l Mortality
LC 50 (Western mosquitofish (*Gambusia affinis*), 96 h): 42 mg/l Mortality
LC 50 (Goldfish (*Carassius auratus*), 96 h): 17 mg/l Mortality

Aquatic Invertebrates

Product: No data available.

Specified substance(s):

SULFURIC ACID
LC 50 (Common shrimp, sand shrimp (*Crangon crangon*), 48 h): 70 - 80 mg/l Mortality
LC 50 (Aesop shrimp (*Pandalus montagui*), 48 h): 42.5 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic Invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and Degradability

Biodegradation

Product: There are no data on the degradability of this product.

BOD/COD Ratio

Product: No data available.

Bioaccumulative Potential

Bioconcentration Factor (BCF)

Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)

Product: No data available.

Mobility in Soil: The product is water soluble and may spread in water systems.

Other Adverse Effects: The product contains a substance which is harmful to aquatic organisms. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN Number: UN 1830
 UN Proper Shipping Name: Sulfuric acid
 Transport Hazard Class(es):
 Class(es): 8
 Label(s): 8
 Packing Group: II
 Marine Pollutant: No

IMDG

UN Number: UN 1830
 UN Proper Shipping Name: SULPHURIC ACID (WITH MORE THAN 51% ACID)
 Transport Hazard Class(es):
 Class(es): 8
 Label(s): 8
 EmS No.: F-A, S-B
 Packing Group: II
 Marine Pollutant: No

IATA

UN Number: UN 1830
 Proper Shipping Name: Sulphuric acid
 Transport Hazard Class(es):
 Class(es): 8
 Label(s): 8
 Marine Pollutant: No
 Packing Group: II

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

SULFURIC ACID Reportable quantity: 1000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Acute (Immediate) Chronic (Delayed) Fire Reactive Pressure Generating

SARA 302 Extremely Hazardous Substance

| Chemical Identity | RQ | Threshold Planning Quantity |
|-------------------|-----------|-----------------------------|
| SULFURIC ACID | 1000 lbs. | 1000 lbs. |

SARA 304 Emergency Release Notification

| Chemical Identity | RQ |
|-------------------|-----------|
| SULFURIC ACID | 1000 lbs. |

SARA 311/312 Hazardous Chemical

| Chemical Identity | Threshold Planning Quantity |
|--------------------------|------------------------------------|
| SULFURIC ACID | 500lbs |

SARA 313 (TRI Reporting)

| Chemical Identity | Reporting threshold for other users | Reporting threshold for manufacturing and processing |
|--------------------------|--|---|
| SULFURIC ACID | 10000 lbs | 25000 lbs. |

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

SULFURIC ACID Reportable quantity: 1000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

SULFURIC ACID Threshold quantity: 10000 lbs

US State Regulations

US. California Proposition 65

SULFURIC ACID Carcinogenic.

US. New Jersey Worker and Community Right-to-Know Act

SULFURIC ACID Listed

US. Massachusetts RTK - Substance List

SULFURIC ACID Listed

US. Pennsylvania RTK - Hazardous Substances

SULFURIC ACID Listed

US. Rhode Island RTK

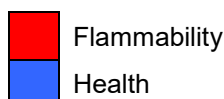
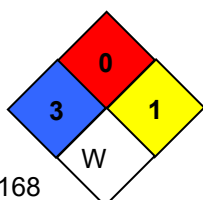
SULFURIC ACID Listed

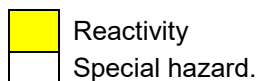
Inventory Status:

| | |
|--|--|
| Australia AICS: | On or in compliance with the inventory |
| Canada DSL Inventory List: | On or in compliance with the inventory |
| EU EINECS List: | On or in compliance with the inventory |
| EU ELINCS List: | Not in compliance with the inventory. |
| Japan (ENCS) List: | On or in compliance with the inventory |
| EU No Longer Polymers List: | Not in compliance with the inventory. |
| China Inv. Existing Chemical Substances: | On or in compliance with the inventory |
| Korea Existing Chemicals Inv. (KECI): | On or in compliance with the inventory |
| Canada NDSL Inventory: | Not in compliance with the inventory. |
| Philippines PICCS: | On or in compliance with the inventory |
| US TSCA Inventory: | On or in compliance with the inventory |
| New Zealand Inventory of Chemicals: | On or in compliance with the inventory |
| Switzerland Consolidated Inventory: | Not in compliance with the inventory. |
| Japan ISHL Listing: | Not in compliance with the inventory. |
| Japan Pharmacopoeia Listing: | Not in compliance with the inventory. |

16. Other information, including date of preparation or last revision

NFPA Hazard ID





Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
W: Water-reactive

Issue Date: 02-02-2015

Revision Date: No data available.

Version #: 2.0

Further Information: No data available.

Disclaimer: THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED "AS IS," AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION<(>,<)> WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

SAFETY DATA SHEET

1. Identification

Product identifier: Sodium Hydroxide, 50% Solution

Other means of identification

Product No.: 5673, 7706, 3735, 3730, 3725, 3719, 3727, 7705, 0897, 0339

Recommended use and restriction on use

Recommended use: Not available.

Restrictions on use: Not known.

Details of the supplier of the safety data sheet

Manufacturer

Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034

Telephone: Customer Service: 855-282-6867

Fax: 610-573-2610
Contact Person: Environmental Health & Safety
E-mail: info@avantormaterials.com

Emergency telephone number:

CHEMTREC: 1-800-424-9300 within US and Canada

CHEMTREC: 1-703-527-3887 outside US and Canada

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metals Category 1

Health Hazards

Skin Corrosion/Irritation Category 1A

Serious Eye Damage/Eye Irritation Category 1

Specific Target Organ Toxicity -
Single Exposure Category 3

Environmental Hazards

Acute hazards to the aquatic
environment Category 3

Label Elements

Hazard Symbol:



Signal Word: Danger

- Hazard Statement:** May be corrosive to metals.
Causes severe skin burns and eye damage.
May cause respiratory irritation.
Harmful to aquatic life.
- Precautionary Statement**
- Prevention:** Keep only in original container. Wash thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.
- Response:** Absorb spillage to prevent material damage. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.
- Storage:** Store in corrosive resistant container with a resistant inner liner. Store locked up. Keep container tightly closed. Store in a well-ventilated place.
- Disposal:** Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.
- Other hazards which do not result in GHS classification:** None.

3. Composition/information on ingredients

Mixtures

| Chemical Identity | Common name and synonyms | CAS number | Content in percent (%)* |
|-------------------|--------------------------|------------|-------------------------|
| SODIUM HYDROXIDE | | 1310-73-2 | 40 - 60% |

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

- General information:** Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.
- Ingestion:** Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
- Inhalation:** Move to fresh air. If breathing stops, provide artificial respiration. If breathing is difficult, give oxygen. Call a physician or poison control center immediately.
- Skin Contact:** Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Corrosive to skin and eyes. Respiratory tract irritation.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: Product is highly caustic. Wear protective gear if spilled during fire fighting.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Product is highly caustic. Wear appropriate protective gear if spilled during firefighting. Contact with metals may evolve flammable hydrogen gas.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Put on protective equipment before entering danger area. See Section 8 of the SDS for Personal Protective Equipment. Keep unauthorized personnel away. Keep upwind. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Neutralize spill area and washings with dilute acetic acid. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Collect in a non-combustible container for prompt disposal. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling: Use personal protective equipment as required. Avoid breathing mists or vapors. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Wash hands thoroughly after handling. Do not eat, drink or smoke when using the product. See Section 8 of the SDS for Personal Protective Equipment.

Conditions for safe storage, including any incompatibilities: Do not store in metal containers. Keep container tightly closed. Store in a well-ventilated place. Store in a dry place.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

| Chemical Identity | type | Exposure Limit Values | Source |
|-------------------|--------------|-----------------------|---|
| SODIUM HYDROXIDE | Ceiling | 2 mg/m ³ | US. ACGIH Threshold Limit Values (2011) |
| | Ceiling_Time | 2 mg/m ³ | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | PEL | 2 mg/m ³ | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
| | Ceiling | 2 mg/m ³ | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |

Appropriate Engineering Controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing.

Respiratory Protection: In case of inadequate ventilation use suitable respirator.

Hygiene measures: Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state: liquid

Form: liquid

Color: Colorless

Odor: Odorless

Odor threshold: No data available.

pH: 14

| | |
|--|----------------------|
| Melting point/freezing point: | 12 °C |
| Initial boiling point and boiling range: | 140 °C |
| Flash Point: | not applicable |
| Evaporation rate: | No data available. |
| Flammability (solid, gas): | No data available. |
| Upper/lower limit on flammability or explosive limits | |
| Flammability limit - upper (%): | No data available. |
| Flammability limit - lower (%): | No data available. |
| Explosive limit - upper (%): | No data available. |
| Explosive limit - lower (%): | No data available. |
| Vapor pressure: | No data available. |
| Vapor density: | No data available. |
| Relative density: | 1.53 (20 °C) |
| Solubility(ies) | |
| Solubility in water: | Miscible with water. |
| Solubility (other): | No data available. |
| Partition coefficient (n-octanol/water): | No data available. |
| Auto-ignition temperature: | No data available. |
| Decomposition temperature: | No data available. |
| Viscosity: | No data available. |

10. Stability and reactivity

| | |
|--|--|
| Reactivity: | Reacts violently with strong acids. |
| Chemical Stability: | Material is stable under normal conditions. |
| Possibility of hazardous reactions: | Hazardous polymerization does not occur. |
| Conditions to avoid: | Avoid contact with oxidizing agents. Reacts violently with strong acids. |
| Incompatible Materials: | Oxidizing agents. Acids. Maleic Anhydride Halogens. Nitromethane. Contact with metals may evolve flammable hydrogen gas. |
| Hazardous Decomposition Products: | Sodium oxides |

11. Toxicological information

Information on likely routes of exposure

| | |
|----------------------|---|
| Ingestion: | May cause burns of the gastrointestinal tract if swallowed. |
| Inhalation: | May cause damage to mucous membranes in nose, throat, lungs and bronchial system. |
| Skin Contact: | Causes severe skin burns. |
| Eye contact: | Causes serious eye damage. |

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

| | |
|----------------------|--------------------|
| Oral Product: | No data available. |
|----------------------|--------------------|

Dermal

Product: No data available.

Inhalation Product: No data available.

Repeated dose toxicity Product: No data available.

Skin Corrosion/Irritation Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation Product: Causes serious eye damage.

Respiratory or Skin Sensitization Product: Not a skin sensitizer.

Carcinogenicity Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro Product: No mutagenic components identified

In vivo Product: No mutagenic components identified

Reproductive toxicity Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure Product: None known.

Aspiration Hazard Product: Not classified

Other effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish Product: No data available.

Specified substance(s):

SODIUM HYDROXIDE LC 50 (Western mosquitofish (*Gambusia affinis*), 96 h): 125 mg/l Mortality

Aquatic Invertebrates

Product: No data available.

Specified substance(s):

SODIUM HYDROXIDE EC 50 (Water flea (*Ceriodaphnia dubia*), 48 h): 34.59 - 47.13 mg/l Intoxication

Chronic hazards to the aquatic environment:

Fish

Product: No data available.

Aquatic Invertebrates

Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and Degradability

Biodegradation

Product: Expected to be readily biodegradable.

BOD/COD Ratio

Product: No data available.

Bioaccumulative Potential

Bioconcentration Factor (BCF)

Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)

Product: No data available.

Mobility in Soil:

The product is water soluble and may spread in water systems.

Other Adverse Effects:

Harmful to aquatic organisms. The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions:

Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging:

Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

| | |
|-------------------------------|---------------------------|
| UN Number: | UN 1824 |
| UN Proper Shipping Name: | Sodium hydroxide solution |
| Transport Hazard Class(es) | |
| Class(es): | 8 |
| Label(s): | 8 |
| Packing Group: | II |
| Marine Pollutant: | Not a Marine Pollutant |
| Special precautions for user: | – |

IMDG

UN Number: UN 1824
 UN Proper Shipping Name: SODIUM HYDROXIDE SOLUTION
 Transport Hazard Class(es)
 Class(es): 8
 Label(s): 8
 EmS No.: F-A, S-B
 Packing Group: II
 Marine Pollutant: Not a Marine Pollutant
 Special precautions for user: -

IATA

UN Number: UN 1824
 Proper Shipping Name: Sodium hydroxide solution
 Transport Hazard Class(es)
 Class(es): 8
 Label(s): 8
 Marine Pollutant: Not a Marine Pollutant
 Packing Group: II
 Special precautions for user: -

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)
US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
 None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

| <u>Chemical Identity</u> | <u>Reportable quantity</u> |
|--------------------------|----------------------------|
| SODIUM HYDROXIDE | 1000 lbs. |

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
 Acute (Immediate)

SARA 302 Extremely Hazardous Substance
 None present or none present in regulated quantities.

SARA 304 Emergency Release Notification

| <u>Chemical Identity</u> | <u>Reportable quantity</u> |
|--------------------------|----------------------------|
| SODIUM HYDROXIDE | 1000 lbs. |

SARA 311/312 Hazardous Chemical

| <u>Chemical Identity</u> | <u>Threshold Planning Quantity</u> |
|--------------------------|------------------------------------|
| SODIUM HYDROXIDE | 10000 lbs |

SARA 313 (TRI Reporting)
 None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

| <u>Chemical Identity</u> | <u>Reportable quantity</u> |
|--------------------------|--------------------------------|
| SODIUM HYDROXIDE | Reportable quantity: 1000 lbs. |

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
 None present or none present in regulated quantities.

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity

SODIUM HYDROXIDE

US. Massachusetts RTK - Substance List

Chemical Identity

SODIUM HYDROXIDE

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity

SODIUM HYDROXIDE

US. Rhode Island RTK

Chemical Identity

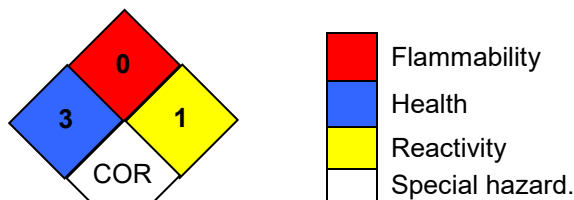
SODIUM HYDROXIDE

Inventory Status:

| | |
|--|--|
| Australia AICS: | On or in compliance with the inventory |
| Canada DSL Inventory List: | On or in compliance with the inventory |
| EU EINECS List: | On or in compliance with the inventory |
| EU ELINCS List: | Not in compliance with the inventory. |
| Japan (ENCS) List: | On or in compliance with the inventory |
| EU No Longer Polymers List: | Not in compliance with the inventory. |
| China Inv. Existing Chemical Substances: | On or in compliance with the inventory |
| Korea Existing Chemicals Inv. (KECI): | On or in compliance with the inventory |
| Canada NDSL Inventory: | Not in compliance with the inventory. |
| Philippines PICCS: | On or in compliance with the inventory |
| US TSCA Inventory: | On or in compliance with the inventory |
| New Zealand Inventory of Chemicals: | On or in compliance with the inventory |
| Switzerland Consolidated Inventory: | Not in compliance with the inventory. |
| Japan ISHL Listing: | Not in compliance with the inventory. |
| Japan Pharmacopoeia Listing: | Not in compliance with the inventory. |

16. Other information, including date of preparation or last revision

NFPA Hazard ID



Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible
COR: Corrosive

| | |
|-----------------------------|--------------------|
| Issue Date: | 01-19-2016 |
| Revision Date: | No data available. |
| Version #: | 2.1 |
| Further Information: | No data available. |

Disclaimer:

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U.S. SILICA COMPANY SAFETY DATA SHEET



1. IDENTIFICATION

Product identifier: Silica Sand, Ground Silica, and Fine Ground Silica

Product Name/Trade Names:

Sand and Ground Silica Sand (sold under various names: ASTM TESTING SANDS • GLASS SAND • FILPRO® • FLINT SILICA • DM-SERIES • F-SERIES • FOUNDRY SANDS • FJ-SERIES H-SERIES • L-SERIES • N-SERIES • NJ SERIES • OK-SERIES • P-SERIES • T-SERIES • hydraulic fracturing sand, all sizes • frac sand, all sizes • MIN-U-SIL® Fine Ground Silica • MYSTIC WHITE II® • #1 DRY • #1 SPECIAL • PENN SAND® • PRO WHITE® • SILURIAN® • Q-ROK® • SIL-CO-SIL® Ground Silica • MICROSIL® • SUPERSIL® • MASON SAND • GS SERIES • PERSPEC • proppant, all sizes • SHALE FRAC® - SERIES • KOSSE WHITE® • OTTAWA WHITE® • OPTIJUMP® • LIGHTHOUSE™

Chemical Name or Synonym:

Crystalline Silica (Quartz), Sand, Silica Sand, Flint, Ground Silica, Fine Ground Silica, Silica Flour.

Recommended use of the chemical and restrictions on use: (non-exhaustive list): brick, ceramics, foundry castings, glass, grout, hydraulic fracturing sand, frac sand, proppant, mortar, paint and coatings, silicate chemistry, silicone rubber, thermoset plastics.

DO NOT USE U.S. SILICA COMPANY SAND OR GROUND SILICA FOR SAND BLASTING

Manufacturer:

U.S. Silica Company
8490 Progress Drive, Suite 300
Frederick, MD 21701
U.S.A.

Phone: 800-243-7500
Emergency Phone: 301-682-0600
Fax: 301-682-0690

2. HAZARD(S) IDENTIFICATION

Classification:

| Physical | Health |
|---------------|---|
| Not Hazardous | Carcinogen Category 1A Specific Target Organ Toxicity – Repeated Exposure Category 1 |



DANGER

May cause cancer by inhalation.
Causes damage to lungs through prolonged or repeated exposure by inhalation.

Response:

If exposed or concerned: Get medical advice.

Disposal:

Dispose of contents/containers in accordance with local regulation.

Prevention

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe dust.
Do not eat, drink or smoke when using this product.
Wear protective gloves and safety glasses or goggles.
In case of inadequate ventilation wear respiratory protection.

3. COMPOSITION / INFORMATION ON INGREDIENTS

| Component | CAS No. | Percent |
|-----------------------------|------------|---------|
| Crystalline Silica (quartz) | 14808-60-7 | 95-99.9 |

4. FIRST-AID MEASURES

Inhalation: First aid is not generally required. If irritation develops from breathing dust, move the person from the overexposure and seek medical attention if needed.

Skin contact: First aid is not required.

Eye contact: Wash immediately with plenty of water. Do not rub eyes. If irritation persists, seek medical attention.

Ingestion: First aid is not required.

Most important symptoms/effects, acute and delayed: Particulates may cause abrasive eye injury. Inhalation of dust may cause respiratory tract irritation. Symptoms of exposure may include cough, sore throat, nasal congestion, sneezing, wheezing and shortness of breath. Prolonged inhalation of respirable crystalline silica above certain concentrations may cause lung diseases, including silicosis and lung cancer.

Indication of immediate medical attention and special treatment, if necessary: Immediate medical attention is not required.

5. FIRE-FIGHTING MEASURES

Suitable (and unsuitable) extinguishing media: Use extinguishing media appropriate for surrounding fire.

Specific hazards arising from the chemical: Product is not flammable, combustible or explosive.

Special protective equipment and precautions for fire-fighters: None required.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment, and emergency procedures: Wear appropriate protective clothing and respiratory protection (see Section 8). Avoid generating airborne dust during clean-up.

Environmental precautions: No specific precautions. Report releases to regulatory authorities if required by local, state and federal regulations.

Methods and materials for containment and cleaning up: Avoid dry sweeping. Do not use compressed air to clean spilled sand or ground silica. Use water spraying/flushing or ventilated/HEPA filtered vacuum cleaning system. Wet before sweeping. Dispose of in closed containers.

7. HANDLING AND STORAGE

Precautions for safe handling:

Avoid generating dust. Do not breathe dust. Do not rely on your sight to determine if dust is in the air. Respirable crystalline silica dust may be in the air without a visible dust cloud. Use adequate exhaust ventilation and dust collection to reduce respirable crystalline silica dust levels to below the permissible exposure limit ("PEL"). Maintain and test ventilation and dust collection equipment. Use all available work practices to control

dust exposures, such as water sprays. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Keep airborne dust concentrations below permissible exposure limits.

Where necessary to reduce exposures below the PEL or other applicable limit (if lower than the PEL), wear a respirator approved for silica containing dust when using, handling, storing or disposing of this product or bag. See Section 8, for further information on respirators. Do not alter the respirator. Do not wear a tight-fitting respirator with facial hair such as a beard or mustache that prevents a good seal between the respirator and face. Maintain, clean, and fit test respirators in accordance with applicable standards. Wash or vacuum clothing that has become dusty.

Participate in training, exposure monitoring, and health surveillance programs to monitor any potential adverse health effects that may be caused by breathing respirable crystalline silica. The OSHA Respirable Crystalline Silica Standards; 29CFR1910.1053, 1915.1053 and 1926.1053, the OSHA Hazard Communication Standard, 29 CFR Sections 1910.1200, 1915.1200, 1917.28, 1918.90, 1926.59 and 1928.21, and state and local worker or community "right-to-know" laws and regulations should be strictly followed.

DO NOT USE U.S. SILICA COMPANY SAND OR GROUND SILICA FOR SAND BLASTING

Conditions for safe storage, including any incompatibilities: Use dust collection to trap dust produced during loading and unloading. Keep containers closed and store bags to avoid accidental tearing, breaking, or bursting.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure guidelines:

Until Effective Date of New OSHA PEL below:

| Component | OSHA PEL | ACGIH TLV | NIOSH REL |
|-----------------------------|--|--|---|
| Crystalline Silica (quartz) | <u>10 mg/m³</u> %SiO ₂ + 2 TWA (respirable dust) | 0.025 mg/m ³ TWA (respirable dust) | 0.05 mg/m ³ TWA (respirable dust) |
| | <u>30 mg/m³</u> %SiO ₂ + 2 TWA (total dust) | | |

If crystalline silica (quartz) is heated to more than 870°C, quartz can change to a form of crystalline silica known as tridymite; if crystalline silica (quartz) is heated to more than 1470°C, quartz can change to a form of crystalline silica known as cristobalite. The OSHA PEL for crystalline silica as tridymite or cristobalite is one-half of the OSHA PEL for crystalline silica (quartz).

New OSHA PEL from 2016 Respirable Crystalline Silica Standard – see Effective Dates below.

| Component | OSHA PEL | ACGIH TLV | NIOSH REL |
|---|---|--|---|
| Crystalline Silica (quartz, cristobalite and tridymite) | 0.05 mg/m ³ TWA (respirable dust) | 0.025 mg/m ³ TWA (respirable dust) | 0.05 mg/m ³ TWA (respirable dust) |

Effective Dates: Construction 29CFR 1926.1153 Effective June 23, 2017
 General Industry and Maritime 29CFR 1910.1053 / 1915.1053 Effective June 23, 2018
 Oil and Gas including Hydraulic Fracturing 29CFR 1910.1053 Effective June 23, 2018

Appropriate engineering controls: Use adequate general or local exhaust ventilation to maintain concentrations in the workplace below the applicable exposure limits listed above.

Respiratory protection: If it is not possible to reduce airborne exposure levels to below the OSHA PEL or other applicable limit with ventilation, use the table below to assist you in selecting respirators that will reduce personal exposures to below the OSHA PEL. This table is part of the OSHA Respirator Standard 29CFR1910.134(d). **Assigned protection factor (APF)** means the workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified by the Standard. For example, an APF of 10 means that the respirator should reduce the airborne concentration of a particulate by a factor of 10, so that if the workplace concentration of a particulate was 150 ug/m³, then a respirator with an APF of 10 should reduce the concentration of particulate to 15 ug/m³. In addition a cartridge change-out schedule must be developed based on the concentrations in the workplace.

1. -- Assigned Protection Factors⁵

| Type of respirator ^{1, 2} | Quarter mask | Half mask | Full facepiece | Helmet/hood | Loose-fitting facepiece |
|---|--------------|-----------------|----------------|-----------------------|-------------------------|
| 1. Air-Purifying Respirator | 5 | ³ 10 | 50 | ..... | ..... |
| 2. Powered Air-Purifying Respirator (PAPR) | ..... | 50 | 1,000 | ⁴ 25/1,000 | 25 |
| 3. Supplied-Air Respirator (SAR) or Airline Respirator | | | | | |
| • Demand mode | ..... | 10 | 50 | ..... | ..... |
| • Continuous flow mode | ..... | 50 | 1,000 | ⁴ 25/1,000 | 25 |
| • Pressure-demand or other positive-pressure mode | ..... | 50 | 1,000 | ..... | ..... |
| 4. Self-Contained Breathing Apparatus (SCBA) | | | | | |
| • Demand mode | ..... | 10 | 50 | 50 | ..... |
| • Pressure-demand or other positive-pressure mode (e.g., open/closed circuit) | ..... | ..... | 10,000 | 10,000 | ..... |

Notes:

¹Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

²The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

³This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

⁴The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

⁵These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

Skin protection: Maintain good industrial hygiene. Protection recommended for workers suffering from dermatitis or sensitive skin.

Eye protection: Safety glasses with side shields or goggles recommended if eye contact is anticipated.

Other: None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.): White or tan sand: granular, crushed or ground to a powder.

Odor: None.

| | |
|---|--|
| Odor threshold: Not determined | pH: 6-8 |
| Melting point/freezing point: 3110°F/1710°C | Boiling point/range: 4046°F/2230°C |
| Flash point: Not applicable | Evaporation rate: Not applicable |
| Flammable limits: LEL: Not applicable | UEL: Not applicable |
| Vapor pressure: Not applicable | Vapor density: Not applicable |
| Relative density: 2.65 | Solubility(ies): Insoluble in water |
| Partition coefficient: n-octanol/water: Not applicable | Auto-ignition temperature: Not determined |
| Decomposition temperature: Not determined | Viscosity: Not applicable |
| Flammability (solid, gas): Not applicable | |

10. STABILITY AND REACTIVITY

Reactivity: Not reactive under normal conditions of use.

Chemical stability: Stable.

Possibility of hazardous reactions: Contact with powerful oxidizing agents, such as fluorine, chlorine trifluoride and oxygen difluoride, may cause fires.

Conditions to avoid: Avoid generation of dust in handling and use.

Incompatible materials: Powerful oxidizers such as fluorine, chlorine trifluoride, and oxygen difluoride and hydrofluoric acid.

Hazardous decomposition products: Silica will dissolve in hydrofluoric acid and produce a corrosive gas, silicon tetrafluoride.

11. TOXICOLOGICAL INFORMATION

Acute effects of exposure:

Inhalation: Inhalation of dust may cause respiratory tract irritation. Symptoms of exposure may include cough, sore throat, nasal congestion, sneezing, wheezing and shortness of breath.

Ingestion: Ingestion in an unlikely route of exposure. If dust is swallowed, it may irritate the mouth and throat.

Skin contact: No adverse effects are expected.

Eye contact: Particulates may cause abrasive injury.

Chronic effects: Prolonged inhalation of respirable crystalline silica may cause lung disease, silicosis, lung cancer and other effects as indicated below.

The method of exposure that can lead to the adverse health effects described below is inhalation.

A. SILICOSIS

Silicosis can exist in several forms, chronic (or ordinary), accelerated, or acute:

Chronic or Ordinary Silicosis is the most common form of silicosis, and can occur after many years (10 to 20 or more) of prolonged repeated inhalation of relatively low levels of airborne respirable crystalline silica dust. It is further defined as either simple or complicated silicosis. Simple silicosis is characterized by lung lesions (shown as radiographic opacities) less than 1 centimeter in diameter, primarily in the upper lung zones. Often, simple silicosis is not associated with symptoms, detectable changes in lung function or disability. Simple silicosis may be progressive and may develop into complicated silicosis or progressive massive fibrosis (PMF). Complicated silicosis or PMF is characterized by lung lesions (shown as radiographic opacities) greater than 1 centimeter in diameter. Complicated silicosis or PMF symptoms, if present, are shortness of breath and cough. Complicated silicosis or PMF may be associated with decreased lung function and may be disabling. Advanced complicated silicosis or PMF may lead to death. Advanced complicated silicosis or PMF can result in heart disease secondary to the lung disease (cor pulmonale).

Accelerated Silicosis can occur with prolonged repeated inhalation of high concentrations of respirable crystalline silica over a relatively short period; the lung lesions can appear within five (5) years of initial exposure. Progression can be rapid. Accelerated silicosis is similar to chronic or ordinary silicosis, except that lung lesions appear earlier and progression is more rapid.

Acute Silicosis can occur after the repeated inhalation of very high concentrations of respirable crystalline silica over a short time period, sometimes as short as a few months. The symptoms of acute silicosis include progressive shortness of breath, fever, cough, weakness and weight loss. Acute silicosis is fatal.

B. CANCER

IARC - The International Agency for Research on Cancer ("IARC") concluded that "crystalline silica in the form of quartz or cristobalite dust is *carcinogenic to humans (Group 1)*". For further information on the IARC evaluation, see IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Volume 100C,"A Review of Human Carcinogens: Arsenic, Metals, Fibres and Dusts " (2011).

NTP classifies "Silica, Crystalline (respirable size)" as Known to be a human carcinogen.

C. AUTOIMMUNE DISEASES

Several studies have reported excess cases of several autoimmune disorders -- scleroderma, systemic lupus erythematosus, rheumatoid arthritis -- among silica-exposed workers.

D. TUBERCULOSIS

Individuals with silicosis are at increased risk to develop pulmonary tuberculosis, if exposed to tuberculosis bacteria. Individuals with chronic silicosis have a three-fold higher risk of contracting tuberculosis than similar individuals without silicosis.

E. KIDNEY DISEASE

Several studies have reported excess cases of kidney diseases, including end stage renal disease, among silica-exposed workers. For additional information on the subject, the following may be consulted: "Kidney Disease and Silicosis", *Nephron*, Volume 85, pp. 14-19 (2000).

F. NON-MALIGNANT RESPIRATORY DISEASES

The reader is referred to Section 3.5 of the NIOSH Special Hazard Review cited below for information concerning the association between exposure to crystalline silica and chronic bronchitis, emphysema and small airways disease. There are studies that disclose an association between dusts found in various mining occupations and non-malignant respiratory diseases, particularly among smokers. It is unclear whether the observed associations exist only with underlying silicosis, only among smokers, or result from exposure to mineral dusts generally (independent of the presence or absence of crystalline silica, or the level of crystalline silica in the dust).

Sources of information:

The *NIOSH Hazard Review - Occupational Effects of Occupational Exposure to Respirable Crystalline Silica* published in April 2002 summarizes and discusses the medical and epidemiological literature on the health risks and diseases associated with occupational exposures to respirable crystalline silica. The *NIOSH Hazard Review* is available from NIOSH - Publications Dissemination, 4676 Columbia Parkway, Cincinnati, OH 45226, or through the NIOSH web site, www.cdc.gov/niosh/topics/silica, then click on the link "NIOSH Hazard Review: Health Effects of Occupational Exposure to Respirable Crystalline Silica".

For a more recent review of the health effects of respirable crystalline silica, the reader may consult *Fishman's Pulmonary Diseases and Disorders*, Fourth Edition, Chapter 57. "Coal Workers' Lung Diseases and Silicosis".

The US Occupational Safety and Health Administration (OSHA) published a summary of respirable crystalline silica health effects in connection with OSHA's Proposed Rule regarding occupational exposure to respirable crystalline silica. The summary was published in the September 12, 2013 Federal Register, which can be found at www.federalregister.gov/articles/2013/09/12/2013-20997/occupational-exposure-to-respirable-crystalline-silica.

Numerical measures of toxicity:

Crystalline Silica (quartz): LD50 oral rat >22,500 mg/kg

12. ECOLOGICAL INFORMATION

Ecotoxicity: Crystalline silica (quartz) is not known to be ecotoxic.

Persistence and degradability: Silica is not degradable.

Bioaccumulative potential: Silica is not bioaccumulative.

Mobility in soil: Silica is not mobile in soil.

Other adverse effects: No data available.

13. DISPOSAL CONSIDERATIONS

Discard any product, residue, disposable container or liner in full compliance with national regulations.

14. TRANSPORT INFORMATION

UN number: None

UN proper shipping name: Not regulated

Transport hazard classes(es): None

Packing group, if applicable: None

Environmental hazards: None

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not determined

Special precautions: None known.

15. REGULATORY INFORMATION

UNITED STATES (FEDERAL AND STATE)

TSCA Status: Crystalline silica (quartz) appears on the EPA TSCA inventory under the CAS No. 14808-60-7.

RCRA: This product is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR §261 et seq.

CERCLA: Crystalline silica (quartz) is not classified as a hazardous substance under regulations of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 40 CFR §302.

Emergency Planning and Community Right to Know Act (SARA Title III): This product contains the following chemicals subject to SARA 302 or SARA 313 reporting: None above the de minimus concentrations.

Clean Air Act: Crystalline silica (quartz) mined and processed by U.S. Silica Company is not processed with or does not contain any Class I or Class II ozone depleting substances.

FDA: Silica is included in the list of substances that may be included in coatings used in food contact surfaces, 21 CFR §175.300(b)(3)(xxvi).

California Proposition 65: Crystalline silica (airborne particles of respirable size) is classified as a substance known to the State of California to be a carcinogen.

California Inhalation Reference Exposure Level (REL): California established a chronic non-cancer effect REL of 3 µg for silica (crystalline, respirable). A chronic REL is an airborne level of a substance at or below which no non-cancer health effects are anticipated in individuals indefinitely exposed to the substance at that level.

Massachusetts Toxic Use Reduction Act: Silica, crystalline (respirable size, <10 microns) is “toxic” for purposes of the Massachusetts Toxic Use Reduction Act.

Pennsylvania Worker and Community Right to Know Act: Quartz is a hazardous substance under the Act, but it is not a special hazardous substance or an environmental hazardous substance.

Texas Commission on Environmental Quality: The Texas CEQ has established chronic and acute Reference Values and short term and long term Effects Screening Levels for crystalline silica (quartz). The information can be accessed through www.tceq.texas.gov.

CANADA

Domestic Substances List: U. S. Silica Company products, as naturally occurring substances, are on the Canadian DSL.

WHMIS Classification: D2A

OTHER NATIONAL INVENTORIES

Australian Inventory of Chemical Substances (AICS): All of the components of this product are

listed on the AICS inventory or exempt from notification requirements.

China: Silica is listed on the IECSC inventory or exempt from notification requirements.

Japan Ministry of International Trade and Industry (MITI): All of the components of this product are existing chemical substances as defined in the Chemical Substance Control Law Registry Number 1-548.

Korea Existing Chemicals Inventory (KECI) (set up under the Toxic Chemical Control Law): Listed on the ECL with registry number 9212-5667.

New Zealand: Silica is listed on the HSNO inventory or exempt from notification requirements.

Philippines Inventory of Chemicals and Chemical Substances (PICCS): Listed for PICCS.

Taiwan: Silica is listed on the CSNN inventory or exempt from notification requirements.

16. OTHER INFORMATION

Date of preparation/revision: August 22, 2016

Hazardous Material Information System (HMIS):

Health *

Flammability 0

Physical Hazard 0

Protective Equipment E

* For further information on health effects, see Sections 2, 8 and 11 of this MSDS.

