

Resource Conservation and Recovery Act (RCRA)

Volume II - Hazardous Waste Storage & Treatment Permit Renewal Request, Explosive Destruction Technology (SDC 1200)

for the Blue Grass Chemical Agent-Destruction Pilot Plant

Blue Grass Army Depot, Richmond, Kentucky



Program Manager Assembled
Chemical Weapons Alternative



Submitted to:

Energy and Environment Cabinet
Kentucky Department for Environmental Protection
Division of Waste Management
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Submitted by:

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A Joint Venture of Bechtel Parsons, Inc. and Parsons Government Services Inc.

This document has been reviewed for CUI, and
CUI-sensitive information has been removed.

Figure B-1: Facility Location and Surrounding Land Use

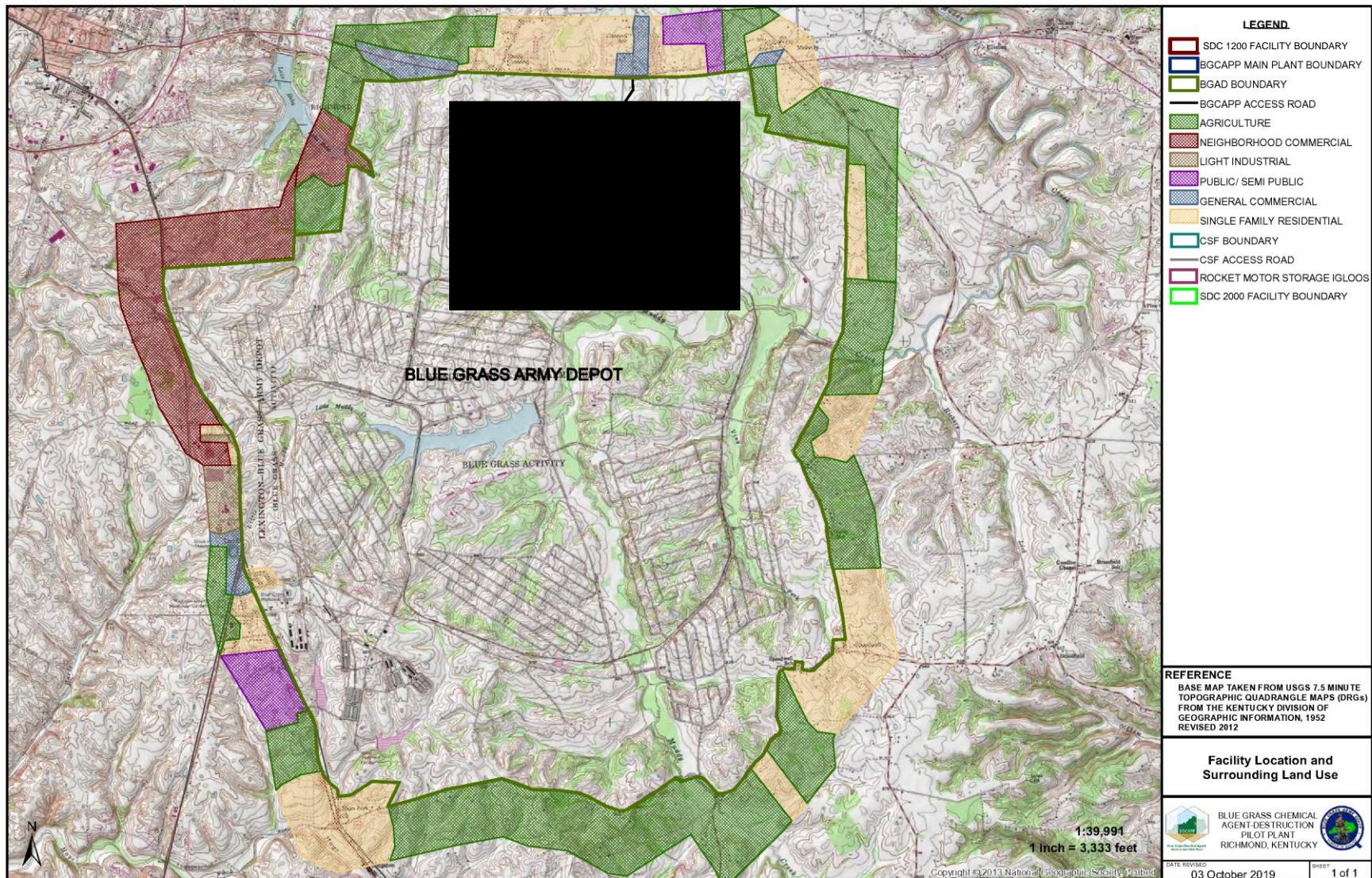


Figure B-2: Facility and Flood Zone

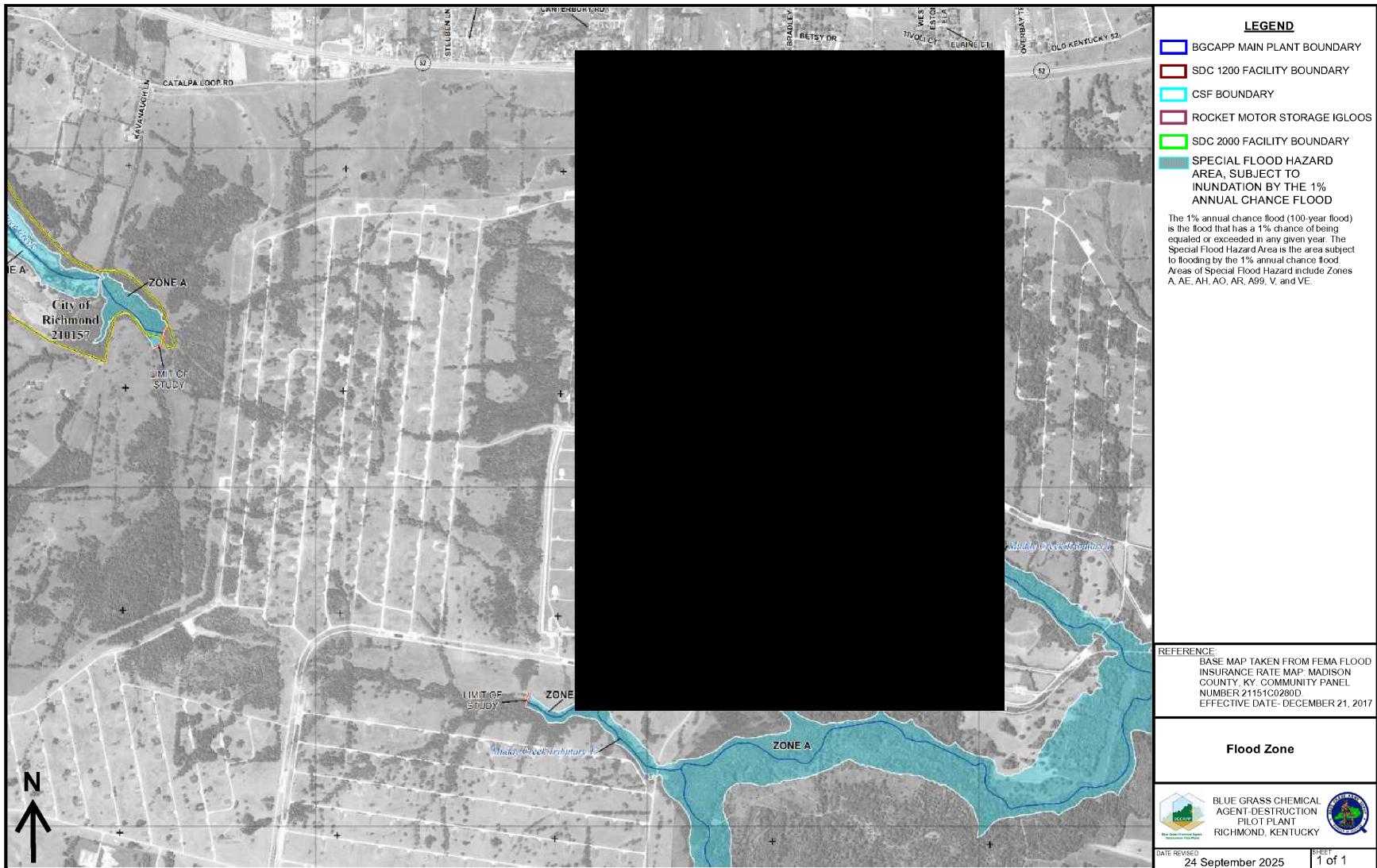
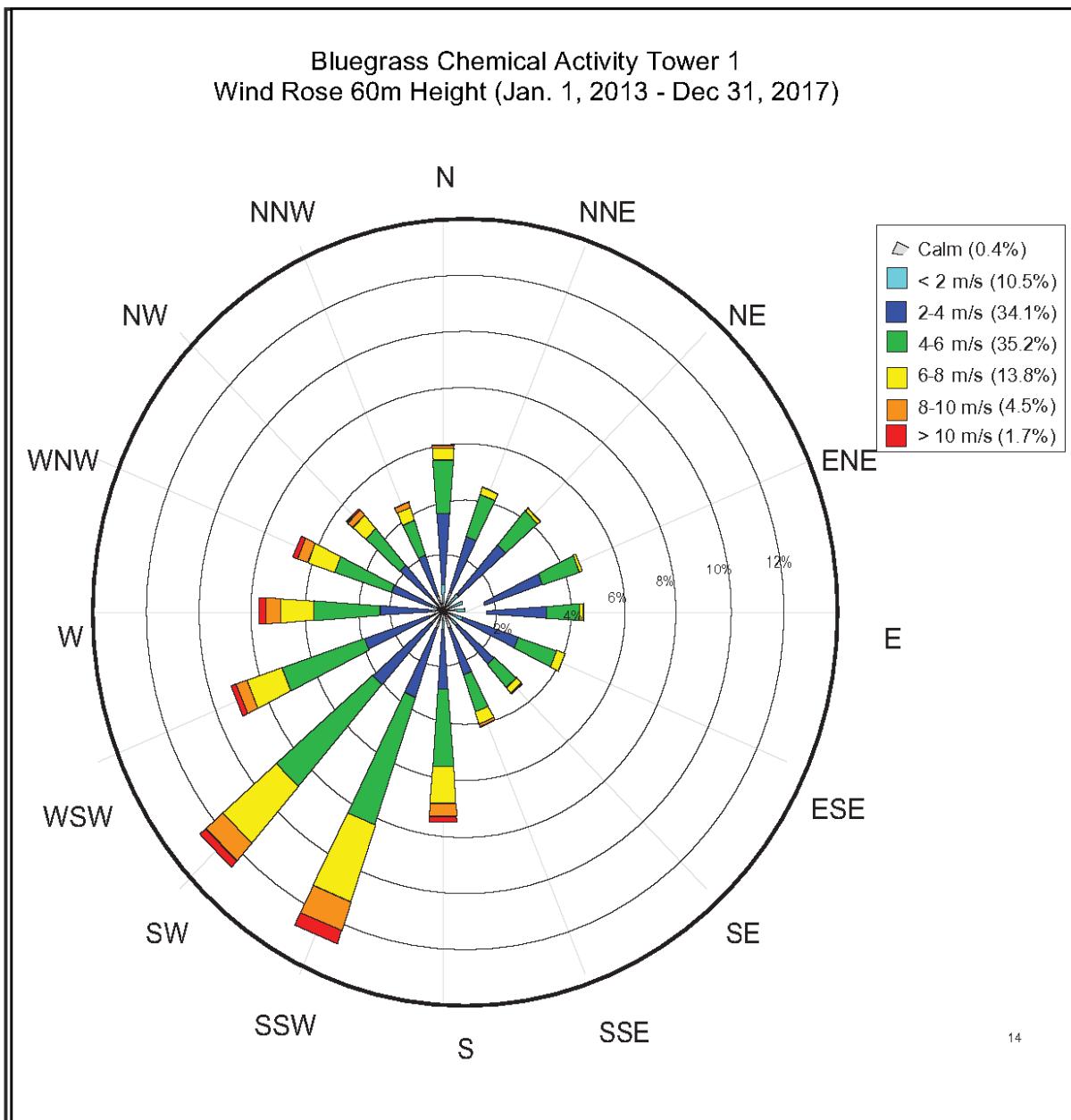


