

Contract No.: EP-W-09-002
WA #: 054-RICO-A282

Region 2 RAC2 Remedial Action Contract

Final Health and Safety Plan

Wolff-Alport Chemical Company Site
Remedial Investigation/Feasibility
Study
Ridgewood, Queens, New York

April 24, 2015

**CDM
Smith**



14 Wall Street, Suite 1702
New York, New York 10005
tel: +1 212 785-9123
fax: +1 212 227-1692
cdmsmith.com

April 24, 2015

Mr. Thomas Mongelli
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway – 20th Floor
New York, New York 10007-1866

PROJECT: EPA Region 2 RAC 2 Contract No.: EP-W-09-002
Work Assignment: 054-RICO-A282

DOCUMENT NO.: 3323-054-02470

SUBJECT: Final Health and Safety Plan
Wolff-Alport Chemical Company Site
Remedial Investigation/Feasibility Study
Ridgewood, Queens, New York

Dear Mr. Mongelli:

CDM Smith Federal Programs Corporation (CDM Smith) is pleased to submit the Final Health and Safety Plan (HASP) for the Wolff-Alport Chemical Company Site (WACC) located in Ridgewood, Queens, New York.

If you have any questions regarding this submittal, please contact me at (732)590-4727.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Muzaffar A. Rahmani
Site Manager

PSO:

cc: H. Eng, EPA Region 2 (Letter Only)
B. MacDonald, CDM Smith (letter only)
T. Bennett, CDM Smith (CD copy)
RAC2 Region 2 Document Control

J. Button, CDM Smith (CD copy)
P. Collopy, CDM Smith (CD copy)
Field Team, CDM Smith



**Wolff-Alport Chemical Company Site
 REMEDIAL INVESTIGATION/FEASIBILITY STUDY
 RIDGEWOOD, QUEENS, NEW YORK
 HEALTH AND SAFETY PLAN**

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****Appendices will be provided before event mobilization***

ACRONYMS

A	air
AHA	Activity Hazard Analysis
ALARA	As Low As Reasonably Achievable
ATSDR	Agency for Toxic Substances and Disease Registry
Bq	Bequerel
CDM Smith	CDM Federal Programs Corporation
CFR	Code of Federal Regulations
cm	centimeters
CNS	central nervous system
CVOC	chlorinated volatile organic compound
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
D	drums
dpm	disintegrations per minute
DPT	direct push technology
EPA	(United States) Environmental Protection Agency
ER	emergency response
ER	electrical resistivity
eV	electron volt
EZ	exclusion zone
FTL	field team leader
FSU	Federal Services Unit
GFCI	ground-fault circuit interrupter
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
H&S	health and safety
HSC	Health & Safety Coordinator
HSM	Corporate Health and Safety Manager
IDLH	Immediately Dangerous to Life or Health
IDW	investigation derived waste
mrem	millirem
MCL	maximum contaminant level
mg/m ³	milligram/cubic meter
MSDS	material safety data sheet
NA	not available
NE	not established
OSHA	Occupational Health and Safety Act
PEL	Permissible Exposure Limit
pCi	picocuries
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSO	Radiation Safety Officer
SM	Site Manager

SSHO	Site Safety & Health Officer
Sv	Sievert
SZ	support zone
TBD	to be determined
TL	Task Leader
TLD	Thermoluminescent Dosimeter
TLV	Threshold Limit Value
TSU	Technical Services Unit
U	unknown
μCi	microcuries
μR	microRoentgen
μrem	microrem
VOC	volatile organic compound
WACC	Wolff-Alport Chemical Company Site
μg/L	microgram per liter
μg/m ³	microgram per cubic meters

HEALTH AND SAFETY PLAN FORM		<i>This document is for the exclusive use of CDM Smith and its subcontractors</i>		CDM Smith	
CDM Smith Health and Safety Program				Project Document # 3323-054-02470	
PROJECT NAME	Wolff-Alport Chemical Company (WACC) Site Remedial Investigation/Feasibility Study (RI/FS)	PROJECT#	EP-W-09-002	REGION	2
SITE ADDRESS	Ridgewood, New York	CLIENT ORGANIZATION	U.S. Environmental Protection Agency		
		CLIENT CONTACT	Thomas Mongelli		
		CLIENT CONTACT PHONE #	212-637-4256		
<input type="checkbox"/> AMENDMENT TO EXISTING APPROVED H&SP?					
<input type="checkbox"/> H&SP AMENDMENT NUMBER? _____ <input type="checkbox"/> DATE OF PREVIOUS H&SP APPROVAL _____					
OBJECTIVES OF FIELD WORK: (e.g. collect surface soil samples):		SITE TYPE: <i>Check as many as applicable</i>			
<p>The purpose of this RI/FS is to select a remedy to eliminate, reduce, or control risks to human health and the environment at the WACC site. The objectives of this investigation are to perform the appropriate amount of sampling to complete characterization of the site by performing</p> <ul style="list-style-type: none"> - hydrogeologic assessment (monitoring well installation, development and testing). - environmental sampling (radiological background, soil, sediment, sewer and building measurements as well as hazardous building materials survey and radiological and non-radiological ground water and sediment sampling) 		Active	<input checked="" type="checkbox"/>	Landfill	<input type="checkbox"/> Unknown <input type="checkbox"/>
		Inactive	<input checked="" type="checkbox"/>	Uncontrolled	<input type="checkbox"/> Military <input type="checkbox"/>
		Secure	<input type="checkbox"/>	Industrial	<input type="checkbox"/> Other (specify)
		Unsecure	<input checked="" type="checkbox"/>	Recovery	<input type="checkbox"/> Residential <input checked="" type="checkbox"/>
		Enclosed space	<input checked="" type="checkbox"/>	Well Field	<input type="checkbox"/> Commercial <input checked="" type="checkbox"/>
		All requirements described in the CDM Smith Health and Safety Manual are incorporated in this health and safety plan by reference. All tasks performed by CDM Smith will be conducted in compliance with this HASP and Hazwoper Standard 29CFR1910.120. The Material Safety Data Sheets will be kept on site during field activities. CDM Smith Subcontractors will be required to perform the work in accordance with this HASP.			
PERSONNEL AND RESPONSIBILITIES					
NAMES OF WORK CREW MEMBERS		Company / Division / Office	Current Training & Medical?	Project or Site Responsibilities	Tasks On Site
Muzaffar "Ali" Rahmani		CDM Smith/EDN	Yes	Site Manager	8
Joseph Button		CDM Smith/NYC	Yes	Task Leader	1-2-3-4-5-6-7-8
Peter Collopy		CDM Smith	Yes	Project Radiation Safety Officer (RSO)	1-2-3-4-5-6-7-8 (periodic)
TBD		TBD	Yes	Radiological Safety Lead	1-2-3-4-5-6-7-8
TBD		CDM Smith	Yes	Site Safety & Health Officer	1-2-3-4-5-6-7-8
TBD		CDM Smith	Yes	Field Staff	1-2-3-4-5-6-7-8
BACKGROUND REVIEW: <input checked="" type="checkbox"/> Complete <input type="checkbox"/> Incomplete					

SITE MAP: Boundary of former WACC Operations



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<p>HISTORY: Summarize conditions that relate to hazard. Include citizen complaints, spills, previous investigations or agency actions, known injuries, etc. WACC operated at this location from approximately 1920 to about 1954. About 1940, the company began importing Monazite sand from the Belgian Congo through the rail spur located in back of the property. Monazite sand is rich in thorium and rare earth elements, and the company extracted these rare earth elements and sold them to various commercial entities. Initially, the thorium (and presumably other radioactive decay products) was considered a waste product and disposed into the sewer. WACC was ordered to halt sewer disposal in the fall of 1947 by the AEC. In order to minimize the waste volume, WACC began concentrating the thorium as a precipitate and then sold the sludge to the AEC.</p> <p>WACC terminated operations at the site in approximately 1954. Land use records after 1954 are limited. In 1988, the site was occupied by Lynda Knitwear. In late 2000, the site was used by the current rental occupants, Primo Auto Body.</p> <p>The building which housed the former WACC operations appears to have been subdivided (access ways between the portions were sealed) at a later date. Most of the areas investigated during this field effort are used for storage or materials with limited/short term entry by individuals. The one exception is in the main working area of Primo Auto Body, (1127A Irving Avenue) where individuals spend their entire working day in the building while completing various auto repairs and body work. The warehouses immediately adjacent to and southeast of the Primo Auto shops are owned by Arctic Glacier Losquadro, Inc. One warehouse is used for storage by Arctic Glacier Losquadro, Inc. and the other by S&M Construction. A delicatessen operated by Jarabacoa Deli Grocery Corp is adjacent to and northwest of the Primo auto shops. Northeast of the delicatessen is a one story facility operated by K&M auto repair.</p> <p>In May 2007, the New York State Department of Environmental Conservation (NYSDEC) and the New York Department of Health and Mental Hygiene (NYDOHMH) tested the site previously occupied by WACC Chemical Corporation and found slightly elevated radiation levels. Subsequent radiological conditions evaluations were made in 2010 (Berger 2010A and Berger 2010B), 2013 (NYSOH 2013), and 2014 (Buenas Veritas 2014). The investigation in 2010 lead to the partial remediation and installation of lead shielding to limit public doses in the auto body shops area and adjacent sidewalk. These partial investigations have resulted in the need to fully characterize the site and potential impacted areas (this Remedial Investigation) to determine future remediation options (Feasibility Study) for the site.</p>																																			
<p>WASTE TYPES: <input type="checkbox"/> Liquid <input checked="" type="checkbox"/> Solid <input checked="" type="checkbox"/> Sludge <input type="checkbox"/> Gas <input type="checkbox"/> Unknown <input type="checkbox"/> Other, specify:</p> <p style="text-align: center;"><i>Check as many as applicable.</i></p> <table border="0"> <tr> <td><input type="checkbox"/> Corrosive</td> <td><input type="checkbox"/> Flammable</td> <td><input checked="" type="checkbox"/> Radioactive</td> </tr> <tr> <td><input type="checkbox"/> Toxic</td> <td><input type="checkbox"/> Volatile</td> <td><input type="checkbox"/> Reactive</td> </tr> <tr> <td><input type="checkbox"/> Inert Gas</td> <td><input type="checkbox"/> Unknown</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> Other:</td> <td colspan="2">Potential PCBs, Lead, Asbestos</td> </tr> </table>				<input type="checkbox"/> Corrosive	<input type="checkbox"/> Flammable	<input checked="" type="checkbox"/> Radioactive	<input type="checkbox"/> Toxic	<input type="checkbox"/> Volatile	<input type="checkbox"/> Reactive	<input type="checkbox"/> Inert Gas	<input type="checkbox"/> Unknown		<input checked="" type="checkbox"/> Other:	Potential PCBs, Lead, Asbestos																					
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		<p>WORK ZONES:</p> <p>The exclusion zone (EZ) includes all active areas in which contaminants may affect personnel through exposure routes, and /or in which heavy equipment and other hazardous materials may be used. Where space is available, the diameter of the EZ around the drill rig will be equal to the height of the mast. The exclusion zone will be marked off by traffic cones or flagged with caution tape at each location. The contamination reduction/decontamination zone (CRZ) is the transition area between the EZ and the support zone (SZ) and will be established at the sample location for groundwater/soil sampling or the field trailer for drilling equipment decontamination. The field trailer and associated lay down areas will be considered the support zone. The buddy system will be in effect at all times.</p>																																	
<p>HAZARDS OF CONCERN: <i>Check as many as applicable.</i></p> <table border="0"> <tr> <td><input checked="" type="checkbox"/> Heat Stress</td> <td>CDMS Guideline</td> <td><input checked="" type="checkbox"/> Noise</td> <td>CDMS Guideline</td> </tr> <tr> <td><input checked="" type="checkbox"/> Cold Stress</td> <td>CDMS Guideline</td> <td><input type="checkbox"/> Inorganic Chemicals</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Explosive/Flammable</td> <td></td> <td><input type="checkbox"/> Organic Chemicals</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Oxygen Deficient</td> <td></td> <td><input checked="" type="checkbox"/> Motorized Traffic</td> <td></td> </tr> <tr> <td><input checked="" type="checkbox"/> Radiological</td> <td></td> <td><input checked="" type="checkbox"/> Heavy Machinery</td> <td></td> </tr> <tr> <td><input type="checkbox"/> Biological</td> <td></td> <td><input checked="" type="checkbox"/> Slips & Falls</td> <td>CDMS Guideline</td> </tr> <tr> <td><input type="checkbox"/> Other:</td> <td colspan="3">_____</td> </tr> <tr> <td><input type="checkbox"/> Other:</td> <td colspan="3">_____</td> </tr> </table>		<input checked="" type="checkbox"/> Heat Stress	CDMS Guideline	<input checked="" type="checkbox"/> Noise	CDMS Guideline	<input checked="" type="checkbox"/> Cold Stress	CDMS Guideline	<input type="checkbox"/> Inorganic Chemicals		<input type="checkbox"/> Explosive/Flammable		<input type="checkbox"/> Organic Chemicals		<input type="checkbox"/> Oxygen Deficient		<input checked="" type="checkbox"/> Motorized Traffic		<input checked="" type="checkbox"/> Radiological		<input checked="" type="checkbox"/> Heavy Machinery		<input type="checkbox"/> Biological		<input checked="" type="checkbox"/> Slips & Falls	CDMS Guideline	<input type="checkbox"/> Other:	_____			<input type="checkbox"/> Other:	_____			<p>FACILITY'S PAST AND PRESENT DISPOSAL METHODS AND PRACTICES:</p> <p>The Wolff-Alport Chemical Corporation (Wolff-Alport) formerly used the Site for the processing of imported monazite sand to extract rare earth elements in the 1940s and 1950s. A byproduct of this process was thorium, a radioactive element. The thorium waste was disposed of by running process liquids into the sewers and burial onsite until 1947. After 1947, Wolff-Alport was ordered to halt sewer disposal by the now defunct Atomic Energy Commission (AEC), thenceforth Wolff-Alport concentrated thorium onsite and sold the sludge to the federal government. Wolff-Alport is reported to have concentrated the thorium as a precipitate from approximately 1947 to 1954 (DOE Bureau of Radiation Control letter dated September 29, 1987).</p>	
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<p>This plan incorporates CDM Smith's procedure for: <i>(Click on the relevant topics to download the hazard guideline. Delete irrelevant topics.)</i></p> <table border="0"> <tr> <td>Housekeeping</td> <td>Traffic and Work Zone Safety</td> <td>Tools and Power Equipment</td> <td>Working Safely Around Geoprobos</td> </tr> <tr> <td>Manual Material Handling</td> <td>Mechanized Personnel Lifts</td> <td>Working Around Heavy Equipment</td> <td>Hazardous Waste Site Controls</td> </tr> <tr> <td>Electrical Safety</td> <td></td> <td>Working Near or Over Water</td> <td>Working Safely Around Drill Rigs</td> </tr> <tr> <td>Lock Out/Tag Out</td> <td></td> <td>Flammable and Combustible Liquids</td> <td></td> </tr> <tr> <td>Compressed Gases</td> <td></td> <td>Hazardous Waste Site Decontamination</td> <td></td> </tr> </table>				Housekeeping	Traffic and Work Zone Safety	Tools and Power Equipment	Working Safely Around Geoprobos	Manual Material Handling	Mechanized Personnel Lifts	Working Around Heavy Equipment	Hazardous Waste Site Controls	Electrical Safety		Working Near or Over Water	Working Safely Around Drill Rigs	Lock Out/Tag Out		Flammable and Combustible Liquids		Compressed Gases		Hazardous Waste Site Decontamination													
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CDM Smith Health and Safety Program				Project Document # 3323-054-02470	
DESCRIPTION AND FEATURES: <i>Include principal operations and unusual features (containers, buildings, dikes, power lines, hillslopes, rivers, etc.)</i>					
<p>The Site is a former monazite sands processing facility that has now been developed into a mix of commercial and residential buildings. The principal contaminant produced by the monazite sands rare earth extraction process is thorium and associated progeny. The WACC site is located at 1127 Irving Avenue in the borough of Queens in an urban, light industrial area bordering with residential areas to the north and west. Immediately east of the former WACC building is warehouse building space. Immediately west is a former deli/grocery that was heavily damaged by a fire in 2007. The rail line behind the site is heavily overgrown and contains a significant amount of illegally dumped trash. The Cemetery of the Evergreens borders the site to the south and east on the opposite side of the rail line. Sewer systems run east west under Irving Avenue and North-South under Cooper Avenue and Moffat Street.</p>					
SURROUNDING POPULATION: (X) Residential (X) Industrial (X) Commercial () Rural () Urban OTHER:					
HAZARDOUS MATERIAL SUMMARY: <i>Highlight or bold waste types and estimate amounts by category.</i>					
CHEMICALS: <i>Amount/Units:</i>	SOLIDS: <i>Amount/Units:</i>	SLUDGES: <i>Amount/Units:</i>	SOLVENTS: <i>Amount/Units:</i>	OILS: <i>Amount/Units:</i>	OTHER: <i>Amount/Units:</i>
Acids	Flyash	Paints	Ketones	Oily Wastes	Laboratory
Pickling Liquors	Mill or Mine Tailings	Pigments	Aromatics	Gasoline	Pharmaceutical
Caustics	Asbestos	Metals Sludges	Hydrocarbons	Diesel Oil	Hospital
Pesticides	Ferrous Smelter	POTW Sludge	Alcohols	Lubricants	Radiological
Dyes or Inks	Non-Ferrous Smelter	Distillation Bottoms	Halogenated (chloro, bromo)	Polynuclear Aromatics	Municipal
Cyanides	Metals	Aluminum	Esters	PCBs	Construction
Phenols	Dioxins		Ethers	Heating Oil	Munitions
Halogens					
Other - specify	Other - specify	Other - specify	Other - TCE and PCE	Other - specify	Other - specify

HEALTH AND SAFETY PLAN FORM

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CDM Smith

CDM Smith Health and Safety Program

Project Document # 3323-054-02470

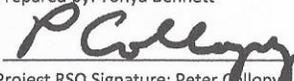
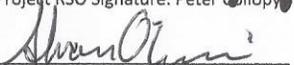
PROTECTIVE EQUIPMENT: *Specify by task. Indicate type and/or material, as necessary. Group tasks if possible. Use copies of this sheet if needed.*

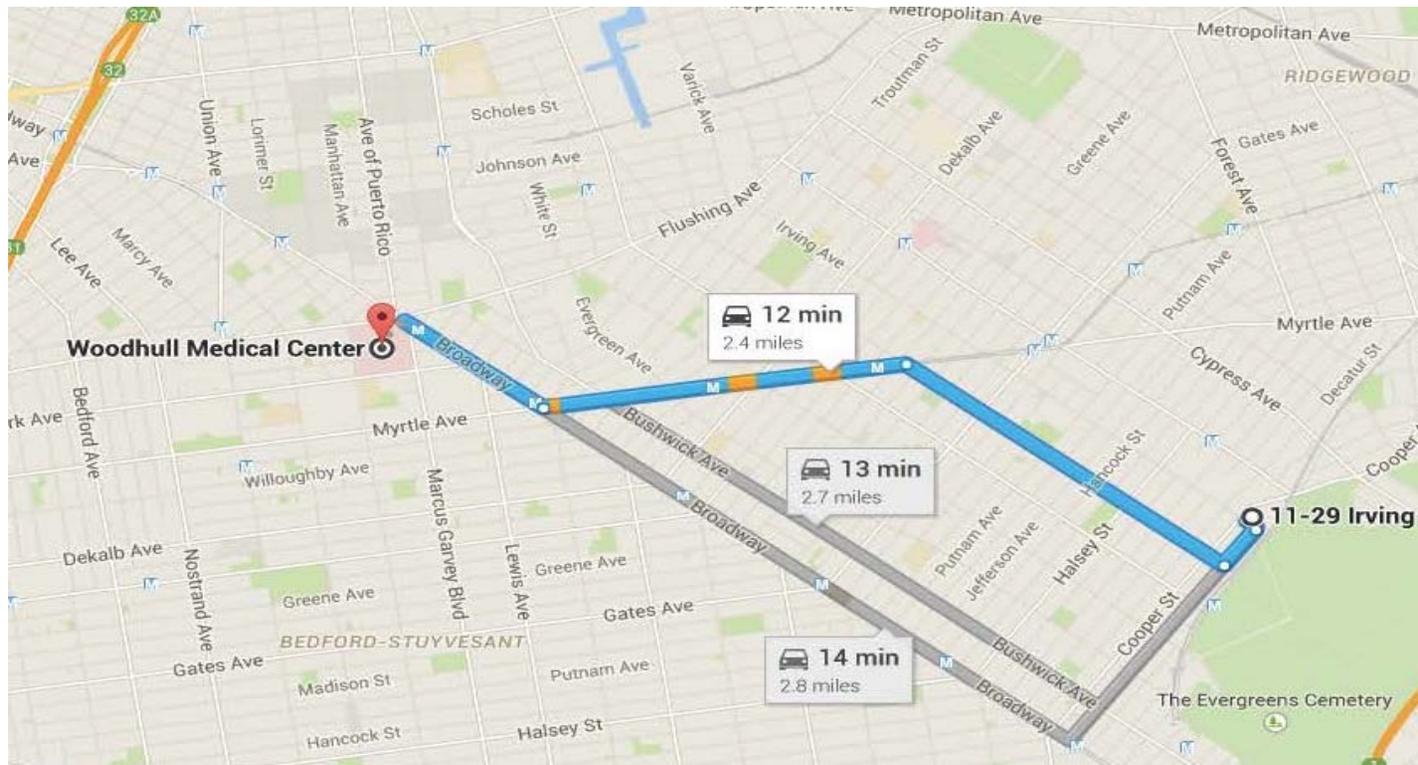
<p>BLOCK A</p> <p>Respiratory: (X) Not needed () SCBA, Airline: () APR: () Cartridge:</p> <p>() Escape Mask: () Other:</p> <p>Head and Eye: () Not needed (X) Safety Glasses: () Face Shield: () Goggles: (X) Hard Hat: if over head hazard exists () Other:</p> <p>Boots: () Not needed (X) Steel-Toe () Steel Shank () Rubber () Leather (X) Overboots: as needed for site conditions</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">TASKS: 1 -2- 3 -4 - 5 - 7 LEVEL: D - Modified (X) Primary () Contingency</p>	<p>BLOCK B</p> <p>Respiratory: () Not needed () SCBA, Airline: (X) APR: (X) Cartridge: P100</p> <p>() Escape Mask: () Other:</p> <p>Head and Eye: () Not needed (X) Safety Glasses: as needed (X) Face Shield: (sewer work) (X) Goggles: (sewer work) (X) Hard Hat: if over head hazard exists () Other:</p> <p>Boots: () Not needed (X) Steel-Toe () Steel Shank () Rubber () Leather (X) Overboots: as needed for site conditions</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">TASKS: 1 -2- 3 -4 - 5 - 7 LEVEL: C or Exit Area () Primary (X) Contingency</p>
<p>BLOCK C</p> <p>Respiratory: (X) Not needed () SCBA, Airline: () APR: () Cartridge: () Escape Mask: () Other:</p> <p>Head and Eye: () Not needed (X) Safety Glasses: () Face Shield: () Goggles: (X) Hard Hat: if over head hazard exists () Other:</p> <p>Boots: () Not needed (X) Steel-Toe () Steel Shank () Rubber () Leather () Overboots: as needed for site conditions</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">TASKS: 6 and 8 LEVEL: D (X) Primary () Contingency</p>	<p>BLOCK D</p> <p>Respiratory: (X) Not needed () SCBA, Airline: () APR: () Cartridge: () Escape Mask: () Other:</p> <p>Head and Eye: () Not needed (X) Safety Glasses: () Face Shield: () Goggles: (X) Hard Hat: if over head hazard exists () Other:</p> <p>Boots: () Not needed (X) Steel-Toe () Steel Shank () Rubber () Leather () Overboots:</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">TASKS: 6 and 8 LEVEL: D Modified () Primary (X) Contingency</p>

All tasks performed by CDM Smith will be conducted in compliance with the HASP and Hazwoper Standard 29CFR1910.120. The Material Safety Data Sheets will be kept on site during field activities. CDM Smith Subcontractors will be required to perform the work in accordance with this Health and Safety Plan.
This health and safety plan form constitutes hazard analysis per 29 CFR 1910.132.

HEALTH AND SAFETY PLAN FORM		This document is for the exclusive use of CDM Smith and its subcontractors		CDM Smith
CDM Smith Health and Safety Program				Project Document # 3323-054-02470
MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets if needed.				
INSTRUMENT	TASK	ACTION GUIDELINES		Meter Type and Action Level Basis
Combustible Gas Meter	1, 2, 3, 4, 5, and 7	> 10 % LEL < 19.5% O ₂ > 5 ppm H ₂ S	stop work, evacuate area, and notify SSHO	BW Honeywell GasAlert or equivalent LEL and O ₂ action levels are standard industry practice and recommended by Detector Manufacturer H ₂ S 5 ppm is the ACGIH STEL
Photoionization Detector	1, 2, 5 and 7	> 2 ppm * > 10 ppm * Above background sustained in breathing zone for five minutes	Notify SSHO and Task Leader Stop work, exit work zone, notify SSHO, Task Leader and contact CDM Site Manager	11.7 or 10.2 eV Lamp MinKae or Equivalent 2 ppm allows detection below the PEL/TLV of most Volatile Organic Compounds and is slightly above the meter background variation peak (1 ppm) The 10 ppm is safeguard value designed to immediately suspend work as no volatile organic compounds should be encountered at that level on that project and the 10 ppm levels allows for short term swings in the meter response if there is significant vehicle traffic adjacent to the work zone.
Airborne Radioactivity -Particulate	1 and 5	> 1E-12 uCi/cc	Potential risk of exceeding 100 mrem Reasses work process Institute dust controls Consider Use of Respiratory Protection	BZA/Filter and Ludlum 2929 Bench Top Counter or system with equivalent of better detection capability The 1E-12 uCi/cc is the Derived Air Concentration for thorium 232 the most limiting radionuclide that will be present on this project.
Airborne Radioactivity - Radon	1, 2, 5 and 6	> 3E-08 uCi/cc	Control time in area, close any holes drilled/open in surface if feasible to do so, consider waiting, if outdoors until windier day and/or consider use of respiratory protection	Track-Etch Dosimeters for continuous long term monitoring Pylon AB6 for shorter term continuous monitoring The 3E-08 uCi/cc is the DAC for Rn-220 the predominant radon nuclide at the site
Surface Contamination	1, 2, 3, 4, 5, and 7	> 200 dpm/100 cm ² removable > 1000 dpm/100 cm ² total	Stop work, re-asses work process Increase, level of PPE if work process changes insufficient. Decontaminate tools/ equipment	Wipes and Ludlum 2929 Bench Top Counter or system with equivalent of better detection capability Ludlum 2224 w/ Ludlum 43-93 or system with equivalent of better detection capability The contamination release criteria are those of the NYCDOH
Direct Radiation	1, 2, 3, 4, 5, and 7	> 2 mrem/hr > 75 mrem/reporting period	Institute ALARA procedures (minimize time, maintain distance) Review work activities and internal dose to determine total dose and means to reduce further doses	Bicron Microrem, Ludlum 19, Ludlum Model 9DP or equivalent monitoring device Landauer Luxel Thermoluminescent Dosimeter (TLD) or equivalent monitoring device The 2 mrem/hr is the level at which in approximately one work week an individual would approach a total dose of 100 mrem. The CDM practice for most projects is to attempt to maintain total exposures to less than 100 mrem; this is strictly a policy objective and not a hard and fast prescriptive "do not exceed" value. The 75 mrem per TLD reporting period acts as the same function as the 2 mrem/hr.
Respirable Dust Monitor Dust monitoring and surrogate for airborne radioactivity monitoring	1, 3	0 to 1 mg/m ³ : Level D > 0.1 mg/m ³ or any visible dust for sustained time period (15 min) shutdown and improve dust control measures for radiological considerations dust levels > 400 ug/m ³ for sustained time period (15 min) require implementation of dust controls and/or respiratory protection		PDR 1000AN or equivalent The 0.1 mg/m ³ is a standard CDM dust control objective for projects and is based upon attempting to maintain dust levels to less than the PM-10 24 hr standard. The 400 ug/m ³ dust level would result in a particulate thorium 232 concentration of 1E-12 if the soil being resuspended contains greater than 1000 pCi/g, the maximum concentration identified at the site
Noise	1, 5	> 85 dB requires hearing protection > 95 dB sustained (>15 min) reassess process and/or review efficacy of hearing protection		NM102 or equivalent

HEALTH AND SAFETY PLAN FORM CDM Smith Health and Safety Program		This document is for the exclusive use of CDM Smith and its subcontractors	CDM Smith Project Document # 3323-054-02470
DECONTAMINATION PROCEDURES			
EXCLUSION, DECONTAMINATION, & SUPPORT ZONES ARE ESTABLISHED IN THE FIELD BASED ON LOCAL SAMPLING/DRILLING AREA CONDITIONS			
Due to the presence of potential radiological contamination, immediately after decontamination, tools/equipment will be surveyed to ensure the surface contamination action levels are not exceeded before release from the work zone buffer area. All decontamination will take place on site and not at off-site locations. On occasion due to physical conditions in the field (e.g. traffic) it may be necessary to decontaminate first and then survey the tools/equipment after the decontamination effort. All personnel working in zones where dispersible forms of radiological contaminants are present will be surveyed prior to leaving the work zone buffer area. These scans and subsequent actions if contamination is detected above action levels are outlined in SOP R-1, Radiological Contamination Control. The SOP is contained in Appendix G to this HASP.			
Personnel Decontamination Summarize below or attach diagram; Respirators will be selected, used, decontaminated, and stored in accordance with CDM H&S Manual as based on OSHA 1910.134 The personal decontamination station will move from location to location based on work site. Wash hands and face if necessary with soap and water upon doffing personal protective equipment. Wash well before hand-to-mouth contact is made. Workers will remove protective clothing in this order: <ul style="list-style-type: none"> - equipment drop - hard hat - boot covers - outer gloves - Tyvek - respirator (if used) - inner gloves - face and hand wash WASH HANDS AND FACE PRIOR TO ANY INGESTION OF FOOD OR LIQUIDS. <input type="checkbox"/> Not Needed	Sampling Equipment Decontamination Summarize below or attach diagram; All sampling equipment will be thoroughly decontaminated as follows: 1) Wash and scrub with low phosphate detergent 2) Potable tap water rinse* 3) Rinse with 10 percent nitric acid, ultrapure (1 percent for carbon steel implements) when sampling for inorganics 4) Deionized water rinse 5) Isopropyl alcohol rinse (pesticide grade or better) when sampling for organics 6) Thorough rinse with deionized, demonstrated analyte-free water (at least five times the amount of solvent used in step 5) 7) Air dry 8) Wrap in aluminum foil for transport * Potable water must be from a municipal water treatment supply system. Phthalate-free gloves must be worn when using solvents. Water quality measurement probes must be rinsed with deionized water between uses. Water level indicator tape must be rinsed/wiped with wet paper towel between uses. If petroleum product is present, requires low phosphate detergent rinse as well. <input type="checkbox"/> Not Needed	Heavy Equipment Decontamination Summarize below or attach diagram; All down-hole equipment and tool parts that contact groundwater or soil have no natural or synthetic components that could absorb and retain most water- or soil-borne organic contaminants. Prior to removal from the work site, potential contaminated soil will be scraped or brushed from the exterior surfaces. The drill rig and all downhole equipment such as augers, split spoon and any other large equipment in the exclusion zone will be steam cleaned. <input type="checkbox"/> Not Needed	
Containment and Disposal Method Decontamination derived wastes will be containerized treated/disposed of by the IDW Subcontractor	Containment and Disposal Method Decontamination derived wastes will be containerized treated/disposed of by the IDW Subcontractor	Containment and Disposal Method Decontamination derived wastes generated from drilling activities will be containerized treated/disposed of by the IDW Subcontractor.	
HAZARDOUS MATERIALS TO BE BROUGHT ONSITE			
<i>Preservatives</i>		<i>Decontamination</i>	
<input checked="" type="checkbox"/> Hydrochloric Acid <input type="checkbox"/> Zinc Acetate <input checked="" type="checkbox"/> Nitric Acid <input type="checkbox"/> Ascorbic Acid <input type="checkbox"/> Sulfuric Acid <input type="checkbox"/> Acetic Acid <input checked="" type="checkbox"/> Sodium Hydroxide <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Alconox TM <input type="checkbox"/> Hexane <input checked="" type="checkbox"/> Liquinox TM <input type="checkbox"/> Isopropanol <input type="checkbox"/> Acetone <input type="checkbox"/> Nitric Acid <input type="checkbox"/> Methanol <input type="checkbox"/> Other: <input type="checkbox"/> Mineral Spirits	<i>Calibration</i> <input checked="" type="checkbox"/> 100 ppm isobutylene <input checked="" type="checkbox"/> Hydrogen Sulfide <input type="checkbox"/> Methane <input type="checkbox"/> Carbon Monoxide <input type="checkbox"/> Pentane <input checked="" type="checkbox"/> pH Standards <input type="checkbox"/> Hydrogen <input checked="" type="checkbox"/> Conductivity Std <input type="checkbox"/> Propane <input type="checkbox"/> Other:	

HEALTH AND SAFETY PLAN FORM CDM Smith Health and Safety Program	<i>This document is for the exclusive use of CDM Smith and its subcontractors</i>	CDM Smith 02371																									
EMERGENCY CONTACTS Site Telephone: To be determined EPA Release Report #: (800) 424 - 8802 CDM Smith 24-Hour Emergency #: (406) 293-8595/(406) 293-2672 Shawn Oliveira Cell Facility Management: NA Other (specify): CHEMTREC Emergency #: (800) 424-9300	EMERGENCY CONTACTS <table border="1"> <thead> <tr> <th>NAME</th> <th>PHONE</th> </tr> </thead> <tbody> <tr> <td>CDM Health and Safety Manager (HSM)</td> <td>Shawn Oliveira (406) 293-8595</td> </tr> <tr> <td>Site Manager (SM)</td> <td>Muzaffar Rahmani (732) 590-4727</td> </tr> <tr> <td>Task Leader</td> <td>Joseph Button (914) 815-2577</td> </tr> <tr> <td>Project RSO (RSO)</td> <td>Peter Collopy (518) 859-1944</td> </tr> <tr> <td>Site Safety and Health Officer (SSHO)</td> <td>TBD TBD</td> </tr> <tr> <td>Health and Safety Coordinator</td> <td>Tonya Bennett (917) 903-5394</td> </tr> <tr> <td>Client Contact</td> <td>Thomas Mongelli (212) 637-4256</td> </tr> <tr> <td>Fire Department</td> <td>Ridgewood 911</td> </tr> <tr> <td>Police Department</td> <td>Ridgewood 911</td> </tr> <tr> <td>State Spill Number</td> <td>New York 1-800-342-9296</td> </tr> <tr> <td>Poison Control Center</td> <td>Nationwide 1-800-222-1222</td> </tr> <tr> <td>Occupational Physician</td> <td>Dr. Jerry Berke 1-800-350-4511</td> </tr> </tbody> </table>	NAME	PHONE	CDM Health and Safety Manager (HSM)	Shawn Oliveira (406) 293-8595	Site Manager (SM)	Muzaffar Rahmani (732) 590-4727	Task Leader	Joseph Button (914) 815-2577	Project RSO (RSO)	Peter Collopy (518) 859-1944	Site Safety and Health Officer (SSHO)	TBD TBD	Health and Safety Coordinator	Tonya Bennett (917) 903-5394	Client Contact	Thomas Mongelli (212) 637-4256	Fire Department	Ridgewood 911	Police Department	Ridgewood 911	State Spill Number	New York 1-800-342-9296	Poison Control Center	Nationwide 1-800-222-1222	Occupational Physician	Dr. Jerry Berke 1-800-350-4511
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SAFETY NARRATIVE: <i>Summarize below</i> Evacuate work zone if any unexpected hazardous conditions are encountered. If Site personnel observe hazards for which they have not been prepared, they will withdraw from the area, notify the SSHR, the Task Leader who in turn will contact the SM and the HSM. Project personnel will not enter or remain in an area until an evaluation has been completed and the HSM deems the area safe for entry. Personnel experiencing illness or adverse physiological effects will receive immediate medical attention.	MEDICAL EMERGENCY <table border="1"> <thead> <tr> <th>PHONE</th> </tr> </thead> <tbody> <tr> <td>Hospital Name: Woodhull Medical Center (718) 963-8000</td> </tr> <tr> <td>Hospital Address: 760 Broadway, Brooklyn, NY 11206</td> </tr> <tr> <td>Name of Contact at Hospital:</td> </tr> <tr> <td>Name of 24-Hour Ambulance: 911</td> </tr> <tr> <td>Route to Hospital:</td> </tr> <tr> <td>Head southeast on Irving Ave toward Kings-Queens Bndy 184 ft</td> </tr> <tr> <td>Irving Ave turns slightly right and becomes Moffat St 0.1 mi</td> </tr> <tr> <td>Turn right onto Knickerbocker Ave 1.0 mi</td> </tr> <tr> <td>Slight left onto Myrtle Ave 0.9 mi</td> </tr> <tr> <td>Turn right onto Broadway (Destination will be on the left)</td> </tr> <tr> <td>Distance to Hospital: Approximately 2.4 miles</td> </tr> </tbody> </table>	PHONE	Hospital Name: Woodhull Medical Center (718) 963-8000	Hospital Address: 760 Broadway, Brooklyn, NY 11206	Name of Contact at Hospital:	Name of 24-Hour Ambulance: 911	Route to Hospital:	Head southeast on Irving Ave toward Kings-Queens Bndy 184 ft	Irving Ave turns slightly right and becomes Moffat St 0.1 mi	Turn right onto Knickerbocker Ave 1.0 mi	Slight left onto Myrtle Ave 0.9 mi	Turn right onto Broadway (Destination will be on the left)	Distance to Hospital: Approximately 2.4 miles														
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HEALTH AND SAFETY PLAN APPROVALS (H&S Mgr must sign each plan) Prepared by: Tonya Bennett Date: 4/20/2015  Project RSO Signature: Peter Collopy Date: 4/20/2015  HSM Signature: Shawn Oliveira Date: 4/21/2015																											



HEALTH AND SAFETY PLAN FORM CDM Smith Health and Safety Program	<i>This document is for the exclusive use of CDM Smith and its subcontractors</i>	CDM Smith Project Document # 3323-054-02470
PRE-ENTRY BRIEFING AND DAILY SAFETY MEETING TOPICS Site background, contaminant levels and potential exposure symptoms PPE requirements for the day Buddy System and communication plan Emergency Response Daily tasks and associated risks; Hazard control Injury and incident reporting Cold/Heat Stress (weather forecast/conditions)		
TRAINING REQUIREMENTS All staff shall review the HASP HAZWOPER 40-hour - all on-site staff 8-hour refresher - all on-site staff Radiological Awareness Training 1 onsite person must have CPR/First Aid Training Certificates will be kept on-site MEDICAL MONITORING Medical monitoring for field staff are as per OSHA standards 29 CFR 1910.120 (f) and 29 CFR 1926.65 (f). Copies of medical certificates shall be kept on-site.		
EMERGENCY EQUIPMENT: Eve wash; Fire extinguisher (type ABC); First aid kit All equipment will be located either in the site vehicle or in the work zone/work zone access point		

HEALTH AND SAFETY PLAN FORM CDM Smith Health and Safety Program	<i>This document is for the exclusive use of CDM Smith and its subcontractors</i>	CDM Smith Project Document # 3323-054-02470
ROLES AND RESPONSIBILITIES		
Site Manager(SM): Mr. Muzaffar " Ali" Rahmani, is responsible for all project tasks under the supervision of the Site Manager, Mr. Rahmani is responsible for coordinating all work with the Drilling, IDW and RA Subcontractors and the Task Leader/ Site Safety and health Representaive(s) (SSHR).	Drilling Subcontractor: A New York licensed driller will provide the drilling services and is responsible for carrying out their tasks safely and for certifying the safety of their equipment on a daily basis.	
Project HSM: Mr. Shawn Oliveira will be responsible for the review of the project-specific Health and Safety Plan (HASP).	Subcontractors- Hazardous building survey, Civil survey, IDW	
RI/FS Task Leader (TL): Mr. Joseph Button, will assist Ms. Muzaffar "Ali" Rahmani, site manager, in implementing and coordinating the field activities during the RI/FS. He will be responsible for all aspects of the RI/FS collection and the preparation of the document plans.		
Site Health & Safety Officer TBD: is responsible for corrdinaitng daily safety activities on the project site. The SSHO aides in monitoring and assessment of site hazardous conditions. The SSHO maintains site safety records		
Project Radiation Safety Officer (RSO): Mr. Peter Collopy will provide over-all guidance for radiological safety and measurement protocols for the project.		
Geologist: The geologist will be responsible for observing stratigraphy of drilling material; documentation of work performed and oversight of driller and drilling activities and air monitoring activities.		
Scientist: TBD, will assist in the collection, preservation, and shipping of samples. The field scientist will be primarily responsible for generating the sampling paperwork and maintenance of chain of custody procedures. They will also be documenting sampling activities and communicating the chain of custodies to the laboratory.		
Field Team: To Be Determined.		

APPENDIX A
ACTIVITY HAZARD ANALYSES

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 4/14/2015 Project: Wolff-Alport RI/FS

Activity: Building Material Hazard Assessment and Sampling

Activity Location: Ridgewood, New York

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
s e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Contusions, abrasions, cuts, and amputations	<ul style="list-style-type: none"> Tools shall be inspected prior to use. Power tools that are equipped with a safety guard will be used with the guard in place. Defective tools shall be tagged and removed from service. 	L
X		Faulty/Damaged Equipment	<ul style="list-style-type: none"> Defective or damaged equipment shall not be used. It shall be tagged as out of service and/or immediately removed from the work site to prevent use. 	L
X		Foot Injury	<ul style="list-style-type: none"> Leather steel-toes boots will be required Steel-toed work boots will be required for all work activities. rubber overboot or hip waders will also be required if the personnel need to pass through standing water. 	L
X		Heat & Cold Stress	<ul style="list-style-type: none"> Personnel will be briefed on the signs and symptoms of heat-related and cold-related illnesses. The SSHO will observe for heat-related and cold-related illnesses. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X	Puncture wounds	<ul style="list-style-type: none"> • Caution shall be used while working around lumber with exposed nails. To the extent practical, nails are to be removed or hammered over to minimize punctures. 	L
X	Slips, trips, and falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Trip hazards will be identified and removed or isolated. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. • If mud pans are used, the pan will be cleaned out as often as possible to avoid slippery conditions. 	L
X	Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • Perform a job safety analysis for any unanticipated hazards and hazard controls 	L
X	Biological Injury	<ul style="list-style-type: none"> • The SSHO (or alternate SSHO) will also survey the work locations for biological hazards prior to beginning work. Care should be taken during field activities to prevent contact with biological hazards. • Protection against insects, such as protective clothing (Level D) and insect repellents will be used. • Where vermin are identified in work areas, the SSHO (or alternate SSHO) shall be immediately notified. • The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L
X	Asbestos and Lead exposure	The subcontractor will take appropriate measures to limit exposure to building materials containing asbestos, lead paints, mercury and polychlorinated biphenyls' (PCBs) during survey and sampling	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Radiation Control -All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L
X		Internal Exposure (Inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m3 for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm2. • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Subcontractor equipment	as per manufacturer specifications	daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM Smith and subcontractor

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training.

This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.



Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 4/14/2015 Project: Wolff-Alport RI/FS

Activity: Civil Survey and Geophysical Survey

Activity Location: Ridgewood, New York

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Contusions, abrasions, cuts, and amputations	<ul style="list-style-type: none"> Tools shall be inspected prior to use. Power tools that are equipped with a safety guard will be used with the guard in place. Defective tools shall be tagged and removed from service. 	L
X		Faulty/Damaged Equipment	<ul style="list-style-type: none"> Defective or damaged equipment shall not be used. It shall be tagged as out of service and/or immediately removed from the work site to prevent use. 	L
X		Foot Injury	<ul style="list-style-type: none"> Leather steel-toes boots will be required Steel-toed work boots will be required for all work activities. rubber overboot or hip waders will also be required if the personnel need to pass through standing water. 	L
X		Heat & Cold Stress	<ul style="list-style-type: none"> Personnel will be briefed on the signs and symptoms of heat-related and cold-related illnesses. The SSHO will observe for heat-related and cold-related illnesses. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X	Power/Electrical Tool Use	<ul style="list-style-type: none"> • Power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and shall be used only for the purpose for which designed. • The electrical power control shall be provided on each machine/power tool to make it possible for the operator to cut off the power for the machine/power tool without leaving the point of operation. 	L
X	Puncture wounds	<ul style="list-style-type: none"> • Caution shall be used while working around lumber with exposed nails. To the extent practical, nails are to be removed or hammered over to minimize punctures. 	L
X	Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Slips, trips, and falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Trip hazards will be identified and removed or isolated. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. • If mud pans are used, the pan will be cleaned out as often as possible to avoid slippery conditions. 	L
X	Mobilization	Utility Clearance	<ul style="list-style-type: none"> • A survey should be conducted to identify any underground utilities tanks, pipes, or other underground structures in accordance with 	L
X	PRE-Operations	Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • Perform a job safety analysis for any unanticipated hazards and hazard controls 	L
X	Operations	Biological Injury	<ul style="list-style-type: none"> • The SSHO (or alternate SSHO) will also survey the work locations for biological hazards prior to beginning work. Care should be taken during field activities to prevent contact with biological hazards. • Protection against insects, such as protective clothing (Level D) and insect repellents will be used. • Where vermin are identified in work areas, the SSHO (or alternate SSHO) shall be immediately notified. • The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L
X	Demobilization	Equipment	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	L
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm2. • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	Tools (Hammer, etc)	Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	GPR and other applicable tools for Geophysical Survey	State License/ applicable training	Subcontractor will inspect before arriving onsite and once daily
X	Civil Survey	State License/ applicable training	Subcontractor will inspect before arriving onsite and once daily

Involved Personnel:

CDM Smith field staff and subcontractors
 All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training.
 This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.



Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 4/14/2015 Project: Wolff- Alport RI/FS

Activity: Downhole Geophysical Investigation of Boreholes

Activity Location: Ridgewood, NY

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Contusions, abrasions, cuts, and amputations	<ul style="list-style-type: none"> • Tools shall be inspected prior to use. • Power tools that are equipped with a safety guard will be used with the guard in place. • Defective tools shall be tagged and removed from service. 	L
X		Faulty/Damaged Equipment	<ul style="list-style-type: none"> • Defective or damaged equipment shall not be used. It shall be tagged as out of service and/or immediately removed from the work site to prevent use. 	L
X		Foot Injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required. • Steel-toed work boots will be required for all work activities. • Rubber overboot or hip waders will also be required if the personnel need to pass through standing water. 	L
X		Heat & Cold Stress	<ul style="list-style-type: none"> • Personnel will be briefed on the signs and symptoms of heat-related and cold-related illnesses. The SSHO will observe for heat-related and cold-related illnesses. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X	Power/Electrical Tool Use	<ul style="list-style-type: none"> • Power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and shall be used only for the purpose for which designed. • The electrical power control shall be provided on each machine/power tool to make it possible for the operator to cut off the power for the machine/power tool without leaving the point of operation. 	L
X	Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in health and safety meeting 	L
X	Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X	Slips, trips, and falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Trip hazards will be identified and removed or isolated. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. • If mud pans are used, the pan will be cleaned out as often as possible to avoid slippery conditions. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Biological Injury	<ul style="list-style-type: none"> • The SSHO (or alternate SSHO) will also survey the work locations for biological hazards prior to beginning work. Care should be taken during field activities to prevent contact with biological hazards. • Protection against insects, such as protective clothing (Level D) and insect repellents will be used. • Where vermin are identified in work areas, the SSHO (or alternate SSHO) shall be immediately notified. • The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L
X	PRE-Operations	Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • Perform a job safety analysis for any unanticipated hazards and hazard controls a 	L
X	Investigation	Downhole Geophysics Exposure to Contaminants	<p>Geophysics should be conducted in accordance with the prepared scope of work and tools used in accordance with manufacturer's operating manuals.</p> <p>Nitrile/Latex gloves and safety glasses with side shields will be worn during geophysics investigations. Tyvek may be required be worn as necessary.</p>	L
X	Demobilization	Equipment	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L
X		Internal Exposure (Inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm2. • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	Tools (Hammer, etc)	Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Gamma probe	Training based on the equipment operating manual	Drilling subcontractor will inspect before arriving onsite and once daily
X	Caliper	Training based on the equipment operating manual	Drilling subcontractor will inspect before arriving onsite and once daily
X	resistivity probes	Training based on the equipment operating manual	Drilling subcontractor will inspect before arriving onsite and once daily

Involved Personnel:

CDM Smith field staff and subcontractor

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training.

This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 4/14/2015 Project: Wolff-Alport RI/FS

Activity: Soil sampling

Activity Location: Ridgewood, New York

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Back Strain or Sprain	<ul style="list-style-type: none"> Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. The back will be kept as straight as possible. Use mechanical means for lifting heavy objects whenever possible (i.e., forklift, lift gate, loader, etc.). 	L
X		Biological	<ul style="list-style-type: none"> The SSHO (or alternate SSHO) will screen the area for biological hazards prior to beginning work. Protection against insects, such as protective clothing (Level D) and insect repellents (where necessary), will be used. Personal hygiene practices, such as frequent hand-washing, will help prevent rodent-borne diseases as well as using caution in areas likely to be occupied by vermin. The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Cold Stress	<ul style="list-style-type: none"> • If manual dexterity is not required of an employee, they shall wear thermally protective gloves for light work below temperatures of 40 degrees F, and for moderate to heavy work for temperatures below 20 degree F. • If fine work is required for more than 10-20 minutes in an environment below 50 degrees F, procedures shall be established by the SSHO for keeping employees hands warm. • If wind chill is a factor at a location, the cooling effect of the wind shall be reduced by shielding the work area or requiring employees to wear an outer windbreak garment • Extremities, ears, nose shall be protected from extreme cold by proper clothing such as hats, gloves, masks, etc. • If clothing is wet, employees shall change into dry clothes before entering a cold environment. 	L
X	Eye injury	<ul style="list-style-type: none"> • Safety glasses will be required during MW sampling operations • A portable eyewash station will be present onsite during all activities. 	L
X	Fall Protection	<ul style="list-style-type: none"> • Based on planned activities fall protection is not expected to be required • If planned activities change and require personnel to be 6' above ground a fall protection plan will be implemented 	L
X	Fire Protection	<ul style="list-style-type: none"> • "Danger" and "No Smoking" signs shall be posted around all flammable and combustible liquid storage areas. • Portable fire extinguishers shall be provided where needed • All aboveground tanks shall have adequately sized concrete containment, such as slab and walls, to contain spills. • Tanks shall be vented with a pipe not less than 13 inch inside diameter and shall be 12 feet high from the adjacent ground level. • Tanks shall be kept 20 feet from buildings. • All tanks shall be properly grounded. • All tanks shall be labeled with the contents and owner's name. • All temporary heating devices must be approved prior to use on the jobsite. • Heaters shall be kept at least 20 feet from buildings and other combustible items. • Job-made heaters, solid fuel salamanders, and open fires are prohibited on the jobsite. 	L
X	Foot injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Hand Injury	<ul style="list-style-type: none"> • Cut resistant gloves will be worn in compliance with ANSI/ISEA 105 during routine drilling activities. • Keep hands away from rotating augers, the hammer, and all other moving parts. • Skid mounted steam cleaners will have protective guarding on all rotating shafts, belts, and pulleys. • Nitrile gloves will be worn while operating the steam cleaner. • Keep hands clear of the water spray. 	L
X	Head Injury	<ul style="list-style-type: none"> • Hard hats will be required during all onsite activities. 	L
X	Heat stress	<ul style="list-style-type: none"> • Drink water • Employee Training for Hot Environments • Employee Work Schedule Considerations • Employee Work Breaks in cooler location • Acclimatization Breaks 	L
X	Housekeeping	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. 	L
X	Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Ensure all self-propelled construction and industrial equipment have backup alarms • If Drill Rigs need to be transported according to manufacturer recommendations • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X	Noise	<ul style="list-style-type: none"> • Hearing protection will be required during hammering and steam cleaning operations inside exclusion zone. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS		HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X		Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X		Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X		Slips/trips/falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. 	L
X		Unauthorized operation	<ul style="list-style-type: none"> • Only trained and authorized personnel will operate and/or assist in drilling operations. • Operators must comply will all applicable state certifications. 	L
X		Working Alone	<ul style="list-style-type: none"> • During certain elements of the field program the SSHO may be working alone. He will have a means of communication at all times and have a defined and posted work schedule. 	L
X	Mobilization	Utility Clearance	<ul style="list-style-type: none"> • Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities tanks, pipes, or other underground structures in accordance with Section 4.e of the APP 	L
X	PRE-Operations	Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • The SSHO will perform a pre-task safety and health analysis for expected hazards and hazard controls prior to conducting that activities 	L
X		Drill Rig and Operator Certifications	<ul style="list-style-type: none"> • Drilling equipment operators are required to have the training, experience and shall be licensed to operate the specific equipment to be used onsite. • The drilling operator shall submit documentation of their competency and licensing to the SSHO prior to the start of any related drilling activities. • Before initial use, vehicles not otherwise inspected by State or local authorities, shall be inspected by a qualified mechanic 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Drill Rig Inspection	<ul style="list-style-type: none"> • The SSHO shall ensure drill rigs are inspected on a daily basis, prior to activities. 	L
X		Personnel Training	CDM Smith and subcontractor employees performing field activities must have the following: <ul style="list-style-type: none"> • 40-Hour HAZWOPER and 3 days of on the job training under the direction of a trained and experienced supervisor • At least 2 employees shall be certified in CPR and First Aid • The SSHO will have 8 hour Supervisor training and a 30 hour OSHA construction safety or equivalent certificate 	L
X	Operations	Cathead hazards	<ul style="list-style-type: none"> • The operator must be trained and experienced in the use of a cathead. • The rope must be in good condition. • The operator shall not wear loose clothing. 	L
X		Chemical Exposure	<ul style="list-style-type: none"> • Exposure to contaminants will be prevented or reduced by delineating zones at the site where prescribed operations will occur. • During injection activities, air will be monitored in the breathing zone using a PID following the below guidelines: <p>0 – 1 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Continue monitoring for VOCs. and working in Level D PPE <p>1 – 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. • Use Draeger tubes (or equivalent) to determine if vinyl chloride is present in the breathing zone. • If Draeger tubes do not detect chemicals, activities may proceed to a 5 ppm reading, sustained over a 5-minute average <p>Greater than 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. 	L
X		Crushing and Pinch points	<ul style="list-style-type: none"> • Drill rods and drill bit stabilizer will be properly transported by either a rack, the rig, or utility trailer. • If transported on a trailer, the rods or stabilizers will be held securely in place. • If feasible, all vehicles and wheeled equipment will have chocks placed under the wheels to prevent rolling. 	M

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Drill rig failure	<ul style="list-style-type: none"> • The mast and cables must be able to support all equipment and drill rods. • Wire cables must be maintained in good condition, free from kinks or broken strands. • All rotating shafts, pulleys or chains must be covered with protective guards. • All drill rigs must be equipped with an emergency kill switch, which is readily accessible to personnel at the rear of the rig. All personnel on the site will know the location of the kill switch and how to use it. • In the event of failure, any maintenance activities will be subjected to a Hazard/Risk Analysis by the SSO. 	L
X	Electrical	<ul style="list-style-type: none"> • If steam cleaners are being powered by a generator, a Ground-Fault Circuit Interrupter (GFCI) will be required 	L
X	Environmental Protection	<ul style="list-style-type: none"> • Absorbent pads will be used when and if a fuel spill occurs. • Dust suppression will be maintained at all times 	L
X	Equipment Decontamination	<ul style="list-style-type: none"> • Operator needs to be trained based on the equipment operating manual • A decontamination pad will be used to contain liquid 	L
X	Power lines/underground utilities	<ul style="list-style-type: none"> • Ensure that there are not any power lines or underground utilities prior to drilling activities. • If work is near an overhead line, care will be taken to ensure there is clearance with raising the mast. • While working near power lines, drill rods will not be leaned against the mast. • If the drill bit encounters anything hard, drilling will stop and the Geologist will be notified. 	L
X	Work Zones	<ul style="list-style-type: none"> • Maintain exclusion zone 1.5 times the mast height when feasible 	L
X	Demobilization	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	L
X	Open Boreholes	<ul style="list-style-type: none"> • Open boreholes shall be capped and flagged. 	L
X	Secure Mast	<ul style="list-style-type: none"> • Drilling equipment shall not be transported with the mast up unless it is specifically approved by the manufacturer, and included in the transportation survey. 	L
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure <ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm². • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Hollow stem auger	40-Hour HAZWOPER, State licensed soil borer	Inspect before arriving onsite and once daily
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	PPE	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Support Vehicles - TBD	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Water Level Meter	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Water Quality Meter	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	direct push technology (DPT) Rig	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM Smith field staff and subcontractors

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training. This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.



Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 4/14/2015 Project: Wolff- Alport RI/FS

Activity: Investigation Derived Waste (IDW) Handling

Activity Location: Ridgewood, NY

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Back Strain or Sprain	<ul style="list-style-type: none"> Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. The back will be kept as straight as possible. Use mechanical means for lifting heavy objects whenever possible (i.e., forklift, lift gate, loader, etc.). 	L
X		Biological	<ul style="list-style-type: none"> The SSHO (or alternate SSHO) will screen the area for biological hazards prior to beginning work. Protection against insects, such as protective clothing (Level D) and insect repellents (where necessary), will be used. Personal hygiene practices, such as frequent hand-washing, will help prevent rodent-borne diseases as well as using caution in areas likely to be occupied by vermin. The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Cold Stress	<ul style="list-style-type: none"> • If manual dexterity is not required of an employee, they shall wear thermally protective gloves for light work below temperatures of 40 degrees F, and for moderate to heavy work for temperatures below 20 degree F. • If fine work is required for more than 10-20 minutes in an environment below 50 degrees F, procedures shall be established by the SSHO for keeping employees hands warm. • If wind chill is a factor at a location, the cooling effect of the wind shall be reduced by shielding the work area or requiring employees to wear an outer windbreak garment • Extremities, ears, nose shall be protected from extreme cold by proper clothing such as hats, gloves, masks, etc. • If clothing is wet, employees shall change into dry clothes before entering a cold environment. 	L
X	Eye injury	<ul style="list-style-type: none"> • Safety glasses will be required during IDW handling • A portable eyewash station will be present onsite during all activities. 	L
X	Fall Protection	<ul style="list-style-type: none"> • Based on planned activities fall protection is not expected to be required • If planned activities change and require personnel to be 6' above ground a fall protection plan will be implemented 	L
X	Fire Protection	<ul style="list-style-type: none"> • "Danger" and "No Smoking" signs shall be posted around all flammable and combustible liquid storage areas. • Portable fire extinguishers shall be provided where needed 	L
X	Foot injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required, 	L
X	Hand Injury	<ul style="list-style-type: none"> • Cut resistant gloves will be worn in compliance with ANSI/ISEA 105 during routine drilling activities. 	L
X	Head Injury	<ul style="list-style-type: none"> • Hard hats will be required during all onsite activities. 	L
X	Heat stress	<ul style="list-style-type: none"> • Drink water • Employee Training for Hot Environments • Employee Work Schedule Considerations • Employee Work Breaks in cooler location • Acclimatization Breaks 	L
X	Housekeeping	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. 	L
X	Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS		HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X		Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X		Slips/trips/falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. 	L
X	Mobilization	Motorized Traffic	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Vehicles may not be driven at speeds greater than the posted speed limit 	L
X	IDW Handling and Disposal	Lack of Pre-Planning	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • The SSHO will perform a pre-task safety and health analysis for expected hazards and hazard controls prior to conducting that activities i 	L
X		Personnel Training	<p>CDM Smith and subcontractor employees performing field activities must have the following:</p> <ul style="list-style-type: none"> • 40-Hour HAZWOPER and 3 days of on the job training under the direction of a trained and experienced supervisor • At least 1 employee shall be certified in CPR and First Aid • The SSHO will have 8 hour Supervisor training 	L
X		Chemical Exposure	<p>Wear required PPE to protect eyes and skin from exposure. Required PPE includes: safety glasses with side shields, nitrile or chemical-resistant gloves, other skin protection (e.g., Tyvek, aprons, etc.) if splash potential exists during handling and disposal.</p>	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Crushing and Pinch points • The fingers will be kept away from any points that may cause the fingers to be pinched or crushed, especially when setting the object down.	L
X		Environmental Protection • Absorbent pads will be used when and if a fuel spill occurs.	L
X	Demobilization	Equipment • All equipment will be secured according to manufacturer recommendations.	L
X	Mobilization and Demobilization	Heavy Equipment Whenever heavy or bulky material is to be moved, the material handling needs shall be evaluated in terms of weight, size, distance, and path of movement. The following hierarchy shall be followed in selecting a means for material handling: a. Elimination of material handling needs by engineering b. Movement by mechanical device c. Movement by manual means with handling aid d. Movement by safe lifting techniques Materials will not be moved over or suspended above personnel unless positive precautions have been taken to protect the personnel from falling objects.	L
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas.	L
X		Internal Exposure (inhalation/Ingestion) • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m ³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm2. • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Drum dolly or forklift	Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Drum Tools	Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	Haul Truck	State license, 40-Hour HAZWOPER and Training based on the equipment operating manual	

Involvement Personnel:

CDM Smith field staff and subcontractor

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training. This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 4/14/2015 Project: Wolff- Alport RI/FS

Activity: Indoor Drilling and Dust Monitoring

Activity Location: Ridgewood, NY

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Mobilization & Demobilization	Driving Safety	• Employees should take precaution driving to and from the field site by driving the speed limit, obeying road signs, wearing seatbelts at all times, driving defensively and taking safety precautions during extreme weather conditions.	L
X		Environmental Protection	If fuel or oil leaks, absorbent pads will be used.	L
X		Crushing injuries	If feasible, all vehicles and wheeled equipment will have chocks placed under the wheels to prevent rolling	L
X		Housekeeping - slips/trips/falls	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. • Cords will be covered or elevated above walkway. • Equipment will be stored when not in use. • Avoid slippery conditions if mud pans are used. 	L
X		Back injuries	Employees will use proper lifting techniques: <ul style="list-style-type: none"> - Bend at knees and grip object with whole hand - Keep back as straight and vertical as possible - Center body weight over feet - Arms and elbows kept close to the body - Heavy or large objects shall be carried by two people - Ensure pathways are clear 	L
X		Eye Injury	<ul style="list-style-type: none"> • Safety glasses will be required during site work • Keep hands away from eyes and skin during work operations. 	L
X		Foot Injury	• Leather steel-toed and steel shanked boots will be required.	L
X		Hand Injury	• Cut-resistant gloves will be worn when handling heavy, rough or sharp objects.	L
X		Head Injury	• Hard hats will be required during site work.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Severe Weather	<ul style="list-style-type: none"> • Geoprobe and other drill rig work will stop when rain interferes with the safety of the operators. • Geoprobe and other drill rig activities will stop during lightning. • Operators, crew, and other support personnel will move out of the exclusion zone and take shelter in other vehicles. 	L
X		Ticks, mosquitoes, poison ivy and other biological contact hazards	<ul style="list-style-type: none"> • Try to avoid areas (long grass, wooded locations) that ticks are likely to inhabit during active months (April through September). • Wear boots or other proper footwear. • Wear long pants that cover your legs. • Cover your arms and leave as little skin exposed as possible. • Wear gloves, and PPE as required by HASP • Tuck pant legs into high boots and tape the area where pants and socks meet. Apply insecticides 	L
X		Fire Prevention	<ul style="list-style-type: none"> • Keep at least one ABC type fire extinguisher on hand. • Fire extinguishers will be fully charged and inspected weekly by subcontractor. • Fuels will be stored in appropriate containers. 	L
X	Drill Rig Setup	Back injury	Personnel will be instructed to lift with their legs and not their backs while handling heavy equipment. Personnel will be encouraged to ask for assistance when carrying heavy/bulky items.	L
X		Heat Stress & Cold Stress	Personnel will be briefed on the signs and symptoms of heat-related and cold-related illnesses. The SSHO will observe for heat-related and cold-related illnesses.	L
X		Defective equipment	All equipment will be inspected prior to being brought on site. Additionally, prior to each use, personnel will perform a pre-use inspection to ensure that it is still safe to operate. The safety representative will also perform routine inspections. CDM SSHO will confirm inspection has been completed by the subcontractor and document inspection in the field logbook.	L
X		Electrical shock	All electrical equipment will be inspected prior to use. A Ground-Fault Circuit Interrupter will be required for all temporary wiring and/or extension cords.	L
X		Electrocution / Explosion	Inspection for buried and overhead utilities in the vicinity of the drilling location will be completed prior to drilling. Review OneCall utility locate services.	L
X		Emergency notification	A cellular phone will be available at all times on the job site. All personnel will be trained on the proper numbers to call for summoning emergency assistance.	L
X		Environmental release	Refueling will be conducted over plastic sheeting.	L
X		Eye injury	Safety glasses with side shields shall be worn for all work activities.	L
X		Fire	Allow equipment to cool before fueling. Fire extinguishers of the proper classification and size will be present on the drill rig.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Foot injury	Steel-toed work boots will be required for all work activities.	L
X		Hand injury	Leather or cut resistant gloves will be required for all work which has a potential for cuts from sharp edges or pinch points.	L
X		Head injury	Hard hats will be required for all work activities involving overhead hazards.	L
X		Injury from motorized equipment/ mechanical or moving parts (Hazardous Energy)	Personnel will be aware of the location of motorized equipment and especially those with limited visibility. Back-up alarms will be required on equipment where it is recommended. All extremities will be kept clear of all moving parts.	M
X		Severe weather	Operations will stop when weather interferes with the safety of the operator and with the threat of severe weather. Operators, crew, and other support personnel will move out of the work zone and gather at assembly point. During thunderstorms, crew will assemble in project motor vehicles (metal topped vehicles with 4 rubber tires and windows up), adjacent to drill location. The SSHO will specify when work may resume; work will not resume until lightning and thunder has stopped for a minimum of 30 minutes.	L
X		Slips, trips, and falls	Good housekeeping requirements will be applied to all work areas. Equipment will be stored unless in use. Trees, roots, weeds, limbs and other ground hazards shall be cleared from the drilling location. Practice good housekeeping to keep the ground around the drilling site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.	L
X		Tip over	Never move the drilling rig with the mast upright. Set hydraulic leveling jacks before raising the mast. Ensure the drilling site foundation is stable and as level as possible.	L
X	Direct Push Activities	Work zone	Drilling area will be marked off and set up as an exclusion zone. Signs identifying PPE requirements will be located outside the zone.	L
X		Emergency notification	A cellular phone will be available at all times on the job site. All personnel will be trained on the proper numbers to call for summoning emergency assistance.	L
X		Equipment inspection	Daily inspections will be performed on all drill rigs and related equipment by the Subcontractor. Any equipment found to be unusable will not be used until repaired or replaced.	L
X		Eye injury	Safety glasses with side shields will be required during drilling operations.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Foot injury	Leather steel-toed boots will be required to worn by onsite personnel.	L
X		Hand injury	Gloves will be worn during routine drilling activities. Keep hands away from rotating augers, the hammer, and all other moving parts.	L
X		Head injury	Hard hats will be required to be worn by onsite personnel during drilling operations. Hard hats will not be required during site set up, but will be required immediately after the mast has been raised, and at any time overhead hazards are present.	L
X		Noise	Hearing protection will be required to be worn by onsite personnel during drilling activities within the exclusion zone.	L
X		Injury from motorized equipment or moving parts	Personnel will be aware of location of motorized equipment, especially those with limited visibility. Back-up alarms will be required on equipment. All extremities will be kept clear of moving parts and machinery. Maintain contact with operator when moving in exclusion zone.	M
X		Overhead clearance/underground utilities	The subcontractor shall ensure that the drilling rig is set up at locations away overhead hazards and the rig has sufficient clearances from ceilings. If the drill bit encounters anything hard, drilling will stop and the CDM Smith field personnel will be notified.	L
X		Severe weather	Operations will stop when weather interferes with the safety of the operator and with the threat of severe weather. Operators, crew, and other support personnel will move out of the work zone and gather at assembly point. During thunderstorms, crew will assemble in project motor vehicles (metal topped vehicles with 4 rubber tires and windows up), adjacent to drill location. The SSHO will specify when work may resume; work will not resume until lightning and thunder has stopped for a minimum of 30 minutes.	L
X		Slips/trips/falls	Good housekeeping requirements will be applied to avoid potential slipping and tripping hazards.	L
X		Unauthorized operation	Only trained and authorized personnel will operate and/or assist in drilling operations. Operators must comply will all applicable state certifications.	L
X	Sleeve Removal and Sample Collection	Heat Stress & Cold Stress	Personnel will be briefed on the signs and symptoms of heat and cold-related illnesses. The Safety Officer will observe for cold-related illnesses.	L
X		Exposure to contaminants	Nitrile/Latex gloves will be worn during sleeve removal and sampling. Tyvek will be worn as necessary.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Eye injury	Safety glasses with side shields shall be worn	L
X		Foot injury	Steel-toed work boots will be required for all personnel in the HAZWOPER zone.	L
X		Hand injury	Leather or cut resistant gloves will be required for all work which has a potential for cuts from sharp steel, push/drill steel, cutting sample sleeves, pinch points, etc. Pinch points will be guarded.	L
X		Head injury	Hard hats will be required for all work in the HAZWOPER zones.	L
X		Slips/trips/ and falls	Good housekeeping requirements will be applied to avoid potential slipping and tripping hazards.	L
X	Decontamination	Electrical hazards	If steam cleaners are being powered by a generator, a GFCI will be required.	L
X		Fire hazards	Turn off the steam cleaner and allow it to cool before refueling. Generators will be turned off during refueling events. Smoking is prohibited during refueling operation.	L
X		Hand injury	Skid-mounted steam cleaners will have protective guarding on all rotating shafts, belts, and pulleys. Nitrile gloves will be worn while operating the steam cleaner. Keep hands clear of the water spray.	L
X		Hearing loss	Hearing protection will be worn during steam cleaning operation.	L
X	Mobilization and Demobilization	Heavy Equipment	<p>Whenever heavy or bulky material is to be moved, the material handling needs shall be evaluated in terms of weight, size, distance, and path of movement. The following hierarchy shall be followed in selecting a means for material handling:</p> <ul style="list-style-type: none"> a. Elimination of material handling needs by engineering b. Movement by mechanical device c. Movement by manual means with handling aid d. Movement by safe lifting techniques <p>Materials will not be moved over or suspended above personnel unless positive precautions have been taken to protect the personnel from falling objects.</p>	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Intrusive Activities	Chemical Exposure	<ul style="list-style-type: none"> Exposure to contaminants will be prevented or reduced by delineating zones at the site where prescribed operations will occur. During Geoprobe Drilling and Sampling activities, air will be monitored in the breathing zone using a PID and dust meter following the below guidelines: <ul style="list-style-type: none"> 0 – 1 ppm, sustained over a 5-minute average Continue monitoring for VOCs. and working in Level D PPE 1 – 5 ppm, sustained over a 5-minute average Stop work immediately and leave the exclusion zone. Move to assigned rally location. Greater than 5 ppm, sustained over a 5-minute average <ul style="list-style-type: none"> Stop work immediately and leave the exclusion zone. Move to assigned rally location. <p>Site soils and their elevated chromium concentrations do present an inhalation hazard to site workers doing intrusive activities. If the onsite dust meter records a level of 1.0 mg/m³ work will be stopped immediately and personnel will leave the exclusion zone. Move to assigned rally location.</p>	L
X	Dust/Air Monitoring		Maintain sustained (>15 min) dust levels below 150 ug/m ³ .	
X	Cutting of Lead and Concrete Sheilding	Hand Injury and dust inhalation	<p>Leather or cut resistant gloves will be required for all work which has a potential for cuts from sharp steel, push/drill steel, cutting sample sleeves, pinch points, etc. Pinch points will be guarded. Subcontractor will wear appropriate PPE to prevent inhalation of dust particles</p> <ul style="list-style-type: none"> Equipment shall be inspected prior to use. 	M
X		Defective equipment		
X		Improper use of equipment	<ul style="list-style-type: none"> Employees shall be instructed in the safe use of the welding, burning, and brazing equipment. Fuel gas and oxygen hoses shall be easily distinguishable and shall not be interchangeable. Hoses shall be inspected at the beginning of each shift and shall be repaired or replaced if defective. 	M
X		Accidental burns	<ul style="list-style-type: none"> Caution will be used while working in the vicinity of hot work. Leather work gloves or welding gloves shall be worn while performing hot work. 	M
X		Eye damage	<ul style="list-style-type: none"> The operator and helper shall wear proper eye protection. 	M

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		<ul style="list-style-type: none"> • A properly trained employee will perform fire watch during the performance of hot work and for 30 minutes after the completion of hot work. • Fire extinguishers are to be inspected prior to use during fire watch. • Hot work operations will be performed as far away from combustible/flammable liquid storage as possible. • If possible, hot work will be performed in an open area (such as a parking lot, or other concrete/graveled surface). 	M
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L
X		<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm². • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day 	L

Add Items

ACTIVITY HAZARDS ANALYSIS

	EQUIPMENT	TRAINING	INSPECTION
X	Drill Rig: Geoprobe	Per subcontractor requirements and manufacturer's instructions	Daily inspection of drill rig prior to start of work.
X	PPE	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	PID	Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Dust meter	Manufacturer's instructions	Daily
X	Venting/Engineering controls to reduce dust	Drilling subcontractor will set up the necessary control/measures to reduce the dust produced	CDM Smith field staff will monitor dust levels during the indoor activities
X	Concrete Saw		
X	Welding equipment to cut lead shielding		

Involved Personnel:

CDM Smith field staff and subcontractors

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training.

This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.



Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 4/14/2015 Project: Wolff- Alport RI/FS

Activity: Monitoring well sampling and synoptic water level measurements

Activity Location: Ridgewood, NY

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Back Strain or Sprain	<ul style="list-style-type: none"> Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. The back will be kept as straight as possible. 	L
X		Biological	<ul style="list-style-type: none"> The SSHO (or alternate SSHO) will screen the area for biological hazards prior to beginning work. Protection against insects, such as protective clothing (Level D) and insect repellents (where necessary), will be used. Personal hygiene practices, such as frequent hand-washing, will help prevent rodent-borne diseases as well as using caution in areas likely to be occupied by vermin. The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Cold Stress	<ul style="list-style-type: none"> • If manual dexterity is not required of an employee, they shall wear thermally protective gloves for light work below temperatures of 40 degrees F, and for moderate to heavy work for temperatures below 20 degree F. • If fine work is required for more than 10-20 minutes in an environment below 50 degrees F, procedures shall be established by the SSHO for keeping employees hands warm. • If wind chill is a factor at a location, the cooling effect of the wind shall be reduced by shielding the work area or requiring employees to wear an outer windbreak garment • Extremities, ears, nose shall be protected from extreme cold by proper clothing such as hats, gloves, masks, etc. • If clothing is wet, employees shall change into dry clothes before entering a cold environment. 	L
X	Eye injury	<ul style="list-style-type: none"> • Safety glasses will be required during MW sampling operations . • A portable eyewash station will be present onsite during all activities. 	L
X	Fall Protection	<ul style="list-style-type: none"> • Based on planned activities fall protection is not expected to be required • If planned activities change and require personnel to be 6' above ground a fall protection plan will be implemented 	L
X	Fire Protection	<ul style="list-style-type: none"> • "Danger" and "No Smoking" signs shall be posted around all flammable and combustible liquid storage areas. • Portable fire extinguishers shall be provided where needed 	L
X	Foot injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required. 	L
X	Hand Injury	<ul style="list-style-type: none"> • Nitrile gloves shall be worn during routine groundwater sampling and water level activities. 	L
X	Head Injury	<ul style="list-style-type: none"> • Hard hats will be required during all onsite activities. 	L
X	Heat stress	<ul style="list-style-type: none"> • Drink water • Employee Training for Hot Environments • Employee Work Schedule Considerations • Employee Work Breaks in cooler location • Acclimatization Breaks 	L
X	Housekeeping	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X	Noise	<ul style="list-style-type: none"> • All personnel performing activities inside of the EZ while groundwater is purged should wear either disposable earplugs or earmuffs, with a minimum noise reduction rating (NRR) of 27 decibels (dB). 	L
X	Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X	Slips/trips/falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. 	L
X	PRE-Operations	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • The SSHO will perform a pre-task safety and health analysis for expected hazards and hazard controls prior to conducting that activities in accordance with Section 4.e of the APP 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Personnel Training	<p>CDM Smith and subcontractor employees performing field activities must have the following:</p> <ul style="list-style-type: none"> • 40-Hour HAZWOPER and 3 days of on the job training under the direction of a trained and experienced supervisor • At least 1 employee shall be certified in CPR and First Aid • The SSHO will have 8 hour Supervisor training. 	L
X	Operations	Chemical Exposure	<ul style="list-style-type: none"> • Exposure to contaminants will be prevented or reduced by delineating zones at the site where prescribed operations will occur. • During monitoring well sampling and synoptic water level activities, air will be monitored in the breathing zone using a PID following the below guidelines: <p>0 – 1 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Continue monitoring for VOCs. and working in Level D PPE <p>1 – 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. • Use Draeger tubes (or equivalent) to determine if vinyl chloride is present in the breathing zone. • If Draeger tube do not detect chemicals, activities may proceed to a 5 ppm reading, sustained over a 5-minute average <p>Greater than 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. 	M
X		Crushing and Pinch points	<ul style="list-style-type: none"> • The fingers will be kept away from any points that may cause the fingers to be pinched or crushed, especially when setting the object down. 	L
X		Environmental Protection	<ul style="list-style-type: none"> • Absorbent pads will be used when and if a fuel spill occurs. 	L
X		Equipment Decontamination	<ul style="list-style-type: none"> • Operator needs to be trained based on the equipment operating manual • Decontamination fluids will be containerized 	L
X	Demobilization	Equipment	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	L
X	<p>Radiation Control- All Tasks</p> <p>Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.</p>	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm². • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Generator	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	PPE	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Submersible Pump	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Water Level Meter	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Water Quality Meter	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM Smith field staff

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training. This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 4/14/2015 Project: Wolff- Alport RI/FS

Activity: Drilling (DPT and Hollow Stem Auger)

Activity Location: Ridgewood, NY

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Back Strain or Sprain	<ul style="list-style-type: none"> Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. The back will be kept as straight as possible. Use mechanical means for lifting heavy objects whenever possible (i.e., forklift, lift gate, loader, etc.). 	L
X		Eye injury	<ul style="list-style-type: none"> Safety glasses will be required during drilling operations. 	L
X		Fall Protection	<ul style="list-style-type: none"> Based on planned activities fall protection is not expected to be required If planned activities change and require personnel to be 6' above ground a fall protection plan will be implemented 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Fire Protection	<ul style="list-style-type: none"> • “Danger” and “No Smoking” signs shall be posted around all flammable and combustible liquid storage areas. • Portable fire extinguishers shall be provided where needed • All aboveground tanks shall have adequately sized concrete containment, such as slab and walls, to contain spills. • Tanks shall be vented with a pipe not less than 13 inch inside diameter and shall be 12 feet high from the adjacent ground level. • Tanks shall be kept 20 feet from buildings. • All tanks shall be properly grounded. • All tanks shall be labeled with the contents and owner's name. • All temporary heating devices must be approved prior to use on the jobsite. • Heaters shall be kept at least 20 feet from buildings and other combustible items. • Job-made heaters, solid fuel salamanders, and open fires are prohibited on the jobsite. 	L
X	Foot injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required. 	L
X	Hand injury	<ul style="list-style-type: none"> • Cut resistant gloves will be worn in compliance with ANSI/ISEA 105 during routine drilling activities. • Keep hands away from rotating augers, the hammer, and all other moving parts. • Skid mounted steam cleaners will have protective guarding on all rotating shafts, belts, and pulleys. • Nitrile gloves will be worn while operating the steam cleaner. • Keep hands clear of the water spray. 	L
X	Head injury	<ul style="list-style-type: none"> • Hard hats will be required during all onsite activities. 	L
X	Heat & Cold Stress	<p>Personnel will be briefed on the signs and symptoms of heat-related and cold-related illnesses. The SSHO will observe for heat-related and cold-related illnesses.</p>	L
X	Housekeeping – slips/trips/falls	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. 	L
X	Noise	<ul style="list-style-type: none"> • Hearing protection will be required during hammering and steam cleaning operations inside exclusion zone. 	L
X	Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X	Slips/trips	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. • If mud pans are used, the pan will be cleaned out as often as possible to avoid slippery conditions. 	L
X	Tripping Hazards	<ul style="list-style-type: none"> • Personnel should avoid crossing over piping and keep hoses away from main walkways. 	L
X	Unauthorized operation	<ul style="list-style-type: none"> • Only trained and authorized personnel will operate and/or assist in drilling operations. • Operators must comply will all applicable state certifications. 	L
X	Mobilization	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Ensure all self-propelled construction and industrial equipment have backup alarms • If Drill Rigs need to be transported according to manufacturer recommendations • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Vehicles may not be driven at speeds greater than the posted speed limit 	L
X	Utility Clearance	<ul style="list-style-type: none"> • Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities tanks, pipes, or other underground structures i 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	PRE-Operations	Drill Rig and Operator Certifications	<ul style="list-style-type: none"> • Drilling equipment operators are required to have the training, experience and shall be licensed to operate the specific equipment to be used onsite. • The drilling operator shall submit documentation of their competency and licensing to the SSHO prior to the start of any related drilling activities • Before initial use, vehicles not otherwise inspected by State or local authorities, shall be inspected by a qualified mechanic 	L
X		Drill Rig Inspection	<ul style="list-style-type: none"> • The SSHO shall ensure drill rigs are inspected on a daily basis, prior to activities . 	L
X		Personnel Training	<p>CDM Smith and subcontractor employees performing field activities must have the following:</p> <ul style="list-style-type: none"> • 40-Hour HAZWOPER and 3 days of on the job training under the direction of a trained and experienced supervisor • At least 2 employees shall be certified in CPR and First Aid • The SSHO will have 8 hour Supervisor training. 	L
X		Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • Perform a job safety analysis for any unanticipated hazards and hazard controls. 	L
X	Operations	Cathead hazards	<ul style="list-style-type: none"> • The operator must be trained and experienced in the use of a cathead. • The rope must be in good condition. • The operator shall not wear loose clothing. 	L
X		Chemical Exposure	<ul style="list-style-type: none"> • During sampling activities, air will be monitored in the breathing zone using a PID • If a 5 minute average reading of 5 ppm or higher occurs, people will leave the work zone. • Exposure to contaminants will be prevented or reduced by delineating zones at the site where prescribed operations will occur. 	L
X		Crushing and Pinch points	<ul style="list-style-type: none"> • Drill rods and drill bit stabilizer will be properly transported by either a rack, the rig, or utility trailer. • If transported on a trailer, the rods or stabilizers will be held securely in place. • If feasible, all vehicles and wheeled equipment will have chocks placed under the wheels to prevent rolling. 	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Drill rig failure	<ul style="list-style-type: none"> • The mast and cables must be able to support all equipment and drill rods. • Wire cables must be maintained in good condition, free from kinks or broken strands. • All rotating shafts, pulleys or chains must be covered with protective guards. • All drill rigs must be equipped with an emergency kill switch, which is readily accessible to personnel at the rear of the rig. All personnel on the site will know the location of the kill switch and how to use it. • In the event of failure, any maintenance activities will be subjected to a Hazard/Risk Analysis. 	L
X		Electrical	<ul style="list-style-type: none"> • If steam cleaners are being powered by a generator, a Ground-Fault Circuit Interrupter (GFCI) will be required 	L
X		Environmental Protection	<ul style="list-style-type: none"> • Absorbent pads will be used when and if a fuel spill occurs. • Dust suppression will be maintained at all times 	L
X		Power lines/underground utilities	<ul style="list-style-type: none"> • Ensure that there are not any power lines or underground utilities prior to drilling activities. • If work is near an overhead line, care will be taken to ensure there is clearance with raising the mast. • While working near power lines, drill rods will not be leaned against the mast. • If the drill bit encounters anything hard, drilling will stop and the Geologist will be notified. 	L
X		Water tanks	<ul style="list-style-type: none"> • All portable water tanks must be securely fastened to the truck frame. • All stationary tanks will have secondary containment • Water tanks should be constructed of materials with adequate side strength, baffled to prevent the sloshing of water side to side, and must have lids with gaskets to prevent water loss. • Only the person filling the water tank will be permitted inside the established work zone • All above-ground tanks shall have adequately sized concrete containment, such as slab and walls, to contain spills. 	L
X		Work Zones	<ul style="list-style-type: none"> • Maintain exclusion zone 1.5 times the mast height when feasible 	L
X	Demobilization	Equipment	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	L
X		Open Boreholes	<ul style="list-style-type: none"> • Open boreholes shall be capped and flagged. 	L
X		Secure Mast	<ul style="list-style-type: none"> • Drilling equipment shall not be transported with the mast up unless it is specifically approved by the manufacturer, and included in the transportation survey. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L
X		Internal Exposure (Inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm². • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Geoprobe	40-Hour HAZWOPER, State licensed soil borer	Inspect before arriving onsite and once daily
X	Hollow Stem Auger	40-Hour HAZWOPER, State licensed driller	Inspect before arriving onsite and once daily
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	Support Vehicles - TBD	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM Smith field staff and subcontractor

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training.

This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation 

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 4/14/2015 Project: Wolff-Alport RI/FS

Activity: Sewer Assessment and Fiberscope Survey

Activity Location: Ridgewood, New York

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
s e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Contusions, abrasions, cuts, and amputations	<ul style="list-style-type: none"> Tools shall be inspected prior to use. Power tools that are equipped with a safety guard will be used with the guard in place. Defective tools shall be tagged and removed from service. 	L
X		Faulty/Damaged Equipment	<ul style="list-style-type: none"> Defective or damaged equipment shall not be used. It shall be tagged as out of service and/or immediately removed from the work site to prevent use. 	L
X		Foot Injury	<ul style="list-style-type: none"> Leather steel-toes boots will be required Steel-toed work boots will be required for all work activities. rubber overboot or hip waders will also be required if the personnel need to pass through standing water. 	L
X		Heat & Cold Stress	<ul style="list-style-type: none"> Personnel will be briefed on the signs and symptoms of heat-related and cold-related illnesses. The SSHO will observe for heat-related and cold-related illnesses. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X	Power/Electrical Tool Use	<ul style="list-style-type: none"> • Power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and shall be used only for the purpose for which designed. • The electrical power control shall be provided on each machine/power tool to make it possible for the operator to cut off the power for the machine/power tool without leaving the point of operation. 	L
X	Puncture wounds	<ul style="list-style-type: none"> • Caution shall be used while working around lumber with exposed nails. To the extent practical, nails are to be removed or hammered over to minimize punctures. 	L
X	Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Slips, trips, and falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Trip hazards will be identified and removed or isolated. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. • If mud pans are used, the pan will be cleaned out as often as possible to avoid slippery conditions. 	L
X	Mobilization	Utility Clearance	<ul style="list-style-type: none"> • A survey should be conducted to identify any underground utilities tanks, pipes, or other underground structures in accordance with 	L
X	PRE-Operations	Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • Perform a job safety analysis for any unanticipated hazards and hazard controls 	L
X	Operations	Biological Injury	<ul style="list-style-type: none"> • The SSHO (or alternate SSHO) will also survey the work locations for biological hazards prior to beginning work. Care should be taken during field activities to prevent contact with biological hazards. • Protection against insects, such as protective clothing (Level D) and insect repellents will be used. • Where vermin are identified in work areas, the SSHO (or alternate SSHO) shall be immediately notified. • The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L
X	Confined Space Entry		<p>Authorized Entrant. This is the individual who has been appropriately trained and authorized for permit-required confined space entry. Specific responsibilities include:</p> <ul style="list-style-type: none"> - Knowing the hazards associated with the confined space including the mode of exposure and the signs and symptoms of over-exposure - Properly using the prescribed personal protective equipment - Maintaining communication with the attendant - Exiting from the confined space as soon as possible when ordered by the attendant or when a prohibited condition exists or when a pre-set alarm activates - Alerting the attendant when a prohibited condition is observed or when signs and symptoms of exposure are encountered - Reviewing the completed permit prior to entry to verify that pre-entry preparations have been completed - Entrants are encouraged to review air monitoring results before entry. 	

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X			<p>Attendant. This is the individual who has been appropriately trained and authorized to perform the duties of the attendant. Attendants may only monitor one confined space at a time. Specific responsibilities include:</p> <ul style="list-style-type: none"> - Remaining outside the permit space during entry operations - Performing non-entry rescues when specified in the site-specific rescue -procedure - Knowing the existing and potential hazards - Maintaining communication with all entrants - Ordering evacuation of the permit space when a prohibited condition exists or when physiological signs of entrant exposure become apparent - Ensuring that unauthorized persons stay clear of permit spaces - Summoning rescue services if such services become necessary - Refraining from performing other duties that may interfere with the primary duty to monitor and protect the safety of authorized entrant(s) 	
X			<p>Attendant. This is the individual who has been appropriately trained and authorized to perform the duties of the attendant. Attendants may only monitor one confined space at a time. Specific responsibilities include:</p> <ul style="list-style-type: none"> - Remaining outside the permit space during entry operations - Performing non-entry rescues when specified in the site-specific rescue -procedure - Knowing the existing and potential hazards - Maintaining communication with all entrants - Ordering evacuation of the permit space when a prohibited condition exists or when physiological signs of entrant exposure become apparent - Ensuring that unauthorized persons stay clear of permit spaces - Summoning rescue services if such services become necessary - Refraining from performing other duties that may interfere with the primary duty to monitor and protect the safety of authorized entrant(s) 	

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		<p>Entry Supervisor. This individual is primarily responsible for the permit-required confined space entry. The entry supervisor must be trained in confined space entry and may serve as the attendant. Specific duties include:</p> <ul style="list-style-type: none"> - Issuing of the confined space entry permit - Verifying individuals that have performed all monitoring and testing of the space are properly trained to conduct the tests - Ensuring that proper procedures and equipment are in place and in good working order before endorsing the permit - Verifying that rescue services are available and that a mechanism to contact these services has been determined - Terminating and canceling permits when entry operations are completed or if a new condition is encountered - Reviewing entry operations that may not provide enough protection and revising the program prior to subsequent entries 	M
X		<p>Rescue Services. These services can be secured from on-site employees or from an off-site service. These individuals must be properly trained and have a complete knowledge in the use of personal protective and rescue equipment, and first aid/CPR. They are to be made aware of the confined space hazards and provided with adequate information to aid in the rescue and treatment of employees. Rescue services provided by an outside service will be given an opportunity to examine the entry site, practice rescue, and decline as appropriate. Rescue services are required to be on site for all IDLH conditions while work is being performed.</p>	M
X		<p>All employees shall receive training in confined space entry before working in confined spaces, prior to a change in assigned duties and when a new hazard has been identified or special deviations occur. This training shall be documented; documentation shall include employees names, dates of training, and the trainer's name.</p> <p>On projects where multiple contractors are working or employees from different organizations are involved in confined space entries, operations shall be coordinated so that the employees of other employers are not endangered</p>	M
X	Atmospheric Testing	<p>Confined space atmospheres are tested using equipment with sufficient sensitivities and specificity to identify and evaluate any hazardous atmospheres that may exist or arise during the performance of operations. This evaluation is necessary so that entry procedures can be developed and acceptable conditions stipulated on the permit. Testing is to be performed in the following order:</p> <ol style="list-style-type: none"> 1) Oxygen 2) Flammable gases and vapors 3) Toxic gases and vapors 	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm². • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	Tools (Hammer, etc)	Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Air monitoring equipment	Operating Manual	Inspect before arriving onsite and once daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM Smith and subcontractors

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training. This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 4/14/2015 Project: Wolff-Alport RI/FS

Activity: Site Reconnaissance, Mobilization and Demobilization

Activity Location: Ridgewood, NY

Prepared By: Tonya M Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Site Reconnaissance, Mobilization and Demobilization	Slips, trips, falls; drowning; heat stress; sun exposure; contaminant exposure	Be aware of grade changes, holes, trip hazards - assess area prior to conducting activities; wear sunscreen. Be aware of potential tide changes. Wear gloves if handling soil. Do not create dust. Wear PDF if over or near water.	L
X	Collect documentation of observations (photographs, sketches, etc.)	Slips, trips, falls; drowning; heat stress; sun exposure; contaminant exposure	Be aware of grade changes, holes, trip hazards - assess area prior to conducting activities; wear sunscreen. Be aware of potential tide changes. Wear gloves if handling soil. Do not create dust. Wear PDF if over or near water.	L
X	Decon surfaces (e.g., boots, equipment) in contact with soil at conclusion of activities	Contaminant exposure	Employ a controlled spray away from personnel.	L
X	Radiation Control -All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m3 for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm2. • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	camera	Manufacturer's instructions	-

Involved Personnel:

CDM Smith and associated subcontractors

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training.

This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.



Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 4/14/2015 Project: Wolff-Alport RI/FS

Activity: Slug Testing

Activity Location: Ridgewood, NY

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Back Strain or Sprain	<ul style="list-style-type: none"> Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. The back will be kept as straight as possible. 	L
X		Biological	<ul style="list-style-type: none"> The SSHO (or alternate SSHO) will screen the area for biological hazards prior to beginning work. Protection against insects, such as protective clothing (Level D) and insect repellents (where necessary), will be used. Personal hygiene practices, such as frequent hand-washing, will help prevent rodent-borne diseases as well as using caution in areas likely to be occupied by vermin. The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Cold Stress	<ul style="list-style-type: none"> • If manual dexterity is not required of an employee, they shall wear thermally protective gloves for light work below temperatures of 40 degrees F, and for moderate to heavy work for temperatures below 20 degree F. • If fine work is required for more than 10-20 minutes in an environment below 50 degrees F, procedures shall be established by the SSHO for keeping employees hands warm. • If wind chill is a factor at a location, the cooling effect of the wind shall be reduced by shielding the work area or requiring employees to wear an outer windbreak garment • Extremities, ears, nose shall be protected from extreme cold by proper clothing such as hats, gloves, masks, etc. • If clothing is wet, employees shall change into dry clothes before entering a cold environment. 	L
X	Eye injury	<ul style="list-style-type: none"> • Safety glasses will be required during MW sampling operations in accordance. • A portable eyewash station will be present onsite during all activities. 	L
X	Fall Protection	<ul style="list-style-type: none"> • Based on planned activities fall protection is not expected to be required • If planned activities change and require personnel to be 6' above ground a fall protection plan will be implemented 	L
X	Foot injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required. 	L
X	Hand injury	<ul style="list-style-type: none"> • Nitrile gloves will be worn while using the slug and downhole geophysics equipment 	L
X	Head Injury	<ul style="list-style-type: none"> • Hard hats will be required during all onsite activities. 	L
X	Heat stress	<ul style="list-style-type: none"> • Drink water • Employee Training for Hot Environments • Employee Work Schedule Considerations • Employee Work Breaks in cooler location • Acclimatization Breaks 	L
X	Housekeeping	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X	Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X	Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X	Slips/trips/falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. 	L
X	Working Alone	<ul style="list-style-type: none"> • During certain elements of the SSHO may be working alone. He will have a means of communication at all times and have a defined and posted work schedule. 	L
X	PRE-Operations Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • The SSHO will perform a pre-task safety and health analysis for expected hazards and hazard controls. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC	
X		<p>CDM Smith and subcontractor employees performing field activities must have the following:</p> <ul style="list-style-type: none"> • 40-Hour HAZWOPER and 3 days of on the job training under the direction of a trained and experienced supervisor • At least 1 employee shall be certified in CPR and First Aid • The SSHO will have 8 hour Supervisor training. 	L	
X	Operations	<p>Chemical Exposure</p> <ul style="list-style-type: none"> • Exposure to contaminants will be prevented or reduced by delineating zones at the site where prescribed operations will occur. • During injection activities, air will be monitored in the breathing zone using a PID following the below guidelines: <p>0 – 1 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Continue monitoring for VOCs. and working in Level D PPE <p>1 – 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. • Use Draeger tubes (or equivalent) to determine if vinyl chloride is present in the breathing zone. • If Draeger tubes do not detect chemicals, activities may proceed to a 5 ppm reading, sustained over a 5-minute average <p>Greater than 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. 	L	
X		Crushing and Pinch points	<ul style="list-style-type: none"> • The fingers will be kept away from any points that may cause the fingers to be pinched or crushed, especially when setting the object down. 	L
X		Environmental Protection	<ul style="list-style-type: none"> • Absorbent pads will be used when and if a fuel spill occurs. 	L
X		Equipment Decontamination	<ul style="list-style-type: none"> • Operator needs to be trained based on the equipment operating manual • Decontamination fluids will be containerized 	L
X	Demobilization	Equipment	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	L
X	<p>Radiation Control- All Tasks</p> <p>Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety subcontractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.</p>	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m3 for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm2. • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	PPE	Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Slug	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Transducer	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Water Level Meter	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily

Involved Personnel:

CDM Smith field staff and subcontractor

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training. This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.

ACTIVITY HAZARDS ANALYSIS

Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

M

Date: 4/14/2015 Project: Wolff- Alport RI/FS

Activity: Groundwater and Soil sampling

Activity Location: Ridgewood, New York

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Prepare and launch vessel	Back Strain or Sprain	<ul style="list-style-type: none"> Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. The back will be kept as straight as possible. Use mechanical means for lifting heavy objects whenever possible (i.e., forklift, lift gate, loader, etc.). 	L
X		Drowning	Follow established plan from captain of boat; wear PFDs at all times	L
X		Cold Stress	<ul style="list-style-type: none"> If manual dexterity is not required of an employee, they shall wear thermally protective gloves for light work below temperatures of 40 degrees F, and for moderate to heavy work for temperatures below 20 degree F. If fine work is required for more than 10-20 minutes in an environment below 50 degrees F, procedures shall be established by the SSHO for keeping employees hands warm. If wind chill is a factor at a location, the cooling effect of the wind shall be reduced by shielding the work area or requiring employees to wear an outer windbreak garment Extremities, ears, nose shall be protected from extreme cold by proper clothing such as hats, gloves, masks, etc. If clothing is wet, employees shall change into dry clothes before entering a cold environment. 	L
X		Eye injury	<ul style="list-style-type: none"> Safety glasses will be required during MW sampling operations A portable eyewash station will be present onsite during all activities. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Fall Protection	<ul style="list-style-type: none"> • Based on planned activities fall protection is not expected to be required • If planned activities change and require personnel to be 6' above ground a fall protection plan will be implemented 	L
X	Fire Protection	<ul style="list-style-type: none"> • "Danger" and "No Smoking" signs shall be posted around all flammable and combustible liquid storage areas. • Portable fire extinguishers shall be provided where needed • All aboveground tanks shall have adequately sized concrete containment, such as slab and walls, to contain spills. • Tanks shall be vented with a pipe not less than 13 inch inside diameter and shall be 12 feet high from the adjacent ground level. • Tanks shall be kept 20 feet from buildings. • All tanks shall be properly grounded. • All tanks shall be labeled with the contents and owner's name. • All temporary heating devices must be approved prior to use on the jobsite. • Heaters shall be kept at least 20 feet from buildings and other combustible items. • Job-made heaters, solid fuel salamanders, and open fires are prohibited on the jobsite. 	L
X	Foot injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required 	L
X	Hand Injury	<ul style="list-style-type: none"> • Cut resistant gloves will be worn in compliance with ANSI/ISEA 105 during routine drilling activities. • Keep hands away from rotating augers, the hammer, and all other moving parts. • Skid mounted steam cleaners will have protective guarding on all rotating shafts, belts, and pulleys. • Nitrile gloves will be worn while operating the steam cleaner. • Keep hands clear of the water spray. 	L
X	Head Injury	<ul style="list-style-type: none"> • Hard hats will be required during all onsite activities. 	L
X	Heat stress	<ul style="list-style-type: none"> • Drink water • Employee Training for Hot Environments • Employee Work Schedule Considerations • Employee Work Breaks in cooler location • Acclimatization Breaks 	L
X	Housekeeping	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. 	L
X	Noise	<ul style="list-style-type: none"> • Hearing protection will be required during hammering and steam cleaning operations inside exclusion zone. 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS		HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Severe Weather: Flooding	<ul style="list-style-type: none"> • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X		Severe Weather: High Winds	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X		Severe Weather: Lightning	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X	I	Slips/trips/falls	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. 	L
X		Unauthorized operation	<ul style="list-style-type: none"> • Only trained and authorized personnel will operate and/or assist in drilling operations. • Operators must comply will all applicable state certifications. 	L
X		Working Alone	<ul style="list-style-type: none"> • During certain elements of the field program the SSHO may be working alone. He will have a means of communication at all times and have a defined and posted work schedule. 	L
X	Mobilization	Utility Clearance	<ul style="list-style-type: none"> • Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities tanks, pipes, or other underground structures in accordance with Section 4.e of the APP 	L
X	PRE-Operations	Reconnaissance	<ul style="list-style-type: none"> • CDM Smith and subcontractors will discuss and view work and staging areas. • The SSHO and subcontractor will perform a health analysis for expected hazards and hazard controls prior to conducting that activities 	L
X		Drill Rig and Operator Certifications	<ul style="list-style-type: none"> • Drilling equipment operators are required to have the training, experience and shall be licensed to operate the specific equipment to be used onsite. • The drilling operator shall submit documentation of their competency and licensing to the SSHO prior to the start of any related vibracoring activities. • Before initial use, vehicles not otherwise inspected by State or local authorities, shall be inspected by a qualified mechanic 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Drill Rig Inspection	<ul style="list-style-type: none"> The SSHO shall ensure vibracore is inspected on a daily basis, prior to activities 	L
X		Personnel Training	CDM Smith and subcontractor employees performing field activities must have the following: <ul style="list-style-type: none"> 40-Hour HAZWOPER and 3 days of on the job training under the direction of a trained and experienced supervisor At least 1 employee shall be certified in CPR and First Aid The SSHO will have 8 hour Supervisor training 	L
X	Operations	Vibracore hazards	<ul style="list-style-type: none"> The operator must be trained and experienced in the use of vibracore. The rig must be in good condition. The operator shall not wear loose clothing. 	L
X		Chemical Exposure	<ul style="list-style-type: none"> Exposure to contaminants will be prevented or reduced by delineating zones at the site where prescribed operations will occur. During injection activities, air will be monitored in the breathing zone using a PID following the below guidelines: <ul style="list-style-type: none"> 0 – 1 ppm, sustained over a 5-minute average <ul style="list-style-type: none"> Continue monitoring for VOCs. and working in Level D PPE 1 – 5 ppm, sustained over a 5-minute average <ul style="list-style-type: none"> Stop work immediately and leave the exclusion zone. Move to assigned rally location. Use Draeger tubes (or equivalent) to determine if vinyl chloride is present in the breathing zone. If Draeger tubes do not detect chemicals, activities may proceed to a 5 ppm reading, sustained over a 5-minute average Greater than 5 ppm, sustained over a 5-minute average <ul style="list-style-type: none"> Stop work immediately and leave the exclusion zone. Move to assigned rally location. 	L
X		Crushing and Pinch points	<ul style="list-style-type: none"> Drill rods and drill bit stabilizer will be properly transported by either a rack, the rig, or utility trailer. If transported on a trailer, the rods or stabilizers will be held securely in place. If feasible, all wheeled equipment will have chocks placed under the wheels to prevent rolling. 	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Vibracore rig failure	<ul style="list-style-type: none"> • The mast and cables must be able to support all equipment and drill rods. • Wire cables must be maintained in good condition, free from kinks or broken strands. • All rotating shafts, pulleys or chains must be covered with protective guards. • Vibracore must be equipped with an emergency kill switch, which is readily accessible to personnel at the rear of the rig. All personnel on the site will know the location of the kill switch and how to use it. • In the event of failure, any maintenance activities will be subjected to a Hazard/Risk Analysis by the SSO. 	L
X		Electrical	<ul style="list-style-type: none"> • If steam cleaners are being powered by a generator, a Ground-Fault Circuit Interrupter (GFCI) will be required 	L
X		Environmental Protection	<ul style="list-style-type: none"> • Absorbent pads will be used when and if a fuel spill occurs. 	L
X		Equipment Decontamination	<ul style="list-style-type: none"> • Operator needs to be trained based on the equipment operating manual • A decontamination pad will be used to contain liquid 	L
X		Power lines/underground utilities	<ul style="list-style-type: none"> • Ensure that there are not any power lines or underground utilities prior to drilling activities. • If work is near an overhead line, care will be taken to ensure there is clearance with raising the mast. • While working near power lines, drill rods will not be leaned against the mast. • If the drill bit encounters anything hard, drilling will stop and the Geologist will be notified. 	L
X		Work Zones	<ul style="list-style-type: none"> • Maintain exclusion zone 1.5 times the mast height when feasible 	L
X	Demobilization	Equipment	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	L
X		Open Boreholes	<ul style="list-style-type: none"> • Open boreholes shall be capped and flagged. 	L
X		Secure Mast	<ul style="list-style-type: none"> • Vibracore equipment shall not be transported with the mast up unless it is specifically approved by the manufacturer, and included in the transportation survey. 	L
X	Radiation Control- All Tasks Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety sub-contractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls.	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm². • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Vibracore Rlg	40-Hour HAZWOPER, State licensed soil borer, Manufacturer's instructions and boat operator's/ Vibracore operator's instructions	Inspect before arriving onsite and once daily
X	PPE- Hard hat, safety vest, steel-toed boots, safety glasses, hearing protection (during drilling), Tyvek or equivalent , (at direction of SHSO), PFD, nitrile/latex inner gloves, cut resistant outer gloves (when handling sharp objects)	40-Hour HAZWOPER and 8- hour refresher	Inspect before arriving onsite and once daily
X	Sample supplies and coolers	40-Hour HAZWOPER and 8- hour refresher	Inspect before leaving dock

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM Smith field staff and subcontractors

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training. This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.