National Fire Protection Association (NFPA):

Health 0

Flammability 0

Instability 0

Web Sites with Information about Effects of Crystalline Silica Exposure:

The U. S. Silica Company web site will provide updated links to OSHA and NIOSH web sites addressing crystalline silica issues: www.ussilica.com, click on “Info Center”, then click on “Health & Safety”.

The Occupational Safety and Health Administration (OSHA) web site contains information on the OSHA standard related to respirable crystalline silica at <https://www.osha.gov/silica/index.html>.

The U.S. National Institute for Occupational Safety and Health (NIOSH) maintains a site with information about crystalline silica and its potential health effects at <http://www.cdc.gov/niosh/topics/silica>.

The IARC Monograph that includes crystalline silica, Volume 100C, can be accessed in PDF form at the IARC web site, <http://monographs.iarc.fr/ENG/Monographs/PDFs/index.php>.

U. S. Silica Company Disclaimer

The information and recommendations contained herein are based upon data believed to be up to-date and correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any

harmful effects that may be caused by purchase, resale, use or exposure to our silica. Customers and users of silica must comply with all applicable health and safety laws, regulations, and orders. In particular, they are under an obligation to carry out a risk assessment for the particular work places and to take adequate risk management measures in accordance with the national implementation legislation of EU Directives 89/391 and 98/24.

1. Identification

| | | |
|---|--|-----------------------|
| Product identifier | NITRIC ACID, SOLUTION, 10% W/W | |
| Other means of identification | | |
| Product code | 1280 | |
| Recommended use | professional, scientific and technical activities: other professional, scientific and technical activities | |
| Recommended restrictions | None known. | |
| Manufacturer/Importer/Supplier/Distributor information | | |
| Company name | GFS Chemicals, Inc. | |
| Address | P.O. Box 245 Powell OH 43065 US | |
| Telephone | Phone | 740-881-5501 |
| | Toll Free | 800-858-9682 |
| | Fax | 740-881-5989 |
| Website | www.gfschemicals.com | |
| E-mail | service@gfschemicals.com | |
| Emergency phone number | Emergency Assistance | Chemtrec 800-424-9300 |

2. Hazard(s) identification

| | | |
|-------------------------|---|--|
| Physical hazards | Not classified. | |
| Health hazards | Skin corrosion/irritation | Category 1 |
| | Serious eye damage/eye irritation | Category 1 |
| | Specific target organ toxicity, single exposure | Category 1 (respiratory system) |
| | Specific target organ toxicity, repeated exposure | Category 1 (respiratory system, tooth) |
| OSHA hazard(s) | Not classified. | |
| Label elements | | |



| | |
|--|--|
| Signal word | Danger |
| Hazard statement | Causes severe skin burns and eye damage. Causes serious eye damage. Causes damage to organs (respiratory system). Causes damage to organs (respiratory system, tooth) through prolonged or repeated exposure. |
| Precautionary statement | |
| Prevention | Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection. |
| Response | If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. |
| Storage | Store locked up. |
| Disposal | Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal. |
| Hazard(s) not otherwise classified (HNOC) | Not classified. |

3. Composition/information on ingredients

Mixtures

| Hazardous components | | |
|---------------------------------|-------------------|----------|
| Chemical name | CAS number | % |
| NITRIC ACID | 7697-37-2 | 10 |
| Non-hazardous components | | |
| Chemical name | CAS number | % |
| WATER | 7732-18-5 | 90 |

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

| | |
|---|---|
| Inhalation | Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a physician or poison control center immediately. |
| Skin contact | Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. For minor skin contact, avoid spreading material on unaffected skin. |
| Eye contact | Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a physician or poison control center immediately. |
| Ingestion | Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. |
| Most important symptoms/effects, acute and delayed | Corrosive effects. Irritation of eyes and mucous membranes. May cause temporary blindness and severe eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Prolonged exposure may cause chronic effects. |
| Indication of immediate medical attention and special treatment needed | In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed. Provide general supportive measures and treat symptomatically. |
| General information | Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse. |

5. Fire-fighting measures

| | |
|--|--|
| Suitable extinguishing media | Use extinguishing agent suitable for type of surrounding fire. Water. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO ₂). |
| Unsuitable extinguishing media | Do not use water jet as an extinguisher, as this will spread the fire. |
| Specific hazards arising from the chemical | None known. |
| Special protective equipment and precautions for firefighters | As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. |

6. Accidental release measures

| | |
|--|--|
| Personal precautions, protective equipment and emergency procedures | Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep people away from and upwind of spill/leak. Keep upwind. Keep out of low areas. Ensure adequate ventilation. Wear appropriate personal protective equipment. |
| Methods and materials for containment and cleaning up | Should not be released into the environment. This product is miscible in water. Prevent entry into waterways, sewers, basements or confined areas. Large Spills: Stop leak if you can do so without risk. Prevent entry into waterways, sewer, basements or confined areas. Dike the spilled material, where this is possible. Neutralize with lime or soda ash. Flush to sewer if local regulations permit. Following product recovery, flush area with water. Clean up in accordance with all applicable regulations. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see section 13 of the MSDS. |
| Environmental precautions | Avoid discharge into drains, water courses or onto the ground. Prevent further leakage or spillage if safe to do so. Do not contaminate water. |

7. Handling and storage

Precautions for safe handling

Do not breathe mist or vapor. Do not get this material in contact with eyes. Do not get this material in contact with skin. Do not get this material on clothing. Avoid prolonged exposure. Wash hands thoroughly after handling. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep container tightly closed. Keep out of the reach of children. Store in a cool, dry place out of direct sunlight.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

| Components | Type | Value |
|-----------------------------|------|---------|
| NITRIC ACID (CAS 7697-37-2) | PEL | 5 mg/m3 |
| | | 2 ppm |

US. ACGIH Threshold Limit Values

| Components | Type | Value |
|-----------------------------|------|-------|
| NITRIC ACID (CAS 7697-37-2) | STEL | 4 ppm |
| | TWA | 2 ppm |

US. NIOSH: Pocket Guide to Chemical Hazards

| Components | Type | Value |
|-----------------------------|------|----------|
| NITRIC ACID (CAS 7697-37-2) | STEL | 10 mg/m3 |
| | | 4 ppm |
| | TWA | 5 mg/m3 |
| | | 2 ppm |

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls

Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Individual protection measures, such as personal protective equipment

Eye/face protection

Chemical goggles are recommended.

Skin protection

Hand protection

Wear protective gloves.

Other

Wear appropriate chemical resistant clothing. It may provide little or no thermal protection. Wear protective gloves.

Respiratory protection

Use a chemical cartridge respirator for concentrations exceeding the Occupational Exposure Limit.

Thermal hazards

Not available.

General hygiene considerations

When using, do not eat, drink or smoke. Do not get in eyes. Do not get this material in contact with skin. Do not get this material on clothing. Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance

Clear.

Physical state

Liquid.

Form

Aqueous solution.

Color

Colorless.

Odor

Slight nitric.

Odor threshold

Not available.

pH

< 1

Melting point/freezing point

24.5 °F (-4.16 °C) estimated

Initial boiling point and boiling range

> 212 °F (> 100 °C)

Flash point

Not available.

Evaporation rate

Not available.

Flammability (solid, gas)

Not applicable.

Upper/lower flammability or explosive limits

| | |
|---------------------------------------|----------------|
| Flammability limit - lower (%) | Not available. |
| Flammability limit - upper (%) | Not available. |
| Explosive limit - lower (%) | Not available. |
| Explosive limit - upper (%) | Not available. |

| | |
|--|----------------------|
| Vapor pressure | 4.21 hPa estimated |
| Vapor density | Not available. |
| Relative density | Not available. |
| Solubility(ies) | Completely miscible. |
| Partition coefficient (n-octanol/water) | Not available. |
| Auto-ignition temperature | Not available. |
| Decomposition temperature | Not available. |
| Viscosity | Not available. |

Other information

| | |
|--------------------------|----------------------|
| Density | 1.06 g/cm3 estimated |
| Molecular formula | HNO3 |
| Molecular weight | 63.01 |
| Percent volatile | 100 % |
| Specific gravity | 1.06 estimated |

10. Stability and reactivity

| | |
|---|--|
| Reactivity | Not available. |
| Chemical stability | Material is stable under normal conditions. |
| Possibility of hazardous reactions | Hazardous polymerization does not occur. |
| Conditions to avoid | Reacts violently with strong alkaline substances. This product may react with reducing agents. Do not mix with other chemicals. |
| Incompatible materials | Incompatible with bases. Alcohols. This product may react with reducing agents. Contact with metals may evolve flammable hydrogen gas. |
| Hazardous decomposition products | Nitrogen oxides (NOx). |

11. Toxicological information**Information on likely routes of exposure**

| | |
|---------------------|---|
| Ingestion | Causes digestive tract burns. |
| Inhalation | May cause irritation to the respiratory system. |
| Skin contact | Causes severe skin burns. |
| Eye contact | Causes severe eye burns. Causes serious eye damage. |

Symptoms related to the physical, chemical and toxicological characteristics Burning pain and severe corrosive skin damage. Permanent eye damage including blindness could result.

Information on toxicological effects

Acute toxicity Causes severe skin burns and eye damage.

| Product | Species | Test Results |
|--|----------------|--|
| NITRIC ACID, SOLUTION, 10% W/W (CAS Mixture) | | |
| Acute | | |
| <i>Inhalation</i> | | |
| LC50 | Mouse | 2440 mg/l, 30 Minutes, estimated 1709 mg/l |
| | Rat | 670 mg/l, 4 Hours, estimated 1380 mg/l, 30 Minutes, estimated |

| Product | Species | Test Results |
|-----------------------------|---------|------------------------------|
| | | 650 mg/l, 4 Hours, estimated |
| Components | Species | Test Results |
| NITRIC ACID (CAS 7697-37-2) | | |
| Acute | | |
| <i>Inhalation</i> | | |
| LC50 | Mouse | 244 mg/l, 30 Minutes |
| | | 67 mg/l, 4 Hours |
| | Rat | 334 mg/l, 30 Minutes |
| | | 244 mg/l, 30 Minutes |
| | | 138 mg/l, 30 Minutes |
| | | 65 mg/l, 4 Hours |

* Estimates for product may be based on additional component data not shown.

| | |
|---|--|
| Skin corrosion/irritation | Causes severe skin burns and eye damage. |
| Serious eye damage/eye irritation | Causes severe eye burns. Causes serious eye damage. |
| Respiratory sensitization | Due to lack of data the classification is not possible. |
| Skin sensitization | Due to lack of data the classification is not possible. |
| Germ cell mutagenicity | Due to lack of data the classification is not possible. |
| Carcinogenicity | This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA. |
| Reproductive toxicity | Due to lack of data the classification is not possible. |
| Specific target organ toxicity - single exposure | Causes damage to organs (respiratory system). |
| Specific target organ toxicity - repeated exposure | Causes damage to organs (respiratory system, tooth) through prolonged or repeated exposure. |
| Aspiration hazard | Due to lack of data the classification is not possible. |
| Chronic effects | Prolonged inhalation may be harmful. Causes damage to organs through prolonged or repeated exposure. |

12. Ecological information

Ecotoxicity Components of this product are hazardous to aquatic life. Because of the low pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.

| Product | Species | Test Results |
|--|---------|--|
| NITRIC ACID, SOLUTION, 10% W/W (CAS Mixture) | | |
| Crustacea | LC50 | Daphnia |
| | | 4643 mg/l, 48 Hours |
| Fish | LC50 | Fish |
| | | 2363 mg/l, 48 Hours |
| Components | Species | Test Results |
| NITRIC ACID (CAS 7697-37-2) | | |
| Crustacea | LC50 | Green or European shore crab (Carcinus maenas) |
| | | 180 mg/l, 48 hours |
| Aquatic | | |
| Crustacea | LC50 | Cockle (Cerastoderma edule) |
| | | 330 - 1000 mg/l, 48 hours |
| Fish | LC50 | Starfish (Asterias rubens) |
| | | 100 - 330 mg/l, 48 hours |

* Estimates for product may be based on additional component data not shown.

| | |
|--------------------------------------|----------------|
| Persistence and degradability | None known. |
| Bioaccumulative potential | Not available. |
| Mobility in soil | Not available. |
| Other adverse effects | Not available. |

13. Disposal considerations

| | |
|--|--|
| Disposal instructions | Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations. Solutions with low pH-value must be neutralized before discharge. |
| Local disposal regulations | Not available. |
| Hazardous waste code | D002: Waste Corrosive material [pH ≤2 or ≥12.5, or corrosive to steel] |
| Waste from residues / unused products | Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions). |
| Contaminated packaging | Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied. |

14. Transport information

DOT

| | |
|-------------------------------------|---|
| UN number | UN2031 |
| UN proper shipping name | Nitric acid other than red fuming, with 20% or less nitric acid |
| Transport hazard class(es) | 8 |
| Subsidiary class(es) | Not available. |
| Packing group | II |
| Special precautions for user | Read safety instructions, SDS and emergency procedures before handling. |
| Labels required | 8 |
| Special provisions | A6, B2, B47, B53, IB2, T8, TP2 |
| Packaging exceptions | None |
| Packaging non bulk | 158 |
| Packaging bulk | 242 |

IATA

| | |
|-------------------------------------|---|
| UN number | UN2031 |
| UN proper shipping name | Nitric acid other than red fuming, with 20% or less nitric acid |
| Transport hazard class(es) | 8 |
| Subsidiary class(es) | - |
| Packaging group | II |
| Environmental hazards | No |
| Labels required | Not available. |
| ERG Code | 8L |
| Special precautions for user | Not available. |

IMDG

| | |
|-------------------------------------|---|
| UN number | UN2031 |
| UN proper shipping name | NITRIC ACID other than red fuming, with less than 65% nitric acid |
| Transport hazard class(es) | 8 |
| Subsidiary class(es) | - |
| Packaging group | II |
| Environmental hazards | |
| Marine pollutant | No |
| Labels required | Not available. |
| EmS | F-A, S-B |
| Special precautions for user | Not available. |

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No information available.

DOT



IATA; IMDG



15. Regulatory information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not on regulatory list.

CERCLA Hazardous Substance List (40 CFR 302.4)

NITRIC ACID (CAS 7697-37-2) LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical No

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

NITRIC ACID (CAS 7697-37-2)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

Food and Drug Administration (FDA) Not regulated.

US state regulations

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. Massachusetts RTK - Substance List

NITRIC ACID (CAS 7697-37-2)

US. New Jersey Worker and Community Right-to-Know Act

NITRIC ACID (CAS 7697-37-2) 500 lbs

US. Pennsylvania RTK - Hazardous Substances

NITRIC ACID (CAS 7697-37-2)

US. Rhode Island RTK

NITRIC ACID (CAS 7697-37-2)

US. California Proposition 65**US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance**

Not listed.

International Inventories

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|-----------------------------|--|-------------------------------|
| Australia | Australian Inventory of Chemical Substances (AICS) | Yes |
| Canada | Domestic Substances List (DSL) | Yes |
| Canada | Non-Domestic Substances List (NDSL) | No |
| China | Inventory of Existing Chemical Substances in China (IECSC) | Yes |
| Europe | European Inventory of Existing Commercial Chemical Substances (EINECS) | Yes |
| Europe | European List of Notified Chemical Substances (ELINCS) | No |
| Japan | Inventory of Existing and New Chemical Substances (ENCS) | Yes |
| Korea | Existing Chemicals List (ECL) | Yes |
| New Zealand | New Zealand Inventory | Yes |
| Philippines | Philippine Inventory of Chemicals and Chemical Substances (PICCS) | Yes |
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last revision**Issue date** January-13-2014**Version #** 01**Further information** Not available.

Disclaimer The information in the sheet was written based on the best knowledge and experience currently available. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Information Product and Company Identification: Product Codes
Composition / Information on Ingredients: Ingredients
Physical & Chemical Properties: Multiple Properties

Safety Data Sheet **Portland Cement**

Section 1. Identification

| | |
|---|---|
| GHS product identifier: | Portland Cement |
| Chemical name: | Calcium compounds, calcium silicate compounds, and other calcium compounds containing iron and aluminum make up the majority of this product. |
| Other means of identification: | Cement, ASTM Type I, II, III, V, Portland Limestone Cement, Plastic Cement, Hydraulic Cement, Oilwell Cement, Well Cement, Class G Cement, InterCem, Type L, CSA Type GU, GUb, GUL, MS, MH, MHL, HE, HEL, LH, LHL, HS |
| Relevant identified uses of the substance or mixture and uses advised against: | Building materials, construction, a basic ingredient in concrete. |
| Supplier's details: | 300 E. John Carpenter Freeway, Suite 1645 Irving, TX 75062 (972) 653-5500 |
| Emergency telephone number (24 hours): | CHEMTREC: (800) 424-9300 |

Section 2. Hazards Identification

Overexposure to portland cement can cause serious, potentially irreversible skin or eye damage in the form of chemical (caustic) burns, including third degree burns. The same serious injury can occur if wet or moist skin has prolonged contact exposure to dry portland cement.

| | |
|--|--|
| OSHA/HCS status: | This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). |
| Classification of the substance or mixture: | SKIN CORROSION/IRRITATION – Category 1 SERIOUS EYE DAMAGE/EYE IRRITATION – Category 1 SKIN SENSITIZATION – Category 1 CARCINOGENICITY/INHALATION – Category 1A SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) [Respiratory tract irritation] – Category 3 |

GHS label elements

Hazard pictograms:



Signal word:

Danger

Hazard statements:

Causes severe skin burns and eye damage.
May cause an allergic skin reaction.
May cause respiratory irritation.
May cause cancer.



Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Use outdoors in a well ventilated area. Wash any exposed body parts thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Contaminated clothing must not be allowed out of the workplace. If exposed or concerned: Immediately get medical advice/attention if you feel unwell or irritation or rash occurs. If on skin: Wash with plenty of water. Take off contaminated clothing and wash it before reuse. If in eyes: Rinse continuously with water for several minutes. Remove contact lenses, if present and easy to do. If inhaled: Remove person to fresh air and keep comfortable and at rest. If swallowed: Rinse mouth. Do not induce vomiting. Restrict or control access to stockpile areas (store locked up). Engulfment hazard: To prevent asphyxiation or suffocation, do not enter a confined space, such as a silo, bulk truck or other storage container or vessel that stores or contains cement without an effective procedure for assuring

| | |
|---|---|
| Disposal: | safety. Store in a well ventilated area. Keep container tightly closed. Dispose of contents/container in accordance with local/regional/national/international regulations. |
| Hazards not otherwise classified (HNOC): | None known |
| Supplemental Information: | Respirable Crystalline Silica (RCS) may cause cancer. Repeated inhalation of respirable crystalline silica (quartz) may cause lung cancer according to IARC and NTP; ACGIH states that it is a suspected cause of cancer. Other forms of RCS (e.g., tridymite and cristobalite) may also be present or formed under certain industrial processes. |

Section 3. Composition/information on ingredients

| | |
|---------------------------|---|
| Substance/mixture: | Mixture |
| Chemical Name: | Calcium compounds, calcium silicate compounds, and other calcium compounds containing iron and aluminum make up the majority of this product. |

CAS number/other identifiers

| Ingredient name | % | CAS number |
|--|------|------------|
| Portland Cement | 100% | 65997-15-1 |
| The structure of Portland cement may contain the following in some concentration ranges: | | |
| Calcium oxide | A-B | 1305-78-8 |
| Quartz | C-D | 14808-60-7 |
| Hexavalent chromium* | E-F | 18450-29-9 |
| Portland cement also contains gypsum, limestone and magnesium oxide in various concentrations. However, because these components are not classifiable as a hazard under Title 29 Code of Federal Regulations 1910.1200, they are not required to be listed in this section. | | |
| Gypsum | G-H | 13397-24-5 |
| Limestone | I-J | 1317-65-3 |
| Magnesium oxide | K-L | 1309-48-4 |

Any concentration shown as a range is to protect confidentiality or is due to process variation.

*Hexavalent chromium is included due to dermal sensitivity associated with the component.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

| | |
|----------------------|---|
| Eye Contact: | Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. |
| Inhalation: | Seek medical help if coughing or other symptoms persist. Inhalation of large amounts of portland cement requires immediate medical attention. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If the individual is not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in a recovery position and get medical attention immediately. Maintain an open airway. |
| Skin Contact: | Get medical attention immediately. Heavy exposure to portland cement dust, wet concrete or associated water requires prompt attention. Quickly remove contaminated clothing, shoes, and leather goods such as watchbands and belts. Quickly and gently blot or brush away excess portland cement. Immediately wash thoroughly with lukewarm, gently flowing water and non-abrasive pH natural soap. Seek medical attention for rashes, burns, irritation, dermatitis and prolonged unprotected exposure to wet cement, cement mixtures or liquids from wet cement. Burns should be treated as caustic burns. Portland cement causes skin burns with little warning. Discomfort or pain cannot be relied upon to alert a person to |

a serious injury. You may not feel pain or the severity of the burn until hours after the exposure. Chemical burns must be treated promptly by a physician. In the event of any complaints or symptoms, avoid further exposure. Get medical attention immediately. Call a poison center or physician. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING unless directed to do so by medical personnel. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Have victim drink 60 to 240 mL (2 to 8 oz.) of water. Stop giving water if the exposed person feels sick as vomiting may be dangerous. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

Ingestion:

Most important symptoms/effects, acute and delayed potential acute health effects

| | |
|----------------------|---|
| Eye contact: | Causes serious eye damage. |
| Inhalation: | May cause respiratory irritation. |
| Skin contact: | Causes severe burns. May cause an allergic skin reaction. |
| Ingestion: | May cause burns to mouth, throat and stomach. |

Over-exposure signs/symptoms

| | |
|----------------------|--|
| Eye contact: | Adverse symptoms may include the following: pain, watering and redness. |
| Inhalation: | Adverse symptoms may include the following: respiratory tract irritation and coughing. |
| Skin contact: | Adverse symptoms may include the following: pain or irritation, redness and blistering may occur, skin burns, ulceration and necrosis may occur. |
| Ingestion: | Adverse symptoms may include the following: stomach pains. |

Indication of immediate medical attention and special treatment needed, if necessary

| | |
|------------------------------------|---|
| Notes to physician: | Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. |
| Specific treatments: | Not applicable. |
| Protection of first-aiders: | No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. |

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

| | |
|--|---|
| Suitable extinguishing media: | Use an extinguishing agent suitable for the surrounding fire. |
| Unsuitable extinguishing media: | Do not use water jet or water-based fire extinguishers. |
| Specific hazards arising from the chemical: | No specific fire or explosion hazard. |
| Hazardous thermal decomposition Products: | Decomposition products may include the following materials: carbon dioxide, carbon monoxide, sulfur oxides and metal oxide/oxides. |
| Special protective actions for fire-fighters: | Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. |
| Special protective equipment for fire-fighters: | Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. |

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

| | |
|-------------------------------------|--|
| For non-emergency personnel: | No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not |
|-------------------------------------|--|

**For emergency responders:
Environmental precautions:**

breathe dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
For personal protective clothing requirements, please see Section 8.
Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has entered the environment, including waterways, soil or air. Materials can enter waterways through drainage systems.

Methods and materials for containment and cleaning up

Small spill:

Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Place spilled material in a designated, labeled waste container. Dispose of waste material by using a licensed waste disposal contractor.

Large spill:

Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place dust in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Large spills to waterways may be hazardous due to alkalinity of the product. Dispose of waste material using a licensed waste disposal contractor. Note: see section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures:

Put on appropriate personal protective equipment (see Section 8). Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure by obtaining and following special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe dust. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material and keep the container tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene:

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities:

A key to using the product safely requires the user to recognize that portland cement reacts chemically with water to produce calcium hydroxide which can cause severe chemical burns. Every attempt should be made to avoid skin and eye contact with cement. Do not get portland cement inside boots, shoes or gloves. Do not allow wet, saturated clothing to remain against the skin. Promptly remove clothing and shoes that are dusty or wet with cement mixtures. Launder/clean clothing and shoes before reuse. Do not enter a confined space that stores or contains portland cement unless appropriate procedures and protection are available. Portland cement can build up or adhere to the walls of a confined space and then release or fall suddenly (engulfment).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

| Ingredient name | Exposure limits |
|-----------------|-----------------|
|-----------------|-----------------|

| | |
|---|--|
| <p>Cement, portland, chemicals</p> | <p>ACGIH TLV (United States, 3/2012) TWA: 1 mg/m³ 8hours. Form: Respirable fraction</p> <p>NIOSH REL (United States, 6/2009) TWA: 5 mg/m³ 10 hours. Form: Respirable fraction TWA: 10 mg/m³ 10 hours. Form: Total</p> <p>OSHA PEL (United States, 6/2010) TWA: 5mg/m³. 8 hours. Form: Respirable fraction TWA: 15 mg/m³. 8 hours. Form: Total dust</p> |
| <p>Calcium oxide</p> | <p>ACGIH TLV (United States, 3/2012) TWA: 2 mg/m³ 8 hours</p> <p>NIOSH REL (United States, 6/2009) TWA: 2mg/m³ 10 hours.</p> <p>OSHA PEL (United States, 6/2010) TWA: 5 mg/m³ 8 hours.</p> |
| <p>Limestone</p> | <p>NIOSH REL (United States, 6/2009) TWA: 5 mg/m³ 10 hours. Form: Respirable fraction TWA: 10 mg/m³ 10 hours. Form: Total</p> <p>OSHA PEL (United States, 6/2010) TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust</p> |
| <p>Magnesium oxide</p> | <p>ACGIH TLV (United States, 3/2012) TWA: 10 mg/m³ 8 hours. Form: Inhalable fraction</p> <p>OSHA PEL (United States, 6/2010) TWA: 15 mg/m³ 8 hours. Form: Total particulates</p> |
| <p>Quartz</p> | <p>ACGIH TLV (United States, 3/2012) TWA: 0.025 mg/m³ 8 hours. Form: Respirable fraction</p> <p>NIOSH REL (United States, 6/2009) TWA: 0.05 mg/m³ 10 hours. Form: Respirable dust</p> <p>OSHA PEL Z-3 (United States, 9/2005) TWA: 10 mg/m³ divided by % SiO₂ + 2: Respirable TWA: 30 mg/m³ divided by % SiO₂ + 2: Total</p> |
| <p>Calcium sulfate (gypsum)</p> | <p>ACGIH TLV (United States, 3/2012) TWA: 10 mg/m³ 8 hours. Form: Respirable fraction</p> <p>NIOSH REL (United States, 6/2009) TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 10 mg/m³ 8 hours. Form: Total dust</p> <p>OSHA PEL Z-1 (United States, 2/2006) TWA: 5 mg/m³ 8 hours. Form: Respirable fraction TWA: 15 mg/m³ 8 hours. Form: Total dust</p> |

Appropriate engineering controls:

Use only with adequate ventilation. If user operations generate dust, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls:

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation.

Individual protection measures

| | |
|-----------------------------|---|
| Hygiene measures: | Clean water should always be readily available for skin and (emergency) eye washing. Periodically wash areas contacted by portland cement with a pH neutral soap and clean, uncontaminated water. If clothing becomes saturated with portland cement, garments should be removed and replaced with clean, dry clothing. |
| Eye/face protection: | To prevent eye contact, wear safety glasses with side shields, safety goggles or face shields when handling dust or wet cement. Wearing contact lenses when working with cement is not recommended. |

Skin protection

| | |
|--------------------------------|---|
| Hand protection: | Use impervious, waterproof, abrasion and alkali-resistant gloves. Do not rely on barrier creams in place of impervious gloves. Do not get portland cement inside gloves. |
| Body protection: | Use impervious, waterproof, abrasion and alkali-resistant boots and protective long-sleeved and long-legged clothing to protect the skin from contact with wet portland cement. To reduce foot and ankle exposure, wear impervious boots that are high enough to prevent portland cement from getting inside them. Do not get portland cement inside boots, shoes, or gloves. Remove clothing and protective equipment that becomes saturated with cement and immediately wash exposed areas of the body. |
| Other skin protection: | Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved. |
| Respiratory protection: | Use properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product, and assigned protection factor of the selected respirator. |

Section 9. Physical and chemical properties

Appearance

| | | | |
|-----------------------------------|--------------------------------|---|---------------------------|
| Physical State: | Solid. [Powder] | Lower and Upper explosive flammable limits | Not applicable |
| Color: | Gray or white | Vapor pressure: | Not applicable |
| Odor: | Odorless | Vapor density: | Not applicable |
| Odor threshold: | Not available | Relative density: | 2.3 to 3.1 |
| pH: | >11.5 [Conc. (% w/w): 1%] | Solubility: | Slightly soluble in water |
| Melting point: | Not available | Solubility in water: | 0.1 to 1% |
| Boiling point: | >1000°C (>1832°F) | Partition coefficient: n-octanol/water: | Not applicable |
| Flash point: | Not flammable. Not combustible | Auto-ignition temperature: | Not applicable |
| Burning time: | Not available | Decomposition temperature: | Not available |
| Burning rate: | Not available | SADT: | Not available |
| Evaporation Rate: | Not applicable | Viscosity: | Not applicable |
| Flammability (solid, gas): | Not applicable | | |

Section 10. Stability and reactivity

| | |
|--|---|
| Reactivity: | Reacts slowly with water forming hydrated compounds, releasing heat and producing a strong alkaline solution until reaction is substantially complete. |
| Chemical Stability: | The product is stable. |
| Possibility of hazardous reactions: | Under normal circumstances of storage and use, hazardous reactions will not occur. |
| Conditions to avoid: | No specific data. |
| Incompatible materials: | Reactive or incompatible with the following materials: oxidizing materials, acids, aluminum and ammonium salt. Portland cement is highly alkaline and will react with acids to produce a violent, heat-generating reaction. Toxic gases or vapors may be given off depending on the acid involved. Reacts with acids, aluminum metals and ammonium salts. Aluminum powder and other alkali and alkaline earth elements will react in wet mortar or concrete, liberating hydrogen gas. Limestone ignites on contact with fluorine and is incompatible with acids, alum, ammonium salts, and magnesium. Silica reacts violently with powerful oxidizing agents such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride yielding possible fire and/or explosions. Silicates dissolve readily in hydrofluoric acid producing a corrosive gas-silicon tetrafluoride. |
| Hazardous decomposition products: | Under normal conditions of storage and use, hazardous decomposition products should not be produced. |

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity: Portland Cement LD50/LC50 = Not available
Irritation/Corrosion: **Skin:** May cause skin irritation. May cause serious burns in the presence of moisture.
Eyes: Causes serious eye damage. May cause burns in the presence of moisture.
Respiratory: May cause respiratory tract irritation.
Sensitization: May cause sensitization due to the potential presence of trace amounts of hexavalent chromium.
Mutagenicity: There are no data available.

Carcinogenicity:
 Classification below:

| Product/ingredient name | OSHA | IARC | ACGIH | NTP |
|-----------------------------|------|------|-------|---------------------------------|
| Cement, portland, chemicals | - | - | A4 | - |
| Quartz | - | 1 | A2 | Known to be a human carcinogen. |

Reproductive toxicity: There are no data available.
Teratogenicity: There are no data available.

Specific target organ toxicity (single exposure)

| Name | Category | Route of Exposure | Target Organs |
|-----------------------------|------------|-----------------------------|---|
| Calcium oxide | Category 3 | Inhalation and skin contact | Respiratory tract irritation, skin irritation |
| Cement, portland, chemicals | Category 3 | Inhalation and skin contact | Respiratory tract irritation, skin irritation |

Specific target organ toxicity (repeated exposure)

| Name | Category | Route of Exposure | Target Organs |
|--------|------------|-------------------|-------------------------------|
| Quartz | Category 1 | Inhalation | Respiratory tract and kidneys |

Aspiration hazard: There are no data available.

Information on the likely routes of exposure

Potential acute health effects: **Eye contact:** Causes serious eye damage.
Inhalation: May cause respiratory irritation.
Skin contact: Causes severe burns. May cause an allergic skin reaction.
Ingestion: May cause burns to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics: **Eye contact:** Adverse symptoms may include the following: pain, watering, redness.
Inhalation: Adverse symptoms may include the following: respiratory tract irritation, coughing
Skin contact: Adverse symptoms may include the following: pain or irritation, redness, blistering may occur, skin burns, ulcerations and necrosis may occur
Ingestion: Adverse symptoms may include the following: stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure: **Short term exposure**
 Potential immediate effects: No known significant effects or critical hazards.
 Potential delayed effects: No known significant effects or critical hazards.

Long term exposure
 Potential immediate effects: No known significant effects or critical hazards.

Potential chronic health effects: Potential delayed effects: No known significant effects or critical hazards.
General: Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation. If sensitized to hexavalent chromium, a severe allergic dermal reaction may occur when subsequently exposed to very low levels.

Carcinogenicity: Portland cement is not classifiable as a human carcinogen. Crystalline silica is considered a hazard by inhalation. IARC has classified crystalline silica as a Group 1 substance, carcinogenic to humans. This classification is based on the findings of laboratory animal studies (inhalation and implantation) and epidemiology studies that were considered sufficient for carcinogenicity. Excessive exposure to crystalline silica can cause silicosis, a non-cancerous lung disease.

Mutagenicity: No known significant effects or critical hazards.

Teratogenicity: No known significant effects or critical hazards.

Developmental effects: No known significant effects or critical hazards.

Fertility effects: No known significant effects or critical hazards.

Numerical measures of toxicity: Acute toxicity estimates: There are no data available.

Section 12. Ecological Information

Toxicity

| Product/ingredient name | Result | Species | Exposure |
|-------------------------|--------------------------------------|---|----------|
| Calcium oxide | Chronic NOEC 100 mg/L Fresh water | Fish-Oreochromis niloticus-Juvenile (Fledgling, Hatchling, Weanling) | 46 days |

Persistence and degradability: There are not data available.
Bioaccumulative potential: There are not data available.
Mobility in soil: Soil/water partition coefficient (Koc): Not available.
Other adverse effects: No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Untreated waste should not be released to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe manner. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff, and contact with soil, waterways, drains and sewers.

Section 14. Transportation information

| | DOT Classification | IMDG | IATA |
|----------------------------|--------------------|---------------|---------------|
| UN number | Not regulated | Not regulated | Not regulated |
| UN proper shipping name | - | - | - |
| Transport hazard class(es) | - | - | - |
| Packing group | - | - | - |
| Environmental hazards | None | None | None |
| Additional information | - | - | - |

Special precautions for user: Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not available.