Figure B-3: Facility Wind Rose



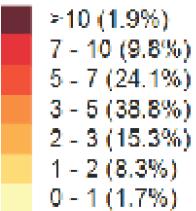
REFERENCE	Facility Wind Rose	LEGEND							
Wind rose created from data obtained by the Bluegrass Chemical Activity Tower 1 at a height of 60 meters. Data was collected from Jan 1, 2013 through Dec 31, 2017. Entries were evaluated and wind rose created using WindRose Pro 3.1	 <p>BLUE GRASS CHEMICAL AGENT-DESTRUCTION PILOT PLANT RICHMOND, KENTUCKY</p> <p>DATE REVISED 26 Sept 2019</p>	<p>Wind speed (m/s)</p>  <table> <tr> <td>>10 (1.9%)</td> </tr> <tr> <td>7 - 10 (9.8%)</td> </tr> <tr> <td>5 - 7 (24.1%)</td> </tr> <tr> <td>3 - 5 (38.8%)</td> </tr> <tr> <td>2 - 3 (15.3%)</td> </tr> <tr> <td>1 - 2 (8.3%)</td> </tr> <tr> <td>0 - 1 (1.7%)</td> </tr> </table>	>10 (1.9%)	7 - 10 (9.8%)	5 - 7 (24.1%)	3 - 5 (38.8%)	2 - 3 (15.3%)	1 - 2 (8.3%)	0 - 1 (1.7%)
>10 (1.9%)									
7 - 10 (9.8%)									
5 - 7 (24.1%)									
3 - 5 (38.8%)									
2 - 3 (15.3%)									
1 - 2 (8.3%)									
0 - 1 (1.7%)									
		<p>SHEET 1 of 1</p>							