Acceptance Authority (digital signature):

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC)
(Use highest code)

L

Date: 4/14/2015 Project: Wolff- Alport RI/FS

Activity: Well Development

Activity Location: Ridgewood, NY

Prepared By: Tonya Bennett

Risk Assessment Code Matrix

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

		Probability				
		Frequent	Likely	Occasional	Seldom	Unlikely
S e v e r i t y	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	All Job Steps	Back Strain or Sprain	<ul style="list-style-type: none"> Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. The back will be kept as straight as possible. 	L
X		Biological	<ul style="list-style-type: none"> The SSHO (or alternate SSHO) will screen the area for biological hazards prior to beginning work. Protection against insects, such as protective clothing (Level D) and insect repellents (where necessary), will be used. Personal hygiene practices, such as frequent hand-washing, will help prevent rodent-borne diseases as well as using caution in areas likely to be occupied by vermin. The attached West Nile Virus Fact Sheet will be reviewed before performing activities onsite 	L

ACTIVITY HAZARDS ANALYSIS

JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Cold Stress	<ul style="list-style-type: none"> • If manual dexterity is not required of an employee, they shall wear thermally protective gloves for light work below temperatures of 40 degrees F, and for moderate to heavy work for temperatures below 20 degree F. • If fine work is required for more than 10-20 minutes in an environment below 50 degrees F, procedures shall be established by the SSHO for keeping employees hands warm. • If wind chill is a factor at a location, the cooling effect of the wind shall be reduced by shielding the work area or requiring employees to wear an outer windbreak garment • Extremities, ears, nose shall be protected from extreme cold by proper clothing such as hats, gloves, masks, etc. • If clothing is wet, employees shall change into dry clothes before entering a cold environment. 	L
X	Eye injury	<ul style="list-style-type: none"> • Safety glasses will be required during MW sampling operations in accordance. • A portable eyewash station will be present onsite during all activities. 	L
X	Fall Protection	<ul style="list-style-type: none"> • Based on planned activities fall protection is not expected to be required • If planned activities change and require personnel to be 6' above ground a fall protection plan will be implemented 	L
X	Fire Protection	<ul style="list-style-type: none"> • "Danger" and "No Smoking" signs shall be posted around all flammable and combustible liquid storage areas. • Portable fire extinguishers shall be provided where needed 	L
X	Foot injury	<ul style="list-style-type: none"> • Leather steel-toes boots will be required in accordance. 	L
X	Hand Injury	<ul style="list-style-type: none"> • Cut resistant gloves will be worn in compliance with ANSI/ISEA 105 during routine drilling activities. 	L
X	Head Injury	<ul style="list-style-type: none"> • Hard hats will be required during all onsite activities. 	L
X	Heat stress	<ul style="list-style-type: none"> • Drink water • Employee Training for Hot Environments • Employee Work Schedule Considerations • Employee Work Breaks in cooler location • Acclimatization Breaks 	L
X	Housekeeping	<ul style="list-style-type: none"> • All sites will be kept clean and free of trash and other debris. • All trash will be properly containerized and removed or staged daily. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Motorized Vehicles	<ul style="list-style-type: none"> • Users of MV's shall possess a license/permit valid for the equipment being operated • Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations. • Vehicles not meeting safe operating conditions shall be immediately removed from service • Cellular phones can only be used with a hands-free device • Seat belts shall be installed and worn • Secure gas cylinders during transport • Vehicles may not be driven at speeds greater than the posted speed limit • All motor vehicles will be inspected before arrival onsite and daily. 	L
X		Noise	<ul style="list-style-type: none"> • All personnel performing activities inside of the EZ while groundwater is purged should wear either disposable earplugs or earmuffs, with a minimum noise reduction rating (NRR) of 27 decibels (dB). • Flooding resulting from a thunderstorm may present a significant safety hazard depending on the site activity, and shall be continually monitored by the SSHO. • If a severe weather event is expected which will impact operations work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X		Severe Weather: Flooding	<ul style="list-style-type: none"> • If high winds are expected, or are encountered during work activities, appropriate action shall be taken to ensure the protection of site workers and the surrounding community. • Work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting 	L
X		Severe Weather: High Winds	<ul style="list-style-type: none"> • If lightning is observed or thunderstorms are heard during work activities, work shall be halted and all personnel will meet at an established rally point identified in the health and safety meeting • Work will not re-commence until lightning and thunder has stopped for a minimum of 30 minutes 	L
X		Severe Weather: Lightning	<ul style="list-style-type: none"> • Identify and remedy tripping hazards. • Follow good housekeeping procedures. • Wear proper footwear such as steel-toed leather boots, and walk slowly on slippery surfaces. (In accordance with Section B.02.b.2.3 of the SSHP) • CDM Smith and subcontractors will discuss and view work and staging areas. • The SSHO will perform a pre-task safety and health analysis for expected hazards and hazard controls prior to conducting that activities in accordance with Section 4.e of the APP 	L
X	PRE-Operations	Reconnaissance		L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Personnel Training	<p>CDM Smith and subcontractor employees performing field activities must have the following:</p> <ul style="list-style-type: none"> • 40-Hour HAZWOPER and 3 days of on the job training under the direction of a trained and experienced supervisor • At least 1 employee shall be certified in CPR and First Aid • The SSHO will have 8 hour Supervisor training 	L
X	Operations	Chemical Exposure	<ul style="list-style-type: none"> • Exposure to contaminants will be prevented or reduced by delineating zones at the site where prescribed operations will occur. • During injection activities, air will be monitored in the breathing zone using a PID following the below guidelines: <p>0 – 1 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Continue monitoring for VOCs. and working in Level D PPE <p>1 – 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. • Use Draeger tubes (or equivalent) to determine if vinyl chloride is present in the breathing zone. • If Draeger tubes do not detect chemicals, activities may proceed to a 5 ppm reading, sustained over a 5-minute average <p>Greater than 5 ppm, sustained over a 5-minute average</p> <ul style="list-style-type: none"> • Stop work immediately and leave the exclusion zone. Move to assigned rally location. 	L
X		Crushing and Pinch points	<ul style="list-style-type: none"> • The fingers will be kept away from any points that may cause the fingers to be pinched or crushed, especially when setting the object down. 	L
X		Environmental Protection	<ul style="list-style-type: none"> • Absorbent pads will be used when and if a fuel spill occurs. 	L
X		Equipment Decontamination	<ul style="list-style-type: none"> • Operator needs to be trained based on the equipment operating manual • Decontamination fluids will be containerized 	L
X	Demobilization	Equipment	<ul style="list-style-type: none"> • All equipment will be secured according to manufacturer recommendations. 	L
X	<p>Radiation Control- All Tasks</p> <p>Note: SOPs for Radiological Control provided as part of HASP and procedures used by radiological safety subcontractor contain details of steps to minimize exposure to direct radiation and dispersible radiological contaminants. The elements listed here summarize the more salient features of those controls</p>	Direct Radiation Exposure	<ul style="list-style-type: none"> • Perform an external dose rate survey of work area and identify high and low exposure rate locations; low dose rate locations to be used when work is not active but workers must remain in work area. • Notify RSO if areas greater than 2 mrem/hr are measured; RSO will work with team leader to ensure steps taken to minimize worker dose for these areas. 	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Internal Exposure (inhalation/Ingestion)	<ul style="list-style-type: none"> • Use dust controls to minimize re-suspension of contaminated soils. • If dust levels approach 400 mg/m³ for a sustained (>15 min) time period then suspend work and re-evaluate dust control measures. • If dust levels remain high and soil activity is greater than 1000 pCi/g use respiratory protection; Notify Project RSO before proceeding. • For work near rail lines, in the interior of buildings, or during excavation or drilling inside buildings perform radon monitoring. Stop work and notify RSO if levels exceed 3E-08 uCi/cc. 	L
X		Dermal Exposure/Equipment Contamination	<ul style="list-style-type: none"> • Wear prescribed PPE to include at minimum double gloves when handling soils or equipment/tools in contact with contaminated soils. • At boundary to work zone survey face, hands and feet to ensure no contamination has been transferred to skin or shoes. Note: The site radiation safety lead may alter this protocol to more extensive personal survey if significant soil contamination of clothing is occurring. • Tools and equipment in contact with contaminated soils, sediment or debris should be wipe surveyed for removable contamination prior to transfer out of the work zone. A direct survey may be used in lieu of wipes provided the instrument's MDA is below 200 dpm/100 cm². • Alternatively, a controlled laydown area for equipment/tools can be established and wipe and direct surveys of equipment can be performed at end of day. 	L

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X	Generator	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Motor Vehicles - TBD	State license	Inspect before arriving onsite and once daily
X	PPE	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Submersible Pump	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Water Level Meter	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily
X	Water Quality Meter	40-Hour HAZWOPER and Training based on the equipment operating manual	Inspect before arriving onsite and once daily

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

CDM Smith: field staff and subcontractors

All personnel whose work will bring them into contact with radiologically contaminated materials or exposure to airborne radiological contaminants will receive radiological safety awareness training.

This AHA was reviewed by Peter Collopy, Senior Health Physicist and Radiation Safety Officer and approved by Shawn Oliveira, CIH, CSP Director of H&S for CDM Federal Programs Corporation.



Acceptance Authority (digital signature):

APPENDIX B
WORK PRACTICES AND GUIDELINES

Section 9

Personal Protective Equipment (PPE)

CDM Smith employees frequently perform tasks that require the use of protective clothing and equipment to shield or isolate them from chemical and physical hazards.

The nature and extent of potential chemical and physical hazards are key factor in choosing PPE. Before mobilization, CDM Smith performs a detailed review of the project site. We review site history, types, and quantities of materials handled at the site, operations performed at the project site, and activities we will perform during the course of the project.

9.1 Use of Personal Protective Equipment

Employees must use PPE identified in H&S plans, as directed by site managers, where recognizable hazards exist, to meet client requirements and in accordance with the guidelines described in this section. Employees must also inspect PPE assigned to them and have worn out or defective equipment replaced.

Personal protective equipment in use shall be inspected daily and maintained in serviceable condition. Items of personal issue shall be cleaned and sanitized as appropriate before any other employee uses them. Defective or damaged equipment shall be taken out of service immediately.

9.1.1 “Baseline” Protection

CDM Smith employees are expected to wear the ensemble of personal protective equipment listed below during all field tasks.

- Full-length trousers ([See Section 9.2.10](#))
- Shirt with sleeves and a collar ([See Section 9.2.10](#))
- Safety glasses with side shields ([See Section 9.2.1](#))
- Hardhat ([See Section 9.2.2](#))
- Steel toe and shank footwear ([See Section 9.2.3](#))
- Protective gloves (if hands will contact rough or contaminated surfaces) ([See Section 9.2.4](#))
- High-visibility vest (if vehicles or heavy equipment operate on site) ([See Section 9.2.5](#))

9.1.2 Rules and Standards for PPE

Use of personal protective equipment is required by OSHA standards contained in 29 CFR 1910 and 29 CFR 1926, and reinforced by EPA regulations in 40 CFR Part 300. Types of protection required by OSHA and the relevant consensus standards are listed in [Table 9-2](#).

9.2 Basic Personal Protective Equipment

9.2.1 Eye Protection

Employees should wear safety glasses during field activities unless it can be demonstrated that there are no potential hazards to the eye. Such hazards include active construction sites, hazardous waste sites and potential contact between hazardous or foreign substances and the eye.

For most dusts and particulates, safety glasses with side shields meeting the requirements of ANSI standard Z87.1-2003 - Occupational and Educational Eye and Face Protective Devices are adequate. For potential splash hazards of liquids, a face shield or splash hood should be used in conjunction with regular safety glasses. In some exposures to mist or heavy dust, goggles may provide the best form of eye protection. If lasers are used, specialized eye protection using specific lenses for the wavelength and energy emitted by a specific laser may be required.

Contact Lenses – Based on current information related to the use of contact lenses in the industrial work environment, contact lenses may be used in most situations. Eye protection such as safety glasses, face shields, or goggles appropriate for the hazards present should be used as well.

9.2.2 Hard Hats

Employees should wear hard hats meeting the requirements of ANSI Z89.1 (2009) unless the safety manager grants a [waiver per Section 9.1.1](#). [no need for link here] Hard hats should be worn with the brim facing forwards unless there is a specific safety related reason to turn the hat backwards. In such instances the webbing in the hat shall be repositioned in the hat so that the back of the webbing is at the back of the head.

9.2.3 Foot Protection

Personnel should wear protective footwear when working on active construction sites, field hazardous waste sites and while performing work activities where there is a danger of foot injuries due to falling or rolling objects, objects piercing the sole, and where employees' feet are exposed to electrical hazards. Safety footwear shall meet the requirements of ASTM standards F2412-05 (Standard Test Methods for Foot Protection) and F2413-05 (Standard Specification for Performance Requirements for Foot Protection) and cover the ankle. Any footwear worn for fieldwork must have a good sturdy tread appropriate for outdoor use and a defined heel.

9.2.4 Hand Protection

Various types of gloves are available for protection against cuts, scrapes, bruises, etc. that may occur during the physical handling of material, equipment tools etc. Gloves should have the qualities required for the work conditions as set by ANSI/ISEA 105 American National Standard for Hand Protection Selection Criteria. CDM Smith issues cotton, leather, nitrile, neoprene, and Kevlar® gloves depending on the work activity and potential hazards. If needed, leather or mesh work gloves can be worn over chemical protective gloves.

9.2.5 High-Visibility Clothing

High-visibility vests or jackets are required whenever personnel work in or around vehicular traffic. High-visibility clothing should meet the level of visibility required for the work conditions in ANSI / ISEA 107 (2010). Employees should also wear high-visibility clothing on active construction or industrial sites where there is frequent movement of trucks, excavation, or other heavy equipment. See [Section 16.22 Traffic and Work Zone Safety](#).

9.2.6 Protective Clothing

Personnel should wear protective clothing in circumstances where there is the potential for hazardous dusts, toxic or contaminated material, mists, or liquids contact the employee's skin or personal clothing. Protective clothing may include disposable or reusable coveralls, polymer coated coveralls, or splash suits. When there is a significant potential for direct contact of liquids or mists, polymer-coated coveralls or splash suits are indicated.

Selection consideration should be given to such factors as size, durability, chemical compatibility, and heat stress potential. Project managers are particularly reminded to consider the correct size of protective garment for very large and small workers. When ANSI/ISEA standard 103, Classification and Performance Requirements for Chemical Protective Clothing, is published, CDM Smith expects to implement its requirements.

Chemical Protective Footwear – Chemical protective footwear should be worn when there is the potential for boots to come into direct contact or be splashed with hazardous materials or waste. When direct contact hazards exist, chemical resistant boots may be worn or boot covers may be worn.

Chemical Protective Gloves – For those activities where there is a potential for direct contact with hazardous or toxic materials, or contaminated soil or groundwater, employees should wear chemical protective gloves. The selection of glove should be based on the activity and the material of potential contact. A wide variety of gloves are available and consideration should be given to dexterity, durability, and material compatibility. Gloves should have the qualities required for the work conditions as set by ANSI/ISEA 105 American National Standard for Hand Protection Selection Criteria.

Flame and Arc - Flash Protective Clothing – Fire resistant clothing used where fires or electrical arcs are a problem shall have a rating of at least HRC Level 2 as set by NFPA Code 2112 Standard on Flame Resistant Garments for Protection of Industrial Personnel against Flash Fire. NOTE: If an arc flash study described in [Section 16-4](#) requires a higher level of protection, wear that level.

9.2.7 Respirators

CDM Smith may issue a respirator to individuals who will frequently use respiratory protection. Employees who are expected to work on projects where the use of respiratory protection is anticipated or required must fulfill the training and medical approval requirements for respirators as described [in Section 11, Respiratory Protection](#) of this manual.

9.2.8 Hearing Protection

Employees shall use hearing protection when noise levels exceed the allowable limit. A Hearing Conservation Program (Section 14) shall be implemented if the allowable limits are exceeded. Devices used for hearing protection shall be certified for the purpose per USEPA regulation [40 CFR 211 subpart B Noise Labeling Standards for Hearing Protection Devices](#).

9.2.9 Specialized Protective Equipment

Specialized protective equipment is available for a wide variety of activities and includes:

- Fall protection harnesses and lanyards (See [Safety Guideline 16.7](#))
- Face shields
- Chaps for work in rough brush
- Spark resistant tools
- Shin guards for chain saws
- Cooling vests (See [Safety Guideline 16.13](#))
- Personal floatation devices

9.2.10 Personal Work Clothing

Employees are expected to supply personal clothing appropriate for their work assignments including long pants, a shirt with sleeves (at least 4" long). NOTE: Some CDM Smith clients insist that employees wear long-sleeve shirts.)

Employees are expected to provide basic outerwear appropriate for protection against normal weather conditions in the geographical areas they are normally assigned. The equipment centers do stock clothing for extreme cold or wet weather. ([See Safety Guideline 16.14.](#)) These include rain suits, insulated coveralls, cold weather work gloves, hardhat liners, etc. Employees may request this equipment directly from the equipment centers.

9.3 Availability of PPE

CDM Smith field equipment centers maintain an inventory of basic PPE including hard hats, safety glasses, hearing protection, harnesses, traffic vests, etc. The specific make and model of equipment is reviewed periodically by the H&S managers to ensure equipment issued to CDM Smith Inc. personnel is of adequate quality. Projects and employees may obtain basic PPE by requesting equipment from the field equipment centers by telephone or through the field equipment center website at <http://cdmweb/fieldequipment/>.

9.3.1 PPE Assigned to the Employee

CDM Smith typically assigns items such as hardhat, safety glasses, hi-visibility vests etc to individual employees. The employee's Group Leader or Direct Manager, in consultation with the H&S Manager assigned to support the employee's division, shall decide what PPE employees need, based on their expected role, and help to arrange for

it. Employees may, with the approval of their manager or group leader, submit a [PPE request](#).

PPE required for use on CDM Smith work activities is provided to CDM Smith employees at no expense to the employee.

9.3.2 Project vs. Overhead Expense

PPE that is used to support activities for specific projects should be charged to those projects. Typical project specific PPE would include consumables such as gloves, disposable Tyvek® suits, respirator cartridges, etc. Non - disposable PPE, used on a specific project can be obtained from the equipment centers for short or moderate durations on a rental basis. In some cases it may be more cost effective for projects to have the equipment centers purchase the equipment for the project. Non-disposable PPE may include respirators, air-supplied respiratory protective systems, or specialized chemical protective clothing. The specific PPE ensemble for a specific project will be identified in the project specific H&S plan and approved by the service group H&S manager responsible for that project.

Employees may request equipment using the Personal Protective Equipment Request form in Appendix A of this section. Individual PPE that is assigned to a specific employee for use on multiple projects should be charged to the employee's division safety equipment overhead number, typically 0000 <DIV> ADMIN.SAFQP. The employee's Group Leader or Direct Manager, with the advice of the relevant health and safety manager, shall decide what PPE may be charged to an overhead account.

Reimbursement for Safety Footwear - CDM Smith will reimburse CDM Smith employees for the cost of purchasing safety footwear up to a maximum amount of \$150.00.

Reimbursement for Prescription Safety Glasses - CDM Smith employees, who require prescription glasses and are expected to work more than 30 days per year in the field or on locations where safety glasses are required, will be reimbursed for the cost of prescription safety glasses meeting the requirements of ANSI Z87.1 up to a maximum of \$175.00. Employees who wear prescription glasses and work less often on projects that require the use of safety glasses should be provided eye protection that fits over their glasses.

Employees may request reimbursement through the expense account system from their resource manager or group leader. The resource manager or group leader shall make the final determination as to whether or not safety glasses are a reimbursable item as described above.

Employees are eligible for this allowance whenever their existing equipment becomes unsafe to use. If, for example, pair of safety glasses breaks the day after CDM Smith pays for them, the employee is eligible to use the allowance again. If the steel-toe shoes are still fully functional 15 years after purchase, the employee is not.

9.4 Levels of Protection

Each type of protective equipment has been designed specifically to protect against a reasonably anticipated chemical and physical hazard. To standardize PPE ensembles, “levels of protection” have been defined to address those chemical and physical hazards that may be present at hazardous waste sites. The levels of protection are defined accordingly:

- | | |
|--------------------------|---|
| <i>Level A</i> | This level is worn when the highest level of respiratory, skin, and eye protection is anticipated as being required. |
| <i>Level B</i> | This level is worn when the highest level of respiratory protection is anticipated as being required, with a lesser level of skin protection being necessary. |
| <i>Level C</i> | This level is worn when criteria for air-purifying respirators are determined to be necessary and a lesser level of skin protection needed. |
| <i>Level D, Modified</i> | This level is worn when activities do not pose a problem from a respiratory protection point of view but may present a skin problem and where cross contamination via shoes needs to be considered. |
| <i>Level D</i> | This level is worn when activities and areas do not present a respiratory or skin hazard. |

Detailed equipment, use, and limitations associated with each level of protection appear in **Table 9-1**.

Table 9-1

Levels of Protection				
Level	Equipment	Protection Provided	Should be Used When:	Limiting Criteria
A	<p>Recommended:</p> <ul style="list-style-type: none"> ▪ Pressure-demand, full facepiece self-contained breathing apparatus (SCBA) or pressure-demand supplied-air respirator with escape SCBA ▪ Full-encapsulating, chemical-resistant suit ▪ Inner chemical-resistant gloves ▪ Chemical-resistant safety boots/shoes ▪ Two-way radio communications <p>Optional:</p> <ul style="list-style-type: none"> ▪ Cooling unit ▪ Coveralls ▪ Long cotton underwear ▪ Hard hat ▪ Disposable gloves and boot covers 	The highest available level of respiratory, skin, and eye protection	<ul style="list-style-type: none"> ▪ The chemical substance is thought to require the highest level of protection for skin, eyes, and the respiratory system based on either: <ul style="list-style-type: none"> - Measured (or potential for) high concentration of atmospheric vapors, gases, or particulates - Site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through intact skin ▪ Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible ▪ Operations must be conducted in poorly ventilated areas until the absence of conditions requiring Level A protection is determined 	<p>Fully encapsulating suit material must be impermeable to the substances involved</p> <p>The use of Level A protection severely limits the practical duration of work effort.</p>

Table 9-1 (Continued)

Level	Equipment	Protection Provided	Should be Used When:	Limiting Criteria
<p>B</p>	<p>Recommended:</p> <ul style="list-style-type: none"> ▪ Pressure-demand, full-facepiece SCBA or pressure-demand supplied air respirator with escape SCBA ▪ Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one-piece chemical splash suit; disposable chemical resistant one-piece suit) ▪ Inner and outer chemical-resistant gloves ▪ Chemical-resistant safety boots/shoes ▪ Hard hat ▪ Two-way radio communications <p>Optional:</p> <ul style="list-style-type: none"> ▪ Coveralls ▪ Disposable boot covers ▪ Face shield ▪ Long cotton underwear 	<p>The same level of respiratory protection but less skin protection than Level A</p> <p>It is the minimum level recommended for initial site entries until the hazards have been further identified</p>	<ul style="list-style-type: none"> ▪ The type and atmospheric concentrations of substances have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres: <ul style="list-style-type: none"> - With IDLH concentrations of specific substances that do not represent a severe skin hazard or - That do not meet the criteria for use of air-purifying respirators <ul style="list-style-type: none"> ▪ Atmosphere contains less than 19.5 percent oxygen ▪ Presence of incompletely identified vapors or gases is indicated by direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin 	<p>Used only when the vapor of gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin</p> <p>Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulates or splashes of material that will affect exposed skin</p>

Table 9-1 (Continued)

<i>Level</i>	<i>Equipment</i>	<i>Protection Provided</i>	<i>Should be Used When:</i>	<i>Limiting Criteria</i>
C	<p>Recommended:</p> <ul style="list-style-type: none"> ▪ Full-facepiece, air-purifying, cartridge-equipped respirator ▪ Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one-piece chemical splash suit; disposable chemical-resistant one-piece suit ▪ Inner and outer chemical-resistant gloves ▪ Chemical-resistant safety boots/shoes ▪ Hard hat ▪ Two-way radio communications <p>Optional:</p> <ul style="list-style-type: none"> ▪ Coveralls ▪ Disposal boot covers ▪ Face shield ▪ Escape mask ▪ Long cotton underwear 	The same level of skin protection as Level B, but a lower level of respiratory protection	<ul style="list-style-type: none"> ▪ The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin ▪ The types of air contaminants have been identified, concentrations measured, and a cartridge is available that can remove the contaminant ▪ All criteria for the use of air-purifying respirators are met 	<p>Effective only against conditions that are fairly well understood.</p> <p>Not effective for conditions that involve:</p> <ul style="list-style-type: none"> • Unknown chemicals that the filtering element might not remove well • Oxygen-deficient atmospheres • Unpredictable concentrations that might overwhelm the filtering element
D MODIFIED	<p>Recommended:</p> <ul style="list-style-type: none"> ▪ Chemical-resistant outer gloves ▪ Disposable shoe covers ▪ Work clothes ▪ Safety boots/shoes ▪ Safety glasses or chemical splash goggles ▪ Hard hat 	No respiratory protection; minimum skin protection	<ul style="list-style-type: none"> ▪ The atmosphere contains no known hazard ▪ Work functions may involve skin contact with hazardous chemicals 	

Table 9-2		
OSHA & Consensus Standards for Personal Protective Equipment		
Type of Protection	Regulation	Reference
General	29 CFR 1910.132	41 CFR Part 50-204.7 General Requirements for Personal Protective Equipment
Eye and Face	29 CFR 1910.133(a)	ANSI standard Z87.1-2003 - Occupational and Educational Eye and Face Protective Devices
Noise Exposure	29 CFR 1910.95	USEPA 40 CFR 211 subpart B
Respiratory	29 CFR 1910.134	ANSI- ¹ Z88.2 (1992) Standard Practice for Respiratory Protection
Hand	29 CFR 1910.132	ANSI/ISEA 105 American National Standard for Hand Protection
Head	29 CFR 1910.135	ANSI Z89.1 (2009) Safety Requirements for Industrial Head Protection
Foot	29 CFR 1910.136	ASTM F2412-05 and F2413-05
Electrical Protective Devices	29 CFR 1910.335(a)(2)	NFPA 70E: Standard for Electrical Safety in the Workplace
Flame - Resistant Garments	29 CFR 1910.335(a)(2)	NFPA Code 2112 Standard on Flame Resistant Garments
Chemical Protective Clothing	29 CFR 1910.132	ANSI/ISEA standard 103, Chemical Protective Clothing (Draft)
High-Visibility Safety Apparel	29 CFR 1926.651(d)	ANSI / ISEA 107(2010) National Standard for High-Visibility Safety Apparel

¹ American National Standards Institute (ANSI), <http://www.ansi.org/>

Appendix A

Personal Protective Equipment Request Form

Employee _____ Division _____ Office _____

Active in CDM Smith Medical Surveillance Program? Yes ___ No ___

Date of last CDM Smith medical exam? _____

Equipment Requested

<u>Item</u>	<u>Requested</u>	<u>Issued</u>
Hard Hat	_____	_____
Safety Glasses	_____	_____
Hi-Visibility Vest	_____	_____
Fall Protection Harness	_____	_____
Work Gloves (___ pairs)	_____	_____
Glove Liners (___ pairs)	_____	_____
Electrical Gloves (___ pairs)	_____	_____
Rain suit	_____	_____
Cloth Coveralls	_____	_____
Fire - Resistant Coveralls	_____	_____
Insulated Coveralls	_____	_____
Goggles	_____	_____
Ear Muffs (___ pairs)	_____	_____
Respirator	_____	_____
Make _____		
Model _____		
Size _____		
Corrective Lens Inserts	_____	_____
_____	_____	_____
_____	_____	_____

You must take reasonable measures to safeguard the items issued to you. Should your employment with CDM Smith terminate for any reason you must return equipment issued for your use. Any loss, theft, or damage of the equipment should be reported promptly to the Equipment Center manager.

Approved by:

Group Leader or Direct Manager/Date Division Charge Number

Section 12

Confined Space Entry

12.1 Purpose and Scope

This program establishes requirements for safe entry into, work in, and exit from confined spaces such as wet wells, manholes, tanks and vessels, or pipelines. It is intended to protect the health of CDM Smith employees and to comply with [29 CFR 1910.146, OSHA's Permit-Required Confined Spaces standard](#). CDM Smith employees or subcontractors may enter a confined space only when these or equivalent CSE procedures are followed.

Confined spaces are dangerous because gases and vapors can accumulate to form oxygen-deficient, explosive, or toxic atmospheres. Entry into the following is considered CSE, unless these procedures provide otherwise.

Tanks	Vessels
Manholes	Pipelines
Water transmission lines	Tunnels
Stilling wells	Junction structures
Valve and metering vaults	Unventilated dry wells
Limited access wet wells	Sewers

Depending on the circumstances, some confined spaces may or may not require a permit. CDM Smith treats trenches, vaults, pits, or diked areas as a permit-required confined space if they pose a potential for trapping a toxic atmosphere. Only designated HSCs or HSMs may determine that work in such a space does not need a permit.

When there is no potential for an atmospheric hazard and the physical hazards can be controlled without entry, employees may consider the space a non-permit required confined space, with a designated HSC or HSM approval. The types of spaces where this might apply include clear wells, sedimentation basins, equalization basins, rapid-mix tanks, flocculation tanks, sand filters, and water plant clarifiers.

12.2 Definitions

Confined Space - A confined space is an enclosed space which:

- Is large enough and configured such that an employee can enter and perform assigned work, **and**
- Has limited or restricted means of entry or exit, **and**
- Is not designed for continuous employee occupancy

Permit-Required Confined Space - Confined spaces that have one or more of the following additional characteristics:

- Contains or has a known potential to contain a hazardous atmosphere, **or**
- Contains a material that can engulf an entrant, **or**
- Has a configuration that could trap or asphyxiate an entrant, **or**
- Contains any other recognized serious safety or health hazard

Emergency - Any occurrence (including any failure of hazard control or monitoring equipment) or event(s) internal or external to the confined space that could endanger entrants.

Engulfment - The surrounding and effective capture of a person by a liquid or finely divided solid substance.

Entry - The act by which a person intentionally passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and occurs when any part of the entrant's body breaks the plane of an opening into the space.

Hot Work - Operations that could provide a source of ignition, such as riveting, welding, cutting, burning, or heating.

Immediately Dangerous to Life or Health - Any condition that poses an immediate threat of loss of life, may result in irreversible or immediate severe health effects, may result in eye damage, irritation or other conditions that could impair escape from the confined space.

Inerting - Rendering the atmosphere of a confined space nonflammable, nonexplosive, or otherwise chemically nonreactive by such means as displacing or diluting the original atmosphere with a gas that is nonreactive with that space.

Isolation - The process by which a confined space is completely protected from the release of energy or material. Isolation is usually accomplished by such means as blanking or blinding, removal or misalignment of pipe sections or spool pieces, double block and bleed, or lockout and/or tagout.

Limited or Restricted Means of Entry or Exit - When the entry occurs while crawling, through a manhole, by a ladder, or on a rope. Entries on grade, through doorways, or on stairways that meet OSHA standards are not restricted.

Non-Permit-Required Confined Space - A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Not Designed for Continuous Employee Occupancy - Spaces that are designed for filling with liquids or solids or contaminated air. Most spaces with continuously operating ventilation and lights are designed for human occupancy.

Oxygen-Deficient Atmosphere - An atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen-Enriched Atmosphere - An atmosphere containing more than 22 percent oxygen by volume.

12.3 Responsibilities

12.3.1 Management Responsibilities

Client Officers – Client officers are responsible for allocating adequate resources to implement these procedures on applicable projects and ensuring applicable CDM Smith CSE contract requirements are met with both the client and subcontractors.

Project Managers – Project managers are responsible for initial identification of workspaces as potential confined spaces and contacting a HSC or the appropriate HSM to evaluate the hazards associated the space. In addition, project managers should:

- Obtain any available information regarding permit space hazards and entry operations from the client or operator of the space
- Coordinate entry operations with the client, when both client personnel, and/or client subcontractor personnel and CDM Smith personnel and/or CDM Smith subcontractor personnel will be working in or near permit spaces
- Inform the client or operator of the space about the permit space program that CDM Smith will follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation
- Include CSE contract addenda in contracts for subcontractors to CDM Smith involved in CSE operations

H&S Coordinator – The HSC is an individual, designated by the HSM, who has training and experience in the evaluation of CSE hazards. A designate HSC may provide technical advice to project managers on the hazards of confined spaces and reviews confined space permits for completeness and appropriate controls.

Direct Managers and Resource Managers – Direct managers and resource managers only assign personnel that have successfully completed CSE training and are familiar with CDM Smith CSE procedures to projects involving entry into confined spaces.

Health and Safety Managers – HSMs are responsible for the development and oversight of the implementation of this program and advising project managers on the applicability of this program to projects. HSMs will designate CSE coordinators within their assigned units as needed.

12.3.2 Confined Space Entry Team Responsibilities

Unless it is determined that liquids or gases are neither present nor can enter the space during the work period, entry by team members requires, at a minimum, people who fill three roles:

Entry Attendant(s) Confined Space Entrant(s) Entry Supervisor

The roles above can be fulfilled with a minimum of two individuals, with one acting as both entry supervisor and attendant or entrant.

CDM Smith achieves confined space safety principally through a detailed plan of cooperation between team personnel in the roles listed in Table 12-1.

**Table 12-1
 Entry Team Requirements**

<i>Position</i>	<i>Role</i>
HSC	A CDM Smith employee trained and authorized by the HSM issue entry permits. HSC are listed on the H&S website
Entry Supervisor	An entry team member trained and authorized to sign and certify that entry permit conditions have been met and authorizes entry into a confined space
Entrant(s)	Entry team members who are trained to perform actual work in confined spaces
Entry Attendant	A team member outside the confined space who monitors conditions inside and outside of the space
Rescuers	Personnel trained in first aid, CPR, and confined space rescue methods who are available to respond to emergencies in confined spaces

CDM Smith employees may fill these roles only when their HSM determines that they are qualified to do so. The personnel who fill these roles must have completed appropriate training and passed the examination required by these procedures. Documentation of this training is to be maintained on the H&S database.

The persons who fill the roles described above shall perform the tasks described below:

Confined Space Entry Supervisor – The CSE supervisor is the individual at the entrance of the confined space who has the responsibility to ensure the provisions of the CSE permit are met in the field and ultimately authorizes entry into a confined space. The CSE supervisor is responsible for:

- Learning about the hazards of the space, the materials in it, and how to recognize the signs and symptoms of exposure to any toxic materials in the space
- Ensuring that the pre-entry checklist on the permit is complete and that conditions are acceptable before any employee enters the space
- Verifying that rescue personnel are available, are able to provide assistance if needed, and that communications are established to contact rescue personnel
- Signing the entry permit authorizing entry into the confined space

- Immediately terminating the entry if a nonpermitted condition occurs

The CSE supervisor may also serve as an entrant or an attendant taking on the additional responsibilities described below.

Confined Space Entrants – CSE entrants are responsible for the following:

- Learning about the hazards of the space, the materials in it, and how to recognize the signs and symptoms of exposure to any toxic materials in the space
- Reading and understanding the entry permit for spaces they enter
- Removing jewelry before entering spaces (jewelry can compromise their protective clothing, catch on objects, or cause a spark)
- Leaving cigarettes, lighters, and pagers outside the space
- Avoiding hand-to-mouth contact during entry
- Inspecting his/her own and each other's personal safety gear before and during the CSE
- Wearing or carrying appropriate air monitoring equipment during the entry
- Complying with these procedures and all of the conditions of the permit
- Following the directions of the entry supervisor and the entry attendant
- Leaving the confined space and reporting to the entry attendant immediately upon detecting any nonpermitted condition, an alarm, or any other changed condition
- While working in a subsurface space, avoiding looking up

Confined Space Attendants – Attendants are responsible for the following:

- Learning about the hazards of the space, the materials in it, and the signs and symptoms of exposure to any toxic materials in the space.
- Reading and understanding the entry permit.
- Remaining outside the confined space, immediately available, and in communication with entrants.
- Leaving their assigned spaces only when replaced by equally qualified attendants or to save their own lives. If an attendant must leave and there is no replacement available, the entrants must exit the confined space.
- Staying continuously aware of the location and condition of all authorized entrants within the confined space by voice, radio, visual observation, or other equally effective means.

- Staying continuously aware of conditions in the space.
- Ordering entrants to exit the confined space at the first indication of hazardous condition (such as instrument alarms, visible releases, or unusual behavior by the entrants).
- Summoning immediate emergency assistance, if needed.
- Warning unauthorized persons not to enter--or to exit immediately if they have already entered--and advise the authorized entrants and management of entry by unauthorized persons.
- Providing support to rescue workers if requested.
- Keeping objects away from the access hole where they can be accidentally knocked, pushed, or dragged into the confined space. Lower tools or supplies to workers inside by a hand line.
- When the job is finished and all objects have been removed from the confined space, ensuring the space has been closed.
- Securing the safety line of any safety harnesses to an extraction tripod, **never** to movable equipment or a vehicle. Monitor the safety line at all times, taking up extra slack as needed. Keep the safety line away from traffic and moving parts of any equipment.
- Testing the means of non-entry retrieval. You must use a mechanical hoist, unless manual methods would be more effective.

Rescue Personnel – Responsibilities of rescue personnel include:

- Remaining immediately available to provide rescue assistance throughout the entry.
- Not performing other tasks that would interfere with their ability to provide timely rescue assistance if needed. They may perform other tasks during an entry only if those tasks do not impede response to emergencies.
- Notifying the attendant if they become unavailable to provide rescue services.

CDM Smith employees assigned responsibilities as rescue personnel must be qualified in the use of SCBA, be current in first aid/CPR training, as well as having completed CDM Smith CSE training.

Note: Properly trained and equipped rescue units from client plant teams or local fire departments are the preferred sources of rescue services if they can provide timely response. If the client plant rescue team or local fire departments are untrained, unequipped, or unavailable to provide rescue services, appropriately trained CDM Smith personnel may be assigned this role. The designated rescue service must be listed on the CSE permit and be contacted before the entry to verify they are available for rescue services if needed.

12.3.3 Responsibilities on Multi-Employer Confined Space Entries

Team members who do not work for CDM Smith may fill the onsite roles, if they meet the training requirements and agree to fulfill the responsibilities outlined below. A CDM Smith construction inspector, for example, may enter a space while a general contractor's employee serves as the entry attendant, if the general contractor's employee: (1) has completed training equivalent to that shown in this program, and (2) can fully perform the attendant's role. Only CSE coordinators or HSMs may evaluate the CSE programs of other organizations.

Although client and subcontractor personnel may participate with CDM Smith personnel in a CSE, this program is for the protection of CDM Smith employees. Clients and subcontractors may use these procedures only if they accept all liability for their use. Subcontractors to CDM Smith that are required to enter confined spaces in the absence of CDM Smith employees should be required to submit a copy of their CSE program to CDM Smith for review and provide documentation that employees have had required training.

12.3.4 Responsibilities of Clients/Owners of Confined Spaces

Owners and operators of facilities that contain confined spaces or control access to confined spaces have specific responsibilities that are outlined in the OSHA CSE standard. They include:

- Informing CDM Smith that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements the OSHA CSE standard
- Apprising CDM Smith of the elements, including the hazards identified and their experience with the space, that make the space in question a permit space
- Apprising CDM Smith of any precautions or procedures that they have implemented for the protection of their employees in or near permit spaces where CDM Smith personnel or CDM Smith subcontractors will be working
- Coordinating entry operations with CDM Smith when both client/owner personnel and CDM Smith personnel or CDM Smith subcontractors will be working in or near permit spaces
- Debriefing CDM Smith at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations

The CDM Smith project manager or CSE supervisor should be proactive in soliciting information on the hazards and configuration of confined spaces.

12.4 Procedure

12.4.1 Summary

No CDM Smith employee may enter a confined space unless these procedures, or equivalent procedures approved by the CSE coordinator or the appropriate HSM, are followed. CDM Smith's CSE program includes:

- Training for confined-space team members
- Preparation and review of the pre-entry checklist
- Requirements for appropriate safety equipment
- Coordination with clients
- Accountability of subcontractors
- Monitoring for hazardous conditions
- Procedures for entries
- Ventilation of hazardous gases
- Rescue procedures and equipment
- Periodic reviews of CSE permits and program

CDM Smith work teams who perform entries at client facilities shall coordinate their schedule and entry procedures with the client. They shall also offer to explain our procedures to the client.

12.4.2 Confined Space Entry Permits

Written entry permits issued and signed by an HSC or HSM are required for any entry into, or work in, confined spaces. Work teams that plan to enter a confined space must complete an entry permit form (Exhibit 12-A of this section, CDM Smith CSE Permit). The permit characterizes possible material and energy inputs to the confined space, identifies the personnel, describes the task, describes monitoring, lists required equipment, and identifies emergency contacts.

Authorization for entry occurs when the entry supervisor confirms permit entry conditions in the field, completes the pre-entry checklist on the entry permit, and signs the form in the field.

Most entry permits address a single work project in a single confined space, under specific conditions, for 1 work period not to exceed 8 hours. Permits may be issued for tasks involving a group of spaces with common hazard potential (for example, an infiltration or inflow study on several manholes in a single branch line). Permits may be approved for longer periods if the personnel, tasks, and hazards are not expected to change. In either case, the entry supervisor must still sign a copy of the permit before each entry.

Employees should note that the permit consists mostly of a checklist on which they show the items they will use by marking a "Y" in the boxes that represent the answers they choose. Items not needed should be left blank. Where the form provides a choice (e.g., glasses or goggles) the employee should circle the one chosen. The special instructions space on the permit is used for describing lockout arrangements, coordination with client or contractor personnel, or the qualifications of the emergency rescue personnel.

The HSC or the HSM must be informed of plans to perform hot work (burning, welding, or cutting) or to introduce chemicals to the space, such as cleaning solutions. The HSC determines safety requirements based on the information he or she receives; therefore, providing complete and accurate information is essential to ensuring a complete permit and a safe entry.

When the entry is complete, the entry supervisor shall write “canceled” across the permit and send it to the HSC or HSM who issued it. The HSC should maintain a file of cancelled permits.

12.4.3 Non-Permit Confined Spaces

A space may be determined to be a non-permit-required confined space if it is determined to be (1) free of atmospheric hazards, and (2) all other hazards are completely controlled and conditions cannot change because the sources of material, energy, or possible air contamination are shut off, locked out, or controlled through ventilation. This determination will be made after completion of a confined space pre-entry hazard evaluation that has been reviewed by a designated HSC or HSM. See Exhibit 12-B of this section or the [Forms section of the H&S Website](#).

Confined spaces that have been approved as non-permit confined spaces may be entered without the need for a written permit, an attendant, continuous air monitoring, or onsite rescue equipment.

12.4.4 Equipment

Table 12-2 below lists typical equipment that could be included in a permit-required CSE.

Table 12-2
Permit-Required Confined Space Entry Equipment

Explosion Proof Lighting	Whole Body Harness
Hard Hat	Tripod
Safety Boots	Winch
Safety Glasses	Retrieval Line or Cable
Goggles	Radios
Protective Coveralls	Fire Extinguishers
Rain Suit	Escape Respirator
Work Gloves	First Aid Kit
Rubber Boots	Traffic Cones
Chemical Protective Gloves	Traffic Barriers
SCBA	Ventilation Blower
SAR	Air Monitoring Instrumentation
Air Purifying Respirator	Duct Tape

The equipment needed for a specific entry and space will depend on the analysis of the hazards of the space and work activities to be conducted during the entry. The CSE permit should be filled out and reviewed with the HSC or HSM.

Circumstances that could affect equipment needs include the following:

- When the air monitoring equipment reveals no contaminants in the air and if there is no potential source of contaminants or oxygen depletion, respiratory protection is unnecessary. It is suggested that portable ventilation and air monitoring equipment be continuously used during these types of entries.
- An SCBA, in stand-by working order, ready for use in emergencies may be required for entries where a readily available outside rescue team cannot be identified.
- Another type of retrieval device may substitute for the tripod and winch assembly.
- Only explosion-safe equipment may be used in confined spaces that pose a potential flammability hazard. Temporary lighting in these spaces, whether electrically or battery operated, must be low-voltage, double-insulated, and explosion-safe. Tools used in confined spaces will be of a nonsparking type unless there is no potential for flammable vapors or gases in the space.

12.4.5 Preparation for Entry

Inspect the area near the confined space for tripping hazards; traffic patterns; and ignition sources such as lit cigarettes, welding, or cutting activities. Provide controls or remove the hazards. If needed, use high-visibility traffic cones, fencing, or barricades, post signs, and assign a team member to control the area. If working in a public roadway, physically protect the entry with a vehicle. Leave some space between the vehicle and the space in the event the vehicle is hit. Isolate the space as described in Section 12.4.6.

Inspect the condition of the entry steps of the confined space. Do not rely on manhole rungs or permanent ladders if the space is often wet. If it appears that the steps will not support your weight or if the confined space contains no steps, provide a ladder and approved hoist, winch, or some other form of ready entry, exit, and fall protection. Only one person at a time may ascend or descend a ladder. Personnel should not carry tools or other objects in their hands while climbing into or out of the confined space. Raise and lower supplies with a rope and bucket. Be sure knots are secure.

Potential emergencies vary with the type of confined space. The rescue equipment, including extraction device and SCBA, should be inspected and tested before space entry.

Co-workers should inspect each other's safety equipment before entry into the confined space to determine if it is properly adjusted and in the proper position. Co-workers should periodically check the integrity of each other's protective clothing and equipment. Problems, such as a tear in the clothing, should be immediately addressed.

When entrance covers are removed, the opening should be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

If entry into the space requires opening a manhole cover, refer to Section 16.23 of this manual, Guidelines for Removing and Replacing Manhole Covers.

12.4.6 Air Monitoring

Multi-channel gas monitors will be used to test the air in the confined space before and during any confined space entries. This testing will be used to both evaluate the atmosphere within the space and to verify that the atmosphere within the space remains within acceptable ranges during the performance of the entry work. This monitoring is to be performed in the following order; oxygen concentration, flammable and combustible gas concentrations, and toxic gases and vapors. The testing can also include specific tests for additional contaminants such as hydrogen sulfide or specific toxic gases and vapors that could be present in the confined space.

- Before entry, the CSE supervisor must test the atmosphere within the confined space by the procedures described below.
- Start up, check voltage, and field check the meters. Do this on site in a clean area, not near or in the confined space.
- Insert the probe about 12 inches into the space. If possible, check for gas in the space without opening the manhole cover or hatch. Read the meters.
- Extend the probe to the level that workers in the space will occupy; read it again. Allow adequate time for sampled gas to reach the gas detectors before recording the reading.
- To the extent possible, measure gas conditions in pockets, corners, etc.
- Always check the low areas in the space since some gases are heavier than air (hydrogen sulfide is heavier, methane lighter).

The air monitors must be field checked in accordance with the instructions contained in the instrument manual. If the detector fails the prescribed field tests, it must be recalibrated by the procedures established by the manufacturer. No entry is permitted unless the required measurements have been collected.

Because gases and vapors tend to vary in concentration in a confined space, the entrant closest to the suspected source must wear or carry the meter throughout the duration of the entry.

If any of the following conditions exist, the team must attempt to eliminate the condition using appropriate engineering controls such as forced ventilation. If the condition cannot be corrected, entry may be allowed using appropriate respiratory protection. All use of respirators must be in accordance with Section 11, Respiratory Protection. If any of the conditions below develop during the entry, entrants must evacuate the space and an attempt must be made to correct the condition using feasible engineering controls. If the condition cannot be corrected, reentry may be allowed using appropriate respiratory protection following the requirements outlined in Section 11.

- A toxic material is present above half of its permissible exposure limit
- Flammable gas is present above 10 percent of the lower explosive limit (LEL)
- Oxygen is below 19.5 percent or above 23.5 percent

To ensure the safety of employees, the confined space shall be monitored periodically and whenever conditions change, such as temporary stoppage of mechanical ventilation or an increase in ambient air temperature. The required frequency of testing shall be a decision of the entry supervisor, based on the ongoing evaluation of the degree of hazard and recommendations from the HSC.

12.4.7 Isolation of the Space

If material or energy can enter the space during entry, take necessary precautions such as preventing accidental introduction of materials into the confined space and locking or tagging out energy sources. Coordinate all lock out/tag outs with the client/owner of the space. Locks, tags, and other lock out/tag out equipment can be obtained from the CDM Smith equipment centers.

Before employee(s) enter a confined space, the space shall be isolated to preclude the entry of materials and energy by one or more of the following methods:

- Remove a valve or connection in the piping and cap the open end of the piping leading to the confined space. Do this as close to the space as possible.
- Install a full-pressure blank in lines with flanged connections as close to the space as possible.
- Close, lock, and tag at least two valves in the piping leading to the confined space. Lock or tag open a drain valve to the atmosphere and check it to ensure it is not plugged.
- De-energize, lock, and tag machinery, pumps, mixers, or other equipment with moving parts or conductors in the confined space.
- Lock the gates to any dumpchute or loading port that connects with the space, or station a person at the port throughout the duration of the entry.

All employees working in the confined space shall be informed of the means by which the space was isolated. All blanks or caps shall be made of a material compatible with the liquid, vapor, or gas with which it may contact. Sometimes CDM Smith employees will enter a space through which flow cannot be stopped (e.g., some municipal sewers). In these cases, the procedures documented in the permit must provide equivalent protection.

12.4.8 Ventilation

When air monitoring indicates a need for ventilation, provide a fresh air inflow until acceptable air levels are achieved. Provide local exhaust or continuous general ventilation when the work itself (e.g., welding or painting with solvent-based paint)

generates a toxic atmosphere. Blowers should be coupled with large-diameter, flexible hose that can direct air into the work area.

The blowers used must meet both the explosion safety and wiring requirements of the National Electrical Code. They shall provide enough airflow to keep contaminant concentrations below 10 percent of the LEL and below 50 percent of the lower of OSHA's permissible exposure levels or the ACGIH threshold limits values.

Gasoline, diesel, or gas-operated equipment used near confined spaces must be oriented so that their exhaust cannot enter the confined space. Exhausted air from the space must be directed away from the work area, downwind, to an area where it presents no hazard.

Ventilation shall continue until acceptable air levels are achieved. Continuing ventilation may be required during entry. All ventilation equipment shall be located upwind to ensure fresh air intake and to ensure that contaminated air does not reach the blower, a potential source of ignition.

12.5 Rescue Procedures

12.5.1 Entrants

Upon detecting an emergency condition, personnel in the confined space must adhere to the following procedures:

- Immediately inform the attendant of the nature of the hazard.
- Exit the space. Assist incapacitated co-workers toward the exit.
- Take no action for which you are not properly trained and equipped. Do not move co-workers who have suffered, or potentially suffered, spinal injury and if in no other danger from the confined space. Only doctors and paramedics may treat spinal injuries.

12.5.2 Attendants

Upon detecting an emergency, the entry attendant must:

- Notify the rescue worker(s).
- Remain outside the confined space to lower necessary rescue equipment into the space and render other necessary assistance.
- Withdraw the worker(s) with the safety line.
- Notify the emergency service providers specified in the permit. Give the location of the emergency and any other pertinent information and guide emergency units to the scene.

12.5.3 Rescue Personnel

Upon notification of an emergency, rescue workers must:

- Report to the confined space as quickly as possible.
- If appropriate, don an SCBA.
- Enter, if safe, to offer assistance to entrants in leaving the space.
- Not enter the space, if they cannot provide assistance with minimal risk to themselves.

Protection of employee life and health is the first priority of the rescue worker. No employee may enter the confined space without an SCBA until all causes of the incapacitation have been eliminated. Rescue workers require protective clothing as resistant as that of the entrants unless otherwise specified in the permit.

Exhibit 12-A Confined Space Entry Permit

Project or Contract: _____

Space to be entered: _____

Section drawing showing material and energy inputs attached? YES or NO

Nature of task: _____

Hot Work? _____

Is there a potential for:

Physical injury? _____	Vehicular traffic? _____	Toxic gases or vapors? _____
Explosive gases? _____	Oxygen deficiency? _____	Exposure to microbes? _____
Heat stress? _____	Cold stress? _____	Engulfment? _____

Duration of permit: From: _____ To: _____

CSE Supervisor: _____

Authorized entrants: _____

Rescuers: _____

Means of communication: _____

Safety Equipment Outside the Space:

Needed?	In Place?	(To be initialed by CSE supervisor)
_____	_____	Traffic cones or barriers in place
_____	_____	Ventilation system in operation
_____	_____	Rescue and retrieval equipment in place
_____	_____	SCBA inspected and ready (topside) for emergency use
_____	_____	Valves locked out or made inoperable (N/A if not applicable)
_____	_____	Electrical equipment disconnected and locked out (or N/A)
_____	_____	Pneumatic and hydraulic equipment disconnected and locked out (or N/A)
<u>YES</u>	_____	Rescue service is currently available
_____	_____	Radio, phone, or portable phone reaches rescue team
_____	_____	Ignition sources eliminated/isolated

Safety Equipment in the Space :

Needed?	In Place?	Needed?	In Place?		
_____	_____	_____	_____	SCBA or airline respirator	5-minute escape pack
_____	_____	_____	_____	Air filtering respirator	Ladder for entry
_____	_____	_____	_____	Steel-toe safety shoes	Rubber overboots
_____	_____	_____	_____	Leather or cloth gloves	Cloth coveralls
_____	_____	_____	_____	Tyvek or Saranex coveralls	PVC rain suit
_____	_____	_____	_____	Safety goggles or glasses	Face shield
_____	_____	_____	_____	Safety harness and lifeline	Hard hat
_____	_____	_____	_____	Fire extinguisher (topside)	Flashlight or lamp

Exhibit 12-A (Continued)

Atmospheric Testing and Conditioning:

Calibrate instruments per manufacturer's instructions. Measure gases just inside the space and at locations workers will occupy.

Needed?	Readings				
<u>N/A</u> Time of Day	_____	_____	_____	_____	_____
_____ Oxygen deficiency (>19.5% and <23.5%)	_____	_____	_____	_____	_____
_____ Flammable gases (Less than 10% LEL)	_____	_____	_____	_____	_____
_____ Toxics (<PEL); Specify: _____	_____	_____	_____	_____	_____
<u>Yes</u> Initials of Attendant	_____	_____	_____	_____	_____

<u>Emergency Service</u>	<u>Provider</u>	<u>Telephone Number</u>	
CDM Smith 24-Hour Emergency	CDM Smith CHSO	800 / 313-5593	
H&S Manager			
Project Manager			
CSE Coordinator			
Client Contact			
Fire Department			
Police Department			
Health Department			
Poison Control Center			
Hospital Address			
Contact at Hospital			
24-Hour Ambulance			
Route to Hospital (instructions or map):			

Special Instructions:

Permit Approved: _____

H&S Coordinator Date

Entry Approved: _____

CSE Supervisor Date

**Exhibit 12-B
Non-Permit Confined Space Hazard Evaluation**

Project or Contract: _____
Space to be entered: _____
Nature of Task: _____
CSE Supervisor: _____
Entrants: _____
Means of Communication: _____

Hazard Evaluation:

- | | | |
|---|-----|----|
| 1. Is the space a confined space (see definition under Section 12.2)
If "NO," neither forms nor permits are needed for entry. | YES | NO |
| 2. Does the space have known or potential hazards, such as,
mechanical, electrical, engulfment, etc. (See list below)?
If NO, the space may be considered a non-permit confined space. | YES | NO |
| 3. Can the hazards be positively controlled without entry into the space?
If YES, document means and methods of control below and the space
may be entered as a non-permit space.
If NO, the space must be entered as a permit-required confined space until the hazards have been controlled.
Use the CSE permit form for that entry. Document the means and methods of control below and the space may
be reclassified as a non-permit confined space. | YES | NO |

Hazard Controls:

List all energy and materials potentially entering the space and/or other hazards of the space. (Attach drawing showing material and energy inputs to the space.)

Describe how hazards listed above have been controlled, list date control was applied.

<u>Hazard</u>	<u>Control</u>	<u>Date</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

I certify that there are no known or potential hazards associated with the space identified with this form, or that all potential nonatmospheric hazards have been controlled as of the date indicated.