Section 15. Regulatory Information

TSCA 6 final risk management: Chromium, ion (Cr6+)
United States inventory (TSCA 8b): Cements are considered to be statutory mixtures under TSCA. CAS 65997-15-1 is included on the TSCA inventory.
CERCLA: This product is not listed as a CERCLA substance
Clean Air Act Section 112 (b): Hazardous Air Pollutants (HAPs) – Not listed
Clean Air Act Section 602: Class I Substances - Not listed
Clean Air Act Section 602: Class II Substances - Not listed
DEA List I Chemicals: (Precursor Chemicals) – Not listed
DEA List II Chemicals: (Essential Chemicals) – Not listed

SARA 311/312

Classification: Immediate (acute) health hazard
 Delayed (chronic) health hazard

Composition/information on ingredients

| Name | % | Fire Hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|----------------------|------|-------------|----------------------------|----------|---------------------------------|---------------------------------|
| Calcium oxide | A-B | No | No | No | Yes | No |
| Quartz | >0.1 | No | No | No | No | Yes |
| Chromium, ion (Cr6+) | <0.1 | No | No | No | Yes | Yes |

SARA 313

| | Product name | CAS number | % |
|----------------------------|----------------------|------------|------|
| Form R-Report requirements | Chromium, ion (Cr6+) | 8540-29-9 | <0.1 |

State regulations

Massachusetts: The following components are listed: cement, portland, chemicals, limestone
New York: None of the components are listed.
New Jersey: The following components are listed: cement, portland, chemicals, gypsum, limestone
Pennsylvania: The following components are listed: cement, portland, chemicals, gypsum, limestone

California Prop. 65

WARNING: This product contains crystalline silica and chemicals (trace metals) known to the State of California to cause cancer, birth defects or other reproductive harm. California law requires the above warning in the absence of definitive testing to prove the defined risks do not exist.

| Ingredient name | Cancer | Reproductive | No significant risk level | Maximum acceptable dosage level |
|----------------------|--------|--------------|---------------------------|---------------------------------|
| Quartz | Yes | No | No | No |
| Chromium, ion (Cr6+) | Yes | Yes | 0.001µg/day (inhalation) | 8.2 micrograms/day (ingestion) |

International regulations

International lists: **Canadian Domestic Substances List (DSL):** Portland cement is included on the DSL.
Mexico Inventory (INSQ): All components are listed or exempted.

Section 16. Other Information

Date of issue: 06/01/2015
Version: 06/01/2015
Revised Section(s): N/Ap

Notice to reader

While the information provided in this safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot anticipate and provide all of the information that might be needed in every situation. Inexperienced product users should obtain proper training before using this product. In particular, the data furnished in this sheet do not address hazards that may be posed by other materials mixed with portland cement to produce portland cement products. Users should review other relevant material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

SELLER MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNING THE ACCURACY OF ANY INFORMATION PROVIDED BY Lehigh Hanson, except that the product shall conform to contracted specifications. The information provided herein was believed by the Lehigh Hanson to be accurate at the time of preparation or prepared from sources believed to be reliable, but it is the responsibility of the user to investigate and understand other pertinent sources of information to comply with all laws and procedures applicable to the safe handling and use of product and to determine the suitability of the product for its intended use. Buyer's exclusive remedy shall be for damages and no claim of any kind, whether as to product delivered or for non-delivery of product, and whether based on contract, breach of warranty, negligence, or otherwise shall be greater in amount than the purchase price of the quantity of product in respect of which damages are claimed. In no event shall Seller be liable for incidental or consequential damages, whether Buyer's claim is based on contract, breach of warranty, negligence or otherwise.

Abbreviations

ACGIH — American Conference of Governmental Industrial Hygienists
CAS — Chemical Abstract Service
CERCLA — Comprehensive Emergency Response and Comprehensive Liability Act
CFR — Code of Federal Regulations
DOT — Department of Transportation
GHS — Globally Harmonized System
HEPA — High Efficiency Particulate Air
IATA — International Air Transport Association
IARC — International Agency for Research on Cancer
IMDG — International Maritime Dangerous Goods
NIOSH — National Institute of Occupational Safety and Health
NOEC — No Observed Effect Concentration
NTP — National Toxicology Program
OSHA — Occupational Safety and Health Administration
PEL — Permissible Exposure Limit
REL — Recommended Exposure Limit
RQ — Reportable Quantity
SARA — Superfund Amendments and Reauthorization Act
SDS — Safety Data Sheet
TLV — Threshold Limit Value
TPQ — Threshold Planning Quantity
TSCA — Toxic Substances Control Act
TWA — Time-Weighted Average
UN — United Nations

Safety Data Sheet

1 IDENTIFICATION OF THE PREPARATION AND COMPANY

Product Name: Sawyer Permethrin Insect Repellent(s): Clothing & Gear
 EPA Reg. No.: 50404-3-58188
 Product Code(s): SP649, SP657, SP647, SP652, SP653, PH647
 Application: Pump / Liquid Insecticide/Repellent for use on clothing
 Supplier: Sawyer Products, Inc.
 605 7th Avenue North
 P.O. Box 188
 Safety Harbor, FL 34695
 E-mail: feedback@sawyer.com
 Website: http://sawyer.com
 Telephone Number: 800-356-7811 (M-F, 9-5, EST)

2 HAZARD IDENTIFICATION

Classification of Preparation: None.
 Primary Hazards: R50/53: Very toxic to aquatic organisms, may cause long-term adverse affects in the aquatic environment.

3 COMPOSITION / INFORMATION ON INGREDIENTS

Product Description: Dangerous preparation according to EU directive 1999/45EC:

Information of Hazardous Substances:

| Substance Name | Concentration | CAS Number | EC Number | Symbols | R-Phrases |
|----------------|---------------|------------|-----------|------------|-----------|
| Permethrin | 0.50%w/w | 52645-53-1 | 258-067-9 | Xn, R50/53 | R22 |

Reference is made to Chapter 16 for full test of each relevant R phrase. Occupational exposure limit(s), if relevant, are listed in Section 8.

4 FIRST-AID MEASURES

Any Special Measure: None.
 First Aid Measures –
 If Swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.
 If Inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control center or doctor for treatment advice.
 Skin Contact: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
 If In Eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

5 FIRE-FIGHTING MEASURES

Extinguishing Media –

Suitable: Carbon dioxide (CO₂), Dry chemical, Foam, Water

Not Suitable: As appropriate for surrounding fire.

Special Exposure Hazards: None known.

Hazardous Thermal Decomposition Products: None.

Special Protective Equipment for Firefighters: Use adequate respiratory equipment in case of insufficient ventilation.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions: Avoid contact with face, eyes, or skin. Avoid breathing vapors or spray mist. Harmful if swallowed. Wash thoroughly after handling and before eating or smoking. Do not use on humans.

Environmental Precautions: This product is extremely toxic to fish and other aquatic organisms. Do not apply directly to water. Do not contaminate water when disposing of equipment washwaters.

Large Spills: Contain with a dike.

Methods for Clean-up: Absorb residues in sand or other inert material. Collect spilled material in containers. Call your local solid waste agency for disposal instructions.

Other Information: Notify Authorities if any exposure to the general public or the environment occurs or is likely to occur.

7 HANDLING AND STORAGE

Handling: Handle in accordance with good occupational hygiene and safety practices in well-ventilated areas.

Storage: Keep in a cool, dry and well-ventilated place (< 95°F)(< 35°C). Do not store where temperature falls below (32°F)(0°C). Protect from sunlight. Keep away from food, drink and animal feedstuff.

Recommended Packaging: Keep only in the original packaging.

Use: Use insecticides safely. Always read the label and product information before use.

8 EXPOSURE CONTROL/PERSONAL PROTECTION

Engineering Measure: Use only in well-ventilated areas. Comply with standard precautionary measures for working with chemicals.

Hygienic Measures: When using do not eat, drink or smoke.

Occupational Exposure Limits: Occupational exposure limits have not been established for this product.

Workplace exposure limits (mg/m³): Not determined for this product.

Personal Protective Equipment: Exposure limits: non-assigned. As a consumer use product there is no requirement for personal protection.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Liquid

Color: Milky white

Odor: Slight (Characteristic)

pH: 6.0 – 7.0

Flash Point (TCC): >200°F (>93°C)

Specific Gravity: 0.995

Pounds/Gallon: 8.31

Solubility (Oil): Negligible

Solubility (Water): Miscible

Shelf Life: 5-years

10 STABILITY AND REACTIVITY

Stability: Stable under normal conditions.

Conditions to avoid: Do not store when Temperature exceeds (< 95°F)(< 35°C) or falls below (32°F)(0°C).

Materials to avoid: None.

Hazardous Decomposition Products: No known.

Reactivity: None.

11 TOXICOLOGICAL INFORMATION

Symptoms of Overexposure for Each Potential Route of Exposure:

Inhaled: None.

Contact with skin or eyes: None.

Absorbed through skin: None.

Swallowed: None.

Health effects or risk from exposure: Acute: *None established* Chronic: *None established*

12 ECOLOGICAL INFORMATION*

No Ecotoxicological research has been carried out on this product.

Eco Toxicity: LD50 quail >675g/kg, LC50 96hr fish (Guppy) = 0.38mg/l, EC50 48hr daphnia = 0.0085mg/l, EC50 72hr algae = 25mg/l.

Mobility: Not specified.

Persistence – degradability: Data given in this section are for the active ingredient: Soil DT50<28 days. Water DT50 6 TO 24 HOURS (ponds & streams), 7 Days (pond sediment).

Bioaccumulative potential: Not specified.

**Extrapolated from Technical Concentrate*

13 DISPOSAL CONSIDERATION

Product residues: Replace cap, wrap clean, empty container in several layers of newspaper, and discard container in rubbish. Containers may be recycled. Treat product residues and non-empty pack as hazardous waste.

Additional warning: None.

14 TRANSPORT INFORMATION

This preparation is not classified as a Dangerous Goods for Transport.

Proper Shipping Name: Insect Repellent/Clothing Treatment
Not Restricted.

15 REGULATORY INFORMATION

TSCA (Toxic Substances Control Act) Regulations, 40CFR710: This preparation is a pesticide and is exempt from TSCA regulation.

CERCLA and SARA Regulations (40CFR355, 370, 372): this preparation does not contain any chemicals subject to the reporting requirements of SARA Sec. 313.

This preparation is classified and labelled in accordance with the Control of Pesticides Regulations (1986) and EU DIRECTIVE 1999/45/EC.

**DANGEROUS FOR THE ENVIRONMENT**

R50/53: Very toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

S29: Do not empty into drains.

To avoid risks to man and the environment, comply with the instructions for use.

16 OTHER INFORMATION

Prepared in accordance with OSHA Hazard Communication Standard (HCS) to conform to the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

The information in this safety data sheet is compiled in compliance with Regulation (EC) 1907/2006.

This product is intended for consumer (amateur) use only.

The information given in this safety data sheet is correct to the best of our knowledge at the date of issue. It is intended as a guide for the safe use, handling, disposal, storage and transportation and is not intended as warranty or as a specification. Recipients of our products must take responsibility for observing the law and regulations. The information relates only to the product supplied and may not be suitable for use with other product materials other than those described within.

Sawyer Products, Inc. disclaims any liability for loss or damage resulting from the use of this data, information suggestions.

Section 1 - Product and Company Identification

Product Identifiers:

| | |
|---------------------------------|--|
| Product name: | Repel Insect Repellent Sportsmen Max Formula 40% DEET |
| EPA reg. number: | 305-46 |
| Recommended product use: | Insect Repellent - Aerosol |

Details of the Supplier of the Safety Data Sheet:

| | |
|---------------------------------|---|
| Manufacturer/Supplier: | Chemsico Div. of United Industries Corp. P.O. Box 142642 St. Louis, MO 63114 |
| For product information: | 1-800-880-1181 |
| For medical emergencies: | 1-800-633-2873 |

Section 2 - Hazards Identification

Conforms to Hazard Communication Standard 29 CFR 1910.1200.

GHS Classification of Substance or Mixture: Flammable aerosol - Category 2**GHS Label Elements:**

Hazard pictogram(s):



Signal word:

WARNING

Hazard statements:

- Flammable aerosol
- Compressed gas – contents under pressure; may burst if heated
- Causes eye irritation
- Harmful if swallowed
- May cause an allergic skin reaction

Precautionary Statements:

- Contents under pressure.
- Do not use or store near heat or open flame.
- Do not puncture or incinerate container.
- Exposure to temperatures above 130°F may cause bursting.
- If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
- Wash hands with soap and water after handling. Do not eat, drink or smoke when using this product. If swallowed: Call a poison control center or doctor for treatment advice if you feel unwell. Rinse mouth.
- If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

Section 3 - Composition / Information on Ingredients

| Chemical Name | CAS# | Weight Percent |
|--------------------------------|----------|----------------|
| DEET (N,N-Diethyl-m-toluamide) | 134-62-3 | 40.0% |
| Ethanol | 64-17-5 | 20.0% |
| Isobutane | 75-28-5 | 10.0% |

Note: Ingredients not identified are proprietary or non-hazardous. Values are not product specifications.

Section 4 - First Aid Measures

| | |
|---------------------------|--|
| Eye contact: | Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison control center or doctor for treatment advice. |
| Skin contact: | After returning indoors, wash treated skin with soap and water. Discontinue use if irritation or rash occurs. |
| Inhalation: | No special requirements |
| Ingestion: | Call a poison control center or doctor immediately for treatment advice. Have person sip if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person. |
| Note to Physician: | None |
| General advice: | If you feel unwell, seek medical advice (show the label where possible). Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Keep out of reach of children. |

Section 5 - Fire Fighting Measures

| | |
|--|---|
| Flammable properties: | Pressurized aerosol container |
| NFPA classification: | NFPA level 1 aerosol |
| Suitable extinguishing media: | Water fog, foam, CO ₂ , dry chemical |
| Unsuitable extinguishing media: | Not available |
| Specific hazards arising from the chemical: | Contents under pressure – container may burst in heat of fire. |
| Protective equipment for firefighters: | Firefighters should wear full protective clothing including self-contained breathing apparatus. |
| Hazardous combustion products: | None known |
| Explosion data: | Not available |
| Sensitivity to static discharge: | Not available |
| Personal precautions: | Keep unnecessary personnel away. Do not touch or walk through spilled material. |

Section 6 - Accidental Release Measures

Personnel precautions: Remove all sources of ignition. Wear personnel protective equipment as recommended in Section 8. Wash thoroughly after handling.

For emergency responders: If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials.

Environmental precautions: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for containment and cleaning up: Stop leak if without risk. Move containers from spill area. Before attempting clean up, refer to hazard data given above. Small spills may be absorbed with earth, sand or absorbent material swept up and placed in suitable, covered, and labeled containers. Prevent large spills from entering sewers or waterways. Contact emergency services and supplier for advice. Never return spills in original containers for re-use.

Section 7 - Handling and Storage

Precautions for safe handling: Put on appropriate personal protective equipment as recommended in Section 8. Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50°C (122°F). Do not pierce or burn, even after use. Do not ingest. Avoid contact with skin, eyes and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous.

Storage: Store in a cool, dry area away from open flame. Do not store above 50°C (122°F).

Section 8 - Exposure Controls / Personal Protection

Exposure guidelines:

| Components with Occupational Exposure Limits | | | | | | | |
|--|-----|-----------------|-------------------|-----------|-------------------|-----------------|-------------------|
| | | Exposure Limits | | | | | |
| | | OSHA PEL | | ACGIH TLV | | Supplier OEL | |
| Chemical name | | ppm | mg/m ³ | ppm | mg/m ³ | ppm | mg/m ³ |
| DEET | TWA | None | | None | | None | |
| Ethanol | TWA | 1000 | 1900 | 1000 | ----- | 1000 | 1900 |
| Isobutane | TWA | Not established | | 1000 | ----- | Not established | |

Engineering controls: General ventilation normally adequate.

Personal protective equipment:

Eye/Face protection: During application, prevent entry into eyes. Wear safety glasses with side shields if using in large applications.

| | |
|--|---|
| Skin and body protection: | After returning indoors, wash treated skin with soap and water. |
| Respiratory protection: | Where exposure guideline levels may be exceeded, use an approved NIOSH respirator. |
| General hygiene considerations: | Handle in accordance with good industrial hygiene and safety practices. When using, do not eat or drink. Wash hands before breaks and immediately after handling the product. |

Section 9 - Physical & Chemical Properties

| | |
|--|--------------------------|
| Appearance: | Clear |
| Color: | Colorless to pale yellow |
| Physical state: | Pressurized liquid |
| Odor: | Ethanol & DEET |
| Odor threshold: | No data available |
| pH: | 8.3 (liquid portion) |
| Melting point: | No data available |
| Freezing point: | No data available |
| Boiling point: | No data available |
| Flash point: | 85°F (liquid portion) |
| Flame Extension | 18" (level 1 aerosol) |
| Flammability limits in air, lower, % by volume: | No data available |
| Flammability limits in air, upper, % by volume: | No data available |
| Vapor pressure: | No data available |
| Vapor density: | No data available |
| Relative density @ 20°C: | 0.922 (liquid portion) |
| Octanol/water coefficient: | No data available |
| Auto-ignition temperature: | No data available |
| Decomposition temperature: | No data available |
| Solubility: | Miscible in water |
| Evaporation rate: | No data available |
| % Volatile organic compounds: | 30.2 |

Section 10 - Chemical Stability & Reactivity Information

Reactivity

| | |
|--------------------------------|----------------------------------|
| Conditions to avoid: | Do not mix with other chemicals. |
| Incompatible materials: | Avoid strong oxidizers. |

Chemical stability

| | |
|---------------------------|--|
| Product stability: | Stable under recommended storage conditions. |
|---------------------------|--|

Other

| | |
|--|--|
| Hazardous decomposition products: | None known |
| Possibility of hazardous reactions: | Hazardous polymerization does not occur. |

Section 11 - Toxicological Information

| | |
|--|--|
| Primary eye irritation: | Causes substantial but temporary eye injury (EPA tox. category II) |
| Primary skin irritation: | Non-irritating (EPA tox. category IV) |
| Acute dermal: | LD ₅₀ > 5000 mg/kg (EPA tox. category IV) |
| Acute inhalation: | LC ₅₀ > 2 mg/L (EPA tox. category IV) |
| Acute oral: | LD ₅₀ > 2000 mg/kg (EPA tox. category III) |
| Sensitization: | Not a skin sensitizer. |
| Chronic effects/ Carcinogenicity: | No data available |
| Mutagenicity: | No data available |
| Reproductive effects: | No data available |
| Teratogenicity: | No data available |
| Ecotoxicity: | No data available |

Section 12 - Ecological Information

| | |
|---|-------------------|
| Environmental effects: | No data available |
| Aquatic toxicity: | None |
| Persistence / degradability: | No data available |
| Bioaccumulation / accumulation: | No data available |
| Partition coefficient: | No data available |
| Mobility in environmental media: | No data available |
| Chemical fate information: | No data available |

Section 13 - Disposal Considerations

| | |
|---|--|
| Waste codes: | Not available |
| Disposal instructions: | Dispose in accordance with all applicable regulations. |
| Waste from residues / unused products: | Not available |
| Contaminated packaging: | Not available |

Section 14 - Transportation Information

| | |
|---|---|
| U.S. Department of Transportation (DOT): | UN-1950, Aerosols, Flammable, 2.1, Limited Quantity |
| IATA: | UN-1950, Aerosols, 2.1 |
| IMDG: | UN-1950, Aerosols, Flammable, Limited Quantity |

Section 15 - Regulatory Information

29 CFR 1910.1200 hazardous chemical**Occupational Safety and Health****Administration (OSHA):** No**CERCLA (Superfund) reportable quantity:**

Not available

Hazard categories**Superfund Amendments and Reauthorization Act of 1986 (SARA):**

Immediate Hazard No

Delayed Hazard No

Fire Hazard No

Pressure Hazard No

Reactivity Hazard No

Section 302 extremely hazardous**Substance:** No**Section 311 hazardous chemical:** No**Clean Air Act (CAA):** Not available**Clean Water Act (CWA):** Not available**State regulations:**

FIFRA labeling: This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and for workplace non-pesticide chemicals. Following is the hazard information as required on the pesticide label:

Signal word: CAUTION

Precautionary statements: Causes substantial but temporary eye injury. Do not get in eyes. Harmful if swallowed. Use of this product may cause skin reactions in rare cases. Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

FLAMMABLE. Contents under pressure. Keep away from heat, sparks and open flame. Do not puncture or incinerate container. Exposure to temperatures above 130°F may cause bursting. Do not apply to synthetic fabrics such as acetate, rayon or spandex. Will not damage cotton, wool or nylon. May damage furniture finishes, leather, plastics and painted and varnished surfaces, including watch crystals, guns, bows and automobiles.

Notification status: All ingredients of this product are listed or are excluded from listing on the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

California Prop. 65: This product does not contain any chemicals known to the state of California to cause cancer, birth defects or any other reproductive harm.

Disclaimer: Information contained herein was obtained from sources considered technically accurate and reliable. While every effort has been made to ensure full disclosure of product hazards, in some cases data is not available and is so stated. Since conditions of actual product use are beyond control of the supplier, it is assumed that users of this material have been fully trained according to the requirements of all applicable legislation and regulatory instruments. No warranty, expressed or implied, is made and supplier will not be liable for any losses, injuries or

consequential damages which may result from the use of or reliance on any information contained in this document.

Section 16 - Other Information

| | | | |
|----------------------|---|----------------|-------------------|
| HMIS ratings: | Health Hazard 1 | Flammability 3 | Physical Hazard 0 |
| Item numbers: | HG-33801; HG-83801; HG-94102 | | |
| Issue date: | 2/22/2016 | | |
| Prepared by: | WPC Brands, Inc. P.O. Box 4406 Bridgeton, MO 63044-0406 (800) 242-1166 | | |



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Common Name: YSI 3823 BUFFER SOLUTION, PH = 10.00
Manufacturer: NCL OF WISCONSIN
SDS Revision Date: 11/2/2004
SDS Format: No Format Specified

Grainger Item Number(s): 4UZC6, 4UZC7
Manufacturer Model Number(s):

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MATERIAL SAFETY DATA SHEET

NCL OF WISCONSIN, INC.
PO BOX 8
BIRNAMWOOD, WI 54414

EMERGENCY TELEPHONE NO: 800-424-9300 (CHEMTREC)

DATE OF THIS REVISION: 11-02-2004

PRODUCT IDENTIFICATION:

PRODUCT NAME: YSI 3823 BUFFER SOLUTION, PH = 10.00

SYNONYMS: NONE.

MOLECULAR WEIGHT: NA

CHEMICAL NAME: NA

CHEMICAL FAMILY: NA

PRODUCT CAS#: NA

FORMULA: NA

INGREDIENTS:

1. DISODIUM EDTA DEHYDRATE

CAS#: 6381-92-6

PERCENT: 1

SARA: NOT LISTED.

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED

HAZARD: SLIGHT. MAY CAUSE IRRITATION. MODERATELY TOXIC BY INGESTION.

2. POTASSIUM CARBONATE

CAS#: 584-08-7

PERCENT: <1

SARA: NOT LISTED

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED.

HAZARD: SLIGHT. CAUSES IRRITATION.

3. POTASSIUM BORATE

CAS#: 12228-88-5.

PERCENT: <1

SARA: NOT LISTED.

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED.

HAZARD: UNKNOWN

4. POTASSIUM HYDROXIDE

CAS#: 1310-58-3

PERCENT: <1

SARA: LISTED.

TLV: 2 MG/M3

PEL: 2 MG/M3

HAZARD: MODERATE. MAY CAUSE BURNS.

5. BLUE FOOD COLORING

CAS#: NOT LISTED.

PERCENT: <0.02

SARA: NOT LISTED.

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED.

HAZARD: NONE KNOWN.

6. DEIONIZED WATER

CAS#: 7732-18-5

PERCENT: >98

SARA: NOT LISTED

TLV: NOT APPLICABLE.

PEL: NOT APPLICABLE.

HAZARD: NONE.

PRECAUTIONARY MEASURES:

AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. WASH THOROUGHLY AFTER HANDLING.

MINIMAL CONTACT, AS WITH ALL CHEMICALS, IS A GOOD POLICY TO FOLLOW.

EMERGENCY/FIRST AID:

IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN OR EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF SWALLOWED, GIVE TWO GLASSES OF WATER OR MILK TO DILUTE. CALL A PHYSICIAN.

DOT HAZARD CLASS: NOT REGULATED

PHYSICAL DATA SECTION ONE

APPEARANCE: CLEAR BLUE SOLUTION.

ODOR: ODORLESS

SOLUBILITY: INFINITELY SOLUBLE IN WATER.

BOILING POINT: 100 DEG. C (212 DEG. F)

MELTING POINT: 0 DEG. C (32 DEG. F)

SPECIFIC GRAVITY: 1.0

VAPOR DENSITY (AIR=1): ESSENTIALLY THE SAME AS WATER.

VAPOR PRESSURE (MM HG): ESSENTIALLY THE SAME AS WATER.

EVAPORATION RATE: ESSENTIALLY THE SAME AS WATER.

FIRE AND EXPLOSION INFORMATION SECTION TWO

FIRE: NOT CONSIDERED TO BE A FIRE HAZARD.

EXPLOSION: NOT CONSIDERED TO BE AN EXPLOSION HAZARD

FIRE EXTINGUISHING MEDIA:

USE ANY SUITABLE MEANS FOR EXTINGUISHING SURROUNDING FIRE.

REACTIVITY DATA SECTION THREE

STABILITY: STABLE UNDER ORDINARY CONDITIONS OF USE AND STORAGE

HAZARDOUS DECOMPOSITION PRODUCTS: NONE KNOWN.

HAZARDOUS POLYMERIZATION: THIS SUBSTANCE DOES NOT POLYMERIZE.

INCOMPATIBILITIES: NONE KNOWN.

LEAK/SPILL/DISPOSAL INFORMATION SECTION FOUR

FLUSH TO SEWER WITH LARGE AMOUNTS OF WATER.

ENSURE COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

REPORTABLE QUANTITY: 5000 LBS.

HEALTH HAZARD INFORMATION SECTION FIVE

A. EXPOSURE/HEALTH EFFECTS:

INHALATION: MAY CAUSE SORE THROAT AND IRRITATION TO MUCOUS MEMBRANES.

INGESTION:

IF SUFFICIENT AMOUNTS ARE INGESTED, SYSTEMIC POISONING MAY OCCUR.

SKIN CONTACT: PROLONGED CONTACT MAY CAUSE IRRITATION.

EYE CONTACT: MAY CAUSE IRRITATION.

CHRONIC EXPOSURE: NO INFORMATION FOUND FOR ANY INGREDIENT.

CANCER INFORMATION: NO INFORMATION FOUND FOR ANY INGREDIENT

AGGRAVATION OF PRE-EXISTING CONDITIONS: NO INFORMATION FOUND

B. FIRST AID:

INHALATION:

REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

INGESTION:

IF SWALLOWED, GIVE TWO GLASSES OF WATER TO DILUTE. GIVE MEDICAL ATTENTION IMMEDIATELY.

SKIN EXPOSURE:

IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING. GET MEDICAL ATTENTION IF IRRITATION DEVELOPS OR PERSISTS.

EYE EXPOSURE:

WASH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, LIFTING LOWER AND UPPER EYELIDS OCCASIONALLY. GET MEDICAL ATTENTIONS IMMEDIATELY.

OCCUPATIONAL CONTROL MEASURES SECTION SIX

VENTILATION SYSTEM:

IN GENERAL, DILUTION VENTILATION IS A SATISFACTORY HEALTH HAZARD CONTROL FOR THIS MATERIAL. HOWEVER, IF CONDITIONS OF USE CREATE DISCOMFORT TO A WORKER, A LOCAL EXHAUST SHOULD BE CONSIDERED.

PERSONAL RESPIRATORS (NIOSH APPROVED):

FOR CONDITIONS OF USE WHERE EXPOSURE TO MIST EXISTS, A DUST/MIST RESPIRATOR MAY BE WORN. FOR EMERGENCIES, A SELF-CONTAINED BREATHING APPARATUS MAY BE NECESSARY.

SKIN PROTECTION: RUBBER GLOVES AND LAB COAT, APRON OR OVERALLS.

EYE PROTECTION:

USE CHEMICAL SAFETY GOGGLES AND/OR A FULL FACE SHIELD WHERE SPLASHING IS POSSIBLE. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS MATERIAL.

MAINTAIN EYE-WASH FOUNTAIN AND QUICK-DRENCH FACILITIES IN WORK AREAS.

STORAGE AND SPECIAL INFORMATION SECTION SEVEN

KEEP IN A TIGHTLY CLOSED CONTAINER. PROTECT CONTAINER FROM PHYSICAL DAMAGE.

THE INFORMATION CONTAINED HEREIN IS PROVIDED IN GOOD FAITH AND IS BELIEVED TO BE CORRECT AS OF THE DATE HEREOF. HOWEVER, NCL OF WISCONSIN, INC. MAKES NO REPRESENTATION AS TO THE COMPREHENSIVENESS OR ACCURACY OF THE INFORMATION. IT IS EXPECTED THAT INDIVIDUALS RECEIVING THE INFORMATION WILL EXERCISE THEIR INDEPENDENT JUDGMENT IN DETERMINING ITS APPROPRIATENESS FOR A PARTICULAR PURPOSE. ACCORDINGLY, NCL OF WISCONSIN, INC WILL NOT BE RESPONSIBLE FOR DAMAGES OF ANY KIND RESULTING FROM THE USE OF OR RELIANCE UPON SUCH INFORMATION. NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR TO THE PRODUCT TO WHICH THE INFORMATION REFERS.

YSI 3823

11/02/2004

DWG #A96025

REV C



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Common Name: YSI 3822 BUFFER SOLUTION, PH = 7.00
Manufacturer: NCL OF WISCONSIN
SDS Revision Date: 11/2/2004
SDS Format: No Format Specified

Grainger Item Number(s): 4UZC5, 4UZC7
Manufacturer Model Number(s):

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MATERIAL SAFETY DATA SHEET

NCL OF WISCONSIN, INC.
PO BOX 8
BIRNAMWOOD, WI 54414

EMERGENCY TELEPHONE NO: 800-424-9300 (CHEMTREC)

DATE OF THIS REVISION: 11-02-2004

PRODUCT IDENTIFICATION:

PRODUCT NAME: YSI 3822 BUFFER SOLUTION, pH = 7.00

SYNONYMS: NONE.

CHEMICAL NAME: NA

PRODUCT CAS#: NA

MOLECULAR WEIGHT: NA

CHEMICAL FAMILY: NA

FORMULA: NA

INGREDIENTS:

1. POTASSIUM PHOSPHATE MONOBASIC

CAS#: 7778-77-0

PERCENT: <1

SARA: NOT LISTED.

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED

HAZARD: MODERATELY TOXIC - MAY CAUSE IRRITATION.

2. SODIUM HYDROXIDE

CAS#: 1310-73-2.

PERCENT: <1

SARA: NOT LISTED

TLV: 2 MG/M3

PEL: 2 MG/M3

3. YELLOW FOOD COLORING

CAS#: NOT LISTED.

PERCENT: <0.02

SARA: NOT LISTED.

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED.

HAZARD: NONE KNOWN.

4. DEIONIZED WATER

CAS#: 7732-18-5

PERCENT: >98

SARA: NOT LISTED.

TLV: NOT APPLICABLE

PEL: NOT APPLICABLE

HAZARD: NONE.

PRECAUTIONARY MEASURES:

AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. WASH THOROUGHLY AFTER HANDLING. MINIMAL CONTACT, AS WITH ALL CHEMICALS, IS A GOOD POLICY TO FOLLOW.

EMERGENCY/FIRST AID:

IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN OR EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF SWALLOWED, GIVE TWO GLASSES OF WATER OR MILK TO DILUTE. CALL A PHYSICIAN.

DOT HAZARD CLASS: NOT REGULATED

SECTION ONE PHYSICAL DATA

APPEARANCE: CLEAR YELLOW SOLUTION

ODOR: ODORLESS

SOLUBILITY: INFINITELY SOLUBLE IN WATER.

BOILING POINT: 100 DEG. C (212 DEG. F)

MELTING POINT: 0 DEG. C (32 DEG. F)

SPECIFIC GRAVITY: 1.0

VAPOR DENSITY (AIR=1): ESSENTIALLY THE SAME AS WATER.

VAPOR PRESSURE (MM HG): ESSENTIALLY THE SAME AS WATER.

EVAPORATION RATE: ESSENTIALLY THE SAME AS WATER.

SECTION TWO FIRE AND EXPLOSION INFORMATION

FIRE: NOT CONSIDERED TO BE A FIRE HAZARD.

EXPLOSION: NOT CONSIDERED TO BE AND EXPLOSION HAZARD

FIRE EXTINGUISHING MEDIA:

USE ANY SUITABLE MEANS FOR EXTINGUISHING SURROUNDING FIRE.

SECTION THREE REACTIVITY DATA

STABILITY: STABLE UNDER ORDINARY CONDITIONS OF USE AND STORAGE

HAZARDOUS DECOMPOSITION PRODUCTS: NONE KNOWN.

HAZARDOUS POLYMERIZATION: THIS SUBSTANCE DOES NOT POLYMERIZE.

INCOMPATIBILITIES: NONE KNOWN.

SECTION FOUR LEAK/SPILL/DISPOSAL INFORMATION

FLUSH TO SEWER WITH LARGE AMOUNTS OF WATER.

ENSURE COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

REPORTABLE QUANTITY: 5000 LBS.

SECTION FIVE HEALTH HAZARD INFORMATION

A. EXPOSURE/HEALTH EFFECTS:

INHALATION: NO INFORMATION FOUND.

INGESTION: LARGE DOSES MAY CAUSE DIARRHEA.

SKIN CONTACT: PROLONGED CONTACT MAY CAUSE IRRITATION.

EYE CONTACT: MAY CAUSE IRRITATION AND DAMAGE.

CHRONIC EXPOSURE:

POTASSIUM PHOSPHATE, ONE OF THE INGREDIENTS, MAY SEQUESTER CALCIUM AND CAUSE CALCIUM PHOSPHATE DEPOSITS IN THE KIDNEYS.

CANCER INFORMATION: NO INFORMATION FOUND FOR ANY INGREDIENT

AGGRAVATION OF PRE-EXISTING CONDITIONS: NO INFORMATION FOUND

B. FIRST AID:

INHALATION:

REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

INGESTION:

IF SWALLOWED, GIVE TWO GLASSES OF WATER TO DILUTE. GIVE MEDICAL ATTENTION IMMEDIATELY.

SKIN EXPOSURE:

IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING. GET MEDICAL ATTENTION IF IRRITATION DEVELOPS OR PERSISTS.

EYE EXPOSURE:

WASH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, LIFTING LOWER AND UPPER EYELIDS OCCASIONALLY. GET MEDICAL ATTENTIONS IMMEDIATELY.

SECTION SIX OCCUPATIONAL CONTROL MEASURES**VENTILATION SYSTEM:**

IN GENERAL, DILUTION VENTILATION IS A SATISFACTORY HEALTH HAZARD CONTROL FOR THIS MATERIAL. HOWEVER, IF CONDITIONS OF USE CREATE DISCOMFORT TO A WORKER, A LOCAL EXHAUST SHOULD BE CONSIDERED.

PERSONAL RESPIRATORS (NIOSH APPROVED):

FOR CONDITIONS OF USE WHERE EXPOSURE TO MIST EXISTS, A DUST/MIST RESPIRATOR MAY BE WORN. FOR EMERGENCIES, A SELF-CONTAINED BREATHING APPARATUS MAY BE NECESSARY.

SKIN PROTECTION: RUBBER GLOVES AND LAB COAT, APRON OR OVERALLS.