Figure B-4: Facility Layout

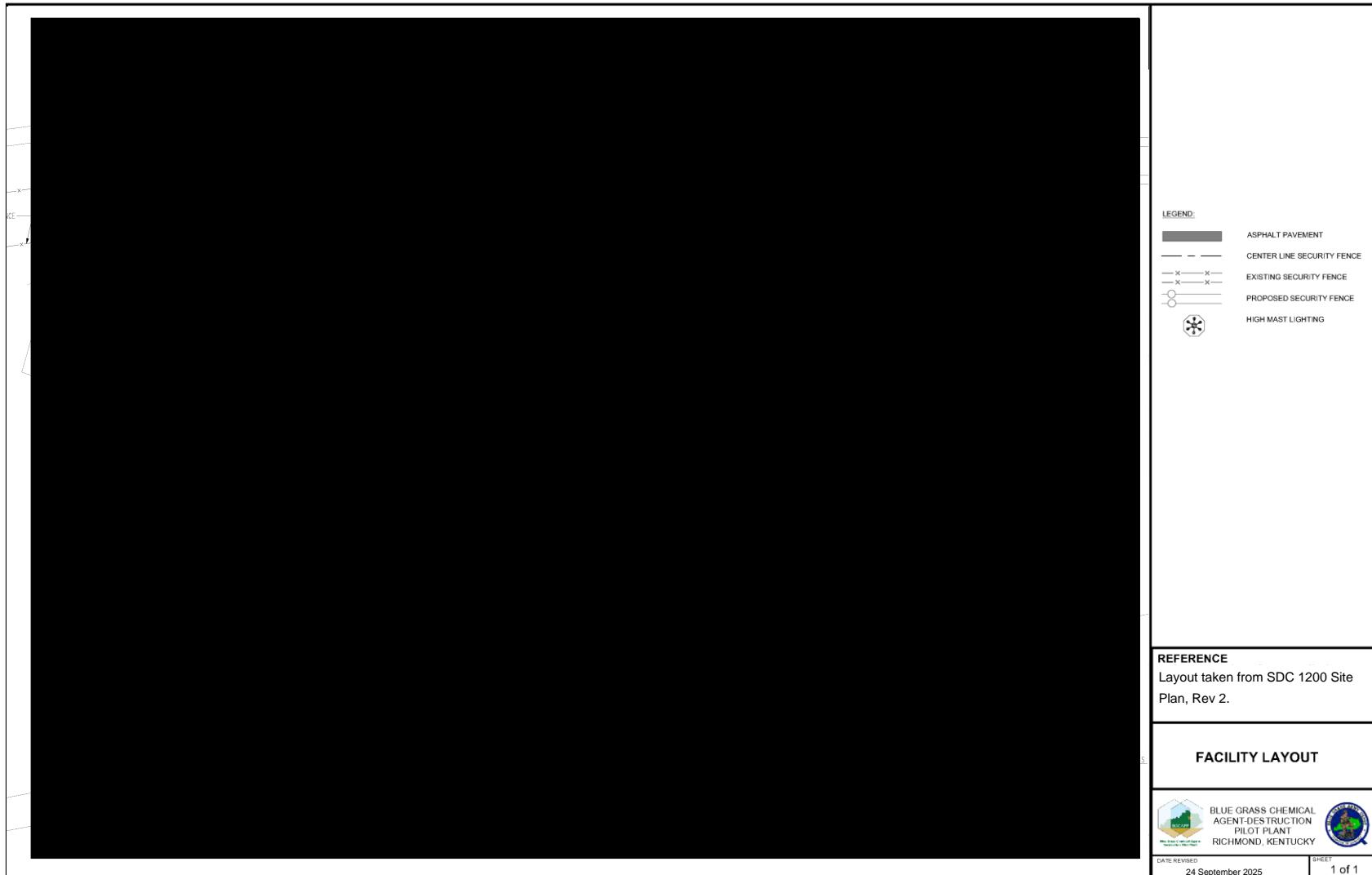


Figure B-5: Geology Surrounding Facility

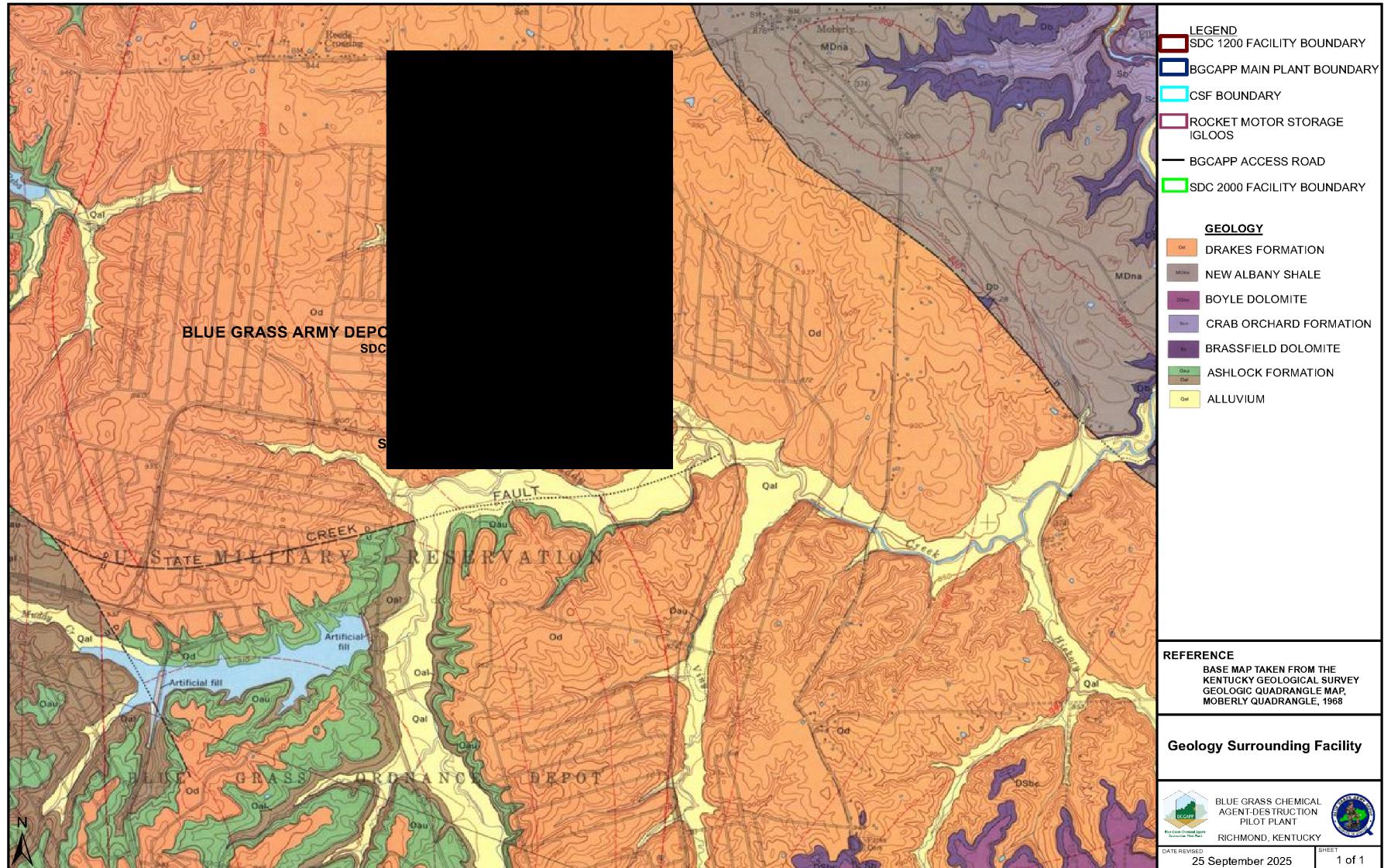


Figure B-6: Soil Types

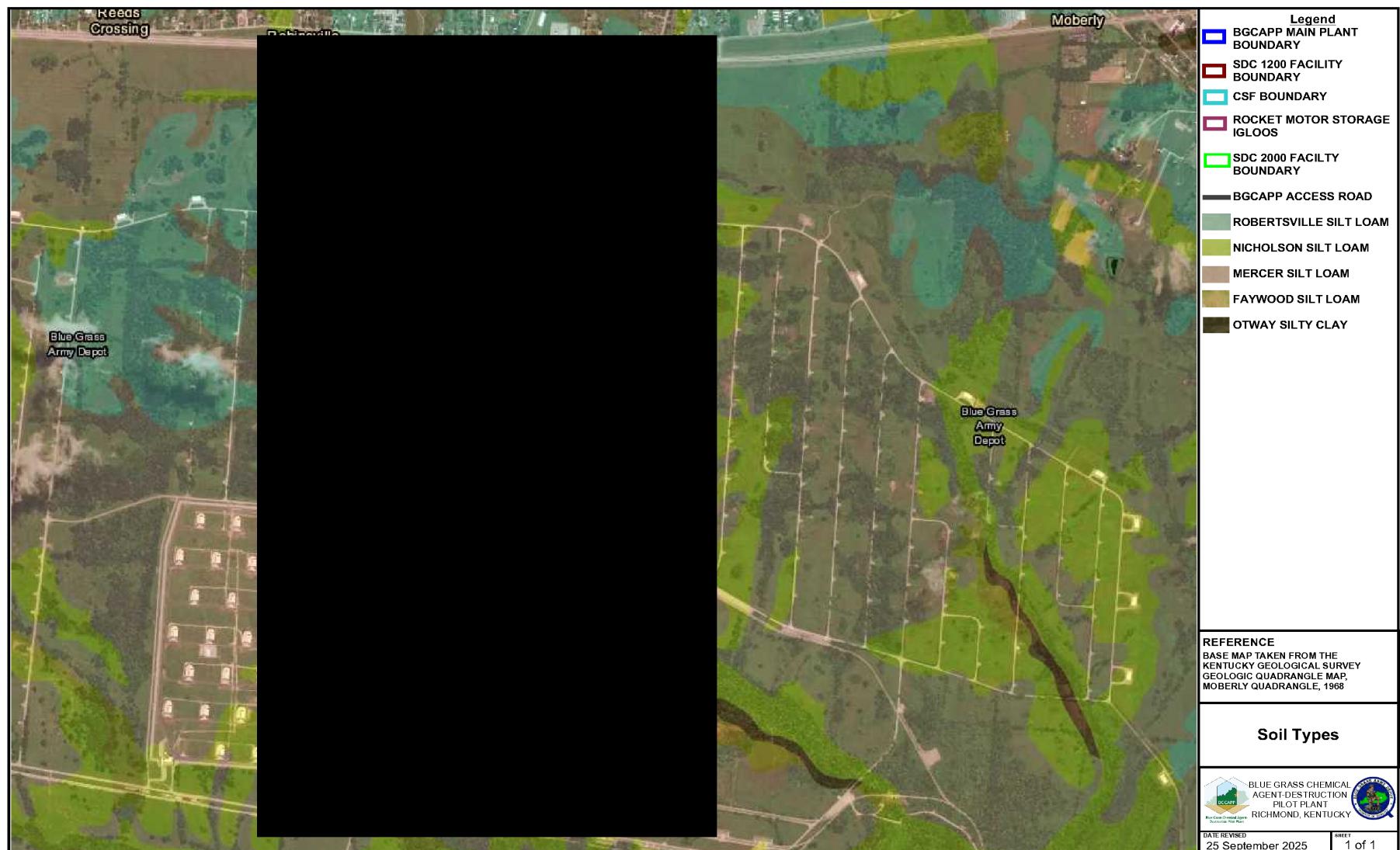


Figure B-7: Traffic Flow



Table C-1: Facility Waste Analyses Plan (WAP) Summary

Wastes Requiring Characterization ¹	Method of Treatment or Disposal	Type of Analysis ^{‡, 1, 2}	Analytical Method ³ / Clearance Criteria (as Applicable)	Frequency of Analysis	Regulatory Requirement	Media Type
Static Detonation Chamber Residue (D004 – D008, D010, D011,, N201)	SDC / Off-Site Shipment	TCLP Metals Agent Derived PCB	EPA SW-846 Method 1311, 3015, 6020 ³ Generator Knowledge EPA SW-846 8081 or 8082 ³	As a minimum: During initial waste generation and when process changes, then annually	401 KAR 39:060 Section 3, 40 CFR 261.24 40 CFR 761	Solid
Buffer Tank Residues (D004 – D008, D010, D011, D022, N001)	SDC / Off-Site Shipment	TCLP Metals Agent-Derived Headspace Monitoring Agent Screen PCB	EPA SW-846 Method 1311, 3015, 6020 ³ Generator Knowledge MINICAMS® or DAAMS Site and waste specific extraction/analytical methods for agent developed IAW the approved LAMP EPA SW-846 8081 or 8082 ³	As a minimum: During initial waste generation and when process changes, then annually	401 KAR 39:060 Section 3, 40 CFR 261.24 401 KAR 39:060 Section 3, 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) Based Upon U.S. Army Policy and Procedures 401 KAR 39:060 Section 3, 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 40 CFR 761	Solid
Cyclone Dust Residues and Filters (D004 – D008, D010, D011, D022, N001)	Off-Site Shipment	TCLP Metals Agent Derived PCB	EPA SW-846 Method 1311, 3015, 6020 ³ Generator Knowledge EPA SW-846 8081 or 8082 ³	As a minimum: During initial waste generation and when process changes, then annually	401 KAR 39:060 Section 3, 40 CFR 261.24 401 KAR 39:060 Section 3, 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 40 CFR 761	Solid
Off-Gas Treatment System (OTS) Scrubber liquids (D002, D004 – D008, D010, D011, N801)	Off-Site Shipment	Corrosivity (pH) TCLP Metals Agent Derived PCB	EPA SW-846 Methods 9040, 9041, 9045 ³ EPA SW-846 Method 1311, 3015, 6020 ³ Generator Knowledge EPA SW-846 8081 or 8082 ³	As a minimum: During initial waste generation and when process changes, then annually	401 KAR 39:060 Section 3, 40 CFR 261.22 401 KAR 39:060 Section 3, 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 401 KAR 39:060 Section 3, 40 CFR 261.24 40 CFR 761	Liquid

Wastes Requiring Characterization ¹	Method of Treatment or Disposal	Type of Analysis ^{*, 1, 2}	Analytical Method ³ / Clearance Criteria (as Applicable)	Frequency of Analysis	Regulatory Requirement	Media Type
Miscellaneous Maintenance and Secondary Wastes (D001 –D011, D018, D019, D022, D027 - D030, D039, D040, F001 – F005, N001, N201, N701, N801N901, N1001)	Decontamination / Off-site Shipment	Ignitability Corrosivity (pH) Reactivity TCLP metals Organics Agent screen (GB) – liquids Headspace Monitoring – solids	EPA SW-846 Method 1010 ³ EPA SW-846 Methods 9040, 9041, 9045 ³ Generator Knowledge EPA SW-846 Method 1311, 3015, 6020 / 7470 ³ EPA SW-846 Methods 1311, 5030, 8260, 8270 ³ Site and waste specific extraction/analytical methods for agent developed IAW the approved LAMP MINICAMS® or DAAMS	Before Disposal	401 KAR 39:060 Section 3; 40 CFR 261.21 401 KAR 39:060 Section 3; 40 CFR 261.22 401 KAR 39:060 Section 3; 40 CFR 261.23 401 KAR 39:060 Section 3; 40 CFR 261.24 401 KAR 39:060 Section 3; 40 CFR 261.24, 261.31 401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i)	Liquid
Laboratory Wastes (D001 –D011, D018, D019, D022, D026 - D030, D035, D037, D038 D039, D040, F001 – F005, N001, N201, N701, N801, N901)	Decontamination / Off-site Shipment	Ignitability Corrosivity (pH) Reactivity TCLP metals Organics Cresols, Pentachlorophenol (phenols) Agent screen (GB) – liquids Headspace Monitoring – solids PCB	EPA SW-846 Method 1010 ³ EPA SW-846 Methods 9040, 9041, 9045 ³ Generator Knowledge EPA SW-846 Method 1311, 3015, 6020 / 7470 ³ EPA SW-846 Methods 1311, 5030, 8260, 8270 ³ EPA SW-846 Method 1311, 3510, 3580, 8041 ³ Site and waste specific extraction/analytical methods for agent developed IAW the approved LAMP MINICAMS® or DAAMS EPA SW-846 8081 or 8082 ³	During initial waste generation and when process changes, then annually; agent screen at frequency required to clear each waste batch for off-site shipment	401 KAR 39:060 Section 3; 40 CFR 261.21 401 KAR 39:060 Section 3; 40 CFR 261.22 401 KAR 39:060 Section 3; 40 CFR 261.23 401 KAR 39:060 Section 3; 40 CFR 261.24 401 KAR 39:060 Section 3; 40 CFR 261.24, 261.31 401 KAR 39:060 Section 3; 40 CFR 261.24 401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 40 CFR 761	Liquid / Solid