Prepared by: _____
Confined-Space Entry Supervisor Date

Reviewed by: _____
H&S Coordinator or Manager Date

Section 14

First Aid & Bloodborne Pathogens

14.1 Purpose and Scope

This section describes how CDM provides First Aid Coverage for employees working at its offices and engaged in engineering services and is intended to meet the requirements of the OSHA General Industry Standards for Medical Services and First Aid (29 CFR 1910.151) and the OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030). CDM employees not working for CDM Constructors, Inc. do not engage in construction work and are **not** subject to the OSHA Construction Industry Standard for Medical Services and First Aid, (29 CFR 1926.50).

14.2 First Aid

14.2.1 Offices

All CDM offices have readily available access to municipal emergency services and are in areas where 911 notification of emergency services are available. Procedures to summon emergency services are provided to new employees during the new employee orientation and are listed in each office's Emergency Plan. In addition, in most cases office security personnel (non-CDM employees) have first aid and/or CPR training and may provide first aid to office occupants. Some CDM employees have voluntarily taken first aid and CPR training and may if they choose to do so, provide first aid to employees who may be injured in the office. However, they are not obligated to do so and providing first aid is not considered part of their job function. (Note: Employees who volunteer to provide first aid are considered "Good Samaritans" and are not subject to the OSHA Bloodborne Pathogens Standard.)

All offices are equipped with a first aid kit appropriate for the number of personnel the kit is intended to serve. First aid kits are located with the office receptionist or kitchen or break area, stored in weatherproof containers containing individually sealed items. CDM has over 80 offices, with as few as 4 employees to over 700 employees in a given location. There is no one standard Office First Aid kit. Office first aid kits should be checked by the office services or health and safety coordinator. The contents of a typical first aid kit are shown in Exhibit 14-A.

Employees that voluntarily participate in first aid/CPR training shall be provided information on:

- Hazards associated with bloodborne pathogens and potential routes of exposure,
- Universal precautions, and
- This procedure and the opportunity for post-exposure evaluation and follow up.

14.2.2 Field Engineering Activities

Field engineering projects at locations where access to a medical facility, hospital or other provider of first aid services is not in near proximity shall include an employee or subcontractor employee who is trained in first aid and have access to a first aid kit. (Note: This does not apply to project locations controlled and operated by an owner or third party that have first aid and or emergency services available in proximity to the project location.) Field engineering projects where a first aid trained employee is required by contract shall also have an employee or subcontractor employee assigned to the project site who is trained in first aid and have access to a first aid kit.

First aid supplies shall be stored in a weatherproof container and contain individually sealed items. The First aid kit will be checked by the project manager or his/her designee prior to commencing work at the project location. First aid supplies will be restocked as needed and checked weekly by the project H&S coordinator.

Field engineering projects with potential exposure to corrosive materials shall have available a portable eyewash station or bottle.

A list of supplies provided in a typical field or office first aid kit is provided in Exhibit 14- A

14.3 Bloodborne Pathogens

14.3.1 Exposure Assessment

The program applies to all CDM employees who may be occupationally exposed to blood or other potentially infectious materials.

CDM employees do not normally work where skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials would reasonably result from the normal performance of their duties.

There are two job functions that may reasonably expose employees to blood or other infectious materials without regard to the use of PPE;

List of Exposure Determinations

1. Employees assigned to provide first aid services on field engineering projects.
2. Employees assigned to solid waste characterization projects.

CDM's medical consultants evaluated the risk associated with potential hepatitis exposure to employees working around sewage and wastewater treatment plants and the merits of providing prophylactic vaccination against hepatitis. They provided a written opinion indicating that the risk of contracting hepatitis did not warrant administration of the vaccine. The full text of the physician opinion is available on the H&S home page.

14.3.2 Exposure Control Plans

Exposure Controls for Field Engineering Project First Aid Providers

Employees providing first aid care in the field shall observe “universal precautions” and use PPE provided in first aid kits. “Universal precautions” are defined as “an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.”

First aid kits shall contain appropriate PPE such as latex gloves and face shields. Employees working on field engineering project normally wear safety glasses. Employees shall wear the provided PPE when providing first aid when designated as a field project first aid provider.

In addition, first aid kits shall contain hand sanitizer or disinfectant wipes employees are to use after providing first aid.

Any bandages or blood soaked materials shall be placed in a leak proof plastic bag for proper disposal. Any employee clothing soiled with blood or infectious material while applying first aid shall be cleaned or disposed of and replaced at CDM’s expense.

Employees who are assigned responsibilities as first aid providers on field engineering projects shall be provided the opportunity to be vaccinated for Hepatitis B at CDM’s expense.

Employees who are assigned responsibilities as first aid providers on field engineering projects shall be provided information on:

- Hazards associated with bloodborne pathogens and potential routes of exposure,
- Universal precautions, and
- This procedure and the opportunity for post-exposure evaluation and follow up.

Exposure Controls for Solid Waste Characterization Projects

Employees engaged in solid waste characterization projects shall observe “universal precautions” and use appropriate PPE identified in a project H&S plan and provided by CDM. “Universal precautions” are defined as “an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.”

Employees who are assigned to solid waste characterization projects that come into direct contact with waste material shall be provided the opportunity to be vaccinated for Hepatitis B at CDM’s expense.

Employees who are assigned to solid waste characterization projects shall be provided information on:

- Hazards associated with bloodborne pathogens and potential routes of exposure,
- Universal precautions, and
- This procedure and the opportunity for post-exposure evaluation and follow up.

14.3.3 Post-Exposure Evaluation and Follow-Up

Following a verbal report of an exposure incident, the direct manager, resource manager, HSC or HSM should immediately offer the exposed employee confidential medical evaluation and testing as well as a post-exposure hepatitis vaccination. The results of medical evaluations and test data maintained by CDM's medical consultant will be reported only to the employee or someone they designate in writing. The examining physician will inform CDM's H&S staff or Human Resources manager only if needed to provide adequate support to affected employee.

Post-exposure evaluation and follow-up should consist of the following steps:

- Documentation of the route(s) of exposure.
- Collection and testing of blood of the exposed employee for HBV and HIV serological status with employee's consent. After obtaining the exposed employee's consent for follow-up testing, a sample of his/her blood shall be collected and tested for HBV and/or HIV as soon as feasible following the exposure incident.
- If the exposed employee consents to baseline blood collection, but does not give consent at that time for HIV serological testing, the sample shall be preserved for at least 90 days. If, within 90 days of the exposure incident, the employee elects to have the baseline sample tested, such testing shall be done as soon as feasible.
- Post-exposure prophylaxis as recommended by the CDM medical consultant when medically indicated. Note: To have maximum potential effect, initiation of post exposure Hepatitis B vaccination should begin within 48 hours of the exposure incident.
- Counseling.
- Evaluation of reported illnesses.

Following post-exposure evaluation and follow-up, the exposed employee shall be provided with a copy of the evaluating healthcare professional's written opinion.

Incident Reporting

Exposure incident means a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that

results from the performance of an employee's duties. If an exposure incident occurs while the employee is in a work setting or while working for CDM the following steps should be taken:

- Employees shall notify their direct manager, resource manager, HSC, or division HSM as soon as feasible following an exposure incident.
- Employees shall complete a bloodborne pathogen (BBP) occupational exposure report, available in Exhibit 14-B of this section or in the Forms section of the H&S Web site. Employees shall sign the BBP occupational exposure report and give the signed and completed form to his/her direct manager or resource manager for review and sign-off.
- The direct manager or resource manager shall forward a copy of the report to the division HSM.

Post-Exposure Testing of the Source Individual

- CDM shall make a good faith effort to identify and obtain consent for HBV and HIV testing of the source individual.
- The source individual's blood shall be collected and tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity.
- If consent is not obtained, CDM shall establish that legally required consent cannot be obtained, and the source individual shall not be tested.
- When the source individual's consent is not required by law, the source individual's blood, if available, shall be collected, tested, and the results documented. The condition "if available" applies to blood samples that have been drawn from the source individual for other testing.
- When the source individual is already known to be infected with HBV or HIV, testing for the source individual's known HBV or HIV status need not be repeated.
- Results of the source individual's testing shall be made available to the exposed employee, and the exposed employee shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.

14.3.4 Training and Medical Records

Training records for all employee training are maintained in CDMs Learning Management System and include date of training, training content, names and job titles. Records are maintained for the duration of employment or 3 years whichever is greater.

The results of medical evaluations and test data maintained by CDM's medical consultant will be reported only to the employee or someone they designate in writing. The examining physician will inform CDM's H&S staff or Human Resources manager only if needed to provide adequate support to affected employee. Records will be provided in a timely manner at no cost to the employee.

Employees are notified of the right to access to medical records associated with their employment at CDM annually.

14.4. BBP Engineering Controls

Virtually all of CDM's potential occupational exposure to blood or other infectious materials occurs in field locations where there are no fixed facilities making implementation and maintenance of engineering controls not feasible. Protection from BBP is provided through administration of proper work procedures, use of PPE and follow up.

Exhibit 14-A Typical First Aid Kit Contents

- 50 - 1 x 3 Adhesive Bandages
- 10 - Knuckle Adhesive Bandages
- 3 - Fingertip Adhesive Bandages
- 1 - 2 inch Sterile Gauze Rolled Bandage
- 2 - 3x3 Sterile Gauze Pads (2/pk)
- 3 - 4x4 Sterile Gauze Pads (2/pk)
- 1 - Triangular Bandage
- 1 - 5" x 9" Trauma Pad (sterile)
- 2 - Sterile Eye Pads
- 1 - 1/2 inch x 10 yds Medical Tape
- 4 - Latex Gloves
- 15 - BZK Antiseptic Wipes (no alcohol)
- 6 - Triple Antibiotic Ointment packs
- 4 - Sting Relief Pads
- 1 - Instant Cold Pack
- 1 - Scissor
- 1 - Tweezer
- 1 - 4 oz. Eye Wash
- 6 - WaterJel Foil Packets
- 1 - CPR Filtershield
- Acetaminophen packs
- Aspirin
- 1 - First Aid Guide

Exhibit 14-B Bloodborne Pathogens Exposure Incident Report

Section 1 - To be completed by Exposed Employee, Direct Manager or Resource Manager, Information about Exposed Employee:

First Name: _____ Middle Initial: _____

Last Name: _____ Division: _____

Office: _____ Employee Number _____

Sex: M F Age: ____

Address: _____

Phone Number: _____

Employment Category: **Length of Employment:** **Time in Occupation:**

Regular Full time Regular Part time Temporary Non-employee

Section 2 - To be completed by Exposed Employee, Direct Manager or Resource Manager, Information about Exposure Incident:

Date of Incident _____ Time: _____

Specific Location of Incident: _____

Witness(es) to the Incident: _____

Employee's Usual Occupation: _____

Occupation at Time of Incident: _____

Direct Manager or Resource Manager _____

Phase of Employee's Workday at Time of Injury:

Performing Work Duties During Meals During Rest Period

Entering or Leaving Workplace Other _____

General Type of Task Being Performed at Time of Incident: _____

Supervision at Time of Accident:

Directly Supervised Indirectly Supervised Not Supervised Supervision Not Feasible

Exhibit 14-A Bloodborne Pathogens Exposure Incident Report (Continued)

Description of Exposure Incident:

Location: _____ Date: _____ Time: _____

Details of Exposure Incident - Identify Type of Exposure, Frequency, Duration, Intensity and Exposure Route

Name, Address, and Phone Number of Attending Physician (If Applicable): _____

Section 3 - To be completed by Exposed Employee, Direct Manager or Resource Manager, Information about the Exposure Source (If known):

Name of Source Individual (If known): _____

Employer of Source Individual: _____

Contact Phone Number: _____

Section 15

Hearing Conservation

15.1 Purpose and Scope

The purpose of this section is to prevent permanent and temporary occupational hearing loss that results from overexposure to noise. This section is applicable to all CDM Smith employees and to all equipment and property used by CDM Smith.

15.2 Definitions

Action Level - An exposure to an 8-hour time-weighted average of 85 decibels measured with a dosimeter or sound-level meter on the A-scale at slow response; or equivalently, a dose of 50 percent measured as per Subsection 15.5.5. The action level is the criterion for instituting noise surveys and employee participation in the audio metric testing program.

Administrative Control - Any procedure that limits noise exposure by control of work schedules.

Audiogram - A chart, graph, or table that results from an audiometric test. An audiogram shows an individual's hearing threshold level as a function of frequency (Hz).

Audiologist - A professional who specializes in the study and rehabilitation of hearing and who is certified by the American Speech, Hearing, and Language Association or licensed by a state board of examiners.

Audiometer - An electronic instrument that measures hearing threshold levels and conforms to the requirements and specifications of the current ANSI Standard S3.6.

Baseline Audiogram - An audiogram against which future audiograms are compared. It may also be described as a reference, pre-placement, pre-assignment, or entrance audiogram.

Biological "Functional" Calibration Check - An audiometric test that uses one or more individuals with known, stable hearing levels to check proper functioning and stability of an audiometer and to identify any unwanted or distracting sounds.

Cut-Off Level - All sound levels at or above the cut-off level are averaged into the calculations that relate to noise exposure. All sound levels below the cut-off level are not included.

Deafness: The condition in which the average hearing threshold level for pure tones at 500; 1,000; 2,000; and 3,000 Hz (frequencies used for speech) is at least 93 decibels (reference ANSI S3.6-1969). This is generally accepted as representing a 100 percent hearing handicap for normal speech.

Decibel (dB) - A unit of measurement of sound-pressure level. The decibel level of a sound is related to the logarithm of the ratio of sound pressure to a reference pressure. The dB has meaning only when the reference is known. The internationally accepted reference pressure used in acoustics is 20 micropascals.

Decibels, A-Weighted (dBA) - A sound level reading in decibels made on the A-weighting network of a sound-level meter at slow response.

Decibels, Peak (dB_P) - A unit used to express peak sound-pressure level of impulse noise.

Dose Criterion Sound Level - The average sound level at a given dose criterion length for which the dose represents 100 percent of the allowable exposure. The Federal Occupational Safety and Health Administration (Fed-OSHA) requires a dose criterion sound level of 90 dBA for an exposure duration of 8 hours. ARC has a dose criterion level of 85 dBA for an 8-hour exposure, per Section 29.6.

Dose Criterion Length - The permissible exposure duration (in hours) for a given dose criterion sound level for which the dose represents 100 percent of the allowable exposure.

Eight-Hour Dose - The actual dose (as a percentage) accumulated over the duration of the work shift and based on a regulations defined criterion level and criterion length.

Engineering Control - Any mechanical device, physical barrier, enclosure, or other design procedure that reduces the sound level at the source of noise generation or along the path of propagation of the noise to the individual. This does not include protection equipment such as earmuffs, plugs, or administrative controls.

Hazardous Noise - Noise generated by an operation, process, or procedure that is of sufficient duration and intensity to be capable of producing a permanent loss of hearing in an unprotected person. Generally, this is interpreted as persistent noise levels equal to or greater than 85 dBA or combinations of higher intensities for durations shorter than 8 hours.

Hertz (Hz) - A unit of measurement of frequency that is numerically equal to cycles per second.

Impulsive or Impact Noise - Variations in noise levels that involve peaks of intensity that occur at intervals of greater than 1 second. If the noise peaks occur at intervals of 1 second or less, the noise is considered continuous.

L_{av} - The average sound level (in dBA) computed for a chosen averaging time duration.

L_{av} (80) - The average sound level (in dBA) computed for a chosen averaging time duration, using an 80-dBA cut-off level. The 80-dBA cut-off level is used by Fed-OSHA for hearing conservation compliance requirements.

Manager - A broad term that can refer to managers, program and project managers, direct managers, site managers, supervisors, department heads, group heads, branch chiefs, owners, and/or persons that operate in a management capacity or supervisory roll with respect to affected employees.

Medical Pathology - A disorder or disease. For the purposes of this chapter, a condition or disease that affects the ear and should be treated by a physician specialist.

Monitoring Audiogram - An audiometric test obtained at least annually to detect shifts in an individual's threshold of hearing by comparison to the baseline audiogram.

Noise - Unwanted sound.

Noise Dose - A measure of cumulative noise exposure over a stated period, which takes into account both the intensity of the sound and the duration of the exposure.

Noise Dosimeter - An electronic instrument that integrates cumulative noise exposure over time and directly indicates a noise dose.

Noise Hazard Area - Any work area with a noise level of 85 dBA or greater.

Otolaryngologist - A physician who specializes in the diagnosis and treatment of disorders of the ear, nose, and throat.

Representative Exposure - The measurements of an employee's noise dose, or an 8-hour time-weighted average sound level that a qualified person deems representative of the exposure of other employees in that work area or job classification.

Standard Threshold Shift (STS) - An average hearing threshold shift of 10 dB or more at 2,000; 3,000; and 4,000 Hz in either ear. A threshold shift can be temporary or permanent. Temporary threshold shift is a change in hearing threshold, primarily due to exposure to high-intensity noise that is usually recovered in 14 to 72 hours. Any loss that remains after an adequate recovery period is termed permanent threshold shift.

Sound-Pressure Level - The term used to identify a sound measurement (expressed in decibels) obtained with a sound-level meter that has a flat frequency response. This is mathematically equivalent to 20 times the common logarithm of the ratio of the measured A-weighted sound pressure to the standard reference pressure of 20 micropascals (measured in decibels). For use with this standard, slow time response is required in accordance with the current ANSI S1.4.

Sound-Level Meter (SLM) - An electronic instrument for the measurement of sound levels that conforms to the requirements for a Type II sound-level meter as specified in ANSI S1.4-1971.

Time-Weighted Average (TWA) Sound Level - The sound level that, if constant over an 8-hour workday exposure, would result in the same noise dose as is measured.

TWA (80) - The time-weighted average level that corresponds to a noise dose computed with an 80-dBA cut-off level.

15.3 Responsibilities

Health and Safety Manager

- Develops and implements a hearing conservation program.

- Provides guidance to employees (and their managers) whose jobs expose them to hazardous noise levels.
- Provides periodic noise monitoring when necessary.
- Periodically reviews the hearing conservation program for compliance standards.
- Provides employees access to noise survey/dosimetry records.
- Coordinates the medical surveillance program that includes baseline and annual audiograms.
- Recommends the selection of hearing protection and specifies performance (attenuation) requirements.
- Notifies management of all areas that have been designated as noise hazard areas.

Health and Safety Coordinators

- Reports suspected hazardous noise areas to the HSM so that noise monitoring can be conducted.
- Ensures that employees who work in designated noise hazard areas (or are otherwise exposed to hazardous noise) receive pre-placement, annual, and termination audiograms.
- Ensures that employees in high-noise areas use hearing protection devices.
- Notifies the HSM of any changes in operations that require noise determinations or evaluations.
- Ensures that hearing protection devices that have been approved by the HSM are available for use by employees.
- Ensures that employees who participate in the Hearing Conservation Program attend required training and provides documentation of such training to the HSM.
- Ensures that caution signs are posted in designated noise hazard areas.
- Ensures the design and application of engineering controls recommended by the HSM that are needed to reduce noise exposures to acceptable limits or to the maximum extent feasible.

Employees

Responsibilities of employees who work in high noise areas are:

- Wear and maintain hearing protection as required by the HSC
- Cooperate with H&S personnel in activities undertaken to evaluate hazardous noise

- Notify direct or project manager or HSC of areas, operations, or equipment that may produce hazardous noise
- Attend hearing conservation training when necessary
- Participate in the medical surveillance program

15.4 Noise Exposure Limits

Protection against the effects of noise exposure shall be provided when sound levels exceed those in Tables 15-1 and 15-2 below. Noise exposure limits are generally applied as an 8-hour exposure limit of 85 dBA. For exposures of shorter or longer durations, the exposure limit may be adjusted as indicated in the table. Hearing conservation program elements are expected to be implemented whenever employee noise exposures equal or exceed an 8-hour time-weighted average of 80 dBA measured as per Subsection 15.5.5. Hearing conservation program elements include exposure monitoring, audiometric testing, medical monitoring, and training. The dose criterion of 80 dBA for an 8-hour exposure is referred to as the action level.

**Table 15-1
Continuous Noise Permissible Exposure Limits**

<i>Duration (Hours)</i>	<i>Sound Level (dBA)*</i>
16	80
8	85
4	90
2	95
1	100
0.5	105
0.25	110
0.125 or less	115

*Measured on the A-scale of a standard sound-level meter set at slow response.

**Table 15-2
Impulse Noise Permissible Exposure Limits**

<i>Sound Level (dBP)*</i>	<i>Permitted Impulses/Day</i>
140	100
130	1,000
120	10,000

*Peak sound-pressure level.

15.5 Hearing Protection Methods

15.5.1 Engineering Controls

Where feasible, facilities and equipment will be procured, designed, operated, and/or modified in such a manner as to prevent employee exposure to continuous noise levels above 85 dBA over an 8-hour TWA or impulsive noise above 125 dBP. Any reduction in employee noise exposure, even if not reduced below 85 dBA, is beneficial. If engineering controls fail to reduce sound levels to within the limits of

Section 15, hearing-protective equipment and/or administrative methods of noise-exposure protection must be used.

15.5.2 Personal Hearing Protection

- PPE is to be used only temporarily or if engineering controls are not feasible or practical.
- The HSCs shall enforce the use of earmuffs and/or plugs by employees assigned to work in areas where they will be exposed to continuous noise (without regard to duration of exposure) in excess of 85 dBA or to impulse noise in excess of 140 dB. Disposable earplugs and/or earmuffs will be made available for employee use (if desired) if noise exposures under 85 dBA create a nuisance. Earplugs will be provided for the exclusive use of each employee and will not be traded or shared.
- Hearing protectors must attenuate employee noise exposure to a level of 85 dBA or below. Both earmuffs and plugs are required where noise levels equal or exceed 110 dBA. For employees with standard threshold shift, protectors must attenuate exposure to an 8-hour TWA of 80 dBA. Estimation of the adequacy of hearing-protector attenuation should be performed according to the methods OSHA specifies in 29 CFR 1910.95 App B, Methods for Estimating the Adequacy of Hearing Protector Attenuation.
- If reusable preformed earplugs are used, they will be permanently issued to the employee and fitted to the employee under medical supervision. During fitting, the employee will be instructed in the proper method of insertion, storage, and cleaning of the earplugs. Earplugs will be checked during annual medical examinations.
- Earmuffs will be provided for employees when analysis of noise environments shows that the attenuation provided by earplugs is not sufficient to reduce noise exposures below 85 dBA. The user shall inspect earmuffs on a regular basis.
- Special hearing-protective equipment, such as sound-suppression communication headsets, may be used in noise hazard areas. These devices should be inspected regularly. Sound-suppression headsets may not be used if they have been damaged, altered, or modified in any way that affects the attenuation characteristics. If replacement parts (such as ear cup seals) are available, the headsets may be repaired and reused. If sound-suppression headsets are not permanently issued to employees, such equipment must be cleaned and sanitized before reissuance.

15.5.3 Administrative Controls

If hearing-protective equipment or engineering controls are not sufficient to attenuate noise to less than 85 dBA, the duration of time spent in the noise hazard area shall be limited so as not to exceed the exposure limits specified in Section 15.4.

15.5.4 Noise Monitoring

- Measurement of potentially hazardous sound levels shall be conducted when any information, observation, or calculation suggests that an employee could be exposed to a noise

level in excess of an 8-hour TWA. This includes, but is not limited to, times when representative exposures need to be documented, when employees complain of excessive noise, or when it is difficult to understand a normal conversation if the speaker and the listener face each other at a distance of 2 feet. Any new equipment, operation, job, or procedure with the potential for creating hazardous noise should be evaluated with regard to noise emissions before startup. All continuous, intermittent, and impulsive sound levels from 80 to 130 dBA will be integrated into the noise measurements.

- Both noise dosimetry and area monitoring will be repeated periodically, or whenever any changes to facilities, equipment, work practices, procedures, or noise-control measures alter potential noise exposures.
- Employees and/or their representatives will be provided an opportunity to observe noise dosimetry and area monitoring activities.
- Areas determined to have noise levels at or above 85 dBA must be posted as noise hazard areas.
- Affected employees (employees whose exposures have been determined to exceed the action level) shall be notified of the results of noise monitoring.

15.5.5 Noise-Measurement Methods

- Sound-level meters must meet Type II requirements of ANSI S1.4 and must be capable of measuring sound in the range of 80 to 130 dBA.
- Noise dosimeters must meet Class 2A-90/80-5 requirements of ANSI S1.25 and be capable of integrating sound levels of 80 dB and above.
- Employee noise doses may be ascertained by using either a noise dosimeter or sound-level meter. If a sound-level meter is used to estimate an employee's dose, the noise survey will include a time and motion study to document the variations in the employee's noise exposure during the working shift. If an employee moves about or noise intensity fluctuates over time, noise exposure is more accurately estimated by personal dosimetry. Regardless of the method chosen, a sufficient number of readings/measurements will be made to accurately reflect noise exposure.
- Employee exposure measurements will be made in such a manner as to accurately represent the actual exposure to noise.
 - B When using a noise dosimeter to determine an employee's noise exposure, the microphone will be attached to the employee in the area of the employee's shoulder.
 - B When using a sound-level meter, the microphone should be positioned not less than 2 inches nor more than 2 feet from the employee's ear.
 - B Measurements will be made with the employee at his/her regular work stations(s).

- Before and after each use, dosimeters and sound-level meters will be calibrated using acoustical calibrators to verify the accuracy of the measuring equipment.
 - B If any sound-level meter or noise dosimeter is dropped, or if the microphone receives a sharp impact, a calibration check shall be performed to ensure that it is still working properly before taking additional measurements.
 - B Sound-level meters and noise dosimeters that are not working properly or are out of calibration shall not be used to determine an employee's noise exposure.

15.6 Medical Surveillance Program

Program Participation

- Whenever an employee is routinely occupationally exposed to continuous noise at or above the action level or to impact or impulsive noise in excess of the limits specified in Section 15.4, the employee shall be enrolled in a medical surveillance program. Employee noise exposure shall be determined without regard to any sound attenuation provided by the use of hearing protectors.
- Each employee placed in a job that required participation in a medical surveillance program shall undergo a physical examination before being assigned to duties that involve exposure to high-intensity noise. The examination shall include a baseline audiogram, a medical examination to determine any preexisting medical pathology of the ear, and a work history to document past noise exposures. The history shall include a detailed review of past work histories and possible occupational and nonoccupational noise exposures.
- When it is discovered that employees have been working where they encounter hazardous noise or incur exposures that exceed the action level and have not had a physical examination, one shall be conducted within 30 days. The audiogram must follow at least 14 hours of no known exposure to sound levels in excess of 80 dBA. This interval should be sufficient to allow recovery from noise-induced temporary threshold shift.
- Personnel who suffer from acute diseases of the ear shall not be placed in hazardous noise areas until the condition has abated, particularly if such diseases preclude the wearing of hearing protectors, cause hearing impairment, or produce tinnitus.
- All employees who are participants in the medical surveillance program must receive an annual audiogram.
- All CDM Smith employees who have participated in the medical surveillance program shall receive a final audiometric examination before termination of employment with CDM Smith, job changes within the installation that would alter noise exposure, transfer to another installation, or retirement.

15.7 Audiometric Testing

15.7.1 Medical Personnel

Medical personnel who perform audiometric tests must be qualified, trained, and knowledgeable in operating equipment used and be under the supervision of an audiologist or physician. If manual audiometers are used, the Council for Accreditation in Occupational Hearing Conservation must certify qualifications of personnel who operate the audiometer. Hearing threshold levels will be determined by audiometers calibrated to zero reference levels of the ANSI S3.6 standard for audiometers.

15.7.2 Pure Tone, Air Conduction Testing

Pure tone, air conduction testing shall be conducted at test frequencies of 500; 1,000; 2,000; 3,000; 4,000; and 6,000 Hz for each ear. Audiometric test equipment shall meet the specification, maintenance, and use requirements of ANSI S3.6. Where a pulsed-tone, self-recording audiometer is used, it will also meet the requirements of 29 CFR 1910.95, Table 3.

- A listening check shall be performed daily before use to ensure that the audiometer is free from distorted or unwanted sounds.
- A functional check shall be performed each day either by using an “acoustical ear” calibrator (dBA sound-level meter with 9A Type Earphone Coupler) or by testing an individual with a known and stable hearing baseline (a “biological check”). A record will be kept of the daily checks. Deviations of 5 dB or more require an acoustical calibration test.
- An acoustical calibration test (using a sound-level meter, octave-band filter set, and a National Bureau of Standards 9A Coupler) shall be performed at least annually (semi-annually for self-recording audiometers), or when a functional check indicates a deviation of 5 dB or more. The acoustical calibration tests shall conform to the requirements of 29 CFR 1910.95, Appendix E. Deviations of 10 dB or more will require an exhaustive calibration.
- An exhaustive calibration shall be performed at least every 2 years, or whenever an acoustical calibration test indicates an error of 10 dB or more. The test will meet the criteria of the current ANSI S3.6 guidelines appropriate for the instrument. Following calibration, the front panel of the audiometer shall be labeled with a tag indicating that it has been calibrated to ANSI S3.6 guidelines and the date of the calibration.
- Rooms used for audiometric testing shall not have background sound-pressure levels that exceed those in the table below. Sound-pressure levels for rooms used for audiometric testing must be checked at least every 2 years.

Table 15-3
Maximum Background Sound-Pressure Levels
for Audiometric Test Booths

<i>Frequency (Hz)</i>	<i>Sound-Pressure Level (dBA)</i>
500	27
1,000	30
2,000	35
4,000	42
8,000	45

- Employees must receive advance written notification of the need to avoid high levels of occupational and nonoccupational noise during the 14 hours immediately preceding an audiometric test. Properly fitted hearing protectors and/or other hearing-protective devices may be used to prevent excessive noise exposures during this period.
- A physician or other qualified person shall compare annual audiograms with the employee's baseline audiogram to determine if it is valid and if a standard threshold shift has occurred. It is desirable to review the employee's audiogram record for patterns of change over time. When determining if a standard threshold shift has occurred, allowances for the effects of aging to the hearing threshold level may be made using the procedure described in 29 CFR 1910.95, Appendix F. Audiograms referenced to ASA-1951 must be converted to ANSI S3.6-1969 before hearing threshold levels can be properly determined (see the table below for conversion).

Table 15-4
Threshold Audiogram Conversion
ASA-1951 to ANSI-1969

<i>Frequency</i>	<i>dB Difference</i>
250	15
500	15
1,000	10
2,000	10
3,000	10
4,000	5
6,000	10
8,000	10

- B To convert an ASA-1951 reference threshold audiogram to ANSI-1969, add the difference in values.
- B To convert ANSI-1969 to ASA-1951, subtract the values.
- When evaluation of an audiogram indicates that a standard threshold shift has occurred, a retest shall be scheduled within 30 days to determine if the shift is temporary or permanent. A medical evaluation may be warranted at this time to determine if an acute medical condition is a contributing factor.
- An annual audiogram may be substituted for the baseline when, in the judgment of the audiologist, otolaryngologist, or physician who is evaluating the audiogram,

the hearing threshold shown on the annual audiogram indicates significant improvement over the baseline audiogram.

- The employee will be notified of audiometric testing results in writing within 21 days of determination of a permanent threshold shift. The subcontract health care provider retained by CDM Smith shall notify the employer and employee in writing of determinations of permanent threshold shifts.

15.7.3 Criteria for Referral to an Audiologist

The following are criteria for referral to an audiologist for more comprehensive testing:

- Average hearing threshold level greater than 25 dB at 500; 1,000; and 2,000 Hz.
- Single frequency loss greater than 55 dB at 3,000 Hz; or greater than 30 dB at 500; 1,000; or 2,000 Hz.
- Difference in average hearing threshold level between the better and poorer ear of more than 15 dB at 500; 1,000; and 2,000 Hz; or more than 30 dB at 3,000; 4,000; and 6,000 Hz.
- Reduction in hearing threshold level in either ear from the baseline or previous monitoring audiogram of more than 15 dB at 500; 1,000; or 2,000 Hz; or more than 30 dB at 3,000; 4,000; or 6,000 Hz.
- Variable or inconsistent responses or unusual hearing loss curves.

15.7.4 Conditions that Require Follow-Up Review of Employees with Hearing Illness and Responses

- When a permanent threshold shift is detected, a follow-up review must be conducted.
- An employee who is not currently using hearing protection shall be provided (and fitted as necessary) with hearing protectors and shall be trained in their use.
- The employee shall be provided/refitted with hearing protectors that offer greater sound attenuation, as warranted, if hearing protectors are already in use.
- The employee shall be trained/retrained on the hazardous effects of noise and the need to use hearing protection.
- The employee's work area shall be investigated to determine if work practices or changes in equipment or procedures can be made that will decrease noise hazards or if changes have resulted in an increase in noise hazards.
- The employee shall be reassigned to work in a low-noise area, as necessary, to prevent further hearing impairment. The employee will continue to participate in the hearing conservation program.

15.8 Noise Hazard Warning Signs

Caution signs that clearly indicate a hazard of high noise levels and the requirements to wear hearing protection shall be posted at the entrance(s) to, and the periphery of, noise hazard areas. Decals or placards with similar statements shall be affixed to power tools and machines that produce hazardous noise levels. Signs and decals shall have wording in black letters on a yellow background (refer to Section 15.11 for noise hazard warning sign specifications).

15.9 Employee Training

- Each employee who participates in the hearing conservation program shall receive annual training. The training must include, but not be limited to:
 - B An overview of the CDM Smith Hearing conservation program
 - B A review of the effects of noise on hearing (including permanent hearing loss)
 - B Noise control principles
 - B The purpose, advantages, disadvantages, and attenuation characteristics of various types of ear protectors
 - B Instruction on selection, fitting, use, and care of hearing protectors
 - B An explanation of the audiometric testing and its purposes
- Personnel will be encouraged to use hearing protectors when exposed to hazardous noise in nonoccupational settings (e.g., from lawn mowers, firearms, etc.).

15.10 Records Maintenance

- Audiogram and noise-exposure records shall be maintained as a permanent part of employee medical records. If noise-exposure measurement records are representative of the exposures of other employees participating in the hearing conservation program, the range of noise levels and the average noise dose will be made a permanent part of the medical records of the other employee as well.
- In addition to audiometric test data, each medical record will, as a minimum, identify:
 - B The audiometric reference level to which the audiometer was calibrated at the time of testing
 - B The date of the last calibration of the audiometer
 - B The name, social security number, and job classification of the employee tested

- B The employee's most recent noise exposure assessment
- B The date(s) hearing conservation training was received
- Records of the background sound-pressure levels in the audiometric test rooms and data and information concerning calibration and repair of sound-measuring equipment and audiometers (as well as all audiometric test data) will be maintained by CDM Smith's medical consultant in accordance with OSHA and other applicable regulations.
- Accurate records of noise surveys/ monitoring, results of the special noise studies, and records of special actions or engineering controls installed to control noise exposures will be maintained for the duration of the affected employee's employment, plus 30 years.

15.11 Signs and Decals

15.11.1 Noise Hazard Warning Sign Specifications

Warning signs must read:

CAUTION
NOISE AREA
MAY CAUSE HEARING LOSS
USE PROPER
HEARING PROTECTION
IN THIS AREA

The lettering is almost always all caps, black, and on a yellow background.

15.11.2 Noise Hazard Warning Decal Specifications

Decals must have a yellow background and black lettering (all caps). The decal must be self-adhesive on the side opposite the written warning. The written warning must read:

CAUTION
NOISY EQUIPMENT MAY CAUSE HEARING LOSS
USE PROPER
HEARING PROTECTION

The word caution is in yellow lettering with a black background superimposed on the yellow background of the label. As shown, the word caution is 2 point sizes larger than the lettering in the rest of the warning.

Section 16

Work Practices and Guidelines

16.1 Purpose and Scope

The work practices and guidelines in this section describe generally accepted safe work practices and include some activities and practices not regulated by OSHA. CDM Smith managers and employees should follow these guidelines when they are applicable to the projects and scope of work they perform. These work practices and guidelines are written for use by design or professional services employees and may be incorporated by reference in project HSPs when applicable work is performed on a project.

The guidelines may need to be adapted to site- and project-specific needs; however, project-specific activities and plans must meet or exceed OSHA standards and be adequate to protect CDM Smith and subcontractor personnel that work under CDM Smith HSPs. The full text OSHA standards can be accessed from the OSHA home page at <http://www.osha.gov>.

16.2 Housekeeping

These guidelines are for the establishment and administration of a clean and orderly work environment at field project sites. A continuous housekeeping program strongly tends to prevent accidents. A clean and orderly work environment can be achieved and maintained through ongoing housekeeping efforts undertaken by personnel at all levels. Project managers shall initiate participation in housekeeping activities and good work habits, not only at the end of a work assignment but throughout the evolution of the project.

- To achieve these benefits, the team shall plan the location of equipment and storage facilities to allow the easy flow of personnel, equipment, materials, fire hazards, and to prevent the obstruction of evacuation, fire fighting, or rescue activities.
- Store materials in a manner that facilitates access of material handling equipment and personnel handling limitations. Lack of sufficient workspace and storage capacity leads to the potential for accidents and decreases efficiency.
- Avoid storage of flammable liquids, such as paints and thinners, unless they are required for specific project needs. If needed, such storage shall be within a metal storage cabinet that has been labeled and approved for the storage of flammable liquids.
- Continuously maintain work areas in a neat and orderly manner.
- Containers should be provided for the collection of waste, trash, and other nonhazardous refuse. Investigation-derived waste and other waste materials that are potentially hazardous should be stored and labeled in accordance with project-specific procedures that meet regulatory and client requirements.
- Deploy leads, hoses, and extension cords so they do not present tripping hazards and are not subject to contact with moisture or physical stress. Where possible, they should be hung overhead with nonconductive material and kept away from walkways, doors, stairs, and ladders.
- Protect protruding rebar and anchor bolts and conspicuously mark them.
- Clean small spills that create slip hazards and/or flammability hazards immediately and do not leave them unattended.
- Keep walkways, aisles, stairways, and passageways in a clear and unobstructed condition.
- Prohibit eating and drinking in work areas where there is potential exposure to toxic or hazardous materials. Smoking is limited to designated smoking areas where there is no such exposure.

16.3 Manual Material Handling

CDM Smith employees should follow the work practices outlined below when lifting and carrying heavy objects.

- Test any load they are required to lift and compare its weight, volume, and shape to their lifting abilities. Employees shall not attempt to lift beyond their capacity.
- Obtain assistance in lifting heavy objects. Back belts or back braces may be used if desired; however, many ergonomists do not believe that these devices create a benefit or provide protection.
- When two or more persons are involved in a manual lift, one person should provide direction of the lift.
- When two or more persons are carrying an object, each employee, if possible, should face the direction in which the object is being carried.
- When two or more persons carry a heavy object that is to be lowered or dropped, there shall be a prearranged signal for releasing the load.
- The right way to lift is easiest and safest. Crouch or squat with the feet close to the object to be lifted, secure good footing, take a firm grip, bend the knees, keep the back vertical, and lift by bending at the knees and using the leg and thigh muscles. Exercise caution when lifting or pulling in an awkward position.
- Employees should avoid twisting or excessive bending when lifting or setting down loads.
- When moving a load horizontally, employees should push the load rather than pull.
- For tasks that require repetitive lifting, the load should be positioned to limit bending and twisting. The use of lift tables, pallets, and mechanical devices should be considered.
- When gripping, grasping, or lifting an object such as a pipe or board, the whole hand and all the fingers should be used. Gripping, grasping, and lifting with just the thumb and index finger should be avoided.

16.4 Electrical Safety Program

CDM Smith addresses the needs of electrical safety through this program. The program was designed to meet the requirements of the:

- National Fire Prevention Association's standard 70E for electrical safety,
- IEEE 1584 standard for arc flash safety, and
- OSHA's electrical safety standards (29 CFR 1910 subpart S & 1926 subpart K)

If this program differs from any of these standards, the more protective policy will prevail. If any word or phrase in this section is unclear, refer to the definitions in NFPA 70 E. (You can download NFPA 70E from <http://subscriptions.techstreet.com/home>)

Employees conducting electrical work, or employees whose work may involve contact with electrical devices, must:

- Comply with this and other sections of the CDM Smith health and safety manual AND
- Only do work for which they are "qualified" in accord with this program AND
- Complete the health and safety training required for their tasks in accord with this program AND
- Complete an electrical safety work permit (Exhibit B) that includes
 - Lock-out and tag-out, if feasible, to bring their workplace into an electrically safe (*zero-state*) work condition
 - Shock hazard analysis as required in program
 - Flash hazard analysis as required in program

Qualified Workers

The electrical safety program makes different provisions for "unqualified" and "qualified" personnel. Most CDM Smith personnel are "unqualified" to work on electrical devices or circuits except in an "electrically safe work condition" (an area that is reliably free of electrical charge and current).

CDM Smith allows "unqualified" personnel to perform work:

- Where electrical hazards are effectively absent
- When all electrical parts and devices present are in closed enclosures approved for site conditions.
- Within the limits of their abilities on systems that are in an "electrically safe work condition,"
- **Outside** the "limited approach boundary" that qualified persons may work inside.

Personnel in the following job classifications *may* be "qualified" to perform work on live electrical devices and circuits as described in this section if their division approves the qualification and they have also completed an acceptable electrical safety course. The limits of each person's qualification will be stated in the qualification letter. See Exhibit A.

- Electricians
- Electrical engineers
- Health and safety managers
- Instrument & control (I & C) engineers
- Others approved by operating units

NOTE: Divisions may “qualify” persons for one type of task or situation and not for others. Each employee is responsible to know the limits of his or her qualification.

- CDM employees who have valid licenses to practice as *electricians* are “qualified” to perform any type of electrical work for which CDM Smith has issued an energized electrical work permit (Exhibit B).
- CDM Smith’s *electrical engineers* are “qualified” to perform tests and collect field data and measurements on any electrical parts and devices for which CDM Smith has issued an energized electrical work permit. They are not “qualified” to modify systems or install electrical parts and devices, except in an “electrically safe work condition.”
- CDM Smith’s *I & C engineers* and *health and safety managers* are “qualified” to perform tests and collect measurements on electrical parts and devices operating at no more than 250 volts if CDM Smith has issued an energized electrical work permit. They are not “qualified” to modify systems or install electrical parts and devices, except in “electrically safe work conditions.” They may, however, modify “live” parts of data – management systems that operate at less than 25 volts
- CDM Smith’s *electrical engineers, I & C engineers, and health and safety managers* are, however, “qualified” to take steps (as conservative as possible) to reduce electrical hazards that become apparent during those tests. Examples of permitted actions might include bending a loose wire away from other conductors and notifying an electrician to properly affix it.
- Presidents of CDM Smith operating divisions may recognize *other personnel* as “qualified,” with the advice of their safety managers and the employee’s group leader. Of course, these presidents should seek advice from knowledgeable personnel.

Training

Your job title alone does not qualify you to conduct electrical work for CDM Smith. Qualified personnel must also complete appropriate electrical safety training. That electrical safety training should include an understanding of

- Appropriate regulations,
- CDM Smith’s Company program, and the
- Information that can be derived from appropriately labeled equipment.

A person who is appropriately trained should understand personal protective equipment including how to select it, don it, doff it, understand its limitations, and know how to maintain it. Completion of CDM Smith University courses HS #106i and THS #191 meets this requirement.

Electrically Safe Work Condition

Unqualified personnel may work on electrical devices only when in an electrically safe work condition. Even qualified personnel must work in electrically safe work condition whenever it's possible. An "electrically safe work condition" exists when which no conductor or parts that an employee can contact carries an electrical current that can harm the employee.

The most common examples of "electrically safe work condition" are places where no electricity is present or where all of the electrical devices are enclosed as required to protect unqualified workers by the National Electrical Code.

Lock-Out

If electrical devices are present, and their enclosures will be disturbed, creating a safe work condition may require lock-out or tag-out. Effective lock-out requires you to follow a specific procedure and describe it in your lockout permit. See Exhibit A in Section 16-5. CDM Smith offers another course (HS#119) to teach employees how to perform lockout. You should take that course if you need to create "electrically-safe work conditions."

Lockout is not complete until a qualified person verifies the safe working condition by verifying the absence of electrical potential. Any meter used for this test must first respond properly to a known live voltage source, followed by a check on the equipment that has been locked out, then again on the known live source. After this test, the qualified person should install Personal Protective Grounds to protect against accidental energization. Wear the appropriate PPE when attaching Personal Protective Grounds. Remove these grounds before re-energizing equipment.

Energized Circuit Work Condition

Some electrical tasks can only be performed while power is still present. Obvious examples include voltage testing and observation of the equipment under load conditions. Such tasks may only be conducted on systems over 50 V only by qualified persons, and only with a CDM Smith Energized Circuit Work Permit (Exhibit B).

Permits are issued to qualified persons by CDM Smith's health and safety managers and other persons designated by the corporate health and safety officer. CDM Smith will normally issue an energized circuit work permit for the duration the work requires. For electricians, who will install or modify a specific electrical appliance or device, the permit may allow work for a period of one day. For electrical engineers, who typically conduct studies during preliminary design or consultation, the permit may last up to a month. For I&C engineers, who maintain an instrumentation and control system, the permit may last up to six months.

The purpose of the permit is to identify appropriate personal protective equipment and any applicable procedures. Every energized circuit work permit must include a shock hazard analysis and a flash hazard analysis. If the owner's electrical consultant has conducted these analyses and properly labeled the equipment, CDM Smith personnel may rely on those analyses.

Shock Hazard Analysis

The qualified person should perform a shock hazard analysis to identify the control distances and assess the condition of the electrical system. The purpose is to identify hazardous conditions and the appropriate personal protective equipment for the team inside the controlled work zone.

After the qualified person examines the system and identifies all of the shock hazards present, he or she must determine the appropriate distances for the

- Limited approach boundary
- Restricted approach boundary and
- Prohibited approach boundary (the distance at which the hazards is the same as touching the conductors)

The most convenient way to assess the shock hazard is to rely on a previous characterization of electrical hazards provided by the owner of the location in which you work. Unless you suspect that the previous analysis was incompetent or inadequate, you may base your decisions on the shock hazard labels you see on the electrical equipment.

The most accurate way to assess the hazard risk category is to have CDM Smith's electrical engineering group performed a shock hazard analysis. If you will perform work in one location over a long period, and no previous analysis has occurred, consider asking the electrical engineering group for help. NOTE: This is a service for which CDM Smith should, normally, charge the client.

If neither of the two methods above are possible in your work situation, qualified personnel may use the rules of thumb provided below to conduct shock hazard analysis.

During work on live electrical parts, "unqualified" personnel must maintain the following distance (the "**Limited Approach Boundary**") from the nearest live part.

- 3.5' (42") for non-moving circuits between 50 and 750 volts
- 5' (60") for non-moving circuits between 751 and 15,000 volts
- 6' (72") for non-moving circuits between 15,001 and 36,000 volts
- 8' (96") for non-moving circuits between 36,001 and 121,000 volts
- 10' (120") for movable conductors less than 72,500 volts

During work on live electrical parts, “qualified” personnel must wear electrical PPE on any parts of their body that comes within the “**Restricted Approach Boundary**” of the nearest live part.

- 1’ (12”) for circuits between 300 and 750 volts
- 2.3’ (26”) for circuits between 751 and 15,000 volts
- 2.6’ (31”) for circuits between 15,001 and 36,000 volts
- 2.8’ (33”) for circuits between 36,001 and 46,000 volts
- 3.2’ (38”) for circuits between 46,001 and 72,500 volts

Any body part that approaches an electrical conductor closer than allowed by the restricted approach zone must be protected with:

- Systems operating at 50 to 500 volts
 - Class 00 material (e.g. gloves)
 - Leather protectors above 250 volts
- Systems operating at 500 to 1000 volts
 - Class 0 material (e.g. gloves)
 - Leather protectors above 250 volts

Flash Hazard Analysis

The qualified person should conduct a flash hazard analysis to determine the flash hazard present, the associated flash hazard boundary, and the required PPE. Flash hazards are represented by the Hazard Risk Category, which in turn depends on the energy intensity that could affect the hands, face, or body of an exposed employee.

The most convenient way to assess the hazard risk category is to rely on a previous characterization of electrical hazards provided by the owner of the location in which you work. Unless you suspect that the previous analysis was incompetent or inadequate, base your decisions on the arc flash hazard labels you see on the electrical equipment.

The most accurate way to assess the hazard risk category is to have CDM Smith’s electrical engineering group performed an arc flash analysis. These studies are complicated, long in duration, and expensive. If you will perform work in one location over a long period of time, and no previous analysis has occurred, consider asking the electrical engineering group for help. NOTE: this is a service for which CDM Smith should, normally, charge the client.

WARNING			
Arc Flash and Shock Hazard Appropriate PPE Required			
Volts	480	Max Short Circuit kA	24.7
PPE Based on 24 inch Working Distance (Arc Flash boundary, PPE required within 32.1 inches)			
Clothing Level	3	Face Shield	YES
Glove Class	00	Eye Protection	YES
Insulated Tools	YES	Hair/Beard Net	YES
Required YES Not Required NO		Arc Flash boundary at energy < 1.2 cal/cm ²	
FLASH PROTECTION Flash Protection at: 18 inches Min. Arc Rating: 17 cal/cm² Flash Protection Boundary: 110 inch Glove Class: 00 Clothing Category: Category 3 <small>FR shirt & pants, coverall, hard hat, safety glasses, flash suit hood, earplugs, leather gloves & shoes</small>		SHOCK PROTECTION Shock Hazard when cover is removed: 480 VAC Limited Approach: 42 inch Restricted Approach: 12 inch Prohibited Approach: 1 inch	
Metro WWTP Switchgear No. 1			
		March 16, 2007	

If neither of the two methods above are possible in your work situation, qualified personnel may use the tables in Exhibit C to identify the potential energy intensity associated with common levels of electric service.

The Hazard Risk Categories are shown below.

- Hazard Risk Category 0 (0 - 2 cal/cm²)
- Hazard Risk Category 1 (2 - 4 cal/cm²)
- Hazard Risk Category 2 (4 - 8 cal/cm²)
- Hazard Risk Category 3 (8 - 25 cal/cm²)
- Hazard Risk Category 4 (25 - 40 cal/cm²)

Personal Protective Equipment

The qualified person conducting the shock and flash hazard analyses should specify the level of protection needed for the work based on the energy that could contact the employee. The following table (from NFPA 70E) describes the ensembles of personal protective equipment that are appropriate.

Work on low-voltage circuits in PLC panels is normally Hazard level 0. Work in PLC panels that may involve contact with conductors operating between 50 and 250 volts is normally Hazard Level 1, unless that conductor is enclosed as required by NEMA codes. A personal protective ensemble for Hazard Level 1 work might include:

- Fire Resistant (FR) long-sleeved shirt and Denim jeans (> 12 oz/yd²) **or** a FR coverall
- Hard Hat (Type E)
- Safety glasses/goggles
- Electrical safety gloves (ASTM Class 00, minimum) for hands that penetrate the restricted approach boundary
- Insulating blankets (ASTM Class 00, minimum) over any exposed live parts that an employee might inadvertently contact

Risk Category	Protective Clothing required	Examples
0	Non-melting, flammable materials (i.e., untreated cotton, wool, rayon, or silk, or blends of these materials) with a fabric weight at least 4.5 oz/yd ² .	- 100% cotton shirt - jeans or - 100% cotton slacks
1	FR shirt and FR pants or FR coverall.	- Nomex clothing - FR pants - Denim jeans* > 12 oz/yd ²
2	Cotton underwear - conventional short sleeve and brief/shorts, plus FR shirt and FR pants Face shield with side protection, chin cups	Flash suits and Flash hoods must be rated above the flash energy levels expected and meet the appropriate ASTM standard.
3	Cotton underwear plus FR Shirt and FR pants plus FR coverall and Flash hood, or cotton underwear plus two FR coveralls and Flash hood <i>or</i> Flash suit and Flash hood.	

4	Cotton Underwear plus FR Shirt and FR Pants plus multilayer flash suit. <i>or</i> Flash suit meeting ASTM F1506 and ASTM F2178	
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*: The requirement for Fire Resistance (FR) discourages the use of metal zippers and fasteners, and fasteners or fabric made of meltable plastic.

Work on low-voltage circuits in PLC panels is normally Hazard level 0. Work in PLC panels that may involve contact with conductors operating between 50 and 250 volts is normally Hazard Level 1, unless that conductor is enclosed as required by NEMA codes.

A personal protective ensemble for Hazard Level 1 work might include:

- Fire Resistant (FR) long-sleeved shirt and Denim jeans (> 12 oz/yd²) **or** a FR coverall
- Hard Hat (Type E)
- Safety glasses/goggles
- Electrical safety gloves (ASTM Class 00, minimum) for hands that penetrate the restricted approach boundary
- Insulating blankets (ASTM Class 00, minimum) over any exposed live parts that an employee might inadvertently contact

Safe Practices for Work with Electrical Equipment

The following work practices can eliminate or minimize the potential for electrical shock, fires, and burns when working or around electrical equipment.

- Treat all electrical circuits as live until their condition has been verified. Treat even low voltages as dangerous.
- Don't wear watches, jewelry, or other conductive objects.
- Use Ground Fault Circuit Interrupters (GFCIs) whenever you use portable electric tools or electrical equipment. If a GFCI outlet is not available, a portable GFCI outlet adapter or GFCI-equipped extension cord should be used. (available from the equipment center)
- Do NOT use your finger or any conductive object to point to circuits, panels, fixtures etc.
- Conduct a tool count before beginning work and after work is completed.
- Visually inspect electrical cords before each use for fraying, cuts, or other damage.
- Do not work with electrical equipment or tools with wet hands or standing in wet areas.

Installation and Maintenance of Electrical Equipment

Electrical equipment can cause shock, flash, or burns, if it is poorly maintained. CDM Smith personnel should observe the following rules of thumb in maintaining tools and equipment.