EYE PROTECTION:

USE CHEMICAL SAFETY GOGGLES AND/OR A FULL FACE SHIELD WHERE SPLASHING IS POSSIBLE. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS MATERIAL.

MAINTAIN EYE-WASH FOUNTAIN AND QUICK-DRENCH FACILITIES IN WORK AREAS.

SECTION SEVEN STORAGE AND SPECIAL INFORMATION

KEEP IN A TIGHTLY CLOSED CONTAINER. PROTECT CONTAINER FROM PHYSICAL DAMAGE.

THE INFORMATION CONTAINED HEREIN IS PROVIDED IN GOOD FAITH AND IS BELIEVED TO BE CORRECT AS OF THE DATE HEREOF. HOWEVER, NCL OF WISCONSIN, INC. MAKES NO REPRESENTATION AS TO THE COMPREHENSIVENESS OR ACCURACY OF THE INFORMATION. IT IS EXPECTED THAT INDIVIDUALS RECEIVING THE INFORMATION WILL EXERCISE THEIR INDEPENDENT JUDGMENT IN DETERMINING ITS APPROPRIATENESS FOR A PARTICULAR PURPOSE. ACCORDINGLY, NCL OF WISCONSIN, INC WILL NOT BE RESPONSIBLE FOR DAMAGES OF ANY KIND RESULTING FROM THE USE OF OR RELIANCE UPON SUCH INFORMATION. NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR TO THE PRODUCT TO WHICH THE INFORMATION REFERS.

YSI 3822

11/02/2004

DWG #: A96024

REV: C



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Common Name: YSI 3821 BUFFER SOLUTION, PH = 4.0
Manufacturer: NCL OF WISCONSIN
SDS Revision Date: 11/2/2004
SDS Format: No Format Specified

Grainger Item Number(s): 4UZC4, 4UZC7
Manufacturer Model Number(s):

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MATERIAL SAFETY DATA SHEET

NCL OF WISCONSIN, INC.
PO BOX 8
BIRNAMWOOD, WI 54414

EMERGENCY TELEPHONE NO: 800-424-9300 (CHEMTREC)

DATE OF THIS REVISION: 11-02-2004

PRODUCT IDENTIFICATION:

PRODUCT NAME: YSI 3821 BUFFER SOLUTION, PH = 4.0

SYNONYMS: NONE.

MOLECULAR WEIGHT: NA

CHEMICAL NAME: NA

CHEMICAL FAMILY: NA

PRODUCT CAS#: NA

FORMULA: NA

INGREDIENTS:

1. POTASSIUM ACID PHTHALATE

CAS# 877-24-7

PERCENT: <2

SARA: NOT LISTED.

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED

HAZARD: MAY CAUSE EYE AND RESPIRATORY TRACT IRRITATION.

2. RED FOOD COLORING

CAS# NOT LISTED.

PERCENT: <0.02

SARA: NOT LISTED

TLV: NOT ESTABLISHED.

PEL: NOT ESTABLISHED

HAZARD: NONE KNOWN.

3. DEIONIZED WATER

CAS# 7732-18-5

PERCENT: >98

SARA: NOT LISTED.

TLV: NOT APPLICABLE

PEL: NOT APPLICABLE

HAZARD: NONE.

PRECAUTIONARY MEASURES:

AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. WASH THOROUGHLY AFTER HANDLING. MINIMAL CONTACT, AS WITH ALL CHEMICALS, IS A GOOD POLICY TO FOLLOW.

EMERGENCY/FIRST AID:

IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN OR EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. IF SWALLOWED, GIVE TWO GLASSES OF WATER OR MILK TO DILUTE. CALL A PHYSICIAN.

DOT HAZARD CLASS: NOT REGULATED

PHYSICAL DATA SECTION ONE

APPEARANCE: CLEAR PINK SOLUTION

ODOR: ODORLESS

SOLUBILITY: INFINITELY SOLUBLE IN WATER.

BOILING POINT: 100 DEG. C (212 DEG. F)

MELTING POINT: 0 DEG. C (32 DEG. F)

SPECIFIC GRAVITY: 1.0

VAPOR DENSITY (AIR=1): ESSENTIALLY THE SAME AS WATER.

VAPOR PRESSURE (MM HG): ESSENTIALLY THE SAME AS WATER.

EVAPORATION RATE: ESSENTIALLY THE SAME AS WATER.

FIRE AND EXPLOSION INFORMATION SECTION TWO

FIRE: NOT CONSIDERED TO BE A FIRE HAZARD.

EXPLOSION: NOT CONSIDERED TO BE AN EXPLOSION HAZARD

FIRE EXTINGUISHING MEDIA:

USE ANY SUITABLE MEANS FOR EXTINGUISHING SURROUNDING FIRE.

REACTIVITY DATA SECTION THREE

STABILITY: STABLE UNDER ORDINARY CONDITIONS OF USE AND STORAGE

HAZARDOUS DECOMPOSITION PRODUCTS:

MAY EMIT TOXIC FUMES OF CARBON MONOXIDE, CARBON DIOXIDE, AND POTASSIUM OXIDE IF INVOLVED IN A FIRE.

HAZARDOUS POLYMERIZATION: THIS SUBSTANCE DOES NOT POLYMERIZE.

INCOMPATIBILITIES: STRONG SOLUTIONS OF NITRIC ACID.

LEAK/SPILL/DISPOSAL INFORMATION SECTION FOUR

FLUSH TO SEWER WITH LARGE AMOUNTS OF WATER.

ENSURE COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

REPORTABLE QUANTITY: 5000 LBS.

HEALTH HAZARD INFORMATION SECTION FIVE

A. EXPOSURE/HEALTH EFFECTS:

INHALATION: MAY CAUSE IRRITATION TO MUCOUS MEMBRANES DUE TO SLIGHT ACIDITY.

INGESTION:

LARGE DOSES MAY CAUSE NAUSEA, VOMITING AND ABNORMAL SENSATIONS IN HANDS AND FEET. BECAUSE OF SLIGHT ACIDITY, MAY CAUSE IRRITATION TO MUCOUS MEMBRANES.

SKIN CONTACT: MAY CAUSE IRRITATION, REDNESS, AND PAIN.

EYE CONTACT: MAY CAUSE IRRITATION AND DAMAGE.

CHRONIC EXPOSURE: NO INFORMATION FOUND.

CANCER INFORMATION: NO INFORMATION FOUND FOR ANY INGREDIENT

AGGRAVATION OF PRE-EXISTING CONDITIONS: NO INFORMATION FOUND

B. FIRST AID:

INHALATION:

REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL A PHYSICIAN.

INGESTION:

IF SWALLOWED, GIVE TWO GLASSES OF WATER TO DILUTE. GIVE MEDICAL ATTENTION IMMEDIATELY.

SKIN EXPOSURE:

IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING. GET MEDICAL ATTENTION IF IRRITATION DEVELOPS OR PERSISTS.

EYE EXPOSURE:

WASH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES, LIFTING LOWER AND UPPER EYELIDS OCCASIONALLY. GET MEDICAL ATTENTIONS IMMEDIATELY.

OCCUPATIONAL CONTROL MEASURES SECTION SIX**VENTILATION SYSTEM:**

IN GENERAL, DILUTION VENTILATION IS A SATISFACTORY HEALTH HAZARD CONTROL FOR THIS MATERIAL. HOWEVER, IF CONDITIONS OF USE CREATE DISCOMFORT TO A WORKER, A LOCAL EXHAUST SHOULD BE CONSIDERED.

PERSONAL RESPIRATORS (NIOSH APPROVED):

FOR CONDITIONS OF USE WHERE EXPOSURE TO MIST EXISTS, A DUST/MIST RESPIRATOR MAY BE WORN. FOR EMERGENCIES, A SELF-CONTAINED BREATHING APPARATUS MAY BE NECESSARY.

SKIN PROTECTION: RUBBER GLOVES AND LAB COAT, APRON OR OVERALLS.

EYE PROTECTION:

USE CHEMICAL SAFETY GOGGLES AND/OR A FULL FACE SHIELD WHERE SPLASHING IS POSSIBLE. CONTACT LENSES SHOULD NOT BE WORN WHEN WORKING WITH THIS MATERIAL.

MAINTAIN EYE-WASH FOUNTAIN AND QUICK-DRENCH FACILITIES IN WORK AREAS.

STORAGE AND SPECIAL INFORMATION SECTION SEVEN

KEEP IN A TIGHTLY CLOSED CONTAINER. PROTECT CONTAINER FROM PHYSICAL DAMAGE.

THE INFORMATION CONTAINED HEREIN IS PROVIDED IN GOOD FAITH AND IS BELIEVED TO BE CORRECT AS OF THE DATE HEREOF. HOWEVER, NCL OF WISCONSIN, INC. MAKES NO REPRESENTATION AS TO THE COMPREHENSIVENESS OR ACCURACY OF THE INFORMATION. IT IS EXPECTED THAT INDIVIDUALS RECEIVING THE INFORMATION WILL EXERCISE THEIR INDEPENDENT JUDGMENT IN DETERMINING ITS APPROPRIATENESS FOR A PARTICULAR PURPOSE. ACCORDINGLY, NCL OF WISCONSIN, INC WILL NOT BE RESPONSIBLE FOR DAMAGES OF ANY KIND RESULTING FROM THE USE OF OR RELIANCE UPON SUCH INFORMATION. NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR TO THE PRODUCT TO WHICH THE INFORMATION REFERS.

YSI 3821

11/02/2004

DWG #A96023

REV C



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Common Name: ZOBELL SOLUTION 061320, 061321, 061322
Manufacturer: YSI
SDS Revision Date: 12/5/2013
SDS Format: GHS-US

Grainger Item Number(s): 52RY64, 52RY65
Manufacturer Model Number(s):

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YSI
A XYLEM BRAND

SAFETY DATA SHEET

1. IDENTIFICATION

PRODUCT IDENTIFIER: YSI ZOBELL SOLUTION 061320, 061321, 061322

OTHER MEANS OF IDENTIFICATION: NOT AVAILABLE.

RECOMMENDED USE: CALIBRATION OF ANALYTICAL INSTRUMENTS / REAGENT. NONE

RECOMMENDED RESTRICTIONS: KNOWN.

MANUFACTURER / IMPORTER / SUPPLIER / DISTRIBUTOR INFORMATION:

COMPANY NAME: YSI, INC

ADDRESS: 1700/1725 BRANNUM LANE

TELEPHONE: (937) 767-7241

E-MAIL: MSDSINFO@YSI.COM

EMERGENCY PHONE NUMBER:

CHEMTREC (US/CANADA): (800) 424-9300

CHEMTREC (INTERNATIONAL) (COLLECT CALLS ACCEPTED): 011 703-527-3887

2. HAZARD(S) IDENTIFICATION

PHYSICAL HAZARDS: NOT CLASSIFIED.

HEALTH HAZARDS: NOT CLASSIFIED.

OSHA DEFINED HAZARDS: NOT CLASSIFIED.

LABEL ELEMENTS:

HAZARD SYMBOL: NONE.

SIGNAL WORD: NONE.

HAZARD STATEMENT:

THE MIXTURE DOES NOT MEET THE CRITERIA FOR CLASSIFICATION.

PRECAUTIONARY STATEMENT:

PREVENTION: OBSERVE GOOD INDUSTRIAL HYGIENE PRACTICES.

RESPONSE: WASH HANDS AFTER HANDLING.

STORAGE: STORE AWAY FROM INCOMPATIBLE MATERIALS.

DISPOSAL:

DISPOSE OF CONTENTS/CONTAINER IN ACCORDANCE WITH
LOCAL/REGIONAL/NATIONAL/INTERNATIONAL REGULATIONS.

HAZARD(S) NOT OTHERWISE CLASSIFIED (HNOC): NOT CLASSIFIED.

ENVIRONMENTAL HAZARDS:

HAZARDOUS TO THE AQUATIC ENVIRONMENT, ACUTE HAZARD: CATEGORY 3

HAZARDOUS TO THE AQUATIC ENVIRONMENT, LONG-TERM HAZARD: CATEGORY 3

3. COMPOSITION/INFORMATION ON INGREDIENTS

MIXTURES:

| CHEMICAL NAME | CAS NUMBER | % |
|------------------------|------------|---------|
| POTASSIUM CHLORIDE | 7447-40-7 | 72 - 78 |
| POTASSIUM FERRICYANIDE | 13746-66-2 | 10 - 15 |

POTASSIUM FERROCYANIDE TRIHYDRATE

14459-95-1

10 - 15

4. FIRST-AID MEASURES

INHALATION:

IF DUST FROM THE MATERIAL IS INHALED, REMOVE THE AFFECTED PERSON IMMEDIATELY TO FRESH AIR. CALL A PHYSICIAN IF SYMPTOMS DEVELOP OR PERSIST.

SKIN CONTACT:

WASH OFF WITH SOAP AND WATER. GET MEDICAL ATTENTION IF IRRITATION DEVELOPS AND PERSISTS.

EYE CONTACT:

RINSE WITH WATER. GET MEDICAL ATTENTION IF IRRITATION DEVELOPS AND PERSISTS.

INGESTION: RINSE MOUTH. GET MEDICAL ATTENTION IF SYMPTOMS OCCUR.

MOST IMPORTANT SYMPTOMS/EFFECTS, ACUTE AND DELAYED:

DIRECT CONTACT WITH EYES MAY CAUSE TEMPORARY IRRITATION.

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED:

PROVIDE GENERAL SUPPORTIVE MEASURES AND TREAT SYMPTOMATICALLY.

5. FIRE-FIGHTING MEASURES

SUITABLE EXTINGUISHING MEDIA: WATER FOG. FOAM. DRY CHEMICAL POWDER.

UNSUITABLE EXTINGUISHING MEDIA: CARBON DIOXIDE (CO₂).

SPECIFIC HAZARDS ARISING FROM THE CHEMICAL:

DURING FIRE, GASES HAZARDOUS TO HEALTH MAY BE FORMED. HYDROCHLORIC ACID. HYDROGEN CYANIDE.

SPECIAL PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS:

SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING MUST BE WORN IN CASE OF FIRE.

FIRE-FIGHTING EQUIPMENT/INSTRUCTIONS:

IN THE EVENT OF FIRE, COOL TANKS WITH WATER SPRAY. WATER RUNOFF CAN CAUSE ENVIRONMENTAL DAMAGE.

SPECIFIC METHODS:

COOL CONTAINERS EXPOSED TO FLAMES WITH WATER UNTIL WELL AFTER THE FIRE IS OUT.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES:

KEEP UNNECESSARY PERSONNEL AWAY. KEEP PEOPLE AWAY FROM AND UPWIND OF SPILL/LEAK. AVOID INHALATION OF DUST FROM THE SPILLED MATERIAL. ENSURE ADEQUATE VENTILATION. WEAR APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT. LOCAL AUTHORITIES SHOULD BE ADVISED IF SIGNIFICANT SPILLAGES CANNOT BE

CONTAINED. FOR PERSONAL PROTECTION, SEE SECTION 8 OF THE SDS.

METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP:
MINIMIZE DUST GENERATION AND ACCUMULATION. SWEEP UP OR VACUUM UP SPILLAGE AND COLLECT IN SUITABLE CONTAINER FOR DISPOSAL. COLLECT DUST USING A VACUUM CLEANER EQUIPPED WITH HEPA FILTER. FOLLOWING PRODUCT RECOVERY, FLUSH AREA WITH WATER. FOR WASTE DISPOSAL, SEE SECTION 13 OF THE SDS.

ENVIRONMENTAL PRECAUTIONS:

PREVENT FURTHER LEAKAGE OR SPILLAGE IF SAFE TO DO SO. AVOID DISCHARGE INTO DRAINS, WATER COURSES OR ONTO THE GROUND.

7. HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING:

MINIMIZE DUST GENERATION AND ACCUMULATION. DO NOT BREATHE DUST. ENSURE ADEQUATE VENTILATION. AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. OBSERVE GOOD INDUSTRIAL HYGIENE PRACTICES.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES:

KEEP CONTAINER TIGHTLY CLOSED. STORE IN A WELL-VENTILATED PLACE. GUARD AGAINST DUST ACCUMULATION OF THIS MATERIAL.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS: NO EXPOSURE LIMITS NOTED FOR INGREDIENT(S).

BIOLOGICAL LIMIT VALUES:

NO BIOLOGICAL EXPOSURE LIMITS NOTED FOR THE INGREDIENT(S).

APPROPRIATE ENGINEERING CONTROLS:

VENTILATION SHOULD BE SUFFICIENT TO EFFECTIVELY REMOVE AND PREVENT BUILDUP OF ANY DUSTS OR FUMES THAT MAY BE GENERATED DURING HANDLING OR THERMAL PROCESSING.

INDIVIDUAL PROTECTION MEASURES, SUCH AS PERSONAL PROTECTIVE EQUIPMENT:

EYE/FACE PROTECTION: USE TIGHT FITTING GOGGLES IF DUST IS GENERATED.

SKIN PROTECTION:

HAND PROTECTION:

FOR PROLONGED OR REPEATED SKIN CONTACT USE SUITABLE PROTECTIVE GLOVES.

OTHER: WEAR SUITABLE PROTECTIVE CLOTHING.

RESPIRATORY PROTECTION:

USE A NIOSH/MSHA APPROVED RESPIRATOR IF THERE IS A RISK OF EXPOSURE TO DUST/FUME AT LEVELS EXCEEDING THE EXPOSURE LIMITS.

THERMAL HAZARDS:

WEAR APPROPRIATE THERMAL PROTECTIVE CLOTHING, WHEN NECESSARY.

GENERAL HYGIENE CONSIDERATIONS:

ALWAYS OBSERVE GOOD PERSONAL HYGIENE MEASURES, SUCH AS WASHING AFTER HANDLING THE MATERIAL AND BEFORE EATING, DRINKING, AND/OR SMOKING.

ROUTINELY WASH WORK CLOTHING AND PROTECTIVE EQUIPMENT TO REMOVE CONTAMINANTS.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:

PHYSICAL STATE: SOLID.

FORM: POWDER WHITE.

COLOR:

ODOR: NONE KNOWN.

ODOR THRESHOLD: NOT AVAILABLE.

PH: NOT AVAILABLE.

MELTING POINT/FREEZING POINT: NOT AVAILABLE.

INITIAL BOILING POINT AND BOILING RANGE: NOT AVAILABLE.

FLASH POINT: NOT AVAILABLE.

EVAPORATION RATE: NOT AVAILABLE.

FLAMMABILITY (SOLID, GAS): NOT AVAILABLE.

UPPER/LOWER FLAMMABILITY OR EXPLOSIVE LIMITS:

FLAMMABILITY LIMIT - LOWER (%): NOT AVAILABLE.

FLAMMABILITY LIMIT - UPPER (%): NOT AVAILABLE.

EXPLOSIVE LIMIT - LOWER (%): NOT AVAILABLE.

EXPLOSIVE LIMIT - UPPER (%): NOT AVAILABLE.

VAPOR PRESSURE: NOT AVAILABLE.

VAPOR DENSITY: NOT AVAILABLE.

RELATIVE DENSITY: NOT AVAILABLE.

SOLUBILITY(IES): INFINITELY SOLUBLE

PARTITION COEFFICIENT (N-OCTANOL/WATER): NOT AVAILABLE.

AUTO-IGNITION TEMPERATURE: NOT AVAILABLE.

DECOMPOSITION TEMPERATURE: NOT AVAILABLE.

VISCOSITY: NOT AVAILABLE.

10. STABILITY AND REACTIVITY

REACTIVITY:

THE PRODUCT IS STABLE AND NON-REACTIVE UNDER NORMAL CONDITIONS OF USE, STORAGE AND TRANSPORT.

CHEMICAL STABILITY: MATERIAL IS STABLE UNDER NORMAL CONDITIONS.

POSSIBILITY OF HAZARDOUS REACTIONS:

NO DANGEROUS REACTION KNOWN UNDER CONDITIONS OF NORMAL USE.

CONDITIONS TO AVOID:

AVOID DISPERSAL OF DUST IN THE AIR (I.E., CLEARING DUST SURFACES WITH COMPRESSED AIR).

INCOMPATIBLE MATERIALS: STRONG OXIDIZING AGENTS. STRONG ACIDS.

HAZARDOUS DECOMPOSITION PRODUCTS: NITROGEN OXIDES. HYDROGEN CYANIDE.

11. TOXICOLOGICAL INFORMATION

INFORMATION ON LIKELY ROUTES OF EXPOSURE:

INGESTION: DO NOT INGEST.

INHALATION: INHALATION OF DUSTS MAY CAUSE RESPIRATORY IRRITATION.

SKIN CONTACT: AVOID CONTACT WITH SKIN.

EYE CONTACT: DUST IN THE EYES WILL CAUSE IRRITATION.

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS:

DIRECT CONTACT WITH EYES MAY CAUSE TEMPORARY IRRITATION.

INFORMATION ON TOXICOLOGICAL EFFECTS:

ACUTE TOXICITY:

| COMPONENTS | SPECIES | TEST RESULTS |
|--|---------|--------------|
| POTASSIUM CHLORIDE (CAS 7447-40-7): | | |
| ACUTE: | | |
| ORAL: | | |
| LD50 | RAT | 2600 MG/KG |
| POTASSIUM FERRICYANIDE (CAS 13746-66-2): | | |
| ACUTE: | | |
| ORAL: | | |
| LD50 | RAT | 4520 MG/KG |
| SKIN CORROSION/IRRITATION: | | |
| DUE TO LACK OF DATA THE CLASSIFICATION IS NOT POSSIBLE. | | |
| SERIOUS EYE DAMAGE/EYE IRRITATION: DUST IN THE EYES WILL CAUSE IRRITATION. | | |
| RESPIRATORY SENSITIZATION: | | |
| DUE TO LACK OF DATA THE CLASSIFICATION IS NOT POSSIBLE. | | |

SKIN SENSITIZATION:

DUE TO LACK OF DATA THE CLASSIFICATION IS NOT POSSIBLE.

GERM CELL MUTAGENICITY:

NO DATA AVAILABLE TO INDICATE PRODUCT OR ANY COMPONENTS PRESENT AT GREATER THAN 0.1% ARE MUTAGENIC OR GENOTOXIC.

CARCINOGENICITY:

THIS PRODUCT IS NOT CONSIDERED TO BE A CARCINOGEN BY IARC, ACGIH, NTP, OR OSHA.

REPRODUCTIVE TOXICITY:

DUE TO LACK OF DATA THE CLASSIFICATION IS NOT POSSIBLE.

SPECIFIC TARGET ORGAN TOXICITY - SINGLE EXPOSURE:

DUE TO LACK OF DATA THE CLASSIFICATION IS NOT POSSIBLE.

SPECIFIC TARGET ORGAN TOXICITY - REPEATED EXPOSURE:

DUE TO LACK OF DATA THE CLASSIFICATION IS NOT POSSIBLE.

ASPIRATION HAZARD: DUE TO LACK OF DATA THE CLASSIFICATION IS NOT POSSIBLE.

12. ECOLOGICAL INFORMATION

ECOTOXICITY: HARMFUL TO AQUATIC LIFE WITH LONG LASTING EFFECTS.

| COMPONENTS | SPECIES | TEST RESULTS |
|-------------------------------------|---------|--------------|
| POTASSIUM CHLORIDE (CAS 7447-40-7): | | |

AQUATIC:

| | | | |
|-----------|------|---|--------------------|
| CRUSTACEA | EC50 | WATER FLEA (DAPHNIA MAGNA) | 83 MG/L, 48 HOURS |
| FISH | LC50 | WESTERN MOSQUITOFISH (GAMBUSIA AFFINIS) | 435 MG/L, 96 HOURS |

POTASSIUM FERRICYANIDE (CAS 13746-66-2):

AQUATIC:

| | | | |
|------|------|-----------------------------|-------------------|
| FISH | LC50 | GUPPY (POECILIA RETICULATA) | 19 MG/L, 96 HOURS |
|------|------|-----------------------------|-------------------|

POTASSIUM FERROCYANIDE TRIHYDRATE (CAS 14459-95-1):

AQUATIC:

| | | | |
|------|------|--|-------------------------------|
| FISH | LC50 | RAINBOW TROUT, DONALDSON TROUT (ONCORHYNCHUS MYKISS) | 28.7 - 37.9 MG/L, 96 HOURS |
|------|------|--|-------------------------------|

PERSISTENCE AND DEGRADABILITY:

NO DATA IS AVAILABLE ON THE DEGRADABILITY OF THIS PRODUCT.

BIOACCUMULATIVE POTENTIAL: NO DATA AVAILABLE FOR THIS PRODUCT.

MOBILITY IN SOIL: NOT AVAILABLE.

OTHER ADVERSE EFFECTS:

NO OTHER ADVERSE ENVIRONMENTAL EFFECTS (E.G. OZONE DEPLETION, PHOTOCHEMICAL OZONE CREATION POTENTIAL, ENDOCRINE DISRUPTION, GLOBAL WARMING POTENTIAL) ARE EXPECTED FROM THIS COMPONENT.

13. DISPOSAL CONSIDERATIONS

DISPOSAL INSTRUCTIONS:

DISPOSE OF CONTENTS/CONTAINER IN ACCORDANCE WITH LOCAL/REGIONAL/NATIONAL/INTERNATIONAL REGULATIONS.

HAZARDOUS WASTE CODE:

THE WASTE CODE SHOULD BE ASSIGNED IN DISCUSSION BETWEEN THE USER, THE PRODUCER AND THE WASTE DISPOSAL COMPANY.

WASTE FROM RESIDUES / UNUSED PRODUCTS:

EMPTY CONTAINERS OR LINERS MAY RETAIN SOME PRODUCT RESIDUES. THIS MATERIAL AND ITS CONTAINER MUST BE DISPOSED OF IN A SAFE MANNER (SEE: DISPOSAL INSTRUCTIONS).

CONTAMINATED PACKAGING:

EMPTY CONTAINERS SHOULD BE TAKEN TO AN APPROVED WASTE HANDLING SITE FOR RECYCLING OR DISPOSAL. SINCE EMPTIED CONTAINERS MAY RETAIN PRODUCT RESIDUE, FOLLOW LABEL WARNINGS EVEN AFTER CONTAINER IS EMPTIED.

14. TRANSPORT INFORMATION

DOT: NOT REGULATED AS A HAZARDOUS MATERIAL BY DOT.

IATA: NOT REGULATED AS A DANGEROUS GOOD.

IMDG: NOT REGULATED AS A DANGEROUS GOOD.

TRANSPORT IN BULK ACCORDING TO ANNEX II OF MARPOL 73/78 AND THE IBC CODE: NOT APPLICABLE.

15. REGULATORY INFORMATION

US FEDERAL REGULATIONS:

THIS PRODUCT IS A "HAZARDOUS CHEMICAL" AS DEFINED BY THE OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200.

TSCA SECTION 12(B) EXPORT NOTIFICATION (40 CFR 707, SUBPT. D): NOT REGULATED.

US. OSHA SPECIFICALLY REGULATED SUBSTANCES (29 CFR 1910.1001-1050): NOT LISTED.

CERCLA HAZARDOUS SUBSTANCE LIST (40 CFR 302.4): NOT LISTED.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA):

HAZARD CATEGORIES:

IMMEDIATE HAZARD: NO

DELAYED HAZARD: NO

FIRE HAZARD: NO

PRESSURE HAZARD: NO
 REACTIVITY HAZARD: NO

SARA 302 EXTREMELY HAZARDOUS SUBSTANCE: NO

SARA 311/312 HAZARDOUS CHEMICAL: NO

SARA 313 (TRI REPORTING): NOT REGULATED.

OTHER FEDERAL REGULATIONS:

CLEAN AIR ACT (CAA) SECTION 112 HAZARDOUS AIR POLLUTANTS (HAPS) LIST:
 NOT REGULATED.

CLEAN AIR ACT (CAA) SECTION 112(R) ACCIDENTAL RELEASE PREVENTION
 (40 CFR 68.130):
 NOT REGULATED.

SAFE DRINKING WATER ACT (SDWA): NOT REGULATED.

FOOD AND DRUG ADMINISTRATION (FDA): NOT REGULATED.

US STATE REGULATIONS:

US. MASSACHUSETTS RTK - SUBSTANCE LIST: NOT REGULATED.

US. NEW JERSEY WORKER AND COMMUNITY RIGHT-TO-KNOW ACT: NOT REGULATED.

US. PENNSYLVANIA RTK - HAZARDOUS SUBSTANCES: NOT REGULATED.

US. RHODE ISLAND RTK: NOT REGULATED.

US. CALIFORNIA PROPOSITION 65:

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986
 (PROPOSITION 65):
 THIS MATERIAL IS NOT KNOWN TO CONTAIN ANY CHEMICALS CURRENTLY LISTED
 AS CARCINOGENS OR REPRODUCTIVE TOXINS.

US - CALIFORNIA PROPOSITION 65 - CARCINOGENS & REPRODUCTIVE TOXICITY (CRT):
 LISTED SUBSTANCE
 NOT LISTED.

INTERNATIONAL INVENTORIES:

| COUNTRY(S) OR REGION | INVENTORY NAME | ON INVENTORY (YES/NO) * |
|-------------------------|---|----------------------------|
| AUSTRALIA | AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) | YES |
| CANADA | DOMESTIC SUBSTANCES LIST (DSL) | YES |
| CANADA | NON-DOMESTIC SUBSTANCES LIST (NDSL) | NO |
| CHINA | INVENTORY OF EXISTING CHEMICAL SUBSTANCES IN CHINA (IECSC) | YES |
| EUROPE | EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS) | YES |
| EUROPE | EUROPEAN LIST OF NOTIFIED CHEMICAL | NO |

SUBSTANCES (ELINCS)

| | | |
|--------------------------------|--|-----|
| JAPAN | INVENTORY OF EXISTING AND NEW CHEMICAL SUBSTANCES (ENCs) | YES |
| KOREA | EXISTING CHEMICALS LIST (ECL) | YES |
| NEW ZEALAND | NEW ZEALAND INVENTORY | YES |
| PHILIPPINES | PHILIPPINE INVENTORY OF CHEMICALS AND CHEMICAL SUBSTANCES (PICCS) | YES |
| UNITED STATES & PUERTO RICO | TOXIC SUBSTANCES CONTROL ACT (TSCA) INVENTORY | YES |

*A "YES" INDICATES THIS PRODUCT COMPLIES WITH THE INVENTORY REQUIREMENTS ADMINISTERED BY THE GOVERNING COUNTRY(S) .

A "NO" INDICATES THAT ONE OR MORE COMPONENTS OF THE PRODUCT ARE NOT LISTED OR EXEMPT FROM LISTING ON THE INVENTORY ADMINISTERED BY THE GOVERNING COUNTRY(S) .

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION

OR LAST REVISION

ISSUE DATE: 05-DECEMBER-2013

REVISION DATE:

VERSION #: 01

NFPA RATINGS:

1
0
0

DISCLAIMER:

THE INFORMATION IN THE SHEET WAS WRITTEN BASED ON THE BEST KNOWLEDGE AND EXPERIENCE CURRENTLY AVAILABLE.

YSI 3682 ZOBELL SOLUTION

917701

SDS US

Safety Data Sheet



1. Identification

| | | | |
|-----------------------------|--|-------------------------|--|
| Product Name: | PRO LSPR 6PK MARK FLUORESCENT ORANGE | Revision Date: | 5/12/2017 |
| Product Identifier: | 2554838 | Supersedes Date: | 6/5/2015 |
| Product Use/Class: | Marking Paint/Aerosols | | |
| Supplier: | Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA | Manufacturer: | Rust-Oleum Corporation 11 Hawthorn Parkway Vernon Hills, IL 60061 USA |
| Preparer: | Regulatory Department | | |
| Emergency Telephone: | 24 Hour Hotline: 847-367-7700 | | |

2. Hazard Identification

Classification

Symbol(s) of Product



Signal Word

Danger

Possible Hazards

27% of the mixture consists of ingredient(s) of unknown acute toxicity.

GHS HAZARD STATEMENTS

| | | |
|-------------------------------------|------|--|
| Carcinogenicity, category 2 | H351 | Suspected of causing cancer. |
| Compressed Gas | H280 | Contains gas under pressure; may explode if heated. |
| Flammable Aerosol, category 1 | H222 | Extremely flammable aerosol. |
| STOT, repeated exposure, category 2 | H373 | May cause damage to organs through prolonged or repeated exposure. |

GHS LABEL PRECAUTIONARY STATEMENTS

| | |
|-----------|--|
| P201 | Obtain special instructions before use. |
| P210 | Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. |
| P211 | Do not spray on an open flame or other ignition source. |
| P251 | Do not pierce or burn, even after use. |
| P260 | Do not breathe dust/fume/gas/mist/vapors/spray. |
| P280 | Wear protective gloves/protective clothing/eye protection/face protection. |
| P308+P313 | IF exposed or concerned: Get medical advice/attention. |
| P314 | Get medical advice/attention if you feel unwell. |
| P405 | Store locked up. |
| P410+P403 | Protect from sunlight. Store in a well-ventilated place. |
| P410+P412 | Protect from sunlight. Do not expose to temperatures exceeding 50°C/ 122°F. |

P501

Dispose of contents/container in accordance with local, regional and national regulations.

3. Composition/Information On Ingredients

HAZARDOUS SUBSTANCES

| <u>Chemical Name</u> | <u>CAS-No.</u> | <u>Wt.% Range</u> | <u>GHS Symbols</u> | <u>GHS Statements</u> |
|--|----------------|-------------------|--------------------|-----------------------|
| Propane | 74-98-6 | 10-25 | GHS04 | H280 |
| Naphtha, Petroleum, Hydrotreated Light | 64742-49-0 | 2.5-10 | GHS08 | H304 |
| n-Butane | 106-97-8 | 2.5-10 | GHS04 | H280 |
| Hydrotreated Light Distillate | 64742-47-8 | 2.5-10 | GHS08 | H304 |
| Xylenes (o-, m-, p- isomers) | 1330-20-7 | 2.5-10 | GHS02-GHS07 | H226-315-319-332 |
| Barium Sulfate | 7727-43-7 | 2.5-10 | Not Available | Not Available |
| Ethylbenzene | 100-41-4 | 1.0-2.5 | GHS02-GHS07-GHS08 | H225-304-332-351-373 |
| Stoddard Solvent | 8052-41-3 | 0.1-1.0 | GHS08 | H304-372 |
| Pigment Orange 13 | 3520-72-7 | 0.1-1.0 | Not Available | Not Available |
| Crystalline Silica / Quartz | 14808-60-7 | 0.1-1.0 | Not Available | Not Available |

4. First-aid Measures

FIRST AID - EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes holding eyelids open. Get medical attention. Do NOT allow rubbing of eyes or keeping eyes closed.

FIRST AID - SKIN CONTACT: Wash skin with soap and water. Remove contaminated clothing. Get medical attention if irritation develops or persists.

FIRST AID - INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention. Do NOT use mouth-to-mouth resuscitation. If you experience difficulty in breathing, leave the area to obtain fresh air. If continued difficulty is experienced, get medical assistance immediately.

FIRST AID - INGESTION: Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. Get immediate medical attention. If swallowed, get medical attention.