Wastes Requiring Characterization ¹	Method of Treatment or Disposal	Type of Analysis ^{*, 1, 2}	Analytical Method ³ / Clearance Criteria (as Applicable)	Frequency of Analysis	Regulatory Requirement	Media Type
Spent Decontamination Solution (D001, D002, D003 D004 – D008, D010, D011, , D022 N901)	Off-site Shipment	Corrosivity (pH) TCLP metals Agent Screen PCB	EPA SW-846 Methods 9040, 9041, 9045 ³ EPA SW-846 Method 1311, 3015, 6020 / 7470 ³ Site and waste specific extraction/analytical methods for agent developed IAW the approved LAMP EPA SW-846 8081 or 8082 ³	Before Disposal	401 KAR 39:060 Section 3; 40 CFR 261.22 401 KAR 39:060 Section 3; 40 CFR 261.24 401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 40 CFR 761	Liquid
Agent and/or Explosively Contaminated Waste (D001, D003, D004 – D008, D010, D011, N001)	SDC / Off-Site Shipment	Ignitability/Reactivity TCLP Metals Headspace Monitoring	Generator knowledge EPA SW-846 Method 1311, 3015, 6020 / 7470 ³ MINICAMS® or DAAMS		401 KAR 39:060 Section 3; 40 CFR 261.21 / 261.23 401 KAR 39:060 Section 3; 40 CFR 261.24 401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i)	Solid
Shipping and Firing Tubes (SFTs) (N101, N102)	Off-site Shipment	Headspace Monitoring PCB	MINICAMS® or DAAMS Generator Knowledge	Before Disposal	401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 40 CFR 761.64	Solid
Carbon Filter, Prefilters and HEPA Filters (D001, D003, D004, D005, D006, D007, D008, D10, D11, D022, N001)	Off-site Shipment	Generator Knowledge TCLP Metals	MINICAMS® or DAAMS EPA SW-846 Method 1311, 3015, 6020 / 7470 ³	NRT Before Disposal	401 KAR 39:060 Section 3; 40 CFR 261.3(a)(2)(iv) and (c)(2)(i) 401 KAR 39:060 Section 3; 40 CFR 261.24	Solid
PCB Process and Secondary Waste from Leaker Processing and ECM Rocket warhead de-mating operations in the ECM	Off-Site Shipment	PCB	EPA SW-846 8081 or 8082 ³	Based on requirements contained in the facility TSCA Authorization	40 CFR 761.64	Solid

NOTES:

Note that these represent all potential characterization requirements for a waste stream or its components; however, some parameters will not apply in cases where a particular waste stream or waste stream component can be characterized by generator knowledge or previous sampling and analysis results.

1 Generator knowledge used to determine whether waste is agent derived. Headspace monitoring used to evaluate potential risks/hazards associated with handling waste solids potentially contaminated with low levels of agent.

2 Results of "total" analyses and composed of 100 percent solids can be divided by a factor of twenty (i.e., as stated in TCLP Method 1311) and compared to the toxicity contaminant limits for each RCRA metal or other contaminant identified in the toxicity characteristic. This approach will be used to characterize wastes and determine if waste numbers D004-D011 or other waste numbers for toxicity are applicable.

3 These are suggested methods, from EPA SW-846 and other sources as referenced in 401 KAR 39:060 Section 2 (referencing 40 CFR. 260.11); the actual method used for any particular analysis will depend upon factors such as previous generator knowledge, off-site laboratory recommendations, and the specific matrix and application. See Table C-3 for potential alternative analytical methods to those listed for each waste stream. Note that not all listed analytical methods will be used for a waste stream if generator knowledge is sufficient for a characterization of the parameter of interest

Table C-2: Sampling Methods and Equipment

Description of Material to be Sampled	Sampling Method ^{1,2}	Equipment ¹
Extremely viscous liquid	ASTM standard D140/D140M-16	Tubing or trier
Crushed or powdered material	ASTM standard D346M-11 (2019) ^{e1}	Tubing, trier, auger, scoop, or shovel
Solid or rock-like material	ASTM standard D420-18	Tubing, trier, auger, scoop, or shovel
Solid or rock-like material	ASTM standard D1452M-16, D5633-04 (2016), and D5451-93(2016)	Tubing, trier, auger, scoop, or shovel
Ash-like material	ASTM standard C311/311M-18	Tubing, trier, auger, scoop, or shovel
Containerized liquid	SW-846	COLIWASA, tubing
Waste tank liquids	Tap	Sampling bottle

NOTES:

¹ The methods and equipment used at the SDC 2000 Facility will potentially differ from those on this table as outlined by 24915 00 9PL 00 00001, Laboratory Analysis and Monitoring Plan (CDRL D007) or individual laboratory operating procedures LOPs.

² American Society for Testing and Materials, annual book of ASTM standards, Volumes 04-03, 04-08, 05-05, Philadelphia, PA

Table C-3: Additional Analytical Methods

Analyses	Additional Methods
TCLP metals	EPA SW-846 Methods 6010, 7471, EPA Method 200.8
Organics	EPA SW-846 Methods 8015, 8081, 8082, 8091, 8095, 8240, 8330, 8332, 8510, 8515
Cresols, Pentachlorophenol (phenols)	EPA SW-846 Method 8540
Cyanides	EPA SW-846 Methods 9012, EPA Method 335.4
pH	EPA Method 150.2
Residual Explosives	Webster's Reagent Kit Expray Kit

Table C-4: Composition of Chemical Agents (GB, VX), Energetics, and Propellant

Composition	GB (%)	VX (%)
O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothiolate (VX)		92.7094
Isopropyl methylphosphonofluoridate (GB)	80.2427	
Diisopropylamine (DIPA)		0.1600
Diisopropylcarbodiimide (DICDI)		0.3000
Dicyclohexylcarbodiimide (DCCDI)		1.6000
Diisopropylaminoethanethiol (RSH)		0.7000
1,3-diisopropylurea (DIPU)	1.7549	0.3000
Pyrodiester [Diethyl dimethylpyrophosphonate] ((CH ₃ CH ₂ O)(CH ₃)P(O)) ₂ O		1.5000
Diisopropyl methylphosphonate (DIMP)	11.2197	
Hydrofluoric acid	0.2217	
Isopropyl fluoride	0.0297	
Tributylamine (TBA)	2.26831	
Chloroform	0.0693	
Isopropyl alcohol	0.4752	
Isopropyl methylphosphonic acid (IMPA)	0.5370	
Bis(2-diisopropylaminoethyl) disulfide (RSSR)		0.7000
Other Organics	2.2766	2.2700
Aluminum		0.000183
Nickel		0.00000135
Copper		0.0000578
Iron		0.0024
Calcium		0.0154
Silicon		0.01253
Other Metals		0.0000375
Total	100.000	100.000

Source: VX: Analysis of the VX agent from the Newport Chemical Agent Disposal Facility (NECDF)

GB: Analysis of the GB agent from the Anniston Chemical Agent Disposal Facility (ANCDF)

Composition	GB (%)	VX (%)
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Energetics

Energetics in GB and VX rocket warheads consist of Composition B (60% RDX [cyclotrimethylenetrinitramine], 39% TNT [2,4,6-trinitrotoluene], and 1% wax) or tetrytol (70% tetryl [2,4,6-trinitrophenylmethylnitramine] and 30% TNT) and RDX.

Propellant

Rocket motor propellant, M28, to be processed as part of the leaker campaign, consists of 60% nitrocellulose, 23.8% nitroglycerin, 9.9% triacetin, 2.6% diethylphthalate, 2.0% lead stearate, and 1.7% nitrodiphenylamine.

Table C-5

DA-PAM 385-61

Toxic Chemical Agent Safety Standards:

Decontamination of Tools, Supplies and Equipment

Population	Decontamination Monitoring Level
Release to Chemical Agent Workers	VSL less than STEL
Release to Non-Chemical Agent Worker on Installation	Less than WPL
Release to General Population	Army approved selected health based criteria depending on anticipated use environment (i.e. GPL, AEGL,HBESL,NHWCL)

USAPHC* Chemical Agent Health-Based Standards and Guidelines Summary Table 2. Criteria for Water, Soil, Waste, etc. (as of July 2011)**

Media	Standard Name	Population	Exposure Scenario	H/HD/HT (Mustard)	GA (Tabun)	GB (Sarin)	GD/GF	VX	Lewisite	Notes/Status	
Water	MFWS <i>Military Field Water Standards</i> ug/L	Designed for military but conservative assumptions can address civilian applications	Short term (~7 day) high volume (15 L/day) consumption	47^{a,b}	4^{a,b,f}	4^{a,b,f}	4^{a,b,f}	4^{a,b,f}	27^{a,b}	These new multi-service criteria (2010 ^a) supersede old values – previous Field Drinking water Standards (FDWS) are now referred to as these MFWS . However actual values are based on same toxicological assessment as past ^b [These values supersedes two previous sets of military FDWS (2005) which include two sets of values, one for 5/L/day consumption, the other for 15 L/day consumption) as well as even older criteria (200 ug/L for Mustard agents/Lewisite and 20 ug/L for nerve agents)]. ^f All nerve agent values reflect lowest estimated ingestion toxicity based on GD. See Notes.	
Soil <i>Health Based Environmental Screening Levels (HBESL)</i>	HBESL – Residential mg/kg	General population: adults and children	Daily exposure, lifetime	0.01^{c,d,e,f,n}	2.8^{c,d,e,n}	1.3^{c,d,e,n}	0.22^{c,d,e,n}	0.042^{c,d,e,n}	0.3^{c,d,e,n}	See Note 1 on Soil HBESL on back of table.	
	HBESL – Industrial mg/kg	General adult population	Frequent exposure 250 days/yr for 30 yrs	0.3^{c,d,n}	68^{c,d,n}	32^{c,d,n}	5.2^{c,d,n}	1.1^{c,d,n}	3.7^{c,d,n}		
Waste (solid and liquid)	HWCL_{sol}^e mg/kg <i>Solid Hazardous Waste (HW) Control Limit</i>	Worker civilian/DoD	Possible occasional exposure at HW treatment facility	6.7^{h,i,n}	680^{h,i,n}	320^{h,i,n}	52^{h,i,n}	10^{h,i,n}	37^{h,i,n}	Were derived by Army (ref h, i) using the chronic toxicity criteria below with risk assessment model similar to that used by EPA Region IX and assumptions denoting specific exposure scenarios associated with waste materials and workers potentially exposed to them. Values were initially documented in a Department of Army proposed hazardous waste management rule presented to the State of Utah (ref i) and later in an October 2000 CHPPM memo to PMCD (ref g). Values are endorsed in DA Policy (ref f, n) for site specific use/consideration.	
	HWC_{liq}^e mg/L <i>Liquid HW Control Limit</i>	Worker civilian/DoD	Possible occasional exposure at HW treatment facility	0.7^{h,i,n}	20^{h,i,n}	8.3^{h,i,n}	0.3^{h,i,n}	0.08^{h,i,n}	3.3^{h,i,n}		
	NHWCL^e mg/kg <i>Non-HW Control Limit (e.g., HW exemption level)</i>	Worker civilian/DoD	At non HW disposal facility, possible occasional exposures	0.3^{h,i,f}	68^{h,i,f}	32^{h,i,f}	5.2^{h,i,f}	1.1^{h,i,f}	3.7^{h,i,f}		
Chronic Toxicity Reference Criteria <i>(Used in risk assessment calculations)</i>	RfD <i>Reference Dose</i> mg/kg/day	General population: adults and children	Lifetime ingested dose at or below which no adverse health effects expected	0.000007_{j, k, l}	0.00004_{j, k, l}	0.00002_{j, k, l}	0.000004_{j, k, l}	0.0000006_{j, k, l}	0.0001_{j, k, l}	NRC/COT (ref j, 1999) gave general endorsement of values; addressed in Final DA OTSG endorsement letter of final RFDs (ref k, 2000); most current documentation of basis and overall status of these values is in peer reviewed article: ref l	
	Cancer Slope Factor (mg/kg/day) ⁻¹	General population: adults and children	Represents the potency of the agent by ingestion to cause increased cancer risk	7.7^{j, k, l}	Not determined to be a carcinogen						The NRC/COT ref j endorsed a less conservative HD Slope Factor of [1.6 mg/kg/day ⁻¹]; DA OTSG (2000) has currently endorsed use of the 7.7; ref k, ref l.
	Inhalation Unit Risk (ug/m ³) ⁻¹	General population: adults and children	Represents the potency of the agent by inhalation to cause increased cancer risk	4.1x10E-3							See Table 20 HD HCD, November 2000 ref m.

NOTES and REFERENCES for Chemical Agent Multi Media/Toxicity Standards Status Table: Existing and Proposed Criteria as of July 2011

* USAPHC was formerly known as the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM).

Application of military drinking water criteria (MFWS): It is noted that contamination of large water supplies with warfare agents is relatively unlikely due to effects of hydrolysis, dilution, and the neutralizing effects of common water treatment processes (*e.g. chlorine). The cited MFWS values were designed for a military scenario in which smaller containerized water supplies directly used for consumption might be intentionally contaminated with significant amounts of agents. Theoretically this situation could result in residual agent levels of concern for several days. The values here assume up to 30 days exposure for up to 15 liters/day consumption which though does occur in extreme heat military environments with high physical activity - is an extremely high rate of drinking water consumption not anticipated for civilians. By comparison USEPA basis its drinking water standards on a 2 L/day consumption rate. As such, MFWS would be appropriate screening criteria for a general population scenario where ingestion rates range from 1-2 liters/day and where most releases to a water supply would involve the hydrolysis, dilution, and treatment processes. It also noted that the nerve agent values all reflect the most acutely toxic ingestion estimate which was based on GD – a single criteria is used because most field detection kits/techniques do not differentiate the type of nerve agent. Alternatively, the ATSDR Oral Minimal Risk Levels (MRLs) are presently available for sulfur mustard agent HD which may also be useful for specific screening assessments - HD MRL for acute-duration exposure of ≤14 days is a dose value 0.0005 mg/kg/day (*not a concentration – must be converted*); MRL for intermediate-duration exposure of 15 to 364 days is 0.00007 mg/kg/day;(ATSDR 2003).

(Soil) HBESLs: were endorsed by headquarters Army (ESOH) in May 1999 ([ref c](#)) were derived (by Army, [ref d – which had criteria reevaluated \(and reaffirmed\) in 2007; see ref d1](#)) using chronic toxicity criteria below with risk assessment model and assumption like that used by USEPA Reg IX to develop soil preliminary remediation goals (PRGs). These are conservative screening criteria for assessing potential long term human exposure/ contact with soil contaminated from (liquid) agent (ambient vapor alone is not expected to result in deposition or soil contamination). Also identified as criteria to determine public release of decontaminated items/ property ([ref e](#)) Note that where there is potential HD or VX soil contamination, breakdown products may also warrant evaluation (see [App f of ref d](#), and [ref g](#)).

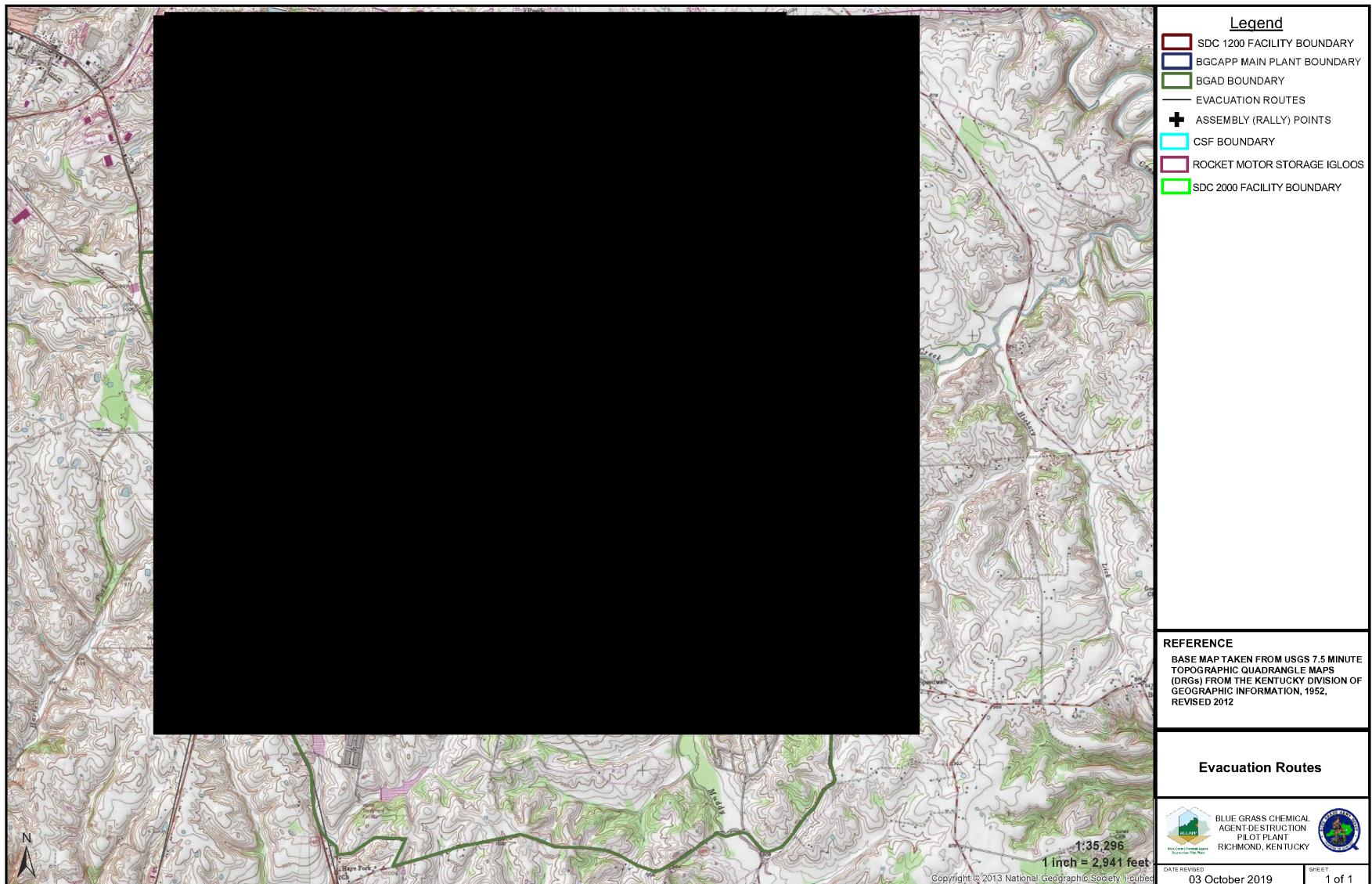
REFERENCES:

- a. TB Med 577, *Sanitary Control and Surveillance of Field Water Supplies*, **May 2010**.
- b. Memorandum, DASG-HS-PE, **16 April 1997**, Subject: Tri-Service Field Water Standards for Nerve Agents.
- c. Memorandum, Headquarters Department of the Army, Office of the Assistant Secretary for Installations, Logistics, and Environment, SUBJ: Derivation of Health Based Environmental Screening Levels (HBESLs) for Chemical Warfare Agents, **May 28, 1999**.
- d. USACHPPM/ORNL Technical Report: *Health Based Environmental Screening Levels for Chemical Warfare Agents*, **March 1999**.
- e. ORNL/TM 080 (2007) Watson and Dolislager "Re-Evaluation of 1999 HBESLs for CWA" **2007**.
- f. DA Pamphlet 385-61, *Toxic Chemical Agent Safety Standards*, **17 December 2008**.
- g. Munro et al; *The Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products*, Environmental Health Perspectives, Volume 107, Number 12, **December 1999**, pp933-974.
- h. Memorandum, Department of the Army – Center for Health Promotion and Preventive Medicine; MCHB-TS-EES; SUBJ: Response to State of Oregon Comments on the Utah Chemical Agent Rule (UCAR), **23 October 2000**; NOTE: This response includes **USACHPPM Information Paper "Management Criteria for Chemical Warfare Agent (CWA)-Contaminated Waste and Media" 10 October 2000 as well as USACHPPM Technical Paper: "Chemical Warfare Agent Health Based Waste Control Limits" dated September 2000**.
- i. U.S. Army-Proposed Utah Chemical Agent Rule (UCAR), **May 1999** (Volume 1, Section XI. Development of Health Based Waste Management Concentration Levels.)
- j. *Review of the US Army's Health Risk Assessments for Oral Exposure to Six Chemical Warfare Agents*, National Research Council, National Academy Press, Wash DC, **1999**. www.nap.edu.
- k. Memorandum, (Army OTSG) MCHB-CG-PPM, Chronic Toxicological Criteria for Chemical Warfare Compounds, **16 February 2000**.
- l. Opresko, D.M., et al, **2001**. Chemical Warfare Agents: Current Status of Oral Reference Doses, *Reviews of Environmental Contamination and Toxicology* Vol. 172 pp 65-85.
- m. USACHPPM Technical Report: *Evaluation of Airborne Exposure Limits for Sulfur Mustard (HD): Occupational and General Population Exposure Criteria*, Technical Report 47-EM-3767-00, **November 2000**.
- n. Memorandum, Department of the Army, Subject: Interim Guidance for Chemical Warfare Material (CMW) Responses, **April 1, 2009**.

Figure G-1: Hazardous Waste Routes



Figure G-2: Evacuation Routes Map



24915-00-9MP-AMS-00001 - MINICAMS/DAAMS Monitoring Table

Station Name	MINICAMS Tag	Mon Level	Agent	MINICAMS Alarm Level	DAAMS Tag	DAAMS Mode	Agent	Station Location	Area Monitored	Sample Line Length ±20%	Power Type	Sample Point HAZ CAT	Notes
MED301GW	16-AMS-AIT5001B	VSL	GB	0.5	N/A	N/A	N/A	Mech Equipment Rm 16-122	Decon Rm/Vestibule (wand) 16-107/109	112'/97'	PLT UPS	C	8
MED301VW	16-AMS-AIT5001C	VSL	VX	0.5	N/A	N/A	N/A	Mech Equipment Rm 16-122	Decon Rm/Vestibule (wand) 16-107/109	112'/97'	PLT UPS	C	8
MED301VW-2	NT	VSL	VX	0.5	N/A	N/A	N/A	Mech Equipment Rm 16-122	Decon Rm/Vestibule (wand) 16-107/109	112'/97'	PLT UPS	C	8,9
MED302G/V	N/A	WPL	N/A	N/A	16-AMS-AI5201-B	HISM	GB/VX	Mech Equipment Rm 16-122	Medical Admin Area 16-105	94'	EGEN	D	
PMB303G/V	N/A	WPL	N/A	N/A	40-AMS-AI5201	HISM	GB/VX	Elect/Util Rm 40-103	OPCW Office Area 40-101	30'	EGEN	D	
CSF501	00-AMS-AIT5001A	VSL	GB	0.5	00-AMS-AI5001	CONF	GB	Container Storage Facility Mon House 110FF	Container Storage Facility Bldg 110FF	65'/65'	POR UPS	C	9, 26
CSF501V	00-AMS-AIT5001B	VSL	VX	0.5		CONF	VX	Container Storage Facility Mon House 110FF	Container Storage Facility Bldg 110FF	65'/65'	POR UPS	C	9, 26
CSF502A	00-AMS-AIT5002A	VSL	GB/VX	0.5	N/A	N/A	N/A	Container Storage Facility Mon House 110FF	Container Storage Facility Bldg 110FF (WAND)	100'	N/A	N/A	8, 9
CSF502B	00-AMS-AIT5002B	VSL	GB/VX	0.5	N/A	N/A	N/A	Container Storage Facility Mon House 110FF	Container Storage Facility Bldg 110FF (WAND)	100'	N/A	N/A	8,9
RTP513	Mobile	VSL	GB/VX	0.5	Mobile	NB	GB/VX	RTAP CA338	RTAP	100'	N/A	N/A	8,9,16
RTP514	Mobile	VSL	GB/VX	0.5	Mobile	NB	GB/VX	RTAP CA338	RTAP	100'	N/A	N/A	8,9,16
RTP515	Mobile	VSL	GB/VX	0.5	Mobile	NB	GB/VX	RTAP CA338	RTAP	100'	N/A	N/A	8,9,16
RTP517	Mobile	VSL	VX	0.5	Mobile	NB	GB/VX	RTAP CA330	RTAP	100'	N/A	N/A	8,9,16
RTP518	Mobile	VSL	VX	0.5	Mobile	NB	GB/VX	RTAP CA330	RTAP	100'	N/A	N/A	8,9,16
RTP519	Mobile	VSL	GB	0.5	Mobile	NB	GB/VX	RTAP CA330	RTAP	100'	N/A	N/A	8,9,16
RTP520	Mobile	VSL	GB	0.5	Mobile	NB	GB/VX	RTAP CA330	RTAP	100'	N/A	N/A	8,9,16
RTP521	Mobile	VSL	VX	0.5	Mobile	NB	GB/VX	RTAP CA331	RTAP	100'	N/A	N/A	8,9,16
RTP522	Mobile	VSL	VX	0.5	Mobile	NB	GB/VX	RTAP CA331	RTAP	100'	N/A	N/A	8,9,16
RTP523	Mobile	VSL	GB	0.5	Mobile	NB	GB/VX	RTAP CA331	RTAP	100'	N/A	N/A	8,9,16
RTP524	Mobile	VSL	GB	0.5	Mobile	NB	GB/VX	RTAP CA331	RTAP	100'	N/A	N/A	8,9,16

24915-00-9MP-AMS-00001 - MINICAMS/DAAMS Monitoring Table

Station Name	MINICAMS Tag	Mon Level	Agent	MINICAMS Alarm Level	DAAMS Tag	DAAMS Mode	Agent	Station Location	Area Monitored	Sample Line Length ±20%	Power Type	Sample Point HAZ CAT	Notes
MMC001	Mobile	VSL	GB/VX	0.5	Mobile	NB	GB/VX	Mobile Mon Cart 001	Mobile Mon Cart	100'	N/A	N/A	7,8,9,16
MMC002	mobile	VSL	GB/VX	0.5	Mobile	NB	GB/VX	Mobile Mon Cart 002	Mobile Mon Cart	100'	N/A	N/A	7,8,9,16

24915-00-9MP-AMS-00001 - MINICAMS/DAAMS Monitoring Table

Station Name	MINICAMS Tag	Mon Level	Agent	MINICAMS Alarm Level	DAAMS Tag	DAAMS Mode	Agent	Station Location	Area Monitored	Sample Line Length ±20%	Power Type	Sample Point HAZ CAT	Notes
EDT301	70-AMS-AIT5001	VSL/WPL	VX	0.5	70-AMS-AI5209	CONF	VX	Mon Shack (ESM) 302	Service Magazine 301	140'/140'	POR UPS	D	14
EDT302	70-AMS-AIT5002	VSL	VX	0.5	70-AMS-AI5210	CONF	VX	Mon Shack (ESM) 302	IONEX 1000 Filter Unit Midbed	70'/80'	POR UPS	C	15
EDT303	70-AMS-AIT5003	VSL	VX	0.5	70-AMS-AI5211	CONF	VX	Mon Shack (ESM) 302	IONEX 1000 filter unit Outlet	95'/105'	POR UPS	C	15
EDT307	70-AMS-AIT5006	VSL/WPL	VX	0.5	70-AMS-AI5204	CONF	VX	Corridor 103	Airlock VES 100	125'/130'	POR UPS	C	12
EDT308	70-AMS-AIT5007	VSL/WPL	VX	0.5	70-AMS-AI5205	CONF	VX	Corridor 103	Munitions Loading Area SDC Rm 104	140'/135'	POR UPS	C	13
EDT309	70-AMS-AIT5008	VSL	VX	0.5	N/A	N/A	N/A	Corridor 103	Buffer Tank Enclosure	50'	POR UPS	B	19
EDT310	70-AMS-AIT5009	VSL/WPL	VX	0.5	70-AMS-AI5209	CONF	VX	Corridor 103	DET Chamber Enclosure	90'	POR UPS	B	19
EDT311	70-AMS-AIT5010	VSL/WPL	VX	0.5	70-AMS-AI5208	CONF	VX	Corridor 103	Scrap Exit Area SDC Rm 104	110'/110'	POR UPS	C	13
EDT312	70-AMS-AIT5011	VSL	VX	0.5	70-AMS-AI5206	CONF	VX	Corridor 103	IONEX 16000HVAC Filter Midbed	70'/70'	POR UPS	C	15
EDT313	70-AMS-AIT5012	VSL	VX	0.5	70-AMS-AI5207	CONF	VX	Corridor 103	IONEX 16000HVAC Filter Stack	90'/90'	POR UPS	C	15
EDT315A	70-AMS-AIT5014A	SEL	VX	0.33	70-AMS-AI5201	CONF	VX	OTS Exhaust Stack Mon house 201	OTS Exhaust Stack	10'/35'	POR UPS	N/A	6, 15, 26
EDT315B	70-AMS-AIT5014B	SEL	VX	0.33	70-AMS-AI5202	CONF	VX	OTS Exhaust Stack Mon house 201	OTS Exhaust Stack	15'/25'	POR UPS	N/A	6, 15, 26
EDT316	70-AMS-AIT5020	VSL	VX	0.5	N/A	N/A	N/A	Mon Shack (ESM) 302	Spare	130'	POR UPS	C	
EDT317	70-AMS-AIT5021	VSL	VX	0.5	N/A	N/A	N/A	Mon Shack (ESM) 302	EONC Point Source	95'	POR UPS	N/A	8
EDT318	70-AMS-AIT5017	WSL	VX	0.5	N/A	N/A	N/A	Corridor 101	SDC Waste Monitoring SDC Rm 104	50'	EGEN	C	8, 9, 19
EDTP01	70-AMS-AIT5015	VSL	VX	0.5	N/A	N/A	N/A	Corridor 101	SDC Waste Monitoring SDC Rm 104	50'	EGEN	C	8, 9, 19
EDTP02	70-AMS-AIT5016	VSL	VX	0.5	N/A	N/A	N/A	Corridor 102	Airlock VES 100 Personnel Monitoring	50'	EGEN	C	8, 9, 19
EDTPDS1	N/A	WPL/GPL	N/A	N/A	NT	NB	VX	Corridor 102	Airlock VES 100 Waste/Skid Monitoring	50'	EGEN	C	8, 16
EDT 330	70-AMS-AIT5030	VSL	VX	0.5	70-AMS-AI5230	CONF	VX	Corridor 103	IONEX 16K Mid-bed	51'/65'	POR UPS	C	15
EDT 331	70-AMS-AIT5031	VSL	VX	0.5	70-AMS-AI5231	CONF	VX	Corridor 103	IONEX 16K Outlet	65'/78'	POR UPS	C	15
EDT 332	70-AMS-AIT5032	VSL	VX	0.5	70-AMS-AI5232	CONF	VX	OTS	IONEX 16K THO Room Mid-bed	91'/91'	POR UPS	C	15
EDT 333	70-AMS-AIT5033	VSL	VX	0.5	70-AMS-AI5233	CONF	VX	OTS	IONEX 16K THO Room Outlet	91'/105'	POR UPS	C	15
EDT 334	70-AMS-AIT5034	SEL	VX	0.33	N/A	N/A	N/A	OTS	OTS Exhaust Mid-bed	35'	POR UPS	C	6

24915-00-9MP-AMS-00001 - MINICAMS/DAAMS Monitoring Table

Station Name	MINICAMS Tag	Mon Level	Agent	MINICAMS Alarm Level	DAAMS Tag	DAAMS Mode	Agent	Station Location	Area Monitored	Sample Line Length ±20%	Power Type	Sample Point HAZ CAT	Notes
EDT 335	70-AMS-AIT5035	VSL/WPL	VX	0.5	70-AMS-AI5235	CONF	VX	OTS	THO Room	65'/52'	POR UPS	C	13
SDC 701	80-AMS-AIT-5001	VSL	GB	0.5	N/A	N/A	N/A	Electrical Room	Buffer Tank Enclosure	144'	POR UPS	B	19
SDC 702	80-AMS-AIT-5002	VSL	GB	0.5	N/A	N/A	N/A	Electrical Room	SDC Room (wand)	193'	POR UPS	B	8, 19
SDC 703	80-AMS-AIT-5003	VSL	GB	0.5	N/A	N/A	N/A	Electrical Room	Det Chamber Enclosure	130'	POR UPS	B	19
SDC 704	80-AMS-AIT-5004	VSL	GB	0.5	N/A	N/A	N/A	Electrical Room	SDC Room Waste Monitoring (wand)	134'	POR UPS	C	8, 19
SDC 705	80-AMS-AIT-5005	VSL/WPL	GB	0.5	80-AMS-AI-5205	CONF	GB	Electrical Room	SDC Room, West	26'/18'	POR UPS	C	13
SDC 706	80-AMS-AIT-5006	VSL/WPL	GB	0.5	80-AMS-AI-5206	CONF	GB	IONEX Electric Container	SDC Room, East	134'/142'	POR UPS	C	13
SDC 707	80-AMS-AIT-5007	WSL	GB	0.5	N/A	N/A	N/A	Electrical Room	SDC Room Waste Monitoring (wand)	95'	POR UPS	C	8, 19
SDC 708	80-AMS-AIT-5008	VSL/WPL	GB	0.5	80-AMS-AI-5208	CONF	GB	Electrical Room	SDC Personnel Vestibule	135'/146'	POR UPS	C/D	12, 15
SDC 708W	80-AMS-AIT-5028	VSL	GB	0.5	N/A	N/A	N/A	Electrical Room	SDC Personnel Vestibule (wand)	135'	POR UPS	C/D	8, 9, 19
SDC 709	80-AMS-AIT-5009	VSL/WPL	GB	0.5	80-AMS-AI-5209	CONF	GB	Electrical Room	SDC Fork Truck Vestibule	140'/150'	POR UPS	C/D	12, 15
SDC 709W	80-AMS-AIT-5029	VSL	GB	0.5	N/A	N/A	N/A	Electrical Room	SDC Fork Truck Vestibule and EONC Monitoring (wand)	140'	POR UPS	C/D	8, 9, 19
SDC 710	N/A	WPL/GPL	N/A	N/A	NT	NB	GB	SDC Fork Truck Vest	SDC Fork Truck Vestibule (wand)	20'	N/A	C/D	8,15, 16
SDC 711	80-AMS-AIT-5011	VSL	GB	0.5	80-AMS-AI-5211	CONF	GB	IONEX Electric Container	IONEX 16000 HVAC-CFU-001A Mid-Bed	108'/110'	POR UPS	C	15
SDC 712	80-AMS-AIT-5012	VSL	GB	0.5	80-AMS-AI-5212	CONF	GB	IONEX Electric Container	IONEX 16000 HVAC-CFU-001A Discharge	104'/102'	POR UPS	C	15
SDC 713	80-AMS-AIT-5013	VSL	GB	0.5	80-AMS-AI-5213	CONF	GB	IONEX Electric Container	IONEX 16000 HVAC-CFU-001B Mid-Bed	90'/92'	POR UPS	C	15
SDC 714	80-AMS-AIT-5014	VSL	GB	0.5	80-AMS-AI-5214	CONF	GB	IONEX Electric Container	IONEX 16000 HVAC-CFU-001B Discharge	87'/86'	POR UPS	C	15
SDC 715	80-AMS-AIT-5015	VSL	GB	0.5	80-AMS-AI-5215	CONF	GB	IONEX Electric Container	IONEX 16000 HVAC-CFU-001C Mid-Bed	74'/78'	POR UPS	C	15
SDC 716	80-AMS-AIT-5016	VSL	GB	0.5	80-AMS-AI-5216	CONF	GB	IONEX Electric Container	IONEX 16000 HVAC-CFU-001C Discharge	71'/74'	POR UPS	C	15
SDC 717	80-AMS-AIT-5017	SEL	GB	0.33	80-AMS-AI-5217	CONF	GB	Monitoring House	OTS Exhaust Stack	16'/24'	PLT	N/A	6, 15, 26
SDC 718	80-AMS-AIT-5018	SEL	GB	0.33	80-AMS-AI-5218	CONF	GB	Monitoring House	OTS Exhaust Stack	16'/24'	PLT	N/A	6, 15, 26
SDC 720	80-AMS-AIT-5020	SEL	GB	0.33	N/A	N/A	N/A	Monitoring House	Process IONEX 4000 HVAC-CFU-022 Mid-Bed	125'	PLT	C	6

24915-00-9MP-AMS-00001 - MINICAMS/DAAMS Monitoring Table

Station Name	MINICAMS Tag	Mon Level	Agent	MINICAMS Alarm Level	DAAMS Tag	DAAMS Mode	Agent	Station Location	Area Monitored	Sample Line Length ±20%	Power Type	Sample Point HAZ CAT	Notes
ECM 801	80-AMS-AIT5022	VSL/WPL	GB	0.5	80-AMS-AI5222	CONF	GB	ECM Monitoring Shack	ECM	115'/145'	POR UPS	C	13
ECM 801V	80-AMS-AIT5050	VSL/WPL	VX	0.5		CONF	VX	ECM Monitoring Shack	ECM	145'/145'	POR UPS	C	13
ECM 802	80-AMS-AIT5024	VSL	GB	0.5	N/A	N/A	N/A	ECM Monitoring Shack	ECM (wand)	120'	POR UPS	C	8
ECM 802V	80-AMS-AIT5051	VSL	VX	0.5	N/A	N/A	N/A	ECM Monitoring Shack	ECM (wand)	145'	POR UPS	C	8
ECM 805	80-AMS-AIT5025	VSL	GB	0.5	80-AMS-AI5225	CONF	GB	ECM Monitoring Shack	ECM IONEX 1000 HVAC-CFU-003 Mid-Bed	134'/144'	POR UPS	C	15
ECM 805V	80-AMS-AIT5053-A	VSL	VX	0.5		CONF	VX	ECM Monitoring Shack	ECM IONEX 1000 HVAC-CFU-003 Mid-Bed	134'/144'	POR UPS	C	15
ECM 806	80-AMS-AIT5026	VSL	GB	0.5	80-AMS-AI5226	CONF	GB	ECM Monitoring Shack	ECM IONEX 1000 HVAC-CFU-003 Discharge	140'/146'	POR UPS	C	15
ECM 806V	80-AMS-AIT5053-B	VSL	VX	0.5		CONF	VX	ECM Monitoring Shack	ECM IONEX 1000 HVAC-CFU-003 Discharge	140'/146'	POR UPS	C	15