- Inspect all electrical equipment and tools before each use. Inspect insulation, fixtures, switches, plugs, fuses, etc. Remove from service any faulty equipment and notify the source of the equipment.
- Use the following precautions when using electrical cords:
 - Do not use light-duty (household) extension cords for field work.
 - Do not use extension cords for permanent installations.
 - Keep extension cords properly covered or raised overhead to prevent tripping hazards and damage from traffic.
 - Extension cords or cables shall not be secured with staples, hung from nails, or suspended by bare wire
 - Only use electrical cords that are equipped with a grounding pole on the plug (three-prong plugs). Never remove a grounding prong from a cord.
- Do not install fuses or circuit breakers larger than the circuit rating.
- Use only approved and properly rated lighting devices and tools in vessels, boilers, and confined spaces.
- All electrical equipment, including motors, generators, wiring, and controls should be installed so that exposed live parts are properly guarded or insulated to provide

adequate protection to operating personnel. Avoid open panels, circuit boxes, and exposed wiring.

- In wet locations:
 - Plugs and receptacles shall be kept out of water unless they are an approved submersible type.
 - Where a receptacle is used in a wet location, it shall be contained in a weatherproof enclosure, the integrity of which is not affected when an attachment plug is inserted. [Connecting through a ground-fault circuit interrupter (GFCI) is the most effective protection.]
 - Temporary lighting strings in outdoor or wet locations (such as tunnels, culverts, valve pits, floating plant, etc.) shall consist of lamp sockets and connection plugs permanently molded to the hard service cord insulation.

Electrical Emergencies

If a rescue from electrical equipment is required, use the following precautions:

- Disconnect the circuit before attempting any rescue.
- Make sure you are standing on a dry surface.
- Use a dry belt, rope, coat, or other non-conductive material to loop over the victim and drag them away from the contact.
- Assess the condition of the victim; do not approach if they are still in contact with the circuit.
- Apply first aid and/or CPR (if you are qualified) and get medical help.

Andrew A. Anybody
Electrical engineer
Saskatoon office
Camp Dresser and McKee

Sunday, January 15, 2012

Dear Mr. Anybody:

Based on professional credentials for which CDM Smith hired you, and the training that you have already received, I designate you as a “Qualified Person” for work near and with electrical devices up to _____ volts and _____ kilovolt \times amperes. This designation is, of course, subject to the following requirements:

- You must follow the procedures outlined in CDM Smith’s electrical safety program, which is described in Section 16-4 of CDM Smith’s Health and Safety Manual.
- You must maintain training on electrical safety as described in that program

If the boxes below are checked, you must complete the training shown before this letter becomes effective.

_____ CDM Smith University course HS #106i

_____ CDM Smith University course THS #191

Salvatore Safety
Senior Vice President
Consulting and Engineering Division
Camp Dresser and McKee

CDM Smith Permit for Work on Energized Circuits

Date work to commence: _____ Date work complete: _____

Equipment description: _____

Work Description: _____

Can this equipment be shut down? Yes No

If "No", why not? _____

Does this equipment have a disconnect? Yes No

Is a utility shutdown required? Yes No

Safe Work Practices:			
Results of Shock Hazard Analysis:			
Shock Protection Boundary: All points within ___ feet ___ inches of an exposed live part.			
Results of Flash Hazard Analysis:			
Flash Protection Boundary: All points within ___ feet ___ inches of an exposed live part.			
Names of individuals who will perform work:			
1.		2.	
3.		4.	
Name of individuals who will be present with a valid First Aid/CPR card:			
1.		2.	
Emergency procedures: <u>Leave the area quickly. Contact authorities.</u>			
Task Supervisor (name and phone #):			
Safety equipment that will be required: _____			
(Attach a sketch of the layout and setup if necessary.)			
Submitted By:			Qualified Person
Approved By:			CDM Smith Site Safety Representative
Approved By:			Client Representative (if required)

System Voltage (volts, phase-to- phase)	Upstream Protection Fault-Clearing Time (sec)	Maximum 3-Phase Bolted- Fault Current for Use of HRC 2 PPE (8 CAL/CM ²)	Maximum 3-Phase Bolted- Fault Current for Use of HRC 4 PPE (40 CAL/CM ²)
690	0.05	39 kA	180 kA
	0.10	20 kA	93 kA
	0.20	10 kA	48 kA
	0.33	Not Recommended	29 kA
	0.50	Not Recommended	20 kA
600	0.05	48 kA	200 kA*
	0.10	24 kA	122 kA
	0.20	12 kA	60 kA
	0.33	Not Recommended	36 kA
	0.50	Not Recommended	24 kA
480	0.05	68 kA	200 kA*
	0.10	32 kA	183 kA
	0.20	15 kA	86 kA
	0.33	8 kA	50 kA
	0.50	Not Recommended	32 kA
400	0.05	87 kA	200 kA*
	0.10	39 kA	200 kA*
	0.20	18 kA	113 kA
	0.33	10 kA	64 kA
	0.50	Not Recommended	39 kA
208	0.05	200 kA*	Not Applicable
	0.10	104 kA	200 kA*

16.5 Lockout/Tagout

Although CDM Smith employees normally oversee, rather than do, construction and maintenance work, they sometimes must examine, enter, or service mechanical equipment. In many cases, CDM Smith employees must work in or around energy sources that are owned and operated by clients or a third party. **Any locks or tags CDM Smith places on equipment owned and operated by an organization other than CDM Smith must be coordinated with the owner/operator of the equipment.**

These guidelines cover inspecting, servicing, and maintaining equipment where unexpected energization or startup of the equipment has the potential to harm employees. These guidelines are intended to prevent accidents and injuries caused by the accidental release of energy.

16.5.1 Definitions

Lockout - The process of preventing the release of material or energy (mechanical, kinetic, potential, electrical, or chemical) from a power source using physical means, such as a lock to maintain an energy isolation device in the safe position, and prevent the inadvertent energization of machinery, equipment, or a system. Lockout usually involves installing a lock at a power (or flow) source so that equipment supplied by that source cannot be operated. Locks may be obtained from the equipment centers. The lockout locks are provided only for lockout purposes and should not be used to lock toolboxes, storage sheds, or other devices.

Tagout - Accomplished by placing a tag on the power source. The tag acts as a warning not to restore energy. It is not a physical restraint. Tags must clearly state **Do Not Operate** or the like. Identifying information must be applied by hand. CDM Smith uses tagout as a complement to lockout, **not** as a substitute.

Authorized Employees - Those who physically lock or tagout equipment for servicing or maintenance. Note that these individuals are not necessarily the people who normally operate the equipment. In some cases, the authorized employee may be a representative of a client or third party operator.

Affected Employees - Those whose job requires them to operate equipment subject to lockout or tagout, or those employees who work in areas where lockout or tagout is used.

16.5.2 What Must Be Locked or Tagged Out?

Employees should implement these guidelines when they are potentially exposed to hazards such as unguarded moving parts, live electrical systems, or flow of material from open pipes, valves, or other systems. This program applies to nonroutine activities. This includes inspections, repair and replacement work, renovation work, and modifications or other adjustments to equipment that may affect CDM Smith employees. For routine activities, mechanical guarding and electrical insulation are the preferred protection.

Some types of energy that lockout/tagout must be used to control include:

Electrical	Mechanical	Pneumatic
Fluids and gases	Hydraulic	Thermal
Gravity		

16.5.3 Client-Performed Lockout

In most cases, lockouts or tagouts should follow the procedures of the owner and operator because they are more likely to understand any special conditions that apply to their facility and its equipment. CDM Smith should request that the operator either perform or oversee lockouts and tagouts for those work activities that require the lockout or tagout of equipment to protect CDM Smith employees or subcontractors. CDM Smith should request that its employees be allowed to place personal locks on systems under the client's procedures. CDM Smith may rely on lockouts performed by client operators provided:

- The lockout follows an established procedure, as opposed to an improvised one. CDM Smith should ask for and review the procedure before performing the work.
- The CDM Smith employees observe the lockout and believe that it controls all harmful energies

The procedure below describes a procedure that CDM Smith personnel should follow when they are responsible for the lockout.

16.5.4 Lockout/Tagout Procedure

When CDM Smith employees perform a service that requires lockout or tagout, they must coordinate all activities with the operator of the facility. The following actions should be performed to execute a lockout or tagout:

- Shut down the equipment
- Isolate equipment
- Apply lockout devices or warning tags
- Release stored energy to achieve a "zero energy state"

Shut the Equipment Down and Isolate It - First, locate all energy sources that power the piece of equipment you will work on. Always look for hidden energy sources. Many machines have more than one power source, so you must study the machines and power sources involved. Notify any affected employees before you start a lockout procedure, then shut off each power and material feed to the equipment.

Every power source has its own procedure for shutoff. Shutoff may be accomplished by pulling a plug, opening a disconnect switch, removing a fuse, closing a valve, bleeding the line, or placing a block in the equipment. Generally, follow this sequence of events:

- Shut down the machine by following the normal method for shutdown.

- Turn off the energy at the main power source.
- Turn the machine switch back on to confirm that the power source has been deactivated.
- Attempt to restart the machine to guarantee that the power is shut off, then return the switch to the off position.

Apply Lockout Devices - Make absolutely sure the power cannot be supplied unless you know about it. If several people will work on a piece of equipment, each must apply his/her own lock. Use a **multiple lockout** device that can accommodate several locks at once. All personal locks shall be accompanied by a tag that identifies the employee(s), is signed and dated by the employee(s) and specifies the work activity being performed. This prevents any accidental startups while another employee may still be working on the machinery.

When all energy sources are locked, inform others of the lockout situation. One way to do this is by applying a tag to the power source. **Note:** Never use another employee's lock and never lend your lock to another employee.

Safe Release of Stored Energy - Equipment must be at "zero energy state" before servicing or maintenance work can begin. To achieve a zero energy state, release energy by draining valves, releasing springs, bleeding air or hydraulic pressure, or supporting elevated weights. When you are finished, test the machine to ensure that all energy was disconnected or released.

Putting the Power Back On - After servicing is finished, make sure all tools and personnel are removed from the area and replace all machine guards. Only then can you remove your tag and lock and reconnect all sources of energy. You may then restart the equipment in accordance with normal startup procedures.

16.5.5 Training and Inspections

Training - All affected CDM Smith employees must be trained in the purpose and use of lockout and tagout before the effort begins. All authorized CDM Smith employees will be trained in recognition of hazardous energy sources, hazardous energy sources in use, and how to follow the lockout/tagout procedure. CDM Smith will conduct retraining when an audit shows deficiencies with the procedures or at the request of a division or resource manager.

Inspections - When these procedures are applied to a single site for more than a month, an inspection must be done by an authorized employee. This inspection should include questions to determine if employees understand the purpose of lockout/tagout, if proper locks and tags are being used, and if established procedures are being followed. Each inspection should be documented with a Lockout/Tagout Inspection Form found in Exhibit 16-A of this section.

16.5.6 Special Conditions

Other Contractors - Contractors and facility operators should inform each other of their lockout/tagout procedures in enough detail for their employees to recognize the function of locks or tags that they may observe during their work. If CDM Smith finds locks or tags on equipment that is related to neither CDM Smith nor client work, the project manager or site supervisor should notify the client. Work should not proceed until the need, function, and ownership of all locks or tags are clarified. Under no circumstance may CDM Smith employees or subcontractors remove locks or tags not placed by CDM Smith or its subcontractors.

Shift and Personnel Changes - The employees ending their shift should remove their locks before leaving. However, they may only remove their lock if it is safe to operate the equipment or another lock is put in place that is under the control of someone on the next shift. When a piece of equipment will remain unsafe until the employee next returns, that lock may remain in place.

Power Sources that Cannot be Locked Out - When a power source cannot be physically locked out, a tagout may be used without locks.

Plug-Supplied Equipment - Any CDM Smith employee who works on an appliance or device that obtains its power through a flexible cord must apply a plug lockout device to its attachment plug or keep the plug in his or her control throughout that effort.

Exhibit 16-A Lockout/Tagout Inspection Form

Project Name: _____ **Project Number:** _____

1. Inspection Conducted by: _____ on _____
2. Machines/Equipment/Operation Inspected: _____

3. Names of Employees Observed: _____

4. Deficiencies Noted: _____

5. Corrective Action Taken: _____

- | | YES | NO |
|--|------------|-----------|
| 6. Have employees (contractors) been trained/instructed in our lockout procedure? | _____ | _____ |
| 7. Are the lock and/or tag devices authorized by the company procedure? | _____ | _____ |
| 8. Are all effected employees (contractors) notified that a lockout is required and the reason for it? | _____ | _____ |
| 9. Is equipment being shut down by required shutdown procedure? | _____ | _____ |
| 10. Are the switches, valves, or other energy isolating devices disconnected or isolated from the equipment? | _____ | _____ |
| 11. Are the energy isolating devices located out/tagged out by an authorized employee's individual lock/tag? | _____ | _____ |
| 12. Are the push buttons or other normal operating controls checked to see if the energy sources are disconnected and that the equipment cannot operate? | _____ | _____ |
| 13. Upon completion, are equipment areas checked to see that no personnel are in the area and all locks/tags are removed? | _____ | _____ |
| 14. If more than one individual is required to lockout equipment, does each person place his/her own personal lock/tag on the energy isolating device(s)?
or Are all steps of group lockout/tagout procedures observed? | _____ | _____ |
| 15. If an employee or contractor is not available to clear his/her lock/tag, does the supervisor remove the lock/tag after taking all the precautions listed in the lockout/tagout program? | _____ | _____ |

16.6 Compressed Gas Cylinders

CDM Smith employees may occasionally be required to work in industrial, laboratory, or construction work environments where compressed gases are stored or used. In some circumstances, employees may be required to use or handle cylinders directly. Employees that perform work involving compressed gas cylinders should be familiar with their hazards and safe practices.

16.6.1 Identification and Labeling

- All gas cylinders should be clearly labeled with their contents and manufacturer.
 - B Do not accept a compressed gas cylinder for use that does not legibly identify its contents by name.
 - B Never rely on the color of the cylinder for identification.
- Gas lines leading from a remote compressed gas supply should be labeled to identify the gas, the laboratory or area served, and the relevant emergency telephone numbers.
- Signs should be posted in areas where flammable compressed gases are stored, identifying the substances and appropriate precautions (e.g., HYDROGEN - FLAMMABLE GAS - NO SMOKING - NO OPEN FLAMES).

16.6.2 Engineering Controls / Design Considerations

- Keep hazardous gas cylinders in gas cylinder cabinets or racks, with the exception of cylinders containing a nontoxic flammable gas and cylinders used in fume hood applications. Those must be firmly braced to prevent falling.
- Place a smoke detector adjacent to flammable gas cylinders, connected if possible to the building alarm system. If possible, interlock smoke detector activation with the shutdown of hazardous gas flow.
- Connect all ducts used to exhaust hazardous compressed gas cylinders or gas-carrying components to a source of exhaust ventilation.
- Place a safety shower or eyewash with a shower wand in areas where corrosive gases are used or stored.
- Make sure that all gas piping is compatible with the gases used and capable of withstanding full cylinder pressure.
- Never lubricate, modify, force, or tamper with a cylinder valve. Use the appropriate regulator on each gas cylinder.
- Use check valves when there is the possibility of backflow into the cylinder.

16.6.3 Using Cylinders

- Always use safety glasses with side shields when handling and using compressed gases, especially when connecting and disconnecting compressed gas regulators and lines.
- Never use a cylinder that cannot be identified positively.
- Never use a cylinder of compressed gas without a pressure-reducing regulator attached to the cylinder valve.
- Use regulators and pressure gauges only with gases and pressure ratings for which they are designed and intended.
- Do not use oil or grease as a lubricant on valves or attachments to oxygen cylinders.
- Never use oxygen as a substitute for compressed air.
- Test cylinders with toxic, corrosive, and pyrophoric gases for possible leaks when receiving, installing, disconnecting, or shipping. Always close the cylinder valve before attempting to stop leaks between the cylinder and regulator.
- Damaged or leaking cylinders should be removed from service and tagged as "DAMAGED or DEFECTIVE."

16.6.4 Storing Cylinders

- Keep cylinders in storage upright, secure, and locked into a compact group.
- Cylinders containing the same gas shall be stored in a segregated group; empty cylinders shall be stored in the same manner.
- Properly secure cylinders with chain, rope, or brackets to prevent falling. Valve protection caps must be fully screwed on unless the container is in active service.
- Protect cylinders stored outside from standing water by providing proper drainage. Where outdoor storage is necessary, an overhead cover is required to avoid rain damage and overheating in sunlight.
- For short-term experiments using hazardous gases, select the smallest cylinder available.
- Return corrosive gas cylinders to the gas supplier within 1 year to avoid regulator and cylinder valve problems due to corrosion.
- Some small cylinders, such as lecture bottles and cylinders of highly toxic gases, are not fitted with rupture devices and may explode if exposed to high temperatures. Use and store these with great care.
- Never place cylinders where they may become part of an electric circuit.

- Avoid areas that are damp or subject to other corrosive materials.
- Do not store flammables, toxic gases, and oxidizers adjacent to each other. Store cylinders in well ventilated locations.
- Areas containing hazardous gas in storage must be appropriately placarded.
- Cylinders in storage must be separated from flammable or combustible liquids and from easily ignitable materials (such as wood, paper, packaging materials, oil, and grease) by at least 40 feet (12 meters) or by fire-resistant partition having at least a 1-hour rating.
- Maintain at least a 20-foot separation between fuel and oxygen cylinders, or install a firewall a minimum of 5 feet high with a 30-minute fire rating.
- Empty cylinders must be closed and the valve cap secured. They must be clearly tagged or marked as MT or EMPTY.

16.6.5 Transporting Cylinders

- Never transport a cylinder with a regulator attached.
- Cylinders larger than lecture-bottle size should be chained or strapped to a wheeled cart during transport to ensure stability.
- Only trained personnel using approved trucks may transport cylinders.
- To protect the valve during transportation, the cover cap should be screwed on hand tight and remain on until the cylinder is in place and ready for use.
- Handle only one cylinder at a time.
- Secure cylinders in a basket or similar device when moving them using a crane or derrick. Do not use slings, ropes, or electromagnets for lifting cylinders. Do not allow cylinders to strike each other.

16.6.6 Piping Incompatibilities and Restrictions

- Do not use copper piping for acetylene.
- Do not use plastic piping in any portion of a high-pressure system.
- Do not use cast iron pipe for chlorine.
- Do not conceal distribution lines where a high concentration of a leaking hazardous gas can build up and cause an accident.
- Distribution lines and their outlets must be clearly labeled as to the type of gas contained.

- Piping systems should be inspected for leaks on a regular basis, preferably weekly. Special attention should be given to fittings.

16.6.7 Emergency Procedures

- Do not remove leaking cylinders from their ventilated enclosures until the leakage has stopped.
- Trip the remote emergency gas shutoff valve/button, if present.
- Close the main cylinder valve to stop or slow the leak. The hazardous gases should be contained in their enclosure until it is clearly safe to approach.
- Do not extinguish a flame involving a combustible gas until the source of gas has been shut off.

16.6.8 Training

Employees that handle or use compressed gases need the following training:

- Safe handling practices for hazardous substances contained in gas cylinders: corrosive, explosive, toxic, etc.
- Identification and signs
- Storage and transportation requirements
- Emergency procedures

16.7 Fall Protection

CDM Smith employees who visit active construction sites may be exposed to falls. A fall exposure is considered to exist when an employee is within 6 lateral feet of a change in elevation of 6 vertical feet or more. Typical exposures can include:

- Excavations
- Roofs
- Leading edge of a surface (floor)
- Floor openings

All employees should use fall protection 100 percent of the time when exposed to a fall in excess of 6 feet or when required by rules such as those of a client or the owner or operator of a facility. Fall protection may consist of any of the following:

- Guardrails
- Safety nets
- Positioning systems
- Warning systems
- Personal fall arrest systems

Employees should not use fall arrest equipment until they have been properly trained. Fall protection training can be arranged by contacting your division HSM. Project managers and site managers shall ensure fall protection is available and used as required for all employees for whom they are responsible and that employees receive adequate training in the use of the equipment.

The following work practices and guidelines should be considered for protection against falls:

- Before working or walking on a surface, consider the strength and structural integrity of the surface. Can it support employees and any needed equipment or material safely? Employees shall work on those surfaces only when the surfaces have the requisite strength and structural integrity.
- When not protected by any other means of fall protection, such as safety nets or scaffold with proper guardrails, employees shall use full body harnesses, lanyards with double-locking snap hooks, and an adequate anchorage (fall arrest equipment). To achieve 100 percent fall protection, employees may need to use a two-lanyard system and/or vertical or horizontal lifelines, retractable lifelines, or other approved positioning devices.
- Employees shall rig fall arrest equipment so that it minimizes the potential for a fall arrest event or any potential free-fall, lateral swing, or contact with any lower object. Under no circumstances shall fall arrest equipment be rigged so that an employee can free-fall more than 6 feet.

- Anchorage points for fall arrest equipment shall be capable of supporting 5,000 pounds per employee attached. Anchorage points for fall arrest equipment shall be located above the employee's body harness attachment point where practical.
- When vertical lifelines are used, a separate lifeline shall protect each employee. The lifeline shall be properly weighted at the bottom and terminated to preclude a device such as a rope grab from falling off the line.
- Horizontal lifelines should be limited to two persons at one time between supports and maintain a safety factor (strength/requirement) of at least 2.
- Before each use, employees shall visually inspect all fall arrest equipment for cuts, cracks, tears or abrasions, undue stretching, overall deterioration, mildew, operational defects, heat damage, or acid or other corrosion. Equipment showing any defect shall be withdrawn from service. All fall arrest equipment subjected to impacts caused by a free-fall or by testing shall be removed from service. CDM Smith personnel shall use full body harnesses for personal fall protection. Fall protection equipment is available from the field equipment centers.
- Fall arrest equipment should be stored in a cool dry place not subjected to direct sunlight.
- Fall arrest equipment shall not be used for any other purpose, such as towropes or hoist lines.
- Proper guardrails shall be installed on open sides of all walkways and runways where the fall distance exceeds 4 feet. Proper guardrails shall be installed on open sided floors where the fall distance exceeds 6 feet. All floor openings or floor holes shall be protected by guardrails or hole covers. If hole covers are used, they shall be strong enough to support the maximum intended load, secured against displacement, and properly labeled.
- When guardrails are used for fall protection, they shall consist of a top rail, intermediate rail, and toeboard. The top rail shall have a vertical height of 42 inches, the midrail shall be at 21 inches, and the toeboard 4 inches. When wood railings are used, the post shall be of at least 2-inch by 4-inch stock spaced not to exceed 8 feet, the top rail shall be of at least 2-inch by 4-inch stock, and the intermediate rail shall be of at least 1-inch by 6-inch stock. If pipe is used, it shall be at least 1½-inch nominal diameter. If structural steel is used, it shall be of 2-inch by 2-inch by 3/8-inch angles or equivalent. If wire rope is used for railings, it shall have a diameter of at least 2 inches and shall be stretched taut to allow no more than a 3-inch deflection.
- When operating a scissor-lift work platform, the lift shall have guardrails on all open sides, with the door access chains or rails in place.
- Employees operating aerial lifts shall wear a body harness and lanyard attached to the aerial lift. Employees shall not attach the lanyard to an independent structure.

- Employees riding in a crane-suspended work platform shall wear a body harness and lanyard attached to the grab rail of the platform.
- Employees working on or near wall forms or rebar shall wear a body harness lanyard and/or positioning device when exposed to a fall in excess of 6 feet.
- Positioning devices shall be rigged to prevent a free-fall greater than 24 inches.
- Stairs, ladders, or ramps shall be provided for all access ways where there is a change in elevation greater than 19 inches.
- Manila or synthetic rope shall not be used as guardrails.
- Employees shall not stand or sit on guardrails.
- Personal fall arrest systems shall not be attached to guardrail systems.
- If warning lines are used, they should consist of rope, wire, or chain and be flagged at intervals of 6 feet or less with high-visibility material. The lowest point should be no less and 34 inches from the surface, and the highest point should be no more than 39 inches. The warning line should be placed at least 6 feet from the edge.
- Safety net systems should be installed as close to the working surface as practical, but in no case more than 25 feet below the working surface and should extend outward at least 8 to 13 feet depending on the vertical fall distance. Safety nets should be drop-tested after initial installation and at 6-month intervals. The maximum size of net mesh should not exceed 36 square inches nor be longer than 6 inches on any side. Mesh opening should be secure to prevent enlargement.
- Body belts should not be used for personal fall arrest. Full body harnesses are required.

16.8 Excavations

CDM Smith employees who work in or around excavations are exposed to many of the same excavation hazards as construction personnel. CDM Smith employees should learn to recognize these hazards and avoid situations that put themselves, other employees, and subcontractors at risk. Employees should be aware of the following safe excavation work practices.

16.8.1 Pre-Excavation Activities

- Before excavation, the location of any underground utilities such as gas, sewer, electricity, and telephone lines should be determined and marked. In public areas, this can be done using the state's one-call system for utility location. On private property, government facilities, etc., the owner must be asked to locate underground utilities. In some cases, it may be necessary to use nonintrusive subsurface investigation techniques to identify underground utilities and installations.
- Excavations should be conducted under the direction of a "competent person." OSHA defines "competent person" as an individual who, by way of training and/or experience, is knowledgeable of applicable standards, is capable of identifying workplace hazards relating to the specific operation, is designated by the employer, and has authority to take appropriate actions. For excavations, the competent person should be on site and is responsible for ensuring the following:
 - B Performing inspections before the start of each shift and as needed throughout the shift to ensure a safe operation
 - B Removing employees from the hazardous area when there is evidence of a possible cave-in
 - B Identifying and correcting hazards associated with the excavation
- Sometimes the excavation is under control of CDM Smith, and CDM Smith should provide the competent person. Often the excavation is under the control of a contractor, and that contractor should provide the competent person.
- For many excavations an excavation permit must be completed before excavating. The permit is usually generated by the owner/operator of a facility or sometimes a prime contractor. The permit should be completed by the competent person for that excavation.
- Surface encumbrances (buildings, utility poles, pavement, or other structures that may be undermined by the excavation) that have a potential to create a hazard to employees or become subject to physical damage must be removed, supported, or neutralized, as necessary, before the start of any excavation work.
- The competent person must evaluate soil conditions and determine the shoring or sloping requirements for the trench or excavation, based on the soil evaluation. If no attempt is made to determine soil type, excavations shall be sloped at an angle not steeper than 1.5 (horizontal) to 1 (vertical) (34 degrees), or a trench box or other

protective system shall be used. For excavations greater than 20 feet (6 meters) in depth, sloping and/or shoring systems must be designed by a professional engineer.

16.8.2 During Excavation

- The competent person must inspect the trench or excavation daily before performing any work within the trench or excavation deeper than 5 feet.
- For trenches less than 5 feet deep, the competent person must inspect and evaluate the potential for a cave-in.
- All excavations that are 4 feet deep or deeper shall have a ladder for access into the excavation with no more than 25 feet of lateral travel in any direction.
- All excavations that are 5 feet deep or deeper and excavations shallower than 5 feet in unstable soil shall be sloped, braced, or shored to prevent cave-ins.
- No material, including trench spoil, may be stored within 2 feet of the edge of the excavation.
- All excavations shall be barricaded with the appropriate barrier tape and other protective devices to protect against falls or other inadvertent entry.
- If possible, excavations should not be left open. If an excavation must be kept open, proper covers, fencing, and security should be provided to prevent public access to the excavation during nonworking hours.
- Tools, equipment, or heavy machinery should not be placed near an excavation where they may affect the structural stability of the walls or fall into the excavation.
- When mobile equipment is operated adjacent to an excavation, or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs should be used. Where possible, the grade should slope away from the excavation.
- An emergency lighting system should be in place in the event of an electrical failure. This may consist of battery-operated flashlights.
- If employees or small equipment must cross over the excavation, provide walkways or bridges with a minimum clear width of 20 inches, equipped with standard rails, and extending a minimum of 24 inches past each surface edge of the trench.
- For excavation work adjacent to natural waterways, avoid polluting of the water by placing spoil piles away from the water and preventing any accumulation of spoils on slopes.

- Place any environmentally impacted soils on plastic liners and cover the spoil piles to prevent further spreading of the contamination. The liners and covers should be durable enough for the intended period of storage.
- For excavations that may contain a hazardous atmosphere, air monitoring should be conducted before entry and periodically during the work to ensure that a safe atmosphere is maintained during excavation work. Air monitoring shall be performed for explosive/flammable vapors, oxygen, and any hazardous gases that may be present such as hydrogen sulfide, carbon monoxide, or other hazardous gases that may be present as a result of activities conducted in the excavation or contaminants in the soil. Use forced ventilation if needed. Acceptable entry conditions are:

B Oxygen content	20.5 percent to 23.5 percent
B Flammable atmosphere	<10 percent of the lower explosive limit (LEL)
B Hydrogen sulfide	<10 ppm
B Carbon monoxide	<25 ppm
B Toxic vapor/gases	< one half compound exposure limit

Note: If air monitoring results indicate levels outside of the conditions above, CDM Smith employees and subcontractors should not enter the excavation and contact the safety coordinator or HSM for guidance.

- Heavy equipment, tools, or individuals shall not operate/work within 10 feet of any power line or exposed electrical distribution component unless it has been de-energized and visibly grounded or provided with an effective insulating barrier.
- Workers should wear PPE including a hard hat, safety glasses, and safety boots.
- Water accumulation is not permitted in any excavation that will be occupied. Remove standing water using pumps and continuously monitor the water level and pump operation.
- The competent person must evaluate soil conditions and stability as new soil layers are uncovered.
- Do not stand under any live load, including an excavator bucket.
- Stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.
- Do not stand in the swing radius of excavation equipment.

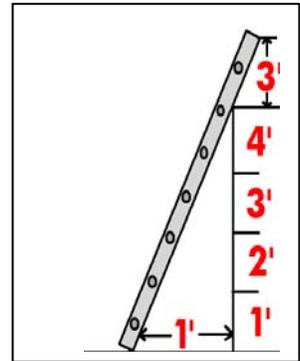
16.9 Ladders

The following guidelines should be followed by CDM Smith employees when using ladders.

16.9.1 Portable Ladders

- Ladders should be used to travel from one elevation to another. Except where it is not feasible, work should not be performed from ladders. When it is necessary to perform work at high elevation, scaffolds or mobile lift equipment should be used.
- If it is necessary to work from a ladder:
 - The ladder must be secured to prevent it from slipping or falling.
 - When possible, employees working more than 6 feet above grade should wear a body harness and lanyard and tie off to a secure anchor, (**not the ladder!**) or have another employee hold the ladder.
- Before using any ladder it should be inspected. Look for:
 - Missing non-skid feet.
 - Worn or frayed ropes.
 - Cracks in sides or rungs.
 - Missing rivets or other fasteners.
 - Bent or missing spreaders.
 - Bowed or distorted members.
 - Loose rungs.
 - Any condition that could cause a safety problem.
 - Ladders that have fallen or been misused should be checked for excessive dents or damage.
 - Ensure that tie-off rope is attached and in good condition.
 - Ensure that the spreaders and locking mechanisms on stepladders are in good condition.
 - Ensure that hinges move easily and are in good condition.
- Ladders should not be painted. Paint can hide damage and defects.
- Select the correct type of ladder for the job. Only fiberglass ladders should be used at electricity-generating facilities. Only nonconductive ladders should be used for work involving electricity or the use of electrically powered tools. Make sure the ladder is long enough to reach the desired point without compromising recommended safe-use procedures.
- Secure ladders by tying the top or bottom to a fixed structure that will support more than the anticipated total load. Maintain an adequate slope with the base at least one quarter of the length of the ladder away from the supporting structure.

- The ladder should extend 3 feet above any landing you will access.
- Do not leave unattended step or straight ladders standing. They should be closed, lowered to the ground, and placed where they do not present tripping hazards.
- Keep the area around the base and top of the ladder free of tripping hazards, and barricade the area if the base or top projects into a passageway.



- When either the length or the weight of a ladder makes it difficult to handle, two people should raise and secure the ladder. One should secure the feet while the other walks under the ladder from the opposite end until it is raised enough to place or move. Raise the extension, if needed. Reverse the process for lowering the ladder.
- Extension ladders must be equipped with necessary irons, locks, and hooks and assembled so the sliding (upper) section is on top of the base (lower) section. In addition, extension ladder sections should overlap at least 3 feet. If the ladder extends more than 4 feet above the top tie-off, place a barrier or flag on the ladder to prevent personnel from climbing beyond a safe point.
- Ensure that shoes/boots are free of mud, oil, or grease before ascending or descending a ladder. Ladder rungs must be cleaned immediately if they become soiled to reduce slipping hazards.
- Employees should use a tool pouch or bucket-and-line to raise or lower materials, rather than carrying them while ascending or descending a ladder.
- Only one employee may climb or descend a ladder at a time.
- When climbing or descending a ladder, face the ladder and maintain three points of contact at all times. (i.e., two feet and one hand, two hands and one foot.)
- Straight ladders should not be climbed beyond the third step from the top.
- Excavations and trenches more than 4 feet deep should have a ladder (or ladders) that extends at least 3 feet above the ground surface placed so that personnel will not travel more than 25 feet horizontally to get to a ladder.
- When storing ladders, take the following precautions:
 - Ladders stored horizontally should have support in a sufficient number of places to prevent sagging and permanent set.
 - Tie together or secure ladders that are stored vertically to keep them from falling into aisles or equipment.

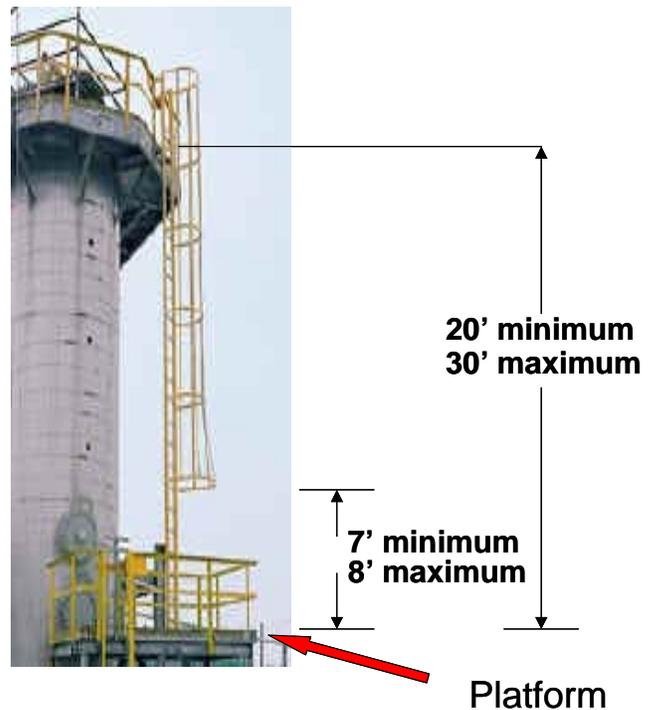
- Do not store wooden ladders near radiators, stoves, or other heat sources that could dry the wood and cause deterioration.
- Do not store wooden ladders near steam lines or other places where they are kept wet or damp enough to rot wood.
- Clean ladders after every use before returning them to storage. Remove all mud, oil, and grease.

16.9.2 Stepladders

- Stepladder legs should be fully spread with the spreader bars locked in place.
- Stepladders should not be used as straight ladders.
- The top two steps should not be used.
- Do not leave tools or materials on the top shelf of a stepladder, remove them before descending a ladder and/or moving it.

16.9.3 Fixed Ladders

- Fixed ladders more than 20 feet high must be caged unless other fall prevention safety devices are installed and used. Fixed ladders with cages exceeding 20 feet in height shall have landing platforms installed every 30 feet. Use of the body harness and lanyard described in Section 16.9.1 would meet this requirement.
- Fixed ladders should be securely attached to an immobile structure and attachments should be inspected annually for signs of deterioration or detachment. Repairs must be made immediately.



16.10 Scaffolds

The following guidelines should be followed when working from scaffolds:

- All scaffolds should be checked before use to ensure it is of sufficient strength and rigidity to safely support the weight of persons and material to which it will be subjected. Scaffolds should be designed and erected to be able to support its own weight and at least 4 times the maximum intended load applied or transmitted to it.
- Questions regarding the capability of a particular scaffold should be addressed to the competent person responsible for the scaffold. Check to see if a scaffold tagging system is in use at the site.
- Scaffolds over 6 feet in height require a standard guardrail. If a standard guardrail is not feasible, employees should use another form of fall protection such as a personal fall arrest system (harness).
- Scaffold planks should be secured in place and extend the end supports by at least 6 inches and (unless they are cleated) no more than 12 inches.
- Scaffold platforms and ramps should be at least 18 inches wide.
- Wooden scaffold planks should be marked for use as scaffold planking and should not be painted (see below).



Grade stamp courtesy of Southern Pine Inspection Bureau



Grade stamp courtesy of West Coast Lumber Inspection Bureau

- Footing and anchorage points for scaffolds should be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. Unstable objects such as barrels, boxes, loose brick, or concrete blocks should not be used to support scaffolds or planks.
- Screw jacks should not extend more than 12 inches.
- Scaffolds should be erected level, plumb, and braced to prevent swaying and displacement.
- Ropes should not be used as guardrails.

- Do not stand on any object to increase reach when on a scaffold, including ladders, step stools, etc.
- The installer of the scaffold should survey and clear the scaffold site of debris that would endanger secure footing for the scaffold or cause a rolling scaffold to tip over.
- Use ladders for access to scaffold platforms. Scaffold rails or braces may only be used if specifically designed by the manufacturer as an access ladder.
- Scaffolds that are 3 times higher than the smallest base dimension must be secured to the building or other solid structure at the second lift and every other lift thereafter.
- Rolling scaffolds may be used only on smooth, level surfaces unless the wheels are contained in wooden or channel-iron runners that are level and stabilized. The following precautions must be observed when working on mobile scaffolds:
 - Check overhead clearances before moving scaffolds. Maintain safe clearance from electrical lines.
 - Remove or secure tools and materials on the deck before moving a rolling scaffold. Do not ride a rolling scaffold while it is being moved.
 - Apply the force as close to the base as practical to move a rolling scaffold.
 - All wheels and casters on rolling scaffolds must have a positive locking device, securely fastened to the scaffold, to prevent accidental movement.
 - Casters or wheels must be locked when the scaffold is in use.

16.11 Mechanized Personnel Lifts

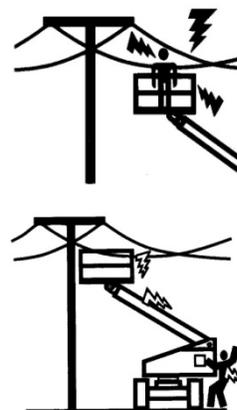
CDM Smith personnel work periodically from mechanized lift equipment. The following information is summarized from the JLG Industries, Inc. web site at: <http://www.jlg.com/> and provides recommended work practices to be implemented when working from mechanized personnel lifts. Instructions for CDM Smith employees who will ride a lift operated by another organization appear at the end of the section.

16.11.1 Pre-Operation

- Only trained, authorized, and qualified personnel may operate lift equipment. They should demonstrate an understanding of safe and proper operation and maintenance of the unit.
- Precautions to avoid all known hazards in the work area must be taken by operators and their supervisor before starting the work.
- Perform a prestart inspection and function check before placing the machine into operation.

16.11.2 Power lines

- Maintain safe clearance from electrical lines and apparatus. The machine does not provide protection from contact with or proximity to an electrically charged conductor.
- Maintain a clearance of at least 10 feet between any part of the machine or its load and any electrical line or apparatus carrying up to 50,000 volts. One foot of additional clearance is required for every additional 30,000 volts.
- Allow for boom sway, rock, or sag and electrical line swaying in estimating these distances.



16.11.3 Wind and Temperature

- Do not add notice boards or similar items to the platform. The addition of such items increases the exposed wind area of the machine.
- Do not operate machine when wind conditions exceed 30 miles per hour (mph).
- Some mechanized lifts can only be operated in nominal ambient temperatures of 0°F to 104°F. Consult the manufacturer to optimize operation outside this range.

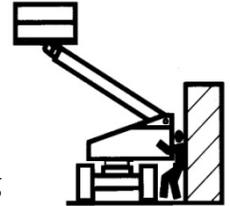
16.11.4 Signs and Warning Labels

- Read and obey all dangers, warnings, cautions, and operating instructions on machine and in the operators and safety manual.
- Be familiar with location and operation of ground station controls.

- Do not operate any machine on which danger, warning, caution, or instruction placards or decals are missing or illegible.

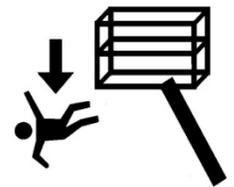
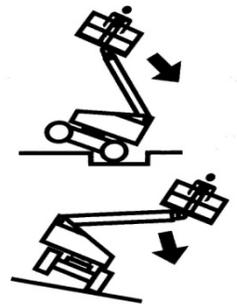
16.11.5 Driving and Crushing Hazards

- Watch for obstructions around machine and overhead when driving.
- Always position boom over rear (drive) axle in line with direction of travel. Remember, if boom is over front (steer) axle, direction of steer and drive movement will be opposite from normal operation.
- Do not use high-speed drive when in restricted or close quarters, or when driving in reverse.
- Keep nonoperating personnel at least 6 feet away from machine during driving operations.
- Check travel path for persons, holes, bumps, drop-offs, obstructions, debris, and coverings that may conceal holes and other hazards.



16.11.6 Operation

- Read and understand the manufacturer's operating manual.
- Operation with boom raised is restricted to a firm, level, and uniform surface. Ensure a firm, level, and uniform supporting surface before raising or extending boom.
- Never position ladders, steps, or similar items on unit to provide additional reach for any purpose.
- When riding in or working from platform, both feet must be firmly positioned on the floor.
- Personnel should wear a full-body harness and lanyard of a length that prevents a fall arrest event, (i.e., short enough so they are unable to fall over the railing).
- Check clearance above, on sides, and bottom of platform when raising, lowering, swinging, and telescoping boom.
- Never slam a control switch or lever through neutral to the opposite direction. Always return switch to neutral and stop, then move switch to the desired position. Operate levers with slow, even pressure.



16.11.7 Barricading, Crushing Hazard

- The operator is responsible for avoiding operation of the machine over ground personnel and warning them not to work, walk, or stand under a raised boom or platform. Position barricades or warning tape/cones.
- Ensure that operators of other overhead and floor machines are aware of the aerial platform's presence. Disconnect power to overhead cranes. Position barricades or warning tape/cones.
- Keep personnel away from pinch points. Position barricades or warning tape/cones.



16.11.8 Transfer to a Structure, Falling Hazard

- To avoid falling, use extreme caution when entering or leaving platform above ground. Enter or exit through gate only. Platform floor must be within 1 foot of adjacent safe and secure structure. Allow for platform vertical movement as weight is transferred to or from platform.
- Transfers between a structure and the aerial platform expose operators to fall hazards. This practice should be discouraged wherever possible. Where transfer must be accomplished to perform the job, two lanyards with an approved fall protection device will be used. One lanyard should be attached to the aerial platform. The other to the structure. The lanyard that is attached to the aerial platform should not be disconnected until such time as the transfer to the structure is complete. Otherwise, do not step outside of platform.

16.11.9 Machine Capacity and Tip Hazards

- Ensure that ground conditions are adequate to support maximum tire load indicated on the tire load decals located on the chassis adjacent to each wheel.
- Never exceed manufacturer's rated platform capacity - refer to capacity decal on machine. Distribute loads evenly on platform floor.
- Do not carry materials on platform railing.



16.11.10 Improper Use

- Do not remove, modify, or disable footswitch by blocking or any other means. Do not disable safety interlocks or limit switches.
- Never "WALK" the length of the boom to gain access to or leave platform.
- Do not use the lift, swing, or telescope functions for the boom to move either the machine or other objects.

- Never use boom for any purpose other than positioning the platform containing personnel, tools, and equipment.
- Do not use the boom as a crane. Structural damage or tipping may occur.
- Never operate a malfunctioning machine. If a malfunction occurs, shut down the machine, tag it as DO NOT USE, and notify your project manager or direct manager.
- Do not assist a stuck or disabled machine by pushing or pulling except by pulling at chassis tie-down lugs.

16.11.11 Towing and Hauling

- Do not tow a machine except in an emergency. See the applicable section in the applicable operators and safety manual for emergency towing procedures.
- Lock turntable before traveling long distances or before hauling machine on a truck or trailer.

16.11.12 Work on Lifts Operated by Others

When CDM Smith personnel board a lift operated by another organization (e.g., when we inspect work that that organization accomplished using the lift), the CDM Smith representative may either:

- Complete the training required by the operator and manufacturer and operate the lift in accordance with the previous sections
- Complete any training needed to act as a passenger and verify that the operator complies with the previous sections for the duration that the CDM Smith representative will be exposed to the hazards of the lift

16.12 Tools and Power Equipment

16.12.1 Hand Tools

CDM Smith employees who have a need to use basic hand tools should use the following work practices:

- All tools used on CDM Smith projects, regardless of ownership, shall be of an approved type and maintained in good condition. Tools are subject to inspection at any time. The project manager has the authority and responsibility to condemn unserviceable tools, regardless of ownership.
- Tag defective tools to prevent their use or removal from the job site.
- Use the proper tool for the job performed.
- Do not use hammers with metal handles, screwdrivers, knives with metal continuing through the handle, and metallic measuring tapes on or near energized electrical circuits or equipment.
- Do not throw tools from place to place or from person to person. Tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- Do not place tools unsecured on elevated places.
- Dress, repair, or replace all impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked before further use.
- Use suitable holders or tongs, not the hands, to hold chisels, drills, punches, ground rods, or pipes that are struck by another employee.
- Do not use shims to make a wrench fit.
- Do not use wrenches with sprung or damaged jaws.
- Do not use pipe or other means to extend a wrench handle for added leverage unless the wrench was designed for such use.
- Use tools only for the purposes for which they have been designed.
- Store and handle tools with sharp edges so that they will not cause injury or damage. They shall not be carried in pockets.
- Use eye protection when using or working around impact type tools (e.g., hammer, chisel, ax, hatchet, etc.).
- Replace wooden handles that are loose, cracked, or splintered. The handle shall not be taped, glued, or lashed with wire.

- Keep all cutting tools such as saws, wood chisels, knives, or axes in suitable guards or in special compartments.
- When using such tools as screwdrivers and wrenches, avoid using your wrists in a bent, flexed, extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral or straight position.
- Do not leave tools lying around where they may cause a person to trip or stumble.
- When working on or above open grating, use a canvas or other suitable covering to cover the grating to prevent tools or parts from dropping to a lower level where others are present, or barricade or guard the danger area.
- Do not depend on the insulation on hand tools to protect users from shock.

16.12.2 Electric Tools

CDM Smith employees who have a need to use electric power tools should use the following work practices:

- The non-current carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless the tool is an approved double-insulated type or the tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-volt DC system.
- All power tools shall be examined before use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and components shall be given a thorough examination for cracks, exposed wires, or other defects.
- Power tools shall be used only within their capability and shall be operated in accordance with the manufacturers' instructions.
- The use of eye protection is required when using or working around power tools.
- Operators should take care to use appropriate hand positions on cutting tools such as saws, drills, or grinders to avoid hand injury.
- All tools shall be kept in good repair and disconnected from the power source while repairs are being made.
- Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts until that hazard is firmly under control.
- GFCI should be used with all electric power tools.
- All guards and safety interlocks with which the tools were purchased shall be in place and in working order.

- Any tool that is identified as defective should be tagged “not for use,” and set aside for repair and/or discarded.
- Do not wear loose or frayed clothing while operating power tools and equipment. Hair should not stick out from hard hats.
- Do not use electrical cords to transport, suspend, hoist, or lower tools.
- Do not allow power cords to lie in water.
- Disconnect rotating tools from the power source before adjusting, servicing, or cleaning them. Follow the lockout procedure described in Section 16.5.
- Do not modify tools.

16.12.3 Pneumatic Tools

CDM Smith employees that use pneumatic power tools should use the following work practices:

- Compressed air and compressed air tools shall be used with caution.
- Pneumatic tools shall never be pointed at another person.
- Pneumatic hose connections should be secured by some positive means to prevent them from becoming accidentally disconnected. Chicago fittings have wire holes to allow such security.
- Pneumatic power tools shall be secured to the hose by some positive means to prevent the tool from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact tools to prevent attachments from being accidentally expelled.
- Compressed air shall not be used for cleaning purposes except when reduced to less than 30 psi and then only with effective chip guarding and PPE.
- Compressed air shall not be used to blow dust or dirt from clothing (or skin).
- The manufacturer’s safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All compressed air hoses exceeding 30 psi shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure or disengagement of a connection.

- Before making adjustments or changing air tools, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection. Disconnection at the quick-change connectors is one way to meet this goal.
- Eye protection is required when using or working around pneumatic tools.
- Use hearing protection if noise exposure is a concern (i.e., if it is too loud to conduct a normal conversation).
- Pneumatic tools shall be operated only by persons trained in their use.
- A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.
- Employees shall not use any part of their bodies to locate or attempt to stop an air leak.
- All guards and safety interlocks must be in place and functional.

16.12.4 Engine-Powered Tools

CDM Smith employees that use engine-powered tools should use the following work practices:

- Stop the engine and allow it to cool before refueling, servicing, or maintenance.
- Use care in refueling. Clean up any small spills of fuel or oil immediately.
- The use of eye protection is required when using or working around engine-powered tools.
- Use hearing protection if noise exposure is a concern (i.e., if it is too loud to conduct a normal conversation).
- If possible, disconnect the spark plug before performing an adjustment, maintenance, or service.
- Use tools in well ventilated areas to eliminate any accumulation of fumes.
- Do not use tools in a flammable or explosive atmosphere.
- Equip engines with spark-arresting mufflers.
- Avoid contact with hot engine components.
- All guards and safety interlocks should be in place and functional.

16.13 Heat Stress

CDM Smith employees may be exposed to hazards associated with hot work environments. Factors that contribute to heat exposure include temperature, humidity, PPE radiant heat, sunlight, access to drinking water, exposure duration, and work activity. Individuals vary widely in their susceptibility to heat stress. Factors that may influence individual susceptibility to heat stress include the following:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

The following guidelines should be considered when CDM Smith employees or subcontractors perform work:

- In ambient air temperatures above 80°F
- That involves heavy physical labor in temperatures above 70°F
- In chemical-protective clothing above 70°F

16.13.1 Hazards Associated with Heat Stress

Heat Stroke – Heat stroke is a serious medical emergency and can lead to death if left untreated. It is an acute and dangerous reaction caused by the failure of heat regulating mechanisms of the body. Persons who are elderly, obese, chronically ill, alcoholic, diabetic, or have circulatory system problems are at greater risk.

- Symptoms include red, hot, dry skin; nausea; headache; weakness; dizziness; elevated body temperature (BT); rapid respiration and pulse; coma; or loss of consciousness.
- Treatment for heat stroke:
 - B Heat stroke is a serious medical emergency. Emergency medical services (911) should be contacted if heat stroke is suspected.
 - B Move the victim to a cool place (shade, air conditioned building, vehicle).
 - B Remove heavy clothing.
 - B Cool the victim with ice packs, wet towels, or cloth.
 - B Keep head and shoulders elevated.
 - B Keep victim's airway open, check breathing and pulse.

Heat Exhaustion – A state of exhaustion or weakness caused by loss of fluids through perspiration and inadequate fluid replacement. Severe cases may result in loss of consciousness (fainting). This condition can progress to heat stroke if left untreated.

- Symptoms include:
 - Pale, clammy, moist skin; heavy sweating; and extreme weakness.
 - BT is normal, pulse is weak and rapid, breathing is shallow.

- The person may have a headache, nausea, or feel dizzy.
- Treatment for heat exhaustion:
 - Remove the victim to a cool location (shade, air conditioned building, or vehicle).
 - Allow the victim to lie down and prop their legs up.
 - Cool the victim with wet towels, cloth, or cold packs.
 - If the victim is not nauseous, they should drink water slowly.
 - If the victim loses consciousness, transport to local medical facility.
 - Continue treatment until symptoms are gone. Consult with CDM Smith medical consultant before returning to work.

Heat Cramps – Heat cramps are a condition that can progress to heat exhaustion or heat stroke. Symptoms include severe cramping of the arms, legs, and abdomen. Treatment includes:

- Removing the victim to a cool location; loosen clothing
- Having the victim slowly drink cool water
- Resting the cramping muscles

Heat Rash – Heat rash is a mild red skin rash in areas where the body is in contact with clothing or protective gear. The area is likely to itch and can be a source of irritation. Treatment includes decreasing the amount of time in protective gear and applying talcum powder to absorb moisture. When possible, wear breathable clothing to prevent a buildup of moisture within the clothing.

16.13.2 Heat Stress Monitoring

Since the susceptibility to heat stress hazards can vary greatly from one individual to another, often the best way to monitor for heat stress is through observing employees and individual physiological monitoring. When working in conditions that have the potential to create heat stress, either heart rate (HR) or BT should be monitored in accordance with the suggested frequency given in Table 16-1 below:

**Table 16-1
Suggested Frequency of Physiological Monitoring for Fit
and Acclimatized Workers^a**

<i>Adjusted Temperature^b</i>	<i>Normal Work Ensemble^c</i>	<i>Impermeable Ensemble</i>
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° to 90°F (30.8° to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° to 87.5°F (28.1° to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° to 82.5°F (25.3° to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° to 77.5°F (22.5° to 25.3°C)	After each 150 minutes of work	After each 120 minutes of work

^a For work levels of 250 kilocalories/hour.

^b Calculate the adjusted air temperature (T_a adj) by using this equation: $T_a \text{ adj } ^\circ\text{F} = T_a \text{ } ^\circ\text{F} + (13 \times \% \text{ sunshine})$. Measure air temperature (T_a) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (100 percent sunshine - no cloud cover and a sharp, distinct shadow; 0 percent sunshine - no shadows).

- ^c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.
- Heart Rate – HR should be measured by the radial pulse for 30 seconds as early as possible in the initial rest period. On an individual basis, if the HR exceeds 110 beats per minute (BPM), that individual should not return to work until their HR drops below 110 BPM and they are fully recovered. If more than one worker has an HR that exceeds 110 BPM, a work rest regimen or other control measures should be implemented to maintain HRs below 110 BPM.
 - Body Temperature – The BT may be measured using a clinical oral thermometer or a clinical ear thermometer. On an individual basis, if the BT exceeds 99.6°F, that individual should not return to work until their BT drops below 99.6°F and they are fully recovered. If more than one worker has a BT in excess of 99.6°F, a work rest regimen or other control measures should be implemented to maintain BTs below 99.6°F.
 - Personnel should monitor themselves and each other for the development of symptoms such as sudden fatigue, nausea, dizziness, irritability, malaise, flu-like symptoms, and lightheadedness.