5. Fire-fighting Measures

EXTINGUISHING MEDIA: Alcohol Film Forming Foam, Carbon Dioxide, Dry Chemical, Dry Sand, Water Fog

UNUSUAL FIRE AND EXPLOSION HAZARDS: FLASH POINT IS LESS THAN 20°F. EXTREMELY FLAMMABLE LIQUID AND VAPOR! Water spray may be ineffective. Closed containers may explode when exposed to extreme heat due to buildup of steam. Closed containers may explode when exposed to extreme heat. Vapors may form explosive mixtures with air. Vapors can travel to a source of ignition and flash back. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Perforation of the pressurized container may cause bursting of the can. No unusual fire or explosion hazards noted.

SPECIAL FIREFIGHTING PROCEDURES: Water may be used to cool closed containers to prevent pressure buildup and possible autoignition or explosion. Full protective equipment including self-contained breathing apparatus should be used. Evacuate area and fight fire from a safe distance. Use water spray to keep fire-exposed containers cool. Containers may explode when heated.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Contain spilled liquid with sand or earth. DO NOT use combustible materials such as sawdust. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Remove all sources of ignition, ventilate area and remove with inert absorbent and non-sparking tools. Dispose of according to local, state (provincial) and federal regulations. Do not incinerate closed containers. Ventilate area, isolate spilled material, and remove with inert absorbent. Dispose of contaminated absorbent, container, and unused contents in accordance with local, state, and federal regulations.

7. Handling and Storage

HANDLING: Wash thoroughly after handling. Wash hands before eating. Remove contaminated clothing and launder before reuse. Use only in a well-ventilated area. Use only with adequate ventilation. Follow all MSDS/label precautions even after container is emptied because it may retain product residues. Avoid breathing fumes, vapors, or mist. Avoid contact with eyes, skin and clothing.

STORAGE: Store in a dry, well ventilated place. Keep container tightly closed when not in use. Keep containers tightly closed. Isolate from heat, electrical equipment, sparks and open flame. Contents under pressure. Do not store above 120 ° F. Store large quantities in buildings designed and protected for storage of flammable aerosols. Keep away from heat, sparks, flame and sources of ignition. Contents under pressure. Do not expose to heat or store above 120 ° F. Avoid excess heat. Product should be stored in tightly sealed containers and protected from heat, moisture, and foreign materials.

8. Exposure Controls/Personal Protection

| Chemical Name | CAS-No. | Weight % Less Than | ACGIH TLV- TWA | ACGIH TLV- STEL | OSHA PEL- TWA | OSHA PEL- CEILING |
|---|------------|-----------------------|-------------------------|--------------------|----------------------|----------------------|
| Propane | 74-98-6 | 20.0 | N.E. | N.E. | 1000 ppm | N.E. |
| Naphtha, Petroleum, Hydrotreated Light | 64742-49-0 | 10.0 | N.E. | N.E. | N.E. | N.E. |
| n-Butane | 106-97-8 | 10.0 | N.E. | 1000 ppm | N.E. | N.E. |
| Hydrotreated Light Distillate | 64742-47-8 | 10.0 | N.E. | N.E. | N.E. | N.E. |
| Xylenes (o-, m-, p- isomers) | 1330-20-7 | 5.0 | 100 ppm | 150 ppm | 100 ppm | N.E. |
| Barium Sulfate | 7727-43-7 | 5.0 | 5 mg/m ³ | N.E. | 15 mg/m ³ | N.E. |
| Ethylbenzene | 100-41-4 | 5.0 | 20 ppm | N.E. | 100 ppm | N.E. |
| Stoddard Solvent | 8052-41-3 | 1.0 | 100 ppm | N.E. | 500 ppm | N.E. |
| Pigment Orange 13 | 3520-72-7 | 1.0 | N.E. | N.E. | N.E. | N.E. |
| Crystalline Silica / Quartz | 14808-60-7 | 1.0 | 0.025 mg/m ³ | N.E. | 50 µg/m ³ | N.E. |

PERSONAL PROTECTION

ENGINEERING CONTROLS: Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof ventilation equipment. Provide general dilution of local exhaust ventilation in volume and pattern to keep TLV of hazardous ingredients below acceptable limits. Prevent build-up of vapors by opening all doors and windows to achieve cross-ventilation.

RESPIRATORY PROTECTION: A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. A NIOSH/MSHA approved air purifying respirator with organic vapor cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits.

SKIN PROTECTION: Use gloves to prevent prolonged skin contact. Use impervious gloves to prevent skin contact and absorption of this material through the skin. Nitrile or Neoprene gloves may afford adequate skin protection.

EYE PROTECTION: Use safety eyewear designed to protect against splash of liquids.

OTHER PROTECTIVE EQUIPMENT: Refer to safety supervisor or industrial hygienist for further guidance regarding types of personal protective equipment and their applications. Refer to safety supervisor or industrial hygienist for further information regarding personal protective equipment and its application.

HYGIENIC PRACTICES: Wash thoroughly with soap and water before eating, drinking or smoking. Remove contaminated clothing immediately and launder before reuse.

9. Physical and Chemical Properties

| | | | |
|---------------------------------|---------------------|--|------------|
| Appearance: | Aerosolized Mist | Physical State: | Liquid |
| Odor: | Solvent Like | Odor Threshold: | N.E. |
| Relative Density: | 0.857 | pH: | N.A. |
| Freeze Point, °C: | N.D. | Viscosity: | N.D. |
| Solubility in Water: | Slight | Partition Coefficient, n-octanol/water: | N.D. |
| Decomposition Temp., °C: | N.D. | Explosive Limits, vol%: | 0.9 - 12.6 |
| Boiling Range, °C: | -37 - 537 | Flash Point, °C: | -96 |
| Flammability: | Supports Combustion | Auto-ignition Temp., °C: | N.D. |
| Evaporation Rate: | Faster than Ether | Vapor Pressure: | N.D. |
| Vapor Density: | Heavier than Air | | |

(See "Other information" Section for abbreviation legend)

10. Stability and Reactivity

CONDITIONS TO AVOID: Avoid temperatures above 120°F (49°C). Avoid contact with strong acid and strong bases. Avoid all possible sources of ignition.

INCOMPATIBILITY: Incompatible with strong oxidizing agents, strong acids and strong alkalies.

HAZARDOUS DECOMPOSITION: By open flame, carbon monoxide and carbon dioxide. When heated to decomposition, it emits acrid smoke and irritating fumes. Contains solvents which may form carbon monoxide, carbon dioxide, and formaldehyde.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

11. Toxicological information

EFFECTS OF OVEREXPOSURE - EYE CONTACT: Causes Serious Eye Irritation

EFFECTS OF OVEREXPOSURE - SKIN CONTACT: Substance may cause slight skin irritation. May cause skin irritation. Allergic reactions are possible. Prolonged or repeated contact may cause skin irritation.

EFFECTS OF OVEREXPOSURE - INHALATION: Harmful if inhaled. High gas, vapor, mist or dust concentrations may be harmful if inhaled. Avoid breathing fumes, spray, vapors, or mist. High vapor concentrations are irritating to the eyes, nose, throat and lungs. Prolonged or excessive inhalation may cause respiratory tract irritation.

EFFECTS OF OVEREXPOSURE - INGESTION: Harmful if swallowed. Aspiration hazard if swallowed; can enter lungs and cause damage.

EFFECTS OF OVEREXPOSURE - CHRONIC HAZARDS: May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion, and blurred vision) and/or damage. High concentrations may lead to central nervous system effects (drowsiness, dizziness, nausea, headaches, paralysis, and blurred vision) and/or damage. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Overexposure to xylene in laboratory animals has been associated with liver abnormalities, kidney, lung, spleen, eye and blood damage as well as reproductive disorders. Effects in humans, due to chronic overexposure, have included liver, cardiac abnormalities and nervous system damage. IARC lists Ethylbenzene as a possible human carcinogen (group 2B).

PRIMARY ROUTE(S) OF ENTRY: Eye Contact, Ingestion, Inhalation, Skin Absorption, Skin Contact

ACUTE TOXICITY VALUES

The acute effects of this product have not been tested. Data on individual components are tabulated below:

| <u>CAS-No.</u> | <u>Chemical Name</u> | <u>Oral LD50</u> | <u>Dermal LD50</u> | <u>Vapor LC50</u> |
|----------------|--|------------------|--------------------|-------------------|
| 74-98-6 | Propane | N.I. | N.I. | 658 mg/L Rat |
| 64742-49-0 | Naphtha, Petroleum, Hydrotreated Light | >5000 mg/kg Rat | >3160 mg/kg Rabbit | >4951 mg/L Rat |
| 106-97-8 | n-Butane | N.I. | N.I. | 658 mg/L Rat |
| 64742-47-8 | Hydrotreated Light Distillate | >5000 mg/kg Rat | >2000 mg/kg Rabbit | >5000 mg/L Rat |
| 1330-20-7 | Xylenes (o-, m-, p- isomers) | 3500 mg/kg Rat | >4350 mg/kg Rabbit | 29.08 mg/L Rat |
| 100-41-4 | Ethylbenzene | 3500 mg/kg Rat | 15400 mg/kg Rabbit | 17.4 mg/L Rat |
| 3520-72-7 | Pigment Orange 13 | >5000 mg/kg Rat | N.I. | N.I. |
| 14808-60-7 | Crystalline Silica / Quartz | 5500 mg/kg Rat | 5500 | 100 mg/L |

N.I. - No Information

12. Ecological Information

ECOLOGICAL INFORMATION: Product is a mixture of listed components. Product is a mixture of listed components.

13. Disposal Information

DISPOSAL INFORMATION: Dispose of material in accordance to local, state, and federal regulations and ordinances. Do not allow to enter waterways, wastewater, soil, storm drains or sewer systems.

14. Transport Information

| | <u>Domestic (USDOT)</u> | <u>International (IMDG)</u> | <u>Air (IATA)</u> | <u>TDG (Canada)</u> |
|------------------------------|--------------------------------------|-----------------------------|-------------------|--------------------------------------|
| UN Number: | N.A. | 1950 | 1950 | N.A. |
| Proper Shipping Name: | Paint Products in Limited Quantities | Aerosols | Aerosols | Paint Products in Limited Quantities |
| Hazard Class: | N.A. | 2.1 | 2.1 | N.A. |
| Packing Group: | N.A. | N.A. | N.A. | N.A. |
| Limited Quantity: | Yes | Yes | Yes | Yes |

15. Regulatory Information

U.S. Federal Regulations:

CERCLA - SARA Hazard Category

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Fire Hazard, Pressure Hazard, Acute Health Hazard, Chronic Health Hazard

Sara Section 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

| <u>Chemical Name</u> | <u>CAS-No.</u> |
|------------------------------|----------------|
| Xylenes (o-, m-, p- isomers) | 1330-20-7 |
| Ethylbenzene | 100-41-4 |

Toxic Substances Control Act:

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(b) if exported from the United States:

| <u>Chemical Name</u> | <u>CAS-No.</u> |
|-----------------------------------|----------------|
| Castor oil, sulfated, sodium salt | 68187-76-8 |

16. Other Information**HMIS RATINGS**

Health: 2* **Flammability:** 4 **Physical Hazard:** 0 **Personal Protection:** X

NFPA RATINGS

Health: 2 **Flammability:** 4 **Instability:** 0

VOLATILE ORGANIC COMPOUNDS, g/L: 551

SDS REVISION DATE: 5/12/2017

REASON FOR REVISION: Product Composition Changed
Substance and/or Product Properties Changed in Section(s):
02 - Hazard Identification
05 - Fire-fighting Measures
16 - Other Information
Statement(s) Changed

Legend: N.A. - Not Applicable, N.E. - Not Established, N.D. - Not Determined

Rust-Oleum Corporation believes, to the best of its knowledge, information and belief, the information contained herein to be accurate and reliable as of the date of this safety data sheet. However, because the conditions of handling, use, and storage of these materials are beyond our control, we assume no responsibility or liability for personal injury or property damage incurred by the use of these materials. Rust-Oleum Corporation makes no warranty, expressed or implied, regarding the accuracy or reliability of the data or results obtained from their use. All materials may present unknown hazards and should be used with caution. The information and recommendations in this material safety data sheet are offered for the users' consideration and examination. It is the responsibility of the user to determine the final suitability of this information and to comply with all applicable international, federal, state, and local laws and regulations.

1. Identification

| | | |
|---|--|-----------------------|
| Product identifier | ISOPROPYL ALCOHOL, REAGENT (ACS) | |
| Other means of identification | | |
| Product code | 2294 | |
| Synonym(s) | ISOPROPANOL * 2-PROPANOL | |
| Recommended use | professional, scientific and technical activities: other professional, scientific and technical activities | |
| Recommended restrictions | None known. | |
| Manufacturer/Importer/Supplier/Distributor information | | |
| Company name | GFS Chemicals, Inc. | |
| Address | P.O. Box 245 Powell OH 43065 US | |
| Telephone | Phone | 740-881-5501 |
| | Toll Free | 800-858-9682 |
| | Fax | 740-881-5989 |
| Website | www.gfschemicals.com | |
| E-mail | service@gfschemicals.com | |
| Emergency phone number | Emergency Assistance | Chemtrec 800-424-9300 |

2. Hazard(s) identification

| | | |
|-------------------------|---|--|
| Physical hazards | Flammable liquids | Category 2 |
| Health hazards | Serious eye damage/eye irritation | Category 2A |
| | Reproductive toxicity | Category 2 |
| | Specific target organ toxicity, single exposure | Category 1 (central nervous system, kidney, systemic toxicity) |
| | Specific target organ toxicity, single exposure | Category 3 respiratory tract irritation |
| | Specific target organ toxicity, single exposure | Category 3 narcotic effects |
| | Specific target organ toxicity, repeated exposure | Category 2 (blood vessel, liver, spleen) |
| OSHA hazard(s) | Not classified. | |

Label elements



| | |
|--------------------------------|---|
| Signal word | Danger |
| Hazard statement | Highly flammable liquid and vapor. Causes serious eye irritation. May cause respiratory irritation. May cause drowsiness or dizziness. Suspected of damaging fertility or the unborn child. Causes damage to organs (central nervous system, kidney, systemic toxicity). May cause damage to organs (blood vessel, liver, spleen) through prolonged or repeated exposure. |
| Precautionary statement | |
| Prevention | Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use only outdoors or in a well-ventilated area. Keep container tightly closed. Use explosion-proof electrical/ventilating/lighting equipment. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection. |

| | |
|--|---|
| Response | In case of fire: Use appropriate media for extinction. Eliminate all ignition sources if safe to do so. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If exposed or concerned: Get medical advice/attention. Call a POISON CENTER or doctor/physician if you feel unwell. If eye irritation persists: Get medical advice/attention. |
| Storage | Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store locked up. |
| Disposal | Dispose of contents/container to an approved incineration plant. |
| Hazard(s) not otherwise classified (HNOC) | Static accumulating flammable liquid |
| Supplemental information | |
| Hazard statement | Static accumulating flammable liquid can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite liquid and vapor. May cause flash fire or explosion. |
| Precautionary statement | |
| Prevention | Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Ground/bond container and receiving equipment. These alone may be insufficient to remove static electricity. |

3. Composition/information on ingredients

Substances

| Hazardous components | | | |
|-----------------------------|---------------------------------|-------------------|----------|
| Chemical name | Common name and synonyms | CAS number | % |
| ISOPROPYL ALCOHOL | ISOPROPANOL 2-PROPANOL | 67-63-0 | 100 |

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

| | |
|---|---|
| Inhalation | Move to fresh air. Call a POISON CENTER or doctor/physician if you feel unwell. |
| Skin contact | Take off immediately all contaminated clothing. Rinse skin with water/shower. Get medical attention if irritation develops and persists. |
| Eye contact | Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists. |
| Ingestion | Rinse mouth. Do not use mouth-to-mouth method if victim ingested the substance. If ingestion of a large amount does occur, call a poison control center immediately. |
| Most important symptoms/effects, acute and delayed | Irritation of eyes and mucous membranes. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Narcosis. Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Proteinuria. Prolonged exposure may cause chronic effects. |
| Indication of immediate medical attention and special treatment needed | Provide general supportive measures and treat symptomatically. |
| General information | Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. IF exposed or concerned: Get medical advice/attention. |

5. Fire-fighting measures

| | |
|--|--|
| Suitable extinguishing media | Water fog. Carbon dioxide (CO ₂). Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only. Alcohol resistant foam. Powder. Water. |
| Unsuitable extinguishing media | Do not use water jet as an extinguisher, as this will spread the fire. |
| Specific hazards arising from the chemical | This product is a poor conductor of electricity and can become electrostatically charged. If sufficient charge is accumulated, ignition of flammable mixtures can occur. To reduce potential for static discharge, use proper bonding and grounding procedures. This liquid may accumulate static electricity when filling properly grounded containers. Static electricity accumulation may be significantly increased by the presence of small quantities of water or other contaminants. By heating and fire, harmful vapors/gases may be formed. |
| Special protective equipment and precautions for firefighters | Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Structural firefighters protective clothing will only provide limited protection. |
| Fire-fighting equipment/instructions | In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials. Move containers from fire area if you can do so without risk. |

Specific methods

In the event of fire and/or explosion do not breathe fumes. Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Use standard firefighting procedures and consider the hazards of other involved materials. Move container from fire area if it can be done without risk.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Transfer by mechanical means such as vacuum truck to a salvage tank or other suitable container for recovery or safe disposal. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep people away from and upwind of spill/leak. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering them. Wear appropriate personal protective equipment.

Methods and materials for containment and cleaning up

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material. Should not be released into the environment. This product is miscible in water. Prevent entry into waterways, sewers, basements or confined areas.

Large Spills: Stop leak if you can do so without risk. Move the cylinder to a safe and open area if the leak is irreparable. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Clean contaminated surface thoroughly. After removal flush contaminated area thoroughly with water. Following product recovery, flush area with water. Prevent entry into waterways, sewer, basements or confined areas. Clean up in accordance with all applicable regulations.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills in original containers for re-use. For waste disposal, see section 13 of the MSDS.

Environmental precautions

Avoid discharge into drains, water courses or onto the ground. Use appropriate containment to avoid environmental contamination. Prevent further leakage or spillage if safe to do so. Do not contaminate water.

7. Handling and storage

Precautions for safe handling

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Vapors may form explosive mixtures with air. Minimize fire risks from flammable and combustible materials (including combustible dust and static accumulating liquids) or dangerous reactions with incompatible materials. Handling operations that can promote accumulation of static charges include but are not limited to: mixing, filtering, pumping at high flow rates, splash filling, creating mists or sprays, tank and container filling, tank cleaning, sampling, gauging, switch loading, vacuum truck operations. For additional information on equipment bonding and grounding, refer to the Canadian Electrical Code in Canada, (CSA C22.1), or the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents" or National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity" or National Fire Protection Association (NFPA) 70, "National Electrical Code". DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Do not breathe mist or vapor. Avoid contact with eyes. Avoid contact during pregnancy/while nursing. Use personal protective equipment as required. Avoid prolonged exposure. When using, do not eat, drink or smoke. Wash hands thoroughly after handling. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store in cool place. Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Store in a well-ventilated place. Keep container tightly closed. Keep in an area equipped with sprinklers. Keep out of the reach of children. Store in a cool, dry place out of direct sunlight.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

| Material | Type | Value |
|---------------------------------|------|-----------|
| ISOPROPYL ALCOHOL (CAS 67-63-0) | PEL | 980 mg/m3 |

Material name: ISOPROPYL ALCOHOL, REAGENT (ACS)

2294

Version #: 01

Revision date: Issue date: June-05-2013

SDS US

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US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

| Material | Type | Value |
|----------|------|---------|
| | | 400 ppm |

US. ACGIH Threshold Limit Values

| Material | Type | Value |
|---------------------------------|------|---------|
| ISOPROPYL ALCOHOL (CAS 67-63-0) | STEL | 400 ppm |
| | TWA | 200 ppm |

US. NIOSH: Pocket Guide to Chemical Hazards

| Material | Type | Value |
|---------------------------------|------|----------------------|
| ISOPROPYL ALCOHOL (CAS 67-63-0) | STEL | 1225 mg/m3 |
| | | 500 ppm |
| | TWA | 980 mg/m3 400 ppm |

Biological limit values**US. ACGIH. BEIs. Biological Exposure Indices**

| Material | Value | Determinant | Specimen | Sampling Time |
|---------------------------------|---------|-------------|----------|---------------|
| ISOPROPYL ALCOHOL (CAS 67-63-0) | 40 mg/l | Acetone | Urine | * |

* - For sampling details, please see the source document.

Appropriate engineering controls Explosion-proof general and local exhaust ventilation. Provide eyewash station.

Individual protection measures, such as personal protective equipment

Eye/face protection Chemical goggles are recommended.

Skin protection

Hand protection Wear protective gloves.

Other Wear appropriate chemical resistant clothing. Wear protective gloves.

Respiratory protection In case of insufficient ventilation, wear suitable respiratory equipment.

Thermal hazards Not available.

General hygiene considerations When using, do not eat, drink or smoke. Avoid contact with eyes. Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

| | |
|---|--|
| Appearance | Clear. |
| Physical state | Liquid. |
| Form | Liquid. |
| Color | Colorless. |
| Odor | Alcoholic. |
| Odor threshold | Not available. |
| pH | Not available. |
| Melting point/freezing point | -127.3 °F (-88.5 °C) |
| Initial boiling point and boiling range | 180.5 °F (82.5 °C) 101.325 kPa |
| Flash point | 53.60 °F (12.00 °C) Closed Cup 75.00 °F (23.89 °C) Open Cup |
| Evaporation rate | Not available. |
| Flammability (solid, gas) | Not applicable. |
| Upper/lower flammability or explosive limits | |
| Flammability limit - lower (%) | 2.5 |
| Flammability limit - upper (%) | 12 |

| | |
|--|---|
| Explosive limit - lower (%) | Not available. |
| Explosive limit - upper (%) | Not available. |
| Vapor pressure | 6.053 kPa at 25 °C |
| Vapor density | 2.1 |
| Relative density | Not available. |
| Solubility(ies) | Miscible |
| Partition coefficient (n-octanol/water) | 0.1 |
| Auto-ignition temperature | 750.2 °F (399 °C) |
| Decomposition temperature | When heated to decomp, emits acrid smoke and fumes. |
| Viscosity | Not available. |
| Other information | |
| Density | 0.78 g/cm ³ estimated |
| Dynamic viscosity | 2.1 mPa.s |
| Dynamic viscosity temperature | 77 °F (25 °C) |
| Flammability class | Flammable IB estimated |
| Flash point class | Flammable IB |
| Heat of combustion (NFPA 30B) | 27.4 kJ/g |
| Molecular formula | C ₃ H ₈ O |
| Molecular weight | 60.10 g/mol |
| Percent volatile | 100 % |
| Specific gravity | 0.785 at 20 °C |
| VOC (Weight %) | 100 % |

10. Stability and reactivity

| | |
|---|--|
| Reactivity | Not available. |
| Chemical stability | Stable at normal conditions. Risk of ignition. |
| Possibility of hazardous reactions | Hazardous polymerization does not occur. |
| Conditions to avoid | Heat, flames and sparks. Avoid temperatures exceeding the flash point. |
| Incompatible materials | Strong oxidizing agents. Isocyanates. Acids. Chlorine. |
| Hazardous decomposition products | May include oxides of carbon. |

11. Toxicological information

Information on likely routes of exposure

| | |
|---|--|
| Ingestion | Not available. |
| Inhalation | Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. May cause irritation to the respiratory system. |
| Skin contact | Due to lack of data the classification is not possible. |
| Eye contact | Causes serious eye irritation. |
| Symptoms related to the physical, chemical and toxicological characteristics | Narcosis. Edema. Liver enlargement. Jaundice. Proteinuria. Behavioral changes. Decrease in motor functions. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. |

Information on toxicological effects

Acute toxicity

| Product | Species | Test Results |
|---------------------------------|---------|----------------------------------|
| ISOPROPYL ALCOHOL (CAS 67-63-0) | | |
| Acute | | |
| <i>Dermal</i> | | |
| LD50 | Rabbit | 5030 - 7900 mg/kg 12800 mg/kg |

| Product | Species | Test Results |
|----------------------|------------|-------------------|
| <i>Oral</i> LD50 | Dog | 4797 mg/kg |
| | Mouse | 3600 mg/kg |
| | | 4.5 g/kg |
| | Rabbit | 8000 mg/kg |
| | | 6410 mg/kg |
| | | 5.03 g/kg |
| | Rat | 4700 - 5800 mg/kg |
| | 5045 mg/kg | |
| | 4.7 g/kg | |
| <i>Other</i> LD50 | Mouse | 1509 mg/kg |
| | Rat | 1099 mg/kg |

* Estimates for product may be based on additional component data not shown.

| | |
|---|--|
| Skin corrosion/irritation | Based on available data, the classification criteria are not met. |
| Serious eye damage/eye irritation | Causes serious eye irritation. |
| Respiratory sensitization | Due to lack of data the classification is not possible. |
| Skin sensitization | Due to lack of data the classification is not possible. |
| Germ cell mutagenicity | Based on available data, the classification criteria are not met. |
| Carcinogenicity | This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA. |
| Reproductive toxicity | Suspected of damaging fertility or the unborn child. |
| Specific target organ toxicity - single exposure | Respiratory tract irritation. Narcotic effects. Causes damage to organs (central nervous system, kidney, systemic toxicity). |
| Specific target organ toxicity - repeated exposure | May cause damage to organs (blood vessel, liver, spleen) through prolonged or repeated exposure. |
| Aspiration hazard | Due to lack of data the classification is not possible. |
| Chronic effects | Prolonged inhalation may be harmful. May cause damage to organs through prolonged or repeated exposure. |

12. Ecological information

Ecotoxicity Contains a substance which causes risk of hazardous effects to the environment.

| Product | Species | Test Results |
|---------------------------------|--|-----------------------|
| ISOPROPYL ALCOHOL (CAS 67-63-0) | | |
| Aquatic | | |
| Fish | LC50 Bluegill (<i>Lepomis macrochirus</i>) | > 1400 mg/l, 96 hours |

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)
0.05

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Incinerate the material under controlled conditions in an approved incinerator. Do not incinerate sealed containers. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. If discarded, this product is considered a RCRA ignitable waste, D001. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Not available.

Hazardous waste code D001: Waste Flammable material with a flash point <140 F

Waste from residues / unused products

Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging

Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

| | |
|-------------------------------------|---|
| UN number | UN1219 |
| UN proper shipping name | Isopropanol or Isopropyl alcohol |
| Transport hazard class(es) | 3 |
| Subsidiary class(es) | Not available. |
| Packing group | II |
| Special precautions for user | Read safety instructions, SDS and emergency procedures before handling. |
| Labels required | 3 |
| Special provisions | IB2, T4, TP1 |
| Packaging exceptions | 4b, 150 |
| Packaging non bulk | 202 |
| Packaging bulk | 242 |

IATA

| | |
|-------------------------------------|----------------|
| UN number | UN1219 |
| UN proper shipping name | Isopropanol |
| Transport hazard class(es) | 3 |
| Subsidiary class(es) | - |
| Packaging group | II |
| Environmental hazards | No |
| Labels required | Not available. |
| ERG Code | 3L |
| Special precautions for user | Not available. |

IMDG

| | |
|-------------------------------------|----------------|
| UN number | UN1219 |
| UN proper shipping name | ISOPROPANOL |
| Transport hazard class(es) | 3 |
| Subsidiary class(es) | - |
| Packaging group | II |
| Environmental hazards | |
| Marine pollutant | No |
| Labels required | Not available. |
| EmS | F-E, S-D |
| Special precautions for user | Not available. |

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code No information available.

DOT





15. Regulatory information

US federal regulations CERCLA/SARA Hazardous Substances - Not applicable.

All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not on regulatory list.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance No

SARA 311/312 Hazardous chemical No

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

Food and Drug Administration (FDA) Not regulated.

US state regulations

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. Massachusetts RTK - Substance List

ISOPROPYL ALCOHOL (CAS 67-63-0)

US. New Jersey Worker and Community Right-to-Know Act

Not regulated.

US. Pennsylvania RTK - Hazardous Substances

ISOPROPYL ALCOHOL (CAS 67-63-0)

US. Rhode Island RTK

ISOPROPYL ALCOHOL (CAS 67-63-0)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Not listed.

International Inventories

| Country(s) or region | Inventory name | On inventory (yes/no)* |
|-----------------------------|--|------------------------|
| Australia | Australian Inventory of Chemical Substances (AICS) | Yes |
| Canada | Domestic Substances List (DSL) | Yes |
| Canada | Non-Domestic Substances List (NDSL) | No |
| China | Inventory of Existing Chemical Substances in China (IECSC) | Yes |
| Europe | European Inventory of Existing Commercial Chemical Substances (EINECS) | Yes |
| Europe | European List of Notified Chemical Substances (ELINCS) | No |
| Japan | Inventory of Existing and New Chemical Substances (ENCS) | Yes |
| Korea | Existing Chemicals List (ECL) | Yes |
| New Zealand | New Zealand Inventory | Yes |
| Philippines | Philippine Inventory of Chemicals and Chemical Substances (PICCS) | Yes |
| United States & Puerto Rico | Toxic Substances Control Act (TSCA) Inventory | Yes |

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s)

16. Other information, including date of preparation or last revision

| | |
|-----------------------------|--|
| Issue date | June-05-2013 |
| Version # | 01 |
| Further information | Not available. |
| Disclaimer | The information in the sheet was written based on the best knowledge and experience currently available. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. |
| Revision Information | Product and Company Identification: Product Codes Composition / Information on Ingredients: Disclosure Overrides |



SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Revision Date 01/27/2015

Version 1.2

SECTION 1. Identification

Product identifier

Product number HX0607
Product name Hydrochloric Acid
34-37% OmniTrace®

Relevant identified uses of the substance or mixture and uses advised against

Identified uses Reagent for research and development

Details of the supplier of the safety data sheet

Company EMD Millipore Corporation | 290 Concord Road, Billerica, MA 01821,
United States of America | General Inquiries: +1-978-715-4321 |
Monday to Friday, 9:00 AM to 4:00 PM Eastern Time (GMT-5)

Emergency telephone 800-424-9300 CHEMTREC (USA)
+1-703-527-3887 CHEMTREC (International)
24 Hours/day; 7 Days/week

SECTION 2. Hazards identification

GHS Classification

Corrosive to Metals, Category 1, H290
Skin corrosion, Category 1B, H314
Serious eye damage, Category 1, H318
Specific target organ systemic toxicity - single exposure, Category 3, Respiratory system, H335
For the full text of the H-Statements mentioned in this Section, see Section 16.

GHS-Labeling

Hazard pictograms



Signal Word
Danger

Hazard Statements

H290 May be corrosive to metals.
H314 Causes severe skin burns and eye damage.
H335 May cause respiratory irritation.

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

HX0607

Version 1.2

Product name

Hydrochloric Acid
34-37% OmniTrace®

Precautionary Statements

P234 Keep only in original container.

P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray.

P264 Wash skin thoroughly after handling.

P271 Use only outdoors or in a well-ventilated area.

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing.

Rinse skin with water/ shower.

P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310 Immediately call a POISON CENTER or doctor/ physician.

P321 Specific treatment (see supplemental first aid instructions on this label).

P363 Wash contaminated clothing before reuse.

P390 Absorb spillage to prevent material damage.

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

P405 Store locked up.

P406 Store in corrosive resistant stainless steel container with a resistant inliner.

P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards

None known.

SECTION 3. Composition/information on ingredients

Chemical nature

Aqueous solution

Hazardous ingredients

Chemical Name (Concentration)

CAS-No.

hydrochloric acid (>= 30 % - < 50 %)

7647-01-0

Exact percentages are being withheld as a trade secret.

SECTION 4. First aid measures

Description of first-aid measures

General advice

First aider needs to protect himself.

Inhalation

After inhalation: fresh air. Call in physician.

Skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

Eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist.

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according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

HX0607

Version 1.2

Product name

Hydrochloric Acid
34-37% OmniTrace®

Ingestion

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation!). Call a physician immediately. Do not attempt to neutralize.

Never give anything by mouth to an unconscious person.

Most important symptoms and effects, both acute and delayed

Irritation and corrosion, Cough, Shortness of breath, cardiovascular disorders, Risk of blindness!

Indication of any immediate medical attention and special treatment needed

No information available.

SECTION 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

Special hazards arising from the substance or mixture

Not combustible.

Ambient fire may liberate hazardous vapors.

Fire may cause evolution of:

Hydrogen chloride gas

Advice for firefighters

Special protective equipment for fire-fighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

Advice for emergency responders: Protective equipment see section 8.

Environmental precautions

Do not empty into drains.

Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills.

Observe possible material restrictions (see sections 7 and 10).

Take up with liquid-absorbent and neutralizing material (e.g. Chemizorb® H⁺, Art. No. 101595).

Dispose of properly. Clean up affected area.

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

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Product name

Hydrochloric Acid
34-37% OmniTrace®

SECTION 7. Handling and storage

Precautions for safe handling

Observe label precautions.

Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers

No metal containers.

Tightly closed.

Store at room temperature.

SECTION 8. Exposure controls/personal protection

Exposure limit(s)

Ingredients

| Basis | Value | Threshold limits | Remarks |
|------------------------------------|---|------------------------------|---------|
| <i>hydrochloric acid 7647-01-0</i> | | | |
| ACGIH | Ceiling Limit Value: | 2 ppm | |
| NIOSH/GUIDE | Ceiling Limit Value and Time Period (if specified): | 5 ppm 7 mg/m ³ | |
| OSHA_TRANS | Ceiling Limit Value: | 5 ppm 7 mg/m ³ | |
| Z1A | Ceiling Limit Value: | 5 ppm 7 mg/m ³ | |

Engineering measures

Technical measures and appropriate working operations should be given priority over the use of personal protective equipment.

Individual protection measures

Protective clothing should be selected specifically for the workplace, depending on concentration and quantity of the hazardous substances handled. The chemical resistance of the protective equipment should be inquired at the respective supplier.

Hygiene measures

Immediately change contaminated clothing. Apply skin- protective barrier cream. Wash hands and face after working with substance.

Eye/face protection

Tightly fitting safety goggles

Hand protection

Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Other protective equipment:

Acid-resistant protective clothing.

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Hydrochloric Acid
34-37% OmniTrace®

Respiratory protection

required when vapors/aerosols are generated.

Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

SECTION 9. Physical and chemical properties

| | |
|--|---|
| Physical state | liquid |
| Color | colorless |
| Odor | stinging |
| Odor Threshold | 0.8 - 5 ppm Gaseous hydrogen chloride (HCl). |
| pH | < 1 at 68 °F (20 °C) |
| Solidification point | -30 °C |
| Boiling point | No information available. |
| Flash point | Not applicable |
| Evaporation rate | No information available. |
| Flammability (solid, gas) | No information available. |
| Lower explosion limit | Not applicable |
| Upper explosion limit | Not applicable |
| Vapor pressure | 190 hPa at 68 °F (20 °C) |
| Relative vapor density | No information available. |
| Density | ca. 1.19 g/cm ³ at 68 °F (20 °C) |
| Relative density | No information available. |
| Water solubility | at 68 °F (20 °C) soluble |
| Partition coefficient: n-octanol/water | Not applicable |

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

HX0607

Version 1.2

Product name

Hydrochloric Acid
34-37% OmniTrace®

| | |
|---------------------------|-------------------------------|
| Autoignition temperature | No information available. |
| Decomposition temperature | No information available. |
| Viscosity, dynamic | 2.3 mPa.s at 59 °F (15 °C) |
| Explosive properties | Not classified as explosive. |
| Oxidizing properties | none |
| Ignition temperature | Not applicable |
| Corrosion | May be corrosive to metals. |

SECTION 10. Stability and reactivity

Reactivity

Corrosive in contact with metals

Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

Possibility of hazardous reactions

Exothermic reaction with:

Amines, potassium permanganate, salts of oxyhalogenic acids, semimetallic oxides, semimetallic hydrogen compounds, Aldehydes, vinylmethyl ether

Risk of ignition or formation of inflammable gases or vapors with:

carbides, lithium silicide, Fluorine

Generates dangerous gases or fumes in contact with:

Aluminum, hydrides, formaldehyde, Metals, strong alkalis, Sulfides

Risk of explosion with:

Alkali metals, conc. sulfuric acid

Conditions to avoid

Heating.

Incompatible materials

Metals, metal alloys

Gives off hydrogen by reaction with metals.

Hazardous decomposition products

in the event of fire: See section 5.

SECTION 11. Toxicological information

Information on toxicological effects

Likely route of exposure

Inhalation, Eye contact, Skin contact

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

HX0607

Version 1.2

Product name

Hydrochloric Acid
34-37% OmniTrace®

Target Organs

Eyes

Skin

Respiratory system

Cornea

Acute oral toxicity

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Acute toxicity estimate: 1,892 mg/kg

Calculation method

Acute inhalation toxicity

Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Acute toxicity estimate: 6.41 mg/l; 4 h

Calculation method

Skin irritation

Mixture causes burns.

Eye irritation

Mixture causes serious eye damage. Risk of blindness!

Specific target organ systemic toxicity - single exposure

Target Organs: Respiratory system

Mixture may cause respiratory irritation.

Specific target organ systemic toxicity - repeated exposure

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard

Regarding the available data the classification criteria are not fulfilled.

Carcinogenicity

IARC

No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA

No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

NTP

No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

ACGIH

No ingredient of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

Further information

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

HX0607

Version 1.2

Product name

Hydrochloric Acid
34-37% OmniTrace®

After uptake:

After a latency period:

cardiovascular disorders

Handle in accordance with good industrial hygiene and safety practice.

Ingredients

hydrochloric acid

No information available.

SECTION 12. Ecological information

Ecotoxicity

No information available.

Persistence and degradability

No information available.

Bioaccumulative potential

Partition coefficient: n-octanol/water

Not applicable

Mobility in soil

No information available.

Additional ecological information

Forms corrosive mixtures with water even if diluted. Harmful effect due to pH shift.

Discharge into the environment must be avoided.

Ingredients

hydrochloric acid

Substance does not meet the criteria for PBT or vPvB according to Regulation (EC) No 1907/2006, Annex XIII.

SECTION 13. Disposal considerations

The information presented only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. Disposal should be in accordance with applicable regional, national and local laws and regulations.

SAFETY DATA SHEET
according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number HX0607
Product name Hydrochloric Acid
34-37% OmniTrace®

Version 1.2

SECTION 14. Transport information

Land transport (DOT)

UN number UN 1789
Proper shipping name HYDROCHLORIC ACID
Class 8
Packing group II
Environmentally hazardous --

Air transport (IATA)

UN number UN 1789
Proper shipping name HYDROCHLORIC ACID
Class 8
Packing group II
Environmentally hazardous --
Special precautions for user no

Sea transport (IMDG)

UN number UN 1789
Proper shipping name HYDROCHLORIC ACID
Class 8
Packing group II
Environmentally hazardous --
Special precautions for user yes
EmS F-A S-B

SECTION 15. Regulatory information

United States of America

SARA 313

The following components are subject to reporting levels established by SARA Title III, Section 313:

Ingredients

hydrochloric acid 7647-01-0 37 %

SARA 302

The following components are subject to reporting levels established by SARA Title III, Section 302:

Ingredients

hydrochloric acid 7647-01-0

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

HX0607

Version 1.2

Product name

Hydrochloric Acid
34-37% OmniTrace®

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

Ingredients

hydrochloric acid

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

Ingredients

hydrochloric acid

DEA List I

Not listed

DEA List II

Listed

Ingredients

hydrochloric acid

7647-01-0

US State Regulations

Massachusetts Right To Know

Ingredients

hydrochloric acid

Pennsylvania Right To Know

Ingredients

hydrochloric acid

New Jersey Right To Know

Ingredients

hydrochloric acid

California Prop 65 Components

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

Notification status

TSCA: All components of the product are listed in the TSCA-inventory.

DSL: All components of this product are on the Canadian DSL.

KOREA: Not in compliance with the inventory

SECTION 16. Other information

Training advice

Provide adequate information, instruction and training for operators.

SAFETY DATA SHEET

according to the (US) Hazard Communication Standard (29 CFR 1910.1200)

Product number

HX0607

Version 1.2

Product name

Hydrochloric Acid
34-37% OmniTrace®

Labeling

Hazard pictograms



Signal Word

Danger

Hazard Statements

H290 May be corrosive to metals.

H314 Causes severe skin burns and eye damage.

H335 May cause respiratory irritation.

Precautionary Statements

Prevention

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response

P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P308 + P310 IF exposed or concerned: immediately call a POISON CENTER or doctor/ physician.

Full text of H-Statements referred to under sections 2 and 3.

| | |
|------|--|
| H290 | May be corrosive to metals. |
| H314 | Causes severe skin burns and eye damage. |
| H318 | Causes serious eye damage. |
| H335 | May cause respiratory irritation. |

Key or legend to abbreviations and acronyms used in the safety data sheet

Used abbreviations and acronyms can be looked up at www.wikipedia.org.

Revision Date 01/27/2015

The information contained herein is based on the present state of our knowledge. It characterizes the product with regard to appropriate safety precautions. It does not represent a warranty of any product properties and we assume no liability for any loss or injury which may result from the use of this information. Users should conduct their own investigations to determine the suitability of the information.

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SAFETY DATA SHEET

SDS ID NO.: 0290MAR019
Revision Date: 06/01/2016

1. IDENTIFICATION

Product Name: Marathon Petroleum No. 2 Ultra Low Sulfur Diesel

Synonym: #2 Diesel; No. 2 Ultra Low Sulfur Diesel 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 15 ppm Sulfur Max with Polar Plus; No. 2 Diesel, Motor Vehicle Use, Undyed; No. 2 Diesel, Motor Vehicle Use, Undyed, with Polar Plus; ULSD No. 2 Diesel 15 ppm Sulfur Max; ULSD No. 2 Diesel 15 ppm Sulfur Max with Polar Plus; No. 2 MV 15 Diesel; No. 2 MV 15 Diesel with Polar Plus; No. 2 Ultra Low Sulfur Diesel Dyed 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 Dyed 15 ppm Sulfur Max; Ultra Low Sulfur Diesel No. 2 Dyed 15 ppm Sulfur Max with Polar Plus; No. 2 Diesel, Tax Exempt-Motor Vehicle Use, Dyed; No. 2 Diesel, Tax Exempt-Motor Vehicle Use, Dyed, with Polar Plus; ULSD No. 2 Diesel Dyed 15 ppm Sulfur Max; ULSD No. 2 Diesel Dyed 15 ppm Sulfur Max, with Polar Plus; No. 2 MV 15 Diesel Dyed; #2 MV 15 CFI Diesel; #2 MV 15 CFI Diesel Dyed; No. 2 Low Sulfur Diesel (TxLED); No. 2 MV 15 Diesel Dyed, with Polar Plus; No. 2 NRLM 15 Diesel Dyed; No.2 NRLM Diesel Dyed; No. 2 MV 500 ppm TxLED; No.2 Low Emission Low Sulfur Diesel; No. 2 Low Sulfur Diesel (TxLED) 500 ppm Sulfur Max; No. 2 Heating Oil 5000 NMA Unmarked; NEMA No. 2 Heating Oil; Heating Oil, No. 2 Low Sulfur 5000 ppm; No. 2 Ultra Low Sulfur Diesel Dyed with <6% Renewable Diesel Fuel; Ultra Low Sulfur No. 2 Diesel Dyed with <6% Renewable Diesel Fuel; No. 2 Diesel Dyed with <6% Renewable Diesel Fuel 15 ppm Sulfur Max; No. 2 Ultra Low Sulfur Diesel with <6% Renewable Diesel Fuel; Ultra Low Sulfur No. 2 Diesel with <6% Renewable Diesel Fuel; No. 2 Diesel with <6% Renewable Diesel Fuel 15 ppm Sulfur Max; Garyville Export Diesel; Export Diesel, Garyville; Diesel Fuel, Export Garyville; #2 Motor Vehicle ULSD 15 ppm with 0-5% Renewable Diesel; Marathon No. 2 ULSD with 0-5% Renewable Fuel with R100; Marathon No. 2 ULSD with 0-5% Renewable Fuel with R99; No. 2 Heating Oil 2000 ppm Sulfur Max, Clear (Undyed) Unmarked; Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Clear (Undyed) Unmarked; ULS Heating Oil 15 ppm Clear (Undyed) Unmarked; ULS HO 15 ppm CLR; Ultra-Low Sulfur Heating Oil (<= 15ppm, Undyed); No. 2 Heating Oil 2000 ppm Sulfur Max, Dyed Unmarked; No. 2 Heating Oil 2000 ppm Sulfur Max, Dyed Marked; Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Dyed Unmarked; Ultra Low Sulfur Heating Oil 15 ppm Sulfur Max, Dyed Marked; 15 ppm Sulfur Heating Oil Grade 67; 15 PPM Heating Oil; 15 PPM Dyed Heating Oil; 0291MAR019; 0306MAR019; 0308MAR019; 0334MAR019; 0335MAR019; 0336MAR019; 0337MAR019; 0340MAR019;

Chemical Family: Complex Hydrocarbon Substance

Recommended Use: Fuel.
Restrictions on Use: All others.

Manufacturer, Importer, or Responsible Party Name and Address:
MARATHON PETROLEUM COMPANY LP
539 South Main Street
Findlay, OH 45840

SDS information: 1-419-421-3070

Emergency Telephone: 1-877-627-5463

2. HAZARD IDENTIFICATION

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|--|------------|
| Flammable liquids | Category 3 |
| Acute toxicity - Inhalation (Dusts/Mists) | Category 4 |
| Skin corrosion/irritation | Category 2 |
| Carcinogenicity | Category 2 |
| Specific target organ toxicity (single exposure) | Category 3 |
| Specific target organ toxicity (repeated exposure) | Category 2 |
| Aspiration toxicity | Category 1 |
| Acute aquatic toxicity | Category 2 |
| Chronic aquatic toxicity | Category 2 |

Hazards Not Otherwise Classified (HNOC)


Static accumulating flammable liquid

Label elements

EMERGENCY OVERVIEW

Danger

FLAMMABLE LIQUID AND VAPOR
 May accumulate electrostatic charge and ignite or explode
 May be fatal if swallowed and enters airways
 Harmful if inhaled
 Causes skin irritation
 May cause respiratory irritation
 May cause drowsiness or dizziness
 Suspected of causing cancer
 May cause damage to organs (thymus, liver, bone marrow) through prolonged or repeated exposure
 Toxic to aquatic life with long lasting effects



Appearance Yellow to Red Liquid **Physical State** Liquid **Odor** Hydrocarbon

Precautionary Statements - Prevention

- Obtain special instructions before use
- Do not handle until all safety precautions have been read and understood
- Keep away from heat/sparks/open flames/hot surfaces. - No smoking
- Keep container tightly closed
- Ground/bond container and receiving equipment
- Use only non-sparking tools.
- Use explosion-proof electrical/ventilating/lighting/equipment
- Take precautionary measures against static discharge
- Do not breathe the mist/vapors/spray
- Use only outdoors or in a well-ventilated area
- Wear protective gloves/protective clothing/eye protection/face protection

Wash hands and any possibly exposed skin thoroughly after handling
Avoid release to the environment

Precautionary Statements - Response

IF exposed or concerned: Get medical attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
If skin irritation occurs: Get medical attention
Wash contaminated clothing before reuse
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor if you feel unwell
IF SWALLOWED: Immediately call a POISON CENTER or doctor
Do NOT induce vomiting
In case of fire: Use water spray, fog or regular foam for extinction
Collect spillage

Precautionary Statements - Storage

Store in a well-ventilated place. Keep container tightly closed
Keep cool
Store locked up

Precautionary Statements - Disposal

Dispose of contents/container at an approved waste disposal plant

3. COMPOSITION/INFORMATION ON INGREDIENTS

No. 2 Ultra Low Sulfur Diesel is a complex mixture of paraffins, cycloparaffins, olefins and aromatic hydrocarbon chain lengths predominantly in the range of eleven to twenty carbons. May contain up to 5% Renewable Diesel. May contain small amounts of dye and other additives (<0.15%) which are not considered hazardous at the concentration(s) used. May contain a trace amount of benzene (<0.01%). Contains a trace amount of sulfur (<0.0015%)

Composition Information:

| Name | CAS Number | % Concentration |
|--------------------------------------|-------------|-----------------|
| No. 2 Diesel Fuel | 68476-34-6 | 50-100 |
| Kerosine, Petroleum | 8008-20-6 | 0-50 |
| Alkanes, C10-C20 branched and linear | 928771-01-1 | 0-5 |
| Naphthalene | 91-20-3 | 0.3-2.6 |

All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

First Aid Measures

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show directions for use or safety data sheet if possible).

Inhalation: Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear, give oxygen and continue to monitor. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Skin Contact: Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes. May be absorbed through the skin in harmful amounts. Get medical attention if irritation persists. Any injection injury from high pressure equipment should be evaluated immediately by a physician as potentially serious (See NOTES TO PHYSICIAN).

Place contaminated clothing in closed container until cleaned or discarded. If clothing is to be laundered, inform the person performing the operation of contaminant's hazardous properties. Destroy contaminated, non-chemical resistant footwear.

Eye Contact: Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Gently remove contacts while flushing. Get medical attention if irritation persists.

Ingestion: Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips, or if patient is lying down, turn body and head to side to prevent aspiration and monitor for breathing difficulty. Never give anything by mouth to an unconscious person. Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Most important signs and symptoms, both short-term and delayed with overexposure

Adverse Effects: Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking. Prolonged or repeated exposure may cause adverse effects to the thymus, liver, and bone marrow.

Indication of any immediate medical attention and special treatment needed

Notes To Physician: INHALATION: This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

SKIN: Leaks or accidents involving high-pressure equipment may inject a stream of material through the skin and initially produce an injury that may not appear serious. Only a small puncture wound may appear on the skin surface but, without proper treatment and depending on the nature, original pressure, volume, and location of the injected material, can compromise blood supply to an affected body part. Prompt surgical debridement of the wound may be necessary to prevent irreversible loss of function and/or the affected body part. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES.

INGESTION: This material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFF/ATC) can be used. Firefighting should be attempted only by those who are adequately trained and equipped with proper protective equipment.

Unsuitable extinguishing media

Do not use straight water streams to avoid spreading fire.

Specific hazards arising from the chemical

This product has been determined to be a flammable liquid per the OSHA Hazard Communication Standard and should be handled accordingly. May accumulate electrostatic charge and ignite or explode. Vapors may travel along the ground or be moved by ventilation and ignited by many sources such as pilot lights, sparks, electric motors, static discharge, or other ignition sources at locations distant from material handling. Flashback can occur along vapor trail. For additional fire related information, see NFPA 30 or the Emergency Response Guidebook 128.

Hazardous combustion products

Smoke, carbon monoxide, and other products of incomplete combustion.

Explosion data

Sensitivity to Mechanical Impact No.

Sensitivity to Static Discharge Yes.

Special protective equipment and precautions for firefighters

Firefighters should wear full protective clothing and positive-pressure self-contained breathing apparatus (SCBA) with a full face-piece, as appropriate. Avoid using straight water streams. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Keep surrounding area cool with water spray from a distance and prevent further ignition of combustible material. Keep run-off water out of sewers and water sources.

Additional firefighting tactics

FIRES INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after the fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

EVACUATION: Consider initial downwind evacuation for at least 1000 feet. If tank, rail car or tank truck is involved in a fire, ISOLATE for 5280 feet (1 mile) in all directions; also, consider initial evacuation of 5280 feet (1 mile) in all directions.

NFPA Health 1 Flammability 2 Instability 0 Special Hazard -

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions:** Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources. All contaminated surfaces will be slippery.
- Protective equipment:** Use personal protection measures as recommended in Section 8.
- Emergency procedures:** Advise authorities and National Response Center (800-424-8802) if the product has entered a water course or sewer. Notify local health and pollution control agencies, if appropriate.
- Environmental precautions:** Avoid release to the environment. Avoid subsoil penetration.
- Methods and materials for containment:** Contain liquid with sand or soil. Prevent spilled material from entering storm drains, sewers, and open waterways.
- Methods and materials for cleaning up:** Use suitable absorbent materials such as vermiculite, sand, or clay to clean up residual liquids. Recover and return free product to proper containers. When recovering free liquids ensure all equipment is grounded and bonded. Use only non-sparking tools.

7. HANDLING AND STORAGE

Safe Handling Precautions: NEVER SIPHON THIS PRODUCT BY MOUTH. Use appropriate grounding and bonding practices. Static accumulating flammable liquid. Bonding and grounding may be insufficient to eliminate the hazard from static electricity. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Vapors may travel along the ground or be moved by ventilation. Flashback may occur along vapor trails. No smoking. Use only non-sparking tools. Avoid breathing fumes, gas, or vapors. Use only with adequate ventilation. Avoid repeated and prolonged skin contact. Use personal protection measures as recommended in Section 8. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. Do not cut, drill, grind or weld on empty containers since explosive residues may remain. Refer to applicable EPA, OSHA, NFPA and consistent state and local requirements.

Hydrocarbons are basically non-conductors of electricity and can become electrostatically charged during mixing, filtering, pumping at high flow rates or loading and transfer operations. If this charge reaches a sufficiently high level, sparks can form that may ignite the vapors of flammable liquids. Sudden release of hot organic chemical vapors or mists

from process equipment operating under elevated temperature and pressure, or sudden ingress of air into vacuum equipment may result in ignition of vapors or mists without the presence of obvious ignition sources. Nozzle spouts must be kept in contact with the containers or tank during the entire filling operation.

Portable containers should never be filled while in or on a motor vehicle or marine craft. Containers should be placed on the ground. Static electric discharge can ignite fuel vapors when filling non-grounded containers or vehicles on trailers. The nozzle spout must be kept in contact with the container before and during the entire filling operation. Use only approved containers.

A buildup of static electricity can occur upon re-entry into a vehicle during fueling especially in cold or dry climate conditions. The charge is generated by the action of dissimilar fabrics (i.e., clothing and upholstery) rubbing across each other as a person enters/exits the vehicle. A flash fire can result from this discharge if sufficient flammable vapors are present. Therefore, do not get back in your vehicle while refueling.

Cellular phones and other electronic devices may have the potential to emit electrical charges (sparks). Sparks in potentially explosive atmospheres (including fueling areas such as gas stations) could cause an explosion if sufficient flammable vapors are present. Therefore, turn off cellular phones and other electronic devices when working in potentially explosive atmospheres or keep devices inside your vehicle during refueling.

High-pressure injection of any material through the skin is a serious medical emergency even though the small entrance wound at the injection site may not initially appear serious. These injection injuries can occur from high-pressure equipment such as paint spray or grease or guns, fuel injectors, or pinhole leaks in hoses or hydraulic lines and should all be considered serious. High pressure injection injuries may be SERIOUS SURGICAL EMERGENCIES (See First Aid Section 4).

Storage Conditions:

Store in properly closed containers that are appropriately labeled and in a cool, well-ventilated area. Do not store near an open flame, heat or other sources of ignition.

Incompatible Materials

Strong oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

| Name | ACGIH TLV | OSHA PELS: | OSHA - Vacated PELs | NIOSH IDLH |
|---|---|--|--|------------|
| No. 2 Diesel Fuel 68476-34-6 | 100 mg/m ³ TWA Skin - potential significant contribution to overall exposure by the cutaneous route | - | - | - |
| Kerosine, Petroleum 8008-20-6 | 200 mg/m ³ TWA Skin - potential significant contribution to overall exposure by the cutaneous route | - | - | - |
| Alkanes, C10-C20 branched and linear 928771-01-1 | - | - | - | - |
| Naphthalene 91-20-3 | 10 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route | TWA: 10 ppm TWA: 50 mg/m ³ | 10 ppm TWA 50 mg/m ³ TWA 15 ppm STEL 75 mg/m ³ STEL | 250 ppm |

Notes:

The manufacturer has voluntarily elected to provide exposure limits contained in OSHA's 1989 air contaminants standard in its SDSs, even though certain of those exposure limits were vacated in 1992.

Engineering measures:

Local or general exhaust required in an enclosed area or with inadequate ventilation. Use mechanical ventilation equipment that is explosion-proof.

Personal protective equipment

- Eye protection:** Use goggles or face-shield if the potential for splashing exists.
- Skin and body protection:** Wear neoprene, nitrile or PVA gloves to prevent skin contact. Glove suitability is based on workplace conditions and usage. Contact the glove manufacturer for specific advice on glove selection and breakthrough times.
- Respiratory protection:** Use a NIOSH approved organic vapor chemical cartridge or supplied air respirators when there is the potential for airborne exposures to exceed permissible exposure limits or if excessive vapors are generated. Observe respirator assigned protection factors (APFs) criteria cited in federal OSHA 29 CFR 1910.134. Self-contained breathing apparatus should be used for fire fighting.
- Hygiene measures:** Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

| | |
|-----------------------|----------------------|
| Physical State | Liquid |
| Appearance | Yellow to Red Liquid |
| Color | Yellow to Red |
| Odor | Hydrocarbon |
| Odor Threshold | No data available. |

| <u>Property</u> | <u>Values (Method)</u> |
|--|------------------------------------|
| Melting Point / Freezing Point | No data available. |
| Initial Boiling Point / Boiling Range | 154-366 °C / 310-691 °F (ASTM D86) |
| Flash Point | 58-76 °C / 136-168 °F (ASTM D93) |
| Evaporation Rate | No data available. |
| Flammability (solid, gas) | Not applicable. |
| Flammability Limit in Air (%): | |
| Upper Flammability Limit: | No data available. |
| Lower Flammability Limit: | No data available. |
| Explosion limits: | No data available. |
| Vapor Pressure | No data available. |
| Vapor Density | No data available. |
| Specific Gravity / Relative Density | 0.82-0.86 (ASTM D4052) |
| Water Solubility | No data available. |
| Solubility in other solvents | No data available. |
| Partition Coefficient | No data available. |
| Decomposition temperature | No data available. |
| pH: | Not applicable |
| Autoignition Temperature | No data available. |
| Kinematic Viscosity | 1.90-3.32 cSt @ 40°C (ASTM D445) |
| Dynamic Viscosity | No data available. |
| Explosive Properties | No data available. |
| VOC Content (%) | No data available. |
| Density | No data available. |
| Bulk Density | Not applicable. |

10. STABILITY AND REACTIVITY

- Reactivity** The product is non-reactive under normal conditions.
- Chemical stability** The material is stable at 70°F, 760 mmHg pressure.

| | |
|---|--|
| <u>Possibility of hazardous reactions</u> | None under normal processing. |
| <u>Hazardous polymerization</u> | Will not occur. |
| <u>Conditions to avoid</u> | Excessive heat, sources of ignition, open flame. |
| <u>Incompatible Materials</u> | Strong oxidizing agents. |
| <u>Hazardous decomposition products</u> | None known under normal conditions of use. |

11. TOXICOLOGICAL INFORMATION

Potential short-term adverse effects from overexposures

| | |
|---------------------|--|
| Inhalation | Harmful if inhaled. May cause irritation of respiratory tract. May cause drowsiness or dizziness. Breathing high concentrations of this material in a confined space or by intentional abuse can cause irregular heartbeats which can cause death. |
| Eye contact | Exposure to vapor or contact with liquid may cause mild eye irritation, including tearing, stinging, and redness. |
| Skin contact | Causes skin irritation. Effects may become more serious with repeated or prolonged contact. May be absorbed through the skin in harmful amounts. |
| Ingestion | May be fatal if swallowed or vomited and enters airways. May cause irritation of the mouth, throat and gastrointestinal tract. |

Acute toxicological data

| Name | Oral LD50 | Dermal LD50 | Inhalation LC50 |
|---|--------------------|-----------------------|-----------------------------------|
| No. 2 Diesel Fuel 68476-34-6 | > 5000 mg/kg (Rat) | > 2000 mg/kg (Rabbit) | >1 - <5 mg/L (Rat) 4 h |
| Kerosine, Petroleum 8008-20-6 | > 5000 mg/kg (Rat) | > 2000 mg/kg (Rabbit) | > 5.28 mg/L (Rat) 4 h |
| Alkanes, C10-C20 branched and linear 928771-01-1 | - | - | >1 - <5 mg/l (Rat) 4 h |
| Naphthalene 91-20-3 | 490 mg/kg (Rat) | > 2000 mg/kg (Rabbit) | > 340 mg/m ³ (Rat) 1 h |

Delayed and immediate effects as well as chronic effects from short and long-term exposure

MIDDLE DISTILLATES, PETROLEUM: Long-term repeated (lifetime) skin exposure to similar materials has been reported to result in an increase in skin tumors in laboratory rodents. The relevance of these findings to humans is not clear at this time. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffer's Encephalopathy), delirium, seizures, and sudden death have been reported from repeated overexposure to some hydrocarbon solvents, naphthas, and gasoline.

MIDDLE DISTILLATES WITH CRACKED STOCKS: Light cracked distillates have been shown to be carcinogenic in animal tests and have tested positive with in vitro genotoxicity tests. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.

ISOPARAFFINS: Studies in laboratory animals have shown that long-term exposure to similar materials (isoparaffins) can cause kidney damage and kidney cancer in male laboratory rats. However, in-depth research indicates that these findings are unique to the male rat, and that these effects are not relevant to humans.

NAPHTHALENE: Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from overexposure to naphthalene. Persons with glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have been reported in persons overexposed to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect. Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) in vitro. Naphthalene has been classified as Possibly Carcinogenic to Humans (2B) by IARC, based on findings from studies in laboratory animals.

DIESEL EXHAUST: The combustion of diesel fuels produces gases including carbon monoxide, carbon dioxide, oxides of nitrogen and/or sulfur, and hydrocarbons that can be irritating and hazardous with overexposure. Long-term occupational overexposure to diesel exhaust and diesel exhaust particulate matter has been associated with an increased risk of respiratory disease, including lung cancer, and is characterized as a “known human carcinogen” by the International Agency for Research on Cancer (IARC), as “a reasonably anticipated human carcinogen” by the National Toxicology Program, and as “likely to be carcinogenic to humans” by the EPA, based upon animal and occupational exposure studies. However, uncertainty exists with these classifications because of deficiencies in the supporting occupational exposure/epidemiology studies, including reliable exposure estimates. Lifetime animal inhalation studies with pulmonary overloading exposure concentrations of diesel exhaust emissions have produced tumors and other adverse health effects. However, in more recent long-term animal inhalation studies of diesel exhaust emissions, no increase in tumor incidence and in fact a substantial reduction in adverse health effects along with significant reductions in the levels of hazardous material emissions were observed and are associated with fuel composition alterations coupled with new technology diesel engines.

Adverse effects related to the physical, chemical and toxicological characteristics

Signs and Symptoms Irritating to the skin and mucous membranes. Symptoms may include redness, itching, and inflammation. May cause nausea, vomiting, diarrhea, and signs of nervous system depression: headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Aspiration hazard. May cause coughing, chest pains, shortness of breath, pulmonary edema and/or chemical pneumonitis. Repeated or prolonged skin contact may cause drying, reddening, itching and cracking. Prolonged or repeated exposure may cause damage to organs.

Sensitization Not expected to be a skin or respiratory sensitizer.

Mutagenic effects None known.

Carcinogenicity Suspected of causing cancer.

Cancer designations are listed in the table below

| Name | ACGIH (Class) | IARC (Class) | NTP | OSHA |
|---|----------------------------------|---------------------------|---------------------------|------------|
| No. 2 Diesel Fuel 68476-34-6 | Confirmed animal carcinogen (A3) | Not Classifiable (3) | Not Listed | Not Listed |
| Kerosine, Petroleum 8008-20-6 | Confirmed animal carcinogen (A3) | Not Classifiable (3) | Not Listed | Not Listed |
| Alkanes, C10-C20 branched and linear 928771-01-1 | Not Listed | Not Listed | Not Listed | Not Listed |
| Naphthalene | Confirmed animal | Possible human carcinogen | Reasonably anticipated to | Not Listed |

| | | | |
|---------|-----------------|------|-----------------------|
| 91-20-3 | carcinogen (A3) | (2B) | be a human carcinogen |
|---------|-----------------|------|-----------------------|

Reproductive toxicity None known.

Specific Target Organ Toxicity (STOT) - single exposure Respiratory system. Central nervous system.

Specific Target Organ Toxicity (STOT) - repeated exposure Thymus. Liver. Bone marrow.

Aspiration hazard May be fatal if swallowed or vomited and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity This product should be considered toxic to aquatic organisms, with the potential to cause long lasting adverse effects in the aquatic environment.

| Name | Algae/aquatic plants | Fish | Toxicity to Microorganisms | Crustacea |
|--|-----------------------------------|--|----------------------------|---|
| No. 2 Diesel Fuel 68476-34-6 | - | 96-hr LC50 = 35 mg/l Fathead minnow (flow-through) | - | 48-hr EL50 = 6.4 mg/l Daphnia magna |
| Kerosine, Petroleum 8008-20-6 | 72-hr EL50 = 5.0-11 mg/l Algae | 96-hr LL50 = 18-25 mg/l Fish | - | 48-hr EL50 = 1.4-21 mg/l Invertebrates |
| Alkanes, C10-C20 branched and linear 928771-01-1 | - | - | - | - |
| Naphthalene 91-20-3 | - | 96-hr LC50 = 0.91-2.82 mg/l Rainbow trout (static) 96-hr LC50 = 1.99 mg/l Fathead minnow (static) | - | 48-hr LC50 = 1.6 mg/l Daphnia magna |

Persistence and degradability Expected to be inherently biodegradable.

Bioaccumulation Has the potential to bioaccumulate.

Mobility in soil May partition into air, soil and water.

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Description of Waste Residues

This material may be a flammable liquid waste.

Safe Handling of Wastes

Handle in accordance with applicable local, state, and federal regulations. Use personal protection measures as required. Use appropriate grounding and bonding practices. Use only non-sparking tools. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. No smoking.

Disposal of Wastes / Methods of Disposal

The user is responsible for determining if any discarded material is a hazardous waste (40 CFR 262.11). Dispose of in accordance with federal, state and local regulations.

Methods of Contaminated Packaging Disposal

Empty containers should be completely drained and then discarded or recycled, if possible. Do not cut, drill, grind or weld on empty containers since explosive residues may be present. Dispose of in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

DOT (49 CFR 172.101):

UN Proper Shipping Name: Fuel Oil, No. 2
UN/Identification No: NA 1993
Transport Hazard Class(es): 3
Packing Group: III

TDG (Canada):

UN Proper Shipping Name: Diesel Fuel
UN/Identification No: UN 1202
Transport Hazard Class(es): 3
Packing Group: III

15. REGULATORY INFORMATION

US Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b): This product and/or its components are listed on the TSCA Chemical Inventory.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302: This product does not contain any component(s) included on EPA's Extremely Hazardous Substance (EHS) List.

| Name | CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs |
|--------------------------------------|---|
| No. 2 Diesel Fuel | NA |
| Kerosine, Petroleum | NA |
| Alkanes, C10-C20 branched and linear | NA |
| Naphthalene | NA |

SARA Section 304: This product may contain component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

| Name | Hazardous Substances RQs |
|--------------------------------------|-------------------------------------|
| No. 2 Diesel Fuel | NA |
| Kerosine, Petroleum | NA |
| Alkanes, C10-C20 branched and linear | NA |
| Naphthalene | 100 lb final RQ 45.4 kg final RQ |

SARA: The following EPA hazard categories apply to this product:

- Acute Health Hazard
- Fire Hazard
- Chronic Health Hazard

SARA Section 313: This product may contain component(s), which if in exceedance of the de minimus threshold, may be subject to the reporting requirements of SARA Title III Section 313 Toxic Release Reporting (Form R).

| Name | CERCLA/SARA 313 Emission reporting: |
|--------------------------------------|-------------------------------------|
| No. 2 Diesel Fuel | None |
| Kerosine, Petroleum | None |
| Alkanes, C10-C20 branched and linear | None |
| Naphthalene | 0.1 % de minimis concentration |

State and Community Right-To-Know Regulations:

The following component(s) of this material are identified on the regulatory lists below:

No. 2 Diesel Fuel

| | |
|---|---|
| Louisiana Right-To-Know: | Not Listed |
| California Proposition 65: | Not Listed |
| New Jersey Right-To-Know: | SN 2444 |
| Pennsylvania Right-To-Know: | Not Listed |
| Massachusetts Right-To Know: | Not Listed |
| Florida Substance List: | Not Listed |
| Rhode Island Right-To-Know: | Not Listed |
| Michigan Critical Materials Register List: | Not Listed |
| Massachusetts Extraordinarily Hazardous Substances: | Not Listed |
| California - Regulated Carcinogens: | Not Listed |
| Pennsylvania RTK - Special Hazardous Substances: | Not Listed |
| New Jersey - Special Hazardous Substances: | Not Listed |
| New Jersey - Environmental Hazardous Substances List: | SN 2444 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories) |
| Illinois - Toxic Air Contaminants: | Not Listed |
| New York - Reporting of Releases Part 597 - List of Hazardous Substances: | Not Listed |
| Kerosine, Petroleum | |
| Louisiana Right-To-Know: | Not Listed |
| California Proposition 65: | Not Listed |
| New Jersey Right-To-Know: | SN 1091 |
| Pennsylvania Right-To-Know: | Present |
| Massachusetts Right-To Know: | Present |
| Florida Substance List: | Not Listed |
| Rhode Island Right-To-Know: | Not Listed |
| Michigan Critical Materials Register List: | Not Listed |
| Massachusetts Extraordinarily Hazardous Substances: | Not Listed |
| California - Regulated Carcinogens: | Not Listed |
| Pennsylvania RTK - Special Hazardous Substances: | Not Listed |
| New Jersey - Special Hazardous Substances: | Not Listed |
| New Jersey - Environmental Hazardous Substances List: | SN 1091 TPQ: 10000 lb (Under N.J.A.C. 7:1G, environmental hazardous substances in mixtures such as gasoline or new and used petroleum oil may be reported under these categories) |
| Illinois - Toxic Air Contaminants: | Not Listed |
| New York - Reporting of Releases Part 597 - List of Hazardous Substances: | Not Listed |
| Alkanes, C10-C20 branched and linear | |
| Louisiana Right-To-Know: | Not Listed |
| California Proposition 65: | Not Listed |
| New Jersey Right-To-Know: | Not Listed |
| Pennsylvania Right-To-Know: | Not Listed |
| Massachusetts Right-To Know: | Not Listed |
| Florida Substance List: | Not Listed |
| Rhode Island Right-To-Know: | Not Listed |
| Michigan Critical Materials Register List: | Not Listed |
| Massachusetts Extraordinarily Hazardous Substances: | Not Listed |
| California - Regulated Carcinogens: | Not Listed |
| Pennsylvania RTK - Special Hazardous Substances: | Not Listed |
| New Jersey - Special Hazardous Substances: | Not Listed |
| New Jersey - Environmental Hazardous Substances List: | Not Listed |
| Illinois - Toxic Air Contaminants: | Not Listed |
| New York - Reporting of Releases Part 597 - List of Hazardous Substances: | Not Listed |
| Naphthalene | |
| Louisiana Right-To-Know: | Not Listed |
| California Proposition 65: | Carcinogen, initial date 4/19/02 |

| | |
|---|--|
| New Jersey Right-To-Know: | SN 1322 SN 3758 |
| Pennsylvania Right-To-Know: | Environmental hazard Present (particulate) |
| Massachusetts Right-To Know: | Present |
| Florida Substance List: | Not Listed |
| Rhode Island Right-To-Know: | Toxic; Flammable |
| Michigan Critical Materials Register List: | Not Listed |
| Massachusetts Extraordinarily Hazardous Substances: | Not Listed |
| California - Regulated Carcinogens: | Not Listed |
| Pennsylvania RTK - Special Hazardous Substances: | Not Listed |
| New Jersey - Special Hazardous Substances: | Carcinogen |
| New Jersey - Environmental Hazardous Substances List: | SN 1322 TPQ: 500 lb (Reportable at the de minimis quantity of >0.1%) |
| Illinois - Toxic Air Contaminants: | Present |
| New York - Reporting of Releases Part 597 - List of Hazardous Substances: | 100 lb RQ (air); 1 lb RQ (land/water) |

Canada DSL/NDL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or are exempt.

Canadian Regulatory Information: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

| Name | Canada - WHMIS: Classifications of Substances: | Canada - WHMIS: Ingredient Disclosure: |
|--------------------------------------|--|--|
| No. 2 Diesel Fuel | B3,D2A,D2B | 0.1% |
| Kerosine, Petroleum | B3,D2B | 1% |
| Alkanes, C10-C20 branched and linear | B3,D2A,D2B | 0.1% |
| Naphthalene | B4,D2A | 0.1% |



Note: Not applicable.

16. OTHER INFORMATION

Prepared By Toxicology and Product Safety

Revision Date: 06/01/2016

Revision Note:

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is intended as guidance for safe handling, use, processing, storage, transportation, accidental release, clean-up and disposal and is not considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SECTION 1: Identification

1.1. Identification

Product form : Substance
 Substance name : Water, Deionized, ACS Reagent Grade, ASTM Type I
 CAS No : 7732-18-5
 Product code : LC26740
 Formula : H₂O

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : For laboratory and manufacturing use only.

1.3. Details of the supplier of the safety data sheet

LabChem Inc
 Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
 Zelienople, PA 16063 - USA
 T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

Classification (GHS-US)

Not classified

2.2. Label elements

GHS-US labeling

No labeling applicable

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Substance type : Mono-constituent

| Name | Product identifier | % | Classification (GHS-US) |
|--|--------------------|-----|-------------------------|
| Water, Deionized, ACS Reagent Grade, ASTM Type I (Main constituent) | (CAS No) 7732-18-5 | 100 | Not classified |

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : If you feel unwell, seek medical advice (show the label where possible).
 First-aid measures after inhalation : Allow victim to breathe fresh air. Allow the victim to rest. Adverse effects not expected from this product.
 First-aid measures after skin contact : Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse. Adverse effects not expected from this product.
 First-aid measures after eye contact : Rinse immediately with plenty of water. Adverse effects not expected from this product.
 First-aid measures after ingestion : Do NOT induce vomiting. Obtain emergency medical attention. Adverse effects not expected from this product.

Water, Deionized, ACS Reagent Grade, ASTM Type I

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according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : Not expected to present a significant hazard under anticipated conditions of normal use.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

5.2. Special hazards arising from the substance or mixture

No additional information available

5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use.

Incompatible products : Metallic sodium.

Incompatible materials : Sources of ignition. Direct sunlight.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation.

Hand protection : Wear protective gloves.

Eye protection : Chemical goggles or safety glasses.

Respiratory protection : None necessary.

Other information : Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Color : Colorless

Water, Deionized, ACS Reagent Grade, ASTM Type I

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| | |
|---|--|
| Odor | : None. |
| Odor threshold | : No data available |
| pH | : 7 |
| Melting point | : 0 °C |
| Freezing point | : No data available |
| Boiling point | : 100 °C |
| Critical temperature | : 374.1 °C |
| Critical pressure | : 218.3 atm |
| Flash point | : No data available |
| Relative evaporation rate (butyl acetate=1) | : No data available |
| Flammability (solid, gas) | : No data available |
| Explosion limits | : No data available |
| Explosive properties | : Not applicable. |
| Oxidizing properties | : None. |
| Vapor pressure | : 17.535 mm Hg |
| Vapor pressure at 50 °C | : 92.51 mm Hg |
| Relative density | : 1 |
| Relative vapor density at 20 °C | : No data available |
| Specific gravity / density | : 0.99823 g/ml |
| Molecular mass | : 18 g/mol |
| Solubility | : Soluble in acetic acid. Soluble in acetone. Soluble in ammonia. Soluble in ammonium chloride. Soluble in ethanol. Soluble in glycerol. Soluble in hydrochloric acid. Soluble in methanol. Soluble in nitric acid. Soluble in sulfuric acid. Soluble in sodium hydroxide solution. Soluble in propylene glycol. |
| Log Pow | : No data available |
| Auto-ignition temperature | : No data available |
| Decomposition temperature | : No data available |
| Viscosity | : No data available |
| Viscosity, kinematic | : 1.004 cSt |
| Viscosity, dynamic | : 1.002 cP |

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Extremely high or low temperatures.

10.5. Incompatible materials

Metallic sodium.

10.6. Hazardous decomposition products

Hydrogen. oxygen.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

| | |
|---------------------------|------------------------|
| Likely routes of exposure | : Skin and eye contact |
| Acute toxicity | : Not classified |

Water, Deionized, ACS Reagent Grade, ASTM Type I

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| Water, Deionized, ACS Reagent Grade, ASTM Type I (7732-18-5) | |
|--|-----------------------------|
| LD50 oral rat | ≥ 90000 mg/kg |
| ATE US (oral) | 90000.000 mg/kg body weight |

| | |
|---|--|
| Skin corrosion/irritation | : Not classified pH: 7 |
| Serious eye damage/irritation | : Not classified pH: 7 |
| Respiratory or skin sensitization | : Not classified |
| Germ cell mutagenicity | : Not classified |
| Carcinogenicity | : Not classified (Based on available data, the classification criteria are not met) |
| Reproductive toxicity | : Not classified |
| Specific target organ toxicity (single exposure) | : Not classified |
| Specific target organ toxicity (repeated exposure) | : Not classified |
| Aspiration hazard | : Not classified |
| Potential Adverse human health effects and symptoms | : Based on available data, the classification criteria are not met. |

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

| Water, Deionized, ACS Reagent Grade, ASTM Type I (7732-18-5) | |
|--|------------------|
| Persistence and degradability | Not established. |

12.3. Bioaccumulative potential

| Water, Deionized, ACS Reagent Grade, ASTM Type I (7732-18-5) | |
|--|------------------|
| Bioaccumulative potential | Not established. |

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : No other effects known.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT
Not regulated for transport

TDG

No additional information available

Transport by sea

No additional information available

Air transport

No additional information available

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SECTION 15: Regulatory information

15.1. US Federal regulations

Water, Deionized, ACS Reagent Grade, ASTM Type I (7732-18-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

Water, Deionized, ACS Reagent Grade, ASTM Type I (7732-18-5)

WHMIS Classification Uncontrolled product according to WHMIS classification criteria

EU-Regulations

No additional information available

National regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm

SECTION 16: Other information

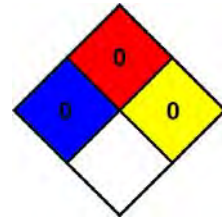
Revision date : 09/12/2014

Other information : None.

NFPA health hazard : 0 - Exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.



HMIS III Rating

Health : 0 Minimal Hazard - No significant risk to health

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

Personal Protection : A

A - Safety glasses

SDS US (GHS HazCom 2012)

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

SAFETY DATA SHEET



Section 1. Identification

Product name BP Unleaded Gasolines
SDS # 12631
Code 12631

Relevant identified uses of the substance or mixture and uses advised against

Product use USE AS MOTOR FUEL ONLY.

Supplier BP Products North America Inc.
150 West Warrenville Road
Naperville, Illinois 60563-8460
USA

EMERGENCY HEALTH INFORMATION: 1 (800) 447-8735
Outside the US: +1 703-527-3887 (CHEMTREC)

EMERGENCY SPILL INFORMATION: 1 (800) 424-9300 CHEMTREC (USA)

OTHER PRODUCT INFORMATION 1 (866) 4 BP - MSDS
(866-427-6737 Toll Free - North America)
email: bpcares@bp.com

Section 2. Hazards identification

OSHA/HCS status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture
FLAMMABLE LIQUIDS - Category 1
SKIN IRRITATION - Category 2
EYE IRRITATION - Category 2A
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1A
TOXIC TO REPRODUCTION (Unborn child) - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
ASPIRATION HAZARD - Category 1

GHS label elements

Hazard pictograms



Signal word

Danger

Hazard statements

Extremely flammable liquid and vapor.
Causes serious eye irritation.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging the unborn child.
May be fatal if swallowed and enters airways.
May cause drowsiness and dizziness.

Precautionary statements

| | | | | | |
|--------------|-----------------------|---------------|-------------|----------|----------------------|
| Product name | BP Unleaded Gasolines | Product code | 12631 | Page: | 1/21 |
| Version | 1 | Date of issue | 12/16/2014. | Format | US (US) |
| | | | | Language | ENGLISH (ENGLISH) |

Section 2. Hazards identification

| | |
|---|---|
| Prevention | Obtain special instructions before use. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge. Avoid breathing vapor. Wash thoroughly after handling. Avoid release to the environment. |
| Response | IF SWALLOWED: Immediately call a POISON CENTER or physician. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention. |
| Storage | Store in well-ventilated place. Keep container tightly closed. |
| Disposal | Dispose of contents and container in accordance with all local, regional, national and international regulations. |
| Hazards not otherwise classified | Contains Benzene. Prolonged or repeated exposure to benzene can cause anaemia and other blood diseases, including leukemia. See toxicological information (Section 11). |

Section 3. Composition/information on ingredients

| Substance/mixture | Mixture | | |
|------------------------|------------|----------|--|
| Ingredient name | CAS number | % | |
| Gasoline | Mixture | 90 - 100 | |
| Ethanol | 64-17-5 | 0 - 10 | |
| Contains: | | | |
| Benzene | 71-43-2 | 0 - 3 | |
| Cyclohexane | 110-82-7 | 0 - 1 | |
| Ethylbenzene | 100-41-4 | 0 - 2 | |
| Toluene | 108-88-3 | 4 - 11 | |
| 1,2,4-Trimethylbenzene | 95-63-6 | 0 - 3 | |
| xylene | 1330-20-7 | 4 - 11 | |
| Naphthalene | 91-20-3 | 0 - 0.5 | |

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

| | |
|---------------------|---|
| Eye contact | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Check for and remove any contact lenses. Get medical attention. |
| Skin contact | In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention. |
| Inhalation | If inhaled, remove to fresh air. Get medical attention. If exposure to vapor, mists or fumes causes drowsiness, headache, blurred vision or irritation of the eyes, nose or throat, remove immediately to fresh air. Keep patient warm and at rest. If any symptoms persist obtain medical advice. |
| Ingestion | Do not induce vomiting. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Aspiration hazard if swallowed. Can enter lungs and cause damage. Get medical attention immediately. |

| | | |
|---|---------------------------|--------------------------------------|
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Section 4. First aid measures

Protection of first-aiders No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Most important symptoms/effects, acute and delayed

See Section 11 for more detailed information on health effects and symptoms.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician Treatment should in general be symptomatic and directed to relieving any effects. Product can be aspirated on swallowing or following regurgitation of stomach contents, and can cause severe and potentially fatal chemical pneumonitis, which will require urgent treatment. Because of the risk of aspiration, induction of vomiting and gastric lavage should be avoided. Gastric lavage should be undertaken only after endotracheal intubation. Monitor for cardiac dysrhythmias.

Specific treatments No specific treatment.

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media In case of fire, use foam, dry chemical or carbon dioxide extinguisher or spray. This substance will float and can be reignited on surface water.

Unsuitable extinguishing media Do not use water jet. Never use water.

Specific hazards arising from the chemical Flammable liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Hazardous combustion products Combustion products may include the following:
carbon dioxide
carbon monoxide
other hazardous substances.

Special protective actions for fire-fighters Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.

Special remarks on fire hazards Do not use water jet.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel Immediately contact emergency personnel. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Put on appropriate personal protective equipment. Floors may be slippery; use care to avoid falling. Eliminate all ignition sources. Entry into a confined space or poorly ventilated area contaminated with vapor, mist or fume is extremely hazardous without the correct respiratory protective equipment and a safe system of work. Wear self-contained positive pressure breathing apparatus (SCBA).

Section 6. Accidental release measures

| | |
|----------------------------------|--|
| For emergency responders | Entry into a confined space or poorly ventilated area contaminated with vapor, mist or fume is extremely hazardous without the correct respiratory protective equipment and a safe system of work. Wear self-contained breathing apparatus. Wear a suitable chemical protective suit. Chemical resistant boots. See also the information in "For non-emergency personnel". |
| Environmental precautions | Liquid leaks generate large volumes of flammable vapor, heavier than air, which may travel to remote sources of ignition (eg. along drainage systems). Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). |

Methods and materials for containment and cleaning up

| | |
|--------------------|--|
| Small spill | Eliminate all ignition sources. Stop leak if without risk. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. The method and equipment used must be in conformance with appropriate regulations and industry practice on explosive atmospheres. |
| Large spill | Eliminate all ignition sources. Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Dike spill area and do not allow product to reach sewage system and surface or ground water. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations. Use spark-proof tools and explosion-proof equipment. Contaminated absorbent material may pose the same hazard as the spilled product. The method and equipment used must be in conformance with appropriate regulations and industry practice on explosive atmospheres. Dispose of via a licensed waste disposal contractor. |

Section 7. Handling and storage

Precautions for safe handling

| | |
|---|---|
| Protective measures | <p>Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid exposure during pregnancy. Do not swallow. Aspiration hazard if swallowed. Can enter lungs and cause damage. Never siphon by mouth.</p> <p>To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.</p> |
| Advice on general occupational hygiene | Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash thoroughly after handling. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures. |
| Conditions for safe storage, including any incompatibilities | Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Store and use only in equipment/containers designed for use with this product. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. |

| | | |
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Section 7. Handling and storage

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks. Do not enter storage tanks. If entry to vessels is necessary, follow permit to work procedures. Entry to any tanks or other confined space requires a full risk assessment and appropriate control measures to be put in place in conformance with appropriate regulations and industry practice on confined space entry. When the product is pumped (e.g. during filling, discharge or ullaging) and when sampling, there is a risk of static discharge. Ensure equipment used is properly earthed or bonded to the tank structure. Electrical equipment should not be used unless it is intrinsically safe (i.e. will not produce sparks). Explosive air/vapor mixtures may form at ambient temperature. If product comes into contact with hot surfaces, or leaks occur from pressurized fuel pipes, the vapor or mists generated will create a flammability or explosion hazard. Product contaminated rags, paper or material used to absorb spillages, represent a fire hazard, and should not be allowed to accumulate. Dispose of safely immediately after use.

Do not enter storage tanks without breathing apparatus unless the tank has been well ventilated and the tank atmosphere has been shown to contain hydrocarbon vapor concentrations of less than 1% of the lower flammability limit and an oxygen concentration of at least 20% volume.

Light hydrocarbon vapors can build up in the headspace of tanks. These can cause flammability/explosion hazards even at temperatures below the normal flash point (note: flash point must not be regarded as a reliable indicator of the potential flammability of vapor in tank headspaces). Tank headspaces should always be regarded as potentially flammable and care should be taken to avoid static electrical discharge and all ignition sources during filling, ullaging and sampling from storage tanks. When the product is pumped (e.g. during filling, discharge or ullaging) and when sampling, there is a risk of static discharge. Ensure equipment used is properly earthed or bonded to the tank structure. Electrical equipment should not be used unless it is intrinsically safe (i.e. will not produce sparks).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

| Ingredient name | Exposure limits |
|-----------------|--|
| Gasoline | ACGIH TLV (United States). TWA: 300 ppm 8 hours. Issued/Revised: 5/1996 TWA: 890 mg/m ³ 8 hours. Issued/Revised: 5/1996 STEL: 500 ppm 15 minutes. Issued/Revised: 5/1996 STEL: 1480 mg/m ³ 15 minutes. Issued/Revised: 5/1996 |
| Ethanol | ACGIH TLV (United States). STEL: 1000 ppm 15 minutes. Issued/Revised: 11/2008 OSHA PEL (United States). TWA: 1900 mg/m ³ 8 hours. Issued/Revised: 6/1993 TWA: 1000 ppm 8 hours. Issued/Revised: 6/1993 |
| Benzene | ACGIH TLV (United States). Absorbed through skin. STEL: 8 mg/m ³ 15 minutes. Issued/Revised: 5/1997 STEL: 2.5 ppm 15 minutes. Issued/Revised: |

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Language ENGLISH

(US)

(ENGLISH)

Section 8. Exposure controls/personal protection

| | |
|------------------------|---|
| xylene | <p>5/1997 TWA: 1.6 mg/m³ 8 hours. Issued/Revised: 5/1997 TWA: 0.5 ppm 8 hours. Issued/Revised: 5/1997 OSHA PEL (United States). STEL: 5 ppm 15 minutes. Issued/Revised: 6/1993 TWA: 1 ppm 8 hours. Issued/Revised: 6/1993 OSHA PEL Z2 (United States). AMP: 50 ppm 10 minutes. Issued/Revised: 6/1993 CEIL: 25 ppm Issued/Revised: 6/1993 TWA: 10 ppm 8 hours. Issued/Revised: 6/1993</p> <p>ACGIH TLV (United States). STEL: 651 mg/m³ 15 minutes. Issued/Revised: 5/1996 STEL: 150 ppm 15 minutes. Issued/Revised: 5/1996 TWA: 434 mg/m³ 8 hours. Issued/Revised: 5/1996 TWA: 100 ppm 8 hours. Issued/Revised: 5/1996 OSHA PEL (United States). TWA: 435 mg/m³ 8 hours. Issued/Revised: 6/1993 TWA: 100 ppm 8 hours. Issued/Revised: 6/1993</p> |
| toluene | <p>OSHA PEL Z2 (United States). AMP: 500 ppm 10 minutes. Issued/Revised: 6/1993 CEIL: 300 ppm Issued/Revised: 6/1993 TWA: 200 ppm 8 hours. Issued/Revised: 6/1993 ACGIH TLV (United States). TWA: 20 ppm 8 hours. Issued/Revised: 11/2006</p> |
| 1,2,4-Trimethylbenzene | <p>ACGIH TLV (United States). TWA: 123 mg/m³ 8 hours. Issued/Revised: 9/1994 TWA: 25 ppm 8 hours. Issued/Revised: 9/1994</p> |
| ethylbenzene | <p>ACGIH TLV (United States). TWA: 20 ppm 8 hours. Issued/Revised: 12/2010 OSHA PEL (United States). TWA: 435 mg/m³ 8 hours. Issued/Revised: 6/1993 TWA: 100 ppm 8 hours. Issued/Revised: 6/1993</p> |
| cyclohexane | <p>ACGIH TLV (United States). TWA: 100 ppm 8 hours. Issued/Revised: 1/2002 OSHA PEL (United States). TWA: 1050 mg/m³ 8 hours. Issued/Revised: 6/1993 TWA: 300 ppm 8 hours. Issued/Revised: 6/1993</p> |
| naphthalene | <p>ACGIH TLV (United States). Absorbed</p> |

Section 8. Exposure controls/personal protection

through skin.

TWA: 52 mg/m³ 8 hours. Issued/Revised: 5/1996

TWA: 10 ppm 8 hours. Issued/Revised: 5/1996

OSHA PEL (United States).

TWA: 50 mg/m³ 8 hours. Issued/Revised: 6/1993

TWA: 10 ppm 8 hours. Issued/Revised: 6/1993

While specific OELs for certain components may be shown in this section, other components may be present in any mist, vapor or dust produced. Therefore, the specific OELs may not be applicable to the product as a whole and are provided for guidance only.

Appropriate engineering controls

All activities involving chemicals should be assessed for their risks to health, to ensure exposures are adequately controlled. Personal protective equipment should only be considered after other forms of control measures (e.g. engineering controls) have been suitably evaluated. Personal protective equipment should conform to appropriate standards, be suitable for use, be kept in good condition and properly maintained. Your supplier of personal protective equipment should be consulted for advice on selection and appropriate standards. For further information contact your national organisation for standards.

Provide exhaust ventilation or other engineering controls to keep the relevant airborne concentrations below their respective occupational exposure limits.

The final choice of protective equipment will depend upon a risk assessment. It is important to ensure that all items of personal protective equipment are compatible.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.

Appropriate techniques should be used to remove potentially contaminated clothing.

Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Chemical splash goggles.

Skin protection

Hand protection

Wear chemical resistant gloves. Gloves made from fluoroelastomer resistant to hydrocarbons and a wide range of chemicals. Nitrile gloves.

Do not re-use gloves. Protective gloves must give suitable protection against mechanical risks (i.e. abrasion, blade cut and puncture). Protective gloves will deteriorate over time due to physical and chemical damage. Inspect and replace gloves on a regular basis. The frequency of replacement will depend upon the circumstances of use.

Consult your supervisor or Standard Operating Procedure (S.O.P) for special handling instructions.

Body protection

Use of protective clothing is good industrial practice. Cotton or polyester/cotton overalls will only provide protection against light superficial contamination that will not soak through to the skin. Overalls should be laundered on a regular basis. When the risk of skin exposure is high (e.g. when cleaning up spillages or if there is a risk of splashing) then chemical resistant aprons and/or impervious chemical suits and boots will be required. Wear suitable protective clothing. Footwear highly resistant to chemicals. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For greatest effectiveness against static electricity, overalls, boots and gloves should all be anti-static. When there is a risk of ignition wear inherently fire resistant protective clothes and gloves. Work clothing / overalls should be laundered on a regular basis. Laundering of contaminated work clothing should only be done by professional cleaners who have been told about the hazards of the contamination. Always keep contaminated work clothing away from uncontaminated work clothing and uncontaminated personal

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Section 8. Exposure controls/personal protection

clothes. When the risk of skin exposure is high (from experience this could apply to the following tasks: cleaning work, maintenance and service, filling and transfer, taking samples and cleaning up spillages) then a chemical protective suit and boots will be required. Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

Use only with adequate ventilation. Do not breathe vapor or mist. If ventilation is inadequate, use a NIOSH certified respirator with an organic vapor cartridge and P95 particulate filter.

If operating conditions cause high vapor concentrations or the TLV is exceeded, use NIOSH-certified, supplied-air respirator.

Use with adequate ventilation.

In case of insufficient ventilation, wear suitable respiratory equipment.

If there is a requirement for the use of a respiratory protective device, but the use of breathing apparatus (independent of ambient atmosphere) is not required, then a suitable filtering device must be worn.

The filter class must be suitable for the maximum contaminant concentration (gas/vapor/aerosol/particulates) that may arise when handling the product.

The correct choice of respiratory protection depends upon the chemicals being handled, the conditions of work and use, and the condition of the respiratory equipment. Safety procedures should be developed for each intended application. Respiratory protection equipment should therefore be chosen in consultation with the supplier/manufacturer and with a full assessment of the working conditions.

Section 9. Physical and chemical properties

Appearance

| | |
|--|---|
| Physical state | Liquid. |
| Color | Clear |
| Odor | Hydrocarbon. |
| Odor threshold | Not available. |
| pH | Not available. |
| Melting point | Not available. |
| Boiling point | 26.67 to 221°C (80 to 430°F) |
| Flash point | Closed cup: -42.778°C (-45°F) |
| Evaporation rate | Not available. |
| Flammability (solid, gas) | Not applicable. Based on - Physical state |
| Lower and upper explosive (flammable) limits | Lower: 1.3% Upper: 7.6% (Estimated.) |
| Vapor pressure | 48.134 to 103.146 kPa (361.97 to 775.66 mm Hg) |
| Vapor density | 3 to 4 [Air = 1] |
| Density | 750 kg/m ³ (0.75 g/cm ³) |
| Solubility | Very slightly soluble in water |
| Solubility | Very slightly soluble in the following materials: cold water. |
| Partition coefficient: n-octanol/water | >3 |
| Auto-ignition temperature | 257°C (494.6°F) |
| Decomposition temperature | Not available. |
| Viscosity | Not available. |

Section 10. Stability and reactivity

| | |
|---|---|
| Reactivity | No specific test data available for this product. Refer to Conditions to avoid and Incompatible materials for additional information. |
| Chemical stability | The product is stable. |
| Possibility of hazardous reactions | Under normal conditions of storage and use, hazardous reactions will not occur. Under normal conditions of storage and use, hazardous polymerization will not occur. |
| Conditions to avoid | Keep away from heat, sparks and flame. Avoid all possible sources of ignition (spark or flame). |
| Incompatible materials | Reactive or incompatible with the following materials: oxidizing materials. Chlorine and Fluorine |
| Hazardous decomposition products | Under normal conditions of storage and use, hazardous decomposition products should not be produced. |

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

| Product/ingredient name | Test | Species | Result | Exposure | Remarks |
|---------------------------|-----------------------|---------|-----------------------------------|----------|-------------------|
| Gasoline | LC50 Inhalation Vapor | Rat | >5610 g/m ³ analytical | 4 hours | Based on Gasoline |
| | LC50 Inhalation Vapor | Rat | >7630 mg/m ³ Nominal | 4 hours | Based on Gasoline |
| | LD50 Dermal | Rabbit | >2000 mg/kg | - | Based on Gasoline |
| | LD50 Oral | Rat | >5000 mg/kg | - | Based on Gasoline |
| Ethanol | LC50 Inhalation Vapor | Rat | 124.7 mg/l | 4 hours | Based on Ethanol |
| | LC50 Inhalation Vapor | Rat | 116.9 mg/l | 4 hours | Based on Ethanol |
| | LC50 Inhalation Vapor | Rat | 133.8 mg/l | 4 hours | Based on Ethanol |
| | LD50 Oral | Rat | 10470 mg/kg | - | Based on Ethanol |
| Conclusion/Summary | Not available. | | | | |

Irritation/Corrosion

| Product/ingredient name | Species | Result | Score | Exposure | Observation | Conc. | Remarks |
|-------------------------|---------|------------------------------------|-------|----------|-------------|-------|-------------------|
| Gasoline | Rabbit | Skin - Irritant | - | - | - | - | Based on Gasoline |
| | Rabbit | Eyes - Non-irritating to the eyes. | - | - | - | - | Based on Gasoline |
| Ethanol | Rabbit | Skin - Non-irritant to skin. | - | - | - | - | Based on Ethanol |

| | | | | | |
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| | | | | | | |
|--------|-----------------------|---|---|---|---|------------------|
| Rabbit | Eyes - Cornea opacity | - | - | - | - | Based on Ethanol |
| Rabbit | Eyes - Iris lesion | - | - | - | - | Based on Ethanol |
| Rabbit | Eyes - Irritant | - | - | - | - | Based on Ethanol |

Sensitizer

| Product/ingredient name | Route of exposure | Species | Result | Remarks |
|-------------------------|-------------------|------------|-----------------|-------------------|
| Gasoline | skin | Guinea pig | Not sensitizing | Based on Gasoline |

Mutagenicity

| Product/ingredient name | Test | Experiment | Result | Remarks |
|---------------------------|----------------------------|---|----------|------------------------------------|
| Gasoline | Equivalent to OECD 476 | Experiment: In vitro Subject: Mammal - species unspecified | Negative | Based on Gasoline |
| | Equivalent to OECD 471 | Experiment: In vitro Subject: Non-mammalian species | Negative | Based on Gasoline |
| | EPA OPPTS 870.5395 | Experiment: In vivo Subject: Unspecified Cell: Germ | Negative | Based on Gasoline vapor condensate |
| | Equivalent to OECD 475 | Experiment: In vivo Subject: Unspecified Cell: Germ | Negative | Based on Gasoline |
| Ethanol | Equivalent to OECD 476 | Experiment: In vitro Subject: Mammal - species unspecified | Negative | Based on Ethanol |
| | Equivalent to OECD 473 | Experiment: In vitro Subject: Non-mammalian species | Negative | Based on Ethanol |
| | Equivalent to OECD 478 | Experiment: In vivo Subject: Unspecified Cell: Germ | Negative | Based on Ethanol |
| Conclusion/Summary | May cause genetic defects. | | | |

Carcinogenicity

| Product/ingredient name | Test | Species | Route | Duration | Result | Remarks |
|-------------------------|------------------------|---------|------------|-----------|-------------------------------------|-------------------|
| Gasoline | Equivalent to OECD 451 | Rat | Inhalation | 113 weeks | Negative - Inhalation - Unspecified | Based on Gasoline |
| | Equivalent to OECD 451 | Mouse | Dermal | 102 weeks | Negative - Dermal - Unspecified | Based on Gasoline |
| Ethanol | EPA OPPTS 870.4200 | Mouse | Oral | 105 weeks | Positive - Oral - Unspecified | Based on Ethanol |

Section 11. Toxicological information

Equivalent - Rat Oral 104 weeks Negative - Based on
to OECD Oral - Ethanol
Unspecified

Conclusion/Summary May cause cancer

Classification

| Product/ingredient name | OSHA | IARC | NTP |
|-------------------------|------|------|--|
| Gasoline | - | 2B | - |
| toluene | - | 3 | - |
| xylene | - | 3 | - |
| Benzene | + | 1 | Known to be a human carcinogen. |
| ethylbenzene | - | 2B | - |
| naphthalene | - | 2B | Reasonably anticipated to be a human carcinogen. |

IARC :

1 - Carcinogenic to human.

2B - Possible carcinogen to human.

3 - Not classifiable as a human carcinogen.

NTP :

Proven - Known to be human carcinogens.

Possible - Reasonably anticipated to be human carcinogens.

OSHA :

+ Potential occupational carcinogen

Reproductive toxicity

| Product/ingredient name | Maternal toxicity | Fertility | Development toxin | Species | Result | Exposure |
|-------------------------|-------------------|-----------|-------------------|---------|------------|--------------|
| Gasoline | - | Negative | - | Rat | Inhalation | 2 generation |
| | - | - | Negative | Rat | Inhalation | 14 days |
| Ethanol | - | Positive | - | Rat | Oral | 2 generation |
| | - | - | Negative | Rat | Inhalation | 18 days |

Conclusion/Summary

Development: Suspected of damaging the unborn child.

Fertility: Not classified. Based on available data, the classification criteria are not met.

Effects on or via lactation: Not classified. Based on available data, the classification criteria are not met.

Specific target organ toxicity (single exposure)

| Name | Category | Route of exposure | Target organs |
|------------------------|------------|-------------------|------------------------------|
| Gasoline | Category 3 | Not applicable. | Narcotic effects |
| xylene | Category 3 | Not applicable. | Respiratory tract irritation |
| toluene | Category 3 | Not applicable. | Narcotic effects |
| 1,2,4-Trimethylbenzene | Category 3 | Not applicable. | Respiratory tract irritation |
| ethylbenzene | Category 3 | Not applicable. | Respiratory tract irritation |
| cyclohexane | Category 3 | Not applicable. | Narcotic effects |

Specific target organ toxicity (repeated exposure)

| Name | Category | Route of exposure | Target organs |
|---------|------------|-------------------|---------------|
| toluene | Category 2 | Not determined | ears |
| Benzene | Category 1 | Not determined | blood system |

Aspiration hazard

| | | | | | |
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| Name | Result |
|--------------|--------------------------------|
| Gasoline | ASPIRATION HAZARD - Category 1 |
| xylene | ASPIRATION HAZARD - Category 1 |
| toluene | ASPIRATION HAZARD - Category 1 |
| Benzene | ASPIRATION HAZARD - Category 1 |
| ethylbenzene | ASPIRATION HAZARD - Category 1 |
| cyclohexane | ASPIRATION HAZARD - Category 1 |

Information on the likely routes of exposure Routes of entry anticipated: Oral, Dermal, Inhalation.

Potential acute health effects

| | |
|---------------------|--|
| Eye contact | Causes serious eye irritation. |
| Skin contact | Causes skin irritation. |
| Inhalation | Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness. |
| Ingestion | Can cause central nervous system (CNS) depression. Irritating to mouth, throat and stomach. Aspiration hazard if swallowed – harmful or fatal if liquid is aspirated into lungs. |

Symptoms related to the physical, chemical and toxicological characteristics

| | |
|---------------------|--|
| Eye contact | Adverse symptoms may include the following: pain or irritation watering redness |
| Skin contact | Adverse symptoms may include the following: irritation redness reduced fetal weight increase in fetal deaths skeletal malformations |
| Inhalation | Adverse symptoms may include the following: nausea or vomiting headache drowsiness/fatigue dizziness/vertigo unconsciousness |
| Ingestion | Adverse symptoms may include the following: nausea or vomiting reduced fetal weight increase in fetal deaths skeletal malformations |

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

| | |
|------------------------------------|----------------|
| Potential immediate effects | Not available. |
| Potential delayed effects | Not available. |

Long term exposure

| | |
|------------------------------------|----------------|
| Potential immediate effects | Not available. |
| Potential delayed effects | Not available. |

Potential chronic health effects

| | |
|------------------------------|---|
| General | Solvent "sniffing" (abuse) or intentional overexposure to vapors can produce serious central nervous system effects, including unconsciousness, and possibly death. |
| Carcinogenicity | May cause cancer. Risk of cancer depends on duration and level of exposure. |
| Mutagenicity | May cause genetic defects. |
| Teratogenicity | Suspected of damaging the unborn child. |
| Developmental effects | No known significant effects or critical hazards. |

| | | | | | |
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Fertility effects No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Other information Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

Additional information Gasoline - Excess exposure to vapors may produce headaches, dizziness, nausea, drowsiness, irritation of eyes, nose and throat and central nervous system depression. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Inhalation of unleaded gasoline vapors did not produce birth defects in laboratory animals. Ingestion of this material can cause gastrointestinal irritation and diarrhea.