16.13.3 Heat Stress Controls and Prevention

- Develop work/rest regimen to maintain physiological parameters within limits described above and prevent development of initial symptoms of heat stress related conditions. If the physiological limits are exceeded or symptoms develop, the work period should be reduced and rest period increased. Rest areas should be cool (in areas such as shade, air conditioned buildings, or vehicles) and away from heat exposure.
- In extreme heat conditions, employees may wear heat-control clothing such as ice vests or cool suits. Physiological monitoring should still be conducted and work/rest regimens implemented to keep physiological parameters within recommended limits.
- Mobile showers or hoses can be used to cool down workers in waterproof protective clothing.
- Shield sources of radiant heat.
- Provide shaded work areas.
- Conduct activities in early morning and late evening to avoid the hottest parts of the day.
- Allow employees to become acclimatized to the heat by performing less strenuous activities for the first few days. Schedule more physically demanding work later.
- Provide adequate, cool drinking water for consumption during break periods.
- Avoid consumption of beverages such as coffee, tea, or colas that act as diuretics and dehydrate the body.

16.14 Cold Stress

Persons working outdoors in low temperatures, especially below freezing, or in wet or snowy weather are potentially subject to cold stress disorders. Factors that contribute to cold stress exposure include temperature, humidity, wind, sunlight, rain, snow, fog, exposure duration, clothing, and work activity. Individual susceptibility to cold stress disorders can vary widely. Individual physical factors that can affect a person's response to cold work environments include a person's general fitness and age.

The following guidelines should be considered when working in ambient air temperatures below 40°F, especially when other contributing weather conditions such as snow, rain, or wind are present.

16.14.1 Hazards Associated with Cold Stress

Hypothermia – Hypothermia results from a cooling of the body's core temperature and if left unattended can become a serious condition. Hypothermia can result in the loss of physical skills and impair judgment thereby contributing to the potential for other accidents. Severe hypothermia can result in death. Hypothermia can occur at temperatures above freezing as well as below.

- Symptoms include shivering, teeth chattering, fumbling hands, slurred speech, and loss of coordination. Eventually, the pulse and respiratory rate may slow. The victim may appear blue or lose color in the face.
- Treatment for hypothermia is to catch symptoms early and move the individual to a warm environment indoors or in a vehicle. If a warm location is not immediately available, the victim should be sheltered from the wind and provided extra clothing such as coats or blankets and observed to determine if their condition is improving. If the victim continues to deteriorate and becomes colder, they should be transported to a medical facility for assistance.

Frostbite – Frostbite is a condition in which the fluids around cells of body tissue freeze. The condition can lead to body tissue damage. The most vulnerable parts of the body are the nose, ears, cheeks, fingers, and toes.

- Symptoms of frostbite include body parts becoming white, firm, cold to the touch, and may feel waxy. The victim will not feel pain in the affected area.
- Treatment of frostbite requires that the victim be brought to a warm environment and the affected areas be allowed to thaw and warm. If frostbite has progressed beyond small patches of skin and affects whole body parts such as a hand, foot, or ear, the victim should be transported to a medical facility for treatment and observation.

16.14.2 Cold Stress Monitoring

Personnel should monitor themselves and each other for signs and symptoms of frostbite and/or hypothermia. If symptoms are observed in an employee or

subcontractor, steps should be taken to treat the symptoms by having the individual go to a warm environment either in a nearby structure or vehicle.

16.14.3 Cold Stress Control and Prevention

Cold stress can easily be prevented with proper planning and prevention. Some basic controls and preventative measures are listed below:

- Forecasted conditions. Consider the effect of wind chill (Table 16-2 on next page).
- Dress in layers and stay dry. Avoid cotton clothing such as socks or T-shirts. Bring extra clothing.
- Wear hardhat liners and gloves. Wear rain gear in rain and snow.
- Curtail work if extreme weather conditions such as a blizzard, extreme wind chill (e.g., less than 0°F), torrential cold rains, or wind is expected.
- For long-term projects in cold environments, consider setting temporary structures with portable heaters.
- Take warming breaks as needed.
- Avoid beverages with caffeine, alcohol, or medications that restrict blood flow.
- Drink warm noncaffeine beverages such as hot chocolate or soups on breaks.

**Table 16-2
Windchill Index**

WINDCHILL INDEX													
Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under calm conditions)													
Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)												
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60	
Equivalent Chill Temperature (°F)													
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60	
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68	
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95	
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112	
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121	
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133	
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140	
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145	
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148	
Wind speeds greater than 40 mph have little additional effect	LITTLE DANGER in < hour with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within 1 minute.				GREAT DANGER Flesh may freeze within 30 seconds.				
	From <i>Fundamentals of Industrial Hygiene</i> , Third Edition. Plog, B.A., Benjamin, G. S., Kerwin, M.A., National Safety Council, 1988.												

16.15 Working Around Heavy Equipment

Good work practices while working around heavy equipment include:

- Assume the operator cannot see you. The operator's vision may be blocked by blind spots. He or she is frequently concentrating on their work and equipment and may not notice a site visitor.
- If you must approach the operator, be sure you have made eye contact with the operator and they know you will be approaching them before approaching the equipment. Verbal contact, direct or by radio, is even better. Do not approach if the equipment is moving or in operation.
- Stay clear of pinch points and swing areas of equipment. At CDM Smith projects, these areas should be taped or barricaded off; however, when equipment moves frequently, you cannot count on other organizations to mark these zones.
- Do not walk near a moving piece of equipment. It could turn or rotate any minute. Modern construction equipment moves fast and in any direction.
- On a noisy site, you may not notice the equipment's back-up alarm. Keep aware of what is happening around you.
- Never walk under a load on a crane or hoist. Indeed, avoid the area under the hook or bucket.
- Do not cut across the path of equipment backing up.
- Wear your hardhat and safety glasses. The safety glasses protect your eyes from dust and debris and the hardhat provides protection for your head and makes you more visible on the site.
- On sites where there is frequent vehicle or construction equipment movement, wear high-visibility clothing.
- Maintain a clearance of at least 10 feet between any part of the machine or its load and any electrical line or apparatus carrying up to 50,000 volts. One foot of additional clearance is required for every additional 30,000 volts.

16.16 Working Near or Over Water

When working on, over, or near water, basic water safety precautions must be taken. Such areas include riverbanks, channels, dock areas, working from vessels of any kind, aeration basins, or other areas where a danger of drowning may exist. Depending on the circumstances, precautions needed may include any or all of the following:

- Employees should wear Coast Guard-approved personal floatation devices (PFDs) (either vests or jackets) where a potential danger of drowning exists. PFDs are required when working from any type of boat or floating platform.
- The PFDs should be inspected before and at the end of each use for wear, torn stitching or straps, inoperable buckles, or other defects.
- Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.
- At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water, unless the width of the water body is small enough to allow any potential rescue to occur from the bank (as would be the case with most aeration basins).

In some circumstances, these precautions may also be required by OSHA regulations. If you are planning to conduct work where water hazards may be present, be sure to take all appropriate precautions. If you will work in this situation, you should review the full text of the OSHA standard, [OSHA Standard for Work Over or Near Water](#) and consult your division HSM or designated HSC.

16.17 Flammable and Combustible Liquids

Work with flammable or combustible liquids exposes the employees to fire, explosion, and toxicity hazards. They should implement the following controls.

16.17.1 Storage and Handling

- Only approved containers and portable tanks should be used for the storage and handling of flammable and combustible liquids.
 - B Approved safety cans shall be used for the handling and use of flammable liquids in quantities greater than 1 gallon.
 - B For quantities of 1 gallon or less, only the original container or approved safety cans shall be used for storage, use, and handling of flammable/combustible liquids.
 - B The requirements for shipping these liquids exceeds those described here. If flammable or combustible liquids must be shipped, the individual offering the material for shipment must have completed DOT Hazardous Material Training. Contact your HSM for information on DOT training.
- Flammable or combustible liquids shall not be stored near exits, stairways, or pathways that people normally use for safe passage.
- No more than 25 gallons of flammable/combustible liquids shall be stored in a room outside of a storage cabinet or tank approved for the purpose.
- Quantities of flammable and combustible liquids in excess of 25 gallons shall be stored in an acceptable or approved cabinet meeting the requirements of 29 CFR 1926.152(b)(2)(i).
- Cabinets shall be labeled in conspicuous lettering, "Flammable - Keep Fire Away."
- Not more than 60 gallons of flammable or 120 gallons of combustible liquids shall be stored in any one storage cabinet. Not more than three cabinets may be located in a single storage area.

16.17.2 Outdoor Storage

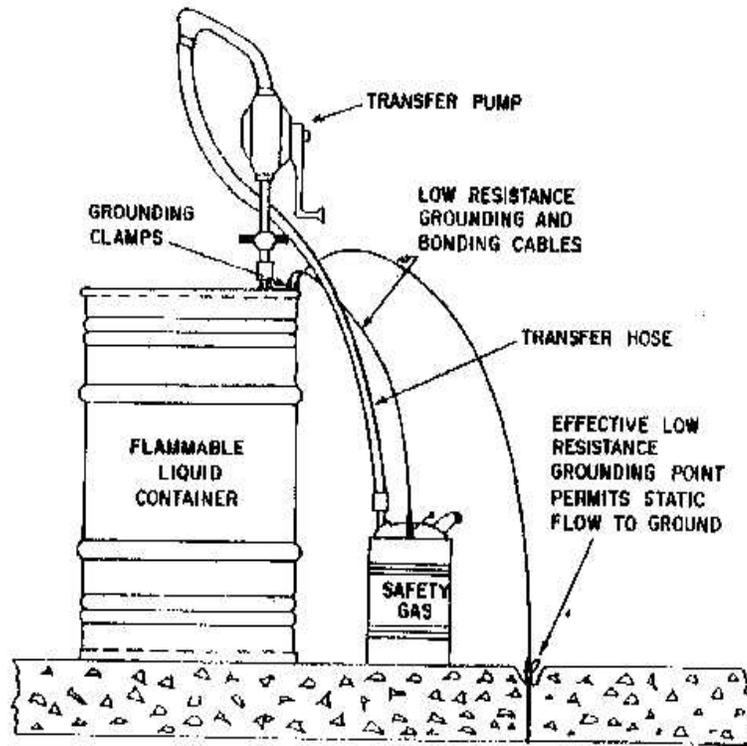
- For storage of flammable and combustible liquids outdoors, containers (not more than 60 gallons each) shall not exceed 1,100 gallons in any one pile or area. Five feet of clearance shall separate piles or groups of containers. These containers shall remain at least 20 feet from any other building or structure.
- Within 200 feet of each pile of containers, there shall be a 12-foot wide access way to permit approach of fire control apparatus.

- The storage area shall be graded in a manner to divert possible spills away from buildings or other exposures, or shall be surrounded by a curb or earth dike at least 12 inches high. Provisions shall be made for the controlled draining of accumulations of groundwater or rainwater, or spills of flammable or combustible liquids when curbs or dikes are used.
- At least one portable fire extinguisher, having a rating of not less than 20 pounds, shall be located not less than 25 feet or more than 75 feet from any flammable or combustible liquid storage area located outdoors.
- Precautions shall be taken to prevent the ignition of flammable/combustible vapors. Sources of ignition include, but are not limited to: open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.

16.17.3 Dispensing Flammable and Combustible Liquids

- Areas where flammable or combustible liquids are dispensed at one time, in quantities greater than 5 gallons from one tank or container to another tank or container, shall be separated from other operations by a distance of 25 feet or by construction having a fire resistance of at least 1 hour. Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable/combustible vapor at or below 10 percent of the LEL.
- Static electricity is generated by the contact and separation of dissimilar material, such as when fluid flows through a pipe or from an orifice into a tank. If the accumulation of static charge is sufficient, a static spark may occur. Transfer of flammable/combustible liquids from one container to another should be done only when containers are electrically bonded and grounded to prevent such accumulation of static charge (Figure 16-3).
- The management of flammable and combustible liquids is much more complicated than is indicated by the length of this section, which reviews only those issues appropriate to the incidental use of these materials.
- Storage and handling of the mobile and combustible liquids should comply with the requirements of National Fire Code No. 30 (see http://www.nfpa.org/Codes/NFPA_Codes_and_Standards/List_of_NFPA_documents/NFPA_30.asp - you will need a password from the CDM Smith Infocenter).

Figure 16-1
Typical Grounding System



16.18 Safety Working Around Drill Rigs

The use of mechanical drill rigs to collect soil samples and install monitoring wells presents significant hazards to operators and helpers, as well as technicians and engineers who may work in proximity to such rigs. CDM Smith employees that manage or oversee drilling operations should be aware of the basic hazards of drilling equipment and operations and have an awareness of safe drilling work practices. The guidelines and work practices described below should be implemented on all projects where mechanical drill rigs are used.

16.18.1 Preparation

- Contract documentation with drillers contracted with CDM Smith should include CDM Smith's standard contract between "Engineer & Subcontractor for Drilling Services," and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at <http://cdmweb/legalforms/inc.htm>.
- Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or magnetometer studies may be needed to identify the location of underground obstructions.
- The work area for the drill rig and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.
- Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.
- OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.
- If working in an area of moving vehicular traffic, appropriate traffic control systems should be in place. Contact local police or traffic control officer, before placing any traffic control equipment (Section 16.22).
- Define an exclusion zone around the drill rig that is at least 1.5 times the height of the mast. Only personnel necessary for the immediate task being performed should be inside the exclusion zone.

16.18.2 Drill Rig Inspection

- After the rig is set up, but before operation, the work area should be inspected for eye, bump, and tripping hazards.
- The driller should inspect the rig daily before operation of the rig. The inspection should include the following:
 - Condition of the vehicle. Brakes should work and tires should have adequate tread. It should have a back-up alarm. If it is driven over the road, it should have all necessary brake lights, headlights, horn, license plates, etc.
 - All welds should be solid, with no sign of visible cracks.
 - All gauges should be functional and legible.
 - All machine guards should be in place.
 - Emergency kill switches should be functional. All site personnel should be aware of the location and function of the kill switches. Have the driller review these with site personnel.
 - Cable and wire rope should be inspected for fraying, decay, “bird caging,” broken strands, kinking, or flattening.
 - All hoses should be secure and in good shape. They should not be loose, bulging, or leaking.
 - High-pressure fittings should be secure and have whip checks (a pin or wire to prevent the hose whipping in the event of a failure of the connection).
 - High-pressure relief valves should be in working order.
 - Wire rope loops should be secure with at least two clamps.
 - The rig should have a fire extinguisher and first aid kit.
 - All tools should be clean and in good working condition. Hooks, eyes, pins, etc. should not be corroded or bent. Rod clamps should be in good condition.
 - If a cathead is used, it should be clean and free of burrs. The cathead rope should be in good condition and not be frayed or have excessive wear.
 - Back-up alarms should be functional.
 - Vehicles should have all lug nuts and they should all be tight.

16.18.3 Work Practices

- All personnel working around drilling operations should wear appropriate PPE including a hard hat, safety glasses, and hard-toed work boots.
- Drill crews should wear work gloves.
- On hazardous waste sites, additional PPE such as respirators, protective clothing, gloves, etc. may also be required.
- In areas where there is vehicular traffic, personnel should also wear high-visibility vests or clothing.
- Maintain an organized work area free from tripping hazards.
- Drill rods or other equipment should not be stored leaning up against equipment.
- Drill holes should be completed or secured before leaving the site for the day. Drill holes should not be left open at an unattended site.
- Boring locations should be placed to minimize the possibility of contacting underground utilities or structures. Clearance should be obtained from the site project manager before drilling begins.
- Do not move the rig with the mast in the upright position.
- Use a spotter when moving the rig from one location to another on the site.
- When sampling activities require working in proximity with heavy equipment or drill rigs, sampling personnel will stand clear of the equipment until sampling is required. They will notify the operator they are going to take a sample and must receive acknowledgment from the operator.
- Do not wear loose clothing such as hooded sweatshirts, parkas, or clothing with hanging drawstrings around drill rigs.
- Monitor weather conditions. Drilling operations should be terminated and the area near the drill rig evacuated during high winds and or storms with the potential for lightning strikes. The lead driller should be consulted to help assess if weather conditions are safe for drilling.
- Drill crew personnel should wear a personal fall arrest harness, connected to a secure tie-off point, when climbing the mast or working where fall exposures exceed 6 feet.
- Hearing protection should be worn during operations that produce significant noise exposures. (If you cannot hold a conversation using a normal voice with someone within 3 feet of you because of background noise, the use of personal hearing protection is recommended.)

16.19 Working Safely with Direct Hydraulic Push (Geoprobe™) Technology

These guidelines apply to the use of direct hydraulic push (Geoprobe™ or similar) technology during site investigations. In addition to the safety precautions listed below, the equipment shall be operated and maintained according to the manufacturer's instructions.

- Contract documents for subcontractors using a Geoprobe should include CDM Smith's standard contract between "Engineer & Subcontractor for Drilling Services" and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at <http://cdmweb/legalforms/inc.htm>.
- The probe rig should be equal to the task. Hiring a contractor who uses a pneumatic hammer when direct hydraulic push is more appropriate, requires unacceptable compromises on safety.
- Before using the Geoprobe or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or a magnetometer may be needed to identify the location of underground obstructions.
- The work area for the Geoprobe and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.
- Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.
- OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.
- The Geoprobe should be operated by one person at a time, including assembly and disassembly of probe rod and accessories. Other field personnel shall stay clear of the probe and vehicle while the probe is in operation, being assembled, or disassembled. This is to ensure the unit is not inadvertently engaged while the operator's hands, fingers, or feet are touching or near moving parts.
- Keep feet clear of the probe as it descends.
- Do not place hands on top of probe rod while the rod is under the probing machine.

- The hydraulic system should be turned off at the control panel when changing probe rods, inserting the hammer, anvil, or attaching any accessories.
- Do not exert downward pressure on the probe to lift the probe foot over 6 inches off the ground.
- Always take the carrier vehicle out of gear and set the emergency brake before starting the push unit up.
- Always extend the probe unit out from the carrier vehicle and deploy the foot to clear the vehicle roofline before folding the probe unit out.
- The operator should stand to the control side of the probe machine and stay clear of the probe foot and derrick while operating the controls.
- Do not exert downward pressure on the probe so that the carrier vehicle tires lift off the ground. Reducing the load on the carrier vehicle may allow the vehicle to shift or slide unexpectedly.
- Be aware that the carrier vehicle's catalytic converter may be hot and has the potential to be a fire hazard if the vehicle is parked over combustible material such as dry leaves, grass, etc.
- The hydraulic system should be shut down and the vehicle engine stopped before attempting to clean or service the probe.
- Use extreme caution when using the machine while parked on loose, soft, or uneven surfaces.

16.20 Hazardous Waste Site Controls

Work sites designated as hazardous waste sites must control access to the work area to only authorized personnel and conform to general work practices expected at hazardous waste site operations as required by the OSHA Standard for Hazardous Waste Operations, 29 CFR 1910.120. The following concepts should be reflected in the HSP for the project.

16.20.1 Access Control

Controlled access to hazardous waste site work areas is required to protect personnel working on the site as well as to limit the potential for transporting contaminants off site. Depending on the size of the work site, hazards and contaminants present, and complexity of the work, access control may range from verbally cautioning nonauthorized personnel to stay away from the work area, to a program including site security, signs, or formal sign-in and sign-out procedures. Details of site-specific access control procedures should be included in the site-specific HSP. Some general work practices for access control are noted below:

For small-scale site investigations that are short-term projects (i.e., days, not weeks or months), identify a work area to the work crew and keep persons not associated with the job site out of the work area. If the site is in an area where nonauthorized persons are likely to be encountered, traffic cones, caution tape, and signs identifying the area as a controlled access area may be used.

For more extensive projects where work may be done for weeks or longer, the team should deploy more extensive access controls. They should:

- Set up physical barriers and hire security personnel to prevent nonauthorized persons from entering the work site.
- Keep the number of personnel and equipment on site to the minimum required to do the project effectively and safely.
- Establish work zones within the site (Section 16.20.2).
- Establish controlled access points to be used by authorized personnel.
- Track the entry and exit of personnel through a check-in, checkout system.
- Establish a formal decontamination corridor from exclusion zones.

16.20.2 Work Zones

Field project managers working under HSPs for hazardous waste operations are required to establish work zones to prevent or reduce the spread of site contaminants to noncontaminated areas on or off site. Movement between zones should be restricted to those that need access to a specific area, and entry and exit between zones should be through designated access control points. A description of the three work-zone system for hazardous wastes is provided below.

Exclusion Zone – The exclusion zone should include any area where contamination is known or suspected. Areas of air, water, or soil that are contaminated with hazardous materials (biohazards, radioactive materials, chemicals) should be included in the exclusion zone. The zone should be well known to site workers. On smaller projects, this can be a verbal identification to site workers, such as “a 20-foot radius around the drill rig.” On larger projects, or in areas that may be encountered by observers or the general public, the zone may need to be defined with caution tape, traffic cones, or in some instances, fencing and barriers. The need will be site-specific and the specific method should be identified in the site-specific HSP. Some work practices that should be followed in the exclusion zone include:

- Employees in the exclusion zone must wear the PPE designated in the site HSP for tasks executed within the zone.
- No eating, drinking, chewing gum or tobacco, smoking, application of cosmetics, including application of lip balm, sunscreen, or insect repellent is allowed in the exclusion zone.
- Sitting or kneeling in areas of high concentrations of contaminants should be avoided.
- If any PPE becomes defective, the employee should leave the work area via the designated egress area, decontaminate as needed, and replace the defective PPE before returning to work in the exclusion zone.
- Prescription drugs should not be used within the exclusion zone unless approved by CDM Smith’s medical consultant. The use of illegal drugs or consumption of alcohol is prohibited.
- When leaving the exclusion zone, employees should exit via the designated access/ egress point(s) and follow decontamination procedures described in the site HSP.

Contaminant Reduction Zone – A contaminant reduction zone (CRZ) is established to provide a transition between the exclusion zone and the support zone. The CRZ is set up at the access control points of the exclusion zone and will vary in size depending on the complexity of activities that need to occur within the zone. For small site investigations, the CRZ may simply be a designated area near containers set up to collect used disposable PPE and some soap and water. For larger projects, the CRZ may include specific decontamination points and be staffed by personnel specifically designated to participate in the decontamination of personnel and equipment exiting the exclusion zone. Depending on the site contaminants, level of contamination, and decontamination procedures, personnel in the CRZ may be required to wear protective clothing, gloves, or respirators. The specific requirements will be outlined in the site HSP. The CRZ should be placed in an area that is not contaminated at the boundary of the exclusion zone.

Support Zone – The support zone is established near the entrance to the site and is far enough from the exclusion zone and CRZ that specialized protective clothing or respirators are not used. The use of normal field PPE such as hard hats, safety glasses,

and safety work boots is expected except for areas such as office trailers, break and lunch areas, or other areas designated as having no known or anticipated hazards. Operational support activities and equipment storage and maintenance areas are located in the support zone. No equipment or personnel should go from the exclusion zone to the support zone without passing through the CRZ and being decontaminated in accordance with the site HSP.

Mobile Work Zone – For those projects that involve brief periods of work in multiple locations, a specific area may be designated as the exclusion zone for the duration of the work performed in that area. The exclusion zone can be terminated (provided there are no ongoing hazards or potential exposures to contaminants) and moved to the next area of work. For example, during soil borings or well installation, the exclusion zone can be defined as, “1.5 times the mast height” of the drill rig. Once the boring has been closed, or well installed and secured, and all drill cuttings have been secured, the area can be opened up and a new exclusion zone established around the next boring location.

16.20.3 Considerations when Establishing Work Zones

Work zones should be large enough to perform tasks within the zone safely, with no exposure to hazards to personnel outside the zone, but they should also be small enough to be able to secure and control access. Some considerations in establishing work zones include:

- Physical and topographical features of the site
- Dimensions of the contaminated area
- Weather
- Physical, chemical, and toxicological characteristics of contaminants and chemicals used in the zone
- Potential for exposure to site contaminants
- Known and estimated concentrations of contaminants
- Air dispersion of contaminants
- Fire and explosion potential
- Planned operations and space needed to perform the work safely
- Surrounding areas
- Decontamination procedures
- History of job site

16.20.4 General Hazardous Waste Site Work Practices

- **Buddy System** - Work should be scheduled so that no person works unobserved within the exclusion zone at any time. Each worker within the exclusion zone should maintain visual contact with at least one other worker on the site. All site personnel should remain aware of each other and monitor each other’s condition.
- **Eating, drinking, chewing gum or tobacco, and smoking** are prohibited within the contaminant reduction and exclusion zones. (**Exception for heat stress:** Squirt bottles of water, Gatorade, or other fluids may be consumed via squirt bottles in the contaminant reduction zone with the approval of the HSM. Open bottles, cups, etc. should not be permitted.)

- Sitting or kneeling should be avoided in areas of known or suspected areas of contamination.
- Hands and face should be thoroughly washed when leaving the work area.
- Defective PPE should be repaired or replaced immediately.

Sections 5, 6, 7, 9, and 11 of this manual are particularly applicable to H&S at hazardous waste sites.

16.21 Decontamination at Hazardous Waste Sites

Proper decontamination helps protect employees and prevents the contamination of uncontaminated areas. Decontamination protects all site personnel by minimizing the transfer of harmful materials into clean areas. It helps prevent mixing of incompatible chemicals and protects the community by preventing uncontrolled transportation of contaminants from the site.

16.21.1 Prevention of Contamination

To prevent contamination, crew members should:

- Follow procedures for proper dressing before entry into the exclusion zone. Proper dressing will minimize the potential for contaminants to bypass the PPE and escape decontamination.
- Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact site materials, or cover equipment and tools with a strippable coating, which can be removed during decontamination.
- Encase any source of contaminants on the site with barriers (e.g., plastic sheeting or over packs).
- Stress work practices that minimize contact with hazardous substances. Use remote sampling, handling, and container-opening techniques.

16.21.2 Decontamination Equipment Selection

In selecting decontamination equipment, consider whether the equipment must be decontaminated for reuse or can be easily disposed. Recommended equipment for decontamination includes:

- Storage tanks or appropriate treatment systems
- Drains or pumps
- Long-handled brushes
- Wash solutions appropriate for the contaminants present
- Rinse solutions appropriate for the contaminants present
- Pressurized sprayers for washing and rinsing
- Curtains, enclosures, or spray booths
- Long-handled rods and shovels
- Containers to hold contaminants and contaminated soils
- Wash and rinse buckets
- Brooms
- Containers for the storage and disposal of contaminated material

16.21.3 Decontamination Design

Decontamination facilities should be located in the CRZ, i.e., the area between the exclusion zone (the contaminated area) and the support zone (the clean area), and described in the site HSP.

- Site-specific factors that affect the decontamination facility design must be considered. Typical factors include:
 - The chemical, physical, and toxicological properties of the wastes
 - The pathogenicity of infectious wastes
 - The amount, location, and containment of contaminants
 - The potential for and location of exposure based on assigned worker duties, activities, and functions
 - The potential for wastes to permeate, degrade, or penetrate materials used for personal protective clothing and equipment, vehicles, tools, buildings, and structures
 - The proximity of incompatible wastes
 - The movement of personnel and/or equipment among different zones
 - The emergencies that may arise
 - The methods available for protecting workers during decontamination
 - The impact of the decontamination process and compounds on worker H&S

- Decontamination Line
 - Decontamination should be an organized process by which levels of contamination are reduced.
 - The decontamination process consists of a series of steps performed in a specific sequence. For example, outer, more heavily contaminated items are decontaminated first, followed by the decontamination and removal of inner, less contaminated items.
 - Each step should be performed at separate stations to prevent cross contamination.
 - Decontamination stations should allow enough separation to prevent cross contamination and should be arranged in order of decreasing contamination.
 - Separate decontamination areas should be provided to isolate workers from different contamination zones containing incompatible wastes or decontamination processes.
 - Entry and exit points should be conspicuously marked. Preferably the entry to the CRZ from the exclusion zone should be separate from the entry to the exclusion zone from the CRZ.
 - Dress-out stations for entry to the CRZ should be separate from redressing areas for exit from the CRZ.
 - Personnel who wish to enter clean areas of the decontamination facility, such as locker rooms, must be appropriately decontaminated first.
 - Examples of decontamination lines and procedures for personnel wearing various levels of protection are provided in Exhibits 16A and B.

16.21.4 PPE for Decontamination Workers

A rule of thumb is that decontamination workers wear a level of protection one level below the level of protection worn in the exclusion zone. However, consideration should be given to the following when determining the level of protection for a given project.

- The nature of site contamination
- Degree of contamination expected on workers leaving the exclusion zone
- The results of wipe tests and onsite air monitoring

Some site-specific cases may require that decontamination personnel wear the same level of PPE as workers in the exclusion zone. Cases include:

- Workers using a steam jet may need a different type of respiratory protection than other decontamination personnel because of the high moisture content of the steam jets.
- Cleaning solutions used and wastes removed during decontamination may generate harmful vapors, requiring a different type of respiratory or clothing protection.

16.21.5 Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated area of a site should be decontaminated to remove any harmful chemicals, radioactive material, or infectious organisms that may have adhered to them. The extent of decontamination will vary depending on the nature of site activity, site contamination, and other factors.

- Decontamination methods available include:
 - Physical removal
 - Chemical detoxification or disinfections/sterilization
 - A combination of both physical and chemical methods
- The selected decontamination method should be reviewed for any safety and health hazards. If the selected method poses a direct health hazard, measures shall be taken to protect both the decontamination personnel and the workers to be decontaminated.
- Physical Removal
 - Physical methods using high pressure and/or heat should be used with caution.
 - Loose contaminants can be removed by using a soap and water rinse with a soft bristle brush to remove dust and vapors that cling to equipment and workers, or that are trapped in small openings, such as clothing or fabric weaving.
- Adhering contaminants can be removed by:
 - Scraping, brushing, and wiping.
 - Solidifying.
 - Freezing (using dry ice or ice water).
 - Adsorption or absorption (e.g., kitty litter or powdered lime).
 - Melting.

- Volatile liquid contaminants can be removed from PPE or equipment by evaporation followed by a water rinse. Evaporation may be expedited by the use of steam jets.
- Chemical Removal
 - Decontamination using chemicals should only be done if recommended by an industrial hygienist or other qualified professional.
 - Any chemical used in the decontamination process must be chemically compatible with the equipment or clothing being decontaminated.
 - Halogenated solvents should only be used for decontamination in extreme cases where other cleaning agents will not remove the contaminant.
- Chemical removal types include the following:
 - Surface contaminants can be dissolved in a solvent.
 - Solidification of liquid or gel contaminants can enhance their physical removal. Typical solidification processes are moisture removal using adsorbents such as grounded clay or powdered lime; and chemical reactions using polymerization chemicals and/or chemical reagents.

16.21.6 Personnel Decontamination

Different levels of personnel protection, as discussed in the PPE guidelines, may be used at any given site. The following is a description of the decontamination process for each level of protection.

- Level D
 - An area should be designated for the gross removal of dirt and mud from gloves and boot covers. Paper towels and buckets of rinse water can be made available for this purpose.
 - Typical decontamination steps for Level D operations are provided in Exhibit 16-B.
 - Soap and water should be used to wash hands and face before leaving the site.
 - Laundering of personal clothing should be completed as soon as possible once offsite.
- Level C and B
 - A decontamination line should be established.
 - Site-specific procedures should be outlined in the site HSP. The recommended procedure for this layout is listed in Exhibit 16-C.
- Level A - It is not anticipated CDM Smith will directly participate in Level A operations. If required, site-specific procedures will be developed in coordination with the division HSM.

16.21.7 Sampling and Monitoring Equipment Decontamination

Sampling equipment often becomes grossly contaminated. Often trowels or drum thieves (coliwassas) are dedicated to a particular site. These should be left in the exclusion zone and disposed of as contaminated waste at the end of site work. Sampling equipment such as split spoons or other equipment that is used to collect several samples must be cleaned and decontaminated between samples to prevent cross contamination. These items should be cleaned and decontaminated in accordance with the project operations or sampling

plan. Dirt and wash solutions from sampling equipment decontamination should be collected and disposed of as investigation-derived waste.

Once grossly contaminated, testing and monitoring instrumentation can be difficult to decontaminate without causing damage to the instrument. Care should be taken in the field to prevent gross contamination of field instruments by avoiding direct contact between the instrument and contaminated soils, water, or surfaces. In some cases it may be necessary to place instruments in plastic bags, leaving small openings for sampling ports, detectors, and exhaust ports. The plastic bags can then be removed as the instrument comes out of the exclusion zone. The outside of instruments can be wiped down with paper towels or brushed off with clean soft brushes.

16.21.8 Heavy Equipment Decontamination

Drill rigs, trucks, backhoes, and other heavy equipment can be difficult to decontaminate. The method generally used is to wash them with water under pressure and scrub accessible areas with soap and warm water. Hot water and steam systems can be effective but may increase air concentrations of contaminants, exposing decontamination workers. Particular care should be taken where equipment comes into direct contact with contaminated soils such as tires, buckets, or treads. In severe cases, tires may need to be replaced or parts sand blasted clean or disposed of. Equipment should be visually inspected to be sure it is free of any visible signs of contamination. In some cases, wipe tests or other methods may be needed to confirm equipment has been adequately decontaminated before leaving the site.

16.21.9 Decontamination Solutions, Disposable PPE, and Site Wastes

Potentially contaminated equipment, disposable PPE, respirator cartridges, disposable sampling equipment, brushes, buckets, waste decontamination solutions, etc. should be secured in drums and labeled. Disposal methods for these materials may depend on client requirements and/or results of site investigation data. The confirmed presence of hazardous materials on the site may require disposal of investigation-derived wastes as hazardous wastes.

Care should be taken during work and decontamination activities to minimize waste materials generated.

Exhibit 16-B Minimum Measures For Level D Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Hard Hat, Outer Boot, and Glove Removal	Remove hard hat, outer boots, and gloves.
Station 4 - Boots, Gloves, and Outer Garment Removal	Remove boots, suit, and inner gloves and deposit in separate containers lined with plastic.
Station 5 - Field Wash	Wash hands and face.

Exhibit 16-C Minimum Measures For Level B, And C Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Hard Hat, Boots, and Gloves Wash and Rinse	Scrub outer boots, hard hat, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Tank/Air Canister Change	If a worker leaves the exclusion zone to change an air tank, air canister, or mask, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boots donned, and joints tapped. Worker returns to duty.
Station 4 - Outer Boots, and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 5 - SCBA/Respirator Removal	SCBA backpack and facepiece/respirator is removed (avoid touching face with fingers). SCBA or respirator is deposited on plastic sheets.
Station 6 - Inner Gloves and Outer Garment Removal	Remove suit and inner gloves and deposit in separate containers lined with plastic.
Station 7 - Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face.

16.22 Traffic and Work Zone Safety

These guidelines apply whenever CDM Smith employees or subcontractors work in areas exposed to vehicular traffic on public streets or highways.

- Where vehicular traffic hazards exist because of work at locations near public streets or roads, a system of traffic and work zone controls should be developed to mitigate the hazard. The system should meet the requirements of Part 6 of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration, or the applicable state version of the MUTCD.
- In general, when the MUTCD allows the use of traffic safety direction devices, such as cones, CDM Smith will supplement those direction devices with a physical barrier, such as a truck.
- All traffic control systems on public roads must be coordinated with local traffic control officials as required by applicable law.
- Periodically evaluate effectiveness of temporary traffic control setups by walking or riding the job area looking for evidence of poor controls and near misses such as swerving traffic, motorists braking quickly, skid marks, blind spots, etc.
- Give motorists plenty of advanced warning of upcoming work zones.
- All employees working within designated work zones or near vehicular traffic should wear high-visibility clothing such as orange, yellow, or yellow-green shirts, jackets, or vests. During wet or inclement weather, similarly colored rainwear should be worn.
- During night work, between the hours of sunset and sunrise, high-visibility clothing should incorporate reflective striping or fabric and be visible at a distance of 1,000 feet. This clothing should meet ANSI standard #107 for High Visibility Safety Apparel.
- All employees working near traffic and vehicles must maintain situational awareness at all times. Stay mindful that warning signs and cones inform drivers to take action but that some drivers may not pay attention, and vehicles may still enter the work zone.

16.23 Removing and Replacing Manhole Covers

16.23.1 Purpose and Scope

CDM Smith personnel sometimes remove, handle, and replace manhole covers, hatch covers, or basin grates. These covers come in different sizes, shapes, and weights and have significant hazards associated with them. The guidelines below describe the hazards associated with manholes and manhole covers, general safety precautions to follow when removing and handling manhole covers, and specific procedures for using two tools designed specifically for the removal and replacement of manhole covers (e.g., a stand-up cover lifter and a manhole cover hook).

16.23.2 Hazards

Hazards associated with manholes and manhole covers include the following:

- Dropped manhole covers may crush fingers or break toes and feet.
- Explosion hazards (Manholes can explode, sending covers several feet in the air, when the air in the sewer exceeds the LEL. In rare cases, covers have been found several hundred feet away.)
- Falls into open manholes.
- Improper lifting may cause injury to backs/shoulders/limbs.
- Impact of vehicular traffic with covers on public or private roadways.

16.23.3 General Safety Precautions

The following general safety precautions should be implemented when removing or replacing manhole covers.

- Use appropriate tools when lifting or handling manhole covers. Sections 4 and 5 include additional information.
- Ensure appropriate traffic control devices are in place where needed before working around manholes.
- Perform atmospheric testing for explosive and toxic gases using a multi-gas monitor around the edges of the manhole before opening and continue monitoring as the cover is first cracked open to determine if an explosive or toxic atmosphere is potentially present. If the LEL measured is greater than 20 percent or toxic gas concentrations are greater than ½ of the PEL (e.g., greater than 5 ppm for hydrogen sulfide), stop work on this manhole and contact your division HSM to determine ventilation requirements.
- Do not leave any open manhole unattended.
- Maintain positional awareness at all times when handling the cover. For example, place feet on a secure and stable surface and be sure that feet and hands are

positioned so they will be clear when the cover is put down. Awareness of the open manhole will help you avoid the fall.

- Spread sand or other material around the manhole area to ensure safe, secure footing if snow, ice, mud, oil, or other conditions make footing difficult.
- Personnel not directly involved in removing or handling the manhole cover should stand clear of the activity.
- DO NOT place fingers under the manhole cover to assist in lifting or replacing; use proper tools.
- Wear leather work gloves that allow a firm grip on tools.
- Do not use an open flame to thaw ice that is present around or over a cover. A small amount of table salt or hot water can be used.
- If a cover is stuck and does not lift easily, place a piece of wood on the cover near the rim and strike the wood with a hammer. Do not strike the cover directly. *Note:* An open flame or spark resulting from metal to metal contact has the potential to ignite an explosive atmosphere within the manhole.
- Clear the area of tools, people, materials, etc. where the cover is to be placed before removing.
- Place the cover in a location that minimizes hazards to other workers, vehicles, and pedestrians.
- When working in a roadway, remove the manhole cover in the direction traffic is moving so you do not have to have your back towards oncoming traffic.
- If entry into the manhole is planned, follow CDM Smith CSE procedures found in Section 12.
- If needed, ask a co-worker for assistance in handling the cover. However, as in any multi-person activity, have one person lead the work and communicate with others on how the action will be done.

16.23.4 Using a Stand-Up Cover Lifter

There are various tools available that allow an individual to safely remove a manhole cover alone. One such tool is the stand-up cover lifter. Stand-up cover lifters may be obtained from the CDM Smith Equipment Centers or from various utility supply vendors.

Opening Covers Using a Stand-Up Lifter



Before using a stand-up cover lifter for the first time, CDM Smith employees should review and follow the manufacturer's instructions. In general, the basic steps to follow include:

- Before using, inspect the hooks, chain, and tool bar for damage such as bending, wear, etc. Do not use a defective tool.
- Place the base of the cover lifter 6 to 10 inches from the edge of the manhole.
- Insert the hook into a hole on the manhole cover. Engage the hook behind the lip or reinforcing ring on the underside of the manhole cover.
- Lean the handle forward and attach a chain link to the hook on the tool handle so that the chain is taut when the handle is vertical.
- Brace your foot BEHIND the base of the lifter and pull the handle toward your body until the cover is 3 to 4 inches out of the frame.
- Reposition the base of the tool and repeat the step above until the cover is clear of the manhole.
- When using this procedure with a rectangular cover, keep the edges of the cover parallel to the sides of the frame of the manhole as the cover slides along the frame to prevent the cover from falling in the manhole.
- This type of tool may also be used to open a hinged cover by placing the tool on the center of the cover, engaging the hook on a handle or lift ring and pulling the handle back towards the hinged side of the cover.
- Once a hinged cover is open, be sure to set the hinge locks to prevent the cover from closing inadvertently.

Replacing Covers Using a Stand-Up Lifter

To replace a manhole cover using a stand-up lifter tool, follow the steps listed below:

- Clear loose material from the frame seat and the sides of the cover. The cover will not sit in the frame evenly if all material is not removed.
- Use the lifter to drag the cover next to the frame opening using the same technique followed to remove the cover. Take care not to fall in the open hole.

16.23.5 Using a Manhole Cover Hook

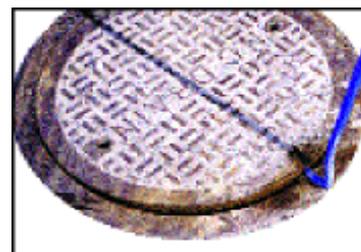
Another tool available to assist in opening manhole covers is the J-type hook. This type of cover hook can be used when there is not an adequate surface to be able to use a stand-up cover lifter. Cover hooks may also be obtained from the CDM Smith Equipment Centers or from various utility supply vendors.



Removing Covers Using a Cover Hook

A J-type cover hook or pick can be used to remove most types of manhole covers. To use the hook, the basic steps to follow include:

- Insert the hook into one of the cover holes until the end of the hook clears the rib on the underside of the cover.
- **If the holes are large enough** to engage the rib, turn the hook and engage the rib and pry the cover open a few inches.
- Re-engage the hook under the rib and place your feet about shoulder width on solid footing. Stand almost over the cover at a right angle to the direction the cover is to be moved, stoop slightly and, using your leg muscles, lift and drag the cover clear of the frame.
- **Use your leg muscles to lift and drag; do not use your back! Be absolutely sure your footing is secure and that your feet and those of co-workers are clear of the cover!**
- Pull the cover to a position where it will not interfere with other work or be a hazard to vehicles or pedestrians. Disengage the hook and place it in a safe location.
- **If the cover holes are too small** to get the hook in far enough to engage the rib, use the point of the hook to pry the cover loose. Lift the cover with the hook just enough so that a second hook can be inserted and used to engage the rib. Place the first hook out of the way in a safe location and remove the cover with the second hook fully engaged using the steps described above.
- **If the cover has lifting holes in the cover instead of the rim**, insert the hook into the lifting hole, unseat the cover about 4 inches by lifting with your legs. Re-engage the hook underneath the cover under the rib and remove the cover as described above.



Replacing Covers Using a Cover Hook

To replace a manhole cover using a J-type cover hook, follow the steps listed below:

- Clean the frame seat, sides, and rib of the cover by removing loose material. The cover will not rest evenly in the seat frame if all loose material has not been removed.
- While standing next to the cover at a right angle to the direction the cover is to be moved, spread your feet to shoulder width and engage the hook under the rim.
- Slightly lift the cover using your leg muscles and swing/drag the cover as it pivots on its opposite edge towards the manhole.
- Move to the opposite side of the cover and repeat this technique until the cover partially covers the opening.

- From the point on the cover that is the farthest from the opening, engage the cover hook under the rim and lift the cover until it slides into the seat frame.

16.23.6 Other Manhole Cover Tools

In addition to the two tools described above, various vendors produce and sell tools or equipment to aid in removing or handling manhole covers. Employees are encouraged to bring to the attention of the equipment centers any tool that makes their job safer and more productive. Take care to review manufacturer's literature and use/maintain tools in accordance with their instructions.

16.24 Cell Phone Safety

16.24.1 Cell Phone Use and Driving

The National Highway Traffic Safety Administration (NHTSA) published a report in 2001 titled *An Investigation of the Safety Implications of Wireless Communications in Vehicles*. Based on the NHTSA report, the following guidelines should be followed when using your cell phone in a vehicle:

- Minimize the use of cell phones while driving. To the extent possible, place calls ahead of time while in the office, home, or if on the road, at a location where you can safely pull off the road.
- If you receive an incoming call, let your voice mail answer it and call the person back after you have stopped the vehicle at a safe location.
- If you must use your phone while driving, use hands-free systems and get to know the features such as auto-redial, speed dial, and voice-activated dialing.
- Engage in short conversations. If lengthy discussions are required, suspend the conversation and find a safe place to stop before continuing the discussion.
- Do not take notes while talking on the phone and driving. (This may seem silly, but was not an uncommon observation made by the authors of the NHTSA report.)

Some of the findings in the NHTSA report are summarized below:

- The use of cell phones while driving increases the risk of an accident.
- Contributing factors included distractions while dialing, being startled when the cell phone rang, and the act of engaging in conversation.
- The most significant factor was the act of conversation. The implication of this is that hands-free systems do not mitigate the biggest hazard associated with the use of cell phones while driving.
- Dialing the cell phone, while a distraction, was similar to the distraction potential of manually tuning a car radio.
- There is currently insufficient data to determine the magnitude of the problem because of the inconsistency of reporting accident causes.
- The presence of cell phones in vehicles enhances the notification of emergency services when needed.
- While cellular telephones clearly have distraction potential from many standpoints, such effects may be minimized if drivers are aware of the hazards, are judicious in their use of the technology, and if ergonomically sound cellular telephone designs are used.
- Eighty-five percent of cell phone users use their cell phones while driving.

- Many cities and states either have passed or are considering legislation to regulate cell phone use while driving.

Additional information related to cell phone H&S can be found at the following websites:

www.nhtsa.dot.gov/people/injury/research/wireless

www.nejm.org/content/2001/0344/0002/0133.asp

www.fda.gov/cdrh/ocd/mobilephone.html

16.24.2 Radio Frequency Radiation

Some of the information related to radio frequency exposure and cell phone use available from recognized peer reviewed journals and government agencies are listed below:

- Numerous studies looking at the use of hand-held cell phones and risk of brain cancer have indicated no association between the use of cell phones and risk of brain cancer. This includes the two most recent studies published in the Journal of the American Medical Association (AMA) and the New England Journal of Medicine (NEJM), which are among the most comprehensive undertaken as of January 2001.
- Some of the studies conducted have indicated there are biological effects associated with exposure to the types and levels of radio frequency radiation associated with cell phone use; however, there is no consensus that these effects are harmful to people.
- An editorial published in the NEJM referencing a study published in its January 2001 issue concluded, "This study allays fears raised by alarmist reports that the use of cellular phones causes brain tumors. Of course, we do not have the final word on this question, and results of future investigations may modify our perspective. Nevertheless, we believe that it is highly unlikely that the use of cellular telephones substantially increases the risk of brain tumors."

Based on the information currently available, there is not a significant health hazard associated with radio frequency radiation exposure related to cell phones. Suggestions for limiting radio frequency radiation exposure related to cellular telephone use have been published by the Food and Drug Administration (FDA) and are listed below:

- Limit cell phone use. Where possible, hold lengthy conversations on conventional phones and use cell phones for short conversations and for situations when conventional phones are not available.
- When using a mobile phone or a cell phone in a vehicle, connect it to an antenna located outside the vehicle.
- Use a "hands free" headset and a remote antenna with the cell phone carried at the waist.
- Use a cell phone with a low specific absorption rate (SAR) as published by the Federal Communications Commission (FCC).

The FCC has published a list of SAR values for almost all cell phone models manufactured since 2000. The SAR is a measure of the amount of radio frequency radiation absorbed under certain test conditions. This information is available at www.fcc.gov/oet/rfsafety/.

CDM Smith Management of Change Form

Facility:	
Date:	Sunday, January 15, 2012
Description of Devices Affected	
Description of Change	

Nature of Proposed Change:

Operations	<input type="checkbox"/>	Procedures	<input type="checkbox"/>	Facility/Equipment	<input type="checkbox"/>
New Product/Materials	<input type="checkbox"/>	OIMS System Change	<input type="checkbox"/>	Other	<input type="checkbox"/>
Temporary	<input type="checkbox"/>	Permanent	<input type="checkbox"/>	Emergency	<input type="checkbox"/>
If temporary, indicate how long change will be in place					

Potential Impacts	
Controls this Change Requires	
Change to Program Documents	
Submitted by:	
Approved by:	

Continue discussion on blank pages if needed

APPENDIX C

MATERIAL SAFETY DATA SHEETS

Alconox

Hydrochloric Acid (HCl)

Hydrogen Sulfide

Isobutylene

Liquinox

Methane 4 Gas

Sodium Hydroxide (NAOH)

Nitric Acid 65%

Nitric Acid

pH 4 Buffer Solution

pH 7 Buffer Solution

pH 10 Buffer Solution

Turbidity 0 NTU Solution

Turbidity 1.0 NTU Solution

Turbidity 10.0 NTU Solution

SPI Supplies Division
Structure Probe, Inc.
P.O. Box 656 West Chester, PA 19381-0656 USA
Phone: 1-(610)-436-5400 Fax: 1-(610)-436-5755
E-mail: spi3spi@2spi.com
WWW: <http://www.2spi.com>
Manufacturer's CAGE: 1P573



Material Safety Data Sheet

SPI #01200-AB and #01200A-AB Alconox® Powdered Detergent

Section 1: Identification

Date Effective..... January 8, 2009
(most recent revision)

Chemical Name/Synonyms... On Label: Alconox®

Emergencies
Contacting CHEMTREC:

24 Hour Emergency Use Only #'s...
Worldwide phone: 1-(703)-527-3887
Worldwide FAX: 1-(703)-741-6090
Toll-free phone: 1-(800)-424-9300 USA only

Product or Trade Name.... SPI #01200-AB
SPI #01200A-AB
Alconox® Powdered Detergent



Hazardous Material Information System USA	Health	1	National Fire Protection Association USA	
	Fire Hazard	0		
	Reactivity	0		
	Personal Protection			

NFPA Rating:
(estimated) Health: 1; Flammability: 0; Reactivity: 0

Section 2: Composition

Component Name	CAS #	Percent	EC #
Sodium Dodecylbenzenesulfonate	25155-30-0	10-30	246-680-4
Sodium Carbonate	497-19-8	7-13	207-838-8
Tetrasodium Pyrophosphate	7722-88-5	10-30	231-767-1
Sodium Phosphate	7758-29-4	10-30	231-838-7

Section 3: Hazard Identification

Emergency overview: Routes of entry include skin contact, eye contact, inhalation, and ingestion. May cause irritation, abdominal pain, vomiting, diarrhea, or gastric distress

Appearance: White granular powder, nearly odorless.

Flash Point: None

Warning!

Target Organs: Eyes, skin.

Potential Health Effects

Eye: May cause irritation.

Skin: Prolonged contact may cause irritation.

Ingestion: May cause abdominal pain, vomiting, diarrhea, or gastric distress.

Inhalation: Particles may cause irritation.

Chronic: Contains a component that may be corrosive.

Section 4: First Aid Measures

Eyes: Upon contact, wash eyes thoroughly with copious amounts of water for at least 15 minutes, holding the eyes open. Seek medical attention.

Skin: Flush area with copious amounts of water. Remove contaminated clothing, wash thoroughly with soap and water. If irritation persists, seek medical attention.

Ingestion: Upon ingestion, dilute with 2-4 glasses of water. Do not induce vomiting. Seek medical attention.

Inhalation: Remove victim to fresh air. If symptoms persist, seek medical attention.

Notes to Physician: Treat supportively and symptomatically.

Section 5: Fire Fighting Measures

Autoignition Temperature: N/A

Flash Point: None.

General Information: Wear full protective equipment including self containing breathing apparatus.

Extinguishing Media: Carbon dioxide, dry chemical, foam, water, water fog.

Unusual Fire/Explosion Hazards: None

Hazardous combustion products: Oxides of carbon (COx).
Hydrocarbons.

Protection of fire fighters: No special measures are required.

Section 6: Accidental Release Measures

Spills/Leaks: Wear appropriate protective equipment. Contain the spill. Small amounts may be flushed to sewer with copious amounts of water. Soak up spill with absorbent material and place in appropriate disposal container.

Section 7: Handling and Storage

Handling: Always wear protective equipment appropriate to the task. Avoid contact with skin, eyes, and clothing. Launder contaminated clothing before reuse.

Avoid extreme temperatures and physical damage.

Storage: Store away from strong acids and strong oxidizing agents, in closed containers. Keep out of reach of children.

Section 8: Exposure Controls and Personal Protection

Engineering Controls: If exposure limit is exceeded, use a NIOSH approved respirator. Safety shower and eye wash stations should be readily accessible in work area.

Exposure Limits

Chemical Name	T.L.V.
Sodium Dodecylbenzenesulfonate	N/A
Sodium Carbonate	N/A
Tetrasodium Pyrophosphate	5 mg/m ³
Sodium Phosphate	N/A

Personal Protective Equipment

Eyes: Glasses with side shields or chemical splash goggles.

Skin: As necessary to prevent skin contact.

Clothing: Protective clothing such as long sleeves or a lab coat should be worn. Neoprene or nitrile gloves are recommended. When handling heated materials, also be sure to use heat-resistant gloves, boots and face protection.

Respirators: If exposure limit is exceeded, use a NIOSH approved respirator.

Section 9: Physical and Chemical Properties

Physical State: Solid.

Appearance: White granular powder.

Odor: Nearly odorless.

pH: 9.5 (1% aqueous solution).

Vapor Pressure: N/A

Vapor Density: N/A

Evaporation Rate: N/A

Viscosity: N/A

Boiling Point: N/A

Freezing/Melting Point: N/A

Autoignition Temperature: N/A

Flash Point: None

Decomposition Temperature: N/A

Explosion Limits:

Lower: N/A

Upper: N/A

Solubility in water: 100 -> 10% w/w

Specific Gravity/Density: 0.85-1.10 (water = 1).

Molecular Formula: N/A

Molecular Weight: N/A

Section 10: Stability and Reactivity

Chemical Stability: Stable under normal conditions.

Conditions to Avoid: None.

Incompatibility with Other Materials: Strong acids, strong oxidizers.

Hazardous Decomposition of Products: See hazardous combustion products.

Hazardous Polymerization: Will not occur.

Section 11: Toxicological Information

LD50: >5000 mg/kg (rat, oral).

LC50: N/A

Sensitization: N/A

Carcinogenicity: Not listed as a carcinogen.

Teratogenicity: N/A

Reproductive Effects: N/A

Neurotoxicity: N/A

Mutagenicity: N/A

Section 12: Ecological Information

Exotoxicity: N/A

Environmental Fate: N/A

Section 13: Disposal Considerations

Disposal: In accordance with local and federal regulations.

Section 14: Transport Information

ADR Classification: Not regulated.

Shipping Information: Not regulated.

Section 15: Regulatory Information

United States

SARA Codes

SARA Hazard Categories Sections 311/312:

Immediate (Acute) Health Hazard: Yes.
Delayed (Chronic) Health Hazard: No.
Fire Hazard: No.
Sudden Release of Pressure: No.
Reactive: No.

SARA Section 313: None.

TSCA: All components of this product are listed on the TSCA inventory.

State (Individual states in the USA): Neither this product nor any of its components appear on any state health hazard lists.

European/International Regulations:

Regulatory Information: EU labeling required.

Hazard Symbols Xi Irritant.

Risk Phrases:

R20: Harmful by inhalation.
R36/37/38: Irritating to eyes, respiratory system, and skin.

Safety Phrases:

- S2: Keep out of the reach of children.
- S8: Keep container dry.
- S22: Do not breathe dust.
- S24/25: Avoid contact with skin and eyes.

CAS# (EU#): 25155-30-0 (246-680-4).
 7758-29-4 (231-838-7).
 497-19-8 (207-838-8).
 7722-88-5 (231-767-1).

Canada

This product has a WHMIS classification of D2B.

DSL Status: All components of this product appear on the DSL.

Section 16: Other Information

If this product should be used in ways that are outside of the intended applications in scanning electron microscope laboratories, and if it is going to be formulated into some other system, so that it becomes just another component of that other system, read the MSDS sheets for the other components before blending as the resulting mixture may have the hazards of all of its parts.

Disclaimer of Liability:

Caution! Do not use SPI Supplies products or materials in applications involving implantation within the body; direct or indirect contact with the blood pathway; contact with bone, tissue, tissue fluid, or blood; or prolonged contact with mucous membranes. Products offered by SPI Supplies are not designed or manufactured for use in implantation in the human body or in contact with internal body fluids or tissues. SPI Supplies will not provide to customers making devices for such applications any notice, certification, or information necessary for such medical device use required by US FDA (Food and Drug Administration) regulation or any other statute.

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Wednesday October 06, 2010

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Conductivity Calibrator 1,000-100,000 micromho/cm

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision date: 04/04/2013

Supersedes: 03/04/2011

Version: 1.0

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

Product Identifier

Product name: Conductivity Calibrator 1,000-100,000 micromho/cm

Product code: 3161, 3163, 3165, 3167, 3168, 3169

Intended Use Of The Product

Use of the substance/preparation: Calibration of YSI Analytical equipment

Name, Address, And Telephone Of The Responsible Party

YSI
1700/1725 Brannum Lane
Yellow Springs, OH 45387

T 937-767-7241

www.ysi.com

MSDSinfo@ysi.com

Emergency Telephone Number

Emergency number : Within USA and Canada: 1-800-424-9300 - Outside USA and Canada: +1 703-527-3887
(collect calls accepted) CHEMTREC

SECTION 2: HAZARDS IDENTIFICATION

Classification Of The Substance Or Mixture

Classification (GHS-US)

Not classified

Label Elements

GHS-US labeling No labeling applicable

Other Hazards Not available

Unknown acute toxicity (GHS US) Not available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Substances

Mixture

Name	Product identifier	% (w/w)	Classification (GHS-US)
Water	(CAS No.) 7732-18-5	93 - 100	Not classified
Potassium chloride	(CAS No.) 7447-40-7	0.1 - 7	Eye Irrit. 2B, H320

Full text of H-phrases: see section 16

SECTION 4: FIRST AID MEASURES

Description Of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: When symptoms occur: go into open air and ventilate suspected area.

Skin Contact: Remove contaminated clothing. Drench affected area with water for at least 15 minutes.

Eye Contact: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

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Ingestion: Rinse mouth. Do NOT induce vomiting

Most Important Symptoms And Effects Both Acute and Delayed

General: Not available

Inhalation: None expected under normal conditions of use..

Skin Contact: May cause mild skin irritation..

Eye Contact: May cause eye irritation..

Ingestion: If a large quantity has been ingested: Diarrhea. Abdominal pain..

Chronic symptoms: Not available

Indication Of Any Immediate Medical Attention And Special Treatment Needed

If exposed or concerned, get medical advice and attention.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing Media

Suitable extinguishing media: Alcohol foam, polymer foam, dry chemical powder, carbon dioxide, water spray, fog.

Unsuitable extinguishing media: None known.

Special Hazards Arising From The Substance Or Mixture

Fire hazard: Not flammable.

Explosion hazard: Product is not explosive.

Reactivity: Hazardous reactions will not occur under normal conditions.

Advice For Firefighters

Precautionary measures fire: Not available

Firefighting instructions: Exercise caution when fighting any chemical fire.

Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection..

Hazardous Combustion Products: Upon heating, toxic fumes are formed. (chlorine). Potassium oxides.

Reference To Other Sections

Refer to section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment And Emergency Procedures

General measures: Handle in accordance with good industrial hygiene and safety practice.

For Non-Emergency Personnel

Protective equipment: Use appropriate personal protection equipment (PPE).

Emergency procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective equipment: Equip cleanup crew with proper protection.

Emergency procedures: Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters.

Methods And Material For Containment And Cleaning Up

For containment: Absorb and/or contain spill with inert material, then place in suitable container.

Methods for cleaning up: Clear up spills immediately and dispose of waste safely.

Reference To Other Sections

See heading 8, Exposure Controls and Personal Protection.

SECTION 7: HANDLING AND STORAGE

Precautions For Safe Handling

Hygiene measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions For Safe Storage, Including Any Incompatibilities

Storage conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use.

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Incompatible materials: Strong acids. Strong oxidizers.

Specific End Use(s)

Calibration of YSI Analytical equipment

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

No Occupational Exposure Limits (OELs) have been established for this product or its chemical components.

Exposure Controls

Appropriate engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Personal protective equipment: Safety glasses. Gloves.



Materials for protective clothing: Not available

Hand protection: Wear chemically resistant protective gloves.

Eye protection: Chemical goggles or safety glasses.

Skin and body protection: Not available

Respiratory protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits.

Other information: When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information On Basic Physical And Chemical Properties

Physical state	: Liquid
Appearance	: Clear
Odor	: Not available
Odor threshold	: Not available
pH	: 6.5 - 7.5
Relative evaporation rate (butyl acetate=1)	: Not available
Melting point	: Not available
Freezing point	: Not available
Boiling point	: 100 °C (212 °F)
Flash point	: Not available
Auto-ignition temperature	: Not available
Decomposition Temperature	: Not available
Flammability (solid, gas)	: Not available
Lower flammable limit	: Not available
Upper flammable limit	: Not available
Vapor pressure	: Not available
Relative vapor density at 20 °C	: Not available
Relative density	: Not available
Specific gravity density	: 1 g/ml
Solubility	: Not available
Log Pow	: Not available
Log Kow	: Not available
Viscosity, kinematic	: Not available
Viscosity, dynamic	: Not available

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Explosion data - sensitivity to mechanical impact : Not available

Explosion data - sensitivity to static discharge : Not available

SECTION 10: STABILITY AND REACTIVITY

Reactivity Hazardous reactions will not occur under normal conditions.

Chemical Stability Stable under normal conditions.

Possibility Of Hazardous Reactions Hazardous polymerization will not occur.

Conditions To Avoid Direct sunlight. Extremely high or low temperatures.

Incompatible Materials Strong acids. Strong oxidizers

Hazardous Decomposition Products Potassium oxides. Upon heating, toxic fumes are formed. (chlorine)

SECTION 11: TOXICOLOGICAL INFORMATION

Information On Toxicological Effects - Product

Acute toxicity : Not classified

LD50 and LC50 Data Not available

Skin corrosion/irritation: Not classified pH: 6.5 - 7.5

Serious eye damage/irritation: Not classified pH: 6.5 - 7.5

Respiratory or skin sensitization: Not classified

Germ cell mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Specific target organ toxicity (repeated exposure): Not classified

Reproductive toxicity: Not classified

Specific target organ toxicity (single exposure): Not classified

Aspiration hazard: Not classified

Symptoms/injuries after inhalation: None expected under normal conditions of use.

Symptoms/injuries after skin contact: May cause mild skin irritation.

Symptoms/injuries after eye contact: May cause eye irritation.

Symptoms/injuries after ingestion: If a large quantity has been ingested: Diarrhea. Abdominal pain.

Information On Toxicological Effects - Ingredient(s)

LD50 and LC50 Data

Potassium chloride (7447-40-7)	
LD50 oral rat	2600 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity

Potassium chloride (7447-40-7)	
LC50 fish 1	1060 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
EC50 Daphnia 1	825 mg/l (Exposure time: 48 h - Species: Daphnia magna)
EC50 other aquatic organisms 1	2500 mg/l (Exposure time: 72 h - Species: Desmodemus subspicatus)
LC50 fish 2	750 - 1020 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 2	83 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])

Persistence And Degradability

Conductivity Calibrator 1,000-100,000 micromho/cm	
Persistence and degradability	Not established.

Bioaccumulative Potential

Conductivity Calibrator 1,000-100,000 micromho/cm	
Bioaccumulative potential	Not established.

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Mobility In Soil Not available

Other Adverse Effects

Other information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste disposal recommendations: Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

SECTION 14: TRANSPORT INFORMATION

In accordance with ICAO/IATA/DOT/TDG

UN Number Not regulated for transport

UN Proper Shipping Name Not regulated for transport

Additional information Not regulated for transport

Overland transport Not regulated for transport

Transport by sea Not regulated for transport

Air transport Not regulated for transport

SECTION 15: REGULATORY INFORMATION

US Federal regulations

Potassium chloride (7447-40-7)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Water (7732-18-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State regulations

Potassium chloride (7447-40-7)

U.S. - Texas - Effects Screening Levels - Long Term

U.S. - Texas - Effects Screening Levels - Short Term

Canadian regulations

Conductivity Calibrator 1,000-100,000 micromho/cm

Uncontrolled product according to WHMIS classification criteria

Potassium chloride (7447-40-7)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification

Class D Division 2 Subdivision B - Toxic material causing other toxic effects

Water (7732-18-5)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification

Uncontrolled product according to WHMIS classification criteria

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by CPR.

SECTION 16: OTHER INFORMATION

Indication of changes : 04/04/2013

Other information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Eye Irrit. 2B

Serious eye damage/eye irritation Category 2B

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Party Responsible For The Preparation Of This Document:

YSI, EHS Manager
1700/1725 Brannum Lane
Dayton, OH 45387
937-767-7241 x433

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

North America GHS US 2012 & WHMIS

SAFETY DATA SHEET

M34514 NA_EN



Occidental Chemical Corporation

A subsidiary of Occidental Petroleum Corporation



HYDROCHLORIC ACID (HCl) (ALL GRADES)

MSDS No.: M34514

Rev. Date: 09-Aug-2012

Rev. Num. 06

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Company Identification: Occidental Chemical Corporation
5005 LBJ Freeway
P.O. Box 809050
Dallas, TX 75380-9050

24 Hour Emergency Telephone Number: 1-800-733-3665 or 1-972-404-3228 (U.S.); CHEMTREC (U.S.): 1-800-424-9300; CHEMTREC (outside U.S.): +1 703-527-3887

To Request an SDS: MSDS@oxy.com or 1-972-404-3245

Customer Service: 1-800-752-5151 or 1-972-404-3700

Trade Name: Hydrochloric Acid (HCl) aqueous all grades

Synonyms: Muriatic Acid, HCl Solution, Aqueous hydrogen chloride

Product Use: Process chemical, Metal cleaning, Water purification, Petroleum Industry

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

Color: Colorless
Physical State: Liquid
Appearance: Clear
Odor: Irritating, Pungent, Sharp

Signal Word: Danger

HYDROCHLORIC ACID (HCl) (ALL GRADES)

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MAJOR HEALTH HAZARDS: CAUSES BURNS TO THE RESPIRATORY TRACT, SKIN AND EYES. CAUSES PERMANENT EYE DAMAGE. DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING.

PHYSICAL HAZARDS: May spatter or generate heat when mixed with water. Contact with metals may evolve flammable hydrogen gas.

PRECAUTIONARY STATEMENTS: Do not breathe vapor or mist. Do not get in eyes, on skin, or on clothing. Do not taste or swallow. Wash thoroughly after handling. Use only with adequate ventilation.

POTENTIAL HEALTH EFFECTS:

Inhalation: May cause irritation (possibly severe), chemical burns, and pulmonary edema.

Skin contact: May cause irritation (possibly severe) and chemical burns.

Eye contact: May cause irritation (possibly severe), chemical burns, eye damage, and blindness.

Ingestion: Not a likely route of exposure.

Chronic Effects: Repeated or prolonged exposure to dilute solutions may result in dermatitis. Discoloration of the teeth may occur as a result of long term exposure.

Interaction with Other Chemicals Which Enhance Toxicity: None known.

Medical Conditions Aggravated by Exposure: None known.

See Section 11: TOXICOLOGICAL INFORMATION

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	%	CAS Number
Hydrogen chloride	9 - 36	7647-01-0
Water	63 - 91	7732-18-5

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer basic life support (Cardio-Pulmonary Resuscitation and/or Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.

SKIN CONTACT: Immediately flush contaminated areas with water. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. GET MEDICAL ATTENTION IMMEDIATELY.

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EYE CONTACT: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION: Not a likely route of exposure.

5. FIRE-FIGHTING MEASURES

Fire Hazard: Negligible fire hazard.

Extinguishing Media: Use media appropriate for surrounding fire.

Fire Fighting: Keep unnecessary people away, isolate hazard area and deny entry. Wear NIOSH approved positive-pressure self-contained breathing apparatus operated in pressure demand mode. Move container from fire area if it can be done without risk. Cool non-leaking containers with water. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Flash point: Not flammable

Hazardous Combustion Products: Hydrogen chloride, Chlorine, Hydrogen gas

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Remove sources of ignition. Wear appropriate personal protective equipment recommended in Section 8 of the SDS. Stop leak if possible without personal risk. Consider evacuation of personnel located downwind if material is leaking. Shut off ventilation system if needed. Completely contain spilled material with dikes, sandbags, etc. Neutralize with soda ash or dilute caustic soda. Collect with appropriate absorbent and place into suitable container. Liquid material may be removed with a properly rated vacuum truck. Keep out of water supplies and sewers. This material is acidic and may lower the pH of the surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies.

7. HANDLING AND STORAGE

Storage Conditions: Store and handle in accordance with all current regulations and standards. Store in rubber-lined steel, acid-resistant plastic or glass containers. Keep container tightly closed. Store in a cool, dry area. Store in a well-ventilated area. Keep away from heat, sparks and open flames. Keep separated from incompatible substances (see Section 10 of SDS). Do not store in aluminum container or use aluminum fittings or transfer lines. Protect from physical damage. Dike and vent storage tanks.

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Handling Procedures: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Regulatory Exposure Limit(s): As listed below

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrogen chloride 7647-01-0	-----	-----	5 ppm 7 mg/m ³

OEL: Occupational Exposure Limit; **OSHA:** United States Occupational Safety and Health Administration; **PEL:** Permissible Exposure Limit; **TWA:** Time Weighted Average; **STEL:** Short Term Exposure Limit

Non-Regulatory Exposure Limit(s): As listed below

Component	CAS Number	ACGIH TWA	ACGIH STEL	ACGIH Ceiling	OSHA TWA (Vacated)	OSHA STEL (Vacated)	OSHA Ceiling (Vacated)
Hydrogen chloride	7647-01-0	-----	-----	2 ppm	-----	-----	5 ppm 7 mg/m ³

- The American Conference of Governmental Industrial Hygienists (ACGIH) is a voluntary organization of professional industrial hygiene personnel in government or educational institutions in the United States. The ACGIH develops and publishes recommended occupational exposure limits each year called Threshold Limit Values (TLVs) for hundreds of chemicals, physical agents, and biological exposure indices.

ENGINEERING CONTROLS: Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear chemical safety goggles with a face-shield to protect against eye and skin contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear chemical resistant clothing and rubber boots when potential for contact with the material exists. Always place pants legs over boots.

Hand Protection: Wear appropriate chemical resistant gloves. Consult a glove supplier for assistance in selecting an appropriate chemical resistant glove.

Protective Material Types: Nitrile, Neoprene, Butyl rubber, Polyvinyl chloride (PVC), Responder®, Trelchem® HPS, Tychem®

Component	Immediately Dangerous to Life/ Health (IDLH)
Hydrogen chloride	50 ppm IDLH

Respiratory Protection: A NIOSH approved full-face respirator equipped with acid gas cartridges (appropriate for hydrogen chloride) may be permissible when symptoms have been observed that are indicative of overexposure. When the level may be above the IDLH, use an SCBA or pressure-demand supplied air with an auxiliary self-contained escape pack. Pressure-demand SCBA (self-contained breathing apparatus) must be used when there is a potential for uncontrolled release or unknown concentrations. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

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9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Clear
Color:	Colorless
Odor:	Irritating, Pungent, Sharp
Odor Threshold:	0.3 ppm (causes olfactory fatigue)
Molecular Weight:	36.46
Molecular Formula:	HCl
Boiling Point/Range:	140 - 221°F (60 - 105 °C)
Freezing Point/Range:	-29 to 5 °F (-34 to -15 °C)
Vapor Pressure:	14.6 - 80 mmHg @ 20 °C
Vapor Density (air=1):	1.3 @ 20 °C
Specific Gravity (water=1):	1.05 - 1.18
Density:	8.75 - 9.83 lbs/gal
Water Solubility:	100%
pH:	2 @ (0.2% solution)
Volatility:	9 - 36% by volume
Evaporation Rate (ether=1):	< 1.00 (butyl acetate = 1)
Flash point:	Not flammable

10. STABILITY AND REACTIVITY

Reactivity/ Stability: Stable at normal temperatures and pressures.

Conditions to Avoid: Avoid heat, flames, sparks and other sources of ignition. Avoid contact with water. Will react with some metals forming flammable hydrogen gas. Hydrogen chloride may react with cyanide, forming lethal concentrations of hydrocyanic acid. Avoid contact with incompatible materials.

Incompatibilities/ Materials to Avoid: Metals, Alkalis, Oxidizing agents, Mercuric sulfate, Perchloric acid, Carbides of calcium, cesium, rubidium, Acetylides of cesium and rubidium, Phosphides of calcium and uranium, Lithium silicide

Hazardous Decomposition Products: chlorine, hydrogen chloride, hydrogen gas

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

IRRITATION DATA: As listed below

Standard Draize (Eye):	rabbit-eye mild
Standard Draize (Skin):	human-skin mild

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TOXICITY DATA:

Component	LD50 Oral:	LC50 Inhalation:	LD50 Dermal:
Hydrogen chloride	700 mg/kg (Rat)	3124 ppm (1 hr-Rat)	5010 mg/kg (Rabbit)
Water	900 mg/kg (Rabbit)	1108 ppm (1hr-Rat)	

TOXICITY:

Inhalation will cause severe irritation and possible burns with coughing and choking. If inhaled deeply, edema and hemorrhage of the lungs may occur. Prolonged exposure may cause discoloration and/or erosion of teeth. Contact with eyes causes immediate severe irritation with possible burns, permanent visual impairment, or total loss of sight. Skin contact with this material may cause severe irritation and corrosion of tissue. Ingestion may cause immediate burns of the mouth, esophagus, and stomach. Ingestion may cause intense pain, nausea, vomiting, bleeding, circulating collapse, shock, and death.

CARCINOGENICITY: This product is not classified as a carcinogen by NTP, IARC or OSHA.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

- **Aquatic Toxicity:**
LC50 *Gambusia affinis*: 282 mg/L 96 hr.
- **Fish Toxicity:**
LC50 Goldfish: 178 mg/L (1 to 2 hour survival time)
- **Freshwater Fish Toxicity:**
LC50 Bluegill: 3.6 mg/L 48 hr
- **Invertebrate Toxicity:**
LC50 Shrimp: 100 - 330 mg/L

FATE AND TRANSPORT:

BIODEGRADATION: This material is inorganic and not subject to biodegradation.

PERSISTENCE: This material is believed not to persist in the environment. This material is believed to exist in the disassociated state in the environment. If released to soil, hydrogen chloride will sink into the soil. The acid will dissolve some soil material (in particular, anything with a carbonate base) and will be somewhat neutralized. The remaining portion is thought to transport downward to the water table. If released to water, it dissociates almost completely and will be neutralized by natural alkalinity and carbon dioxide.

BIOCONCENTRATION: This material is not expected to bioconcentrate in organisms.

ADDITIONAL ECOLOGICAL INFORMATION: This material has exhibited toxicity to terrestrial organisms. May decrease pH of waterways and adversely affect aquatic life.

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13. DISPOSAL CONSIDERATIONS

Reuse or reprocess, if possible. All disposals of this material must be done in accordance with local, state and federal regulations. Dispose in accordance with all applicable regulations. May be subject to disposal regulations: U.S. EPA 40 CFR 261.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

UN NUMBER: UN1789
PROPER SHIPPING NAME: Hydrochloric acid solution
HAZARD CLASS/ DIVISION: 8
PACKING GROUP: II
LABELING 8
REQUIREMENTS:
RQ (lbs): RQ 5,000 Lbs. (Hydrochloric acid)

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

UN NUMBER: UN1789
SHIPPING NAME: Hydrochloric acid solution
CLASS OR DIVISION: 8
PACKING/RISK GROUP: II

15. REGULATORY INFORMATION

U.S. REGULATIONS

OSHA REGULATORY STATUS:

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): If a release is reportable under CERCLA section 103, notify the state emergency response commission and local emergency planning committee. In addition, notify the National Response Center at (800) 424-8802 or (202) 426-2675.

Component	CERCLA Reportable Quantities:
Hydrogen chloride	5000 lb (final RQ)

EPCRA EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):

If a release is reportable under EPCRA, notify the state emergency response commission and local emergency planning committee. If the TPQ is met, facilities are subject to reporting requirements under EPCRA Sections 311 and 312.

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Component	EPCRA RQs	Threshold Planning Quantity (TPQs)
Hydrogen chloride	5000 lb (EPCRA RQ)	500 lb (TPQ) gas only

EPCRA SECTIONS 311/312 HAZARD CATEGORIES (40 CFR 370.10):

Acute Health Hazard, Reactive Hazard

EPCRA SECTION 313 (40 CFR 372.65):

The following chemicals are listed in 40 CFR 372.65 and may be subject to Community Right-to Know Reporting requirements.

Component	Status:
Hydrogen chloride	Listed – Aerosol form only

OSHA PROCESS SAFETY (PSM) (29 CFR 1910.119): Not regulated

NATIONAL INVENTORY STATUS

U.S. INVENTORY STATUS: Toxic Substance Control Act (TSCA): All components are listed or exempt

TSCA 12(b): This product is not subject to export notification

Canadian Chemical Inventory: All components of this product are listed on either the DSL or the NDSL.

STATE REGULATIONS

California Proposition 65:

This product is not listed, but it may contain impurities/trace elements known to the State of California to cause cancer or reproductive toxicity as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act.

Hydrogen chloride	
California Proposition 65 Cancer WARNING:	Not Listed
California Proposition 65 CRT List - Male reproductive toxin:	Not Listed
California Proposition 65 CRT List - Female reproductive toxin:	Not Listed
Massachusetts Right to Know Hazardous Substance List	Listed
New Jersey Right to Know Hazardous Substance List	sn 1012; sn 2909 (gas only)
New Jersey Special Health Hazards Substance List	corrosive
New Jersey - Environmental Hazardous Substance List	Listed
Pennsylvania Right to Know Hazardous Substance List	Listed
Pennsylvania Right to Know Special Hazardous Substances	Not Listed
Pennsylvania Right to Know Environmental Hazard List	Listed
Rhode Island Right to Know Hazardous Substance List	Listed

CANADIAN REGULATIONS

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.

Canada - CEPA Schedule I - Toxic Substance list	Not Listed
WHMIS - Classifications of Substances:	• E - Corrosive material

HYDROCHLORIC ACID (HCl) (ALL GRADES)

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16. OTHER INFORMATION

Prepared by: OxyChem Corporate HESS - Product Stewardship

Disclaimer:

This information is intended solely for the use of individuals trained in the NFPA and/or HMIS systems.

HMIS: (SCALE 0-4) (Rated using National Paint & Coatings Association HMIS: Rating Instructions, 2nd Edition)

Health: 3 **Flammability:** 0 **Reactivity:** 1

NFPA 704 - Hazard Identification Ratings (SCALE 0-4)

Health: 3 **Flammability:** 0 **Reactivity:** 1

Reason for Revision:

- Updated 24 Hour Emergency Telephone Number: SEE SECTION 1
- PPE recommendations have been modified: SEE SECTION 8
- Updated Transportation Information: SEE SECTION 14
- Revised California Proposition 65 Statement: SEE SECTION 15
- Revised Preparer Information: SEE SECTION 16
- Added "End of Safety Data Sheet" phrase

IMPORTANT:

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OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Safety Data Sheet available to your employees.

End of Safety Data Sheet



AGA GAS, INC. (216) 642-6600
6055 ROCKSIDE WOODS BLVD
P.O. BOX 94737
CLEVELAND, OH 44101-4737

**MATERIAL
SAFETY
DATA SHEET**

No. 038

PRODUCT NAME Hydrogen Sulfide	CAS # 7783-06-4
TRADE NAME AND SYNONYMS Hydrogen Sulfide, (D.O.T.)	DOT I.D. No.: UN 1053 RQ 100(45.4)
CHEMICAL NAME AND SYNONYMS Hydrogen Sulfide; Sulfuretted Hydrogen	DOT Hazard Class: Division 2.3
ISSUE DATES AND REVISIONS Revised May 1998	Formula H ₂ S
	Chemical Family: Nonmetal Hydride

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT TWA = 10 Molar PPM; STEL = 15 Molar PPM (ACGIH 1997). OSHA 1995 Acceptable ceiling concentration = 20 Molar PPM (Continued on Page 4)
SYMPTOMS OF EXPOSURE Continuous exposure to low (15-50 ppm) concentration will generally cause irritation to mucous membranes and conjunctivae of the eyes. It may also cause headache, dizziness, or nausea. Higher concentrations (200-300 ppm) can result in respiratory arrest leading to coma or unconsciousness. Exposures for more than 30 minutes at concentrations of greater than 700 ppm have been fatal. Continuous inhalation of low concentrations may (Continued on Page 4)
TOXICOLOGICAL PROPERTIES Inhalation of hydrogen sulfide is highly toxic. It is also an irritant to mucous tissue, membranes and the conjunctivae of the eyes. Continued exposure renders the olfactory sensors inoperative. Toxicologically its reaction with enzymes in the bloodstream inhibit cell respiration resulting in pulmonary paralysis, sudden collapse and death. This overshadows its irritant effect on mucous membranes and tissues which at worst will cause pulmonary edema or conjunctival lesions. Hydrogen sulfide is not listed in the IARC, NTP or by OSHA as a carcinogen or potential carcinogen. (Continued on Page 4)
RECOMMENDED FIRST AID TREATMENT PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HYDROGEN SULFIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF FIRE OR EXPLOSION HAZARD. RESCUE PERSONNEL SHOULD RECOGNIZE THE HAZARDS OF OVEREXPOSURE DUE TO OLFACTORY FATIGUE. Inhalation: Extreme fire hazard when rescuing semiconscious or unconscious persons due to flammability of hydrogen sulfide. Avoid use of rescue equipment which might contain ignition sources or cause static discharge. Move affected person to an uncontaminated area. If breathing has stopped, give assisted respiration. Oxygen or a mixture of 57 carbon dioxide in oxygen should be administered by a qualified person. Keep victim warm and calm. Seek immediate medical assistance. Further treatment should be symptomatic and supportive. (Continued on Page 4)

Information contained in this material safety data sheet is offered without charge for use by technically qualified personnel at their discretion and risk. All statements, technical information and recommendations contained herein are based on tests and data which we believe to be reliable, but the accuracy or completeness thereof is not guaranteed and no warranty of any kind is made with respect thereto. This information is not intended as a license to operate under or a recommendation to practice or infringe any patent of this Company or others covering any process, composition of matter or use.
Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product.

Hydrogen Sulfide

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	
Hydrogen sulfide will explode or burn over a wide range of mixtures in air. It becomes dangerously reactive when mixed with concentrated nitric acid or other strong oxidizers such as sulfuric acid. Vapors will combust spontaneously when mixed with vapors of chlorine, oxygen difluoride or nitrogen trifluoride.	
PHYSICAL DATA	
BOILING POINT -76°F (-60°C)	LIQUID DENSITY AT BOILING POINT 57.1 lb/ft ³ (915 kg/m ³)
VAPOR PRESSURE @ 70°F (21.1°C) 267 psia (1840 kPa)	GAS DENSITY AT 70°F, 1 atm .091 lb/ft ³ (1.46 kg/m ³)
SOLUBILITY IN WATER Soluble	FREEZING POINT -117°F (-82.8°C)
EVAPORATION RATE N/A (Gas)	SPECIFIC GRAVITY (AIR=1) @70°F (21.1°C) = 1.21
APPEARANCE AND ODOR Shipped and stored as a liquid under its own vapor pressure. Vapor is colorless with a characteristic "rotten egg" odor.	

FIRE AND EXPLOSION HAZARD DATA		
FLASH POINT (Method used) N/A (Gas)	AUTO IGNITION TEMPERATURE 554°F (290°C)	FLAMMABLE LIMITS % BY VOLUME (See Page 4) LE 4.0 UEL 44.0
EXTINGUISHING MEDIA Carbon dioxide, dry chemical or water spray		ELECTRICAL CLASSIFICATION NEC Class 1
SPECIAL FIRE FIGHTING PROCEDURES Shut off flow of gas. Cool surrounding fire-exposed containers with water spray. Fire fighters should use self-contained breathing apparatus.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Hydrogen sulfide is slightly heavier than air so may accumulate in low spots and may "travel" a considerable distance to a flame or other source of ignition.		

REACTIVITY DATA		
STABILITY Unstable		CONDITIONS TO AVOID Avoid heat, flame or other sources of ignition.
Stable	X	
INCOMPATIBILITY (Materials to avoid) Concentrated nitric acid, chlorine, nitrogen trifluoride, oxygen difluoride or other strong oxidizing agents.		
HAZARDOUS DECOMPOSITION PRODUCTS Oxides of sulfur		
HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID None
Will Not Occur	X	

SPILL OR LEAK PROCEDURES	
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in use r's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.	
WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container <u>properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place</u> to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.	

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)		Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.	
VENTILATION Hood with forced ventilation	LOCAL EXHAUST To prevent accumulation above the TWA	SPECIAL	N/A
	MECHANICAL (Gen.) N/A	OTHER	N/A
PROTECTIVE GLOVES Neoprene or butyl rubber, PVC, polyethylene			
EYE PROTECTION Safety goggles or glasses			
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountain"			

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION			
DOT Shipping Name:	Hydrogen sulfide	DOT Hazard Class:	Division 2.3
DOT Shipping Labels:	Toxic Gas; Flammable gas	I.D. No.:	UN 1053 RQ 100(45.4)
SPECIAL HANDLING RECOMMENDATIONS			
<p>Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<750 psig) piping or systems.</p> <p>Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.</p>			
SPECIAL STORAGE RECOMMENDATIONS			
<p>Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of noncombustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.</p> <p>For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1 and G-12.</p>			
SPECIAL PACKAGING RECOMMENDATIONS			
<p>Many metals corrode rapidly with wet hydrogen sulfide. Anhydrous (water content <- 40°F or C) hydrogen sulfide can be handled in carbon steel, aluminum, Inconel®, Stellite® and 304 and 316 stainless steels. Avoid hard steels which are highly stressed since they may be susceptible to hydrogen embrittlement from hydrogen sulfide.</p>			
OTHER RECOMMENDATIONS OR PRECAUTIONS			
<p>Earth-ground and bond all lines and equipment associated with the hydrogen sulfide system. All electrical equipment should be non-sparking or explosion proof. Do not rely on the olfactory sense to detect the presence of hydrogen sulfide. Analytical devices and instrumentation are readily available for this purpose. Perform frequent analytical tests to be certain that the TWA is not being exceeded.</p>			
(Continued on Page 4)			

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

Hydrogen Sulfide

HEALTH HAZARD

TIME WEIGHTED AVERAGE EXPOSURE LIMIT - Continued

with an acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift of 50 Molar PPM for 10 mins. once only if no other measurable exposure occurs.

SYMPTOMS OF EXPOSURE - Continued

cause olfactory fatigue or paralysis rendering the detection of its presence by odor ineffective.

TOXICOLOGICAL PROPERTIES - Continued

Persons in ill health where such illness would be aggravated by exposure to hydrogen sulfide should not be allowed to work with or handle this product.

RECOMMENDED FIRST AID TREATMENT - Continued

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO HYDROGEN SULFIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for at least 15 minutes.

SPECIAL PRECAUTIONS

OTHER RECOMMENDATIONS OR PRECAUTIONS - Continued

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles.

Hydrogen Sulphide is considered a toxic chemical and is subject to the reporting requirements of SARA, Title III, Section 313.

NFPA No. for hydrogen sulfide = 3 4 0 None



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR

MSDS NO: 248

Version:3

Date: August, 2010

1. Chemical Product and Company Identification

Gasco Affiliates, LLC
320 Scarlett Blvd.
Oldsmar, FL 34677

TELEPHONE NUMBER: (800) 910-0051

24-HOUR EMERGENCY NUMBER: 1-800-424-9300

FAX NUMBER: (866) 755-8920

E-MAIL: info@gascogas.com

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR

CHEMICAL NAME: Isobutylene in air

COMMON NAMES/ SYNONYMS: None

TDG (Canada) CLASSIFICATION: 2.2

WHIMIS CLASSIFICATION: A

2. COMPOSITION/ INFORMATION ON INGREDIENTS

INGREDIENT	%VOLUME	PEL-OSHA	TLV-ACGIH	LD ₅₀ or LC ₅₀ Route/Species
Isobutylene FORMULA: C ₄ H ₈	0.0001-0.9	N/A	N/A	N/A
Air FORMULA: Mixture	99.0 to 99.9999	N/A	N/A	N/A

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Release of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly ventilated environments); individuals in such atmospheres may be asphyxiated. Isobutylene may cause drowsiness and other central nervous system effects in high concentrations; however, due to the low concentration of this gas mixture, this is unlikely to occur.

ROUTE OF ENTRY:

Skin Contact
No

Skin Absorption
No

Eye Contact
No

Inhalation
Yes

Ingestion
No

HEALTH EFFECTS:

Exposure Limits
Yes

Irritant
No

Sensitization
No

Reproductive Hazard
No

Mutagen
No

Carcinogenicity: --NTP: No IARC: No OSHA: No

EYE EFFECTS:

N/A.

SKIN EFFECTS:

N/A.



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR

INGESTION EFFECTS:

Ingestion unlikely. Gas at room temperature.

INHALATION EFFECTS:

Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under normal routine use.

NFPA HAZARD CODES

Health: 1
Flammability: 0
Reactivity: 0

HMIS HAZARD CODES

Health: 1
Flammability: 0
Reactivity: 0

RATING SYSTEM

0= No Hazard
1= Slight Hazard
2= Moderate Hazard
3= Serious Hazard
4= Severe Hazard

4. FIRST AID MEASURES

EYES:

N/A

SKIN:

N/A

INGESTION:

Not required

INHALATION:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

5. FIRE-FIGHTING MEASURES

These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be projected considerable distances - thereby hampering fire fighting efforts.

6. ACCIDENTAL RELEASE MEASURES

In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

7. HANDLING AND STORAGE

Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Use adequate ventilation for extended use of gas.



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

PRODUCT NAME: ISOBUTYLENE (1 PPM – 0.9%) IN AIR

9. PHYSICAL AND CHEMICAL PROPERTIES

PARAMETER:	VALUE:
Physical state	: Gas
Evaporation point	: N/A
pH	: N/A
Odor and appearance	: Colorless, odorless gas

10. STABILITY AND REACTIVITY

Stable under normal conditions. Expected shelf life 48 months.

11. TOXICOLOGICAL INFORMATION

No toxicological damage caused by this product.

12. ECOLOGICAL INFORMATION

No ecological damage caused by this product.

13. DISPOSAL INFORMATION

Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured; but GASCO encourages the consumer to return cylinders.

14. TRANSPORT INFORMATION

	<u>United States DOT</u>	<u>Canada TDG</u>
PROPER SHIPPING NAME:	Compressed Gas N.O.S. (Isobutylene in Air)	Compressed Gas N.O.S. (Isobutylene in Air)
HAZARD CLASS:	2.2	2.2
IDENTIFICATION NUMBER:	UN1956	UN1956
SHIPPING LABEL:	NONFLAMMABLE GAS	NONFLAMMABLE GAS

15. REGULATORY INFORMATION

Isobutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

16. OTHER INFORMATION

This MSDS has been prepared in accordance with the Chemicals (Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of GASCO, and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.

MSDS/S010/248/ August, 2010

Safety Data Sheet

acc. to OSHA HCS

Printing date 05/16/2013

Reviewed on 05/16/2013

1 Identification of the substance/mixture and of the company/undertaking

- **Product identifier**
- **Trade name:** LIQUINOX
- **Article number:** 60515, 60516, 60517, 60518
- **Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.
- **Application of the substance / the preparation** Laboratory chemicals
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**
Electron Microscopy Sciences
1560 Industry Road
USA-Hatfield, PA 19440
Tel: 215-412-8400 Fax: 215-412-8450
email: sgkcck@aol.com
www.emsdiasum.com
- **Information department:** Product safety department
- **Emergency telephone number:**
ChemTrec 1-800-424-9300 Contract CCN7661
1-703-527-3887

2 Hazards identification

- **Classification of the substance or mixture**
- **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**
 **Harmful**
Harmful if swallowed.
- **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of international guidelines.
- **Classification system:**
The classification was made according to the latest editions of international substances lists, and expanded upon from company and literature data.

- **Label elements**
- **Labelling according to EU guidelines:**
The product has been classified and marked in accordance with directives on hazardous materials.
- **Code letter and hazard designation of product:**
 **Harmful**
- **Hazard-determining components of labelling:**
sodium dodecylbenzenesulphonate, pure
- **Risk phrases:**
Harmful if swallowed.
- **Safety phrases:**
Do not breathe gas/fumes/vapour/spray (appropriate wording to be specified by the manufacturer).
Wear suitable protective clothing.
This material and its container must be disposed of as hazardous waste.

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USA

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Trade name: **LIQUINOX**

(Contd. of page 1)

- **Classification system:**
- **NFPA ratings (scale 0 - 4)**



- **HMIS-ratings (scale 0 - 4)**

HEALTH	2	Health = 2
FIRE	0	Fire = 0
REACTIVITY	0	Reactivity = 0

- **Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.

3 Composition/information on ingredients

- **Chemical characterization: Mixtures**
- **Description:** Mixture of the substances listed below with nonhazardous additions.

- **Dangerous components:**

25155-30-0	sodium dodecylbenzenesulphonate, pure	Acute Tox. 3, H301	25-50%
------------	---------------------------------------	--------------------	--------

4 First aid measures

- **Description of first aid measures**
- **General information:**
Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.
- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:** Generally the product does not irritate the skin.
- **After eye contact:** Rinse opened eye for several minutes under running water.
- **After swallowing:** Immediately call a doctor.
- **Information for doctor:**
- **Most important symptoms and effects, both acute and delayed** No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Firefighting measures

- **Extinguishing media**
- **Suitable extinguishing agents:**
CO₂, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **Special hazards arising from the substance or mixture** No further relevant information available.
- **Advice for firefighters**
- **Protective equipment:** No special measures required.

USA

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Trade name: **LIQUINOX**

(Contd. of page 2)

6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures** Not required.
- **Environmental precautions:**
Dilute with plenty of water.
Do not allow to enter sewers/ surface or ground water.
- **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Dispose contaminated material as waste according to item 13.
Ensure adequate ventilation.
- **Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

- **Handling:**
- **Precautions for safe handling**
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of aerosols.
- **Information about protection against explosions and fires:** No special measures required.
- **Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by storerooms and receptacles:** No special requirements.
- **Information about storage in one common storage facility:** Not required.
- **Further information about storage conditions:** None.
- **Specific end use(s)** No further relevant information available.

8 Exposure controls/personal protection

- **Additional information about design of technical systems:** No further data; see item 7.
- **Control parameters**
- **Components with limit values that require monitoring at the workplace:**
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.
- **Additional information:** The lists that were valid during the creation were used as basis.
- **Exposure controls**
- **Personal protective equipment:**
- **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Wash hands before breaks and at the end of work.
- **Breathing equipment:**
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use respiratory protective device that is independent of circulating air.
- **Protection of hands:**
The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

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- **Material of gloves**

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

- **Penetration time of glove material**

The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

- **Eye protection:** Goggles recommended during refilling.

9 Physical and chemical properties

- **Information on basic physical and chemical properties**

- **General Information**

- **Appearance:**

Form:	Liquid
Color:	Colorless
Odor:	Odorless
Odour threshold:	Not determined.

- **pH-value:** Not determined.

- **Change in condition**

Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	100 °C (212 °F)

- **Flash point:** Not applicable.

- **Flammability (solid, gaseous):** Not applicable.

- **Ignition temperature:**

Decomposition temperature:	Not determined.
-----------------------------------	-----------------

- **Auto igniting:** Product is not selfigniting.

- **Danger of explosion:** Product does not present an explosion hazard.

- **Explosion limits:**

Lower:	Not determined.
Upper:	Not determined.

- **Vapor pressure at 20 °C (68 °F):** 23 hPa (17 mm Hg)

- **Density:** Not determined.

- **Relative density** Not determined.

- **Vapour density** Not determined.

- **Evaporation rate** Not determined.

- **Solubility in / Miscibility with**

Water:	Fully miscible.
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- **Partition coefficient (n-octanol/water):** Not determined.

- **Viscosity:**

Dynamic:	Not determined.
-----------------	-----------------

Kinematic:	Not determined.
-------------------	-----------------

- **Solvent content:**

Organic solvents:	0.0 %
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Water:	70.0 %
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Trade name: **LIQUINOX**

(Contd. of page 4)

· **Other information** *No further relevant information available.*

10 Stability and reactivity

- **Reactivity**
- **Chemical stability**
- **Thermal decomposition / conditions to be avoided:** *No decomposition if used according to specifications.*
- **Possibility of hazardous reactions** *No dangerous reactions known.*
- **Conditions to avoid** *No further relevant information available.*
- **Incompatible materials:** *No further relevant information available.*
- **Hazardous decomposition products:** *No dangerous decomposition products known.*

11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:**
- **Primary irritant effect:**
- **on the skin:** *No irritant effect.*
- **on the eye:** *No irritating effect.*
- **Sensitization:** *No sensitizing effects known.*
- **Additional toxicological information:**
The product shows the following dangers according to internally approved calculation methods for preparations:
Harmful
- **Carcinogenic categories**

- **IARC (International Agency for Research on Cancer)**

None of the ingredients is listed.

- **NTP (National Toxicology Program)**

None of the ingredients is listed.

12 Ecological information

- **Toxicity**
- **Aquatic toxicity:** *No further relevant information available.*
- **Persistence and degradability** *No further relevant information available.*
- **Behavior in environmental systems:**
- **Bioaccumulative potential** *No further relevant information available.*
- **Mobility in soil** *No further relevant information available.*
- **Additional ecological information:**
- **General notes:**
Water hazard class 2 (Self-assessment): hazardous for water
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
- **Results of PBT and vPvB assessment**
- **PBT:** *Not applicable.*
- **vPvB:** *Not applicable.*
- **Other adverse effects** *No further relevant information available.*

USA

(Contd. on page 6)

Safety Data Sheet

acc. to OSHA HCS

Printing date 05/16/2013

Reviewed on 05/16/2013

Trade name: LIQUINOX

(Contd. of page 5)

13 Disposal considerations

- **Waste treatment methods**
- **Recommendation:**
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- **Uncleaned packagings:**
- **Recommendation:** Disposal must be made according to official regulations.
- **Recommended cleansing agent:** Water, if necessary with cleansing agents.

14 Transport information

- | | |
|---|--|
| · UN-Number | UN2810 |
| · DOT, ADR, IMDG, IATA | UN2810 |
| · UN proper shipping name | TOXIC LIQUID, ORGANIC, N.O.S. (sodium dodecylbenzenesulphonate, pure) |
| · DOT, IMDG, IATA | 2810 TOXIC LIQUID, ORGANIC, N.O.S. (sodium dodecylbenzenesulphonate, pure) |
| · ADR | 2810 TOXIC LIQUID, ORGANIC, N.O.S. (sodium dodecylbenzenesulphonate, pure) |
| · Transport hazard class(es) | |
| · DOT | |
|  | |
| · Class | 6.1 Toxic substances. |
| · Label | 6.1 |
| · ADR, IMDG, IATA | |
|  | |
| · Class | 6.1 Toxic substances |
| · Label | 6.1 |
| · Packing group | III |
| · DOT, ADR, IMDG, IATA | III |
| · Environmental hazards: | |
| · Marine pollutant: | No |
| · Special precautions for user | Warning: Toxic substances |
| · Danger code (Kemler): | 60 |
| · EMS Number: | F-A,S-A |
| · Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code | Not applicable. |

USA

(Contd. on page 7)



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

**PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%),
HYDROGEN SULFIDE (0.001- 0.025%, OXYGEN (0.0015- 23.5%), BALANCE NITROGEN**

MSDS NO: 401

Version:3

Date: August, 2010

1. Chemical Product and Company Identification

Gasco Affiliates, LLC
320 Scarlett Blvd.
Oldsmar, FL 34677

TELEPHONE NUMBER: (800) 910-0051

24-HOUR EMERGENCY NUMBER: 1-800-424-9300

FAX NUMBER: (866) 755-8920

E-MAIL: info@gascogas.com

PRODUCT NAME: MULTI-MIX

CHEMICAL NAME: Methane, Carbon Monoxide, Hydrogen Sulfide, Oxygen in Nitrogen

COMMON NAMES/ SYNONYMS: None

TDG (Canada) CLASSIFICATION: 2.2

WHIMIS CLASSIFICATION: A

2. COMPOSITION/ INFORMATION ON INGREDIENTS

INGREDIENT	%VOLUME	PEL-OSHA	TLV-ACGIH	LD ₅₀ or LC ₅₀ Route/Species
Methane FORMULA: CH ₄	0 to 2.5%	Simple Asphixiate	Simple Asphixiate	N/A
Carbon Monoxide FORMULA: CO	0.0005 to 1.0%	50 ppm	25 ppm	1811 ppm/ 4 hours (rat)
Hydrogen Sulfide FORMULA: H ₂ S	0.001 to 0.025%	20 ppm	10 ppm	444 ppm (rat)
Oxygen FORMULA: O ₂	0.0015 to 23.5%	N/A	N/A	N/A
Nitrogen FORMULA: N ₂	Balance	Simple Asphyxiate	Simple Asphyxiate	N/A

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

This product is a colorless gas, which has a rotten-egg odor. The odor cannot be relied on as an adequate warning of the presence of this product, because olfactory fatigue occurs after over-exposure to hydrogen sulfide. Hydrogen sulfide and carbon monoxide are toxic to humans in relatively low concentrations. Over-exposure can cause skin or eye irritation, nausea, dizziness, headaches, collapse, unconsciousness, coma, and death.



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

**PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%),
HYDROGEN SULFIDE (0.001- 0.025%), OXYGEN (0.0015- 23.5%), BALANCE NITROGEN**

ROUTE OF ENTRY:

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion No
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HEALTH EFFECTS:

Exposure Limits Yes	Irritant Yes	Sensitization No	Reproductive Hazard Yes	Mutagen No
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Carcinogenicity: --NTP: No IARC: No OSHA: No

EYE EFFECTS:

Hydrogen sulfide can cause eyes to become scratchy, irritated and even teary. Above 50 ppm of hydrogen sulfide, there is an intense tearing blurring of vision, and pain when looking at light.

SKIN EFFECTS:

Over-exposure to carbon monoxide can be indicated by the lips and fingernails turning bright red. High concentrations of hydrogen sulfide may also be irritating to the skin.

INGESTION EFFECTS:

Ingestion unlikely. Gas at room temperature.

INHALATION EFFECTS:

Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under routine circumstances of use. Over-exposure to hydrogen sulfide can cause dizziness, headache, and nausea. At 12- 16% Oxygen, breathing and pulse rate is increased, muscular coordination is slightly disturbed.

NFPA HAZARD CODES

Health: 4
Flammability: 0
Reactivity: 0

HMIS HAZARD CODES

Health: 4
Flammability: 0
Reactivity: 0

RATING SYSTEM

0= No Hazard
1= Slight Hazard
2= Moderate Hazard
3= Serious Hazard
4= Severe Hazard

4. FIRST AID MEASURES

EYES:

PERSONS WITH POTENTIAL EXPOSURE SHOULD NOT WEAR CONTACT LENSES. Flush contaminated eyes with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 15 minutes. Seek immediate medical attention.

SKIN:

Remove contaminated clothing as rapidly as possible. Flush affected area with copious quantities of water. Seek immediate medical attention.

INGESTION:

Not required

INHALATION:

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

**PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%),
HYDROGEN SULFIDE (0.001- 0.025%), OXYGEN (0.0015- 23.5%), BALANCE NITROGEN**

5. FIRE-FIGHTING MEASURES

These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be projected considerable distances - thereby hampering fire fighting efforts.

6. ACCIDENTAL RELEASE MEASURES

In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

7. HANDLING AND STORAGE

Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Use adequate ventilation for extended use of gas.

9. PHYSICAL AND CHEMICAL PROPERTIES

PARAMETER:	VALUE:
Physical state	: Gas
Evaporation point	: N/A
pH	: N/A
Odor and appearance	: Colorless gas with a rotten-egg odor

10. STABILITY AND REACTIVITY

Stable under normal conditions. Expected shelf life 15 months.

11. TOXICOLOGICAL INFORMATION

This gas mixture contains components that may cause embryotoxic effects in humans; however, due to the small size of the cylinder no toxicological damage is anticipated.

12. ECOLOGICAL INFORMATION

No ecological damage caused by this product.

13. DISPOSAL INFORMATION

Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured; but GASCO encourages the consumer to return cylinders.



MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

**PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%),
HYDROGEN SULFIDE (0.001- 0.025%), OXYGEN (0.0015- 23.5%), BALANCE NITROGEN**

14. TRANSPORT INFORMATION

	<u>United States DOT</u>	<u>Canada TDG</u>
PROPER SHIPPING NAME:	Compressed Gas N.O.S. (Oxygen, Nitrogen)	Compressed Gas N.O.S. (Oxygen, Nitrogen)
HAZARD CLASS:	2.2	2.2
IDENTIFICATION NUMBER:	UN1956	UN1956
SHIPPING LABEL:	NONFLAMMABLE GAS	NONFLAMMABLE GAS

15. REGULATORY INFORMATION

The components of this product are listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds each.

TOXIC SUBSTANCE CONTROL ACT (TSCA)

All Ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

16. OTHER INFORMATION

This MSDS has been prepared in accordance with the Chemicals (Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of GASCO, and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.

MSDS/S010/401/August, 2010



Health	3
Fire	0
Reactivity	2
Personal Protection	J

Material Safety Data Sheet

Sodium hydroxide, Pellets, Reagent ACS MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium hydroxide, Pellets, Reagent ACS

Catalog Codes: SLS4090

CAS#: 1310-73-2

RTECS: WB4900000

TSCA: TSCA 8(b) inventory: Sodium hydroxide

CI#: Not available.

Synonym: Caustic Soda

Chemical Name: Sodium Hydroxide

Chemical Formula: NaOH

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

sodium hydroxide + zinc metal dust causes ignition of the latter. Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, allyl alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichlorethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontaneously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

Special Remarks on Explosion Hazards:

Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aqueous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxide + impure tetrahydrofuran, which can contain peroxides, can

cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:

Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

CEIL: 2 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.]

Boiling Point: 1388°C (2530.4°F)
Melting Point: 323°C (613.4°F)
Critical Temperature: Not available.
Specific Gravity: 2.13 (Water = 1)
Vapor Pressure: Not applicable.
Vapor Density: Not available.
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water.
Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances:

Highly reactive with metals. Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

Special Remarks on Reactivity:

Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahydrofuran is very exothermic, a mild explosion being noted on one occasion. Reactive with water, acids, acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, organic halogens, metals (i.e aluminum, tin, zinc), nitromethane, glacial acetic acid, acetic anhydride, acrolein, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrochloric acid, sulfuric acid, hydrosulfuric acid, nitric acid, oleum, propiolactone, acrylonitrile, phosphorus pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans: Causes damage to the following organs: lungs.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagenic). Investigation as a mutagen (cytogenetic analysis), but no data available.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: May be harmful if absorbed through skin. Causes severe skin irritation and burns. May cause deep penetrating ulcers of the skin. Eyes: Causes severe eye irritation and burns. May cause chemical conjunctivitis and corneal damage. Inhalation: Harmful if inhaled. Causes severe irritation of the respiratory tract and mucous membranes with coughing, burns, breathing difficulty, and possible coma. Irritation may lead the chemical pneumonitis and pulmonary edema. Causes chemical burns to the respiratory tract and mucous membranes. Ingestion: May be fatal if swallowed. May cause severe and permanent damage to the digestive tract. Causes severe gastrointestinal tract irritation and burns. May cause perforation of the digestive tract. Causes severe pain, nausea, vomiting, diarrhea, and shock. May cause corrosion and permanent destruction of the esophagus and digestive tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hydroxide Minnesota: Sodium hydroxide Massachusetts RTK: Sodium hydroxide New Jersey: Sodium hydroxide Louisiana spill reporting: Sodium hydroxide California Director's List of Hazardous Substances: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

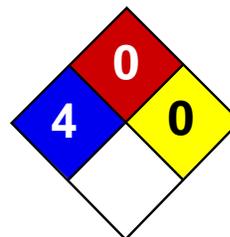
References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 05/21/2013 12:00 PM

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Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet

Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric acid, 65%

Catalog Codes: SLN2161

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming

CI#: Not applicable.

Synonym: Nitric Acid, 65%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory

tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of combustible materials

Explosion Hazards in Presence of Various Substances:

Explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. (Nitric Acid, fuming)

Special Remarks on Explosion Hazards:

Reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalies and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium

acetylides explode in contact with nitric acid. Explosive reaction with Nitric Acid + Nitrobenzene + water. Detonation with Nitric Acid + 4-Methylcyclohexane. (Nitric acid, fuming)

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States] TWA: 2 STEL: 4 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Acrid. Disagreeable and choking. (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point: 121°C (249.8°F)

Melting Point: -41.6°C (-42.9°F)

Critical Temperature: Not available.

Specific Gravity: 1.408 (Water = 1)

Vapor Pressure: 6 kPa (@ 20°C)

Vapor Density: 2.5 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.29 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in cold water, hot water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:

Highly reactive with alkalis. Reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

Special Remarks on Reactivity:

A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid + Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

Special Remarks on Corrosivity:

In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg (Nitric acid, fuming)

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin. Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury. Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible "coffee grounds" appearance of the vomitus . May cause perforation of the digestive tract. Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning. Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting. Chronic Potential Health Effects: Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contraction or spasticity, weakness, loss of coordinaton, mental confusion), and urinary system (kidney faillure, decreased urinary output after several hours of

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Nitric acid UNNA: 2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

New York release reporting list: Nitric acid, fuming Rhode Island RTK hazardous substances: Nitric acid, fuming Pennsylvania RTK: Nitric acid, fuming Florida: Nitric acid, fuming Minnesota: Nitric acid, fuming Massachusetts RTK: Nitric acid, fuming

New Jersey: Nitric acid, fuming TSCA 8(b) inventory: Water; Nitric acid, fuming SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65% CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R8- Contact with combustible material may cause fire. R35- Causes severe burns. S23- Do not breathe gas/fumes/vapour/spray [***] S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36- Wear suitable protective clothing. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 4

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

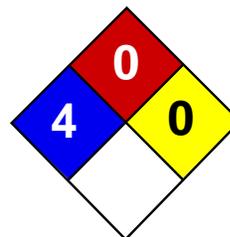
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 10:59 AM

Last Updated: 05/21/2013 12:00 PM

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Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet

Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric acid, 65%

Catalog Codes: SLN2161

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming

CI#: Not applicable.

Synonym: Nitric Acid, 65%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	35
Nitric acid, fuming	7697-37-2	65

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory

tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of combustible materials

Explosion Hazards in Presence of Various Substances:

Explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:

Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. (Nitric Acid, fuming)

Special Remarks on Explosion Hazards:

Reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalies and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium

acetylides explode in contact with nitric acid. Explosive reaction with Nitric Acid + Nitrobenzene + water. Detonation with Nitric Acid + 4-Methylcyclohexane. (Nitric acid, fuming)

Section 6: Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:

Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States] TWA: 2 STEL: 4 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Acrid. Disagreeable and choking. (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point: 121°C (249.8°F)

Melting Point: -41.6°C (-42.9°F)

Critical Temperature: Not available.

Specific Gravity: 1.408 (Water = 1)

Vapor Pressure: 6 kPa (@ 20°C)

Vapor Density: 2.5 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.29 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in cold water, hot water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances:

Highly reactive with alkalis. Reactive with reducing agents, combustible materials, organic materials, metals, acids.

Corrosivity:

Extremely corrosive in presence of aluminum, of copper. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

Special Remarks on Reactivity:

A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid + Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

Special Remarks on Corrosivity:

In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available. LC50: Not available.

Chronic Effects on Humans:

Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

Other Toxic Effects on Humans:

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg (Nitric acid, fuming)

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin. Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury. Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible "coffee grounds" appearance of the vomitus . May cause perforation of the digestive tract. Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning. Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting. Chronic Potential Health Effects: Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contraction or spasticity, weakness, loss of coordinaton, mental confusion), and urinary system (kidney faillure, decreased urinary output after several hours of

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Nitric acid UNNA: 2031 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

New York release reporting list: Nitric acid, fuming Rhode Island RTK hazardous substances: Nitric acid, fuming Pennsylvania RTK: Nitric acid, fuming Florida: Nitric acid, fuming Minnesota: Nitric acid, fuming Massachusetts RTK: Nitric acid, fuming

New Jersey: Nitric acid, fuming TSCA 8(b) inventory: Water; Nitric acid, fuming SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65% CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):

R8- Contact with combustible material may cause fire. R35- Causes severe burns. S23- Do not breathe gas/fumes/vapour/spray [***] S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36- Wear suitable protective clothing. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 4

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 05/21/2013 12:00 PM

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MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s)

00654-00, 05942-21, 05942-22, 05942-24, 05942-25, 05942-26, 05942-27, 35653-01, 35654-00

Product Identity

BUFFER, Standard, pH 4.01; BUFFER, High Accuracy, pH 4.000 (Color Coded Red)

Manufacturer's Name

RICCA CHEMICAL COMPANY

Emergency Telephone Number (24 hr)

CHEMTREC®: 800-424-9300

Address (Number, Street, City, State, and ZIP Code)

P.O. Box 13090

Telephone Number For Information

817-461-5601

Arlington, Texas 76094

Date Prepared

3-7-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits	
			ACGIH TLV	OSHA PEL
Potassium Acid Phthalate	877-24-7	0.95 – 1.05	N/A	N/A
Preservative* (No Mercury compounds or Formaldehyde)	proprietary	<0.5	N/A	N/A
Inert Dye	proprietary	<0.1	N/A	N/A
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆

EMERGENCY OVERVIEW

Non-flammable, non-toxic, non-corrosive. Does not present any significant health hazards. Wash areas of contact with water.

☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin.

EYE CONTACT: May cause slight irritation.

INHALATION: Not likely to be hazardous by inhalation.

SKIN CONTACT: May cause slight irritation.

INGESTION: Large doses may cause nausea, vomiting, diarrhea and cramps.

CHRONIC EFFECTS / CARCINOGENICITY:

IARC – No

NTP – No

OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

No information found in "Registry of Toxic Effects of Chemical Substances" or other information sources.

REPRODUCTION INFORMATION:

No information found in "Registry of Toxic Effects of Chemical Substances" or other information sources.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A

METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A

UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material and dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE: Clear, red colored liquid

pH: 4

ODOR: odorless

BOILING POINT (°C): approximately 100

SOLUBILITY IN WATER: infinite

MELTING POINT (°C): approximately 0

SPECIFIC GRAVITY: approximately 1

VAPOR PRESSURE: N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: Nitric Acid



MATERIAL SAFETY DATA SHEET

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of Carbon and Potassium.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Rat: >3200 mg/kg (Potassium Acid Phthalate), details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water, neutralize with weak sodium hydroxide solution, and then flush to sewer if local regulations allow. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME: Not regulated
D.O.T. HAZARD CLASS: None
U.N. / N.A. NUMBER: None
PACKING GROUP: None
D.O.T. LABEL: None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Not reportable

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Special Notice Key: None
HMIS® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Protective Equipment: B (Protective eyewear, gloves)

Rev 1, 10-16-2000: (Section 1) added catalog number 35653-01.

Rev 2, 03-25-2003: Reviewed and approved.

Rev 3, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.



MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s)

00654-04, 35654-04, 05942-41, 05942-42, 05942-44, 05942-45, 35653-02

Product Identity

BUFFER, Standard, pH 7.00 (Color Coded Green)

Manufacturer's Name

RICCA CHEMICAL COMPANY

Emergency Telephone Number (24 hr)

CHEMTREC®: 800-424-9300

Address (Number, Street, City, State, and ZIP Code)

P.O. Box 13090

Telephone Number For Information

817-461-5601

Arlington, Texas 76094

Date Prepared

3-8-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits	
			ACGIH TLV	OSHA PEL
Sodium Phosphate, Dibasic	7558-79-4	< 1	N/A	N/A
Potassium Phosphate, Monobasic	7778-77-0	< 1	N/A	N/A
Preservative* *(No Mercury Compounds or Formaldehyde)	Proprietary	< 0.1	N/A	N/A
Inert Dye	Proprietary	< 0.1	N/A	N/A
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆

EMERGENCY OVERVIEW

Non-flammable, non-toxic, non-corrosive. Does not present any significant health hazards. May cause irritation. Wash areas of contact with water

☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin.

EYE CONTACT: May cause slight irritation.

INHALATION: May cause allergic respiratory reaction to those allergic to phosphates.

SKIN CONTACT: May cause slight irritation to those allergic to phosphates.

INGESTION: Large doses may cause stomach upset.

CHRONIC EFFECTS / CARCINOGENICITY:

IARC – No

NTP – No

OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

No information found in "Registry of Toxic Effects of Chemical Substances" or other information sources.

REPRODUCTION INFORMATION:

No information found in "Registry of Toxic Effects of Chemical Substances" or other information sources.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A

METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A

UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, clay, etc.) and dispose of in accordance with local regulations. Check with local agencies for the proper disposal of phosphate containing solutions.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE: Clear, green liquid

pH: 7

ODOR: Odorless

BOILING POINT (°C): approximately 100

SOLUBILITY IN WATER: Infinite

MELTING POINT (°C): approximately 0

SPECIFIC GRAVITY: approximately 1

VAPOR PRESSURE: N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: None identified.

HAZARDOUS DECOMPOSITION PRODUCTS: Phosphorus oxides may form when heated to decomposition.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Rat: (Sodium Phosphate Dibasic) 17 gm/kg; LD50, Dermal, Rabbit: (Potassium Phosphate Monobasic) >4640 mg/kg; details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water, then flush to sewer if local regulations allow for the flushing of phosphate containing solutions. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME: Not regulated
D.O.T. HAZARD CLASS: None
U.N. / N.A. NUMBER: None
PACKING GROUP: None
D.O.T. LABEL: None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Sodium Phosphate, Dibasic - 5,000 pounds.

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed.

PENNSYLVANIA: Sodium Phosphate Dibasic is listed as an environmental hazard on the state Hazardous Substance list.

Section 16. Other Information

NFPA Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Special Notice Key: None
HMIS® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Protective Equipment: B
				(Protective eyewear, gloves)

Rev 1, 8-25-2000: (Section 2) corrected concentration of preservative from 1 – 2 to < 0.1%.

Rev 2, 03-25-2003: Reviewed and approved, (Section 15) added CERCLA reportable quantity.

Rev 3, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.



MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s)

00654-08, 35654-08, 05942-61, 05942-62, 05942-64, 05942-65, 05942-66, 05942-67, 35653-03

Product Identity

BUFFER, Standard, pH 10.00; BUFFER, High Accuracy, pH 10.000 (Color Coded Blue)

Manufacturer's Name

RICCA CHEMICAL COMPANY

Emergency Telephone Number (24 hr)

CHEMTREC®: 800-424-9300

Address (Number, Street, City, State, and ZIP Code)

P.O. Box 13090

Telephone Number For Information

817-461-5601

Arlington, Texas 76094

Date Prepared

3-8-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits	
			ACGIH TLV	OSHA PEL
Sodium Carbonate	497-19-8	< 1	N/A	N/A
Sodium Bicarbonate	144-55-8	< 1	N/A	N/A
Preservative* *(No Mercury compounds or Formaldehyde)	proprietary	< 0.1	N/A	N/A
Inert Dye	proprietary	< 0.1	N/A	N/A
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆

EMERGENCY OVERVIEW

Non-flammable, non-toxic, non-corrosive. Does not present any significant health hazards. Wash areas of contact with water.

☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin.

EYE CONTACT: May cause slight irritation.

INHALATION: Not likely to be hazardous by inhalation.

SKIN CONTACT: May cause slight irritation.

INGESTION: Large doses may cause nausea, vomiting, diarrhea and cramps.

CHRONIC EFFECTS / CARCINOGENICITY:

IARC – No

NTP – No

OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

Mutation data cited in "Registry of Toxic Effects of Chemical Substances" for Sodium Bicarbonate in rats.

REPRODUCTION INFORMATION:

Reproductive data cited in "Registry of Toxic Effects of Chemical Substances" for Sodium Bicarbonate and Sodium Carbonate in mice.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

SKIN CONTACT: Flush with plenty of water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A

METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A

UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire.

FIRE & EXPLOSION HAZARDS: Not considered to be a fire or explosion hazard.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions.

FIRE FIGHTING EQUIPMENT: Use protective clothing and breathing equipment appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material and treat as normal refuse. Small amounts of the liquid may be flushed to the drain with excess water. Always dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, blue colored liquid	pH:	10
ODOR:	Odorless	BOILING POINT (°C):	approximately 100
SOLUBILITY IN WATER:	Infinite	MELTING POINT (°C):	approximately 0
SPECIFIC GRAVITY:	approximately 1	VAPOR PRESSURE:	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage.

INCOMPATIBILITY: Acids

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of Sodium.

HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Rat: 4090 mg/kg (Sodium Carbonate), 4220 mg/kg (Sodium Bicarbonate), details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Dilute with water, then flush to sewer if local regulations allow. If not allowed, save for recovery or recycling in an approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME: Not regulated
D.O.T. HAZARD CLASS: None
U.N. / N.A. NUMBER: None
PACKING GROUP: None
D.O.T. LABEL: None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: The above items either do not contain any specifically hazardous material or the potentially hazardous material is present in such low concentration that the items do not present any immediate threat to health and safety. These items do not meet the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY: Not reportable

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No

SECTION 311/312 HAZARDOUS CATEGORIES: No

SECTION 313 TOXIC CHEMICALS: No

RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed.

Section 16. Other Information

NFPA® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Special Notice Key: None
HMIS® Ratings:	Health: 1	Flammability: 0	Reactivity: 0	Protective Equipment: B

(Protective eyewear, gloves)

Rev 1, 01-15-2003: added catalog number 35653-03.

Rev 2, 03-25-2003: Reviewed and approved.

Rev 3, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and



MATERIAL SAFETY DATA SHEET

which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.



Issuing Date 11/19/2009

Revision Date 2/21/2013

Revision Number 0

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name TURBIDITY STD., 0.0 NTU 2020 / TC 3000 EPA/ISO
Product Code(s) 1480
Recommended Use Laboratory chemicals. Industrial (not for food or food contact use).
Company LaMotte Company, Inc.
802 Washington Avenue
P.O. Box 329
Chestertown, MD 21620
USA
Emergency Telephone Number 24 Hour Emergency Number (CHEM-TEL):
USA, Canada, Puerto Rico 1-800-255-3924
Outside North American Continent (Call collect) 813-248-0585

2. HAZARDS IDENTIFICATION

Emergency Overview

The product contains no substances which in their current physical state are considered to be hazardous to health
Appearance Clear, colorless **Physical State** Liquid **Odor** Odorless

OSHA Regulatory Status This material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Potential Health Effects
Principle Routes of Exposure Ingestion.

Acute Toxicity
Eyes No hazard from product as supplied.
Skin No known hazard in contact with skin.
Inhalation Not an expected route of exposure.
Ingestion No known effect based on information supplied.

Chronic Effects
Main Symptoms No information available.

Aggravated Medical Conditions None known.

Interactions with Other Chemicals Not applicable.

Environmental Hazard There is no known ecological information for this product.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula Water

Chemical Name	CAS-No	Weight %
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	0
Water	7732-18-5	100

4. FIRST AID MEASURES

General Advice No hazards which require special first aid measures.

Eye Contact None under normal use.

Skin Contact None under normal use.

Inhalation Not applicable.

Ingestion None under normal use.

Notes to Physician Treat symptomatically.

Protection of First-aiders Use personal protective equipment. See Section 8 for more detail.

5. FIRE-FIGHTING MEASURES

Flammable Properties Not a fire hazard.

Suitable Extinguishing Media Water spray, dry chemical, carbon dioxide (CO₂), or foam.

NFPA	Health Hazard 0	Flammability 0	Stability 0	Physical and Chemical Hazards -
HMIS	Health Hazard 0	Flammability 0	Stability 0	

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions None required.

Methods for Cleaning Up Soak up with inert absorbent material.

7. HANDLING AND STORAGE

Handling Handle in accordance with good industrial hygiene and safety practice. Do not ingest. Do not eat, drink, or smoke when using this product.

Storage Keep containers tightly closed in a dry, cool, and well-ventilated place. Keep out of the reach of children.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH

AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7	None Known	None Known	None Known
Water 7732-18-5	None Known	None Known	None Known

Personal Protective Equipment**Eye/Face Protection**

No special protective equipment required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear, colorless	Odor	Odorless
Physical State	Liquid	pH	6.0 - 7.0
Boiling Point/Range		100 °C / 212 °F	

Water Solubility Infinite

10. STABILITY AND REACTIVITY

Stability	Stable.
Incompatible Products	Not applicable.
Conditions to Avoid	Extremes of temperature and direct sunlight.
Hazardous Decomposition Products	None under normal use.
Hazardous Reactions	None under normal processing.
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION**Acute Toxicity**

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known
Water	90 mL/kg (Rat)	None Known	None Known

Chronic Toxicity

Chemical Name	ACGIH	IARC	NTP	OSHA
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known	None Known
Water	None Known	None Known	None Known	None Known

Chemical Name	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known
Water	None Known	None Known	None Known

12. ECOLOGICAL INFORMATION

Ecotoxicity

Chemical Name	Toxicity to Algae	Toxicity to Fish	Microtox	Daphnia Magna (Water Flea)
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known	None Known
Water	None Known	None Known	None Known	None Known
Chemical Name	Log Pow			
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known			
Water	None Known			

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method Can be disposed as waste water, when in compliance with local regulations.

Chemical Name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water - 9003-70-7	None Known	None Known	None Known	None Known
Water - 7732-18-5	None Known	None Known	None Known	None Known

14. TRANSPORT INFORMATION

DOT Not regulated

IATA Not regulated

IMDG/IMO Not regulated

15. REGULATORY INFORMATION

International Inventories

Component	TSCA	DSL	EINECS/ELINCS	ENCS	IECSC	KECL	PICCS	AICS
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7 (0)	XU	X	EINECS/ELINCS	6-155; 6-167; 6-2006	X	KE-10320	X	X
Water 7732-18-5 (100)	Present	X	X	ENCS	X	KE-35400	X	X

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Chemical Name	CAS-No	Weight %	SARA 313 - Threshold Values %
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	0	None Known
Water	7732-18-5	100	None Known

SARA 311/312 Hazard Categories

Acute Health Hazard	No
Chronic Health Hazard	No
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7 (0)	None Known	None Known	None Known	None Known
Water 7732-18-5 (100)	None Known	None Known	None Known	None Known

Chemical Name	CAS-No	Weight %	HAPS data	VOC Chemicals	Class 1 Ozone Depletors	Class 2 Ozone Depletors
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	0	None Known	None Known	None Known	None Known
Water	7732-18-5	100	None Known	None Known	None Known	None Known

CERCLA

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known
Water	None Known	None Known

U.S. State Regulations

Chemical Name	CAS-No	California Prop. 65
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	None Known
Water	7732-18-5	None Known

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known	None Known	None Known
Water	None Known	None Known	None Known	None Known	None Known

International Regulations

Mexico - Grade No information available.

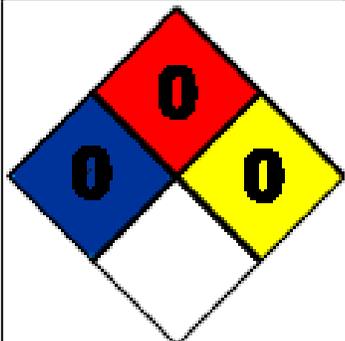
Chemical Name	Carcinogen Status	Exposure Limits
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known
Water	None Known	None Known

Canada

Component	WHMIS Hazard Class

AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7 (0)	Not determined
Water 7732-18-5 (100)	Uncontrolled product according to WHMIS classification criteria

16. OTHER INFORMATION

NFPA	HMIS	PPE	Transport Symbol						
	<table border="1"> <tr> <td style="background-color: #0000FF; color: white;">Health Hazard</td> <td style="text-align: center; font-weight: bold;">0</td> </tr> <tr> <td style="background-color: #FF0000; color: white;">Fire Hazard</td> <td style="text-align: center; font-weight: bold;">0</td> </tr> <tr> <td style="background-color: #FFFF00; color: black;">Reactivity</td> <td style="text-align: center; font-weight: bold;">0</td> </tr> </table>	Health Hazard	0	Fire Hazard	0	Reactivity	0		
Health Hazard	0								
Fire Hazard	0								
Reactivity	0								

Prepared By Regulatory Affairs Department
Issuing Date 11/19/2009
Revision Date 21-Feb-2013
Revision Note MSDS was reviewed per Canada request - Canada requires a 3 yr MSDS review.
Disclaimer

The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of MSDS



Issuing Date 8/6/2010

Revision Number 0

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name Turbidity Standard 1.0 NTU (2020we/TC3000we/LTC3000we)
Product Code(s) 1450
Recommended Use Laboratory chemicals. Industrial (not for food or food contact use).
Company LaMotte Company, Inc.
802 Washington Avenue
P.O. Box 329
Chestertown, MD 21620
USA
Emergency Telephone Number 24 Hour Emergency Number (CHEM-TEL):
USA, Canada, Puerto Rico 1-800-255-3924
Outside North American Continent (Call collect) 813-248-0585

2. HAZARDS IDENTIFICATION

Emergency Overview

The product contains no substances which at their given concentration are considered to be hazardous to health

Appearance Clear, colorless solution **Physical State** Liquid **Odor** Odorless

OSHA Regulatory Status This product is an article which contains a chemical substance. Safety information is given for exposure to the article as sold, but considers exposure to the chemical if user has direct eye and skin contact with the chemical.

Potential Health Effects
Principle Routes of Exposure Skin contact, Ingestion

Acute Toxicity
Eyes May cause irritation.
Skin May cause irritation.
Inhalation Not an expected route of exposure.
Ingestion No known hazard by swallowing.

Chronic Effects No known effect based on information supplied.

Aggravated Medical Conditions No information available.

Interactions with Other Chemicals No information available..

Environmental Hazard No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Weight %
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	<1
Water, distilled	7732-18-5	>99

4. FIRST AID MEASURES

General Advice	No hazards which require special first aid measures.
Eye Contact	Rinse thoroughly with water as necessary. If irritation persists or develops, contact a physician.
Skin Contact	Wash off with warm water and soap. If skin irritation persists, call a physician.
Inhalation	Not expected.
Ingestion	Drink 1 or 2 glasses of water.
Notes to Physician	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Not a fire hazard.
Suitable Extinguishing Media	Water spray, dry chemical, carbon dioxide (CO ₂), or foam.

Explosion Data

NFPA	Health Hazard 0	Flammability 0	Stability 0	Physical and Chemical Hazards -
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6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Refer to Section 8.
Methods for Cleaning Up	Soak up with inert absorbent material. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling	Handle in accordance with good industrial hygiene and safety practice. Do not ingest. Do not eat, drink or smoke when using this product.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep from freezing. Keep out of the reach of children.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7	None Known	None Known	None Known
Water, distilled 7732-18-5	None Known	None Known	None Known

Personal Protective Equipment

Eye/Face Protection

No special protective equipment required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear, colorless solution	Odor	Odorless
Physical State	Liquid	pH	6.0 - 7.0
Boiling Point/Range	100 °C		

10. STABILITY AND REACTIVITY

Stability	Stable.
Incompatible Products	Organic material. (No hazardous reaction).
Conditions to Avoid	Do not freeze. (Once frozen, polymer will not remain completely suspended)..
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known
Water, distilled	None Known	None Known	None Known

Chronic Toxicity

Chronic Toxicity No known effect based on information supplied.

Chemical Name	ACGIH	IARC	NTP	OSHA
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known	None Known
Water, distilled	None Known	None Known	None Known	None Known

Chemical Name	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known
Water, distilled	None Known	None Known	None Known

12. ECOLOGICAL INFORMATION

Ecotoxicity

Chemical Name	Toxicity to Algae	Toxicity to Fish	Microtox	Daphnia Magna (Water Flea)
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known	None Known
Water, distilled	None Known	None Known	None Known	None Known

Chemical Name	Log Pow
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known
Water, distilled	None Known

13. DISPOSAL CONSIDERATIONS

Waste Disposal Method Can be disposed as waste water, when in compliance with local regulations.

Chemical Name
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water - 9003- 70-7
Water, distilled - 7732-18-5

Chemical Name	RCRA - Halogenated Organic Compounds	RCRA - P Series Wastes	RCRA - F Series Wastes	RCRA - K Series Wastes
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water - 9003- 70-7	None Known	None Known	None Known	None Known
Water, distilled - 7732-18-5	None Known	None Known	None Known	None Known

14. TRANSPORT INFORMATION

DOT Not regulated

IATA Not regulated

IMDG/IMO Not regulated

15. REGULATORY INFORMATION

International Inventories

Component	TSCA	DSL	EINECS/ELINCS	ENCS	IECSC	KECL	PICCS	AICS
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7 (<1)	XU	X	EINECS/ELINCS	6-155; 6-167; 6-2006	X	KE-10320	X	X
Water, distilled 7732-18-5 (>99)	Present	X	X	ENCS	X	KE-35400	X	X

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Chemical Name	CAS-No	Weight %	SARA 313 - Threshold Values %
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	<1	None Known
Water, distilled	7732-18-5	>99	None Known

SARA 311/312 Hazard Categories

Acute Health Hazard No

Chronic Health Hazard No

Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

Clean Water Act

Component	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7 (<1)	None Known	None Known	None Known	None Known
Water, distilled 7732-18-5 (>99)	None Known	None Known	None Known	None Known

Chemical Name	CAS-No	Weight %	HAPS data	VOC Chemicals	Class 1 Ozone Depletors	Class 2 Ozone Depletors
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	<1	None Known	None Known	None Known	None Known
Water, distilled	7732-18-5	>99	None Known	None Known	None Known	None Known

CERCLA

Chemical Name	Hazardous Substances RQs	Extremely Hazardous Substances RQs
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known
Water, distilled	None Known	None Known

U.S. State Regulations

Chemical Name	CAS-No	California Prop. 65
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	None Known
Water, distilled	7732-18-5	None Known

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known	None Known	None Known
Water, distilled	None Known	None Known	None Known	None Known	None Known

International Regulations

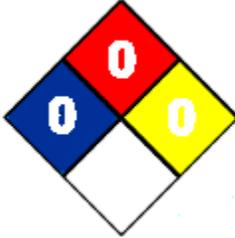
Mexico - Grade No information available.

Chemical Name	Carcinogen Status	Exposure Limits
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known
Water, distilled	None Known	None Known

Canada**WHMIS Hazard Class**

Not determined

16. OTHER INFORMATION

NFPA	HMIS	PPE	Transport Symbol						
	<table border="1"> <tr> <td data-bbox="509 268 716 310">Health Hazard</td> <td data-bbox="719 268 794 310">0</td> </tr> <tr> <td data-bbox="509 315 716 357">Fire Hazard</td> <td data-bbox="719 315 794 357">0</td> </tr> <tr> <td data-bbox="509 361 716 403">Reactivity</td> <td data-bbox="719 361 794 403">0</td> </tr> </table>	Health Hazard	0	Fire Hazard	0	Reactivity	0		
Health Hazard	0								
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Prepared By Regulatory Affairs Department

Issuing Date 8/6/2010

Revision Date

Revision Note Initial Release.

Disclaimer

The information provided on this MSDS is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as 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 material or in any process, unless specified in the text.

End of MSDS



Issuing Date 8/6/2010

Revision Number 0

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name Turbidity Standard 10.0 NTU (2020we/TC3000we/LTC3000we)
Product Code(s) 1451
Recommended Use Laboratory chemicals. Industrial (not for food or food contact use).
Company LaMotte Company, Inc.
802 Washington Avenue
P.O. Box 329
Chestertown, MD 21620
USA
Emergency Telephone Number 24 Hour Emergency Number (CHEM-TEL):
USA, Canada, Puerto Rico 1-800-255-3924
Outside North American Continent (Call collect) 813-248-0585

2. HAZARDS IDENTIFICATION

Emergency Overview

The product contains no substances which at their given concentration are considered to be hazardous to health

Appearance Clear, colorless solution **Physical State** Liquid **Odor** Odorless

OSHA Regulatory Status This product is an article which contains a chemical substance. Safety information is given for exposure to the article as sold, but considers exposure to the chemical if user has direct eye and skin contact with the chemical.

Potential Health Effects
Principle Routes of Exposure Skin contact, Ingestion

Acute Toxicity
Eyes May cause irritation.
Skin May cause irritation.
Inhalation Not an expected route of exposure.
Ingestion No known hazard by swallowing.

Chronic Effects No known effect based on information supplied.

Aggravated Medical Conditions No information available.

Interactions with Other Chemicals No information available..

Environmental Hazard No information available.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Weight %
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	9003-70-7	<1
Water, distilled	7732-18-5	>99

4. FIRST AID MEASURES

General Advice	No hazards which require special first aid measures.
Eye Contact	Rinse thoroughly with water as necessary. If irritation persists or develops, contact a physician.
Skin Contact	Wash off with warm water and soap. If skin irritation persists, call a physician.
Inhalation	Not expected.
Ingestion	Drink 1 or 2 glasses of water.
Notes to Physician	Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Not a fire hazard.
Suitable Extinguishing Media	Water spray, dry chemical, carbon dioxide (CO ₂), or foam.

Explosion Data

NFPA	Health Hazard 0	Flammability 0	Stability 0	Physical and Chemical Hazards -
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6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Refer to Section 8.
Methods for Cleaning Up	Soak up with inert absorbent material. After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling	Handle in accordance with good industrial hygiene and safety practice. Do not ingest. Do not eat, drink or smoke when using this product.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep from freezing. Keep out of the reach of children.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water 9003-70-7	None Known	None Known	None Known
Water, distilled 7732-18-5	None Known	None Known	None Known

Personal Protective Equipment

Eye/Face Protection No special protective equipment required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear, colorless solution	Odor	Odorless
Physical State	Liquid	pH	6.0 - 7.0
Boiling Point/Range	100 °C		

10. STABILITY AND REACTIVITY

Stability	Stable.
Incompatible Products	Organic material. (No hazardous reaction).
Conditions to Avoid	Do not freeze. (Once frozen, polymer will not remain completely suspended)..
Hazardous Polymerization	Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known
Water, distilled	None Known	None Known	None Known

Chronic Toxicity

Chronic Toxicity No known effect based on information supplied.

Chemical Name	ACGIH	IARC	NTP	OSHA
AMCO polymer spheres (Styrene Divinyl Benzene Copolymer Beads) suspended in water	None Known	None Known	None Known	None Known
Water, distilled	None Known	None Known	None Known	None Known

Chemical Name	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
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12. ECOLOGICAL INFORMATION

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Chemical Name	Toxicity to Algae	Toxicity to Fish	Microtox	Daphnia Magna (Water Flea)
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Water, distilled	None Known	None Known	None Known	None Known

Chemical Name	Log Pow
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Water, distilled 7732-18-5 (>99)	Present	X	X	ENCS	X	KE-35400	X	X

U.S. Federal Regulations

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SARA 311/312 Hazard Categories

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Fire Hazard	No
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Reactive Hazard	No

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Component	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
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Water, distilled	None Known	None Known	None Known	None Known	None Known

International Regulations**Mexico - Grade**

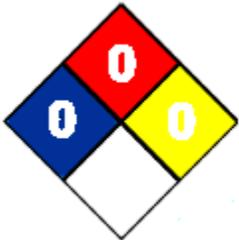
No information available.

Chemical Name	Carcinogen Status	Exposure Limits
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Water, distilled	None Known	None Known

Canada**WHMIS Hazard Class**

Not determined

16. OTHER INFORMATION

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Prepared By Regulatory Affairs Department

Issuing Date 8/6/2010

Revision Date

Revision Note Initial Release.

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End of MSDS

APPENDIX D
OSHA POSTER (ENGLISH AND SPANISH)

Job Safety and Health

It's the law!



Occupational Safety
and Health Administration
U.S. Department of Labor

EMPLOYEES:

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the *OSH Act* that apply to your own actions and conduct on the job.

EMPLOYERS:

- You must furnish your employees a place of employment free from recognized hazards.
- You must comply with the occupational safety and health standards issued under the *OSH Act*.

This free poster available from OSHA –
The Best Resource for Safety and Health



Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported consultation programs in each state.

1-800-321-OSHA (6742)

www.osha.gov

OSHA 3165-02 2012R



Seguridad y Salud en el Trabajo

¡Es la Ley!



Administración de Seguridad y Salud Ocupacional

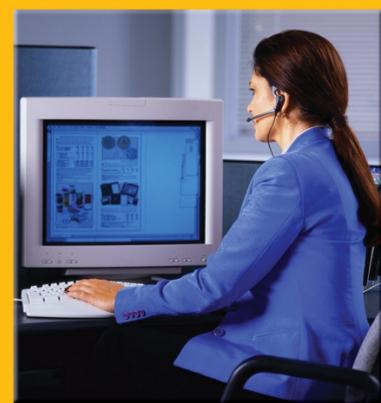
Departamento de Trabajo de los EE. UU.

EMPLEADOS:

- Usted tiene el derecho de notificar a su empleador o a la OSHA sobre peligros en el lugar de trabajo. Usted también puede pedir que la OSHA no revele su nombre.
- Usted tiene el derecho de pedir a la OSHA que realice una inspección si usted piensa que en su trabajo existen condiciones peligrosas o poco saludables. Usted o su representante pueden participar en esa inspección.
- Usted tiene 30 días para presentar una queja ante la OSHA si su empleador llega a tomar represalias o discriminar en su contra por haber denunciado la condición de seguridad o salud o por ejercer los derechos consagrados bajo la Ley OSH.
- Usted tiene el derecho de ver las citaciones enviadas por la OSHA a su empleador. Su empleador debe colocar las citaciones en el lugar donde se encontraron las supuestas infracciones o cerca del mismo.
- Su empleador debe corregir los peligros en el lugar de trabajo para la fecha indicada en la citación y debe certificar que dichos peligros se hayan reducido o desaparecido.
- Usted tiene derecho de recibir copias de su historial o registro médico y el registro de su exposición a sustancias o condiciones tóxicas o dañinas.
- Su empleador debe colocar este aviso en su lugar de trabajo.
- Usted debe cumplir con todas las normas de seguridad y salud ocupacionales expedidas conforme a la Ley OSH que sean aplicables a sus propias acciones y conducta en el trabajo.

EMPLEADORES:

- Usted debe proporcionar a sus empleados un lugar de empleo libre de peligros conocidos.
- Usted debe cumplir con las normas de seguridad y salud ocupacionales expedidas conforme a la Ley OSH.



Los empleadores pueden obtener ayuda gratis para identificar y corregir las fuentes de peligro y para cumplir con las normas, sin citación ni multa, por medio de programas de consulta respaldados por la OSHA en cada estado del país.

1-800-321-OSHA (6742)

www.osha.gov

OSHA 3167-01-07R



APPENDIX E
INJURY ILLNESS REPORT FORM



Injury/Illness Report Form

Effective: 1/3/2012 / Revision: 01

Information about Injured, Sick, or Involved Employee

First Name:		MI:		Last Name:	
Employee Number:		Unit:	Click to Select	Office:	
Phone Number:			Group Leader or Direct Manager		
Address:					
Employer:	<input type="checkbox"/> CDM Smith <input type="checkbox"/> Subcontractor	Employee Status:	<input type="checkbox"/> Full Time <input type="checkbox"/> Part Time		
Name of Subcontractor Firm:				Subcontractor Phone No.	
Subcontractor Address:					

Information about Accident/Injury/Illness

Date of Accident:		Time of Accident:		Vehicle Involved?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Injury or Illness:	<input type="checkbox"/> Injury <input type="checkbox"/> Illness	Property Damage?	<input type="checkbox"/> Yes <input type="checkbox"/> No	Client Service Group:	Click to Select
Project and Location of Accident: (Project Name, City and State)					
Project Manager:		Witness(es):	Attach witness statement if available		

(Attach additional information if needed, i.e pictures, diagrams, etc.)

Description of Accident:(Explain what happened).

Description of Injury(Identify body part and substance or object that caused harm)

Immediate Actions Taken or Required:



Injury/Illness Report Form

Effective: 1/3/2012 / Revision: 01

Did the injured employee receive medical treatment?*	<input type="checkbox"/> Yes <input type="checkbox"/> No	Did the employee return to work?	<input type="checkbox"/> Yes <input type="checkbox"/> No
--	---	----------------------------------	---

***Note: If the employee receives medical treatment from an offsite medical facility they must get a "work status report" from the Doctor or Medical Professional that provides treatment.**

Name of Clinic/Medical Facility

Name of Doctor:

Clinic/Medical Facility Address:

Phone No.:

Current Status of Employee:

Signatures:

Employee	X	Date:	/ /
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Type or Print Name:

Group Leader or Direct Manager:	X	Date:	/ /
---------------------------------	---	-------	-----

Type or Print Name:

H&S Manager:	X	Date:	/ /
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Type or Print Name:

For Office Use Only:

Case No.:	OSHA Recordable? <input type="checkbox"/> Yes <input type="checkbox"/> No
-----------	---

Project No.:	Accident or Diagnosis Date:
--------------	-----------------------------

Injury/Illness Severity, based on initial evaluation:	OSHA Illness Code:
---	--------------------

<input type="checkbox"/> First Aid Only <input type="checkbox"/> Medical Treatment <input type="checkbox"/> Lost Workdays – Restricted Activity <input type="checkbox"/> Lost Workdays – Away from Work <input type="checkbox"/> Fatality Date: _____ <input type="checkbox"/> Total Number of Lost Days: _____	<input type="checkbox"/> Occupational Skin Diseases or Disorders <input type="checkbox"/> Dust Diseases of the Lungs <input type="checkbox"/> Respiratory Conditions Due to Toxic Agents <input type="checkbox"/> Poisoning <input type="checkbox"/> Disorders Due to Physical Agents <input type="checkbox"/> Disorders Associated with Repeated Trauma <input type="checkbox"/> All Other Occupational Illnesses
--	--

Additional Comments: _____

APPENDIX F
EMPLOYEE MEETING RECORD

APPENDIX G
RADIOLOGICAL CONTROL STANDARD OPERATING
PROCEDURES

Wolff- Alport RI/FS Radioactive Contamination Control

Project Specific SOP R-1
Revision: 0
Date: February 2015

Prepared: Peter Collopy

Technical Review: Chris Marlowe

PM Approval: M. A. Lehmani

Editorial Review: Kim Jaynes

1.0 Objective

The objective of this technical standard operating procedure (SOP) is to define the techniques and requirements for preventing personal contamination, minimizing contamination spread beyond the work zone, monitoring for contamination on personnel and equipment, and implementing decontamination techniques when contamination exceeds project action levels.

2.0 Background

2.1 Discussion

The Wolff-Alport work site contains radiological contaminants that consist principally of thorium 232 and its decay progeny and, to a lesser extent, uranium 238 and its decay chain progeny. Because the decay chains for thorium 232 and uranium 238 have radionuclides that emit both alpha and beta radiations, and because thorium 232 is the higher concentration, radionuclide action levels and monitoring techniques will be specified to ensure contamination is controlled for the presence of thorium 232 and its decay progeny. This focus on thorium 232 will concomitantly control any uranium and decay chain progeny to an equal extent.

2.2 Associated Procedures

SOP R-5, Operation of Field Portable Alpha-Beta Dual Phosphor Contamination Detectors

SOP R-4, Operation of Laboratory Benchtop Alpha-Beta Dual Phosphor Detectors

3.0 General Responsibilities

Task Leader – Ensure personnel assigned to work where contact with radioactive contamination may occur have received radiological awareness training.

Lead Radiation Safety Technician – Ensure instruments used for monitoring are within the current calibration cycle and are functionally checked daily. Oversee personal scanning to ensure the methods used are in accordance with procedural requirements. Perform surveys of equipment to ensure contamination levels are within acceptance criteria for unrestricted use.

Note: All field team member responsibilities are defined in the quality assurance project plan (QAPP)

4.0 Required Equipment

Whatman 41 paper wipes or wipes of equivalent size and composition

Ludlum 2224 with 43-93 or detection system with equivalent detection capability

Ludlum 2929 or detection system with equivalent detection capability

5.0 Procedure

5.1 Action Levels

Table 1 below provides the project action levels that, when measured, require decontamination to prevent the spread of contamination beyond the project site.

Table 1-Project Contamination Action Levels

Measurement	Removable Contamination	Total Surface Contamination
Personal Skin and Clothing	N/A	Indistinguishable from Alpha Background Count Rate
Tools and Equipment	< 200 dpm/100 cm ² alpha	< 1000 dpm/100 cm ² alpha

5.2 Pre-task Set-up

1. Establish an ingress and egress point within the work zone to be used for monitoring of personnel and tools prior to release from the work zone.
2. Perform functional check of instruments to be used in contamination monitoring.
3. Review any historical data for the work zone area to determine the likelihood of contacting high levels of radiological contaminants.
4. Refer to AHA for PPE requirements for work to be conducted.
5. Establish a disposal container at ingress/egress point for any personal protective equipment (PPE) found to be or suspected of radioactive contamination, or PPE not monitored for radioactive contaminants above the action levels listed in Table 1.

5.3 Egress monitoring

5.3.1 Personal and clothing

Each individual exiting the area will scan their outer gloves or have them scanned to determine if contamination greater than background count rates is present. Alternatively, an assumption can be made that the outer wear is contaminated and PPE can thus be disposed of as contaminated waste.

If	Then
Contamination is found on the gloves	Scan the entire body prior to removal of PPE
Contamination is not found on gloves	Remove PPE and scan feet and ungloved hands before exiting the area.
Contamination is found on skin	Decontaminate skin using a warm wash cloth or wipe and re-survey; if after three attempts skin remains contaminated, note survey results and contact the project radiation safety officer
Contamination is found on clothing	Attempt to remove contamination from clothing using tape; if decontamination fails, confiscate clothing for further decontamination or disposal by Lead Radiation Safety Technician

5.4.2 Equipment Monitoring

Note: The following steps assume that survey and decontamination of tools or equipment will be performed prior to exiting the work zone. In those cases where survey and decontamination cannot be performed, the tools or equipment can be removed to a staging area for further survey and decontamination provided the equipment or tools are covered to prevent contact with personnel handling the tools or equipment.

Where standard decontamination practices for tools and equipment are being implemented prior to release of tools or equipment from the work zone, perform a direct scan of at least 10% of the surface and at locations with the greatest likelihood of contact with contamination in the ground, sediments, or building materials.

If contamination level is	Then
≥ 1000 dpm/100 cm ²	Attempt another decontamination of areas where scanning shows high levels of contaminants and re-scan
≥ 200 dpm/100 cm ² and < 1000 dpm/100 cm ²	Take standard 100 cm ² wipes of the surface and analyze using the bench-top alpha-beta counting system
< 200 dpm/100 cm ²	Release from area without further survey

Where decontamination is not performed use a large area wipe (LAW) to collect the surface contamination and scan the wipe.

If wipe results are	Then
Indistinguishable from background	Perform a direct scan of at least 10% of the surface and of locations with the greatest likelihood of contact with contamination in the ground, sediments, or building materials and release equipment and tools if scan is less than 1000 dpm/100cm ² .
Greater than background alpha count rate levels	Take standard 100 cm ² wipes of the surface and analyze using the bench-top alpha-beta counting system and scan, and Perform a direct scan of at least 10% of the surface and of locations with the greatest likelihood of contact with contamination in the ground, sediments, or building materials

If tools or equipment remain contaminated after survey and decontamination, then dispose of tools or equipment as low level radioactive waste (LLRW).

Note: During the project, if tools or equipment become contaminated but will be re-used, then eventual disposal as LLRW can be delayed provided that the contaminated portions will not come in contact with sample materials and the tool or equipment is clearly marked as contaminated and stored in an area posted as a Radioactive Materials Area.

6.0 Restrictions/Limitations

None

7.0 References

Instrument Manuals

Wolff- Alport RI/FS External Exposure Control		Project Specific SOP R-2 Revision: 0 Date: February 2015
Prepared: <u>Peter Collopy</u>	Technical Review:	<u>Chis Marlowe</u>
PM Approval: <u>M. A. Lehmani</u>	Editorial Review:	<u>Kim Jaynes</u>

1.0 Objective

The objective of this technical standard operating procedure (SOP) is to provide guidance for maintaining external radiation exposures as low as reasonably achievable (ALARA).

2.0 Background

2.1 Discussion

The Wolff-Alport work site contains radiological contaminants that consist principally of thorium 232 and its decay progeny and, to a lesser extent, uranium 238 and its decay chain progeny. Both decay chains have radionuclides that emit photon radiations. The level of contamination at the site indicates detection of greater than background exposure rates is not an issue.

Because this site does not fall under the scope of any state or federal radioactive materials licensing provisions, CDM Smith will employ best management practices for worker radiation protection. Consequently, while not required by regulation, CDM Smith's ALARA goal will be to maintain exposures below the regulatory level of 100 mrem (1mSv) per year to a member of the public.

Maintaining exposures below 100 mrem (1 mSv) per year involves limiting exposures to both internal and external sources. To accomplish this, action levels are based on the assumption that an individual on this project will work no longer than 300 hours of actual in-field or work-zone exposure. Because the 100 mrem goal includes both internal and external dose, ALARA responses to limit external dose will be triggered at an exposure or dose rate of 0.250 mrem/hr (0.0025 mSv/hr). This provides an administrative control that allows for the worker's total dose assessment relative to future work he or she may perform.

In this document the assumption is made that radiation exposure is equivalent to radiation dose, so these terms will be used interchangeably.

2.2 Associated Procedures

SOP R-6 Operation of Gross Gamma Counting Field Instrumentation

SOP R-7, Operation of Portable Exposure Rate Detectors

3.0 General Responsibilities

Task Leader – Ensure personnel assigned to work where contact with radioactive materials or exposure to greater than background levels of radiation may occur have received radiological awareness training.

Lead Radiation Safety Technician – Ensure instruments used for monitoring are within the current calibration cycle and are functionally checked daily. Perform surveys of work zones and work in progress and indicate steps workers should take to minimize external exposure. Ensure project personnel working more than forty hours on the site have been issued and are wearing a Thermoluminescent Dosimeter (TLD).

Note: All field team member responsibilities are defined in the quality assurance project plan (QAPP)

4.0 Required Equipment

1. Ludlum 2221 with 44-10 detector or detection system with equivalent detection capability
2. Ludlum 19 or Bicon Microrem or detection system (s) with equivalent detection capability
3. Pressurized Ionization Chamber (PIC) with low dose rate measurement capability

5.0 Procedure

5.1 Action Levels

1. Areas where radiation levels exceed 2000 uR/hr will need to be posted to warn workers where higher than typical radiation levels will be encountered for this project.

Note: It is expected this situation will only occur where IDW is containerized and stored.

2. Work zones or areas where exposure rates approach 0.250 mrem (250 uR or 0.0025 mSv) per hour will require the Lead Radiation Safety Technician to inform workers of locations where the higher dose rates are found as well as locations where dose rates are low; the latter should be used as a staging/work or between task wait area.
3. Areas where the gross gamma count rates, as determined by using a 2"x2" sodium iodide detector, are ten times higher than background will be surveyed with an exposure or dose rate meter to determine the actual external dose rates for the work area.

5.2 Work Zone Exposure Control

Pre-work Steps

1. All project workers will be issued TLDs at the beginning of each calendar quarter of site work.
2. TLDs will be switched out at the end of a calendar quarter and a new TLD for the upcoming calendar quarter will be issued.
3. Historical survey results will be reviewed with project workers prior to entering a specific work zone to ensure they are aware of the level of contaminants and exposure rates that may be present.

Work Zone Controls

1. During equipment set-up the Lead Radiation Safety Technician will survey the work zone to verify the expected exposure rate levels.

Note: This survey requirement can be delegated to another individual provided that individual has been trained on instrument operation and limitations as well as survey methodology.

2. The Lead Radiation Safety Technician will inform the workers if there are significant dose rates present, and will provide information as to where the highest and lowest dose rates occur in the work zone.
3. Periodic measurements of the work zone will be performed in areas where significant quantities of soils or sediments are being accumulated at the surface.

6.0 Restrictions/Limitations

None

7.0 References

Instrument Manuals

**Wolff- Alport RI/FS
Internal Exposure Control**

Project Specific
SOP R-3
Revision: 0
Date: April 2015

Prepared: Peter Collopy

Technical Review: Chris Marlowe

PM Approval: M. A. Lehman

Editorial Review: Kim Jaynes

1.0 Objective

The objective of this technical standard operating procedure (SOP) is to provide guidance for maintaining external radiation exposures as low as reasonably achievable (ALARA).

2.0 Background

2.1 Discussion

The Wolff-Alport work site contains radiological contaminants that consist principally of thorium 232 and its decay progeny and, to a lesser extent, uranium 238 and its decay chain progeny. Because the decay chains for thorium 232 and uranium 238 have radionuclides that emit both alpha and beta radiations, and because thorium 232 is the higher concentration radionuclide at the site, monitoring and control techniques will be specified to ensure internal exposures to thorium 232 and its decay progeny are maintained ALARA. This focus on thorium 232 will concomitantly control any uranium and decay chain progeny to an equal extent.

Because this site does not fall under the scope of any state or federal radioactive materials licensing provisions, CDM Smith will employ best management practices for worker radiation protection. Consequently, while not required by regulation CDM Smith will attempt to maintain exposures below the public regulatory level of 100 mrem (1mSv) per year. This value is a project ALARA objective and there may be a need for some individuals to exceed this value. In those cases the Project RSO will review and approve those exceedances.

Maintaining exposures below 100 mrem (1 mSv) per year involves limiting exposures to both internal and external sources. To accomplish this, action levels are based on the assumption that an individual on this project will work no longer than 300 hours of actual in-field or work-zone exposure. Additionally, it is assumed that 75% of the exposure may result from either internal or external sources. This is a non-conservative assumption, but it makes administration of the program more practicable.

The Thorium Derived Air Concentration (DAC) from Appendix B, Table 2 of the 10CFR20 regulation is used as the dose estimator for this project. Exposure for 300 hours at an air concentration of 1.3E-13 would result in 75 mrem (0.75 mSv) for this project, a concentration level that is extremely difficult to measure and analyze for an immediate assessment of the airborne concentration. Consequently, air monitoring noted in this SOP is designed to serve as a surrogate for more conventional filter collection and analysis methods when monitoring airborne radioactivity. In this case, because of the delay and uncertainty of monitoring results, greater reliance will be placed on engineering control and work practices to limit internal exposures.

In addition there are several locations where exposure to radon-220, a decay chain progeny of thorium 232, may be of significance. They are work near the rail spur north of the Wolf-Alport buildings and in enclosed spaces such as the basement of the delicatessen. It is not expected that

the dose contribution will from radon will impact the over-all dose goal of 100 mrem but radon monitoring will be conducted and internal doses assessed from radon sources.

Respiratory protection (PPE) will only be assigned if engineering controls and work practices are not successful in limiting exposure to dusts and re-suspended debris and soils.

2.2 Associated Procedures

SOP R-11, Operation of MIE Personal Dataram Model PDR 1000AN or air monitor system with equivalent or better detection capability
SOP R-10, Operation of the SKC 224-44MTX pump and 37mm cyclone cassette or equivalent air particulate collection system
SOP R-4 Operation of the Ludlum 2929 or equivalent detection systems

3.0 General Responsibilities

Task Leader – Ensure personnel assigned to work where contact with radioactive materials may occur have received radiological awareness training.

Lead Radiation Safety Technician – Ensure instruments used for monitoring are within the current calibration cycle and are functionally checked daily.

Note: All field team member responsibilities are defined in the quality assurance project plan (QAPP).

4.0 Required Equipment

1. MIE Personal Dataram Model PDR 1000AN or detection system with equivalent detection capability
2. SKC 224-44MTX pump and 37mm cyclone cassette or detection system (s) with equivalent sampling capability
3. Ludlum 2929 or equivalent detection systems
4. Pylon AB6 continuous radon monitor or system with equivalent detection capability

5.0 Procedure

5.1 Action Levels

1. Work zones or areas where soil contamination levels exceed 100 pCi/g will require greater emphasis on dust control and work practices to limit internal exposures.
2. Contaminated areas inside buildings where invasive techniques such as grinding or drilling on or through the contaminated surface occur will require greater emphasis on dust control and work practices to limit internal exposures.
3. PDR readings greater than 400 ug/m³ signal a potential for high radioactive airborne concentrations, and work modifications are required to reduce dust levels.
4. Radon levels exceeding 3E-08 pCi/L will require cessation of work and assessment by the project RSO for determining means for limiting radon exposures.

5.2 Work Zone Exposure Control

Pre-work Steps

1. Historical survey results will be reviewed with project workers prior to entering a specific work zone to ensure they are aware of the level of contaminants and potential for airborne exposures.
2. At least one individual working in close proximity to disturbed radioactive contaminants should wear a breathing zone air sampler or be monitored with a PDR 1000.

3. For radon monitoring the Pylon AB6 will be placed in as close as proximity to the breathing zone as possible without interfering with the work.

Work Zone Controls

1. Where practicable, stand up-wind of any invasive work activities.
2. For large drilling operations where significant materials are being brought to the surface and made airborne, use a water spray to limit re-suspension.
3. For operations such as sample collection and mixing, a spray bottle can be used to mist the soils if the material is extremely dry.
4. If removing building materials, either spray the surface with a surfactant before removal or cover with plastic and work within the plastic cover so that material is confined to the containment.

6.0 Restrictions/Limitations

None

7.0 References

Instrument Manuals