In a long-term inhalation study of whole unleaded gasoline vapors, exposure-related kidney damage and kidney tumors were observed in male rats. Similar kidney effects were not seen in female rats or in mice. At the highest exposure level (2056 ppm), female mice had an increased incidence of liver tumors. Results from subsequent scientific studies have shown that a broad variety of chemicals cause these kidney effects only in the male rat. Further studies have discovered the means by which the physiology of the male rat uniquely predispose it to these effects. Consequently, the Risk Assessment Forum of the Environmental Protection Agency has recognized that these responses are not predictive of a human health hazard. The liver tumors that were increased in the high-dose female mice are likewise of questionable significance because of their high spontaneous occurrence even without chemical exposure and because the rate of their occurrence is accelerated by a broad spectrum of chemicals not commonly considered to be carcinogens (e.g., phenobarbital). Thus, the significance of the mouse liver tumor response in terms of human health is questionable.

Gasoline is a complex mixture of hydrocarbons and contains benzene (typically no more than 2 volume%), toluene, and xylene. Chronic exposure to high levels of benzene has been shown to cause cancer (leukemia) in humans and other adverse blood effects (anemia). Benzene is considered a human carcinogen by IARC, NTP and OSHA. Over exposure to xylene and toluene can cause irritation to the upper respiratory tract, headache and narcosis. Some liver damage and lung inflammation were seen in chronic studies on xylene in guinea pigs but not in rats.

Solvent "sniffing" (abuse) or intentional overexposure to vapors can produce serious central nervous system effects, including unconsciousness, and possibly death.

Gasoline as a mixture is classified as a 2B (possible human) carcinogen by IARC.

Gasoline engine exhaust is classified as possibly carcinogenic to humans by IARC (2B). This classification is based primarily on animal and in vitro studies of gasoline engine exhaust condensates/extracts. Studies of the gaseous exhaust stream in animals did not provide sufficient evidence for classification as a carcinogen.

Gasoline: Additional toxicity information on the components:

Benzene: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

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Benzene: Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC), the National Toxicology Program, and OSHA consider benzene to be a human carcinogen. Chronic exposures to high levels of benzene have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to higher dosage levels resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level. Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material.

Toluene: Aspiration of this material into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this material. Deliberate inhalation of high concentrations of toluene has been linked to damage of the brain, liver and kidney. Inhalation of very high concentrations of toluene, such as in cases of solvent abuse, has resulted in sudden death which may be a result of cardiac arrhythmia or central nervous system depression. Mental and/or growth retardation has been reported in children of women who deliberately inhale toluene during pregnancy (usually at thousands of ppm). Fetal developmental toxicity was observed when pregnant rats were exposed to toluene at levels of 1500 ppm. Maternal toxicity was also observed at this concentration. Prolonged, high level exposure to toluene in laboratory animals has resulted in hearing loss. Exposure studies in rats have resulted in adverse effects on the kidney, liver and central nervous system. Studies in occupationally exposed individuals indicate that toluene exposure has been associated with impaired color vision and decreased performance in some neurobehavioral tests. There are occupational studies which report an association between inhalation exposure to toluene and adverse effects on reproduction including spontaneous abortion. The methodology of these studies and the reliability of the results have been questioned. In a two-generation study in rats, inhalation of toluene at levels up to 2000 ppm did not produce adverse effects on fertility or reproductive performance.

Xylenes: Xylene has been reported to cause central nervous system effects at concentrations above the recommended exposure limit. Xylene vapor becomes irritating at relatively high levels. In one study, eye irritation was reported at exposures of 460 ppm and in one person at 230 ppm after 15 minutes. In another study, no one reported eyes, nose and throat irritation at mixed xylene exposures up to 230 ppm for 30 minutes. Dermal LD50 is expected to be greater than 10g/kg in rabbits, based on test results from similar materials.

Mixed xylenes caused slight hearing loss in rats exposed to 800 ppm in the air for 14 hours/day for six weeks. There is no information available for lower concentrations; however, similar chemicals that have caused these hearing effects at similar concentrations have not caused effects at lower concentrations.

Pregnant animals exposed to xylene or its isomers have been reported to cause development toxicity in rodents when exposed by inhalation. The developmental effects observed consisted of delayed development and minor skeletal variations, but no malformations. Because of the high exposure levels used in these studies, we do not believe that these results imply an increased risk of reproductive toxicity to workers exposed to xylene levels at or below the exposure limits.

Xylene and its isomers are not genotoxic.

Technical grade xylene has been tested in a National Toxicology Program carcinogenicity study in rats and mice dosed orally for two years. There was no evidence of carcinogenicity.

Ethylbenzene: The National Toxicology Program (NTP) conducted a 13-week inhalation study with male and female rats and mice at exposure concentrations ranging from 100

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to 1000 ppm ethylbenzene. No rats or mice died during the study. Kidney, liver, and lung weights were increased in the exposed rats, while weight increases were observed only in the livers of exposed mice. Treatment-related histopathologic changes were not observed in any tissues of rats and mice.

NTP also exposed male and female rats and mice by inhalation to 0, 75, 250, or 750 ppm ethylbenzene for 2 years. There was a statistically significant increase in the number of kidney tumors in male and female rats at 750 ppm. There were also increased incidences of lung tumors in male mice and liver tumors in female mice that were statistically significant at 750 ppm. Except for the male rat kidney tumors, the incidence of the tumors were within the range observed for non-exposed animals from other studies conducted by NTP. The significance of these findings to humans is unknown. Ethylbenzene is not genotoxic. The International Agency for Research on Cancer (IARC) has evaluated ethylbenzene and found it to be possibly carcinogenic to humans (Group 2B).

Ethylbenzene is not genotoxic.

This product contains trimethylbenzenes. These compounds cause irritation to the eyes, nose and respiratory tract. Repeated dermal exposure can defat and irritate the skin. Inhalation may cause dizziness and drowsiness. Studies in laboratory animals with mixtures of C9 aromatic hydrocarbons produced adverse effects on development such as increased fetal mortality, reduced fetal weight, and delayed ossification at high exposure concentrations. Effects were reduced if exposure was terminated prior to delivery. There was no evidence of reproductive toxicity.

Naphthalene has been reported to cause developmental toxicity in mice after oral exposure to relatively high dose levels, but developmental toxicity was not observed in NTP (National Toxicology Program) sponsored studies in rats and rabbits. Ingestion or inhalation of naphthalene can result in hemolysis and other blood abnormalities, and individuals (and infants) deficient in glucose-6-phosphate dehydrogenase may be especially susceptible to these effects. Inhalation of naphthalene may cause headache and nausea. Airborne exposure can result in eye irritation. Naphthalene exposure has been associated with cataracts in animals and humans.

Ethanol - Human data: In humans excessive consumption of alcoholic beverages during pregnancy is associated with the induction of Fetal Alcohol Syndrome in the offspring. Reduced birth weight and physical and mental defects occur. There is no evidence that such effects might be caused by exposures other than direct ingestion of alcoholic drinks. In humans high lifetime consumption of alcoholic beverages can be associated with certain cancers and effects on the liver. There is no evidence that these can be caused by exposure other than direct ingestion of alcoholic drinks (IARC 1988).

Section 12. Ecological information

Toxicity

No testing has been performed by the manufacturer.

| Product/ingredient name | Species | Test/Result | Exposure | Effects | Remarks |
|-------------------------|----------------|---|----------|-------------------|--------------------------------------|
| Gasoline | Micro-organism | Acute EC50 15.41 mg/l Nominal Fresh water | 40 hours | growth inhibition | - |
| | Algae | Acute EL50 3.1 mg/l Nominal Fresh water | 72 hours | (growth rate) | Based on Gasoline |
| | Algae | Acute EL50 3.7 mg/l Nominal Fresh water | 96 hours | (growth rate) | Based on Gasoline |
| | Daphnia | Acute EL50 4.5 mg/l Nominal Fresh water | 48 hours | Mobility | Based on straight-run light gasoline |
| | Fish | Acute LL50 10 mg/l Nominal | 96 hours | Mortality | Based on Naphtha |

| | | | | | |
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| | Fresh water | | | (petroleum), isomerisation | |
|--------------|--|----------------|---------------|---|------------------|
| Fish | Acute LL50 8.2 mg/l Nominal Fresh water | 96 hours | Mortality | Based on Naphtha (petroleum), light alkylate | |
| Algae | Acute NOELR 0. 5 mg/l Nominal Fresh water | 72 hours | (growth rate) | Based on Gasoline | |
| Daphnia | Acute NOELR 0. 5 mg/l Nominal Fresh water | 48 hours | Mobility | Based on Straight run gas oil | |
| Daphnia | Chronic EL50 10 mg/l Nominal Fresh water | 21 days | Reproduction | Based on Naphtha (petroleum), light alkylate | |
| Daphnia | Chronic EL50 >40 mg/l Nominal Fresh water | 21 days | Mobility | Based on Naphtha (petroleum), light alkylate | |
| Fish | Chronic EL50 10 mg/l Nominal Fresh water | 21 days | Reproduction | Based on: Naphtha (petroleum), light alkylate; read across between species | |
| Fish | Chronic LL50 5.2 mg/l Nominal Fresh water | 14 days | Mortality | Based on Naphtha (petroleum), light catalytic reformed | |
| Daphnia | Chronic NOELR 2.6 mg/l Nominal Fresh water | 21 days | Reproduction | Based on Naphtha (petroleum), light alkylate | |
| Daphnia | Chronic NOELR 16 mg/l Nominal Fresh water | 21 days | Mobility | Based on Naphtha (petroleum), light alkylate | |
| Fish | Chronic NOELR 2.6 mg/l Nominal Fresh water | 14 days | Mortality | Based on Naphtha (petroleum), light catalytic reformed | |
| Fish | Chronic NOELR 2.6 mg/l Nominal Fresh water | 21 days | Reproduction | Based on: Naphtha (petroleum), light alkylate; read across between species | |
| soil, plants | Chronic PNEC >0. 4 mg/kg | - | - | - | |
| Ethanol | Algae | EC50 675 mg/l | 4 days | - | Based on Ethanol |
| | Aquatic plants | EC50 4432 mg/l | 7 days | - | Based on Ethanol |

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| | | | | |
|---------|-----------------------|----------|---|------------------|
| Daphnia | Acute LC50 5012 mg/l | 48 hours | - | Based on Ethanol |
| Fish | Acute LC50 153 g/l | 96 hours | - | Based on Ethanol |
| Fish | Acute LC50 14.2 g/l | 96 hours | - | Based on Ethanol |
| Daphnia | Chronic LC50 2 mg/l | 10 days | - | Based on Ethanol |
| Daphnia | Chronic LC50 9.6 mg/l | 9 days | - | Based on Ethanol |

Conclusion/Summary Not available.

Persistence and degradability

Partially biodegradable.

| Product/ingredient name | Test | Result | Remarks |
|-------------------------|------|--------------------------|------------------|
| Ethanol | EPA | 95 % - Readily - 15 days | Based on Ethanol |
| | EPA | 84 % - Readily - 20 days | Based on Ethanol |
| | EPA | 74 % - Readily - 5 days | Based on Ethanol |
| | EPA | 74 % - Readily - 10 days | Based on Ethanol |

Conclusion/Summary Not available.

| Product/ingredient name | Aquatic half-life | Photolysis | Biodegradability |
|-------------------------|-------------------|------------|------------------|
| Ethanol | - | - | Readily |

Bioaccumulative potential

This product is not expected to bioaccumulate through food chains in the environment.

Mobility in soil

Soil/water partition coefficient (K_{oc}) Not available.

Mobility Spillages may penetrate the soil causing ground water contamination.

Other ecological information Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

Section 13. Disposal considerations

Disposal methods The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.






United States - RCRA Toxic hazardous waste "U" List

| | | |
|---|---------------------------|--------------------------------------|
| Product name BP Unleaded Gasolines | Product code 12631 | Page: 17/21 |
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Section 13. Disposal considerations

| Ingredient | CAS # | Status | Reference number |
|--|-----------|--------|------------------|
| Xylene | 1330-20-7 | Listed | U239 |
| Toluene; Benzene, methyl- | 108-88-3 | Listed | U220 |
| Benzene (l,T) | 71-43-2 | Listed | U019 |
| Cyclohexane (l); Benzene, hexahydro- (l) | 110-82-7 | Listed | U056 |

Section 14. Transport information

| | DOT Classification | TDG Classification | IMDG | IATA |
|----------------------------|---|--|--|---|
| UN number | UN1203 | UN1203 | UN1203 | UN1203 |
| UN proper shipping name | GASOLINE | GASOLINE | MOTOR SPIRIT or GASOLINE or PETROL MARINE POLLUTANT | Motor spirit or Gasoline or Petrol |
| Transport hazard class(es) | 3  | 3  | 3   | 3  |
| Packing group | II | II | II | ---- |
| Environmental hazards | No. | No. | Yes. | No. |
| Additional information | <p>Reportable quantity 333.33 lbs / 151.33 kg [53.304 gal / 201.78 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.</p> <p>Limited quantity Yes.</p> <p>Packaging instruction Passenger aircraft Quantity</p> | <p>The marine pollutant mark is not required when transported by road or rail.</p> <p>Explosive Limit and Limited Quantity Index 30</p> <p>Passenger Carrying Ship Index 100</p> <p>Passenger Carrying Road or Rail Index 5</p> <p>Special provisions 17, 82, 88</p> | <p>The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.</p> <p>Emergency schedules (EmS) F-E, S-E</p> <p>Special provisions 243</p> | <p>The environmentally hazardous substance mark may appear if required by other transportation regulations.</p> <p>Passenger and Cargo Aircraft Quantity limitation: 5 L Packaging instructions: 353</p> <p>Cargo Aircraft Only Quantity limitation: 60 L Packaging instructions: 364</p> <p>Limited Quantities - Passenger Aircraft</p> |

Section 14. Transport information

| | | | | |
|--|--|--|--|---------------------------------------|
| | limitation: 5 L | | | Quantity limitation: 1 L |
| | Cargo aircraft Quantity limitation: 60 L | | | Packaging instructions: Y341 |
| | Special provisions 144, 177, B1, B33, IB2, T4, TP1 | | | Special provisions A100 |

Special precautions for user Not available.

Transport in bulk according
to Annex II of MARPOL
73/78 and the IBC Code

Proper shipping name

MARPOL Annex 1 rules apply for bulk shipments by
sea.
Category: gasoline and spirits

Section 15. Regulatory information

U.S. Federal regulations

United States inventory
(TSCA 8b)

All components are listed or exempted.

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 311/312

Classification

Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

SARA 313

| | Product name | CAS number | Concentration |
|--|------------------------|------------|---------------|
| Form R - Reporting requirements | toluene | 108-88-3 | 4 - 11 |
| | xylene | 1330-20-7 | 4 - 11 |
| | Benzene | 71-43-2 | 0 - 3 |
| | 1,2,4-Trimethylbenzene | 95-63-6 | 0 - 3 |
| | ethylbenzene | 100-41-4 | 0 - 2 |
| | cyclohexane | 110-82-7 | 0 - 1 |
| | naphthalene | 91-20-3 | 0 - 0.5 |
| Supplier notification | toluene | 108-88-3 | 4 - 11 |
| | xylene | 1330-20-7 | 4 - 11 |
| | Benzene | 71-43-2 | 0 - 3 |
| | 1,2,4-Trimethylbenzene | 95-63-6 | 0 - 3 |
| | ethylbenzene | 100-41-4 | 0 - 2 |
| | cyclohexane | 110-82-7 | 0 - 1 |
| | naphthalene | 91-20-3 | 0 - 0.5 |

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts

The following components are listed: XYLENE; TOLUENE; ETHYL ALCOHOL;
BENZENE; PSEUDOCUMENE; ETHYL BENZENE; CYCLOHEXANE

New Jersey

The following components are listed: XYLENES; BENZENE, DIMETHYL-; TOLUENE;
BENZENE, METHYL-; ETHYL ALCOHOL; ALCOHOL; BENZENE; PSEUDOCUMENE; 1,
2,4-TRIMETHYL BENZENE; ETHYL BENZENE; BENZENE, ETHYL-; CYCLOHEXANE;
NAPHTHALENE; MOTH FLAKES

| | | | | | |
|--------------|-----------------------|---------------|-------------|----------|-----------|
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Section 15. Regulatory information

| | |
|---------------------|--|
| Pennsylvania | The following components are listed: GASOLINE; BENZENE, DIMETHYL-; BENZENE, METHYL-; DENATURED ALCOHOL; BENZENE; PSEUDOCUMENE; BENZENE, ETHYL-; CYCLOHEXANE; NAPHTHALENE |
| California Prop. 65 | WARNING: This product contains a chemical known to the State of California to cause cancer. ethylbenzene; naphthalene; cumene WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. toluene WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm. Benzene Other Prop 65 chemicals will result under certain conditions from the use of this material. For example, burning fuels produces combustion products including carbon monoxide, a Prop 65 reproductive toxin. |

Other regulations

| | |
|-------------------------------|---|
| Australia inventory (AICS) | At least one component is not listed. |
| Canada inventory | All components are listed or exempted. |
| China inventory (IECSC) | At least one component is not listed. |
| Japan inventory (ENCS) | At least one component is not listed. |
| Korea inventory (KECI) | At least one component is not listed. |
| Philippines inventory (PICCS) | At least one component is not listed. |
| Taiwan inventory (CSNN) | |
| REACH Status | For the REACH status of this product please consult your company contact, as identified in Section 1. |

Section 16. Other information

Hazardous Material Information System (U.S.A.)

| | | |
|---------------------|---|---|
| Health | * | 2 |
| Flammability | | 3 |
| Physical hazards | | 0 |
| Personal protection | | X |

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

National Fire Protection Association (U.S.A.)



History

| | |
|--------------------------------|-------------------------|
| Date of issue/Date of revision | 12/16/2014. |
| Date of previous issue | No previous validation. |

| | | | | | |
|--------------|-----------------------|---------------|-------------|----------|-----------|
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| | | | (US) | Language | ENGLISH |
| | | | | | (ENGLISH) |

Section 16. Other information

Key to abbreviations

ACGIH = American Conference of Industrial Hygienists
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
CAS Number = Chemical Abstracts Service Registry Number
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
OEL = Occupational Exposure Limit
SDS = Safety Data Sheet
STEL = Short term exposure limit
TWA = Time weighted average
UN = United Nations
UN Number = United Nations Number, a four digit number assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.

✔ Indicates information that has changed from previously issued version.

Notice to reader

All reasonably practicable steps have been taken to ensure this data sheet and the health, safety and environmental information contained in it is accurate as of the date specified below. No warranty or representation, express or implied is made as to the accuracy or completeness of the data and information in this data sheet.

The data and advice given apply when the product is sold for the stated application or applications. You should not use the product other than for the stated application or applications without seeking advice from BP Group.

It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. The BP Group shall not be responsible for any damage or injury resulting from use, other than the stated product use of the material, from any failure to adhere to recommendations, or from any hazards inherent in the nature of the material. Purchasers of the product for supply to a third party for use at work, have a duty to take all necessary steps to ensure that any person handling or using the product is provided with the information in this sheet. Employers have a duty to tell employees and others who may be affected of any hazards described in this sheet and of any precautions that should be taken. You can contact the BP Group to ensure that this document is the most current available. Alteration of this document is strictly prohibited.

| | | | | | |
|--------------|-----------------------|---------------|-------------|----------|----------------------|
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| | | | | Language | ENGLISH (ENGLISH) |

SAFETY DATA SHEET

Product Trade Name: HOLEPLUG® 3/4

Revision Date: 20-Apr-2017

Revision Number: 16

1. Identification

1.1. Product Identifier

Product Trade Name: HOLEPLUG® 3/4
Synonyms: None
Chemical Family: Mineral
Internal ID Code: HM003666

1.2 Recommended use and restrictions on use

Application: Fluid Loss Additive
Uses advised against: No information available

1.3 Manufacturer's Name and Contact Details

Manufacturer/Supplier

Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251

Halliburton Energy Services
645 - 7th Ave SW Suite 1800
Calgary, AB
T2P 4G8
Canada

Prepared By: Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

1.4. Emergency telephone number

Emergency Telephone Number: 1-866-519-4752 or 1-760-476-3962
Global Incident Response Access Code: 334305
Contract Number: 14012

2. Hazards Identification

2.1 Classification in accordance with paragraph (d) of §1910.1200

| | |
|--|--------------------|
| Carcinogenicity | Category 1A - H350 |
| Specific Target Organ Toxicity - (Repeated Exposure) | Category 2 - H373 |

2.2. Label Elements

Hazard Pictograms



| | |
|---------------------------------|--|
| Signal Word: | Danger |
| Hazard Statements | H350 - May cause cancer by inhalation H372 - Causes damage to organs through prolonged or repeated exposure if inhaled |
| Precautionary Statements | |
| Prevention | P201 - Obtain special instructions before use P202 - Do not handle until all safety precautions have been read and understood P260 - Do not breathe dust/fume/gas/mist/vapors/spray P264 - Wash face, hands and any exposed skin thoroughly after handling P270 - Do not eat, drink or smoke when using this product P280 - Wear protective gloves/eye protection/face protection |
| Response | P308 + P313 - IF exposed or concerned: Get medical advice/attention P314 - Get medical attention/advice if you feel unwell |
| Storage | P405 - Store locked up |
| Disposal | P501 - Dispose of contents/container in accordance with local/regional/national/international regulations |

2.3 Hazards not otherwise classified

None known

3. Composition/information on Ingredients

| Substances | CAS Number | PERCENT (w/w) | GHS Classification - US |
|----------------------------------|------------|---------------|-------------------------------------|
| Crystalline silica, quartz | 14808-60-7 | 1 - 5% | Carc. 1A (H350) STOT RE 1 (H372) |
| Crystalline silica, cristobalite | 14464-46-1 | 0.1 - 1% | Carc. 1A (H350) STOT RE 1 (H372) |
| Crystalline silica, tridymite | 15468-32-3 | 0.1 - 1% | Carc. 1A (H350) STOT RE 1 (H372) |

The exact percentage (concentration) of the composition has been withheld as proprietary.

4. First Aid Measures

4.1. Description of first aid measures

| | |
|-------------------|---|
| Inhalation | If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult. |
| Eyes | In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists. |
| Skin | Wash with soap and water. Get medical attention if irritation persists. |
| Ingestion | Under normal conditions, first aid procedures are not required. |

4.2 Most important symptoms/effects, acute and delayed

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

4.3. Indication of any immediate medical attention and special treatment needed**Notes to Physician**

Treat symptomatically.

5. Fire-fighting measures**5.1. Extinguishing media****Suitable Extinguishing Media**

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

5.2 Specific hazards arising from the substance or mixture**Special exposure hazards in a fire**

Not applicable

5.3 Special protective equipment and precautions for fire-fighters**Special protective equipment for firefighters**

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**

Use appropriate protective equipment. Avoid creating and breathing dust.

See Section 8 for additional information

6.2. Environmental precautions

None known.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage**7.1. Precautions for safe handling****Handling Precautions**

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities**Storage Information**

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 60 months.

8. Exposure Controls/Personal Protection**8.1 Occupational Exposure Limits**

| Substances | CAS Number | OSHA PEL-TWA | ACGIH TLV-TWA |
|----------------------------|------------|---------------------------|------------------------------|
| Crystalline silica, quartz | 14808-60-7 | TWA: 50 µg/m ³ | TWA: 0.025 mg/m ³ |

| | | | |
|----------------------------------|------------|---------------|------------------|
| Crystalline silica, cristobalite | 14464-46-1 | TWA: 50 µg/m³ | TWA: 0.025 mg/m³ |
| Crystalline silica, tridymite | 15468-32-3 | TWA: 50 µg/m³ | Not applicable |

8.2 Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

8.3 Individual protection measures, such as personal protective equipment

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:

Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid **Color** Tan to Gray
Odor: Mild earthy **Odor** No information available
Threshold:

| <u>Property</u> | <u>Values</u> |
|---|--------------------------|
| <u>Remarks/ - Method</u> | |
| pH: | 7.5 |
| Freezing Point / Range | No data available |
| Melting Point / Range | No data available |
| Boiling Point / Range | No data available |
| Flash Point | No data available |
| Flammability (solid, gas) | No data available |
| Upper flammability limit | No data available |
| Lower flammability limit | No data available |
| Evaporation rate | No data available |
| Vapor Pressure | No data available |
| Vapor Density | No data available |
| Specific Gravity | 2.12 |
| Water Solubility | Insoluble in water |
| Solubility in other solvents | No data available |
| Partition coefficient: n-octanol/water | No data available |
| Autoignition Temperature | No data available |
| Decomposition Temperature | No data available |
| Viscosity | No data available |
| Explosive Properties | No information available |
| Oxidizing Properties | No information available |

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Hydrofluoric acid.

10.6. Hazardous decomposition products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information**11.1 Information on likely routes of exposure**

Principle Route of Exposure Eye or skin contact, inhalation.

11.2 Symptoms related to the physical, chemical and toxicological characteristics**Acute Toxicity****Inhalation**

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact
Skin Contact
Ingestion

May cause mechanical irritation to eye.
None known.
None known.

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline

silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

11.3 Toxicity data

Toxicology data for the components

| Substances | CAS Number | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|----------------------------------|------------|---|-------------------|-------------------|
| Crystalline silica, quartz | 14808-60-7 | > 15000 mg/kg (human) | No data available | No data available |
| Crystalline silica, cristobalite | 14464-46-1 | > 15000 mg/kg (human) (similar substance) | No data available | No data available |
| Crystalline silica, tridymite | 15468-32-3 | >15,000 mg/kg (Human) | No data available | No data available |

| Substances | CAS Number | Skin corrosion/irritation |
|----------------------------------|------------|----------------------------|
| Crystalline silica, quartz | 14808-60-7 | Non-irritating to the skin |
| Crystalline silica, cristobalite | 14464-46-1 | Non-irritating to the skin |
| Crystalline silica, tridymite | 15468-32-3 | Non-irritating to the skin |

| Substances | CAS Number | Serious eye damage/irritation |
|----------------------------------|------------|--|
| Crystalline silica, quartz | 14808-60-7 | Non-irritating to the eye |
| Crystalline silica, cristobalite | 14464-46-1 | Mechanical irritation of the eyes is possible. |
| Crystalline silica, tridymite | 15468-32-3 | Mechanical irritation of the eyes is possible. |

| Substances | CAS Number | Skin Sensitization |
|----------------------------------|------------|---------------------------|
| Crystalline silica, quartz | 14808-60-7 | No information available. |
| Crystalline silica, cristobalite | 14464-46-1 | No information available |
| Crystalline silica, tridymite | 15468-32-3 | No information available |

| Substances | CAS Number | Respiratory Sensitization |
|----------------------------------|------------|---------------------------|
| Crystalline silica, quartz | 14808-60-7 | No information available |
| Crystalline silica, cristobalite | 14464-46-1 | No information available |
| Crystalline silica, tridymite | 15468-32-3 | No information available |

| Substances | CAS Number | Mutagenic Effects |
|----------------------------------|------------|----------------------------|
| Crystalline silica, quartz | 14808-60-7 | Not regarded as mutagenic. |
| Crystalline silica, cristobalite | 14464-46-1 | Not regarded as mutagenic. |
| Crystalline silica, tridymite | 15468-32-3 | Not regarded as mutagenic. |

| Substances | CAS Number | Carcinogenic Effects |
|----------------------------------|------------|--|
| Crystalline silica, quartz | 14808-60-7 | Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury. |
| Crystalline silica, cristobalite | 14464-46-1 | Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury. |
| Crystalline silica, tridymite | 15468-32-3 | Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury. |

| Substances | CAS Number | Reproductive toxicity |
|----------------------------------|------------|--------------------------|
| Crystalline silica, quartz | 14808-60-7 | No information available |
| Crystalline silica, cristobalite | 14464-46-1 | No information available |
| Crystalline silica, tridymite | 15468-32-3 | No information available |

| Substances | CAS Number | STOT - single exposure |
|----------------------------------|------------|---|
| Crystalline silica, quartz | 14808-60-7 | No significant toxicity observed in animal studies at concentration requiring classification. |
| Crystalline silica, cristobalite | 14464-46-1 | No significant toxicity observed in animal studies at concentration requiring classification. |
| Crystalline silica, tridymite | 15468-32-3 | No significant toxicity observed in animal studies at concentration requiring classification. |

| Substances | CAS Number | STOT - repeated exposure |
|----------------------------------|------------|--|
| Crystalline silica, quartz | 14808-60-7 | Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs) |
| Crystalline silica, cristobalite | 14464-46-1 | Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs) |
| Crystalline silica, tridymite | 15468-32-3 | Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs) |

| Substances | CAS Number | Aspiration hazard |
|----------------------------------|------------|-------------------|
| Crystalline silica, quartz | 14808-60-7 | Not applicable |
| Crystalline silica, cristobalite | 14464-46-1 | Not applicable |
| Crystalline silica, tridymite | 15468-32-3 | Not applicable |

12. Ecological Information

12.1. Toxicity

Substance Ecotoxicity Data

| Substances | CAS Number | Toxicity to Algae | Toxicity to Fish | Toxicity to Microorganisms | Toxicity to Invertebrates |
|----------------------------------|------------|--|---|----------------------------|--|
| Crystalline silica, quartz | 14808-60-7 | EC50 (72 h) =440 mg/L (Selenastrum capricornutum)(similar substance) | LL0 (96 h) =10000 mg/L (Danio rerio)(similar substance) | No information available | LL50 (24 h) >10000 mg/L (Daphnia magna)(similar substance) |
| Crystalline silica, cristobalite | 14464-46-1 | No information available | LL0 (96 h) 10000 mg/L (Danio rerio)(similar substance) | No information available | LL50 (24 h) >10000 mg/L (Daphnia magna)(similar substance) |
| Crystalline silica, tridymite | 15468-32-3 | No information available | LL0 (96h) 10,000 mg/L(Danio rerio) (similar substance) | No information available | LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance) |

12.2. Persistence and degradability

| Substances | CAS Number | Persistence and Degradability |
|----------------------------------|------------|--|
| Crystalline silica, quartz | 14808-60-7 | The methods for determining biodegradability are not applicable to inorganic substances. |
| Crystalline silica, cristobalite | 14464-46-1 | The methods for determining biodegradability are not applicable to inorganic substances. |
| Crystalline silica, tridymite | 15468-32-3 | The methods for determining biodegradability are not applicable to inorganic substances. |

12.3. Bioaccumulative potential

| Substances | CAS Number | Log Pow |
|----------------------------------|------------|--------------------------|
| Crystalline silica, quartz | 14808-60-7 | No information available |
| Crystalline silica, cristobalite | 14464-46-1 | Not bioaccumulative |
| Crystalline silica, tridymite | 15468-32-3 | No information available |

12.4. Mobility in soil

| Substances | CAS Number | Mobility |
|----------------------------------|------------|--------------------------|
| Crystalline silica, quartz | 14808-60-7 | No information available |
| Crystalline silica, cristobalite | 14464-46-1 | No information available |
| Crystalline silica, tridymite | 15468-32-3 | No information available |

12.5 Other adverse effects

No information available

13. Disposal Considerations

13.1. Waste treatment methods

Disposal methods If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations.

14. Transport Information

US DOT

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Canadian TDG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable

Special Precautions for User None

15. Regulatory Information

US Regulations

US TSCA Inventory All components listed on inventory or are exempt.

TSCA Significant New Use Rules - S5A2

| Substances | CAS Number | TSCA Significant New Use Rules - S5A2 |
|----------------------------------|------------|---------------------------------------|
| Crystalline silica, quartz | 14808-60-7 | Not applicable |
| Crystalline silica, cristobalite | 14464-46-1 | Not applicable |
| Crystalline silica, tridymite | 15468-32-3 | Not applicable |

EPA SARA Title III Extremely Hazardous Substances

| Substances | CAS Number | EPA SARA Title III Extremely Hazardous Substances |
|------------|------------|---|
| | | |

| | | |
|----------------------------------|------------|----------------|
| Crystalline silica, quartz | 14808-60-7 | Not applicable |
| Crystalline silica, cristobalite | 14464-46-1 | Not applicable |
| Crystalline silica, tridymite | 15468-32-3 | Not applicable |

EPA SARA (311,312) Hazard Class

Chronic Health Hazard

EPA SARA (313) Chemicals

| Substances | CAS Number | Toxic Release Inventory (TRI) - Group I | Toxic Release Inventory (TRI) - Group II |
|----------------------------------|------------|---|--|
| Crystalline silica, quartz | 14808-60-7 | Not applicable | Not applicable |
| Crystalline silica, cristobalite | 14464-46-1 | Not applicable | Not applicable |
| Crystalline silica, tridymite | 15468-32-3 | Not applicable | Not applicable |

EPA CERCLA/Superfund Reportable Spill Quantity

| Substances | CAS Number | CERCLA RQ |
|----------------------------------|------------|----------------|
| Crystalline silica, quartz | 14808-60-7 | Not applicable |
| Crystalline silica, cristobalite | 14464-46-1 | Not applicable |
| Crystalline silica, tridymite | 15468-32-3 | Not applicable |

EPA RCRA Hazardous Waste Classification

If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65

| Substances | CAS Number | California Proposition 65 |
|----------------------------------|------------|---------------------------|
| Crystalline silica, quartz | 14808-60-7 | carcinogen |
| Crystalline silica, cristobalite | 14464-46-1 | carcinogen |
| Crystalline silica, tridymite | 15468-32-3 | carcinogen |

U.S. State Right-to-Know Regulations

| Substances | CAS Number | MA Right-to-Know Law | NJ Right-to-Know Law | PA Right-to-Know Law |
|----------------------------------|------------|---|----------------------|----------------------|
| Crystalline silica, quartz | 14808-60-7 | Carcinogen Extraordinarily hazardous | 1660 | Present |
| Crystalline silica, cristobalite | 14464-46-1 | Carcinogen Extraordinarily hazardous | 1657 | Present |
| Crystalline silica, tridymite | 15468-32-3 | Carcinogen Extraordinarily hazardous | 1663 | Present |

NFPA Ratings:

Health 0, Flammability 0, Reactivity 0

HMIS Ratings:

Health 0*, Flammability 0, Physical Hazard 0, PPE: At

Canadian Regulations

Canadian Domestic Substances All components listed on inventory or are exempt.
List (DSL)

16. Other information**Preparation Information****Prepared By**

Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

Revision Date:

20-Apr-2017

Reason for Revision

SDS sections updated:
1

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key or legend to abbreviations and acronyms used in the safety data sheet

bw – body weight

CAS – Chemical Abstracts Service

d - day

EC50 – Effective Concentration 50%

ErC50 – Effective Concentration growth rate 50%

h - hour

LC50 – Lethal Concentration 50%

LD50 – Lethal Dose 50%

LL50 – Lethal Loading 50%

mg/kg – milligram/kilogram

mg/L – milligram/liter

mg/m³ - milligram/cubic meter

mm - millimeter

mmHg - millimeter mercury

NIOSH – National Institute for Occupational Safety and Health

NTP – National Toxicology Program

OEL – Occupational Exposure Limit

PEL – Permissible Exposure Limit

ppm – parts per million

STEL – Short Term Exposure Limit

TWA – Time-Weighted Average

UN – United Nations

w/w - weight/weight

Key literature references and sources for data

www.ChemADVISOR.com/

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet