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# APPENDIX F

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## Great Black Swamp Inland Zone Sub-Area Resource Inventory List

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## Federal Resources

Federal Resources Available for Response

Federal Resources Available for Response

EPA Region 5 Equipment Catalog

The EPA Region 5 Equipment Catalog details available response equipment including where the equipment is located in Region 5.

EPA Region 5 Emergency Response Capability

The EPA Region 5 Emergency Response Capability Catalog details the capabilities of EPA Region 5's Emergency Response Branch.

## State Resources

State response resources will be listed upon discovery.

## Local Resources

Local response resources will be listed upon discovery.

## Private Sector Resources

Private sector response resources will be listed upon discovery.

## Other Resources

Other response resources will be listed upon discovery.

United States  
Environmental  
Protection  
Agency  
Region 5  
January-2020

# USEPA REGION 5 FIELD EQUIPMENT CATALOG

(IL: Willowbrook, Chicago, Des Plaines, Marion. MI: Ann Arbor, Traverse City.  
OH: Westlake, Cincinnati. IN: Indianapolis. WI: Green Bay. MN: St. Paul)



# INTRODUCTION

This equipment catalog was developed by U.S. Environmental Protection Agency (EPA), Region 5 Superfund staff for the purpose of helping Region 5, Removal Program On-Scene Coordinators (OSCs) understand the types and quantities of field response equipment located throughout Region 5 and field services available to them through the Field Services Section (FSS).

The equipment presented in this catalog includes all Removal Program equipment at the following Region 5 locations\*:

- Willowbrook Warehouse, Willowbrook, Illinois
- Chicago Office (5th floor equipment closet)
- Des Plaines, Illinois (back-up EOC)
- Ann Arbor, Michigan
- Westlake, Ohio
- Cincinnati, Ohio
- Green Bay, Wisconsin
- Indianapolis, Indiana
- Marion, Illinois
- Saint Paul, Minnesota
- Traverse City, Michigan

Equipment presented in this catalog includes items that are part of the National Equipment List (NEL). This catalog also presents a selection of other non-removal program equipment, such as trailers, that might be useful to OSCs.

To access Willowbrook Warehouse equipment, please visit the Warehouse Monday through Friday, 8:00 am to 5:00 pm, or call the warehouse at 630-481-5000. The Willowbrook Warehouse is located at 600-A Joliet Road, Willowbrook, Illinois.

To access equipment at Ann Arbor or Westlake, please call Jeff Borseth at 734-214-4899.

For all other inquiries concerning equipment at other locations presented in this catalog or the catalog itself, contact Steve Padovani, Chief, Field Services Section (FSS), Region 5 Superfund Division at 312-353-6755.

Please note, this catalog will be updated periodically to help ensure the inventory presented is current.

*\* The Region 5 Willowbrook Warehouse is the primary location for centrally managing the Region 5 Emergency Response Program's emergency response and removal assets. Staffs that support these effort responsibilities include but are not limited to; tagging, inventorying, tracking calibrating, maintenance and shipping of Region 5 response assets. Based on the Emergency Response Program Concept of Operations, a portion of the Region 5 equipment assets are decentralized and assigned directly and to their program office. Assigned equipment has been identified as critical to support the health and safety of OSCs and as the program's overall response mission.*

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# **1. ER RESPONSE HEALTH & SAFETY**

**This section presents descriptions of the following health, safety & PPE:**

- 1-1. Respiratory Protection**
  - a. Air Purifying Respirator**
    - i. Scott AV 3000 Respirator**
    - ii. Scott 420 Plus PAPR**
  - b. Air Supplied Respirator**
    - i. Scott Air Pack 4.5 SCBA**
    - ii. SCBA with Supplied Air**
    - iii. Level A Pass-Through Suit**
  - c. Breathing Air Filling Station (Air Trailer)**
    - i. Compressor, Breathing Air Filling Station**
    - ii. Trailer, Breathing Air Filling Station**
  - d. Respiratory Protection Equipment Matrix**
- 1-2. Cooling Vest, Isotherm**
- 1-3. Hazmat Suit, Level A**
- 1-4. Blood Pressure Monitor**
- 1-5. Coveralls**
  - a. Tyvek**
  - b. Saranex**
  - c. Nomex**
- 1-6. Boot Covers, Latex**
- 1-7. Thermometer, Infrared**
- 1-8. Lightning Detector, Personal**
- 1-9. Gloves**
  - a. Neox, Edmont, 9-922**
  - b. Silver Shield, North**
  - c. Butyl, North**
  - d. Viton, North**
  - e. Nitrile**
  - f. Vinyl**
  - g. Work**
  - h. Nylon Foam, Winter Gloves**

# **1. ER RESPONSE HEALTH & SAFETY**

## **(Continued)**

- 1-10. Rubber Boots**
- 1-11. Hard Hats**
- 1-12. Flotation Devices, Personal (PFD)**
- 1-13. Signage, Barricade Tape, Sticker Labels**
- 1-14. Sound Level Meter**
- 1-15 Ductless Fume System**



## 1-1. Respiratory Protection

### Description:

To promote consistency and interchangeability among EPA Emergency Responders, EPA has chosen Scott brand as the standard issue respirator. OSCs and support staff use tight fitting full face pieces as either negative pressure air purifying respirators (APR) or atmospheric supplying respirators (ASR). EPA Emergency Responders must choose from the EPA standard issue equipment unless the individual cannot achieve an acceptable fit test using the standard issue face piece. In these circumstances another brand of respirator may be substituted in accordance with guidance in EPA's Respiratory Protection Program. Each Region 5 OSC is assigned APR and ASR equipment. The following sections identify the standard issue respiratory protection equipment and their current configurations.

#### 1-1.a. Air Purifying Respirator

##### 1-1.a.i. Scott AV 3000 Respirator- Scott AV3000

Respirator consists of a sure seal face piece, a model 742 1/4 turn adapter configured with 742 series cartridges for operating in a non-CBRN environment; It also can be configured with a 40 mm CBRN adaptor and either a multi-purpose canister (MPC) or CBRN canister for operating in CBRN environment (Figure 1). The respirator can also be configured with a EPIC voice amplifier with the addition of a EPIC mounting bracket (Figure 2).



Figure 1.

#### OSC Assigned APR Parts List;

Manufacturer: Scott Safety

1. AV 3000 Respirator w/ Sure Seal Face Piece P/N 31001738 (small) 31001739 (medium) 31001740 (large) (1 ea.)
2. MPC Cartridges or Canisters P/N 045170 (1 set)
3. 40 mm Adaptor P/N 805059-01
4. 742 Series Cartridges P/N 7422-SD1 (also see attached selection guide)
5. 742 1/4 Turn Adapter P/N 805622-01 (Twin Cartridge Model)
6. EPIC Voice Amplifier P/N 200261-01
7. EPIC Voice Amplifier Bracket P/N 200715-01



Figure 2.

### 1-1.a.ii. Scott 420 Plus Powered Air Purifying Respirator Kit

The SCOTT C420 Plus respirator kit consists of a SCOTT AV 3000 Sure Seal respirator, a breathing tube to connect the face piece to the blower assembly, and a blower assembly with a fresh battery installed and fitted with two (2) matching filtration canisters/cartridges that are selected based on the contaminant of concern. A belt assembly supports the blower assembly on the user's waist. An Airflow Indicator which is used to check for minimum airflow is also provided. This configuration along with the CBRN CAP-1 canisters qualifies for Chemical, Biological, Radiological, and Nuclear (CBRN) approval status under the NIOSH standard.



**Figure 3.**

#### OSC Assigned C420 PAPR Parts List; Manufacturer - Scott Safety

1. AV 3000 Respirator w/ Sure Seal Face Piece P/N 31001738 (small) P/N 31001739 (medium) 31001740 (large) (one per OSC)
2. MPC Cartridges or Canisters P/N 045170 (1 set) (see attached selection guide)
3. C 420 PAPR Kit P/N 200698-30 (1 ea.)
4. Batteries LiSO2 P/N 805358-01 Nickel Metal Hydride P/N 31001504 (5.0 volt/5.8 amp) (1 ea.)
5. Air Flow Indicator P/N 805374-01(1 ea.)
6. Battery Charger P/N 200703-01(1 ea.)
7. 36-inch breathing tube, P/N: 200829-36
8. Belt assembly P/N 805359-01
9. Battery cap for Nickel Metal Hydride battery P/N 31001506 (1 ea.)



### 1-1.b. Air Supplied Respirator (ASR)

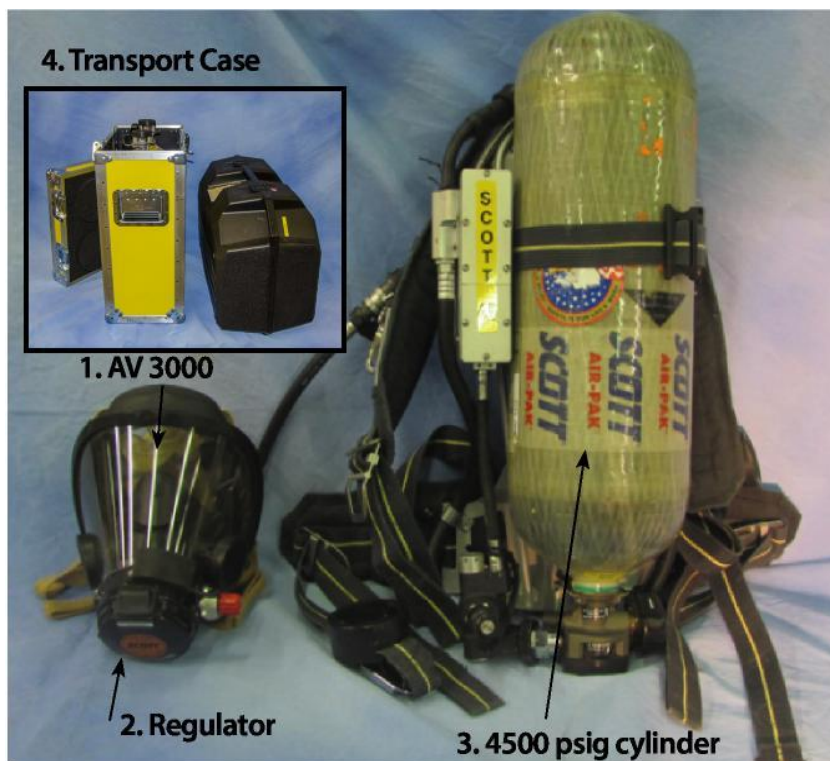
An ASR is required for high hazard environments, including those that are oxygen deficient (less than 19.5 % oxygen) or high concentrations of contaminants that create IDLH (Immediate Danger to Life and Health) conditions. Under IDLH conditions, the ASR must be configured to be either a full-face piece pressure demand self-contained breathing apparatus (SCBA) or as a full face piece pressure demand supplied air respirator (SAR) with an auxiliary self-contained air supply.

#### 1-1.b.i.) Scott Air-Pak 4.5 SCBA Equipment

Set-Consists of an AV3000 Sure Seal respirator, a cylinder and valve assembly to store a supply of breathing air under pressure, a back frame and harness assembly to support the cylinder and valve assembly and pressure reducer on the body, a back frame mounted pressure reducer to supply the air to the breathing regulator, a remote pressure gauge mounted on the wearer's right shoulder strap and an air saver switch on top of the breathing regulator.

OSC Assigned SCBA Parts List

1. AV 3000 Respirator (same as above)
2. Regulator
3. 4500 psig Cylinders
4. Transport Case
5. SCBA Harness
6. Low Pressure Air Line



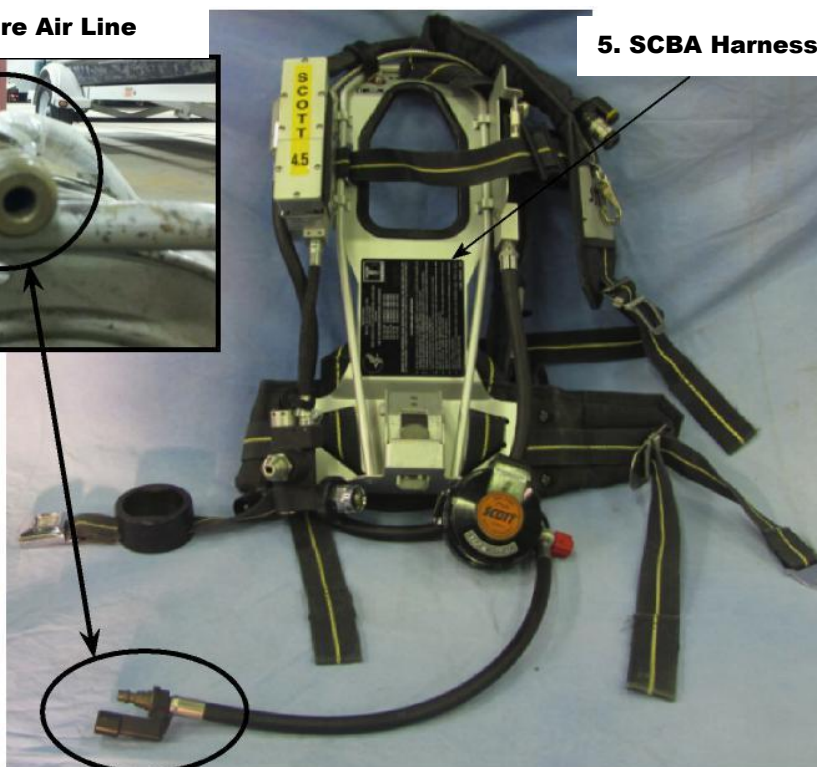
#### 6. Low Pressure Air Line

#### 1-1.b.ii.) SCBA w/ Auxiliary Supplied Air

The Scott mask mounted breathing regulator is equipped with a quick disconnect fitting in the low pressure air hose leading to the regulator. The quick disconnect enables the breathing regulator to be disconnected without the use of tools. This connection also enables the regulator to be supplied breathing air via a low pressure air line hose that is connected to a portable air source providing an uninterrupted supply of breathing air. The Region has configured a mobile air trailer to serve as a cylinder fill station or to provide an uninterrupted supply of breathing air. The Region 5 Air Trailer is maintained and mobilized by the Environmental Quality Management ERRS contactors location in Hammond, Indiana.



#### 5. SCBA Harness



### 1-1.b.iii.) Level A Pass Through Suit

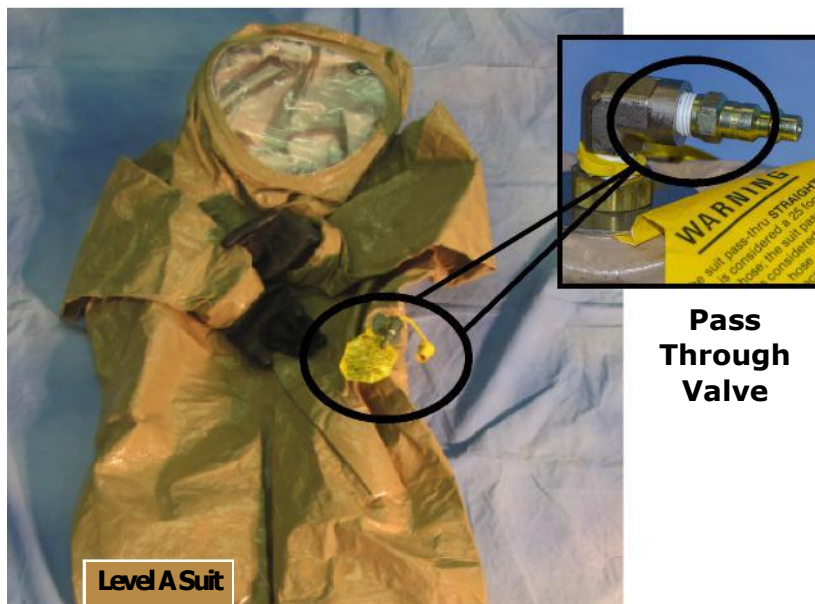
The Kappler/DuPont Tychem Responder Level A suits are designed with a pass through valve for direct connection to an uninterrupted supply of breathing air via a low pressure hose.

#### Quantity Available:

Willowbrook: 3

#### NOTE:

**These suits are strictly for training purposes only.**



**Pass Through Valve**

### 1-1.c.) Breathing Air-Filling Station (Air Trailer)

This system is a 16-foot trailer that has been configured with Bauer CFSII 3M Air Compressor. This system utilizes a multistage air cooled compressor coupled to a water cooled diesel engine. The trailer provides protection from inclement weather and road debris. This system can be operated as a cylinder fill station or as a standalone system supplying an uninterrupted supply of breathing air through a low pressure air-line to an SCBA regulator. Operating as a cylinder fill station, it utilizes the multi-stage compressor to compress air to the correct pressure and filter out carbon monoxide, oil, water, taste and odor from the air to SCBA cylinders. Fill times will depend on the ambient temperature. Operating as a standalone system it utilizes the multistage compressor to compress and filter the ambient air. Air can be delivered directly from the compressor or through four 6000 psig storage cylinders located underneath the trailer. A high pressure line delivers the filtered air from the system to a junction box or splitter that connects to four individual low pressure air-line hoses and coupling assemblies. Each individual line is 300 feet in length. These low pressure lines connect directly to the SCBA regulator line. Performance checks on the air trailer are performed on a quarterly basis along with the collection of an air sample to verify Grade E air quality.

#### High Pressure Line

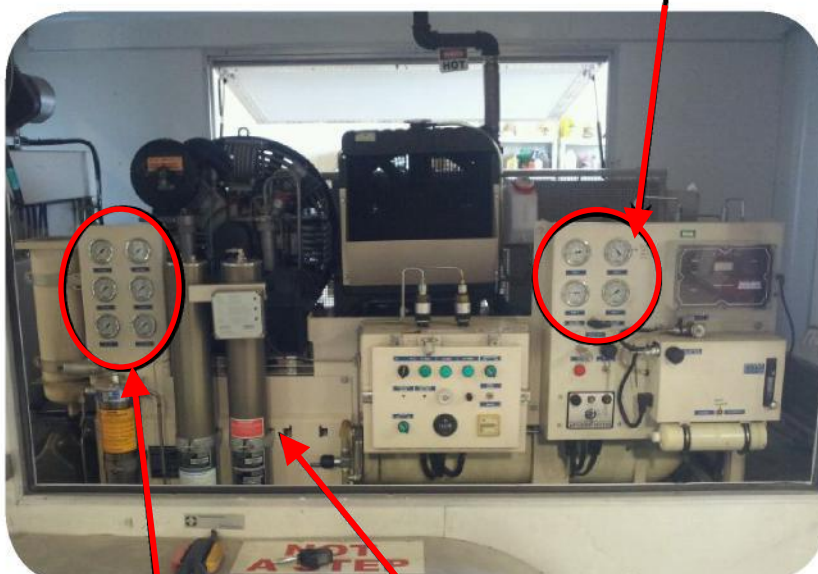


**Cylinder Fill Station**

**Low Pressure Line**

#### Also See Section 9-9.

#### Storage Cylinder



**Compressor Gauges**

**Air Filtration System**

**1-1.d. Respiratory Protection Equipment Matrix**

<i>Respiratory Protection Surplus &amp; Assigned Equipment Matrix</i>													
<b>Equipment</b>		<i>Program Office</i>											
<b>RP Equipment</b>	<b>P/N</b>	<b>Willowbrook (spare) [ER]</b>	<b>Chicago (spare)</b>	<b>Ann Arbor (spare)</b>	<b>Westlake (spare)</b>	<b>Des Plaines (spare)</b>	<b>Cincinnati</b>	<b>Green Bay</b>	<b>Indianapolis</b>	<b>St. Paul</b>	<b>Marion</b>	<b>Traverse City</b>	<b>Regional Totals (spare)</b>
AV 3000 SS Respirator	805773-83	5	12	7	0	1	1	1	2	1	1	1	32
742 1/4 Turn Adaptor	805622-01	5	12	7	0	1	1	1	2	1	1	1	32
742 PF Cartridge (OV)	7422-SD-1	10	24	14	9	2	2	2	4	2	2	2	73
742 PF Cartridge (MV)	7422-2B-1	10	24	14	20	2	2	2	4	2	2	2	84
40 mm CBRN Adapter	200423-01	5	12	7	0	1	1	1	2	1	1	1	32
MPC 40PF (PAPR) Canister	45170	5	12	7	4	1	1	1	2	1	1	1	36
MPC Plus 40 mm Canister	905557-01	5	12	7	4	1	1	1	2	1	1	1	36
CBRN CAP-1 Canister	45135	5	12	7	8	1	1	1	2	1	1	1	40
C 420 PAPR Kit (CBRN)	200698-00	5	12	7	0	1	1	1	2	1	1	1	32
PAPR Hose	200829-36	5	12	7	0	1	1	1	2	1	1	1	32
Battery End Cap C420 PAPR	31001506	5	12	7	0	1	1	1	2	1	1	1	32
LiS02 Battery (PAPR)	805358-01	5	12	7	0	1	1	1	2	1	1	1	32
Ni Metal Hydride Batt. (PAPR)		5	12	7	0	1	1	1	2	1	1	1	32
Battery Charger	20073-01	5	12	7	0	1	1	1	2	1	1	1	32
SCBA 3.5 Harness		5	12	7	0	1	1	1	2	1	1	1	32
4500 psig Cylinder	10009672	5 (4) [1]	11 (5)	7 (4)	6 (3)	1 (0)	2	2	2	2	2	2	42 (16) [1]
Transport Case (yellow-Anvil)	804497	5	12	7	3	1	1	1	2	1	1	1	35
EPIC Comm Bracket	220715	5	12	7	0	1	1	1	2	1	1	1	32
EPIC Voice Amplifier	200261-01	5	12	7	0	1	1	1	2	1	1	1	32
EPIC Lapel MIC	200262-04	5	12	7	0	1	1	1	2	1	1	1	32
PTT Paddle Epic RI	200725-01	5	12	7	0	1	1	1	2	1	1	1	32

This Matrix is intended to identify surplus respiratory protection equipment in addition to equipment assigned to each OSC.  
Regional totals include OSC assigned equipment. There are currently 38 OSCs in Region 5.



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## 1-2. Cooling Vest

**Manufacturer:**

Bullard

**Model:**

Isotherm Cooling Vest

**Quantity Available:**

Willowbrook 8

Ann Arbor: 7

Westlake: 4

**Description:**

The Isotherm is a reusable cooling vest for field use in hot conditions. Torso cooling for approximately two hours for each insert sets.

## 1-3. Hazmat Suit, Level A

**Manufacturer:**

DuPont

**Model:**

Dupont Tychem TK

**Quantity Available:**

Willowbrook 4

Ann Arbor: 4

Westlake: 4

**Description:**

High performance encapsulated suit with attached gloves and socks.

(On National Equipment List)



### 1-4. Blood Pressure Monitor

**Manufacturer:** OMRON

**Model:** HEM-711 with Intelli sense

**Quantity Available:**

Willowbrook: 1

**Description:**

Automatic blood pressure monitor with display, arm cuff, storage bag, 14 memory storage. Includes AC adapter and digital oral thermometer.



### 1-5.a. Tyvek Coverall

**Manufacturer:** DuPont

**Model:** Tyvek coverall TY127SWH

**Quantity Available:**

Quantities of this item will vary over time at these locations.

Willowbrook, Chicago, Westlake

**Description:**

DuPont Tyvek® Coverall. Comfort Fit Design. Respirator Fit Hood. Elastic Wrists and Ankles. Elastic Waist. Serged Seams. White.



### 1-5.b. Saranex Coverall

**Manufacturer:** DuPont

**Model:** Tychem SLL22BG1, Chem Max 850

**Quantity Available:**

Quantities of this item will vary over time at these locations.

Willowbrook, Chicago, Ann Arbor

**Description:**

ChemMax® 2 offers quality, value, durability and the proven protection of Dow Saranex® 23P barrier film. Hood, storm flap over zipper, elastic face and wrists, attached boots

(see appendix G for permeation data)

### 1-5.c. Nomex Clothing

**Manufacturer:** Protexall, Rubin Brothers, Inc.

**Model:** Jackets, Nomex III Coverall

**Quantity Available:**

Quantities of these items will vary over time at this location.

Willowbrook

**Description:**

Nomex clothing helps protect wearer from direct exposure to fire. Nomex won't melt or drip.



## 1-6. Latex Boot Covers

**Manufacturer:** Onguard

**Model:** 2400 9002

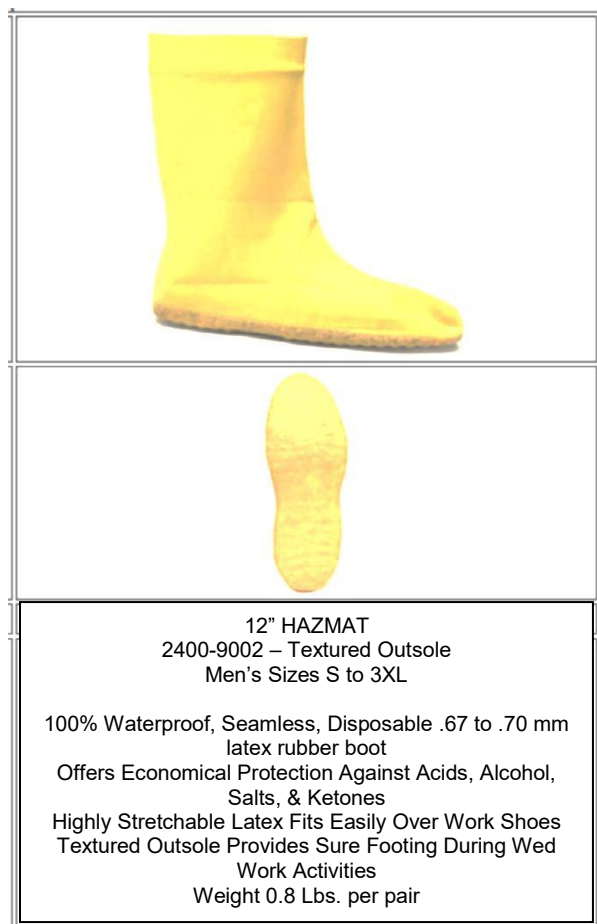
**Quantity Available:**

Quantities of this item will vary over time at these locations.

Willowbrook, Chicago, Ann Arbor

**Description:**

Textured outsole, 100% waterproof, seamless, disposable .67mm - .70mm latex rubber boot, highly stretchable latex fits easily over work shoes, textured outsole provides sure footing during wet work activities



## 1-7. Thermometer

**Manufacturer:** Fluke

**Model:** Infrared thermometer

**Quantity Available:**

Willowbrook: 1

Chicago: 1

Ann Arbor: 2

Westlake: 1

Cincinnati: 1

Green Bay: 1

Traverse City: 1



**Description:**

Handheld Infrared Thermometer with laser sighting. Temperature Range: -25° F to 1600° F. Close Focus for measuring small surfaces down to 1/4 in. Measuring distance: 0 to > 40 Ft.; 2 AA alkaline batteries; Weight: 1 lb. 6 oz.





## 1-8. Personal Lightning Detector

**Manufacturer:** Strike Alert

**Model:** LD-1000 Personal Lightning Detector

**Quantity Available:**

Willowbrook: 6

Ann Arbor: 2

**Description:**

Strike Alert provides an early warning of approaching lightning strikes, and lets you know if the storm is coming your way. The detector is housed in a small pager-like casing that can be clipped on a belt loop.

## 1-9. Gloves



**Manufacturer:** Various

**Model:** Nitrile Glove, Gauntlet Supported, Gauntlet Unsupported, Standard Unsupported, Exam Unsupported.

**Quantity Available:** Quantities of these items will vary over time at these locations.

Willowbrook, Ann Arbor

**Description:** Nitrile gloves are disposable gloves made of synthetic rubber. They contain no latex proteins and offer excellent resistance to wear and tears. Nitrile gloves are more puncture resistant

than many other types of rubber gloves and can be used to offer superior resistance to many types of chemicals. They are often considered to be one of the strongest types of disposable glove and are generally safe for people who are allergic to latex.

### 1-9.a. Edmont Neox Glove 9-922

**Manufacturer:** Edmont Neox Glove 9-922

**Model:** 9-922 wet/dry, chemical resistant black glove with gauntlet cuff.

**Quantity Available:** Quantities of this item will vary over time at this location. Willowbrook

**Description:** Black chemical resistant glove made of neoprene coating. Use for handling specialty chemicals such as: oils, acids, caustics, alcohols, petrochemicals.



### 1-9.b. North Silver Shield Glove

**Manufacturer:** North Silver Shield Glove

**Model:** Silver Shield Glove

**Quantity Available:** Quantities of this item will vary over time at this location. Willowbrook

**Description:** Resistant to over 280 different chemicals, including alcohols, aliphatics, aromatics, chlorines, ketones and esters - Provides high performance protection in the most demanding applications.

Economical - Disposable glove, no need for cleaning and re-cycling.

No latex or chemical accelerators - Little or no allergic reactions.

Ambidextrous design for single glove use. Single glove can be discarded without wasting a pair.

Can be used as a secondary inner glove - Allows worker maximum protection in heavy duty jobs where the dangers of mechanical damage to gloves are high.



### 1-9.c. North Butyl Gloves



**Manufacturer:** North by Honeywell

**Model:** Butyl Gloves

**Quantity Available:** Quantities of this item will vary over time at this location.

Willowbrook:

**Description:** Black chemical gloves with highest permeation resistance to gas & water vapor for greater worker protection, especially when handling toxic substances.

Highly resistant to ketones (MEK, MIBK, acetone) and esters (tricresyl phosphate, amyl acetate, ethyl acetate).

Flexible and sensitive, even at lower temperatures.

Curved finger and hand design provides a better fit for greater worker comfort.



### 1-9.d. Viton Glove, North

**Manufacturer:** North

**Model:** F-124 Viton Glove

**Quantity Available:** Quantities of this item will vary over time at this location. Willowbrook

**Description:**

North Viton® - Unsupported Gloves

Unsurpassed performance against chlorinated & aromatic solvents.

Features and Benefits

- Excellent chemical resistance to chlorinated and aromatic solvents.
- Can be used in water-based solvents without dissolving.
- Superior resistance to PCBs.
- Curved finger and hand design provides a better fit for greater worker comfort.





### 1-9.f. Vinyl Gloves

**Manufacturer:** Various

**Model:** Disposable Vinyl Glove

**Quantity Available:** Quantities of this item will vary over time at these locations.

Willowbrook, Ann Arbor

**Description:** Medical grade quality One size fits all, ambidextrous Powder-free to reduce dry skin irritation



### 1-9.g. Work Gloves

**Manufacturer:** Various

**Model:** Work Glove

**Quantity Available:** Quantities of this item will vary over time at this location.

Willowbrook

**Description:** Cotton gauntlet style glove with leather palm and fingers



### 1-9.h. Nylon Foam Gloves (winter)

**Manufacturer:** Wells-Lamont

**Model:** CF2179 Bemac Flambeau Winter Glove

**Quantity Available:** Quantities of this item will vary over time at this location.

Willowbrook

**Description:**

Bemac Flambeau Glove

PVC with Sandy finish

Orange/Red

Knit Wrist Cuff

Heavy Weight Nylon Foam Removable Washable Liner



### 1-10. Rubber Boots

**Manufacturer:** Various

**Model:** Various

**Quantity Available:**

Quantities of these items will vary over time at these locations.

Willowbrook, Chicago,  
Ann Arbor

**Description:** Rubber boots,  
steel toe.



### 1-11. Hard Hats

**Manufacturer:** Various

**Model:** White cap style 4 point  
snap lock and white full brim  
with two connecting points for  
chin strap.

**Quantity Available:** Quantities  
of these items will vary over  
time at these locations.

Willowbrook, Chicago,  
Ann Arbor, Westlake

**Description:** Adjustable, one size fits all construction workplace environment hard hats constructed from high density polyethylene plastic. Meets OSHA requirements. Cap type hat commonly used for general purpose work environments while full brim is used inside Level A suits to keep a gap area around the head area.

## 1-12. Personal Flotation Devices (PFD)

**Manufacturer:** Various

**Models:**

Type I off-shore life jacket (back row),  
Type IV throw-able device (front row left),  
Type V near-shore work vest (front row middle)  
Inflatable suspender vest Type A/M/24 (front row right).

**Quantity Available:** Quantities of these items will vary over time at these locations.

Willowbrook, Chicago, Des Plaines, Ann Arbor, Westlake, Cincinnati, Green Bay, Indianapolis, Marion, Saint Paul, Traverse City.

**Description:**

Water flotation devices for working on open water or near open water. PFDs are available in different sizes to accommodate variances in body weight. Check specification label before use. Note: Certain jobs or work platforms may require special PFD's.







### 1-13. Signage, Banner Guard and Sticker Labels



**Model:** N/A

**Quantity Available:** Quantities of these items will vary over time at these locations.

**Willowbrook:**

Banner guards include:

"Danger Asbestos"

"Caution"

"Hazardous Materials Do Not Enter"

Stickers include:

"Hazardous Waste"

"Flammable Liquid"

"Flammable Gas"

"Flammable Solid"

"Poison"

"Poison Gas"

**Ann Arbor:** Rolls of caution tape, plus, other various rolls.

**Description:**

Various signs, banners & Stickers as shown. Designs are mostly made of metal or fiberglass.

"Exclusion Zone" signs are made of cardboard.

**NOTE: Lost or damaged signs while on-site must be replaced using site specific funds.**



## 1-14. Sound Level Meter

**Manufacturer:** BAFX Products

**Model:** 05-SLM 001

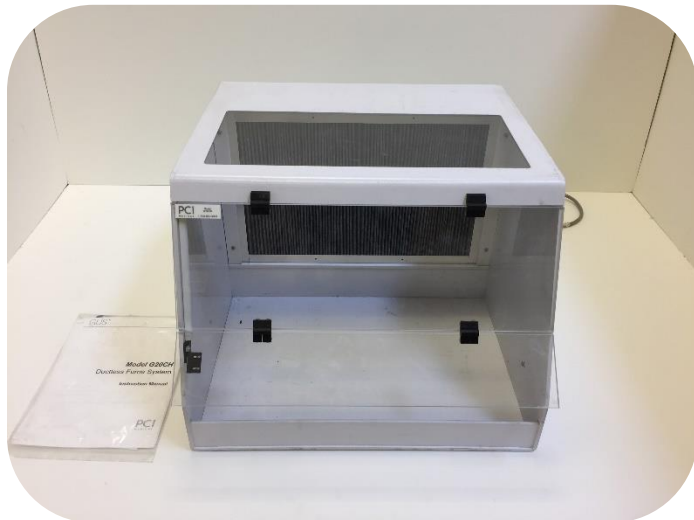
**Quantity Available:**

Willowbrook: 1

**Description:**

Measurement range 30dB to 130dB in dBA & dBC frequencies, internal storage capacity of 4,700 data points, includes analysis software for Windows XP, Accuracy within +/-1.5 dB, adjustable sample rate reset to 20x/second, requires 4 AA batteries, also 6V DC wall adapter option (but not part of this kit).





### 1-15. GUS® Ductless Fume System with Three Phase Filter

**Manufacturer:** PCI Medical

**Model:** G20CH

**Quantity Available:** Westlake: 1 system

**Description:**

A ductless fume system used as a safe environment for processing toxic chemicals. Dangerous fumes are drawn away from staff using a three-phase filter (See below figure). Two layers of filter are

composed of a patented carbon media that absorbs chemical fumes. Air then passes through a high efficiency particulate air (HEPA) filter that is 99.99% efficient at 0.3 microns.

**Dimensions:** 16" x 21" x 27" at 38 lbs.



**Filter**

**Type:** Combo Heap and Activated Carbon

**Dimensions:** 18.75" x 12.125" x 3.5"

## **2. ER HAZMAT**

**This section presents descriptions of the following ER Hazmat equipment:**

### **2-1. Mercury Vapor Analyzer**

- a. Lumex 915 Plus Atomic Absorption Spectrometer**
- b. Lumex RA-915M Atomic Absorption Spectrometer**
- c. Jerome 431-X, Gold Film Sensor Method**
- d. Jerome J505, Atomic Fluorescence Spectroscopy**

### **2-2. Chemical Analyzer, Chip Measurement System**

### **2-3. Elemental Analysis, X-Ray Fluorescence**

- a. Innov-X Alpha 4000 SL**
- b. Innov-X Delta DP-4000**
- c. Bruker S1 Titan 600**
- d. Olympus Vanta VMR**

### **2-4. Multi Threat Monitoring Devices**

- a. MultiRAE Pro**
- b. AreaRAE**
  - i. AreaRAE Enclosures**
- c. AreaRAE Pro**
- d. AreaRAE Sensor Conditioning Stations**
- e. Portable Radio-Frequency Modem for RAE Systems**
- f. Calibration Gases**

## **2. ER HAZMAT**

### **2-5. Multi Gas Monitoring Devices**

- a. Photoionization Detector, UltraRAE PGM-7360**
- b. Photoionization Detector, MultiRAE Benzene**
- c. PID/FID, Toxic Vapor Analyzer, TVA-2020**
- d. Colorimetric Tape Target Gas Monitor, SPM Flex**

### **2-6. Particulate Monitors**

- a. Portable DataRAM, PDR1500**
- b. DustTrak DRX Handheld 8534**
- c. DustTrak II, 8533EP**

### **2-7. Hydrogen Sulfide Monitor**

## 2-1. Mercury Vapor Analyzer



### 2-1.a. Atomic Absorption Spectroscopy Analyzer

**Type:**

Atomic Absorption Spectrometer

**Manufacturer:**

Lumex

**Model:**

RA-915+ Mercury Analyzer

**Quantity Available:**

Ann Arbor: 1

Cincinnati: 1

Traverse City: 1

**Description:**

The RA-915+ is a portable Zeeman Mercury Analyzer. It is a portable spectrometer designed for interference free analysis/monitoring of mercury content in ambient air. Measures Mercury concentrations in ppb. Powered by an internal rechargeable battery. Weighs 7.5 kg.



### 2-1.b. Atomic Absorption Spectroscopy Analyzer

**Type:**

Atomic Absorption Spectrometer

**Manufacturer:**

Lumex

**Model:**

RA-915M Mercury Analyzer

**Quantity Available:**

Chicago: 1

Westlake: 1

**Description:**

The RA-915M Mercury Analyzer is a portable multifunction atomic absorption spectrometer with Zeeman background correction, which eliminates the effect of interfering impurities. Powered by an internal rechargeable battery that provides up to 12 hours of operation. Weighs 7 kg.



## 2-1. Mercury Vapor Analyzer



### 2-1.c. Gold Film Analyzer

**Type:**

Gold Film

**Manufacturer:**

Arizona Instrument

**Model:**

Jerome 431-X Mercury Analyzer

**Quantity Available:**

Willowbrook: 1

Ann Arbor: 1

Westlake: 1

(On National Equipment List)

**Description:**

The 431-X is a portable handheld gold film Mercury Vapor Analyzer. It measures Mercury concentrations in ppm. Powered by internal rechargeable battery. Weighs 7 lb.



### 2-1.d. Atomic Fluorescence Spectroscopy Analyzer

**Type:**

Atomic Fluorescence Spectroscopy

**Manufacturer:**

Jerome

**Model:**

J 505

**Quantity Available:**

Willowbrook: 1

Indianapolis: 1

(On National Equipment List)

**Description:**

A portable fluorescence spectroscopy analyzer which has a simpler, smaller and lighter weight detection cell than other spectroscopy instruments. Has less interferences than those units using atomic absorption method. Weight 7 lbs.



## 2-2. Chemical Analyzer

### Manufacturer:

Dräger

### Model:

CMS Analyzer

### Quantity Available:

Willowbrook: 2

Ann Arbor: 1

Westlake: 1

(On National Equipment List)

### Description:

The CMS (Chip Measurement System) is a portable handheld electronic colorimetric grab sampling system. Uses compound specific colorimetric chips (10 samples per chip) and provides concentration measurements in parts per million. Currently 56 compound sensitivity specific chips available for this system. Internal data logger. Alkaline battery powered for mobility (7 hour run time).

**SPECIAL NOTE: We no longer stock colorimetric chips, due to low turnover, so chips must be purchased by user.**

## 2-3. Elemental Analysis, X-Ray Fluorescence

### 2-3.a. Elemental Analysis XRF Alpha-4000

**Manufacturer:**

Olympus/Innov-X

**Model:**

Alpha 4000 SL XRF

**Quantity Available:**

Willowbrook: 1

Ann Arbor: 1



**Description:**

The alpha-4000 is a handheld X-ray Fluorescence Analyzer. It is used to detect metals in soils and other media. Powered by removable rechargeable battery packs with 8 hour run time. Weighs 2.625 lbs.

### 2-3.b. Elemental Analysis XRF DP-4000

**Manufacturer:**

Olympus/Innov-X

**Model:**

Delta DP-4000 XRF

**Quantity Available:**

Willowbrook: 2



**Description:**

The Delta DP-4000 is a handheld X-Ray Fluorescence Analyzer. The DP-4000 detects metal contaminants in soils and other media. One unit is equipped with the Lead Paint Module which makes it capable of detecting elemental lead in paint analysis. The unit is powered by a rechargeable battery pack or by external power in the charging/sampling cradle.





### 2-3.c. Elemental Analysis XRF S1 TITAN 600

**Manufacturer:**

Bruker

**Model:**

S1 TITAN 600

**Quantity Available:**

Ann Arbor: 1

Westlake: 1

#### Description:

The SI Titan is a light handheld X-ray Fluorescence Analyzer. It is used to detect metals in soils and other media. Powered by removable rechargeable battery packs with 8-10 hours run time. Weighs 3.3 lbs.



### 2-3.d. Elemental Analysis XRF VANTA VMR

**Manufacturer:**

Olympus

**Model:**

Vanta VMR

**Quantity Available:**

Willowbrook: 2

#### Description:

The Vanta VMR handheld X-ray Fluorescence Analyzer features the Olympus "new Axon" technology, providing a faster and accurate elemental analysis. Data is easily exported via Wi-Fi, Bluetooth, or USB. Unit is powered by removable rechargeable 14.4 V. Li-ion battery or 18V power transformer 100-240 VAC, 50-60 Hz. Weighs 3.39lbs.

## 2-4. Multi Threat Monitoring Devices

### 2-4.a. MultiRAE Pro

**Manufacturer:**

RAE Systems

**Model:**

MultiRAE Pro PGM-6248

**Quantity Available:**

Willowbrook:	3
Chicago:	3
Green Bay:	1
Ann Arbor:	3
Indianapolis:	1
Westlake:	2
St. Paul:	1
Cincinnati:	1
Marion:	1
Des Plaines:	1

(On National Equipment List)



**Description:**

The MultiRAE PRO is a portable handheld wireless Multi Threat Monitor. It's configuration allows it to monitor Oxygen Level, Lower Explosive Limit (LEL) of combustible gases and vapors, Volatile Organic Compounds (VOCs), 2 Toxics (CO and H<sub>2</sub>S installed) and Gamma radiation. It has a selection of 20 different interchangeable electrochemical sensors available for toxic compounds. VOC sensor detects concentrations in ppb. The Gamma sensor has a range of 0 to 20,000  $\mu$ REM/h with a resolution of 1  $\mu$ REM/h. The dose range is 1  $\mu$ REM to 4.29 REM.

### 2-4.b. AreaRAE

**Manufacturer:**

RAE Systems

**Model:**

AreaRAE Rapid Deployment Kit (RDKit)

**Quantity Available:**

Willowbrook:	2
Ann Arbor:	1
Chicago:	1
Westlake:	1

(On National Equipment List)

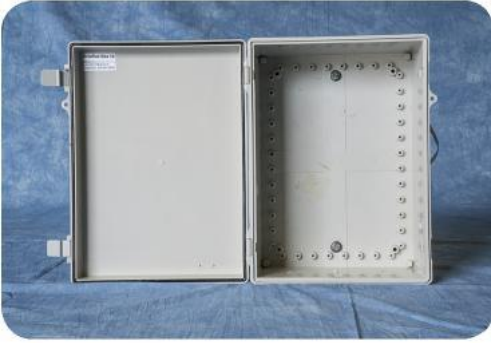


**Description:**

The AreaRAE Rapid Deployment Kit is a wireless remote multigas monitoring system. The kit comes with 4 PGM5020 ruggedized, battery powered multi gas monitors with built in radio transmitters. The ruggedized host controller (laptop w/ receiver) running ProRAE Guardian software can track and monitor readings up to two miles away. The monitors can detect Oxygen Level, Lower Explosive Level, Volatile Organic Compounds, and two different selectable toxic compounds at ppm concentrations (standard confined entry configuration includes Hydrogen Sulfide and Carbon Monoxide Sensors). Additional monitors with the same radio channels can be used with the system (up to 64 units simultaneously).



## 2-4.b.i. AreaRAE Enclosures



**Manufacturer:** L-Com

**Model:** NBE 141006 14" x 10" x 6" two latch lockable enclosure

**Quantity Available:**

Willowbrook: 20

Ann Arbor: 4

**Description:** Associated parts: Band-IT mini Brak-ITS flared leg D31099; 40" x 0.5" SS quick release worm gear damp and 4 number combination lock.

**Note:** Units are currently being evaluated for excess.

## 2-4.c. AreaRAE PRO

**Manufacturer:**

RAE Systems

**Model:**

AreaRAE PRO Rapid Deployment Kit

**Quantity Available:**

Willowbrook: 1

Westlake: 1

START-Chicago: 1

START-Detroit: 1

START-Westlake: 1

(On National Equipment List)



**Description:**

The AreaRAE PRO Rapid Deployment Kit is a wireless area monitor kit that can detect toxic and combustible gases, VOC levels and meteorological factors that can determine the speed and direction of the threats. The kit includes 4 GPS enabled AreaRAE PRO Monitors, PGM-6560D. The ruggedized host controller (laptop w/ receiver) running PRORAE Guardian software can track and monitor readings up to 2 miles away. Additional monitors with the same radio channels can be used with the system, up to 64 units simultaneously.

## 2-4.d. AreaRAE Sensor Conditioning Stations



**Manufacturer:** RAE Systems

**Models:** SensorRAE 4R+ and SensorRAE

**Quantity Available:**

Willowbrook: 1 of each

Westlake: 2 of each

**Description:** AreaRAE sensor warming and conditioning station for either 4 or 6 sensors allowing for immediate deployment. Case is ruggedized and waterproof for storing and transporting sensors.

## 2-4.e. Portable Radio-Frequency Modem for RAE Systems



**Manufacturer:** RAE Systems

**Model:** RLM-3001

**Quantity Available:**

Willowbrook: 15

Westlake: 1

START-Chicago: 2

START-Detroit: 2

START-Westlake: 2

(On National Equipment List)

**Description:**

Provides long-range wireless communication between remote portable air monitors (MultiRAE Pro, AreaRAE, UltraRAE) and a base station or computer for comprehensive monitoring. 3 Configuration modes: Remote, Host, Repeater.



## 2-4.f. Calibration Gases

**Manufacturer: Various**

**Model: Various**

**Quantity Available:**

Varies per usage & expiration dates.  
All R5 offices and out-stationed OSCs  
expected to have available stocks.

**SPECIAL NOTICE:**

Calibration must be conducted with  
gases that fall within acceptable usage  
dates. **GAS CANISTERS CANNOT BE  
SHIPPED/TRANSPORTED ON  
AIRCRAFT.**

**Description:**

Used to calibrate monitoring sensors.



Typical gas requirements shown below:

<u>COMPONENTS</u>		<u>CONCENTRATION</u>
<b>ARGUS-HAZCO</b>		<b>Part No.</b>
Hydrogen Sulfide (H <sub>2</sub> S)		10 ppm
Carbon Monoxide (CO)		50 ppm
Methane (CH <sub>4</sub> )		50% LEL
Oxygen (O <sub>2</sub> )		18%
Nitrogen (N <sub>2</sub> )		Balance
<b>ARGUS-HAZCO</b>		<b>Part No.</b>
Chlorine (Cl <sub>2</sub> )		10 ppm
Nitrogen (N <sub>2</sub> )		Balance
<b>ARGUS-HAZCO</b>		<b>Part No.</b>
Hydrogen Cyanide (HCN)		10 ppm
Nitrogen (N <sub>2</sub> )		Balance
<b>ARGUS-HAZCO</b>		<b>Part No.</b>
Phosphine (PH <sub>3</sub> )		5 ppm
Nitrogen (N <sub>2</sub> )		Balance
<b>ARGUS-HAZCO</b>		<b>Part No.</b>
Ammonia (HCN)		50 ppm
Nitrogen (N <sub>2</sub> )		Balance
<b>ARGUS-HAZCO</b>		<b>Part No.</b>
Isobutylene (C <sub>4</sub> H <sub>8</sub> )		100 ppm
Air		Balance

**Note: Other brand names may be available**

## 2-5. Multi Gas Monitoring Devices

### 2-5.a. Photoionization Detector, UltraRAE



**Type:**

Photoionization Detector

**Manufacturer:**

RAE Systems

**Model:**

UltraRAE 3000 PGM-7360

**Quantity Available:**

Willowbrook: 2

Ann Arbor: 2

Westlake: 1

**Description:**

The UltraRAE 3000 is a portable handheld compound-specific VOC Monitor. It is a Photoionization Detector that has an extended range of 0.05 to 10,000 ppm in VOC Mode and 50 ppb to 200 ppm in benzene-specific mode. Uses RAE-Sep tubes for detecting specific compounds. Comes with 9.8 eV UV lamp and is powered by a Li-Ion battery pack with 16 hour run time. Weighs 26 oz.

### 2-5.b. Photoionization Detector, MultiRAE Benzene



**Type:**

Photoionization Detector

**Manufacturer:**

RAE Systems

**Model:**

MultiRAE Benzene

**Quantity Available:**

Willowbrook: 2

**Description:**

The MultiRAE Benzene is a wireless portable six gas Monitor with Benzene-Specific Measurement. It is a Photoionization Detector that has an extended range of 0 to 2,000 ppm in VOC Mode and 0 ppm to 200 ppm in benzene-specific mode. Uses Benzene RAE-Sep Tube Cartridges. Comes with 9.8 eV UV lamp and is powered by a Li-Ion battery pack with 18 hour run time. Weighs 31oz.



### 2-5.c. PID/FID Toxic Vapor Analyzer

**Type:**

FID/PID

**Manufacturer:**

Thermo Scientific

**Model:**

TVA2020 Toxic Vapor Analyzer

**Quantity Available:**

Willowbrook: 1

Ann Arbor: 1

Westlake: 1

**Description:**

The TVA 2020 is a portable combination Photo Ionization Detector/Flame Ionization Detector (FID/PID). The detectors can be used separately or simultaneously. The PID can detect Organic Vapors in a range from 0.5 to 500 ppm while the FID can detect Organic Vapors in a range from 1.0 ppm to 10,000 ppm. The FID allows detection of higher ionization potential VOCs than the PID cannot detect. The unit weighs 9.4 lb. and has a typical run time of 10 hours minimum on battery power. These units come with a handheld probe with measurement display and function buttons.



### 2-5.d. Colorimetric Tape Gas Monitor

**Type:**

Colorimetric Tape

**Manufacturer:**

Honeywell

**Model:**

SPM Flex

**Quantity Available:**

Westlake: 1

START-Chicago: 2

START-Detroit: 2

START-Westlake: 1

**Description:**

The Single Point Monitor (SPM) is a portable fast response monitor for the detection of a target gas. Uses compound specific colorimetric tape (not included) to provide concentration values in parts per billion. Tapes have short shelf life and are purchased as needed. Powered by internal rechargeable battery pack. Weight 9.1 lbs.



## 2-6. Particulate Monitors



### 2.6.a. DataRAM, Portable

**Manufacturer:**

Thermo Scientific

**Model:**

pDR 1500 DataRAM

**Quantity Available:**

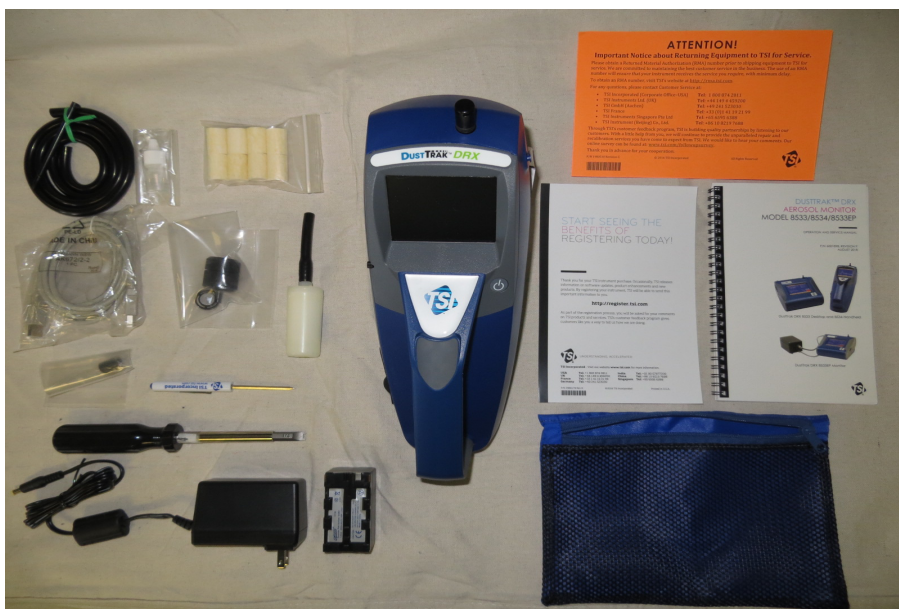
Willowbrook: 1

Ann Arbor: 2

Westlake: 1

**Description:**

Personal data ram. Portable real time particulate monitor. Pump has flow range of 1.0 to 3.5  $\mu$  m. Maximum response range of 0.1 to 10  $\mu$  m. Cut point range 1 to 10  $\mu$  m. Available with cyclone pairs of PM10/PM4 and PM2.5/PM1. Run time on a set of alkaline batteries: 1.2  $\mu$  m > 24 hrs and 3.5 L/min > 6 hrs. Weight: 41 oz.



### 2-6.b. DustTrak DRX Handheld

**Manufacturer:**

TSI Incorporated

**Model:**

8534

**Quantity Available:**

Willowbrook: 2

Ann Arbor: 1

Westlake: 1

**Description:**

The DustTrak DRX handheld monitor is a battery operated, data-logging, light-scattering laser photometers that gives you real-time aerosol mass readings. The aerosol monitor can simultaneously measure size-segregated mass fraction concentrations corresponding to PM1, PM2, Respirable, PM10 and total PM size fractions. The internal rechargeable battery provides a battery runtime of up to 6 hours. Unit weight is 3.3 lbs.



## 2-6.c. DustTraK II Desktop

**Manufacturer:**  
TSI Incorporated

**Model:**  
8533EP

**Quantity Available:**  
Willowbrook: 16

**Description:**

Measures Atmospheric particulate matter (PM) or particulates using 90° light scattering method.

Includes:

External pump kit, inlet heater, battery pack/charger and tripod.

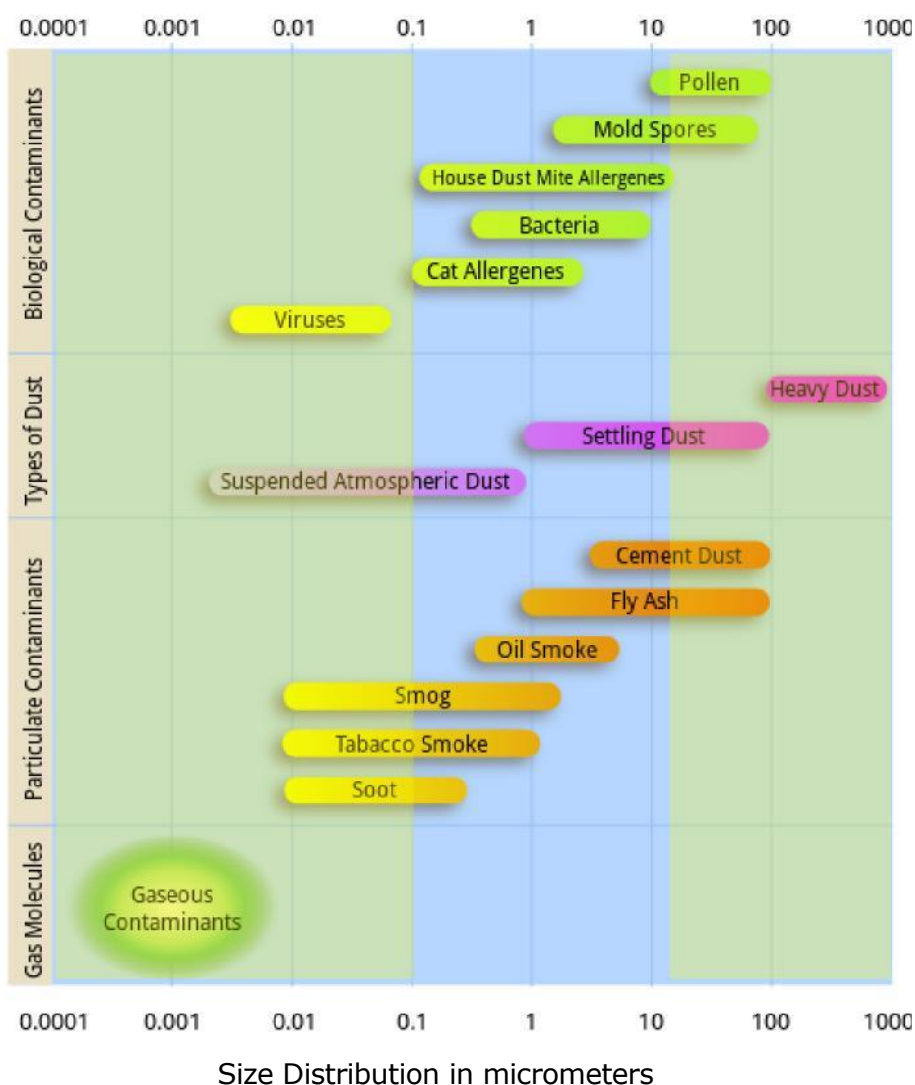
Viper System compatible.

Size segregated Mass Functions for PM1, PM2.5, Respirable (PM4), PM10, and Total.

**Contacts:** Jim Mitchell 312-353-9537, Brian Cooper 312-353-8651



Particle size range 0.1 to approximately 15  $\mu\text{m}$   
(see chart below-blue zone).





## 2-7.0 H2S Sensor

**Manufacturer:**

Interscan

**Model:**

Single gas monitor

**Quantity Available:**

Willowbrook: 2

**Description:**

Single gas monitor. Includes H<sub>2</sub>S sensor. Measures to ppb.

**Note: The Sensors in these units need to remain wet and once they dry out, they will need to be replaced. The sensors will need to be purchased by the user. The single gas monitor is a good candidate for site work, but not for Emergency Response.**

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### **3. ER CHEMICAL WARFARE AGENT DETECTORS**

This section presents descriptions for various chemical agent detector equipment:

#### **3-1. Proengin AP2Ce (Flame Spectrophotometer)**

#### **3-2. Colorimetric Chemical Agent Detectors**

##### **a. Dräger CDS Simultantest (colorimetric)**





### 3-1. Flame Spectrophotometer

**Type:**

Flame Spectrophotometer

**Manufacturer:**

Proengin

**Model:**

AP2Ce

**Quantity Available:**

Westlake: 1

Ann Arbor: 1

Willowbrook: 1

**Description:**

The AP2Ce is a portable handheld Chemical Agent Detector. It is a Flame Spectrophotometer that detects sulfur and phosphorus atoms and can be used to monitor for chemical agents GA, GB, GD, GF, HD and Vx. It is a ruggedized, simplified military type instrument that can detect agents in all forms: vapor, aerosols, droplets, dust agents and frozen agents. The AP2Ce runs off a rechargeable battery pack or disposable Li-Ion batteries. The unit weighs 4.5 lb. The hydrogen source to operate the detector is included in the case.



### 3-2.a. Chemical Detector, Dräger

**Type:**

Colorimetric

**Manufacturer:**

Dräger

**Model:**

CDS Simultantest

**Quantity Available:**

Willowbrook: 1

Ann Arbor: 2

Cincinnati: 1

**Description:**

Dräger CDS Simultantest Kit (Civil Defense System) colorimetric sampling detects precursors to chemical agents.

**SPECIAL NOTE: Colorimetric tubes have short shelf life and are not stocked. User must purchase tubes for specific site applications.**

## **4. ER BIO-RESPONSE**

### **4-1. Biological Sampling Supplies**

## 4-1. Biological Sampling Supplies

**NOTE:** Check with laboratory before sample collection to ensure the laboratory will accept the material. Although these materials have been vetted with the laboratory response network (LRN) individual laboratories may not accept the type of sample.

**Check the expiration date prior to use.**



**Type:** Wipe Samples

**Quantity Available:**

Willowbrook: 50

Cincinnati: 25

Westlake: 25

**Description:** The sponges are sterile and pre-wetted with a neutralizing buffer solution and has been approved for use by the laboratory response network (LRN) for general biological sampling. These wipes are the same wipes provided for BioWatch Phase 1 sampling (Anthrax, Plague, Tularemia, etc) and have been used for Ricin. After wipe sample is collected, the sponge is put into a sterile specimen container.

**Type:** Packing Material

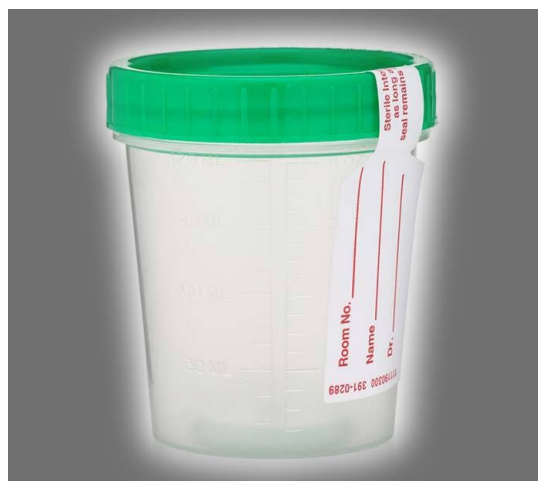
**Quantity Available:**

Willowbrook: 50

Cincinnati: 25

Westlake: 25

**Description:** Sterile Specimen cups for packing the wipe sample. Parafilm is available to wrap around the lid to ensure the lid does not come loose after sampling.



**Type:** Air Samples (MCE Filter)

**Quantity Available:**

Willowbrook: 30

Cincinnati: 10

Westlake: 10

**Description:** Sterile MCE filter sample cassette. Appropriate for air sampling for biological agents.

**Requires a low flow sample pump and tubing for use.**

## **5. ER RADIATION RESPONSE**

### **5-1. Health & Safety**

- a. Thermoluminescent Dosimeter (TLD)**
- b. Electronic Personal Dosimeter (EPD)**

### **5-2. OSC Response Kits**

- a. Case 1 - Exposure Rate Monitoring**
  - i. Model 192 Micro R Exposure Rate Meter**
- b. Case 2 - Contamination and Exposure Rate Monitoring**
  - i. Model 2241-3 Survey Meter**
    - 1. Model 133-2 Gamma Exposure Rate Probe**
    - 2. Model 44-9 Pancake GM Probe**
    - 3. Model 43-90 Alpha Scintillator Probe**

### **5-3. OSC Response Kit Wallet Card**

### **5-4. Removal Support**

- a. Contamination Monitoring**
  - i. Model 2241-2 Survey Meter with 44-9 Pancake GM and 43-90 Alpha Scintillation Probes (“ABG” Case)**
  - ii. Model 2241 Survey Meter with 44-9 Pancake GM Probe (“BG” kit)**
- b. Exposure Rate Monitoring**
  - i. Fluke 451B Ion Chamber**
  - ii. Personal Radiation Monitors**
- c. Air Sampling**
  - i. H-810 Air Sampler**
- d. Air and Wipe Sample Counting**
  - i. Model 3030 Alpha/Beta Counter**
- e. Radioisotope Identification**
  - i. SAM-940 Radioisotope Identifier (RIID)**
- f. Gamma Count Rate Monitoring**
  - i. Model 2221 with Model 44-10 2” x 2” NaI Detector**
- g. Personnel / Decon Line Monitoring**
  - i. Model 52-2 Portal Monitor**
- h. Neutron Monitoring**
  - i. Model 15 Neutron Probe with G-M detector**



## 5-1. Health & Safety

### 5-1.a. Thermoluminescent Dosimeter (TLD)

**Manufacturer:** Panasonic

**Model:** UD-800 series

**Quantity Available:** 1 assigned to each OSC

**Description:** The standard device used for external radiation dose monitoring is the Thermoluminescent Dosimeter (TLD). TLDs provide the official dose of record and are capable of measuring both Hp10 (deep) and Hp07 (shallow) components of external ionizing radiation dose resulting from gamma, X-ray, and some beta radiation. TLDs are normally exchanged, and their results are reported on a calendar-quarterly basis. However, the exchange interval can be more frequent, contingent upon factors such as a worker's declared pregnancy, the potential for elevated worker exposures in high radiation areas, and

other conditions as determined by the Radiation Program Representative or Radiation Safety Officer in consultation with the SHEMP Manager. Depending on work activities, additional special dosimeters may be required, for example, extremity TLD dosimeters (ring, wrist), or neutron dosimeters.



### 5-1.b. Electronic Personal Dosimeter (EPD)

**Manufacturer:** Thermo / Siemens

**Model:** EPD-MK2

**Quantity Available:** 1 assigned to each OSC, 20 surplus in Willowbrook

**Description:** The Siemens EPD MK2 Electronic Personal Dosimeter (EPD) is a self-reading dosimeter that monitors dose and dose rate from gamma radiation, x-ray radiation, and beta radiation. Display and function are controlled by a single button on the front of the unit, recessed to prevent inadvertent operation. An EPD is issued to each OSC in the Removal Program, while an additional cache of EPDs are maintained at the Willowbrook Warehouse to support rotation and large-scale radiation incidents. EPD functionality includes: 1) On/Off 2) Test 3) Dose rate and 4) Total accumulated dose. The EPD has various

alarm set-points for Hp10 (deep) and Hp07 (shallow) integrated dose and dose rate exceedance. Selection of these alarm set-points is consistent with the administrative limits set by OSHA and EPA Health & Safety policy for the performance of normal operations or site work where the administrative control level (ACL) of 0.5 rem over 12 consecutive months applies. Modifications to the EPD alarm set-points may be necessary for EPA personnel responding to a National Response Framework (NRF) incident or other radiological emergency under Incident Command supervision where exceeding the ACL is necessary. Programming of EPA set-points can only be performed by the Region 5 Superfund Health Physicist, or other appropriately trained staff.



## 5-2. OSC Response Kits



OSC Response Kits - Each Program Office is provided with 2 radiation equipment cases. Case 1 is configured with one survey meter to estimate gamma radiation exposure rate at levels ranging from background to 5,000 micro-R/hr (5 mR/hr). Case 2 is configured with one radiation survey meter that can be connected to three different probes for determining the presence of alpha and beta contamination (fixed and removable) and gamma radiation exposure rate at levels ranging from 100 micro-R/hr

(0.1 mR/hr) to 1 R/hr. The instruments provided are intended to support the health and safety of responders consistent with EPA's Radiation Health and Safety Program.

### 5-2.a. Case 1 - Exposure Rate Monitoring Kit

The instrument in Case 1 is intended for sensitive gamma radiation detection and exposure rate estimation at background levels (5 to 20  $\mu\text{R/hr}$ ) up to 5,000  $\mu\text{R/hr}$  (5 mR/hr) which is a level requiring posting as a radiation area under Nuclear Regulatory Authority (NRC) regulations.



#### 5-2.a.i Model 192 Micro-R Exposure Rate Meter

**Manufacturer:** Ludlum

**Model:** Model 192 Micro-R Meter

**Quantity Available:** 18 Case 2 kits at Program Offices and Willowbrook

**Description:** The Ludlum Model 192 MicroR survey meter is a high-sensitivity gamma microR ( $\mu\text{R}$ ) ratemeter used for low-level gamma survey. It employs an internally housed sodium iodide (NaI) detector and is sensitive to slight changes in background radiation. The 192 has four range selections: X1 (0 – 5  $\mu\text{R/hr}$ ), X10 (0 – 50  $\mu\text{R/hr}$ ), X100 (0 – 500  $\mu\text{R/hr}$ ), and X1000 (0 – 5,000  $\mu\text{R/hr}$ ). When the instrument is turned on, it takes an eight-second measurement of background radiation levels and determines a deviation alarm setting. If the radiation level exceeds this setting, the alarm audio will beep and the

front panel red lamp will flash. At readings above 100  $\mu\text{R/hr}$  and if more accurate exposure rate measurements are required, users are encouraged to use the Ludlum 2241-3 with the 133-2 probe or other appropriate instrument.



## 5-2.b. Case 2 - Contamination and Exposure Rate Monitoring Kit

The instruments in Case 2 are intended to support alpha and beta contamination measurement (both fixed and removable contamination), and measurement of higher exposure rates ranging from 100  $\mu\text{R/hr}$  (0.1 mR/hr) up to 1,000 mR/hr (1 R/hr). One survey meter is provided with the ability to connect to the three different probes provided in the case.



### 5-2.b.i. Model 2241-3 Survey Meter

**Manufacturer:** Ludlum

**Model:** 2241-3

**Quantity Available:** 18 Case 2 kits at Program Offices and Willowbrook

**Description:** This instrument is a general purpose, digital ratemeter with a built-in scaler that provides timed counts over a user specified period. This system will store detector setup information for up to four detectors and offers a front-panel mounted rotary switch so personnel can quickly swap detectors in the field. The LCD presents readings in a four-digit, auto-ranging and moving decimal format. The LCD's backlight can be activated and remains lit for a user-adjustable interval. Front-panel controls include a rotary switch for selecting between Off, and up to four detector setups; separate switches for selecting

Ratemeter Mode and Scaler Mode, audio on/off, and fast/slow response time; and push-buttons for activating the LCD backlight and for either resetting the counts or acknowledging alarms. Calibration, user configured alarms, scaler count intervals and detector setups can be configured via an internally housed switchboard or through an RS-232 serial interface to a PC.



### 5-2.b.i.1 Model 133-2 Gamma Exposure Rate Probe

**Manufacturer:** Ludlum

**Model:** 133-2

**Quantity Available:** 18 Case 2 kits at Program Offices and Willowbrook

**Description:** This is an energy compensated Geiger-Mueller probe for gamma exposure rate measurements ranging from 100  $\mu\text{R/hr}$  (0.1 mR/hr) up to 1,000,000  $\mu\text{R/hr}$  (1,000 mR/hr or 1 R/hr). Typical measurements made with this probe include: area gamma monitoring (generally at 1-meter above the ground) and measurements from packages and objects ("contact" measurements without touching and measurements at 1-meter away). The probe is connected to the 2241-3 survey meter using the cable included in the Case 2 kit.

## 5-2.b. Case 2 - Contamination and Exposure Rate Monitoring Kit (continued)



### 5-2.b.i.2. Model 44-9 Pancake GM Probe

**Manufacturer:** Ludlum

**Model:** 44-9

**Quantity Available:** 18 Case 2 kits at Program Offices and Willowbrook

**Description:** This Geiger-Mueller (GM) pancake-type detector is one of the most popular radiation detectors used throughout the world. The 44-9 can detect alpha, beta, and gamma contamination and is conveniently shaped and sized for checking contamination on people and objects. Measurements are made by holding the detector face above the surface being surveyed, generally about 0.1 to 0.25-inch away and without touching the person or object. The probe is connected to the 2241-3 survey meter using the cable included in the Case 2 kit.



### 5-2.b.i.3. Model 43-90 Alpha Scintillator Probe

**Manufacturer:** Ludlum

**Model:** 43-90

**Quantity Available:** 18 Case 2 kits at Program Offices and Willowbrook

**Description:** This alpha scintillator probe is exceptionally sensitive for the detection and measurement of only alpha contamination without detecting other beta and gamma contamination, if present. Measurements are made by holding the detector face as close to the surface being surveyed without touching it. The probe is connected to the 2241-3 survey meter using the cable included in the Case 2 kit.



### 5-3 OSC Response Kit Wallet Card

Radiation Meter/Detector	Radiation Detected	UNITS	Sensitivity	Range	Bkgd Range
Ludlum Micro-R Model 192†	$\gamma^*$	micro-roentgen/milli-roentgen	600,000 cpm = 1mR/hr	5 - 5,000 uR/hr or .005 - 5 mR/hr**	5-15 uR/hr
Ludlum Model 2241-3 + 44-9 Pancake	$\alpha, \beta, \gamma^*$	cpm	3300cpm = 1mR/hr	0 - 999,000 cpm	30-60 cpm
Ludlum Model 2241-3 + 43-90 Alpha	$\alpha$	cpm	N/A	0 - 999,000 cpm	0-1 cpm
Ludlum Model 15 + 44-7 End Window	$\alpha, \beta, \gamma^*$	cpm	2100 cpm = 1mR/hr	0 - 999,000 cpm	20-40 cpm
Eberline RO-20 Ion Chamber	$\gamma^*$	milli-roentgen/roentgen	N/A	.1 mR - 50 R**	N/A
Ludlum Model 15 + Bf <sub>3</sub> Neutron	neutrons	cpm	60cpm = 1mR/hr	0 - 999,000 cpm	0
SAM-935 MCA	$\gamma^*$ and neutron (if He <sub>3</sub> detector present)	micro-roentgen/milli-roentgen & std. dev. above bkgd.	N/A	.01 mR/hr - 30 mR/hr†	5-15 uR/hr

$\alpha$  = alpha particle travels 2 inches, does not penetrate skin, tyvek, etc, internal hazard.

$\beta$  = beta particle (electron) travels 12 feet per MeV, low penetrating ability, does not penetrate tyvek, internal and external hazard

$\gamma$  = gamma photon travels hundreds of feet, high penetrating ability, use time distance and shielding for protection, internal and external hazard

\* X-rays will also be detected with energies typically less than 100keV

\*\* 1000uR/hr = 1 mR/hr 1000mR/hr = 1 R/hr NOTIFICATION LEVEL 100uR/hr TURNBACK LEVEL 1.5 R/hr  
per hazard evaluation flow chart during Emergency Responses only

† Range is not capable of detecting TURNBACK LEVEL

#### Activity

1,000 millicuries = 1 Curie

1,000 micro curies = 1 millicurie

1 millicurie of Cs<sup>137</sup> @ 1 meter ~ 500 uR/hr

1 millicurie of Ra<sup>226</sup> @ 1 meter ~ 1 mR/hr

**EPA Radiation Dose Limits** Non-Emergency Response site worker = 500 mRem/year  
Emergency Response = 5,000 mRem (5 Rem)

**Decon** Pancake detector > 100 cpm decontaminate Respiratory protection > 400 cpm  
Alpha Scintillometer > 50 cpm decontaminate with pancake or alpha

## 5-4.a. Removal Support – Contamination Monitoring

The following contamination monitoring equipment is available upon request to support removal actions and radiological emergency response activities. While this equipment is maintained at the Willowbrook Warehouse, a limited number are kept calibrated and the rest are inactive. Inactive equipment requires calibration prior to its use, which may require 2 to 4 weeks following its request.



### 5-4.a.i. Model 2241-2 Survey Meter with 44-9 Pancake GM and 43-90 Alpha Scintillation Probes ("ABG" Case)

**Manufacturer:** Ludlum

**Models:** 2241-2, 44-9, and 43-90

**Quantity Available:** 8 ABG Case kits at Willowbrook (2 calibrated, the rest are inactive)

**Description:** "ABG" cases provide alpha, beta, and gamma contamination measurement capability. The case includes a Ludlum 2241-2 survey meter, similar to the 2241-3 but only capable of connecting two

different probes. The probes included in this case are the 44-9 pancake GM probe and the 43-90 alpha scintillation probe. The probes are connected to the 2241-2 survey meter using the cable included in the "ABG" case.



### 5-4.a.ii. Model 2241 Survey Meter with 44-9 Pancake GM Probe ("BG" kits)

**Manufacturer:** Ludlum

**Models:** 2241 and 44-9

**Quantity Available:** 7 BG kits at Willowbrook (2 calibrated, the rest are inactive)

**Description:** "BG" cases provide beta and gamma contamination measurement capability. The case includes a Ludlum 2241 survey meter, similar to the 2241-3 but only capable of connecting one probe. The detector included in this kit is the 44-9 pancake GM probe. The probe is connected to the 2241 survey meter using the cable included in the kit.

## 5-4.b. Removal Support – Exposure and Dose Rate Monitoring

The following exposure rate monitoring equipment is available upon request to support removal actions and radiological emergency response activities. While this equipment is maintained at the Willowbrook Warehouse, a limited number are kept calibrated and the rest are inactive. Inactive equipment requires calibration prior to its use, which may require 2 to 4 weeks following its request.



### 5-4.b.i. Fluke 451B Ion Chamber

**Manufacturer:** Fluke Biomedical

**Model:** 451B-DE-SI-RYR

**Quantity Available:** 3 at Willowbrook

**Description:** The 451B is a portable air ionization chamber instrument used to measure gamma deep dose rate ( $H^*10$ ) consistent with ICRU-47. It effectively measures gamma dose rates ranging from 10  $\mu\text{Sv/hr}$  up to 500  $\text{mSv/hr}$  (1  $\text{mR/hr}$  up to 50  $\text{R/hr}$ ) when the sliding beta shield is closed. With the beta shield open, the 451B can measure skin dose at  $H^*(0.07)$ . It measures dose rate and total dose simultaneously, with the capability to record the peak dose rate. It features an LCD display with both numeric and bar-graph readings, and is auto-ranging and auto-zeroing. The 451B also has a RS-232 port that can support remote operation via a long cable, and can operate with EPA Region 5's FAST software for geospatial data collection.



### 5-4.b.ii. Personal Radiation Monitors

**Manufacturer:** Canberra

**Models:** UDR-13A, UDR-13BR, UDR-14, UDR-14E

**Quantity Available:**

Willowbrook: UDR-13BR (2), UDR-14 (2), UDR-14E (6) All Inactive

START-Chicago: UDR-13BR (3)

START-Detroit: UDR-13BR (3)

START-Westlake: UDR-13BR (3)

START-Indianapolis: UDR-13A (2)

**Description:** The UDR-series personal radiation monitors provide exposure rate and total exposure measurement in an extremely rugged instrument. Features include a large, easy-to-read back-lit LCD display, and audible, visual and vibrating alarms. These are generally useful for health and safety measurements in areas ranging from 1- $\text{mR/hr}$  to 200,000  $\text{mR/hr}$  (200  $\text{R/hr}$ ).

## 5-4.c. Removal Support – Air Sampling



### 5-4.c.i. H-810 Air Sampler

**Manufacturer:** RAdCo

**Model:** H-810 Air Volume Totalizer (AVT)

**Quantity Available:** 12 at Willowbrook

**Description:** The H-810 AVT is a High Volume Air Sampler with an Air Volume Totalizer. The Model H-810 samples the environment until the desired total volume or total elapsed time has been reached and then turns itself off. The H-810 requires an external 120VAC power source to operate. This air sampler is equipped with a 2" filter holder and 47mm particulate filters (LB5211). These filters are counted with the model 2929 or 3030 to determine airborne concentrations of radioactive materials.



## 5-4.d. Removal Support – Air and Wipe Sample Counting



### 5-4.d.i. Model 3030 Alpha/Beta Counter

**Manufacturer:** Ludlum

**Model:** 3030

**Quantity Available:** 3 at Willowbrook (all are inactive)

**Description:** The Model 2929 and 3030 are available to perform simultaneous alpha and beta radiation measurement on air filter and wipe (swipe) samples. Data from the measurement of air filters these are used to calculate airborne radioactivity concentrations, and data from the measurement of wipe/swipes/smears are used to determine the concentration of removable activity from a surface. The 3030 requires beta and alpha radioactive plate sources for daily functional and efficiency checks.

## 5-4.e. Removal Support – Radioisotope Identification



### 5-4.e.i. SAM-940 Radioisotope Identifier (RIID)

**Manufacturer:** Berkeley Neucleonics

**Model:** SAM-940

**Quantity Available:** 7 at Willowbrook

**Description:** The SAM-940 is a portable radioisotope identifier (RIID) with the ability to identify multiple gamma-emitting radionuclides concurrently within seconds. Upon identification it can provide the assumed category of the radioisotope: medical, naturally occurring, industrial, and special nuclear material. Spectral data are saved to a SD card which can be sent to a health physicist for further analysis. Six SAM-940s have sodium iodide (NaI) probes, and one SAM-940 has a lanthanum bromide (LaBr) probe for higher identification resolution.

## 5-4.f. Removal Support – Gamma Count Rate Monitoring



### 5-4.f.i. Model 2221 with Model 44-10 2" x 2" NaI Probe

**Manufacturer:** Ludlum

**Model:** 2221 with 44-10

**Quantity Available:** 9 at Willowbrook (2 dedicated to site use)

**Description:** The Model 2221 is a general purpose ratemeter and scaler, with simultaneously operating analog meter and LCD digital displays. The 2221 can also perform scaler counting (total counts) over selectable periods ranging from 0.1 to 5 minutes. During scaler counting one can switch the display for current count rate information. The 2221 has a variety of controls and settings on front that make it easy to configure for site-specific remediation work. The 2221s are supplied with a 44-10 2" x 2" sodium iodide (NaI) probe. When calibrated together, this system can be used to support site

assessment and remediation verification activities. Operation can be performed by a person performing radiological surveys by either walking across a site, or by mounting the instruments to a vehicle that is driven across a site. The 2221s have RS-232 data export features, so they can be used in radiological geospatial surveys when configured with GPS system and a laptop computer running EPA Region 5's FAST software.

## 5-4.g. Removal Support – Personnel/Decon Line Monitoring



### 5-4.g.i. Model 52-2 Portal Monitor

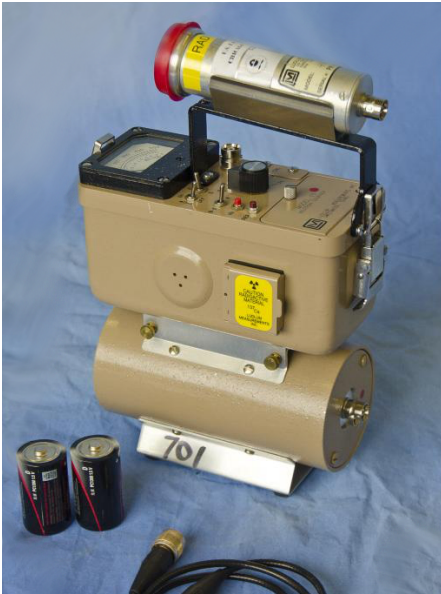
**Manufacturer:** Ludlum

**Model:** 52-2

**Quantity Available:** 2 at Willowbrook (inactive)

**Description:** The Model 52-2 Personnel Portal Monitor is a beta/gamma personnel contamination monitor. It can be used in walk-through mode or the more sensitive stop-and-count mode. Has audio and LED condition indicators and an LCD Display for setup and detector counts. Powered by 85-250 VAC or three "D" cell alkaline batteries (24 hour run time). 81"H x 24"W. Weight in storage/transport case (wheeled) —110 lb.

## 5-4.h. Removal Support – Neutron Monitoring



### 5-4.h.i. Model 15 Neutron Probe with G-M detector

**Manufacturer:** Ludlum

**Model:** 15

**Quantity Available:** 2 at Willowbrook (inactive)

**Description:** The Model 15 is a survey meter coupled to a Model 42-14H neutron probe and moderator, and a Model 44-7 thin end-window GM detector. This combination provides the capability for measuring and monitoring fast and slow neutrons (removable moderator for thermal neutrons), as well as alpha, beta, and gamma contamination with the GM detector.

## **6. METEOROLOGICAL**

### **6-0. Weather Monitoring MK III Weather Station**



**Display may be different.**



## 6-0. Weather Monitoring

### Manufacturer:

Rainwise

### Model:

MK III Weather Station

### Quantity Available:

(On National Equipment List)

Willowbrook: 2

Ann Arbor: 2

Westlake: 1

Cincinnati: 1

### Description:

The MK III is a Solar-Powered Wireless Weather Station. It is powered by a small solar panel attached to the station. The display unit is wireless and has a range of about 50 ft. The station measures wind speed and direction, temperature, humidity, barometric pressure and rainfall.

## **7. AIR SAMPLING EQUIPMENT**

**This section presents descriptions of the following air sampling equipment:**

### **7-1. Low Flow Air Sampling Pumps**

- a. GilAir-5, *500 to 5000 mL/min.* (5 pump kit)**
- b. AirChek XR5000, *5 to 5000 mL/min.***
- c. Pocket Pump TOUCH, *20 to 500 mL/min.***

### **7-2. High Flow Air Sampling Pumps**

- a. Aircon-2, *2 to 30 L/min.***

### **7-3. Air Flow Calibration Pumps**

- a. Defender 510/520/530**

## 7-1. Low Flow Air Sampling Pumps

### 7-1.a. GilAir-5 (5 Pump Kit)

**Manufacturer:** Sensidyne

**Model:** Gilian GilAir-5

**Quantity Available:**

Willowbrook: 25 Pumps (six 5 pack kits)

Westlake: 5 Pumps (one 5 pack kit)

**Description:**

The GilAir-5 is a low-flow Constant Flow Air Sampling Pump. It comes in a pack of 5 pumps. They operate at a constant flow rate in a range from 500 to 5000 ml/min (0.5 to 5 L/min).

(On National Equipment List)



### 7-1.b. AirChek XR5000

**Manufacturer:** SKC Incorporated

**Model:** AirChek XR5000

**Quantity Available:**

Westlake: 5

**Description:**

Constant flow portable air sampler suitable for low flow gas/vapor or high flow particulate sampling. Adjustable from 5 to 5000 ml/min. (0.005 to 5 L/min)

Includes charging train: AC power adapter to charging unit to unit's battery pack.





### 7-1.c. Pocket Pump TOUCH

**Manufacturer:** SKC Incorporated

**Model:** Pocket Pump TOUCH

**Quantity Available:**

Westlake: 3

**Description:**

The Pocket Pump TOUCH personal air sample pump provides low flows suitable for gas and vapor sampling. Can be paired with the SmartWave mobile app or PC via bluetooth connection. UL Listed for intrinsic safety. Adjustable from 20 to 500 ml/min. (0.02 to 0.5 L/min).

## 7-2. High Flow Air Sampling Pumps



### 7-2.a. Aircon-2

**Manufacturer:**

Sensidyne

**Model:**

AirCon-2

**Quantity Available:**

Willowbrook: 9

Ann Arbor: 3

Westlake: 3

**Description:**

The Aircon-2 is a High Volume Air Sampler. It has a constant flow range of 2 to 30 L/min. The Aircon-2 is powered by sealed lead-acid battery packs capable of 8 hour run time. The packs can be stacked to increase the run time. Needs two battery packs to run 8 hours.

**Note: Batteries inside battery cases can be replaced with off the shelf batteries. Refer to battery specs on the batteries inside the cases.**



## 7-3. Air Flow Calibration Pumps



### 7-3.a. Defender 510/520/530

**Manufacturer:**

MesaLabs/Bios International

**Model:**

Defender 510/520/530 Primary Flow Calibrator

**Quantity Available:**

Willowbrook: 7

*510L (1), 510M (1), 510H (1), 530M (2), 530H (2)*

Ann Arbor: 2

*530M (1), 530H (1)*

Westlake: 2

*520M (1), 530M (1), 530H (1)*

**Description:**

The Defender 510, 520, and 530 are a series of Primary Standard Pump Calibrators with each pump series available in 3 models, 5XXL, 5XXM, 5XXH. Each model meets a certain range of flow rates, (L) Low flow, (M) Medium flow and (H) High flow, that can be used to calibrate the low flow personal pumps, GilAir-3, as well as the medium GilAir-5, to high flow pumps of the Aircon2 and PQ 200.

## **8. FIELD COMMUNICATION**

**This section presents descriptions of the following field communication equipment:**

### **8-1. Two-Way Radio Sets**

- a. Motorola HT 1250 (for Level A)**
- b. Motorola XTS 5000**

### **8-2. Satellite Phone, Iridium Model 9555**

### **8-3. Portable Satellite Unit (PSU)**

## 8-1. Two-Way Radio Sets

### 8-1.a. Motorola HT 1250 Intrinsically Safe



**Manufacturer:**

Motorola

**Model:**

HT-1250 Two-way Radio

**Quantity Available:**

Willowbrook: 20

Ann Arbor: 7

Westlake: 5

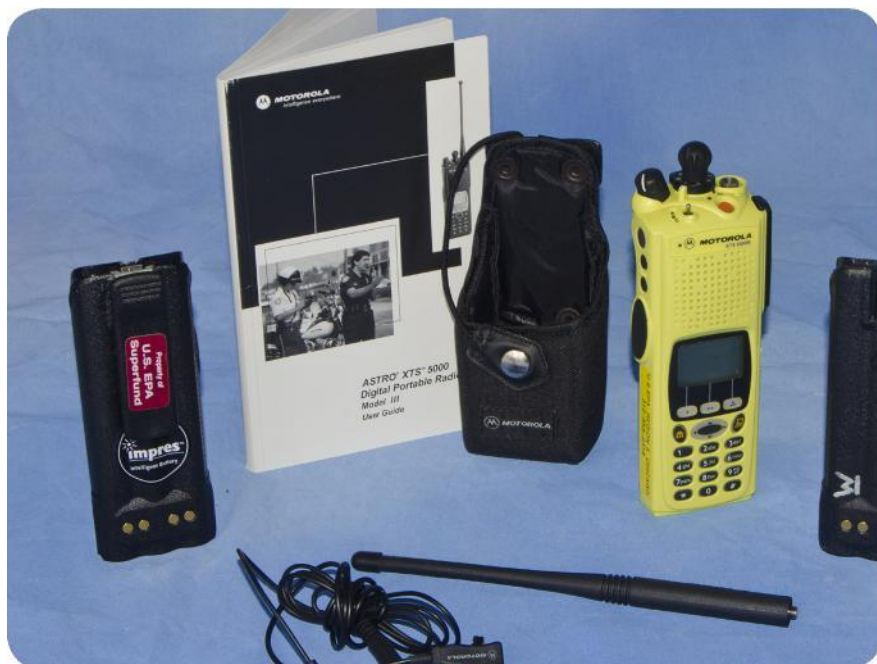
Cincinnati: 1

(On National Equipment List)

**Description:**

The HT-1250 is a handheld digital Two-Way Radio. They operate in the VHF Range and have 6 EPA Channels programmed in. They are intrinsically safe and can be used in Hot Zone.

### 8-1.b. Motorola XTS 5000



**Manufacturer:**

Motorola

**Model:**

XTS 5000 Two-way Radio

**Quantity Available:**

Willowbrook: 24

Ann Arbor: 9

Westlake: 5

Cincinnati: 1

(On National Equipment List)

**Description:**

The XTS 5000 is a handheld digital Two-Way Radio. These radios operate in the VHF range (30-300MHz) and have 6 EPA Channels programmed in. They are capable of Front Panel Programming for tuning to any frequency in the VHF Range.

## 8-2. Two-Way Communication Satellite Phone

**Manufacturer:** Iridium

**Model:** 9555 Satellite Phone

**Quantity Available:** Willowbrook: 1; Ann Arbor: 1; Westlake 1

(On National Equipment List)

**Description:**

Iridium 9555 quick access interface, with menu-driven commands and graphical display, offers straightforward usability. Setting up the handset is fast and easy, with:

- Simplified dialing with + key international access (with country code and number)
- A choice of 21 languages for menu prompts, and Iridium 9555 users also benefit from inherent performance advantages due to the proximity to the Earth of Iridium's unique Low Earth Orbiting (LEO) global satellite constellation. These include:
- The lowest communication delays of all mobile satellite service providers
- The lowest latency of voice and data communications, and
- The shortest registration time



## 8-3. Portable Satellite Unit\*

**Manufacturer:** Various

**Model:** Various

**Quantity Available:** Two Storage Locations:  
(On National Equipment List)

**PSU-1,** Stored at the Westlake, Ohio Office.

**PSU-2,** Stored at the Willowbrook Warehouse.

**Description:** The PSUs are a National Asset purchased and supported by the EPA National Approach to Response-Field Communications (NARFCOM) group. PSUs are field ready, line of sight, always-on satellite dish and control unit that provides 24/7/365 Internet and Voice over Internet Protocol (VoIP) phone service to EPA On-Scene Coordinators and Response Support Corp (RSC) members deployed to Emergency Responses and Removal Sites. The satellite contract provides Internet service, which can be upgraded on the fly during an Emergency Response; unlimited VoIP phone service; 24-hour help desk support; on-site maintenance support; and system upgrade/update potential to all EPA Regions and Special Teams. The system is designed to fit inside a Suburban or pickup truck and the control unit, is about the size of a small suit case. The control unit has several cables, some up to 100' long, that are attached to the antenna. The antenna is designed to be outdoors, but the control unit must be kept and operated indoors. **NOTE: NOC recommends a 20-30' exclusion zone in front of the dish due to signal propagation, although smaller areas have been used successfully.**

PSU-1 Phone Number: 312-212-3002 PSU-2 Phone Number: 312-212-3009

Note: Numbers may change annually. Also, dialing codes are different depending on type of system called (Cell, POTS). Call contacts below for information.

24-Hour Satellite Support (Knight-Sky): 240-252-1963 or noc@knight-sky.com, also notify Jon Gulch: 734-740-9017. The Quick-Start Guide for the Region 5 PSU is located at:

[www.epaosco.org/r5co](http://www.epaosco.org/r5co)

(Private Login Required)

\*For inquiries related to this asset, contact:

Jeff Borseth: 734-692-7663 or

Jim Ursic: 312-353-1526





## **9. TRANSPORTATION**

**(All located at Argonne except MCP and Air Trailer)**

**This section presents descriptions of the following trailers, boat motors and boat:**

### **9-1. Cargo Trailer, Enclosed**

- a. 8' Enclosed** GVWA 2,000 Lbs.
- b. 14' Enclosed** GVWA 2,990 Lbs.
- c. 20' Enclosed** GVWA 12,000 Lbs.
- d. 10' Enclosed**
- e. 12' Enclosed** GVWA 3,000 Lbs.
- f. 22' Enclosed** GVWA 7,000 Lbs.
- g. 14' Enclosed** GVWA 7,000 Lbs.

### **9-2. Cargo Trailer, Flat Bed**

- a. 16' Flat Bed, Dual Ramps** GVWA 10,000 Lbs.
- b. 11' Flat Bed, Tilting Bed** GVWA 6,200 Lbs.
- c. 11' Flat Bed, Single Ramp** GVWA 3,500 Lbs.

### **9-3. Cargo Trailer, Boat**

- a. 12' Support Profile, Flat Bottom**

### **9-4. Mobile Trailer, Processing Platform**

- a. HazMat Trailer**

### **9-5. Marine Transportation**

- a. Gasoline, Outboard 4 Stroke**
  - i. 15 hp Johnson**
  - ii. 9.9 hp Mercury**
- b. Gas/Oil Mix, Outboard 2 Stroke**
  - i. 15 hp Mercury**
- c. Electric Motor**
  - i. 40 Lb. Thrust Trolling Motor**
- d. Jon Boat, 12' Aluminum with Trailer**

## **9. TRANSPORTATION**

**(Continued)**

- 9-6. Mobile Command Post (MCP - Bluebird)**
- 9-7. Mobile Command Vehicle (MCV - Sprinter)**
- 9-8. Mule UTV 4WD/2WD**
- 9-9. Air Trailer (see section 1-1.c.i)**

## 9-1. Cargo Trailers, Enclosed



### 9-1.a. Wells Cargo 8' Box

**Manufacturer:**

Wells Cargo

**Model:**

TC8

**Box Dimensions, Interior:**

7' 9" L x 4' 8" W x 4' 8" H

**Quantity Available:** 1

Stored at Argonne National Laboratory, Lemont, Illinois Contact  
Willowbrook Warehouse or Jim Ursic

**Description:**

8' enclosed single axle trailer. Single right hand reverse swing rear door 4' 5" H x 4' W. Cargo capacity 1,400 lb., trailer wt. 600 lbs., GVWR 2,000 lbs. Requires 2" ball and flat 4 connector. Lock key number 548. Has wiring for an optional internal alarm (requires control fob and car battery). Built 1987.

**License Plate:** EPA 5211T



**9-1.b.  
Wells Cargo 14' Box**

**Manufacturer:**

Wells Cargo

**Model:**

TM141M

**Box Dimensions, Interior:**

13' 9" L x 5' 10" W x 6' 6" H

**Quantity Available: 1**

Stored at Argonne National  
Laboratory, Lemont, Illinois

Contact Willowbrook  
Warehouse or Jim Ursic



**Description:**

14' enclosed one axle trailer. Gas generator, combination electric air conditioner/electric heater and nose-cone. Cargo capacity 1,850 lbs., trailer wt. 1,150 lbs., GVWR 3,000 lbs. Electric (battery) breakaway system. Ramp rear door and right side access door. Requires 2" ball and round 7 connector. Primary vehicle for moving IMT equipment and is on emergency stand-by. Requires key for lock number 548. Built 1993.

**License Plate:** EPA 5204T



## 9-1.c. 20' Box Trailer



**Manufacturer:**

Avenger

**Model:**

CW820TAE

**Box Dimensions, Interior:**

19' 8" L x 11' 7" W x 7' 10" H

**Quantity Available:** 1

Stored at Argonne National Laboratory, Lemont, Illinois Contact  
Willowbrook Warehouse or Jim Ursic

**Description:**

20' enclosed two axle trailer. Cargo capacity 8,420 lbs., trailer wt. 3,580 lbs., GVWR 12,000 lbs. Right side access door and double rear doors and floor rails. Trailer is currently used for equipment/tool storage and is not immediately roadworthy. Purchased for transporting GeoProbe but current towing vehicle and typical IL driver license Class rating is beyond trailers weight limits. Requires 2  $\frac{5}{16}$ " ball and round 7 connector and weight distribution system for hitch. Built 1998.

**License Plate:** EPA 5208T

## 9-1.d. 10' Box Trailer

**Manufacturer:**

Play-Tow

**Model:**

N/A

**Quantity Available: 1**

Stored at Argonne National laboratory, Lemont, Illinois  
Contact willowbrook Warehouse or Jim ursic.

**Description:**

10' enclosed one axle trailer. Single right hand reverse swing rear door. Sky light on roof. Requires 2" ball and flat 4 connector.

**License Plate:** EPA 5205T

## 9-1.e. 12' Box Trailer



**Manufacturer:**

Wells Cargo

**Model:**

TM121M

**Box Dimensions, Interior:**

11' 9" L x 5' 9" W x 5' 6" H

**Quantity Available: 1**

Stored at Argonne National Laboratory, Lemont, Illinois.

Contact Willowbrook Warehouse or Jim Ursic



**Description:**

12' enclosed one axle trailer with nose-cone. Cargo capacity 3,000 lbs.. Ramp rear door and right side access door. Requires 2" ball and flat 4 connector. Pre-wired for door alarms with remote FOB. Requires key for lock number 548. Built 1998.

**License Plate:** EPA 5203T



## 9-1.f. 22' GIS Trailer

**Manufacturer:**

American Hauler

**Model:**

Night Hawk NH851STA2

**Quantity Available: 1**

Stored at Argonne National Laboratory, Lemont, Illinois

Contact Willowbrook Warehouse or Brian Cooper

**Description:**

22' enclosed two axle GIS-office trailer. Maximum Cargo wt. 4,250 lbs., Trailer wt. 2,750 lbs., GVWR is 7,000 lbs. Ramp rear door and right side access door. Electric heat/air conditioner. Electric brakes and round 7 connector. Requires 2 5/16" ball. Counter and cabinet space, interior and exterior lighting, exterior awning, skylight and left side window. Requires external portable generator (not included) or shore power. Built 2004.

**License Plate:** EPA 5248T



## 9-1.g. 14' Vibracore Equipment Trailer

**Manufacturer:**

Southwest

**Model:**

Express-line

**Box Dimensions, Interior:**

13' 9" L x 6' 8" W x 6' H

**Quantity Available: 1**

Stored at Argonne National Laboratory, Lemont, Illinois. Built 2000.

Contact Willowbrook Warehouse or Chuck Roth.

**Description:**

14' enclosed two axle vibracore boat trailer. Cargo capacity 4,700 lbs., Trailer wt. 2,290 lbs., GVWR 7,000 lbs. Rear double doors and right side access door. Electric brakes and round 7 connector. Requires 2 <sup>5</sup>/<sub>16</sub>" ball. Note: Special Purpose unit, pre-configured and currently loaded to carry vibracore, Jon boats, and equipment.

**License Plate:** EPA 5201T

## 9-2. Cargo Trailers, Flat Bed

### 9-2.a. 16' GeoProbe Trailer



**Manufacturer:**

Hooper

**Model:**

16x7 Flatbed

**Quantity Available: 1**

Stored at Argonne National Laboratory, Lemont, Illinois. Primary Transportation for GeoProbe.

Contact Willowbrook Warehouse or Jim Ursic



**Description:**

16' flatbed two axle trailer. 16' L x 7' W. Cargo capacity 8,000 lbs., Trailer wt. 2,000 lbs., GVWA 10,000 lbs. Two axle flatbed with fold down ramps, wood deck, electric (battery), break away system and spare tire. Requires 2-5/16" ball and round 7 blade connector. Reserved for GeoProbe transportation. Built 2000.

**License Plate:** EPA 5212T



## 9-2.b. 11' Tilting Flat Bed



**Manufacturer:**

Eager Beaver

**Model:**

TL6

**Quantity Available: 1**

Stored at Argonne National Laboratory, Lemont, Illinois.

Contact Willowbrook Warehouse or Jim Ursic



**Description:**

11' flatbed one axle trailer. 11' L x 5.5' W. Maximum Cargo wt. 6,000 lbs., Trailer wt. 1,300 lbs., GVWA 7,300 lbs. One axle flatbed with tilt bed deck, electric (battery) break away system and spare tire. Tow mechanism is a tow eye and round 7 connector. Built 1990.

**License Plate:** EPA 5210T

## 9-2.c. 11' Flat Bed Single Ramp

**Manufacturer:**

Schrack

**Model:**

N/A

**Quantity Available: 1**

Stored at Argonne National Laboratory, Lemont, Illinois

Contact Willowbrook Warehouse or Chuck Roth

**Description:**

11' flatbed one axle trailer. 11' L x 5' W. GVWA 3,500 lbs. One axle flatbed with expanded metal ramp, wood deck and spare tire. Requires a 2" ball and flat 4 connector.

**License Plate:** EPA 5207T



## 9-3. Cargo Trailers, Boat

### 9-3.a. 12' Jon Boat Tilting Bed Trailer

**Manufacturer:**

Cox

**Model:**

Mark CF800

**Quantity Available: 1**

Stored at Argonne National Laboratory, Lemont, Illinois. Obtained through CH<sub>2</sub>M Hill.

Contact Willowbrook Warehouse or Jim Ursic

**Description:**

12' one axle trailer for Jon Boat. Frame configured for flat bottom Jon boat with spare tire and manual winch. Requires a 1-7/8" ball and flat 4 connector.

**License Plate:** EPA 5206T

## 9-4. Mobile Trailer, Processing Platform

### 9-4.a. HazMat Office/Processing Platform



**Manufacturer:**

Wells Cargo

**Model:**

AS 142 - 46962

**Box Dimensions, Interior:**

19' L x 8' W x 9' H

**Quantity Available: 1**

Stored at Ann Arbor Office, Michigan

Contact Willowbrook Warehouse or  
Jeff Borseth



**Description:**

Small mobile improvised lab/processing platform, counter space, vent-hood (not certified fume hood), sink, (no holding tank-external port), air conditioning/heat, roof vent, gasoline generator (Briggs & Stratton 8750/7000 watt), 2 propane tanks for heat, roll-out awning, curb door w/step, rear double doors, stabilizing jacks, two axle, small side windows/screen both sides, GVWR 7,200 lbs., requires 2-5/16" ball, electric brakes and breakaway system, and round 7 connector. Built 1990.

**License Plate:** EPA 5197T



## 9-5. Marine Transport



### 9-5.a.i. Johnson 4 Stroke Motor

**Type:** 4 Stroke Gas Motor

**Manufacturer:** Johnson

**Model:** 15hp outboard motor, forward and reverse speeds with stand and tank

**Description:** 15hp outboard motor

**Quantity per location:** 1

(Willowbrook Warehouse)

Contact Jim Ursic



### 9-5.a.ii. Mercury 4 Stoke Motor

**Type:** 4 Stroke Gas Motor

**Manufacturer:** Mercury

**Model:** 9.9 hp-F9.9M

**Description:** 9.9 4 stoke motor gas fueled with stand and tank

**Quantity per location:** 1

(Willowbrook Warehouse)

Contact Chuck Roth

### 9-5.b.i Mercury 2 Stroke Motor

**Type:** 2 Stroke Oil/Gas Fuel Mixture Motor

**Manufacturer:** Mercury

**Model:** 15hp outboard motor, forward and reverse speeds with stand and tank

**Description:** 15hp outboard motor with stand and tank.

**Quantity per location:** 1

(Willowbrook Warehouse)

Contact Jim Ursic



### 9-5.c. Electric Trolling Motor

**Type:** 12v Electric Motor

**Manufacturer:** Minn Kota

**Model:** Turbo 90

**Description:** Electric trolling motor. 40 lb thrust, 5 forward-2 reverse speeds, with weed-less wedge propeller.

**Quantity per location:** 1

(Willowbrook Warehouse)





**9-5.d. 12' Aluminum Jon Boat with Trailer****Manufacturer:** Smoker-Craft**Model:** Jon 1232**Quantity per location:** 1  
(Willowbrook Warehouse)**Description:**

12 foot Aluminum Jon boat with Trailer. Weight limits: 3 Persons or 375 lbs., total craft limitations are 540 lbs. for persons, motor and gear. Up to 10 hp outboard motor. Trailer has 1 7/8" ball and flat 4 connector. Trailer has a tilt feature for easy loading/unloading.

**WARNING:**

**Staff must complete "Boating Safety Course" training to operate boats. Contact Health and Safety Office for required training. Approximately a two hour CD presentation. Course is a one time requirement, no refreshers are needed.**

## 9-6. Mobile Command Post\*

**Manufacturer:** BlueBird

**Model:** Custom Manufactured

**Quantity Available:** 1 - Stored at the Contractor EQ Warehouse in Hammond, Indiana

Equipment maintained and transported by US. EPA Contractor and requires a CDL license to move.

\*For inquiries related to this vehicle contact:

Jeff Borseth (734-214-4899 or 734-740-9012 cell) or Jim Ursic (312-353-1526).

**Fuel:** Vehicle and on-board generator, diesel (both use same tank). **Do not use** Biodiesel.

**Description:** The MCP is made up of two main areas, separated by a slide pocket door; a forward work area with several workstations and the communications rack and a rear conference room with video conferencing capability. The MCP can be hard-wired to electrical shore power and phones or can operate from an on-board generator. The MCP has a satellite dish for internet data service, satellite television, Voice over Internet Protocol (VoIP) phones, and radio communications equipment. The MCP can monitor Regional television broadcasts via satellite and local stations through the Internet and local over-air broadcast for situational news updates and changing weather patterns. The MCP is equipped with a telescoping external camera that can elevate above the scene and remotely operated to zoom in on nearby events. Security camera images can be captured on an on-board DVD-R recorder. An internal camera is in the command staff area of the MCP so briefings can be conducted and transmitted wirelessly to other locations, such as field command posts or the Regional office. The MCP has a computer network system with wired and wireless Internet, fax capability, and a local print server with two color printers and a large color plotter. The network is available on several on-board workstations and one external work area with flat panel display. The MCP has its own compact weather station. The MCP can be staffed with fully trained Logistics/Communications Unit personnel through the Region 5 Response Support Corp (RSC). Awning can be configured with surrounding curtain.

MCP Phone Number is currently being updated. If phone number is needed, please contact Jon Gulch 734-740-9017.

24-Hour Satellite Support (Knight-Sky): 240-252-1963 or noc@knight-sky.com, also notify Jon Gulch 734-740-9017.

The QuickStart Guide for the Region 5 MCP is located at: [www.epaossc.org/r5coms](http://www.epaossc.org/r5coms) (Private Login Required)





## 9-7. Mobile Command Vehicle\*

**Manufacturer:** Freightliner

**Model:** Sprinter, Custom Modified

**Quantity Available:** 1 - Stored at the USEPA Willowbrook warehouse.

\*For inquiries related to this vehicle contact Jesse Aparicio (630-481-5000) or Steve Padovani (312-353-6755).

**Fuel:** Diesel (vehicle and generator) Note: Generator uses fuel from vehicle fuel tank.

### Description:

The EPA Region 5 MCV is an 18-foot Sprinter for communications and compact mobile office space. The MCV was designed by On-Scene Coordinators to be an always available asset that is in ready condition for immediate deployment to any Emergency Response incident or for short-term use on Removal Sites. The MCP is made up of one main area with three workstations and the communications rack with a flat screen monitor. The MCV can be hard-wired to electrical power or can operate from an on-board generator. The MCV has a satellite dish for internet data service, Voice over Internet Protocol (VoIP) phone, and radio repeater. The MCV can monitor Regional television broadcasts via satellite and local stations through the Internet and over-air broadcast for situational news updates and changing weather patterns. The MCV has a computer network system with wired and wireless Internet, fax capability, and a local color printer. The MCV can be staffed with fully trained Logistics/Communications Unit personnel through the Region 5 Response Support Corp (RSC).

MCV Phone Number is currently being updated. If phone number is needed, please contact Jon Gulch 734-740-9017.

24-Hour Satellite Support (Knight-Sky): 240-252-1963 or [noc@knight-sky.com](mailto:noc@knight-sky.com), also notify Jon Gulch 734-740-9017

The QuickStart Guide for the Region 5 MCV is located at: [www.epaosc.org/r5coms](http://www.epaosc.org/r5coms) (Private Login Required)



## 9-8. Mule UTV 4WD/2WD

**Manufacturer:** Kawasaki

**Model:** Mule 3010 KAF620E year 2005.

Fuel type: gas

**Quantity Available:**

Willowbrook: 1

Westlake: 1

**Description:**

Utility vehicle with tilt bed, 2 passenger, 14.7 kW/3,600 rpm, curb weight 1,367lbs. Two speeds forward, one reverse. Interior heater, enclosed cabinet, seat belts, DC/AC converter, 1" hitch receptor, head/tail lights.

Note : Must be transported on trailer.

Contact: Chuck Roth 312-886-0242



## 9-9. Air Trailer (See Also Section 1-1.c.)

**Manufacturer:**

Haulmark (trailer); Bauer Compressors (bottle station)

**Model:** KD?/12WT3 (trailer); CFSII-3M (bottle station)

**Quantity Available:**

EQ Warehouse Hammond, IN: 1

**Description (trailer):**

GVWR: 10,000 lbs/ dual axle, two barn door rear opening, flip up side openings, electric brakes, connector round 7, hitch, 3" Eye type coupler, spare tire, EPA logos.

**Description (compressor):**

Three bottle filling station

**SPECIAL NOTICE:** Equipment maintained by EQ. Air samples from compressor must be analyzed by certified air laboratory quarterly to ensure air purity is within approved limits. Operators must be trained in use of this equipment.

Contact: Steve Peterson 312-353-1422

**License Plate:** EPA 5200T





## **10. SPECIALIZED EQUIPMENT**

**This section presents descriptions of the following *Removal* warehouse equipment:**

**10-1. Chemical Identifiers, Portable**

- a. HazMatID Elite & 360 Chemical Identifiers**
- b. Point-and-Shoot Chemical Identifier**

**10-2. Thermal Imaging Camera (Color)**

**10-3. Fluid Level Meters/Water Quality Samplers**

- a. Water Level Meter**
- b. T-L-C Meter (Temperature, Water Level, Conductivity)**
- c. Oil/Water Interface Probe**
- d. Multi Probe System Water Quality Sampler YSI 556 MPS**

**10-4. Portable Electric Generators**

- a. 5600 watt generator (gasoline)**
- b. 3500 watt generator (gasoline)**
- c. 2000 watt generator (gasoline)**
- d. 800 watt generator, non-removal (gasoline)**

**10-5. Traffic Control Equipment, Temporary**

- a. Workers Signage**
- b. Flagman Icon Signage**
- c. Traffic Cones**

**10-6. Containment Pool, Portable**

**10-7. Water Buoys**

**10-8. Barrel Pump, Hand Operated**

**10-9. Tripod, Flexible, Small**

**10-10. Drum Thief, Glass**

## **10. SPECIALIZED EQUIPMENT**

### **(Continued)**

- 10-11. Solar Powered Electrical Supply System**
- 10-12. Kemmerer Water Sampler**
- 10-13. Ultra-Violet Light**
- 10-14. Global Navigation Satellite System (GNSS) Receiver**
- 10-15. Dual Grade Laser Level Kit**

## 10-1. Chemical Identifiers, Portable



### 10-1.a. Chemical Identification

**Manufacturer:**

Smiths Detection

**Model:**

HazMatID Elite & HazMatID 360

**Quantity Available:** (On National Equipment List)

Willowbrook: 1 of each

Ann Arbor: 1 (HazMatID 360)

**Description:**

The HazMatID 360 & Elite are advanced portable FT-IR Chemical Identifier.

It creates an Infrared Spectrum "fingerprint" of a liquid or solid sample and compares it to an extensive internal library of IR fingerprints for known compounds. The results are displayed in percent probability of a match to the closest identified compounds.

### 10-1.b. Point-and-Shoot Chemical Identifier

**Manufacturer:** Thermo Scientific

**Model:** First Defender RM

**Quantity Available:** Westlake: 1



**Description:**

- Quickly identifies unknown solid and liquid chemicals from a vast sample library including: explosives, toxic industrial chemicals (TICs), toxic industrial materials (TIMs), chemical warfare agents (CWAs) white powders, narcotics and more
- Mixture analysis software identifies mixture components in seconds including solid/liquid combinations and aqueous solutions
- Handheld weighs less than 2 lb (800g) for easy transport
- Certified to meet MIL STD-810G requirements for ruggedness
- Designed for use in the hot zone with tough form factor, quick decontamination and easy operation in full Level A gear
- Non-contact sampling requires no calibration and no consumables
- Point-and-shoot™ operation through sealed translucent containers avoids contamination and exposure and maintains evidence

## 10-2. Thermal Imaging Camera (Color)



**Type:** Color, WiFi communication

**Manufacturer:**

FLIR

**Model:**

E60

**Quantity Available:**

Willowbrook: 1

Westlake: 1

**Description:**

Compact thermal imaging camera with 320x240 IR resolution and measurement modes, 3 spots, 4 area box, isotherm, auto hot/cold spots. Bluetooth; 3.5" touchscreen; picture-in-picture and multi spectral dynamic imaging.



## 10-3 Fluid Level Meters/Water Quality Samplers



### 10-3.a. Water Level Meter

**Manufacturer:**

Solinst

**Model:**

101 P2

**Quantity Available:** Willowbrook: 3

**Description:**

Water level meter for measuring water levels in wells up to 150' deep with diameters of 0.55" or more. Heat Embossed Markings on Polyethylene Tape every 1/100 of a foot.

### 10-3.b. T – L - C Meter

**Manufacturer:**

YSI

**Model:**

3000

**Quantity Available:** Willowbrook: 1

**Description:**

Self-contained filed instrument and probe system that measures temperature, water level or depth, conductivity and temperature compensated conductivity for water quality applications. The meter can deploy to a depth of 150 feet. Probe diameter is 1", depth marked every foot.





### 10-3.c. Oil/Water Interface Probe

**Manufacturer:**

ORS Environmental Equipment

**Model:**

1068013

**Quantity Available:** Willowbrook: 2

**Description:**

Hand held interface probe for measuring depth to water or oil in tanks or wells. The system is approved for Class 1, Division 1, Group D applications. The unit is intrinsically safe provided the following requirements are met: Batteries must be changed only in a non-hazardous location and **Batteries must be Duracell Type MN1500 (size AA). Substitution will impair intrinsic safety and void approval.** The probe is 1" in diameter and has 100 feet of cable. Tape is marked every 1/10' and in cm. Oil slick must be  $\geq 1/16"$ . Always use grounding cable.



### 10-3.d. YSI 556 MPS Water Quality Sampler

**Manufacturer:**

YSI

**Model:**

556 MPS (Multi Probe System)

**Quantity Available:**

(On National Equipment List)

Willowbrook: 2

Ann Arbor: 1

Westlake: 1

**Description:**

The 556 MPS is a portable handheld multi-parameter water sampling system. This meter measures dissolved oxygen, temperature, conductivity, pH and Oxidation-Reduction Potential (ORP). Powered by alkaline batteries. 50 foot probe cable. Unit has been discontinued, but still supported by YSI.

## 10-4. Portable Electric Generators



### 10-4.a. 5600 Watt Gas Generator

**Manufacturer:** Craftsman

**Model:** 5600

**Quantity Available:** Willowbrook: 5  
Des Plaines: 1  
Ann Arbor: 1\*  
(\*Located with HazCat Trailer)

**Kit Includes:** 5600watt gasoline generator.  
Acquired on National Buy after 9/11.

### 10-4.b. 3500 Watt Gas Generator

**Manufacturer:** Honda

**Model:** 3500 Gas Generator

**Quantity Available:**

Willowbrook: 2

**Kit Includes:** Gas generator, small  
tool kit



#### Generator Specifications

Engine	8 HP, Single Cylinder, Overhead Valve, Air Cooled
Displacement	242 cc
AC Output	120/240V 3500W max. (29.2114.6A) 3000W rated (25.0/12.5A)
Receptacles	20A 125V Duplex NEMA Plug Number: 5-20P  30A 125V Locking Plug NEMA Plug Number: L5-30P  20A 125/250V Locking Plug NEMA Plug Number: L14-20P
DC Output	<b>12V, 100W, (8.3A)</b>
Starting System	Recoil (Optional Electric)
Fuel Tank Capacity	4.5 gallons
Run Time on One Tankful	8.5 hrs. @ rated load 14.2 hrs. @ 1/2 load
Dimensions (L x W x H)	23.8" x 25.8" x 22.4"
Noise Level	68 dB © rated load
Dry Weight	160 lbs.



### 10-4.c. 2000 Watt Gas Generator

**Manufacturer:** Honda

**Model:** EU2000i

**Quantity Available:**

Willowbrook: 2

Ann Arbor: 1

Westlake: 1

**Description:** Engine: Honda GX200

- Displacement: 98.5cc
- AC Output: 120V 2000W max - 16.7A, 1600W rated - 13.5A
- Receptacles: 20A 125V Duplex
- DC Output: 12V, 96W - 8A
- Starting System: Recoil
- Fuel Tank Capacity: 1.1 gallon
- Runtime per tankful 4 hrs at rated load, 96 hrs at 1/4 load
- Dimensions: 20.1 in. x 11.4 in. x 16.7 in.
- Dry weight 46 lbs.



### 10-4.d. 800 Watt Gas Generator

**Manufacturer:** Honda

**Model:** EX800 Gas Generator

**Quantity Available:** Willowbrook: 1

**Kit Includes:** Small gas generator, hour meter

Note: This is not Removal equipment and normally used for geophysical equipment. Contact Jim Ursic for access.





## 10-5. Traffic Control Equipment, Temporary



### 10-5.a. Workers Signage

**Type:** Worker Icon

**Manufacturer:** USA Sign

**Model:** 5'Wide, fabric

**Quantity Available:** Willowbrook: 1

**Description:** Worker icon with stand, large 5'wide, roll-able fabric panel.



### 10-5.b. Flagman Icon Signage

**Type:** Flagman Icon

**Model:** 4'wide, fabric roll-able panel

**Quantity Available:**

Willowbrook: 1

**Description:** Flagman icon with stand, 4'wide, roll-able fabric with stand.



### 10-5.c. Traffic Cones

**Type:** 1 9" & 28" tall, orange plastic traffic cones

**Model:** Various

**Quantity Available:** Willowbrook: 9 Mixed sizes

**Description:** Plastic traffic cones, no reflective tape. Not all cones are marked "EPA" or "USEPA"

### 10-6. Containment Pool

**Type:** Containment Pool

**Quantity Available:**

Willowbrook: 1

**Description:** Collapsible sides that can be folded for storage. 6" sides and 5" square plastic with stiff side boards.







### 10-7. Water Buoys

**Type:** Closed Area with icon

**Manufacturer:** Rolyan

**Model:** Closed area with icon

**Quantity Available:** Willowbrook: 4

**Description:** Plastic buoys 10" diameter and 5' long with weighed bottom and eye loop for securing line(s). Also has reflective tape.



### 10-8. Hand Operated Barrel Pump

**Type:** Rotary Drum Pump

**Manufacturer:** ABC Industrial Supplies

**Model:**

**Quantity Available:** Willowbrook: 1

**Description:** Three section suction tube with bung.



### 10-9. Flexible Tripod

**Type:** 9" Flexible tripod

**Manufacturer:** JOBY

**Model:** Gorillapod

**Quantity Available:** Willowbrook: 1

**Description:** Small 9" portable flexible tripod, with case.



### 10-10. Glass Drum Thief

**Type:** Drum Thief/Coliwaser

**Manufacturer:** CONBAR Environmental Products

**Model:** 5500

**Quantity Available:** Willowbrook 24

**Description:** Disposable, glass, Viton Seal, 42" long, 200 ml capacity.

## 10-11. Solar Power System, 200 Watt

**Type:** In-house built Solar Power System

**Manufacturer:** In-House Assembly

**Model:** N/A

**Quantity Available:** Willowbrook: 1

**Description:** System allows up to 30 amps at 12 volts for approximately 360 watts of power with full or partial sun.

Examples of power requirements related to this system

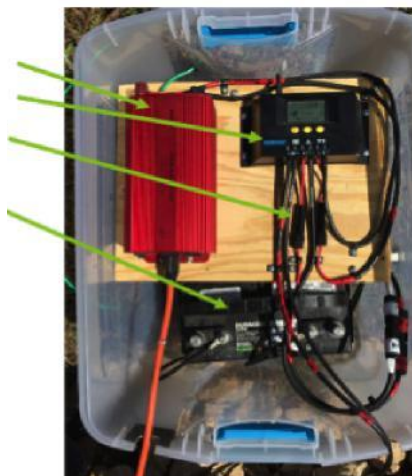
Electronics	Watts	Amp hours	Total Battery
Computer	40 to 120	3.3 to 10	56 Amp Hours
Printer	30 to 50 (3 to 5)*	2.5 to 4.2	
Cell Phone Charger	2 to 6	0.2 to 0.5	
Power Drill Battery Charger	220	18.3	
LED Work Light	20 to 40	1.6 to 3.3	

- 3 to 5 watts on standby mode
- 56 Amp hours based on 12 volt marine deep cycle battery purchased for this system.
- 200 Watt systems powers 3 laptop computers, a printer, charged cell phones, and recharged a power drill battery
- Also Powered small air compressor



### Basic Components

- 1,000 Watt Inverter
- 30 Amp Charge Controller
- Cables, Connectors & Fuses
- Marine Deep Cycle 12 Volt Battery
- Solar Panels
- Miscellaneous: plastic case, grounding rods, extra wire



## 10-12. Kemmerer Water Sampler

**Manufacturer:** WILDCO

**Model:** 1204 and 1510

**Quantity Available:** Willowbrook: 2

**Description:** Portable water sampler with messenger weight.

**SPECIAL NOTE:** Samplers with blue seals may leach phosphorus and mercury and are not recommended for chemical sampling. Requires Rinsate Samples prior to use.







### 10-13. Ultra-Violet Light

**Type:** 395 mm 12 LED Bulbs

**Model:** UV Sight

**Quantity Available:** Willowbrook: 1

**Description:** Locates stains. Requires 3 AAA batteries.

**NOTES:** Eye protection recommended; Do not use for prolonged periods of time, turn off if overheated.



### 10-14. GNSS Receiver

**Manufacturer:**

EOS Positioning Systems

**Model:**

Arrow 100 GNSS Receiver

**Quantity Available:**

Willowbrook: 7

Ann Arbor: 1

Westlake: 1

#### Description:

The Arrow 100 is a Submeter GNSS (Global Navigation Satellite System) receiver for use with a variety of mobile devices, including a smartphone, tablet, or notebook computer. The unit can achieve up to 60cm real-time accuracy, under ideal conditions.

**Note:** This unit is not intended for Survey Grade measurements. (See APPENDIX B)



**UPDATE PHOTO**

## 10-15. Grade Laser Kit

**Manufacturer:**

Leica Geosystems

**Model:**

Rugby 880 Dual Grade Laser

**Quantity Available:**

Willowbrook: 1

**Description:**

The Rugby 880 is a dual grade laser, that provides continuous high laser accuracy for precision grading and excavation depth confirmation. This unit is capable of tilting  $\pm 10\%$  in a single axis, and  $\pm 3\%$  in both axes, along with vertical & horizontal self-leveling (within  $\pm 6$  degrees).

Provides an accuracy of  $\pm 1/16$ -inch at 100 feet, and a max operating range of up to 4,200 feet.

## **11. Miscellaneous Non-Removal Equipment**

**This section presents descriptions of the following warehouse equipment:**

- 11-1. Torpedo heater**
- 11-2. Air compressor**
- 11-3. Power Washer-Hot Water**
- 11-4. Overpack Drum**
- 11-5. Hand Augers**
- 11-6. Utility Light on Tripod**
- 11-7. Mixing Bowls**
- 11-8. Hip Waders**
- 11-9. Duffel Bags**
- 11-10. Groundwater Sampling Pump - Grundfos**
- 11-11. Groundwater Sampling Pump - Keck**
- 11-12. Sediment Hand Corer - 20"**
- 11-13. Sediment Sampling, Clam-Shell Type**
  - a. Dredge Sampler – Petite**
  - b. Bottom Grab Sampler - 9" Ekman**
- 11-14. Binoculars**
- 11-15. Digital Camera**
- 11-16. Ice Auger**
- 11-17. Slam Bar**

**(Continued on next page)**

## **11. Miscellaneous Non-Removal Equipment (Continued)**

- 11-18. Post Hole Digger**
- 11-19. Steel Ramps**
- 11-20. Air Circulator**
- 11-21. Steel Well Sounding Tape Measure**
- 11-22. Measuring Wheel Feet**
- 11-23. Sieves**
- 11-24. Coolers, Sample/Food**
- 11-25. Ladders**
- 11-26. Folding Tables**
- 11-27. Bags, zip lock type**
- 11-28. Light Table, portable**
- 11-29. Tripod, Prism Pole**
- 11-30. Tripod, Engineering**
- 11-31. Engineering Stadia Rod**
- 11-32. Hand Tools**
- 11-33. Flagging Tape**
- 11-34. Floor Mat**





### 11-1. Torpedo Heater

**Type:**

Kerosene fuel

**Manufacturer:**

Remington

**Model:**

100 Portable Forced Air  
Torpedo Heater

**Quantity Available:**

Willowbrook: 1

**Description:**

Portable torpedo heater with blower



### 11-2. Air Compressor

**Type:**

Gasoline Engine

**Manufacturer:**

Emglo

**Model:**

Air compressor

**Quantity Available:**

Willowbrook: 1

**Description:**

Air compressor



### 11-3. Pressure Washer

**Type:**

Hot Water Power Washer

**Manufacturer:**

Arrow

**Model:**

Hot Water Pressure washer

**Quantity Available:** Willowbrook: 1

**Description:**

Power washer can be fueled with gasoline, diesel, or kerosene, also has suction hose to dispense soap into pressure stream.



### 11-4. Overpack

**Manufacturer:**

Overpack

**Model:**

Overpack

**Quantity Available:**

Willowbrook: 1

**Description:**

Overpack drum with screw lid (plastic)

## 11-5. Hand Augers-Soil Sampling

**Manufacturer:**

Various

**Model:**

N/A

**Quantity Available:**

Willowbrook: 20 augers

Westlake: 2 hammer augers

**Description:**

Hand Augers for soil sampling down to 5 feet. Available in 1", 1.5", 2", 3" and 4" diameters.



## 11-6. Utility Light

**Manufacturer:**

(N/A)

**Model:**

N/A

**Quantity Available:** Willowbrook: 4

**Description:**

Two-head tripod mount Utility Light, 120 VAC. 1,000W (500Wx2) 83 Amp Rated for wet conditions.





### 11-7. Stainless Steel Mixing Bowls

**Manufacturer:**

Various

**Model:**

N/A

**Quantity Available:**

Willowbrook: 14 bowls  
various sizes

**Description:**

Stainless steel mixing bowls, various sizes, for soil and sediment compositing and mixing.



### 11-8. Hip wader

**Manufacturer:**

Varies

**Model:**

Hip wader

**Quantity Available:**

Willowbrook:

Quantities of this item will vary over time at this location.

**Description:**

Hip wader





## 11-9. Canvas Duffel Bags

**Manufacturer:** Various

**Model:** Various

**Quantity Available:** Willowbrook: Quantities of these items will vary over time at this location.

**Description:**

Canvas duffel bags, various sizes and colors.



## 11-10. Groundwater Sampling Pump

**Manufacturer:** Reel EZ (reel); Grundfos Redi Flo (pump); BMI converter (controller)

**Models:** Reel EZ, MP 1, BMI

**Quantity Available:** Willowbrook: 1

**Description:**

Portable pumping and sampling system for high and low flow sampling (pump; water-jacketed, variable speed submersible impeller type).

System is used for purging, sampling and water quality monitoring in wells as small as 2" ID. The reel is made from lightweight aluminum with has a built in cable guide and Happy Hose® (cable, tubing and safety cable bonded together). The reel is made to install at ground level or attached to vertical well casing. Power supply is required to output single phase 230 volts at 60 Hz and 10 amps; this power supply feeds the controller/

converter for the pump which converts to 3 phase 25 volts to 3 phase 220 volts at 46 to 400 Hz at 5.5 amps. Pump has 2 HP with thermal overload and is 1.81" in diameter; length is 11.3". Max depth 200, flow rates up to 9 gpm or less dependent on head and depth. Additional Equipment Required for Operation: Honda Generator EM3500.

## 11-11. Keck Pump

**Manufacturer:** Keck (reel); Grundfos Redi Flo (pump); BMI converter (controller)

**Model:** Keck (large collector w/center discharge and wheels), MP 1, BMI

**Quantity Available:** Willowbrook: 1 system

### Description:

Portable pumping and sampling system for high and low flow sampling (pump; water-jacketed, variable speed submersible impeller type).

System is used for purging, sampling and water quality monitoring in wells as small as 2" ID. The reel is made from lightweight aluminum with 2 hard rubber wheels for portability. Unit has center discharge and requires separate discharge tubing, power cable and safety cable. Power supply is required to output single phase 230 volts at 60 Hz and 10 amps; this power supply feeds the controller/converter for the pump which converts to 3 phase 25 volts to 3 phase 220

volts at 46 to 400 Hz at 5.5 amps. Pump has 2 HP with thermal overload and is 1.81" in diameter; length is 11.3". Max depth 200, flow rates up to 9 gpm or less dependent on head and depth.

Additional Equipment Required for Operation: Honda Generator EM3500







## 11-12. 20-inch Aquatic Sediment Hand Core Sampler

**Manufacturer:**

Wildco

**Model:**

20-inch Hand Core Sampler

**Quantity Available:**

Willowbrook: 4

**Description:**

Hand operated 20-inch stainless steel liner-type sediment sampler intended for shallow coring in fresh, salt or brackish waters. Includes stainless steel core tube threaded at both ends, two removable handles, screw pin clevis and automatic polyurethane flutter valve, 2 nosepieces, 2 clear CAB liner tubes with caps, and 3 eggshell catchers. Includes a 4 foot T-handle and Two additional 4' rod sections for a total extension of 12'

Operation: push it into bottom sediments using handles on the head assembly. After the corer penetrates the bottom, twist or pull it free to retrieve sample. The hand corer works by creating a partial vacuum which holds the sample in place and helps prevent washout. As the tube is pulled up, the polyurethane flutter valve on the head assembly tightly seals the upper end of the sampler. As long as the bottom end of the tube is 2-3" (50-75 cm) under water, the corers will hold.

## 11-13.a. Petite Sediment Sampling Dredge

**Manufacturer:** Ekman

**Model:**

6 inch

**Quantity Available:**

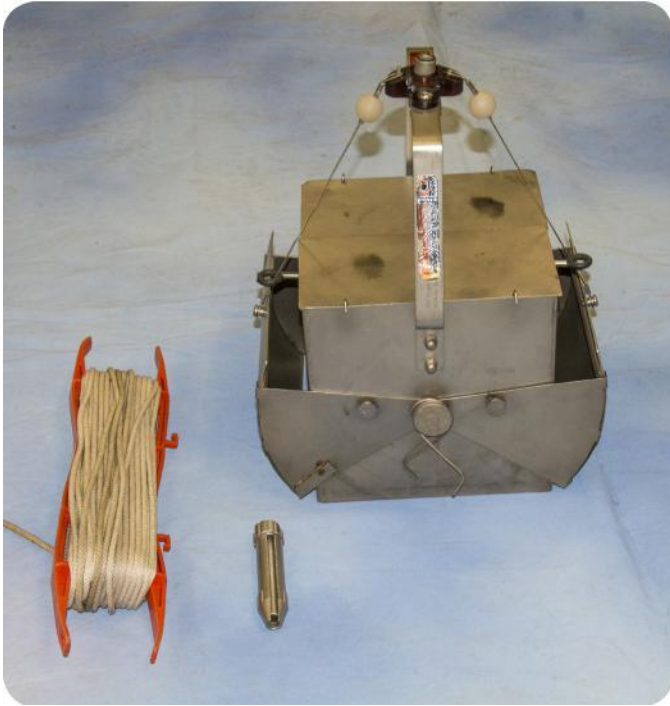
Willowbrook: Two 6-inch dredges

**Description:**

Petite dredge for sampling benthic communities inhabiting soft bottomed aquatic environments. Hinged upper doors swing open as dredge is lowered, allowing water to pass through and minimize shock wave. Stainless steel messenger closes dredge, preventing washout of sample. Cable release system, with bar grip, helps set dredge with greater safety. Dredge is constructed of stainless steel with special welding for added strength and durability. A case, line, and messenger are included.



### 11-13.b. 9" Sediment Sampling Dredge



**Manufacturer:** Wildco

**Model:**  
9" Ekman Dredge

**Quantity Available:** Willowbrook: 1  
**Description:**

Simple to use fresh and salt water sediment grab sampler designed for hard bottoms such as sand, gravel, consolidated marl or clay. It's a sturdy dredge deliberately made heavy for biting deep into the bottom and is good for invertebrate recovery. Self-closing scoops have center pivot closing action. A case, line, and messenger are included.

### 11-14 Binoculars

**Manufacturer:** Swift, Nikon, OpTex

**Model:**

Swift model 774 (7x15), Swift model 789 (7x50), Nikon model Action (10x50), OpTex model 104 (10x50)

**Quantity Available:**

Willowbrook: Two 7x15 power, one 7x50 power, two 10x50 power.



**Description:**

**Magnification Power** Binoculars are identified by 2 numbers. The first is magnification power, the second is the diameter of the front lenses, explained below.

Example: 7 x 15 binoculars have a magnification power of 7.

A magnification power of 7 means that an object will appear 7 times closer than it would to your unassisted eye. For example, if you view a deer that stands 200 yards away from you through 7x binoculars, it will appear as though it were 28.6 yards away (200 divided by 7).

Note: binoculars with magnification powers greater than 10 amplify the movements of your hands, making steady viewing difficult.

**Objective Lens Diameter** The second number used in binocular identification refers to the diameter (in millimeters) of the objective lenses (those farther from your eyes; those closer to the "object" being viewed).

Example: 7 x 15 binoculars have objective lenses measuring 15mm.

The diameter of the objective lenses largely determines how much light your binoculars can gather. If you have 2 binoculars with exactly the same specifications except for objective lens diameter, those with the larger diameter objective lenses will capture more light. More light means a brighter view, particularly in low-light conditions.



## 11-15. Digital Camera

**Manufacturer:** Canon

**Model:**

PowerShot SX260 HS (PC1742)

**Quantity Available:** Willowbrook: 6 cameras

Ann Arbor: 6 cameras

**Description:**

12 MegaPixel Digital Camera, CMOS Sensor, 20X Optical Zoom, GPS, HD Video



## 11-16. Ice Auger

**Quantity Available:** Willowbrook: 1

**Description:**

7" diameter and 16" Auger depth



## 11-17. Slam Bar

**Quantity Available:** Willowbrook: 4

**Description:**

2" and 3" diameter



### 11-18. Post Hole Digger

**Quantity Available:** Willowbrook: 4

**Description:**

Makes post holes.



### 11-19. Steel Ramps

**Quantity Available:** Willowbrook: 1

set **Description:**

One set steel ramps with expanded metal holes for traction. One side has small lip for easy access. 7' 6" long and is 3" thick.



### 11-20. Air Circulator

**Manufacturer:** Patton

**Model:** 1010 MP

**Quantity Available:** Willowbrook: 2

**Description:**

30" blade -2 speed fan. Support can be raised for increased height.

## 11-21. Steel Well Sounding Tape Measure

**Manufacturer:** Lufkin

**Model:** 100' Steel Tape in 1/10's of inch

**Quantity Available:**

Willowbrook: 5

**Description:**

Steel tape has brass weight on end of tape for sounding the bottom of monitoring wells. Length of brass weight must be corrected for measurements. Also used for measuring groundwater levels by rubbing a block of blue chalk on the first few feet of tape and calculate depth to where the chalk is wet (a darker blue color).



## 11-22. Measuring wheel-feet with case

**Manufacturer:** Rolatape

**Model:** N/A

**Quantity Available:** Willowbrook: 4

**Description:**

Distance measuring wheel in feet. Resettable counter.



## 11-23. Sieves

**Manufacturer:** Combustion Engineering

**Model:** U.S.A. Standard Testing Sieve

**Quantity Available:** Willowbrook: 1 each

**Description:**

Size References: A.S.T.M.E-11 Specification, Millimeter, inches and Tyler Equivalent

ASTNE-11 sizes available, 6, 7, 10, 18, 25, 45, 60, 120, 170, 230 and 325





### 11-24. Coolers for Samples/Food

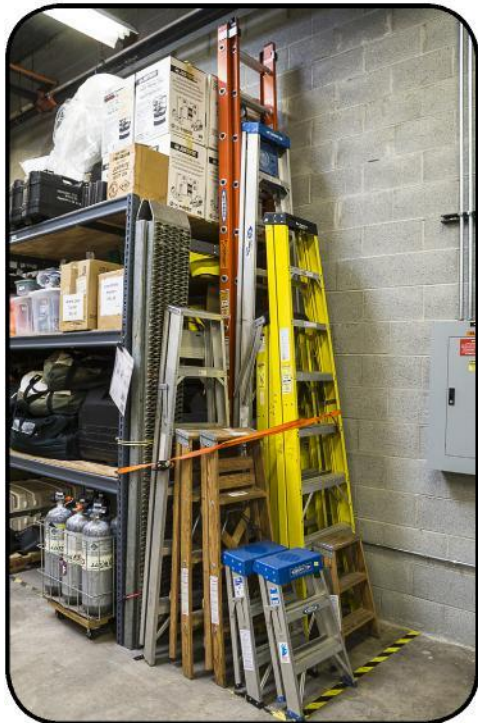
**Manufacturer:** Various

**Model:** Various

**Quantity Available:** Willowbrook: 6

**Description:**

Coolers available for food and non-food purposes.



### 11-25. Ladders, Portable

**Manufacturer:** Various

**Model:** Various

**Quantity Available:** Willowbrook: 8

**Description:**

Ladders, aluminum, wood, fiberglass, step-ladders, extension ladders.



### 11-26. Tables, folding

**Manufacturer:** Various

**Model:** Various

**Quantity Available:** Willowbrook: 6

**Description:**

Various folding tables.





### 11-27. Bags, zip lock type

**Manufacturer:** Various

**Model:** Various

**Quantity Available:** Willowbrook: Varies

**Description:**

14"x 24"; 12"x 15"; 12"x 12"; 10.5"x 11"; 9"x 12";  
8"x 10"; 5.5"x 8"; 4.5"x 14"

All bags are 4 mil in thickness



### 11-28. Light Table, portable, AC powered

**Manufacturer:** Gagne, Inc

**Model:** Porta-Trace

**Quantity Available:** Willowbrook: 1

**Description:**

18"x 11" AC powered light table, comes with its own travel case.



### 11-29. Tripod, prism pole

**Manufacturer:** Tru Point Products

**Model:** N/A

**Quantity Available:** Willowbrook: 4

**Description:**

Used for holding round survey poles, etc. up to 1 3/8" diameter poles.

Note: center pole not part of issued unit.



### 11-30. Tripod, engineering

**Manufacturer:** Lietz

**Model:** N/A

**Quantity Available:** Willowbrook: 1

**Description:**

Used for holding survey instruments.



### 11-31. Stadia Rod, Engineering

**Manufacturer:**

**Model:**

**Quantity Available:** Willowbrook: 1

**Description:**

Fiberglass, 35 feet in tenths, comes with fabric cover.



### 11-32. Hand Tools, various

**Manufacturer:** Various

**Model:** Various

**Quantity Available:** Willowbrook: Varies

**Description:**

Various handheld tools.



### 11-33. Flagging Tape

**Manufacturer:** N/A

**Model:** N/A

**Quantity Available:** Willowbrook: Various rolls

**Description:**

Plastic, 1"width, assorted color, flagging tapes.



### 11-34. Floor Mat, Black

**Manufacturer:** N/A

**Model:** N/A

**Quantity Available:** Willowbrook: 1

**Description:**

Black floor mat, approx. 3'x4'. Water bottle for Scale.

## **APPENDICES**

### **IN-HOUSE FIELD SERVICES**

<b>APPENDIX A.</b>	<b>DIRECT PUSH (GEOPROBE)</b>
<b>APPENDIX B.</b>	<b>TOTAL STATION SURVEY</b>
<b>APPENDIX C.</b>	<b>SAMPLING &amp; SURVEY BOATS</b>
<b>APPENDIX D.</b>	<b>GEOPHYSICAL SURVEYS</b>
<b>APPENDIX E.</b>	<b>RADIATION HEALTH PHYSICIST</b>
<b>APPENDIX F.</b>	<b>DATA ACQUISITION (VIPER)</b>
<b>APPENDIX G.</b>	<b>PNEUMATIC SLUG TEST</b>

### **PROTECTIVE CLOTHING PERMEATION DATA**

<b>APPENDIX I.</b>	<b>ASTM F1001 CHART</b>
<b>APPENDIX II.</b>	<b>PROTECTIVE SUITS &amp; GLOVES</b>



# Appendix A

## FIELD SERVICES SECTION

### Direct Push Sampling System - GeoProbe® 540B



## Region 5 Superfund Division

### Access to Services:

**Jim Ursic: 312.353.1526**

**[Ursic.James@epa.gov](mailto:Ursic.James@epa.gov)**



## **BACKGROUND**

The USEPA, Region 5 Superfund Division owns, maintains and deploys a GeoProbe® 540B direct push sampling unit mounted on a CASE® 1840 skid steer for mobility. The unit provides a means to sample soil, ground water, and soil gas at Superfund sites. In addition, this equipment is used to install piezometers (small wells), drill through concrete to access soil/water beneath and obtain sub-surface resistivity measurements to detect shallow contaminate plumes. This system was purchased on November 5, 1998. However, EPA did own a less powerful unit prior to this system.



Collecting Ground Water Samples Using GeoProbe® 540B

The unit has a compact size for accessing entrance areas as small as 4'8" wide and 6'4" high and once deployed at a sampling location requires an operating height of 10'. The front articulating probing hammer allows operations on steep grades or to reach elevated areas. The system is transported on a FSS owned flatbed trailer towed by a FSS support vehicle which has built-in compartments to transport and store tooling and supplies for the probe. Two trained and experienced FSS staff members operated the unit until 2007 when one operator left the Section leaving Jim Ursic as the only operator. If needed, the operator has access to experienced USEPA contractor assistants familiar with the GeoProbe® (not as operators) and all have backgrounds in chemistry who aid in sample collection.

An additional benefit of this particular equipment configuration is the probing hammer unit (white assembly seen in Figure 1) can be disconnected in about 10 minutes allowing the unit to be used as a conventional Skid Steer. The only additional Skid Steer equipment FSS has purchased is an adjustable pallet fork. This configuration is used in our Willowbrook warehouse to move large pallets and to load and unload pallets from trucks. The main GeoProbe® tool assembly can be reconnected and tested in about 20 minutes using several built-in quick connect hydraulic lines.



Soil Samples Ready for Analysis

This equipment supports the entire Region 5 Superfund program and has been used primarily as: 1) an initial sampling reconnaissance tool or 2) supplementing major site investigation processes when additional sampling is desired to augment previous sampling efforts. This system has a typical depth of investigation to about 30' below ground surface, but under optimal conditions could reach 45'.

### Soil Sampling

This unit can sample soil using several accepted methods which include:

- a) Dual Tube (DT22) Sampling which allows collection of soil in clear plastic liners. Collection can either be depth specific or continuously.
- b) Macro Core (MC5) Sampling which collects soil in greater quantities in clear plastic liners and can also be applied to specific depths or continuously.

### Ground Water Sampling

There are three methods to sample ground water, one vacuum type, one impeller and two low flow methods through probe rods or wells.

- a) The vacuum system uses a Cole Parmer peristaltic pump which is subject to limited depths of sampling.
- b) A Grundfos Pump operates on a mechanical impeller method generally used for purging wells.
- c) One low flow method is a mechanical bladder pump with an electric actuator.
- d) The other low flow method is a Geocontrol Pro air operated bladder pump.

### Temporary Access to Specific Depths for Ground Water Sampling

There are two methods to access ground water at specific depth intervals

- a) A mill slot tube 3' long, having a 2.125" I.D. with 42 slots 1.5" long and 0.020" wide slots (0.5 mm or 20 slot). This tube is pushed to the desired depth and is then ready for sampling.
- b) Single Point 16 (SP 16) ground water sampling unit is pushed to desired depth and an expendable probe point is removed and the rod string is pulled up 5 feet, allowing a stainless steel screen to deploy for sampling. When sampling is complete the rod string is removed from the hole, reset with a new expendable probe point ready for the next sampling depth. The opening for sampling is 0.5"

### Pre-packed Screen Monitoring Wells or Pizometers

There are two options for installing pre-packed monitoring wells.

- a) I.D. of 0.75" with an O.D. of 1.4" and schedule 40 PVC, 0.010" slots, 0.125 spacing, 20/40 mesh sand. Total length 3' and can be stacked.
- b) I.D. of 0.5" with O.D. of 1.4" and schedule 80 PVC, 0.010" slots, 0.125 spacing, 20/40 mesh sand. Total length 3' and can be stacked.



### **Soil Vapor Implants & Post Run Tubing (PRT) System**

Two methods are available for sampling soil vapor. One is used for temporary gas sampling while the other uses an expendable screen attached to tubing.

- a) The PRT system is driven to the desired depth and an expendable probe tip is removed down hole, the probe string is pulled back several inches and the gas is sampled through a tube attached to the bottom of the string
- b) Implants are designed to remain in the ground at a desired depth with tubing attached that reaches the surface. When sampling is complete the tubing is pulled out or cut while the screened implant remains in the ground with the expendable probe tip. The screen has 0.25" I.D, 6" long with 0.15 mm pore openings.

### **Direct Sensing Electrical Conductivity**

This system is used for determining geology of the ground or best used for determining depths of certain contaminate plumes. The unit measures changes in the electrical properties in the ground using Wenner array to detect changes in ground conductivity. Changes can be due to changes in stratigraphy or contaminants having much higher or lower electrical properties than the host materials. The measurements are recorded on a computer as the probe string is pushed into the ground.

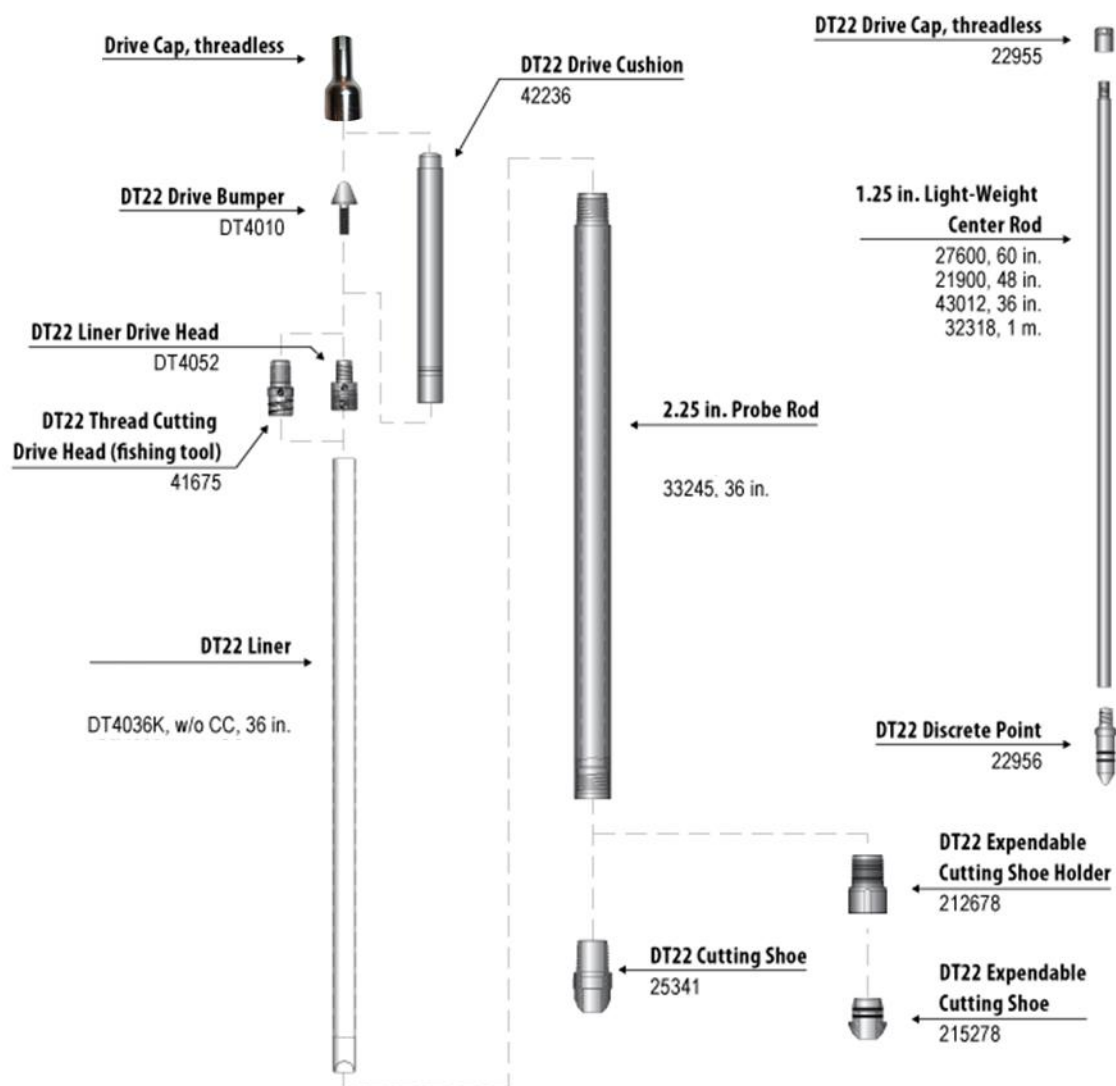
### **Concrete Breakers and Coring Systems**

There are two options for going through concrete floors/roadways.

- a) A carbide drill bit can be used to drill a hole in concrete, but will not penetrate metal rebar. The diameter is 3.5"
- b) A diamond tipped concrete coring bit is used to remove concrete and any metal rebar. The diameter is 5".

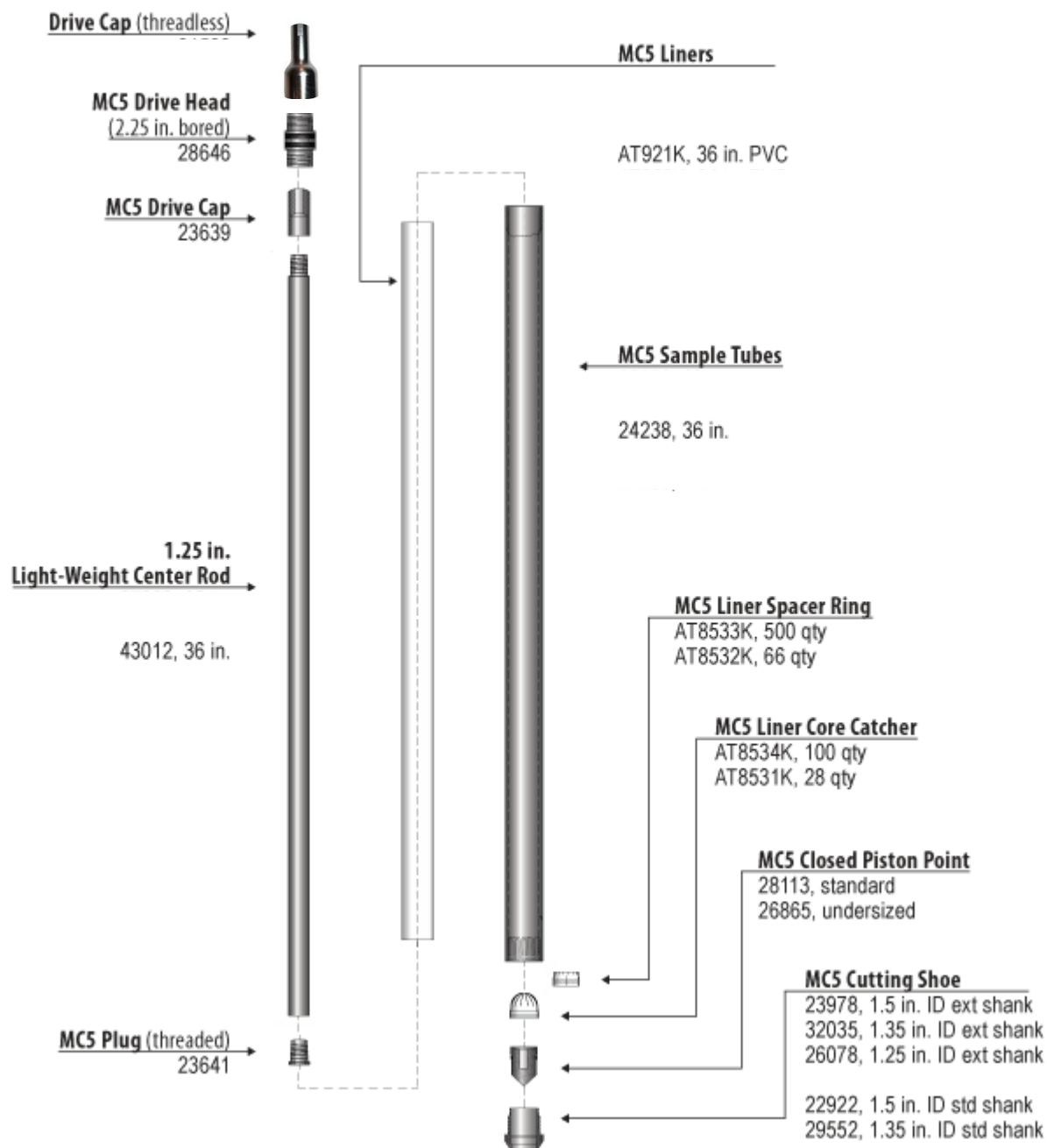
# Dual Tube 22 Soil Sampling System

Figure 1



## Macro Core (MC5) Soil Sampling System

Figure 2







Peristaltic Pump



Grundfos Pump



Mechanical Bladder Pump



Air – Water Lines for  
Bladder Pump



Air Activated Bladder  
Pump



Flow Through Cell

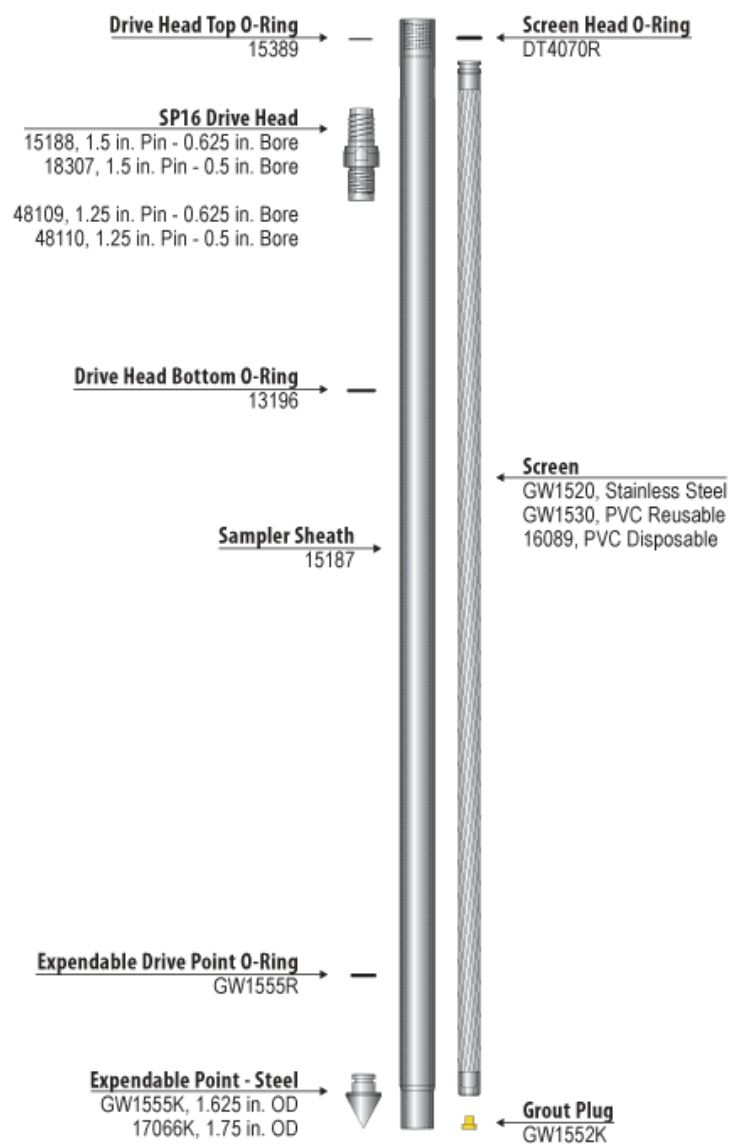


Mill Slot Probe Rod for GW Sampling

Figure 4

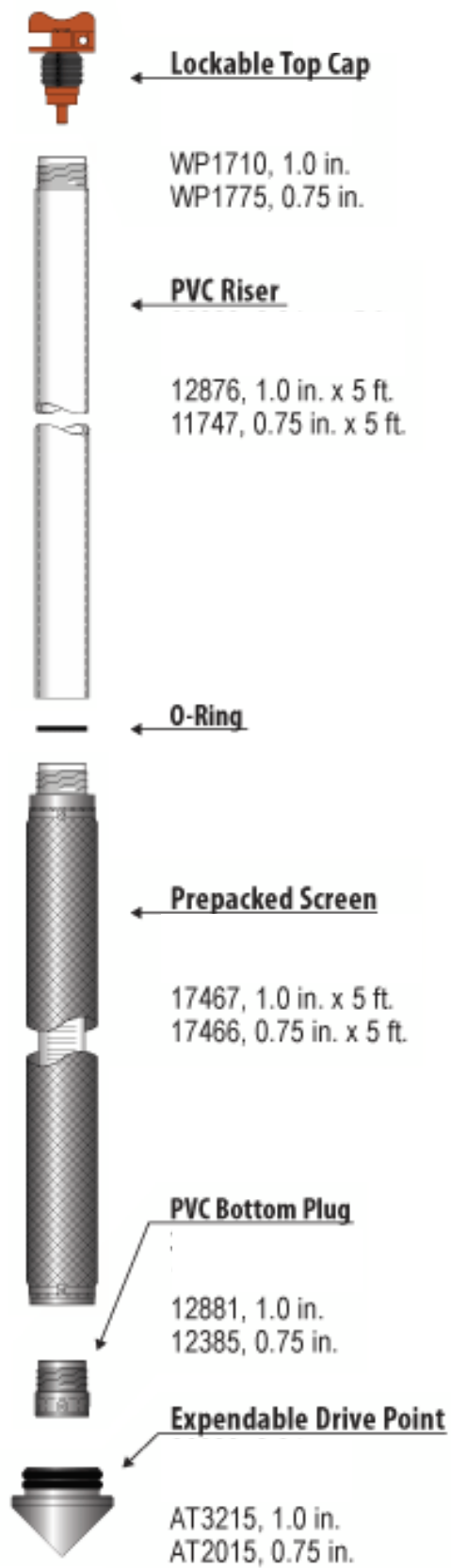
## Screen Point 16 Ground Water Sampler

Figure 5



# Pre-Packed Well Screen

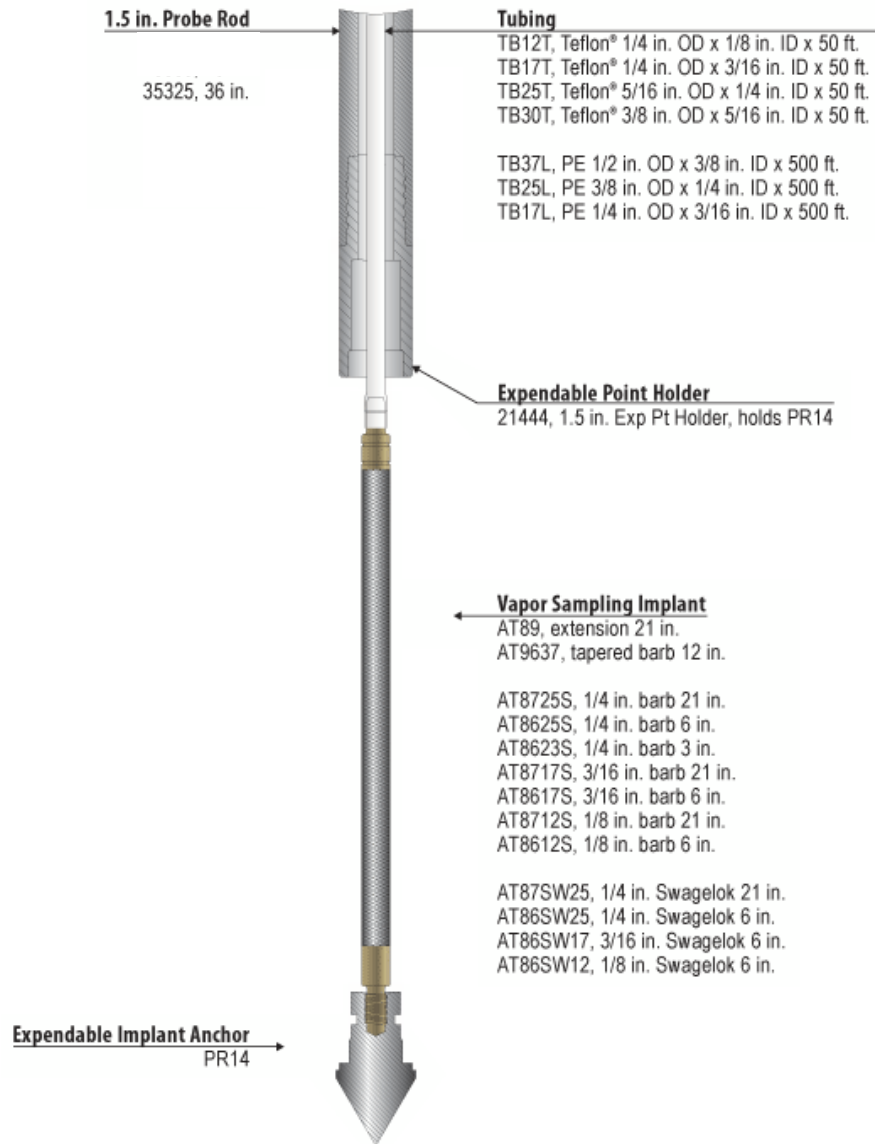
Figure 6





# Soil Vapor Implants

Figure 7



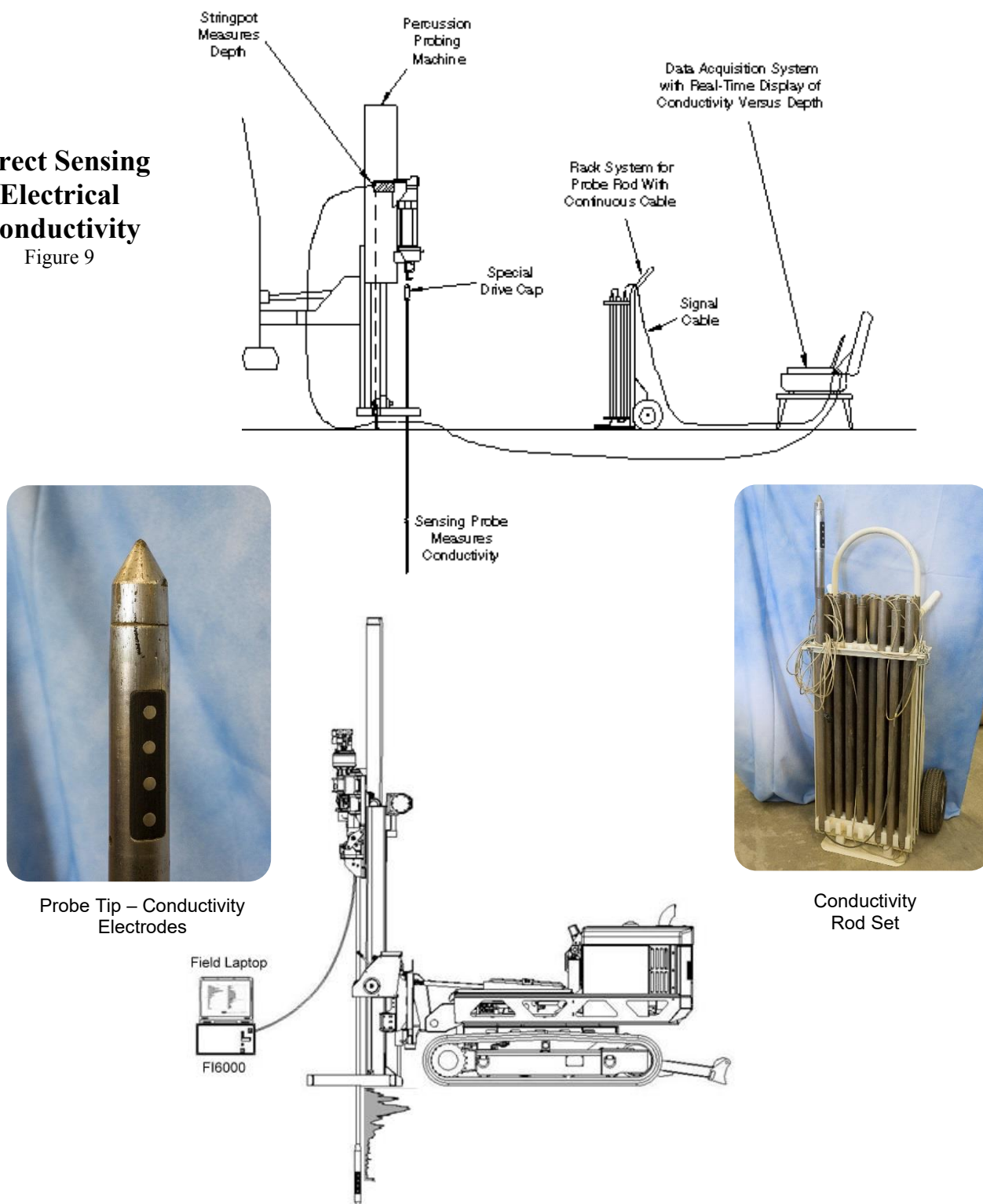
## Soil Vapor Implants

Figure 8



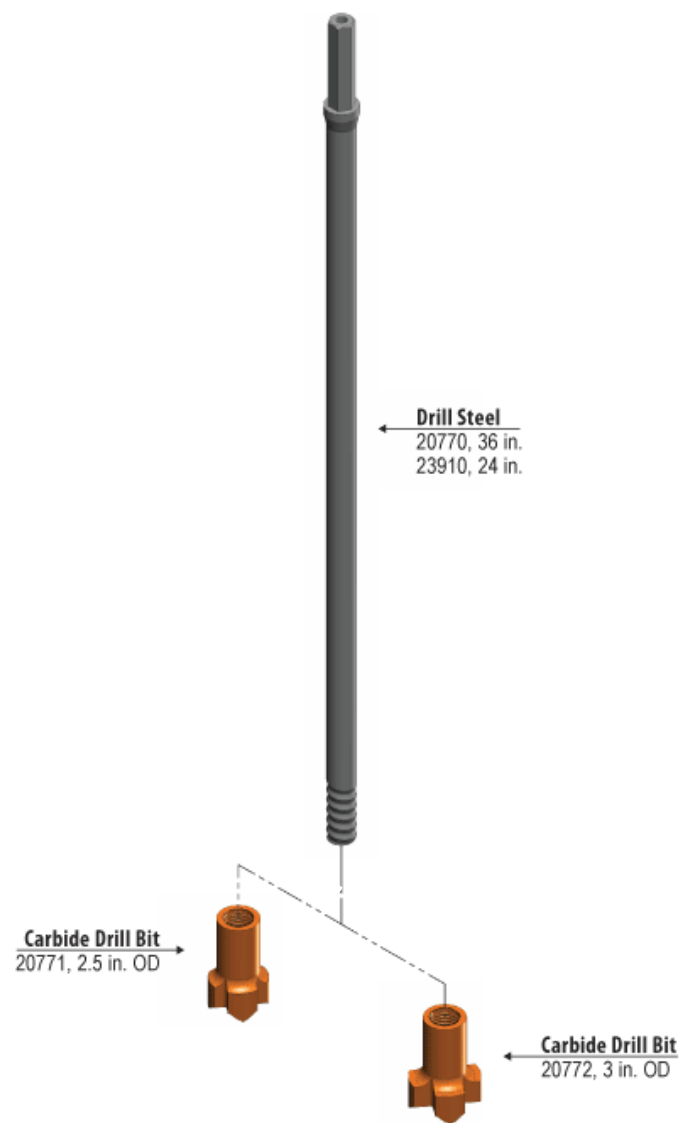
## Direct Sensing Electrical Conductivity

Figure 9



## Carbide Drill Bit

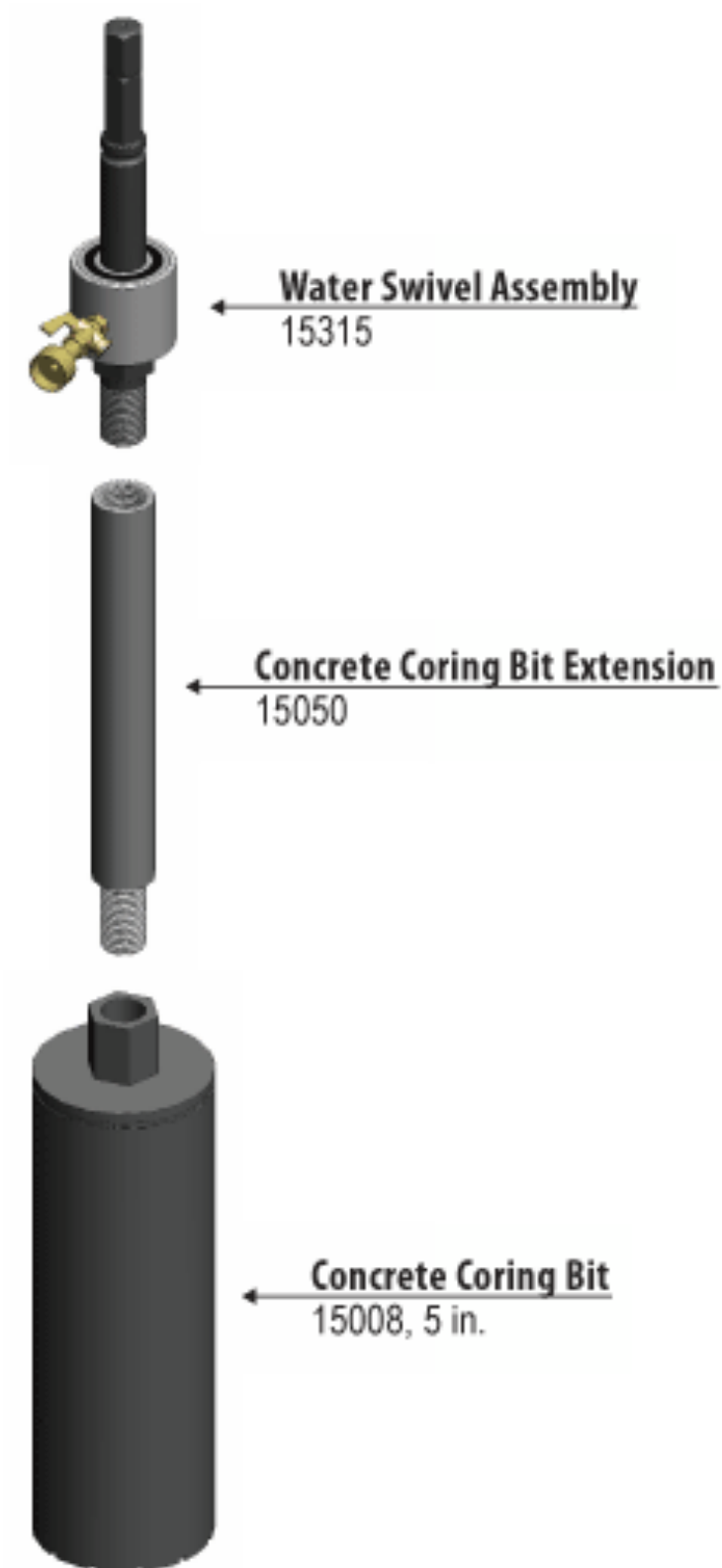
Figure 10





## Diamond Drill Coring Bit

Figure 11



Concrete Coring Bit  
8" Concrete Foundation Core  
12 minutes to Cut

# APPENDIX B

## Total Station Survey Services



To access these services contact:

Brian Cooper: 312-353-8651

[cooper.brian@epa.gov](mailto:cooper.brian@epa.gov)

The Leica Complete Total Station is an electronic/optical instrument used for highly accurate surveying (X, Y, and Z or northing, easting and elevation).

The Leica Complete Total Station consists of an RTK GPS receiver, with 1 cm accuracy, and an optical total station (survey transit). The RTK GPS provides extremely accurate X-Y coordinates plus true elevation to centimeter accuracy. When paired with the optical total station, surveys can be performed on almost any terrain, including areas with considerable vegetation, which is a major limitation with other GPS technology. The total station is laser guided and locks onto the stadia rod reflector allowing for rapid data collection and less field time. Another time-saving feature is that the base corrections for RTK GPS come from a network of base stations provided by each state's transportation agencies (at no cost). The GPS corrections are transmitted via internet connection to the Leica computer. Although this requires a mobile internet connection (MiFi) to transfer the data from the base network, set-up and survey time are considerably reduced.

With the Leica system, EPA has the ability to obtain very accurate coordinates which are often critical for both assessment sampling and removal operations. Elevation surveys (contouring on a map) assist in understanding the dynamics of a contaminant on a site and often can be used to reduce or eliminate certain areas from an AOC. Highly accurate sample locations are often needed to accurately determine remediation footprints and subsequent removal boundaries. RTK GPS has also been useful to accurately determine water levels for bathymetric surveys and groundwater flow. Below is a list of survey objectives during 2012 and 2013.

#### Survey objectives in FY2012-2013:

Collect sample locations with 1 cm accuracy

Survey wells to model groundwater flow

Survey for elevation contouring

Establish local benchmarks

Map removal areas and staging areas.

Assess removal construction accuracy

Sediment movement post-construction

One of the benefits of this tool when used by the FIELDS program is that FIELDS uses the tool to provide in-depth analyses that contractor services would not offer, or would need to be contracted out to multiple sources. The following is one small example using the Portage Creek Site.

At Portage Creek, FIELDS used the total station to produce highly accurate maps of removal footprints and provide in-field setup of removal grids. The elevation model that was produced was also used by the backhoe rig operator during the removal to determine the correct depth to excavate each grid cell. Post-removal surveys assessed the quality of the excavation and will later measure the extent of post-construction sediment movement over time. This process will be completed in ten different areas over the course of the project. Additionally, surveys and mapping of potential staging areas have been useful in the efficient placement of staging



equipment. Three images produced from this survey and data analysis work are presented below.

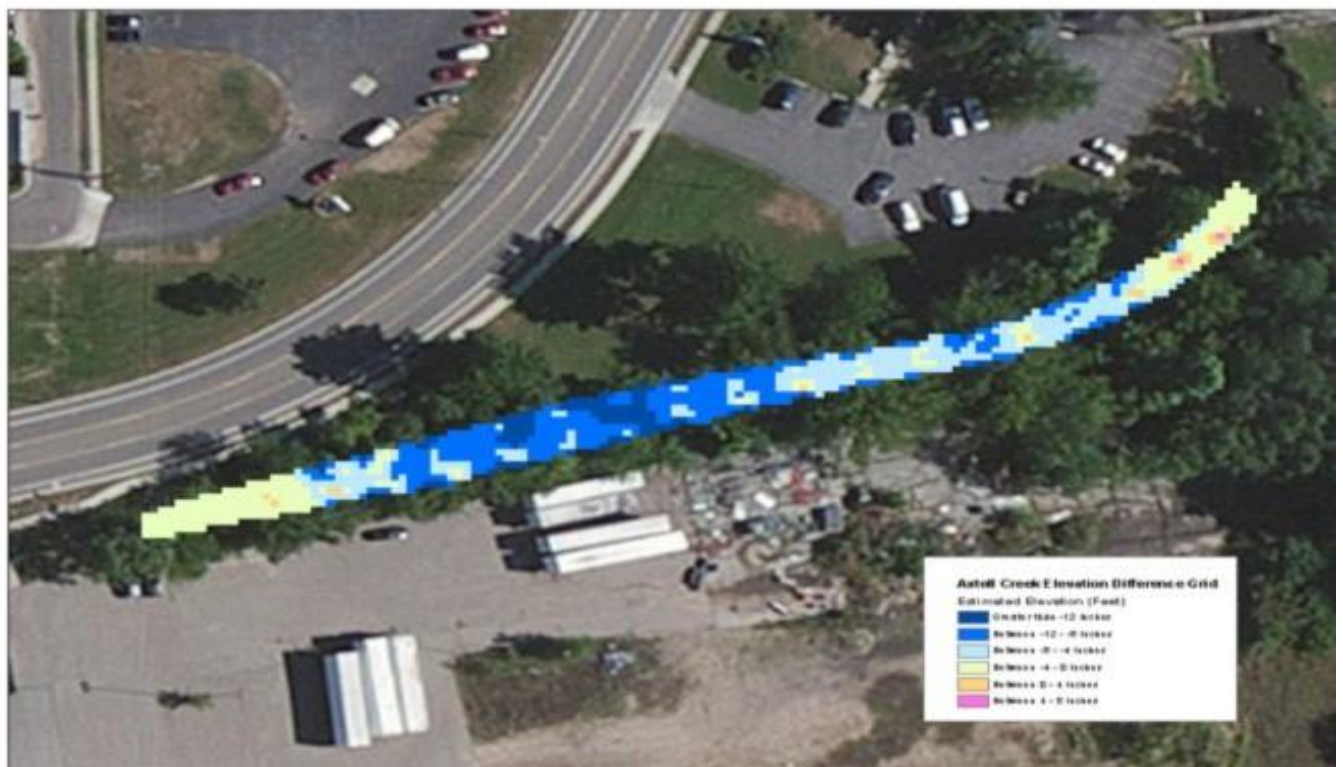


Pre-removal x, y, and z elevation points and contours



Post-removal x, y, and z elevation points and contours





Difference between pre- and post-removal

# APPENDIX C

## Sampling and Survey Boats



### **To access these services contact:**

Chuck Roth: 312-886-0242

John Canar: 312-886-6182, or

Brian Cooper: 312-353-8651

The USEPA, Region 5 Superfund Division owns, and the FSS FIELDS Program maintains and uses, boats for sediment sampling (cores and ponars) and for bathymetric and sub-bottom surveys. There are currently three Superfund Division staff who are trained, experienced and competent in the operation of this boat: John Canar, Brian Cooper and Charles Roth.

The boats (shown below) currently used consist of two small boats connected together and is referred to as the “twin jon boats” or “the little dog”. This boat unit is equipped with a 10 hp engine and can be used individually or in tandem as a pontoon boat. The boat is assembled on-site so that it can be used on small water bodies where larger, trailer transported boats would be difficult to use. It is rigged with an A-frame for core sampling, with power supplied by batteries or a small portable generator. It has a six-inch draft and is best suited for work on small bodies of water (ex, streams, rivers, small lakes).



# APPENDIX D

## Environmental Geophysical Methods

D – 1.0 Surface Applications

D – 2.0 Borehole Applications



To access these services contact:

Jim Ursic: 312-353-1526

[ursic.james@epa.gov](mailto:ursic.james@epa.gov)



## BACKGROUND

The USEPA, Region 5 Superfund Division owns maintains and deploys several environmental geophysical methods. These methods include surface and borehole geophysical applications. These methods support the Remedial and Removal Branches in the Superfund Division.

Surface methods are used to locate buried objects, such as tanks, piping, foundations, edges of landfills, and dump sites. It is also used to locate plumes and define geology.

Borehole geophysical methods are used to evaluate physical conditions within existing wells, help drillers properly locate well screen intervals, measure lateral and horizontal flow within well, measure fluid parameters and determine geologic conditions near the well. Our logging platform is a Chevy Suburban that has on-board generator, printer, controlling software and cable to reach depths of 1,800 feet. Tools are also available to sample water at these extreme depths through probes equipped with empty cylinders that can be filled by activating an automated valve to capture and seal the sample.

The operators of this equipment prefer to use several different, but relevant, methods when evaluating problems. This provides another level of data to confirm any anomalies that may be found.

Geophysical activities within the section have been ongoing since 1987. All equipment is stored and maintained at our Willowbrook warehouse.

## Surface Geophysical Methods

### Gradient Magnetometer

The cesium vapor proton precession magnetometer is shown below being carried by the operator although it can be mounted on an All-Terrain-Vehicle for larger sites. It is often the first instrument deployed when looking for ferrous objects. It is deployed in a dual sensor configuration (two white canisters in photo below) known as a gradient mode since this reduces unwanted background interference. Its sensing depth limitation is based on the amount of mass present so the greater the ferrous mass the deeper it can be detected.



Gradient Magnetometer Hand Carried



Gradient Magnetometer Mounted on ATV.

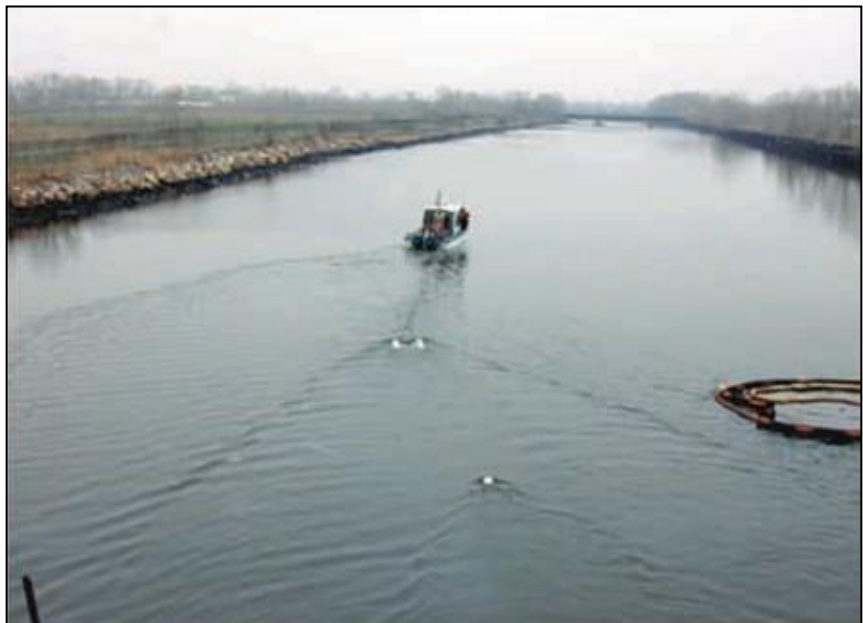
## Marine Applications of Magnetics

Region 5 Does Not Own Marine Tools – But Has Access to Instruments



Man Holding Marine Magnetometer Prior to Deployment.

Calumet Channel Gary, IN.  
USCG Towing Marine  
Seismic Tool (closest  
to boat) and Marine  
Magnetometer to Locate  
Pipelines Crossing  
Channel.



## D-1.0 Surface Geophysical Methods

### Electromagnetics

There are two categories of electromagnetic instruments, time domain and frequency domain. It is important to note that although these instruments are used to find anomalies below ground, they are not shielded from metal objects above the tools, such as power lines.

#### Frequency Domain Electromagnetics

These instruments include the EM31, EM34, EM38 and GEM2. These instruments measure terrain conductivity, in-phase response, and magnetic susceptibility of rock, soil, fill, pore fluids and metal. There are additional differences between the EM38, EM31 and EM34 and is based on how their geometries are applied. Each of the EM38, 31 & 34 instruments have differing coil spacing which determines the depth of investigation, generally the depth, in optimum conditions, will be approximately one and one half times the coil spacing.

The one exception to this rule is the GEM2 instrument which have digital processors to enable the operator to program specific frequencies (EM38, 31 & 34 have fixed frequencies) to approximate the desired depths of investigation. Up to six frequencies can be collected at one time. One drawback to this system is that data is collected so fast, it is futile to have a digital readout. This instrument is extremely sensitive to any metal worn by the operator and every effort should be made to reduce the amount of metal on the operator.

#### Time Domain Electromagnetics

The EM61 is a time domain instrument and is also known as a high sensitivity metal detector. The increased sensitivity of this instrument limits how far the tool can transmit and receive information, which is about 15' below the ground surface. One advantage of the tool is that its signal is fairly limited to the extent of the 1 meter by ½ meter antenna. Unlike the magnetometer, which responds to a wide area around an anomaly, the EM61 can easily define the limits of a tank, for example.



EM61: Operator pushing antennas and wearing a backpack with electronics and battery. Data are collected by a data logger mounted on handle bars.



EM34: Orange and white round antennas in shipping case. Options for cables, 10M, 20M and 40M in length allow for shallow and deeper exploration.



EM38: Instrument has one-meter coil spacing for near surface investigations.





**Gem2:**

Commonly known as the ski, operator is surveying a parking lot in search of buried Tanks.



**EM61:**

Being towed on Torch Lake in shallow waters to locate metal flasks that may contain Mercury. Note GPS over antennas & rubber raft To isolate tool from nearby metal towing craft.

## Surface Geophysical Methods

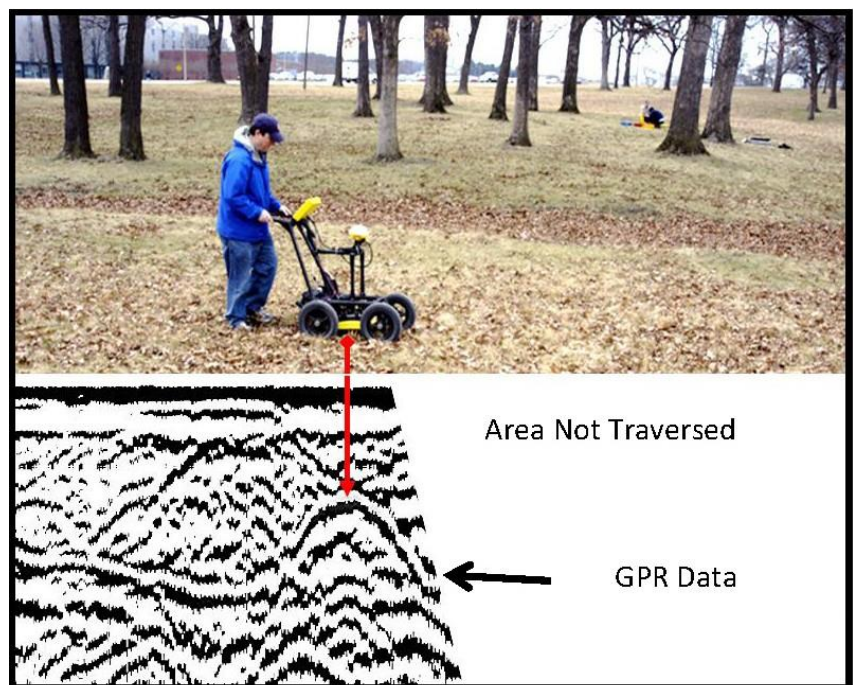
### Ground Penetrating Radar

Ground penetrating Radar or GPR provides the best resolution of the near subsurface. It is capable of detecting the shape of rounded objects near-surface, such as tanks. When properly calibrated for the soil conditions, it can be used to calculate the depth of a target.

Unlike other geophysical methods the data from the system is immediately plotted on a display as data are collected so the operator has an idea where targets exist as they move over the ground. GPR is very limited in its operating conditions; it works best in dry sand.

Wet or moist ground such as wet sand and clay tend to absorb and scatter the transmitted pulses. This can be overcome, somewhat, by lowering the frequency of the antenna, but doing so also reduces the resolution of the data. So, a general rule of thumb, high frequencies offer the best resolution of small objects, while low frequencies can penetrate deeper - but loose resolution of small objects and only detecting larger objects.

The GPR can generally detect thicker layers of petroleum based contaminants near surface provided it has not volatilized in the ground.



GPR pushed along to collect data. Black and white lines underneath the unit show data. The red arrow is pointing to the top of a hyperbola which is generally the signature of a buried tank.





GPR antennas can take many forms. To the left is a GPR unit with separate transmitter and receiver. In order to obtain good GPR records using this system, it is moved only several inches at a time.



GPR configured to be towed by ATV for large sites.

## D-2.0 Borehole Geophysical Methods

Borehole geophysical tools provide information about conditions in and around the well bore whether it is the fluids in the well, pore fluids outside the bore, stratigraphy, water movement and casing/well bore condition.

Parameters measured can either be combined into one tool or isolated into one tool. Depending on the parameters being measured, operators must know the well bore conditions, for example: some tools will not work in cased wells, where some are able to detect outside plastic casing. Other tools require the well bore must be full of a fluid.

Generally, more complicated tools have larger diameters and require inside well diameters of 3 inches or more. Since environmental monitoring wells are usually 2 inches in diameter, this is a concern.

One of the primary uses of borehole geophysics is to locate the proper location for placing well screens. Therefore, proper application would be to log wells just after they have been drilled and before well casing is set.

Region 5 does not own any tools that require a radioactive source due to licensing issues and liability issues if a tool is lost in a hole.

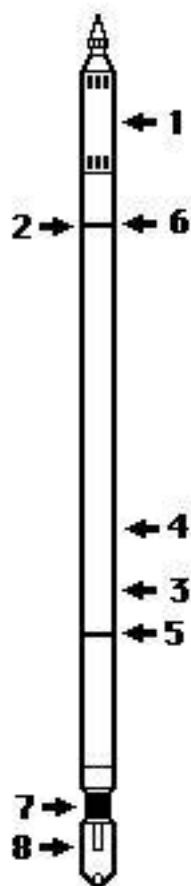
### Background Information 9041 Tool

The 9041 tool is a multi-parameter resistivity tool primarily used for water well logging and monitoring wells.

The tool records nine different parameters simultaneously in one pass of the borehole.

The nine parameters are the following:

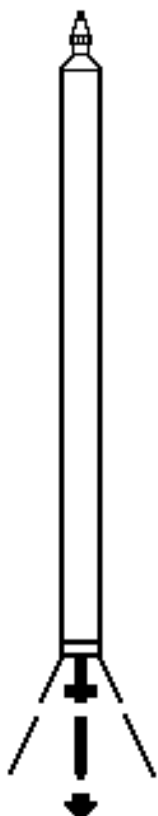
natural gamma, spontaneous potential, single point resistance, 16 in. normal resistivity, 64 in. normal resistivity, 48 in. lateral resistivity, fluid resistivity, temperature, and differential temperature.



Features		Features Properties Measured (see diagram)
Properties Measured (see diagram)		
1. Fluid Resistivity: Offset: 17.0 cm (6.7 in.)  2. Natural Gamma: 2.5 x 10.1 cm (1.0 x 4.0 in.) NAI Scintillation Offset: 137.2 cm (54 in.) Normal Resistivity: 2. 64 in. Normal: Offset: 118.11 cm (46.5 in.)  3. 16 in. Normal: Offset: 179.07 cm (70.5 in.)	5. Lateral Resistivity 48 in. Offset: 179.07 cm (70.5 in.)  6. Spontaneous Potential: +/- 0.1 mv resolution Offset: 36.6 cm (14.4 in.)  7. Single Point Resistance: +/- 0.1 ohm resolution Offset: 207.3 cm (81.6 in.)  8. Temperature/Delta Temperature: 0.004 C (0.007 F) resolution Offset: 210.3 cm (82.8 in.)	Tool Specifications Length: 213 cm (84 in.)  Temperature: 50 C (122 F)  Diameter: 64 mm (2.5 in.)  Pressure: 232 kg/cm2 (3300 PSI)  Weight: 15 kg (33 lbs.)  Logging Speed: 9 m/min. (30 ft./min.)  Tool Voltage Required: 50 VDC

### Background Information on 9605 Tool

The 9065 Three Arm Caliper logging tool, is a three--arm caliper configuration used to measure the diameter of the borehole. They can be used in both open and cased holes.



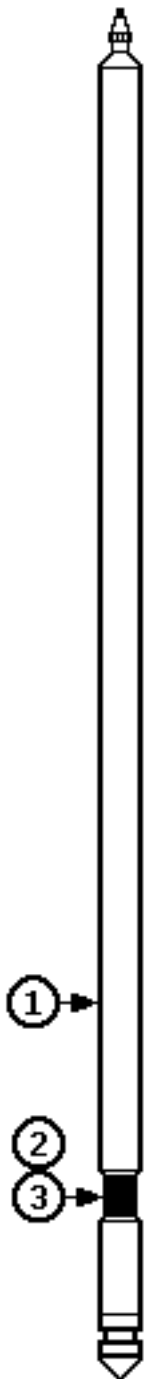
Features	
Properties Measured (see diagram)	Tool Specifications
<p>1. Three Arm Caliper: Short-- or Long-- arm configuration, motor operated</p> <p>Sensor Offset:</p> <p>Short--arm: 156 cm (61.5 in.)</p> <p>Long--arm: 195.4 cm (76.9 in.)</p>	<p>Tool Length:</p> <p>With Short--arms: 178 cm (64 in.)</p> <p>With Long--arms: 203 cm (80 in.)</p> <p>Temperature: 70 C (158 F)</p> <p>Diameter: 43 mm (1.7 in.)</p> <p>Pressure: 281 kg/cm<sup>2</sup> (4000 PSI)</p> <p>Weight:</p> <p>Short--arm: 7.7 kg (20 lbs.)</p> <p>Long--arm 9.2 kg (24 lbs.)</p> <p>Logging Speed: 9 m/min. (30 ft./min.)</p> <p>Tool Voltage Required: 56 VDC</p>

Sensor Response Ranges		
Sensor	Response Limits	Accuracy
Short--Arm Caliper	5.1 to 61.0 cm (2 to 24 in)	+/--0.38 cm (0.15 in)
Long--Arm Caliper	5.1 to 91.4 cm (2 to 36 in)	+/--0.64 cm (0.25 in)
Tool Information		
Item	Model #	
Three Arm Caliper, Short Arm or Long Arm	9065	

## Background Information on 9060 Tool

The 9060 tool is a multi--parameter slim hole mining and hydrology tool that records natural gamma, SP, single--point resistance.

With the tool's slim--hole design, it can also be used in 5.08 cm (2 in.) steel or plastic cased holes to record natural gamma for lithology. Even with its simple design, this tool records all three parameters simultaneously, without any merging or down logging required.



Features	
Properties Measured (see diagram)	Tool Specifications
1. Natural Gamma: 1.3 x 7.6 cm (0.5 x 3.0 in.) NAI Scintillation Offset: 276.8 cm (69.6 in.) 2. Spontaneous Potential +/-0.1 ohm Resolution Offset: 204.2 cm (80.4 in.) 3. Single Point Resistance +/-0.1 ohm Resolution Offset: 204.2 cm (80.4 in.)	Length: 225.5 cm (88.8 in.) Temperature: 75 C (167 F) Diameter: 3.6 cm (1.4 in.) Pressure: 281 kg/cc2 (4000 PSI) Weight: 14.5 kg (16 lb.) Logging Speed: 9 m/min. (30 ft./min.) Tool Voltage Required: 30 VDC

Sensor Response Ranges		
Sensor	Response Limits	Accuracy
Natural Gamma	0--10,000 API units	+/-5%
Resistance	0 to 1500 ohms	+/-5%
Spontaneous Potential	--400 to 400 mv	+/-10mv



### Borehole Television Camera (downhole & side-view)

This unit is a black and white borehole camera. The pointed metal tip shown in the center of this photograph contains a mirror at a 45 degree angle. This mirror rotates to show the sidewalls of the well bore or casing provided fluids in the well are clear. It can also operate in dry holes. There is also another camera lens tip that only views downhole.



This unit is circa 1960 and was obtained from an EPA laboratory in Las Vegas, it has been repaired twice over the years and we were informed by the manufacturer that it will not be supporting this model in the future.

We have two sets of cables and printed circuit cards, one set is for the 100' cable length and the other is for the 200' cable length.

The following tools are not owned by EPA Region 5, but can be accessed through the USGS for our use along with others not mentioned such as various flowmeters.

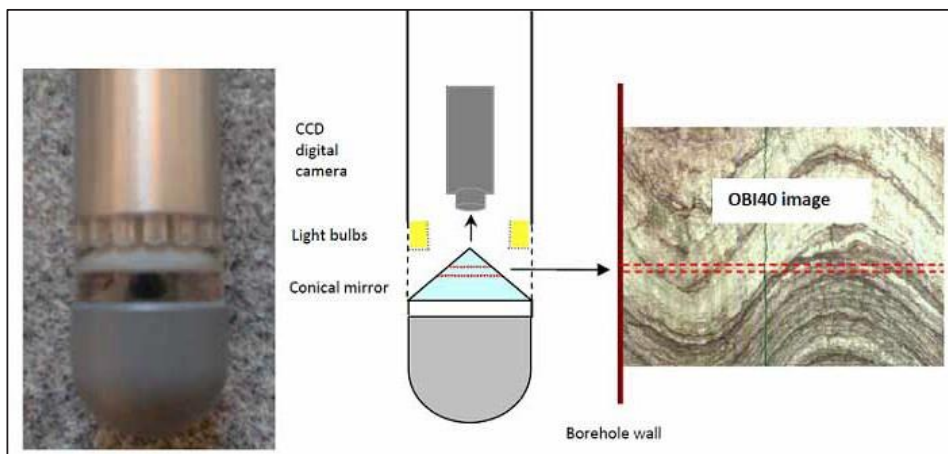
### Q40 OBI-1000, Optical Televiewer

The QL40 OBI and the OBI40 Optical Borehole Imagers are advanced slimhole logging tools designed for optical imaging of the surface wall of open and cased wells, either in air or clear water.

The QL40 OBI tool is supplied as a bottom sub of the Quick Link (QL) product line. It can either be combined with other QL40 tools to form a tool string or it can be run as a stand-alone tool. The OBI40 is the standalone-non stackable-version.

Designed to complement the ALT Acoustic Televiewers (ABI) in dry well situations, the tool operates with the ALT Logger and Matrix logging systems. They can be run on any

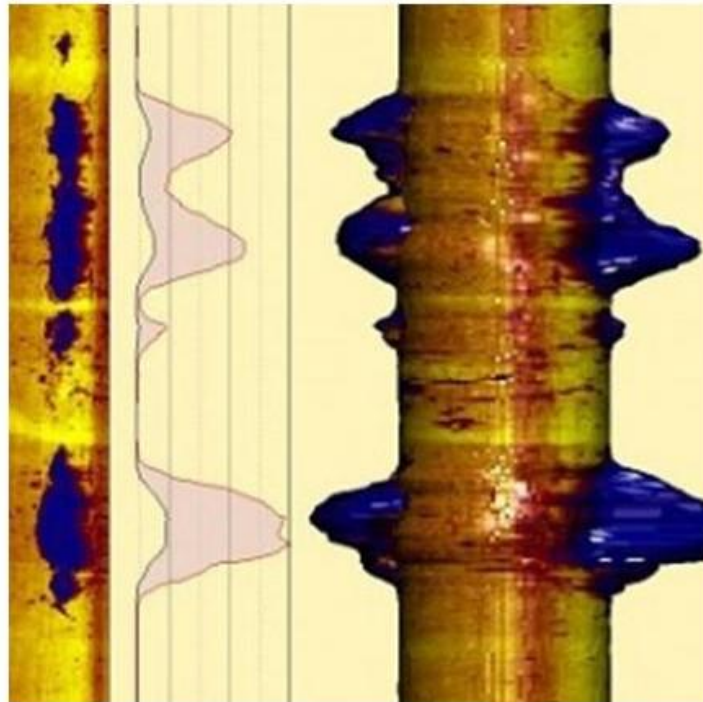
standard wireline (mono, 4 or 7 conductor, coax). The optical televiewer is fully downhole digital. It includes a high precision deviation sensor (APS544) allowing accurate orientation of the image and borehole.



The OBI incorporates a high resolution, high sensitivity CCD digital camera with matching Pentax optics. The CCD camera, located above a conical mirror, captures the reflection of the borehole wall. The light source is provided by a light ring assembly located in the optical head.



## Q40ABI-1000 Acoustic Televiewer



The ABI40 is the next generation of the pioneering FAC40. Based on 8 years of experience and market leadership with BHTV technology, the new system consists of the industry standard focused acoustical head with new deviation subsystem and completely redesigned electronics. The new electronic architecture uses a 14bits@10Mhz A/D converter directly coupled to a super FAST 75Mops DSP processor capable of performing complex data processing in real time on each individual ultrasonic wave train.

The ABI40 tool generates an image of the borehole wall by transmitting ultrasound pulses from a rotating sensor and recording the amplitude and travel time of the signals reflected at the interface between mud and borehole wall. The amplitude of these reflections is representative of the properties of the rock surrounding the borehole. The travel time represents the borehole shape and diameter and is used to provide exceptionally accurate borehole diameter measurements, which makes the tool ideal for casing inspection and structural geology.

Compared to the FAC40, which measures one echo (one amplitude and one travel time), the ABI40 is a multi-echo system. This is achieved by digital recording of the reflected acoustic wave train. On line analysis of the acoustic data is made by a DSP (digital signal processor). Sophisticated algorithms allow the system to detect reflections from the acoustic window and to separate/classify all subsequent echoes.

# APPENDIX E

## Radiation Health Physicist



To access these services contact  
Gene Jablonowski at  
312-886-4591  
[Jablonowski.Eugene@epa.gov](mailto:Jablonowski.Eugene@epa.gov)

**Eugene (Gene) Jablonowski serves as the Regional Radiation Expert and Senior Superfund Health Physicist who can provide radiation, assessment, and remediation support for the Removal and Remedial programs including:**

- Advice and actions at sites involving radiation. Advice may be to EPA staff, EPA management, State and local government officials, potentially responsible parties, consultants, the media and the general public. Response actions may include document review, instrument selection, health and safety plan development, quality assurance and quality control plan development, site assessment, criteria development, risk assessment, and verification.
- Advice and recommendations to EPA management on radiation issues.
- Development and review of radiation risk assessments, serving as the Regional Radiation Risk Assessor.
- Review of documents involving radiation issues for EPA Headquarters, EPA Region 5, Regional states, Regional municipalities, health physicists, other professionals, consultants, and the general public.
- Review of documents involving radiation quality assurance and quality control.
- Review of documents involving radiation health and safety.
- Training of Regional staff or other relevant parties on radiation issues.
- Participation in EPA Regional, EPA Headquarters, Federal, State, municipal committees and working groups that involve radiological issues.
- Participation in the review and critique of State, county and municipal plans for emergency response to Regional nuclear power plant accidents, including participation in the Federal Emergency Management Agency's (FEMA) Radiation Assessment Committee (RAC).
- Of particular interest to the Removal program:
  - Orphan source recovery, packaging and transportation.
  - Waste transportation and disposal consultation.
  - Liaison to other EPA offices, Federal agencies and organizations with radiological missions.
  - Radiation investigation development and review.

Gene's activities also include:

- Working on radiological emergency response planning, exercises and training for nuclear power plant (NPP), radiological dispersal device (RDD), and improvised nuclear device (IND) incidents.
- Member of the Advisory Team for Environment, Food and Health (Advisory Team), an inter-agency radiological emergency response group tasked with providing protective action recommendations to state and local governments on behalf of its member agencies.
- Federal Radiological Monitoring and Assessment (FRMAC) Type 1 Liaison who can explain FRMAC's data products and assist with their interpretation, and can also dispense information about FRMAC (capabilities, processes and status).

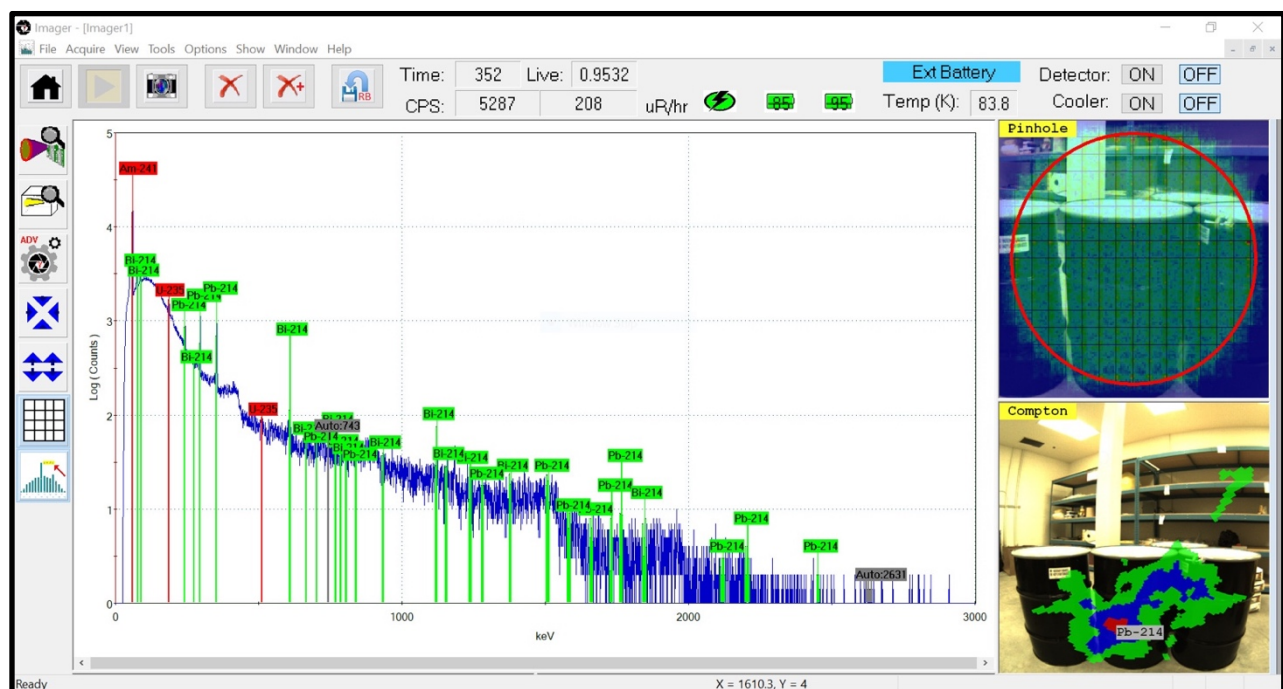


- IMT Environmental Unit Leader.
- Radiation Task Force Leader (RTFL) trainer.
- Member of the International Atomic Energy (IAEA) ENVIRONET Steering Committee and the Coordinator of its In-Situ Measurement Workgroup, as well as participation in IAEA radiological assessment and assistance missions.

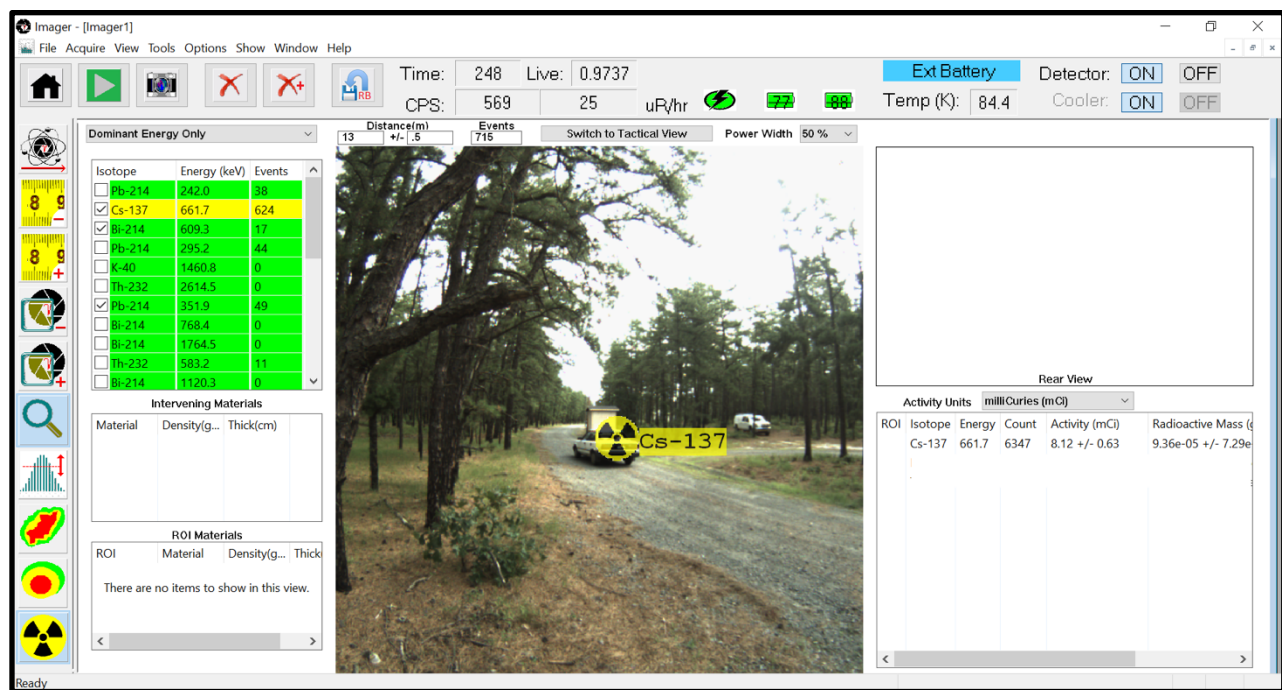
Gene manages and uses an array of sophisticated radiation monitoring and detection equipment that is located at the Willowbrook warehouse to accomplish his work. An overview of that equipment is provided below. Much of this equipment, however, has complex functionalities and may require special training and support to properly use and should only be accessed through Gene's services. Gene can also provide support on all of the removal program radiation equipment.



The PHDs GeGI-5 is a gamma radiation imager and radioisotope identifier. Equipped with segmented high-purity germanium (HPGe) detector and a digital camera, the GeGI can visually indicate the location of gamma radiation sources on its LCD screen. It can also quickly estimate the activity (amount) of those sources, whether they are point sources or distributed across an area within its field of view. This is an exceptional device for identifying and quantifying discrete radioactive sources, such as orphan sources. Region 5 also has a GeGI-4, the previous generation used in the assessment of a former cobalt facility. Two example screen shots of the display are provided below.



Example of GeGI Display at Orphan Source Project



Example of GeGI Display at Military Exercise



Example of GeGI-4 in Building Assessment



The ORTEC Trans-SPEC-DX-100T is a portable High Purity Germanium (HPGe) gamma spectrometer that can be used for the identification and quantification of radioactive sources, such as point sources and containers of material. When mounted on a special tripod with its detector pointed downward (1 meter above the ground, aka “M-1”), it can perform in-situ measurement of radioactivity in soil and surfaces, potentially eliminating the need for physical sample collection. An anticipated consequence management application is to use this alongside an RSDetection ion chamber (mentioned below) for radiological assessments, and to determine radiation dose as it relates to the deposited radionuclide contamination mixture. Region 5 has two units.



The ORTEC Micro-Trans-SPEC is similar to the trans-SPEC-DX-100T with similar features and applications, but smaller and lighter to carry. Since the detector is smaller detector it is less sensitive than the trans-SPEC, meaning longer count times are required where needed. Region 5 has one Micro-Trans-SPEC unit. An example of a Micro-Trans-Spec on a tripod for soil and surface measurement (aka “M-1” configuration) is on the left.

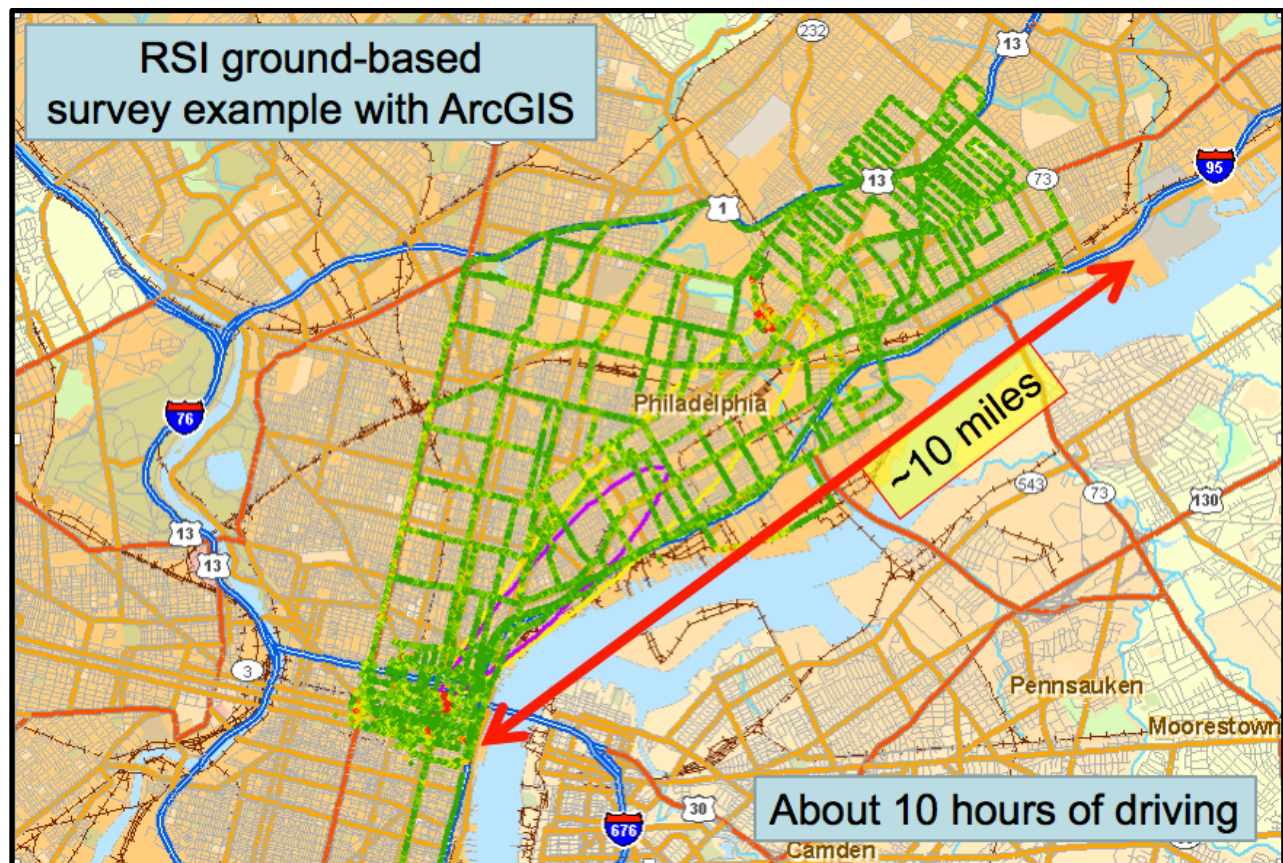


The General Electric / Baker-Hughes RSDetection is the next generation Reuter Stokes environmental radiation monitor, providing superior technology for the detection and measurement of low-level gamma radiation. The RSDetection’s detector is a high-pressure ionization chamber (HPIC) that provides unmatched sensitivity, reliability, and stability for measurements at natural background levels. The RSDetection is typically mounted on a tripod for area radiation measurements 1-meter above the ground surface. It can support site assessment activities and verification of remediation and meets the needs for regulatory compliance with cleanup standards. It can also be used to ground truth aerial radiation measurement systems, and support radiological assessments following wide-area incidents. An anticipated consequence management application is to use this alongside an ORTEC Trans-Spec for radiological assessments, and to determine radiation dose as it relates to the deposited radionuclide contamination mixture.



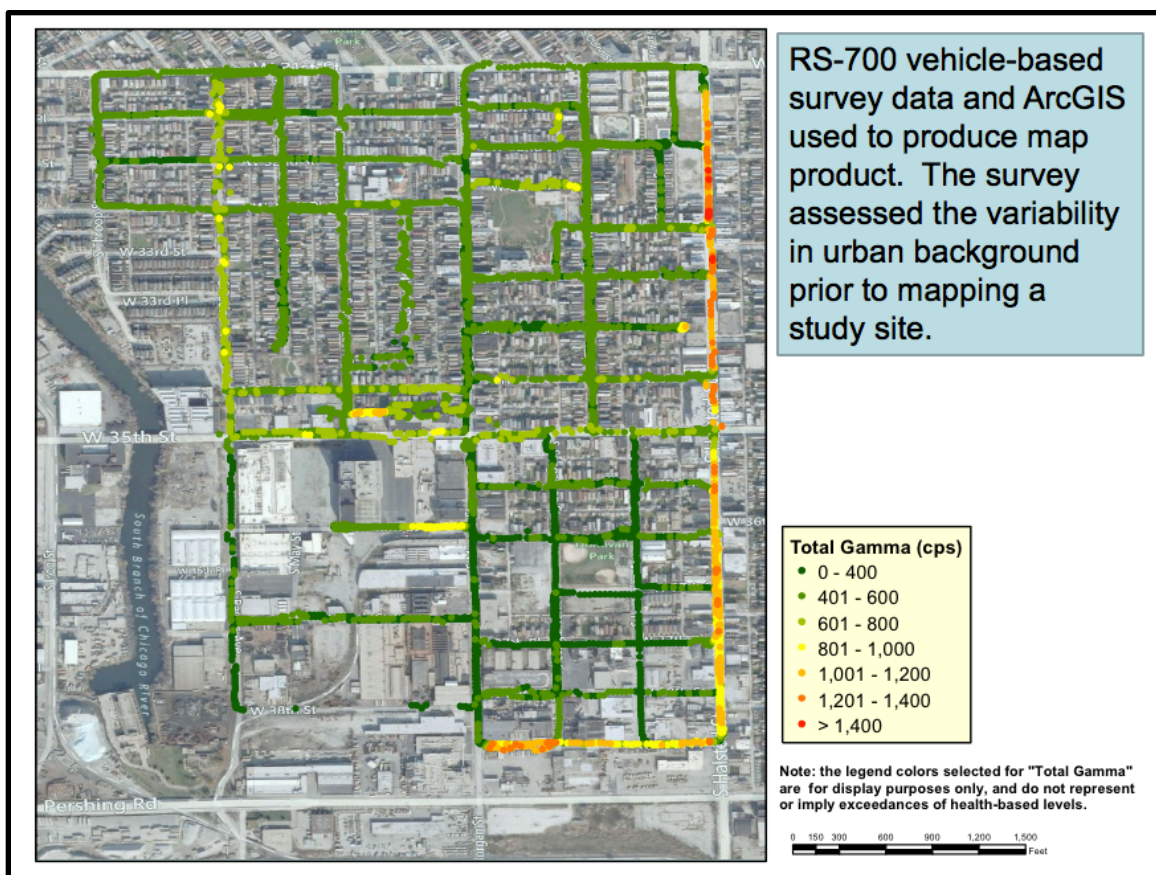


The Radiation Solution RS-700 system consists of a large sodium-iodide (NaI) detector (4" x 4" x 16") coupled with a gamma spectrometer, a GPS unit, and a rugged laptop, providing a system that can perform wide-area gamma mapping outdoors and indoors. For outdoor applications, the system can be mounted on a cart (pictured) or on a vehicle (ATV, van, SUV). For indoor applications the system is mounted on a cart and a Leica Total Station is used for indoor GPS-like positioning. The RS-700 can provide real-time gamma radiation mapping to the user, identification of the gamma-emitting radionuclides, and export the collected data for using in GIS systems. This hardware is similar to what is used on EPA's ASPECT aircraft, and DOE's AMS aircraft, and other government applications.

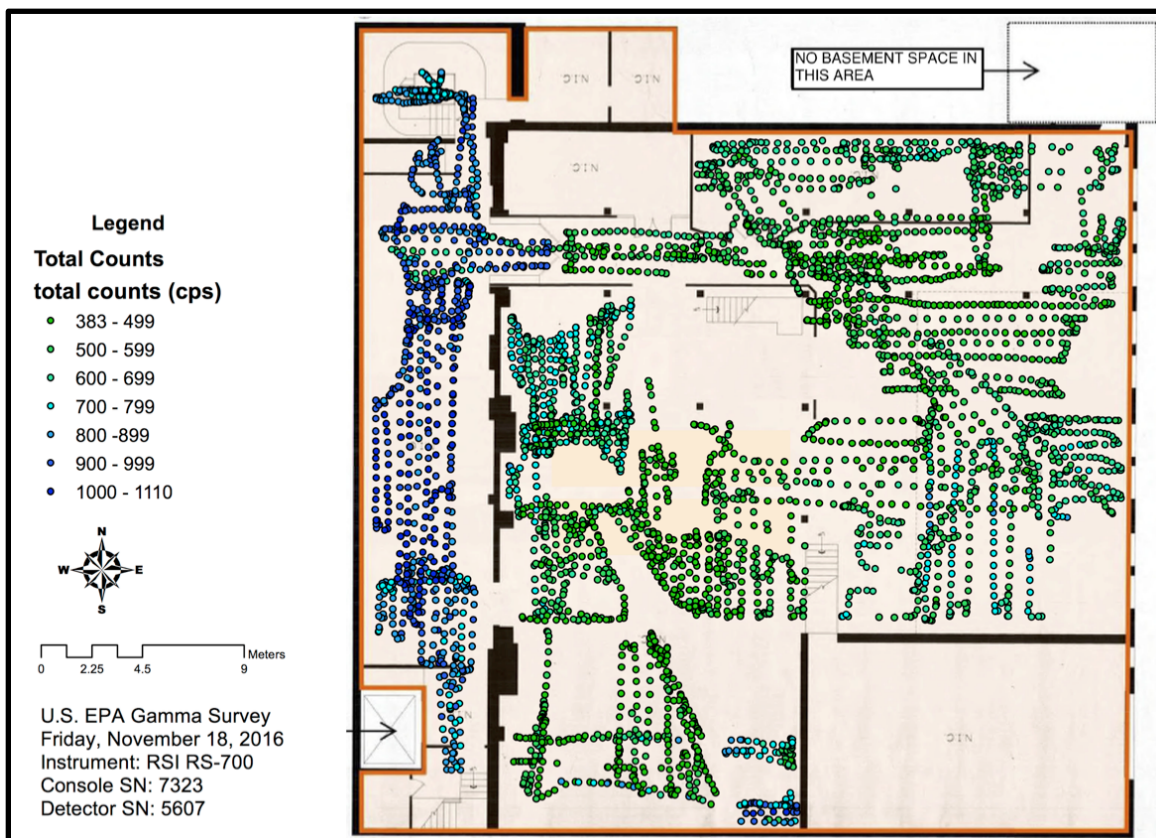


Example Data Product of RS-700 Urban Gamma Mapping for Liberty RadEx





Example Data Product of RS-700 Urban Gamma Mapping for Site Study



Example Data Product of RS-700 Indoor Mapping with Leica Total Station



The CANBERRA Colibri VLD-GPS is a survey meter with its own built-in GPS and data-logging capability. Its internal “very low dose” detector has a measurement range from background up to 100 mrem/hr, with these measurements and their GPS locations automatically logged every 5 seconds. The Colibri can also use external probes that are connected either by cable or wirelessly with Bluetooth. External probes include a NaI 2” x 2” probe, 15cm<sup>2</sup> alpha/beta PIPs probe, 100cm<sup>2</sup> alpha/beta scintillation probe, and a wide range gamma probe (up to 1,000 rem/hr). Data can be exported from the Colibri as an ASCII CSV file. This data can then be used with GIS software to produce maps of the automated dose rate measurements along with any other external probe data that was collected. An example Colibri data product is presented on the following page. Region 5 has three Colibri and probe sets.



The ORTEC IDM-200 system is a portable High Purity Germanium (HPGe) gamma spectrometer for applications such as in-situ measurement of surfaces and objects, and analysis of samples. The Region’s IDM-200 is currently configured with lead shielding to support sample analysis. Region 5 has one IDM-200 system.

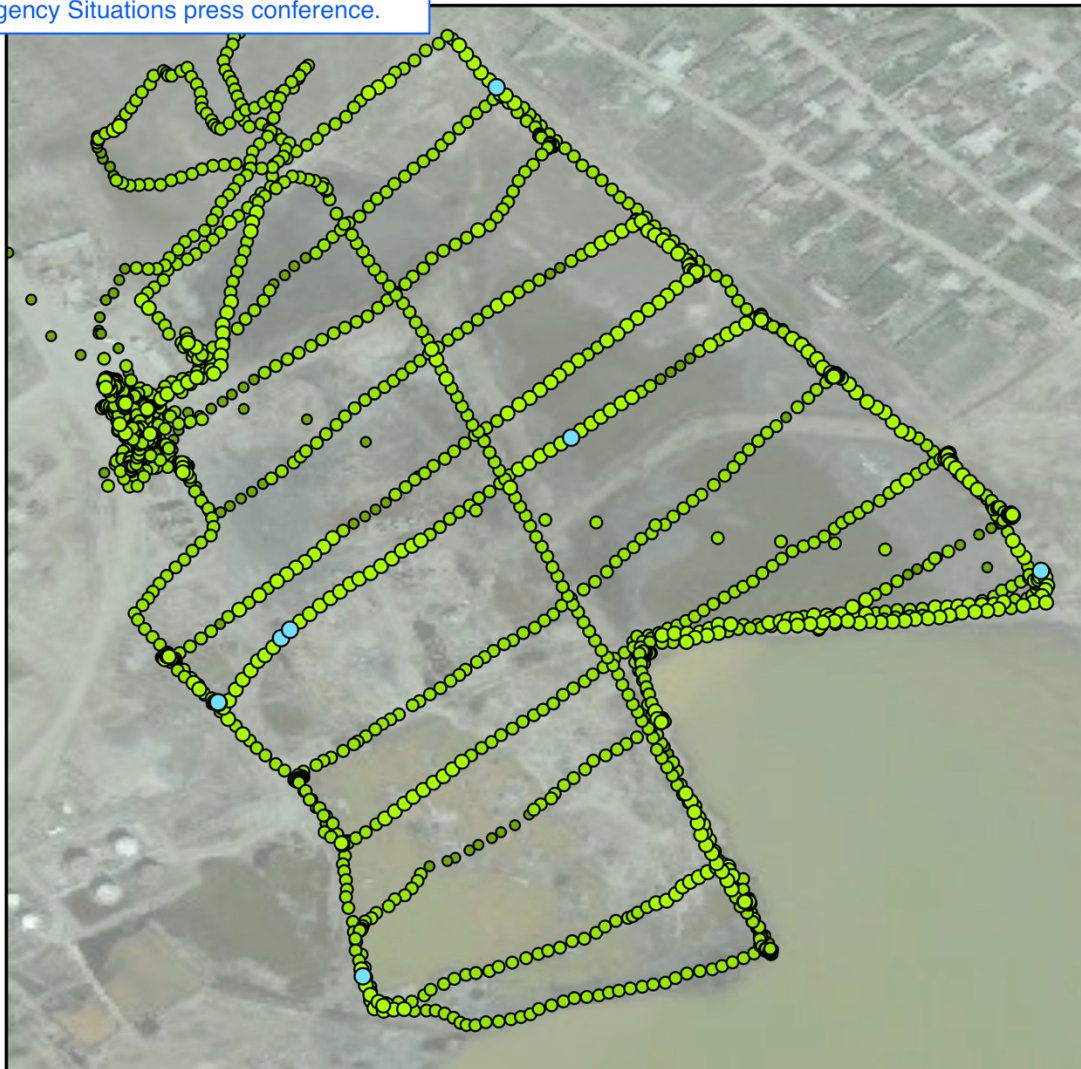


The CANBERRA iSolo is a portable, single-sample, alpha/beta counter. The iSolo is designed for the analysis of air filters and most other types of alpha/beta samples. When analyzing air filters, the iSolo discriminates both radon and thoron and their progeny from transuranic and fission product materials on the air filter samples. The iSolo uses a solid state silicon PIPS<sup>®</sup> detector for alpha and beta detection. The iSOLO can be operated for 10 hours or more with internal batteries and is totally self-contained. Region 5 has two iSolo alpha/beta counters.



Example map of radiation data collection from Neftchala site. Data was collected and map was created by Gene Jablonowski for presentation at the Ministry of Emergency Situations press conference.

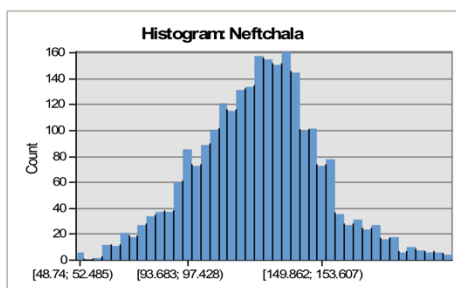
### Neftchala Site



#### Gamma Dose Rate (nSv/hr)

##### nSvHr

- 0 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 270
- 270 - 400
- > 400



0 25 50 100 150 200  
Meters

**Dose Rate Measurements**  
**Canberra Colibri VLD-GPS (SN: 26)**  
Labeled points indicate static measurements



Note: legend colors are for display purposes only and do not represent or imply exceedance of health-based levels.

Example of Data Product from Canberra Colibri VLD-GPS Gamma Mapping in Azerbaijan

# APPENDIX F

## Remote Sensor Data Acquisition

900mHz Radio Modems & Cellular LINC/Gateway Go-Kits



To access these services contact:

Brian Cooper: 312-353-8651

[cooper.brian@epa.gov](mailto:cooper.brian@epa.gov)

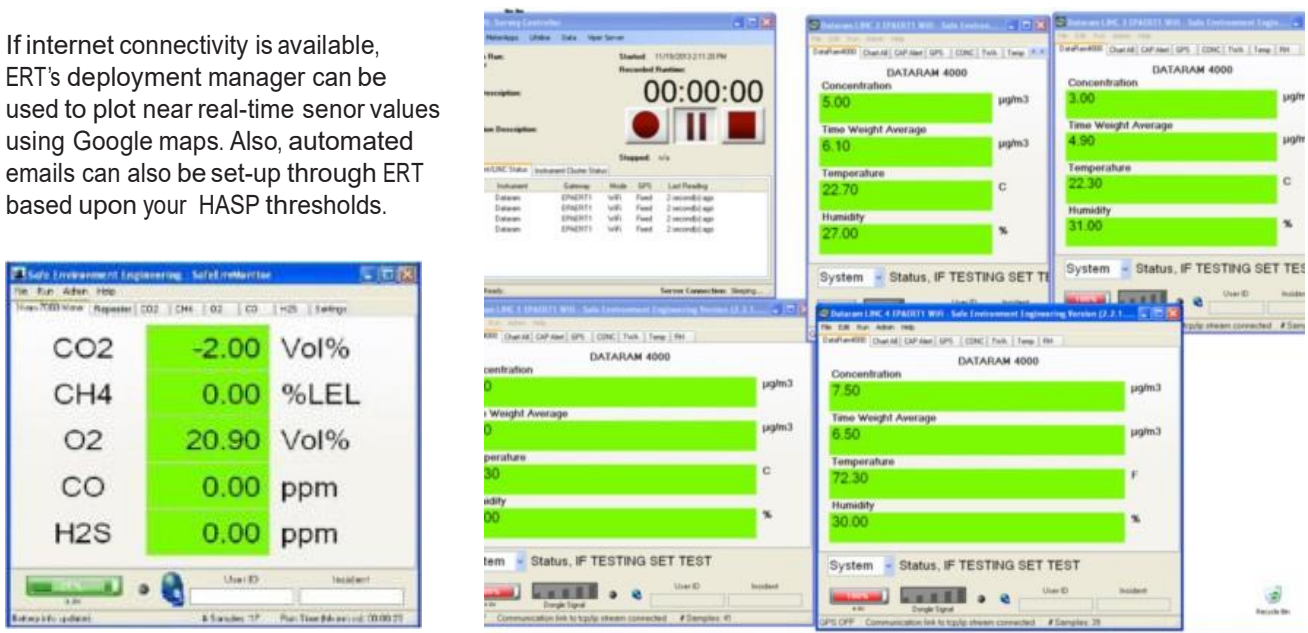


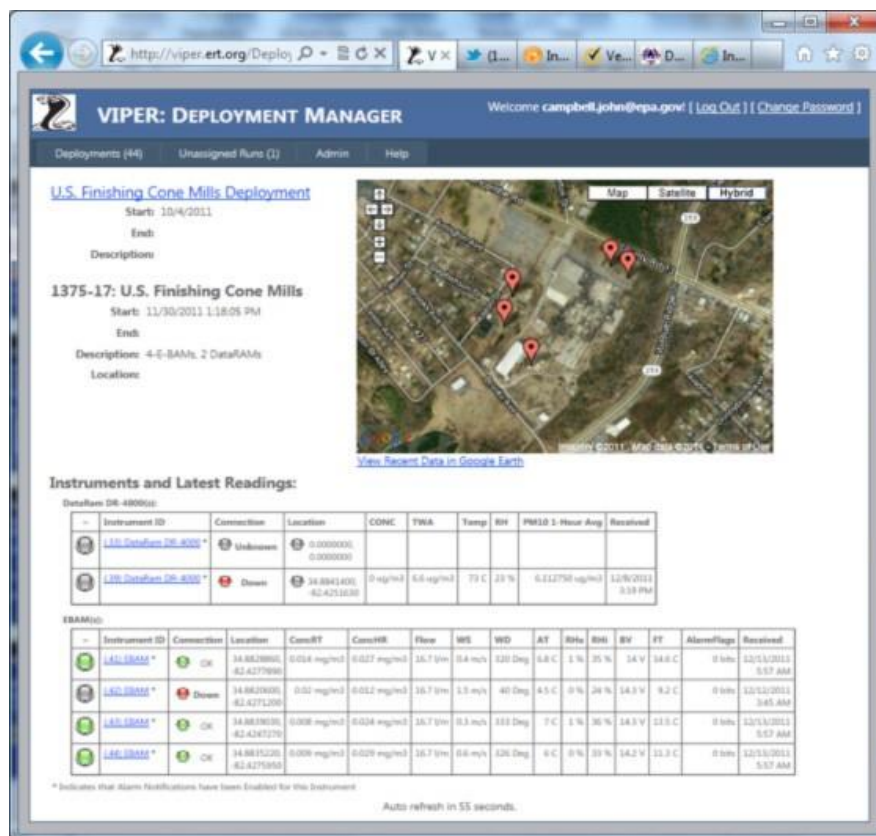
The FIELDS Hybrid Viper system is a wireless network based communications system designed to enable real time transmission of data from field sensors to a local computer and enterprise server to help provide data management, analysis, and visualization. The system incorporates the use of 900 Mhz radio modems in order to transmit data from the field to a laptop in the command post. The system incorporates a number of field data sensors including Thermo dataram 4000s, Rae System's multiraes, Ludlum 2241s, Honeywell's SPMs and other sensors. The system can link up to 8 devices at a time with the current configuration. Distance is limited based-upon terrain, buildings, and interference but is usually effective up to a 1 mile range. Indoor data collection can also be achieved.



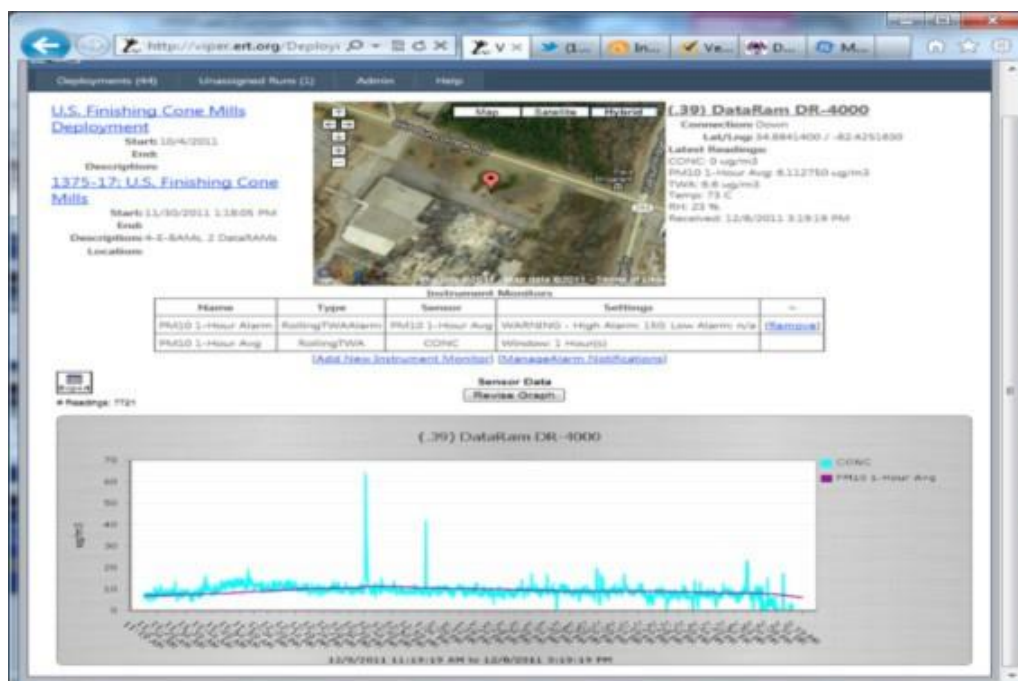
The viewing computer will emulate the remote instruments meter face by displaying real-time sensor values every second on the screen. Color and audio alarms can be set based-upon HASP requirements. Each sensor value is then stored locally on the laptop and time stamped. GPS coordinates can also be integrated into each reading allowing for data mapping.

If internet connectivity is available, ERT's deployment manager can be used to plot near real-time sensor values using Google maps. Also, automated emails can also be set-up through ERT based upon your HASP thresholds.





Near real-time histograms can also be generated through the deployment manager. The histograms can plot values for each instrument depicting exceedances at time intervals. The data can they be exported as a comma delimited file for use in excel or other spreadsheet programs.



Currently we have 8 Hyper-Viper setups in the region. Each set-up contains 4 radio modem pairs but pairs can be added or removed based upon site requirements. High gain antennas and amplifiers can be added to the system if needed. START training is available and has been ongoing. Once the system is set-up initially operation of the system is very easy. The system has been deployed successfully on over 20 removal sites.





## Viper Life•line Go-Kit

### Manufacturer:

Safe Environment Engineering

### Model:

Viper Life•line Go-Kit

### Quantity Available:

Willowbrook: 5

START-Chicago: 3

START-Detroit: 3

START-Westlake: 3

### Description:

The Viper Life•line Go-Kit is wireless network telemetry system that has been pre-configured for use with a TSI DustTrak DRX aerosol monitor. The kit includes 1 Life•line Gateway, 1 LINC (Life•line Interoperable Network Communicator), and their chargers. The Life•line Gateway included in this kit utilizes a cellular modem to remotely transmit data to ERT's servers. This means the kit can be deployed anywhere as there is adequate cellular coverage.

**NOTE: YOU WILL NEED TO OBTAIN A CELLULAR SIM CARD WITH A STATIC PUBLIC FACING IP. WE DO NOT PROVIDE THESE.**



## Life•line Smart Gateway

### Manufacturer:

Safe Environment Engineering

### Model:

Life•line Smart Gateway

### Quantity Available:

Willowbrook: 1

START-Chicago: 1

START-Detroit: 1

START-Westlake: 1

### Description:

The Life•line Smart Gateway is an All-in-One sensor data acquisition & transmission device, as well as a local host server. This device can be used with or without LINC's or other gateways. Data can be remotely transmitted to ERT's servers, or can be stored locally and accessed via a remote desktop connection forgoing the need for a virtual machine.

**NOTE: YOU WILL NEED TO OBTAIN A CELLULAR SIM CARD WITH A STATIC PUBLIC FACING IP. WE DO NOT PROVIDE THESE.**





## Spare Viper LINC (Generic)

**Manufacturer:**  
Safe Environment Engineering

**Model:**  
LINC

### Quantity Available:

Willowbrook: 7  
START-Chicago: 2  
START-Detroit: 2  
START-Westlake: 2

### Description:

These spare Viper LINC (Life•line Interoperable Network Communicators) are pre-configured for use with a TSI DustTrak DRX, but can be reprogrammed for use with a variety of instruments.

**NOTE: These LINC require a Safe Env. Gateway or Smart Gateway to function.**



## Viper SPM LINC

**Manufacturer:**  
Safe Environment Engineering

**Model:**  
Viper SPM LINC

### Quantity Available:

Willowbrook: 1  
START-Chicago: 2  
START-Detroit: 2  
START-Westlake: 2

### Description:

These Viper SPM LINC (Life•line Interoperable Network Communicators) are pre-configured for use with a Honeywell SPM Flex.

**NOTE: These LINC require a Safe Env. Gateway or Smart Gateway to function.**



**FIELD  
SERVICES  
SECTION**

# APPENDIX G

## Pneumatic Slug Test Kit by GeoProbe®

GW1600

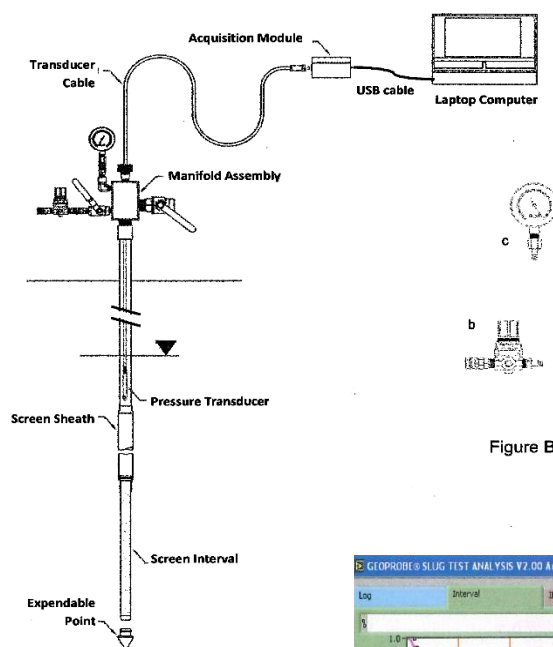


Figure A: Typical field setup with SP15/16 groundwater sampler

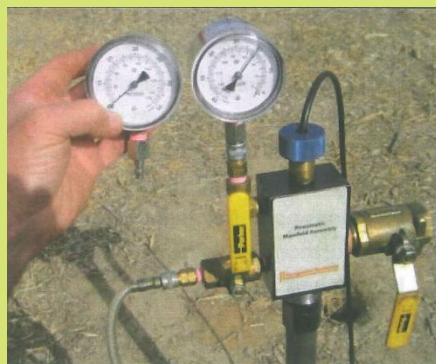
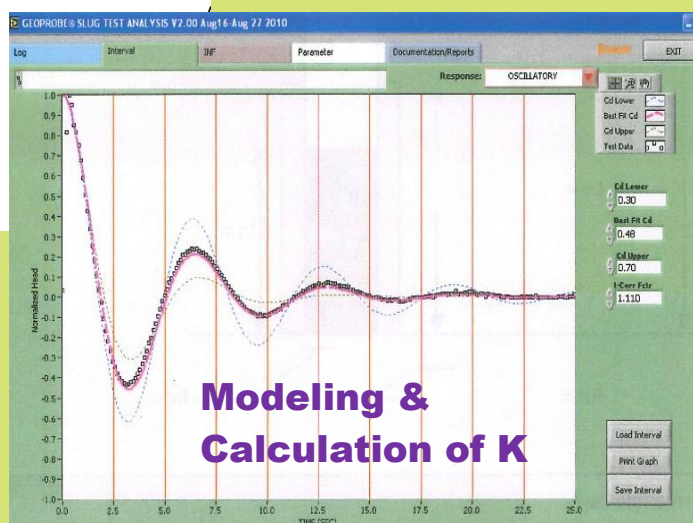


Figure B



**Modeling &  
Calculation of K**

To access these services contact:

Jim Ursic: 312-353-1526

[ursic.james@epa.gov](mailto:ursic.james@epa.gov)

## BACKGROUND

The USEPA, Region 5 Superfund Division, owns maintains and deploys a pneumatic slug test kit for existing 2" monitoring wells or temporary wells installed by direct push method which allows considerable flexibility in placing slug test locations. Cable length of the slug test transducer, which limits the depth of a slug test in existing wells, is just under 100 feet. Depth limitations for the Region 5 direct push rod and screen equipment is between 20 to 30 feet depending on stratigraphy. This method is used to support the Remedial and Removal Branches in the Superfund Division.

The slug test responses are modeled and used to determine the hydraulic conductivity (K) of the screened aquifer. Included in this slug test kit is a slug test analysis software package. This package includes the Bouwer and Rice model and the Hvorslev model for calculation of K. The software provides variants of these two basic models for confined or unconfined aquifers, partially or fully penetrating wells, and over or underdamped aquifer responses. A correction for oscillatory slug test responses in small-diameter wells, by Butler, also is included in this analysis software.

The system is capable of using rising head or falling head pneumatic tests in small direct push rods.

Standard operating procedure of this system conforms to the ASTM Standard Practice D 7242 (ASTM 2013a) for performing pneumatic slug tests with direct push methods.

## Appendix I: Permeation Data for ASTM Recommended List of Chemicals for Evaluating Protective Clothing Materials (ASTM F1001)

<u>Challenge Chemical</u>	<u>CAS Number</u>	<u>Physical State</u>	<u>ChemMax® 2</u>
Acetone	67-64-1	Liquid	9
Acetonitrile	75-05-8	Liquid	<15
Ammonia Gas	7664-41-7	Gas	15
1,3-Butadiene Gas	106-99-0	Gas	>480
Carbon Disulfide	75-15-0	Liquid	imm.
Chlorine Gas	7782-50-5	Gas	>480
Dichloromethane	75-09-2	Liquid	imm.
Diethylamine	109-89-7	Liquid	imm.
Dimethyl Formamide	68-12-2	Gas	18
Ethyl Acetate	141-78-6	Liquid	21
Ethylene Oxide Gas	75-21-8	Gas	24
n-Hexane	110-54-3	Liquid	21
Hydrogen Chloride Gas	7647-01-0	Gas	>410
Methanol	67-56-1	Liquid	>480
Methyl Chloride Gas	74-87-3	Gas	>480
Nitrobenzene	98-95-3	Liquid	45
Sodium Hydroxide, 50%	1310-73-2	Liquid	>480
Sulfuric Acid, 98%	7664-93-9	Liquid	>480
Tetrachloroethylene	127-18-4	Liquid	imm.
Tetrahydrofuran	109-99-9	Liquid	imm.
Toluene	108-88-3	Liquid	imm

Index: imm = immediate



## Appendix II: Permeation Data for Suits and Gloves

See following pages for information on suits and gloves.



# CHEMICAL RESISTANCE GUIDE

This Chemical Resistance Guide incorporates three types of information:

- Degradation (D) is a deleterious change in one or more of the glove's physical properties. The most obvious forms of degradation are the loss of the glove's strength and excessive swelling. Several published degradation lists (primarily "The General Chemical Resistance of Various Elastomers" by the Los Angeles Rubber Group, Inc.) were used to determine degradation.
- Breakthrough time (BT) is defined as the elapsed time between initial contact of the liquid chemical with the outside surface of the glove and the time at which the permeation rate reaches 0.1 mg/m<sup>2</sup>/sec. WHEN BREAKTHROUGH OCCURS, THE GLOVE IS NO LONGER PROVIDING ADEQUATE PROTECTION.
- Permeation rate (PR), measured in milligrams per square meter per second (mg/m<sup>2</sup>/sec) is the measured steady state flow of the permeating chemical through the glove elastomer. Glove thickness plays an important role in resistance to permeation.

The glove styles tested for permeation were the SSG, F101, B174, CS113B, LA102G and PNLB1815. The permeation data in this guide are based on permeation tests performed in accordance with ASTM Standard F 739 under laboratory conditions by North Safety Products or independent AIHA accredited laboratories. Neither North Safety Products nor the independent laboratory assumes any responsibility for the suitability of an end user's selection of gloves based on this guide.

## General Recommendation:

The Guide also provides a color-coded general recommendation on which gloves should be evaluated and tested first, based on data from multiple sources. (See general recommendation color key). Technical Assistance Data on chemicals not listed here can be obtained by calling the North Technical Service Department at

(800) 430-4110. North also offers [ezGuide™](#), an interactive software program which is designed to electronically help you select the proper glove for use against specific chemicals. This "user friendly" guide walks you step-by-step through the process to determine what type of glove to wear and its permeation resistance to the selected contaminant. Product features, benefits and ordering information of the suggested products also are included in the program. [ezGuide](#) can be accessed from the North web site, [www.northsafety.com](http://www.northsafety.com) or ordered by e-mailing us at [marketing@northsafety.com](mailto:marketing@northsafety.com).

The finest chemical handling gloves deserve to be used with the finest respiratory products. Please consult the current North Safety Products Respiratory Protection Catalog and [ezGuide™](#) for proper respiratory selection.

## Warning:

Protective gloves and other protective apparel selection must be based on the user's assessment of the workplace hazards. Glove and Apparel materials do not provide unlimited protection against all chemicals. It is the users responsibility to determine before use that the Glove and Apparel will resist permeation and degradation by the chemicals (including chemical mixtures) in the environment of intended use.

Failure by the user to select the correct protective gloves can result in injury, sickness or death




To obtain maximum life, protective gloves and other protective apparel should have chemicals removed from the surface by washing or other appropriate methods after each use. Protective apparel should be stored away from the contaminating atmosphere.

Punctured, torn or otherwise ruptured apparel must be removed from service; unservicable apparel may be disposed of only in accordance with applicable waste disposal regulations.

## Key to Degradation and Permeation Ratings

E - Excellent	Exposure has little or no effect. The glove retains its properties after extended exposure
G - Good	Exposure has minor effect with long term exposure. Short term exposure has little or no effect
F - Fair	Exposure causes moderate degradation of the glove. Glove is still useful after short term exposure but caution should be exercised with extended exposure
P - Poor	Short term exposure will result in moderate degradation to complete destruction
N/D	Permeation was not detected during the test
I/D	Insufficient data to make a recommendation

## General Recommendation Color Key

	Good for total immersion
	Good for accidental splash protection and intermittent contact
	Only use with extreme caution. Glove will fail with only short exposure

## Physical Performance Chart

Physical Characteristics	Silver Shield®	Viton†	Butyl	Chemsoft®	Nitrile	Natural Rubber
Abrasion Resistance	F	G	G	E	E	E
Cut Resistance	P	G	G	E	E	E
Puncture (Snag) Resistance	P	G	G	E	E	E
Flexibility	E	G	G	E	E	E
Heat Resistance	F	G	G	G	G	G
Ozone Resistance	E	E	E	G	G	P
Tensile Strength	E	G	G	E	E	E
Low Gas Permeability	E	E	E	F	F	P

Note: Products in these categories vary in capabilities. Laboratory tests are necessary for specific recommendations.




† Viton is a Registered Trademark of DuPont Company.

		Silver Shield			Viton			Butyl			Chemsoft			Nitrile			Natural Rubber		
Chemical Name	CAS No.	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR
Acetaldehyde	75-07-0	E	>8 hrs	N/D	P	0 min	281.9	E	>8 hrs	0.066	I/D	I/D	I/D	P	0 min	161	I/D	I/D	I/D
Acetic Acid (100%) (Glacial)	64-19-7	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	F	37 min	13.3	F	38 min	1.9	F	1.3 hrs	0.39
Acetic Aldehyde	75-07-0	E	>8 hrs	N/D	P	0 min	281.9	E	>8 hrs	0.066	I/D	I/D	I/D	P	0 min	161	I/D	I/D	I/D
Acetic Ester	141-78-6	E	>8 hrs	N/D	I/D	I/D	I/D	E	7.6 hrs	3.4	I/D	I/D	I/D	P	8 min	145	I/D	I/D	I/D
Acetone	67-64-1	E	>8 hrs	N/D	P	2 min	383	E	>8 hrs	N/D	P	1 min	42.3	P	3 min	291	P	8 min	93.2
Acrylic Acid	79-10-7	E	>8 hrs	N/D	G	5.9 hrs	0.23	E	>8 hrs	N/D	I/D	I/D	I/D	F	I/D	I/D	G	54 min	1.6
Acrylonitrile	107-13-1	E	>8 hrs	N/D	F	14 min	28	E	>8 hrs	N/D	P	4 min	42	P	6 min	29.8	P	16 min	0.11
Ammonia (99%)	7664-41-7	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Ammonium Hydroxide (29%)	1336-21-6	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	F	2 hrs	0.115	F	2.2 hrs	0.05	G	60 min	28.7
Aniline	62-53-3	E	>8 hrs	N/D	P	6 min	18.7	E	>8 hrs	N/D	I/D	I/D	I/D	F	1.1 hrs	45	I/D	I/D	I/D
Aniline Oil	62-53-3	E	>8 hrs	N/D	P	6 min	18.7	E	>8 hrs	N/D	I/D	I/D	I/D	F	1.1 hrs	45	I/D	I/D	I/D
Benzaldehyde	100-52-7	I/D	I/D	I/D	E	>8 hrs	4	E	>8 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Benzene	71-43-2	E	>8 hrs	N/D	E	5.9 hrs	0.012	P	31 min	32.3	P	I/D	I/D	P	<6 min	>29	I/D	I/D	I/D
Bromoacetonitrile	590-17-0	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Bromobenzene	108-86-1	E	I/D	I/D	E	>8 hrs	N/D	P	32 min	39.8	I/D	I/D	I/D	P	13 min	9.1	I/D	I/D	I/D
1,3-Butadiene	106-99-0	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D
Butyl Acetate	123-86-4	E	>8 hrs	N/D	P	I/D	I/D	G	1.8 hrs	7.61	I/D	I/D	I/D	P	29 min	54.4	F	18 min	47
Butyraldehyde	123-72-8	I/D	I/D	I/D	P	54 min	9	E	>8 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Carbon Bisulfide	75-15-0	E	>8 hrs	N/D	E	>8 hrs	N/D	P	3 min	98.4	I/D	I/D	I/D	P	9 min	51	I/D	I/D	I/D
Carbon Disulfide	75-15-0	E	>8 hrs	N/D	E	>8 hrs	N/D	P	3 min	98.4	I/D	I/D	I/D	P	9 min	51	I/D	I/D	I/D
Carbon Tetrachloride	56-23-5	E	>8 hrs	N/D	E	>13 hrs	N/D	P	I/D	I/D	F	1.3 hrs	3.45	G	3.4 hrs	5	I/D	I/D	I/D
Caustic Soda (50%)	1310-73-2	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D
Chlorine	7782-50-5	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
2-Chloroethanol	107-07-3	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Chloroform	67-66-3	E	>8 hrs	N/D	E	9.5 hrs	0.46	P	I/D	I/D	I/D	I/D	I/D	P	4 min	352	I/D	I/D	I/D
3-Chloroprene	107-05-1	E	>4 hrs	N/D	F	31 min	16	P	50 min	281	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Curing Agent Z	N/A	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Cyclohexane	110-82-7	E	>4hrs	N/D	E	>7 hrs	N/D	P	50 min	103.8	E	>8 hrs	N/D	G	I/D	I/D	I/D	I/D	I/D
Cyclohexanol	108-93-0	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>11 hrs	N/D	E	>6 hrs	N/D	E	>16 hrs	N/D	I/D	I/D	I/D
Cyclohexanone	108-94-1	E	>8 hrs	N/D	P	29 min	86.3	E	>16 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	F	15 min	46.9
Di(2-ethylhexyl)phthalate	117-81-7	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D
Dibutylphthalate	84-74-2	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>16 hrs	N/D	E	>8 hrs	N/D	E	>16 hrs	N/D	I/D	I/D	I/D
1,2-Dichloroethane	107-06-2	E	>8 hrs	N/D	E	>8 hrs	N/D	P	2.9 hrs	53	I/D	I/D	I/D	P	8 min	82.7	I/D	I/D	I/D
Dichloromethane	75-09-2	E	>8 hrs	N/D	F	1 hr	7.32	I/D	I/D	I/D	I/D	I/D	I/D	P	4 min	766	I/D	I/D	I/D
Diethyl Ether	60-29-7	E	>8 hrs	N/D	P	12 min	21.5	P	8 min	92.2	I/D	I/D	I/D	P	14 min	21.8	I/D	I/D	I/D

D = Degradation  
BT = Breakthrough Time  
PR = Permeation Rate

E = Excellent  
G = Good  
F = Fair  
P = Poor

N/D = None Detected  
I/D = Insufficient Data




 Good for total immersion  
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		Silver Shield			Viton			Butyl			Chemsoft			Nitrile			Natural Rubber		
Chemical Name	CAS No.	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR
Diethyl Oxide	60-29-7	E	>8 hrs	N/D	P	12 min	21.5	P	8 min	92.2	I/D	I/D	I/D	P	14 min	21.8	I/D	I/D	I/D
Diethylamine	109-89-7	E	>8 hrs	N/D	P	35 min	852	P	47 min	46	I/D	I/D	I/D	F	I/D	I/D	I/D	I/D	I/D
Diethylaminoethanol	100-37-8	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>7.8 hrs	0.02	E	>8 hrs	N/D	I/D	I/D	I/D
1,4-Diethylene Dioxide	123-91-1	I/D	I/D	I/D	P	23 min	26.8	E	>20 hrs	N/D	I/D	I/D	I/D	P	28 min	77.1	I/D	I/D	I/D
Diethylene Ether	123-91-1	I/D	I/D	I/D	P	23 min	26.8	E	>20 hrs	N/D	I/D	I/D	I/D	P	28 min	77.1	I/D	I/D	I/D
Diethylene Oxide	123-91-1	I/D	I/D	I/D	P	23 min	26.8	E	>20 hrs	N/D	I/D	I/D	I/D	P	28 min	77.1	I/D	I/D	I/D
Diethylenetriamine	111-40-0	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Diisobutyl Ketone (80%)	108-83-8	E	>8 hrs	N/D	F	1.1 hrs	90.6	G	3.3 hrs	41.2	I/D	I/D	I/D	F	2.9 hrs	49	I/D	I/D	I/D
Dimethyl Acetamide	127-19-5	F	1.5 hrs	0.728	P	25 min	3	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Dimethyl Formamide	68-12-2	E	>8 hrs	N/D	P	8 min	6.5	E	>8 hrs	N/D	I/D	I/D	I/D	F	9 min	15	I/D	I/D	I/D
Dimethyl Mercury	593-74-8	E	>4 hrs	<0.017	P	<15 min	3.1	P	<15 min	46.7	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Dimethyl Sulfoxide	67-68-5	G	I/D	I/D	F	1.5 hrs	5	E	>8 hrs	N/D	F	41 min	3.7	F	40 min	5.2	I/D	I/D	I/D
Dimethylketone	67-64-1	E	>8 hrs	N/D	P	2 min	383	E	>8 hrs	N/D	P	1 min	42.3	P	3 min	291	P	10 min	12.2
Diocetyl Phthalate	117-81-7	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D
1,4-Dioxane	123-91-1	I/D	I/D	I/D	P	23 min	26.8	E	>20 hrs	N/D	I/D	I/D	I/D	P	28 min	77.1	I/D	I/D	I/D
Dioxyethylene Ether	123-91-1	I/D	I/D	I/D	P	23 min	26.8	E	>20 hrs	N/D	I/D	I/D	I/D	P	28 min	77.1	I/D	I/D	I/D
Divinyl Benzene	1321-74-0	E	>8 hrs	N/D	E	>17 hrs	N/D	F	2.2 hrs	238	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Epichlorohydrin	106-89-8	I/D	I/D	I/D	P	2 hrs	4	E	>8 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
1,2-Epoxypropane	75-56-9	I/D	I/D	I/D	P	1 min	1790	F	2.2 hrs	7	I/D	I/D	I/D	P	<6 min	>3.9	I/D	I/D	I/D
Ethanal	75-7-0	E	>8 hrs	N/D	P	0 min	281.9	E	>8 hrs	0.066	I/D	I/D	I/D	P	0 min	161	I/D	I/D	I/D
Ethanol	64-17-5	E	>8 hrs	N/D	I/D	I/D	I/D	E	>8 hrs	N/D	F	1.2 hrs	3.3	I/D	I/D	I/D	I/D	I/D	I/D
Ether	60-29-7	E	>8 hrs	N/D	P	12 min	21.5	P	8 min	92.2	I/D	I/D	I/D	P	14 min	21.8	I/D	I/D	I/D
Ethyl Acetate	141-78-6	E	>8 hrs	N/D	P	I/D	I/D	G	7.6 hrs	3.4	I/D	I/D	I/D	P	8 min	145	I/D	I/D	I/D
Ethyl Alcohol	64-17-5	E	>8 hrs	N/D	I/D	I/D	I/D	E	>8 hrs	N/D	F	1.2 hrs	3.3	I/D	I/D	I/D	G	31 min	2.4
Ethyl Aldehyde	75-07-0	E	>8 hrs	N/D	P	0 min	281.9	E	>8 hrs	0.066	I/D	I/D	I/D	P	0 min	161	I/D	I/D	I/D
Ethyl Ether	60-29-7	E	>8 hrs	N/D	P	12 min	21.5	P	8 min	92.2	I/D	I/D	I/D	P	14 min	21.8	I/D	I/D	I/D
Ethylamine (70% in water)	75-04-7	F	51 min	0.65	P	I/D	I/D	E	>12 hrs	N/D	I/D	I/D	I/D	F	1.1 hrs	30.1	I/D	I/D	I/D
Ethylene Dichloride	107-06-2	E	>8 hrs	N/D	E	>8 hrs	N/D	F	2.9 hrs	53	I/D	I/D	I/D	P	8 min	82.7	I/D	I/D	I/D
Ethylene Glycol	107-21-1	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	E	>8 hrs	N/D	I/D	I/D	I/D	E	>8hrs	N/D
Ethylene Oxide	75-21-8	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Formaldehyde (37% in water)	50-00-0	E	>8 hrs	N/D	E	>16 hrs	N/D	E	>16 hrs	N/D	E	>8hrs	0.007	E	>21 hrs	N/D	I/D	I/D	I/D
Furfural	98-01-1	E	>8 hrs	N/D	F	3.5 hrs	14.8	E	>16 hrs	N/D	I/D	I/D	I/D	P	24 min	265	I/D	I/D	I/D
Glutaraldehyde (25%)	111-30-8	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	E	>6 hrs	N/D
Heptane	142-82-5	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	E	>6 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D
Hexahydrobenzene	110-82-7	E	>4hrs	N/D	E	>7 hrs	N/D	F	50 min	103.8	E	>8 hrs	N/D	F	I/D	I/D	I/D	I/D	I/D

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		Silver Shield			Viton			Butyl			Chemsoft			Nitrile			Natural Rubber		
Chemical Name	CAS No.	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR
Hexahydrophenol	108-93-0	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>11 hrs	N/D	E	>6 hrs	N/D	E	>16 hrs	N/D	I/D	I/D	I/D
Hexamethylene	110-82-7	E	>4hrs	N/D	E	>7 hrs	N/D	F	50 min	103.8	E	>8 hrs	N/D	F	I/D	I/D	I/D	I/D	I/D
Hexanaphthene	110-82-7	E	>4hrs	N/D	E	>7 hrs	N/D	F	50 min	103.8	E	>8 hrs	N/D	F	I/D	I/D	I/D	I/D	I/D
Hexane	110-54-3	E	>8 hrs	N/D	E	>8 hrs	N/D	P	I/D	I/D	E	>6 hrs	N/D	E	I/D	I/D	I/D	I/D	I/D
Hydrochloric Acid (37%)	7647-01-0	E	>8 hrs	N/D	E	I/D	I/D	E	I/D	I/D	E	>6 hrs	N/D	E	>6 hrs	N/D	E	>6 hrs	N/D
Hydrofluoric Acid (48%)	7664-39-3	E	>8 hrs	0.013	G	I/D	I/D	F	I/D	I/D	I/D	I/D	I/D	G	1 hr	0.49	E	7 hrs	0.18
Hydrogen Chloride (gas)	7647-01-0	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Iodomethane	74-88-4	P	4 min	0.026	E	6.3 hrs	0.7	F	55 min	82	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Isobutyl Alcohol	78-83-1	E	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D
Isopropyl Alcohol	67-63-0	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	E	>6 hrs	N/D	E	>6 hrs	N/D	G	1.7 hrs	0.42
Ketohexamethylene	108-94-1	E	>8 hrs	N/D	P	29 min	86.3	E	>16 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	F	2.1 hrs	0.07
Methacrylic Acid	79-41-4	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	F	1.7 hrs	23	I/D	I/D	I/D
Methacrylonitrile	126-98-7	E	I/D	I/D	F	4 min	462	E	>8 hrs	N/D	I/D	I/D	I/D	P	7 min	560	I/D	I/D	I/D
Methanol	67-56-1	E	6 hrs	0.02	F	3 hrs	1	E	>8 hrs	N/D	I/D	I/D	I/D	F	32 min	11.8	F	19 min	1.97
Methenyl Trichloride	67-66-3	E	>8 hrs	N/D	E	9.5 hrs	0.46	I/D	I/D	I/D	I/D	I/D	I/D	P	4 min	352	I/D	I/D	I/D
Methyl Alcohol	67-56-1	E	6 hrs	0.02	F	3 hrs	1	E	>8 hrs	N/D	I/D	I/D	I/D	F	32 min	11.8	F	19 min	1.97
1-Methyl-4-tert-butylbenzene	98-51-1	E	>8 hrs	N/D	E	>8 hrs	N/D	F	1.78 hrs	8	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Methyl Cellosolve	109-86-4	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	F	55 min	13.2	F	45 min	0.56
Methyl Chloride	74-87-3	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	0.0013	I/D	I/D	I/D	I/D	I/D	I/D
Methyl Chloroform	71-55-6	E	>8 hrs	N/D	E	>15 hrs	N/D	P	I/D	I/D	I/D	I/D	I/D	P	37 min	76.4	I/D	I/D	I/D
Methyl Iodide	74-88-4	P	4 min	0.026	E	6.3 hrs	0.7	F	55 min	82	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Methylamine (40% in water)	74-89-5	F	46 min	1.28	E	>16 hrs	N/D	E	>15 hrs	N/D	F	1.7 hr	7	E	>8 hrs	N/D	I/D	I/D	I/D
Methylbenzene	108-88-3	E	>8 hrs	N/D	E	>16 hrs	N/D	P	6 min	511	I/D	I/D	I/D	P	11 min	68.1	P	3 min	82.2
Methylene Chloride	75-09-2	E	>8 hrs	N/D	F	1 hr	7.32	P	I/D	I/D	P	I/D	I/D	P	4 min	766	I/D	I/D	I/D
4,4-Methylene Dianiline	101-77-9	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	F	I/D	I/D	I/D	I/D	I/D
Monoethanolamine	141-43-5	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D
Morpholine	110-91-8	E	>8 hrs	N/D	G	1.9 hrs	97	E	>16 hrs	N/D	I/D	I/D	I/D	P	48 min	206	I/D	I/D	I/D
Naphtha	8052-41-3	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	E	>8 hrs	N/D	E	>6 hrs	N/D	I/D	I/D	I/D
n-Hexane	110-54-3	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	E	>6 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D
Nitrobenzene	98-95-3	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	F	29 min	1.7	P	7 min	8.4
Nitromethane	75-52-5	I/D	I/D	I/D	I/D	I/D	I/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	P	7 min	2.83
1-Nitropropane	108-03-2	E	>8 hrs	N/D	P	17 min	26.1	E	>8 hrs	N/D	I/D	I/D	I/D	P	12 min	29.5	I/D	I/D	I/D
n-Methyl-2-Pyrrolidone	872-50-4	I/D	I/D	I/D	I/D	I/D	I/D	E	8 hrs	N/D	I/D	I/D	I/D	F	1.45 hrs	0.388	F	1.26 hrs	3.14
n-Propyl Acetate	109-60-4	E	>8 hrs	N/D	I/D	I/D	I/D	F	2.7 hrs	2.86	I/D	I/D	I/D	P	17 min	72.5	I/D	I/D	I/D
Oxalic Acid	144-62-7	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	G	I/D	I/D	I/D	I/D	I/D

D = Degradation  
BT = Breakthrough Time  
PR = Permeation Rate

E = Excellent  
G = Good  
F = Fair  
P = Poor

N/D = None Detected  
I/D = Insufficient Data




 Good for total immersion  
 Good for accidental splash protection and intermittent contact  
 Only use with extreme caution. Glove will fail with only short exposure

		Silver Shield			Viton			Butyl			Chemsoft			Nitrile			Natural Rubber		
Chemical Name	CAS No.	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR	D	BT	PR
p-Dioxane	123-91-1	I/D	I/D	I/D	P	23 min	26.8	E	>20 hrs	N/D	I/D	I/D	I/D	P	28 min	77.1	I/D	I/D	I/D
Perchloric Acid (70%)	7601-90-3	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D
Perchloroethylene	127-18-4	E	>8 hrs	N/D	E	>17 hrs	N/D	P	I/D	I/D	F	1 hr	3.8	F	1.3 hrs	5.5	I/D	I/D	I/D
Perchloromethane	56-23-5	E	>8 hrs	N/D	E	>13 hrs	N/D	I/D	I/D	I/D	F	1.3 hrs	3.45	F	3.4 hrs	5	I/D	I/D	I/D
Phenol (85% in water)	108-95-2	E	>8 hrs	N/D	E	>15 hrs	N/D	E	>20 hrs	N/D	I/D	I/D	I/D	P	39 min	>1500	F	2.2 hrs	4.64
Phenylamine	62-53-3	E	>8 hrs	N/D	P	6 min	18.7	E	>8 hrs	N/D	I/D	I/D	I/D	F	1.1 hrs	45	I/D	I/D	I/D
Phosphoric Acid (85%)	7664-38-2	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D
Pimelic Ketone	108-94-1	E	>8 hrs	N/D	P	29 min	86.3	E	>16 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	F	2.1 hrs	0.07
2-Propanone	67-64-1	E	>8 hrs	N/D	P	2 min	383	E	>8 hrs	N/D	P	1 min	42.3	P	3 min	291	P	10 min	12.2
Propyl Acetate	109-60-4	E	>8 hrs	N/D	P	I/D	I/D	G	2.7 hrs	2.86	I/D	I/D	I/D	P	17 min	72.5	I/D	I/D	I/D
Propyl Alcohol	71-23-8	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	G	3.8 hrs	0.35	E	4.4 hrs	1.1	I/D	I/D	I/D
Propylene Oxide	75-56-9	I/D	I/D	I/D	P	1 min	1790	F	2.2 hrs	7	I/D	I/D	I/D	P	<6 min	>3.9	I/D	I/D	I/D
p-tert-Butyltoluene	98-51-1	E	>8 hrs	N/D	E	>8 hrs	N/D	F	1.78 hrs	8	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Pyridine	110-86-1	I/D	I/D	I/D	P	38 min	74	E	>8 hrs	N/D	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Sodium Hydroxide 50%	1310-73-2	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D
Stoddard Solvent	8052-41-3	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	E	>8 hrs	N/D	E	>6 hrs	N/D	I/D	I/D	I/D
Styrene	100-42-5	E	>6 hrs	N/D	E	>6 hrs	N/D	F	35 Mins	0.19	P	16 min	39	P	11 min	>3.35	I/D	I/D	I/D
Sulfuric Acid (50%)	7664-93-9	E	>6 hrs	N/D	E	I/D	I/D	E	I/D	I/D	G	>8 hrs	N/D	G	>6 hrs	N/D	G	>6 hrs	N/D
Sulfuric Acid (93%)	7664-93-9	E	>8 hrs	N/D	E	>8 hrs	N/D	E	>8 hrs	N/D	P	2 min	N/D	F	1.9 hrs	11.4	G	5.1 hrs	N/D
Tetrachloroethylene	127-18-4	E	>8 hrs	N/D	E	>17 hrs	N/D	P	I/D	I/D	F	1 hr	3.8	F	1.3 hrs	5.5	I/D	I/D	I/D
Tetrachloromethane	56-23-5	E	>8 hrs	N/D	E	>13 hrs	N/D	I/D	I/D	I/D	F	1.3 hrs	3.45	F	3.4 hrs	5	I/D	I/D	I/D
Tetrahydrofuran	109-99-9	E	>8 hrs	N/D	P	0 min	327	F	27 min	112	P	I/D	I/D	P	0 min	167	P	5 min	360
Thioglycolic Acid	68-11-1	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D	I/D
Toluene	108-88-3	E	>8 hrs	N/D	E	>16 hrs	N/D	P	6 min	511	P	I/D	I/D	P	11 min	68.1	P	3 min	82.2
Toluene Diisocyanate	584-84-9	E	>8 hrs	N/D	I/D	I/D	I/D	E	I/D	I/D	F	1 hr	2.52	G	I/D	I/D	I/D	I/D	I/D
1,1,1-Trichloroethane	71-55-6	E	>8 hrs	N/D	E	>15 hrs	N/D	P	I/D	I/D	I/D	I/D	I/D	F	37 min	76.4	I/D	I/D	I/D
Trichloroethylene	79-01-6	E	>8 hrs	N/D	E	7.4 hrs	0.24	P	14 min	550	I/D	I/D	I/D	P	4 min	283	P	<5 min	894
Trichloromethane	67-66-3	E	>8 hrs	N/D	E	9.5 hrs	0.46	I/D	I/D	I/D	I/D	I/D	I/D	P	4 min	352	I/D	I/D	I/D
Triethanolamine	102-71-6	I/D	I/D	I/D	I/D	I/D	I/D	E	>8 hrs	N/D	E	>8 hrs	N/D	I/D	I/D	I/D	E	>8 hrs	N/D
Triethylamine	121-44-8	I/D	I/D	I/D	E	>8 hrs	N/D	P	I/D	I/D	E	5.8 hrs	0.18	E	>8 hrs	N/D	I/D	I/D	I/D
Vinegar Naphtha	141-78-6	E	>8 hrs	N/D	P	I/D	I/D	E	7.6 hrs	3.4	I/D	I/D	I/D	P	8 min	145	I/D	I/D	I/D
Vinylstyrene	1321-74-0	E	>8 hrs	N/D	E	>17 hrs	N/D	F	2.2 hrs	238	I/D	I/D	I/D	P	I/D	I/D	I/D	I/D	I/D
Xylene	1330-20-7	E	>8 hrs	N/D	E	>8 hrs	N/D	P	I/D	I/D	P	I/D	I/D	P	21 min	18.5	I/D	I/D	I/D

D = Degradation  
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 Good for total immersion  
 Good for accidental splash protection and intermittent contact  
 Only use with extreme caution. Glove will fail with only short exposure



## Silver Shield®/4H® Chemical Protection Guide

A comprehensive listing of Permeation Rates and Breakthrough Times for North Silver Shield®/4H® Hazardous Chemical Gloves, Aprons, Sleeves and Booties against 280 Chemical Contaminants in two temperatures.

### TEST PROCEDURE

Chemical testing as per ASTM Standard F 739-91.

Detection limit: 0.1 µg / cm² / min.

Chemical testing as per EN 374: CE-0120.

### KEY TO BREAKTHROUGH AND PERMEATION RATE

NT - Not Tested

NC - Not Calculated

C - Known or suspected Carcinogen

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)	
		Break-Through Time minutes	Permeation Rate µg / cm² / minute	Break-Through Time minutes	Permeation Rate µg / cm² / minute
ACCUMIXR (mixture) N-Alkyl Dimethyl Benzyl Amm. Chloride	68391-01-5				
N-Alkyl Dimethyl Ethylbenzyl Amm. Chloride Water	68956-79-6 7732-18-5	> 240		NT	
Ethyl Alcohol	64-17-5				
Acetaldehyde	75-07-0	> 240		NT	
Acetic Acid 100%	64-19-7	> 480		53	2.4
Acetic Anhydride	108-24-7	> 480		> 240	
Acetone	67-64-1	> 1440		> 240	
Acetone/Petrol 1:1	67-64-1 8032-32-4	9	NC	3	NC
Acetone/Toluene/ Methylated Spirit/ Conc. Ammonia 2 : 1 : 1 : 1	67-64-1 108-88-3 — 7664-41-7	190	NC	40	NC

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JB## PI MYY

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)		
		Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	
Acetone/Water 20:80	67-64-1	> 240		> 240		
Acetonitrile	75-05-8	> 1440		> 240		
Acetonitrile 25% in water	75-05-8	> 240		> 240		
Acetophenone	98-86-2	> 480		> 240		
Acrolein	107-02-8	> 480		> 240		
Acrylamide 15% in MEK	79-06-1 78-93-3	> 240		> 240		C
Acrylamide Mixture n-n' methylenebisacrylamide	79-06-1 110-26-9	> 240		> 240		
Acrylate UV Lacquer (ethylacetate/butylacetate)	—	> 240		> 240		
Acrylic Acid	79-10-7	> 240		> 210	NC	
Acrylonitrile	107-13-1	> 480		> 240		C
AeroShell Fluid 4	—	> 240		> 240		
Allyl chloride	107-05-1	> 240		> 240		
Allylamine (propyleneamine)	107-11-9	15	NC	NT		
Ammonia Water 2N	7664-41-7	110	NC	40	NC	
Ammonia Water 25%	7664-41-7	> 240		30	NC	
Ammonium Fluoride 34%	12125-01-8	> 240		> 240		
Ammonium Hydroxide (29, 1 w/w%) in water	1336-21-6	> 240		> 240		
Aniline	62-53-3	> 1440		> 240		
BENLATER (BenomyI)	17804-35-2	> 240		NT		
Benzaldehyde	100-52-7	> 480		> 240		
Benzene	71-43-2	> 1440		> 240		C
3, 3', 4, 4' Benzophenone Tetracarboxylic Dianhydride	2421-28-5	> 240		NT		
Benzyl Alcohol	100-51-6	> 480		NT		
Benzyl Chloride	100-44-7	> 480		> 240		
Benzyl Cyanide	140-29-4	> 240		> 240		
n-Benzyl Dimethylamine	103-83-3	> 240		NT		
Bisphenol A diglycidyl Ether (EPOXY) 50% in MEK	1675-54-3 78-93-3	> 480		> 240		
Bromoacetic Acid	79-08-3	> 240		> 240		
Bromoacetonitrile	590-17-0	> 240		> 240		
2-Bromoacetophenone	70-11-1	> 240		> 240		
1-Bromoethylethyl Carbonate	89766-09-6	> 240		> 240		
1, 4-Butanediol diglycidyl ether 50% in MEK	2425-79-8 78-93-3	> 240		> 240		
n-Butanol	71-36-3	> 480		> 240		
sec-Butanol	78-92-2	> 480		> 240		
tert-Butanol	75-65-0	> 480		> 240		
n-Butyl Acetate	123-86-4	> 480		> 240		
Butyl Acrylate	141-32-2	> 480		> 240		
2-Butoxyethanol (butyl glycol)	111-76-2	> 240		> 240		
tert-Butyl Hydroperoxide	75-91-2	> 240		NT		
Butyraldehyde	123-72-8	> 480		> 240		
Carbon Disulfide	75-15-0	> 1440		> 240		
Carbon Tetrachloride	56-23-5	> 480		> 240		
Chlorine	7782-50-5	> 240		NT		
Chloroacetone	78-95-5	> 240		> 240		
2-Chloroethanol	107-07-3	> 240		> 240		
Chloroform	67-66-3	> 1440		> 240		C
Chloroform/ tert. Butanol 80 : 20	67-66-3 75-65-0	> 240		> 8		C

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)		
		Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	
Chloroform	67-66-3	> 240		> 240		C
w/30% Methanol	67-56-1					
3-Chloropropene	107-05-1	> 240		NT		
CLOVA THINNER #19 <sup>®</sup>						
Toluene 50%	108-88-3					
MEK 15%	78-93-3	> 240			NT	
Methanol 15%	67-56-1					
2-Butoxyethanol 10%	111-76-2					
Ethyl Acetate 10%	141-78-6					
Chromic Acid 50%	1333-82-0	> 240		> 240		
Chromic Acid/ Sulphuric Acid	1333-82-0 7664-93-9	> 240		> 240		
Coal Tar/ Benzene 1:1	— 71-43-2	> 240		> 240		C
Corrosive Fluid Dyrup 49685	—	102	NC	20	NC	
Creosote	8001-58-9	> 240		> 240		C
p-Cresol 50% in MEK	106-44-5 78-93-3					
Cyclohexane	110-82-7	> 480		> 240		
Cyclohexanol	108-93-0	> 480		> 240		
Cyclohexanone	108-94-1	> 480		> 240		
Cyclohexylamine 32%	108-91-8					
Morpholine 8%	110-91-8	> 240	NT			
Water 60%						
Cyclopentanone	120-92-3	> 240		> 240		
CYMBUSHR (Cypermethrin)	52315-07-8	> 240		NT		
DEEP WOODS OFF <sup>®</sup> (Mixture)						
N, N-Diethyltoluamide	134-62-3	> 240		NT		
Ethanol	64-17-5					
DEGALAN S 309 <sup>®</sup> (Mixture)	—	> 240		NT		
DEGALAN S 696 <sup>®</sup> (Mixture)	—	> 240		NT		
Diacetone alcohol	123-42-2	> 240		> 240		
4, 4'-Diaminodiphenyl- methane (MDA) 50% in MEK	537-65-5 78-93-3	> 480		> 240		C
1, 2-Dibromoethane	106-93-4	> 480		NT		
Dibutyl Ether	142-96-1	> 480		NT		
Di-n-Butyl Phthalate	84-74-2	> 240		> 240		
1, 3-Dichloro-2-Butene	926-57-8	> 240		NT		
1, 2-Dichlorobenzene	95-50-1	> 240		> 240		
1, 2-Dichloroethane	107-06-2	> 240		> 240		C
1, 1-Dichloroethylene	75-35-4	> 420		> 420		
Dichloromethane 90%	75-09-2					
Isopropyl Alcohol 10%	67-63-0	> 480		> 240		
Diethanolamine						
50% in Water	111-42-2	> 240		> 240		
n, n-Diethylacetamide	685-91-6	> 480		> 240		
Diethylamine	109-89-7	> 60	NC	6	NC	
Diethylenetriamine	111-40-0	> 240		NT		
Diethyl Ether	60-29-7	> 480		> 240		
N, N Diethyl nitrosoamine	55-18-5	> 240		NT		



Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)		
		Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	
Diethylphthalate (Phthalic acid diethylester)	84-66-2	> 240		NT		
Diisobutyl ketone	108-83-8	> 240		> 240		
Dimercapthiodiazole 10% in Butyldioxol/MEK 1:1	1072-71-5	> 240		> 240		
N, N Dimethyl- Cyclohexylamine	98-94-2	> 480		NT		
Dimethylmercury	593-74-8	60		NT		
Dimethyl Sulfoxide	67-68-5	> 480		194	2.2	
N, N-Dimethylacetamide	127-19-5	> 240		> 240		
2 – Dimethylamino - Ethanol	108-01-0	350		NT		
N, N-Dimethylaniline	121-69-7	> 240		> 240		
Dimethylethanolamine	108-01-0	> 240		> 240		
Dimethylethylamine	598-56-1	9	NC	2	NC	
Dimethylformamide	68-12-2	> 1440		> 240		
Dimethylsulphate	77-78-1	> 240		> 240		C
Dinol	—	> 240		NT		
Dinoseb (47, 6% in Xylene)	88-85-7 1330-20-7	> 240		> 240		
1, 4-Dioxane	123-91-1	> 480		> 240		C
Dipentene (limonen)	138-86-3	> 480		36		
2, 3-Diphenyl-2-cyclopropen- 1-one 2% Acetone	886-38-4 67-64-1	> 240		> 240		
w/10% Propyleneglycol	57-55-6					
Di-(2-ethylhexyl) phthalate	117-81-7	> 240		> 240		C
Diquat Dibromide	85-00-7	> 240		> 240		
Dodecane	112-40-3	> 480		> 240		
Dynasylan BH-N	—	> 480		NT		
Epichlorohydrin	106-89-8	> 240		> 240		C
EPOXIDHARZ-KLEBSTOFF® Schüco art. 298011 A	—	> 240		> 240		
EPOXIDHARZ-KLEBSTOFF® Schüco art. 298011 B	—	> 240		> 240		
Ethanol 96%	64-17-5	> 480		> 240		
Ethanolamine	141-43-5	> 480		> 240		
Ethidium Bromide	1239-45-8	> 480		NT		
2-(2-Aminoethoxy)ethanol	929-06-6	> 240		> 240		
2-Ethoxy-1-Propanol	19089-45-5	> 240		> 240		
Ethyl Acetate	141-78-6	> 1440		> 240		
Ethyl Acrylate	140-88-5	> 240		> 240		C
Ethyl Benzene	100-41-4	> 480		> 480		
Ethyl Glycol	110-80-5	> 240		> 240		
Ethyl Glycol Acetate	111-15-9	> 240		> 240		
Ethylendiamine	107-15-3	92	NC	47	NC	
Ethylene Glycol	107-21-1	> 240		> 240		
Ethylene Oxide	75-21-8	> 240		NT		
Extraction petrol 80/110	—	> 240		> 240		
Fluoroboric solution: Hydrofluoric acid	7664-39-3	> 240		NT		
Boric acid	10043-35-3					
Nitric acid	7697-37-2					
Formaldehyde	50-00-0	> 240		> 240		
Formaldehyde 37% w/10% Methanol	50-00-0 67-56-1	> 480		> 240		C

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)		
		Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	
Formic Acid 98-100%	64-18-6	120	NC	60	NC	
Freon 113	76-13-1	> 240		> 240		
Furfural	98-01-1	> 480		> 240		
Furfuryl Alcohol	98-00-0	> 480		> 240		
GammaButyrolactone Merck 801661	96-48-0	> 480		NT		
GLANCER (mixture)	—	> 240		NT		
Glutardialdehyde 2% in Water	111-30-8	> 240		> 240		
Glutardialdehyde 25% in Water	111-30-8	> 240		> 240		
Glycerol	56-81-5	> 240		> 240		
Glycerol Monothioglycolate 80%	30618-84-9	> 240		NT		
Glycerolpropoxy-triacrylate	—	> 240		> 240		
GLUMA	—	> 240		NT		
Heptane	142-82-5	> 480		> 240		
1, 1, 1, 3, 3, 3 – Hexamethyl Disilazane	999-97-3	> 240		> 240		
n-Hexane	110-54-3	> 1440		> 240		
Hexane/Benzene 9:1	110-54-3 71-43-2	> 240		> 240		C
Hydraulic oils	—	> 240		> 240		
Hydrazin 80%	7803-57-8	> 240		> 240		C
Hydrocarbon Mixture (K-Blend)	—	> 240		NT		
Hydrochloric Acid 2N	7647-01-0	> 240		> 240		
Hydrochloric Acid 37%	7647-01-0	> 240		NT		
Hydrochloric Acid 37% /Nitric Acid 65% 3:1	7647-01-0 7697-37-2	> 240		> 240		
Hydrofluoric Acid 10%	7664-39-3	> 240		120	NC	
Hydrofluoric Acid 30%	7664-39-3	> 240		120	NC	
Hydrofluoric Acid 40%	7664-39-3	> 240		120	NC	
Hydrofluoric Acid 49%	7664-39-3	> 240		30	NC	
Hydrofluoric Acid 70%	7664-39-3	60	NC	30	NC	
Hydrofluoric Acid 100%	7664-39-3	15				
Hydrogen Cyanide	74-90-8	> 240		NT		
Hydrogen Peroxide 30%	7722-84-1	> 240		NT		
Hydroquinone 33% in Ethanol	123-31-9 64-17-5	> 240		> 240		
2-Hydroxy-Methacrylate (HEMA)	868-77-9	> 240		NT		
2-Hydroxyethyl-N, N, N- Trimethyl ammonium Hydroxid	—	> 240		> 240		
2-Hydroxyethyl Acrylate	818-61-1	> 240		> 240		
IMRON 192R	—	> 240		NT		
S/Hexamethylene Diisocyanate 37%	—	> 240				
Isobutanol	78-83-1					
Isopentylalcohol/ Chloroform 1:24	123-51-3 67-66-3	176	NC	40	NC	C
Isophorone	78-59-1	> 240		> 240		
Isopropanol	67-63-0	> 240		> 240		
Isopropyl Nitrate	1712-64-7	> 240		NT		
Jet Fuel (Jet A-1/Shell)	—	> 240		> 240		

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)		
		Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	
KOVAC'S INDOLREAGENT®	—	> 240		> 240		
Lubricat. Oil, DTE 25	—	> 240		> 240		
Malathion	121-75-5	> 240		NT		
2-Mercaptoethanol	60-24-2	> 240		> 240		
Mercury (Hg)	7939-97-6	> 480		NT		
Methacrylic Acid	79-41-4	> 480		> 240		
Methacrylic Adhesive	—	> 240		> 240		
Methanol	67-56-1	> 480		30	1.6	
1-Methoxy-2-Propanol	107-98-2	> 240		> 240		
1-Methoxy-2-Propylacetate	108-65-6	> 240		> 240		
2-Methoxyethanol	109-86-4	> 240		> 240		
2-Methoxyethyl-Acetate	110-49-6	> 240		> 240		
Methyl Acetate	79-20-9	> 480		> 240		
Methyl Ethyl Ketone (MEK)	78-93-3	> 1440		> 240		
Methyl Ethyl Ketone/ Toluene 1:1	78-93-3 108-88-3	114	NC	9	NC	
5-Methyl-2-Hexanone (Methyl Isoamyl Ketone)	110-12-3	> 480		> 240		
Methyl Isobutyl Ketone	108-10-1	> 480		> 240		
Methyl Methacrylate	80-62-6	> 480		> 480		
5-Methyl-5-Norbornene 2, 3-Dicarboxylic Anhydride (Methyl Nadic Anhydride)	25134-21-8	> 240		NT		
Methyl-pentyl-ketone	110-43-0	> 240		> 240		
Methyl n-propyl Ketone (2-Pentanone)	107-87-9	> 480		NT		
N-Methyl-2-Pyrrolidone	872-50-4	> 240		> 240		
Methyl-tert-Butyl Ether	1634-04-4	> 480		NT		
Methyl Trichlorosilane	75-79-6	> 240		NT		
Methylamine 40%	74895	> 240		80	1.3	
4, 4' -Methylene bis (MOCA, MBOCA or MBOCHA) (2-Chloroaniline) 50% in Acetone	101-14-4 67-64-1	> 240		NT		C
Methylene Bisphenyl- 4, 4-diisocyanate (MDI)	101-68-8	> 480		> 240		
Methylene Chloride	75-09-2	> 1440		> 240		C
4, 4' -Methylenedianiline 10% in Isopropyl alcohol	537-65-5 67-63-0	> 240		NT		
Methylenedianiline 50% in MEK (MDA)	537-65-5 78-93-3	> 480		NT		C
Methyliodide	74-88-4	123	NC	8	NC	
Mixture of: N-Methyl Pyrrolidone Butyrolactone Styrene	872-50-4 96-48-0 100-42-5	> 480		> 480		
Mixture of: Methylene Chloride 20% Trichlorethylene 20% Xylene 45% Mineral Spirits 15%	75-09-02 79-01-06 1330-20-7 8032-32-4	> 240		> 240		
Mixture of: MEK 66% Cyclohexanone 24% Toluene 10%	78-93-3 108-94-1 108-88-3	> 480		NT		

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)		
		Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	Break-Through Time minutes	Permeation Rate µg / cm <sup>2</sup> / minute	
Mixture of: 1, 3-Phenylenediamine 30% Ethylacetate 70%	108-45-2 141-78-6	> 480		NT		
Mixture of: Toluene 50% Isopropylalcohol 25% Methylethylketone 25%	108-88-3 67-63-0 78-93-3	> 480		NT		
Morpholine	110-91-8	> 480		94	2.5	
Mustard Gas	505-60-2	> 1440		> 1440		C
N35091 Cleaning agent	—	> 480		NT		
N 39/3010 Thinner	—	> 480		NT		
Naphthalene 25% in Toluene	91-20-3	> 240		> 240		
1-Naphthylamine 25% in Isopropanol	134-32-7	> 240		> 240		
Nicotine	54-11-5	> 240		> 240		
Ninhydrin 4% in 2-Methoxyethanol	485-47-2	> 240		> 240		
Nitric Acid 2N	7697-37-2	> 480		> 240		
Nitric Acid 65%	7697-37-2	> 40		NT		
Nitric Acid 100% (red fuming)	7697-37-2	180	NC	60		
Nitrobenzene	98-95-3	> 1440		> 240		
2-Nitrobenzylbromide	3958-60-9	> 240		> 240		
4-Nitrodiphenylamine	119-75-5	> 240		> 240		
Nitroethane	79-24-1	> 480		> 240		
Nitroglycerol	55-63-0	> 240		NT		
Nitroglycol	628-96-6	> 240		NT		
Nitromethane	75-52-5	> 480		> 240		
2-Nitropropane	79-46-9	> 240		> 240		C
O-Toluidine	95-53-4	> 480		> 480		
Orthocid 83	133-06-2	> 240		NT		
KVK PARATHION 35R	—	> 240		NT		
PAINTSTRIPPER D23® 30% in Dichloromethane	—	200	NC	NT		
PCB 12/60 Chloric	1336-36-3	> 240		> 240		C
Pentane	109-66-0	> 480		> 240		
Perchloric Acid 70%	760 1-90-3	> 240		> 240		
Perchloroethylene	127-18-4	> 480		> 480		C
PERGA KAN® Domo/Master A/S - DK	—	> 240		> 240		
PERMA FLUID "MICA" (8% Ammonia Thioglycolate)	—	> 240		> 240		
Petroleum (Gasoline) 95 & 96 unleaded/leaded	93572-29-3	> 240		> 240		
Petroleum (Gasoline) (Shell specialty)	—	> 240		> 240		
80% Petroleum 20% n-Methyl-2-pyrrolidon	— 872-50-4	> 240		> 240		
Petroleum ether 80/110	8032-32-4	> 480		> 480		
Phthalic Acid Anhydride	85-44-9	> 240		NT		
Phenol 50% in MEK	108-95-2 78-93-3	> 240		> 240		

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		Break-Through Time minutes	Permeation Rate µg / cm² / minute	Break-Through Time minutes	Permeation Rate µg / cm² / minute	
Phenol/Isopentanol/ Chloroform 25:1:24	108-95-2 123-51-3 67-66-3	130	NC	70	NC	C
Phosphoric Acid 85%	766-38-2	> 240		> 240		
Phosphorylic Chloride	10025-87-3	> 240		> 240		
PHOTO RESIST 1450® (INMOS)	111-15-9 1330-20-7 123-86-4	> 240		> 240		
3-Picolyl Chloride Hydrochloride 25% in water	6959-48-4	> 240		> 240		
3-Picolyl Chloride Hydrochloride/ Acetonitrile/water 4:3:9	6959-48-4 75-05-8	> 240		> 240		
4-Picolylchloride hydrochloride	1822-51-1	> 240		> 240		
Polyethyleneglycol	25322-68-3	> 480		NT		
Polyol mixture	—	> 480		NT		
Posistrip LE, (INMOS)	110-91-8 96-48-0 872-50-4	> 240		> 240		
Potassium Hydroxide 50%	1310-58-3	> 240		> 240		
Potass. Permanganate Solution, Saturated	7722-64-7	> 240		NT		
PRAMITOLR	1610-18-0	> 240		NT		
PRO STRIPR (Mixture): Monoethanolamine Glycol Ether Isopropanol Polyoxyethylene Phenylether Phosphate Ammonium Hydroxide	141-43-5 111-76-2 67-63-0 39464-70-5 1336-21-6	> 240		NT		
1-Propanol	71-23-8	> 240		> 240		
Propiophenone	93-55-0	> 240		> 240		
Propyl Acetate	109-60-4	> 480		> 240		
Propylene Glycol	57-55-6	> 240		> 240		
Propylene Glycol Morioethyl Ether Acetate	19234-20-9	> 240		> 240		
1, 2-Propylene Oxide	75-56-9	> 480		NT		
1, 2-Propylene Oxide in Water	75-56-9	> 240		26	3.0	C
Propyzamide 50% (Kerb 50®) 10% suspended in Water	23950-58-5	> 240		NT		
Pyridine	110-86-1	> 480		> 240		
PYROTEC HFD 46R	—	> 240		NT		
Quinoline	91-22-5	> 240		> 240		
REGLONER	85-00-7	> 240		NT		
830 RESIST STRIPPERR (INMOS)	929-06-6 872-50-4	> 240		> 240		
ROUNDUP® Glyphosat-isopropylamine derivate 450 g/l	38641-94-0	> 240		NT		
SADOFOS PRIMER® 17	—	> 240		> 240		
SADOFOS PRIMER® 513	—	> 240	64	NC		

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)		
		Break-Through Time minutes	Permeation Rate µg / cm² / minute	Break-Through Time minutes	Permeation Rate µg / cm² / minute	
Silver Cyanide 4%	506-64-9	> 240		NT		
SKYDROL® (mix of Tributyl phosphate/ Dibutylphenolphosphate)	126-73-8	> 480		NT		
Sodium Hydroxide 2N	1310-73-2	> 1440		> 240		
Sodium Hydroxide 50%	1310-73-2	> 480		> 240		
Sodium Hydroxide 96-98%	1310-73-2	> 480		NT		
Sodium Hypochlorite 15% in Water	7681-52-9	> 240		> 240		
SOLMASTER® Methylene Chloride/Ethanol	—	> 240		> 240		
STAR THINNER 7040® Xylene/Butylglycol	1330-20-7 111-76-2	> 240		> 240		
Styrene	100-42-5	> 1440		> 240		
Sulphuric Acid 90%	7664-93-9	> 480		> 240		
Sulphuric Acid 93%	7664-93-9	> 1440		NT		
Sulphuric Acid 96% w.65% SO <sub>3</sub> (oleum)	7664-93-9	120	NC	30	NC	
Sulphuric Acid 2N	7664-93-9	> 240		> 240		C
Sulphuric Acid 96% Hydrogen Peroxide 30% 3:1	7664-93-9 7722-84-1	> 480		NT		
Tetrachloroethylene	127-18-4	> 1440		> 240		
Tetraethyl Orthosilicate	78-10-4	> 480		> 480		
Tetrafluoroboric Acid (HBF <sub>4</sub> ) 35%	16872-11-0	> 240		NT		
Tetrahydrofuran	109-99-9	> 480		> 240		
Tetrahydrofuran 50% Toluene 50%	109-99-9 108-88-3	89	NC	NT		
Tetramethyl Ammonium Hydroxide in water	75-59-2	> 240		> 240		
Thioglycolic Acid	123-93-3	> 240		> 240		
Thiourea 7, 5% in 50% Ethanol	62-56-6 64-17-5	> 240		> 240		
Toluene	108-88-3	> 1440		> 240		
Toluene-2, 4-Diisocyanate TDI 40% in Xylene	584-84-9 1330-20-7	> 480		> 240		
Toluene Isopropanol 1:1	108-88-3 67-63-0	> 240		> 240		
Transformer Oil Nytro 10X, Nynås/Oslo	—	> 240		> 240		
Transmission Oil Opel, Dextron GM 6137M	—	> 240		> 240		
Tributylphosphate	126-73-8	> 240		> 240		
1, 1, 1-Trichloroethane	71-55-6	> 480		> 240		C
1, 1, 1-Trichloroethane w. 3% 1, 4-Dioxane	71-55-6 123-91-1	> 240		> 240		
1, 1, 1-Trichloroethane /Ethanol/Turpentine amounts unknown	71-55-6 64-17-5 8006-64-2	> 240		NT		
1, 1, 1-Trichloroethane 73% Methylene Chloride 17% Dodecylbenzensulphonic acid 10%	71-55-6 75-02-9 2776-87-0	> 240		NT		
1, 1, 1-Trichloroethane/ Propyleneglycolmono- ethyletheracetate 3:1	71-55-6 19234-20-9	> 240		>240		
Trichloroethylene	79-01-6	> 1440		> 240		

Chemical	C A S Reg. No.	21° C (70° F)		35° C (95° F)	
		Break-Through Time minutes	Permeation Rate µg / cm² / minute	Break-Through Time minutes	Permeation Rate µg / cm² / minute
Triethanolamine 50% in Water	102-71-6	> 240		> 240	
Triethylenediamine	280-57-9	> 480		NT	
Triethylendiamine 25% in Water	280-57-9	> 240		220	NT
Triethylene Tetramine (TETA) 50% in MEK	112-24-3 78-93-3	> 240		> 240	
Trifluoroacetic Acid	76-05-1	> 240		> 240	
Triphosgene	32315-10-9	> 240		> 240	
Tripropylene glycol Diacrylate	42978-66-5	> 240		> 240	
TURCO 5092* (Stripping agent)	—	132	NC	28	NC
U-V RESIN 20074*	—	> 240		> 240	
Vinyl Acetate	108-05-4	> 480		> 240	
Vinyl Chloride 99%	75-01-4	> 480		> 480	
N-Vinylpyrrolidone	88-12-0	> 240		> 240	
White Spirit (Naphtha)	8052-41-3	> 480		> 240	
XYLAMON®	—	> 240		NT	
Xylene	1330-20-7	> 1440		> 240	
Xylene/Ethyl Glycol 1:1	1330-20-7, 110-80-5	> 240		> 240	

*All product or corporate names listed as trademarks or registered trademarks are the property of their respective companies.*



# EPA Region 5 Superfund and Emergency Management Division Response Capabilities

This catalog provides an overview of the EPA Region 5 Superfund and Emergency Management Division's (SEMD) capabilities for the local, State, Tribal and Federal response communities.

## Superfund Overview

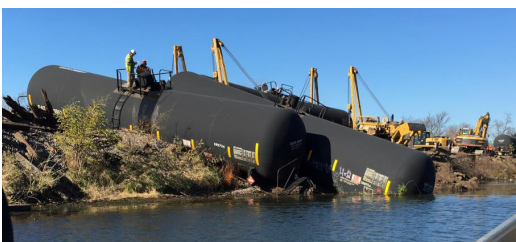
The Superfund program was created in 1980 when Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), amended in 1986 by the Superfund Amendments and Reform Act (SARA). These laws created a program to clean up abandoned or uncontrolled hazardous waste sites that pose a threat to human health or the environment. It made "potentially responsible parties" (owners, operators, or transporters to the facility, also known as PRPs) retroactively, jointly, and severally responsible for cleaning up the sites. For those sites where the PRPs cannot be found, are bankrupt, or refuse to perform the cleanup, it created a separate Federal fund (the "Superfund") for the U.S. Environmental Protection Agency (EPA) to carry out the cleanup.



## What Type of Emergency Response or Cleanups does EPA Conduct?

*Emergency responses that must be addressed immediately, such as:*

- Derailed train cars containing hazardous chemicals
- Fires containing hazardous materials
- Traffic incidents involving hazardous materials spills
- Chemical or mercury spills
- Chemical air releases where air monitoring is required
- Potable water system contamination





## Reimbursement to Local Governments for Emergency Response to Hazardous Substance Releases

In the event of a release of hazardous substances, EPA may reimburse local governments for expenses related to the release and associated emergency response measures. The Local Governments Reimbursement (LGR) Program provides a “safety net” of up to \$25,000 per incident to local governments that do not have funds available to pay for response actions. For more information, including details on eligibility and how to apply for reimbursement: <https://www.epa.gov/emergency-response/local-governments-reimbursement-program>

## Superfund Local Government Reimbursement Program

- Alleviates financial burden on local governments
  - Town, township, city, municipality, parish, county
  - Federally-recognized Indian Tribe
- Reimbursements provided for:
  - Rental or leasing of equipment
  - Special technical and laboratory services
  - Evacuation services
  - Replacement of equipment lost or destroyed

## Time-critical removals

Time-critical removals are defined as sites that should be cleaned up within a few months of discovery. In most communities typical time-criticals are:

- Abandoned hazardous waste sites including plating waste or unknown drums, tanks or other containers
- Vapor intrusion sites
- Lead or chemical contaminated soil sites, especially in residential settings

Removal sites are managed by an On-Scene Coordinator (OSC), often supported by EPA contractors and in coordination with local officials.



## Oil Spill Response

Since CERCLA explicitly excluded cleanup of petroleum-only releases, those sites (if the release threatens a navigable water) are handled by OSCs under the Oil Pollution Act (OPA) of 1990. The OPA has its own appropriation, including funding received from the U.S. Coast Guard National Pollution Fund Center. The OPA, which is a part of the Clean Water Act (CWA), strengthened EPA's ability to prevent and respond to catastrophic oil spills. A fund is available to EPA and the Coast Guard to clean up oil spills when the responsible party is incapable or unwilling to do so. The OPA also requires the development of Area Contingency Plans to prepare and plan for oil spill response on a regional scale. EPA Region 5 maintains a staff of Area Planners dedicated to this work.







## How to Contact EPA for Oil and Hazardous Substance Response

The National Response System (NRS) is a mechanism routinely and effectively used to respond to a wide range of oil and hazardous substance releases. It is a multi-layered system involving individuals and teams from local, State, Tribal, and Federal agencies, as well as industry and other organizations.

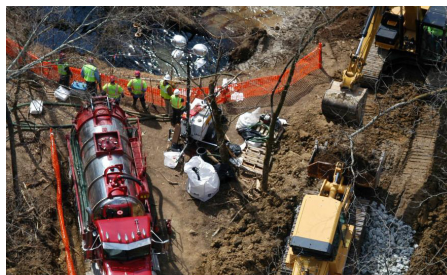
At the heart of the system is the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The NCP outlines the process to ensure that the Federal government's resources and expertise are available immediately for response actions that are beyond the capabilities of local and State responders. The NCP provides the framework for the NRS and establishes how it works.

The National Response Center (NRC) is a part of the Federally established National Response System and staffed 24 hours a day at 1-800-424-8802.

It is the designated Federal point of contact for reporting all oil, chemical, radiological and biological discharges into the environment, anywhere in the United States and its territories.

Reports to the NRC activate the

NCP and the Federal government's response capabilities. It is the responsibility of the NRC staff to notify the pre-designated OSC assigned to the area of the incident and to collect available information on the size and nature of the release, the facility or vessel involved, and the party or parties responsible for the release.



## Superfund Program in Region 5



EPA manages its programs through ten regional offices across the country. Region 5 is responsible for the following six Midwestern states: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin. Within the Regional office located in Chicago, the program is handled by the Superfund and Emergency Management Division (SEMD), which includes OSCs managing emergency responses and time-critical removal actions and Remedial Project Managers managing NPL sites.







## Region 5 Emergency Response Branch

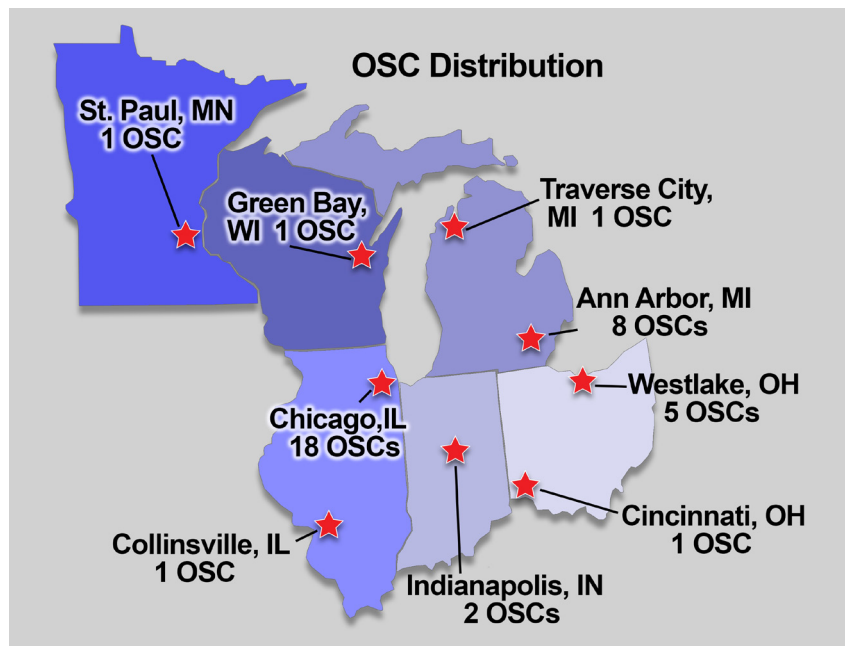
Region 5 maintains 38 Level A response-ready OSCs, who have also received advanced training in biological, chemical, and radiological terrorism response, as well as training in advanced Incident Command System (ICS) operations. The Regional office also has “reach back” capacity to activate several hundred additional emergency trained staff with a wide range of specialized skills and expertise.

Emergency response has recognized the value and benefit of having OSCs work in close proximity to the communities they serve. OSCs stationed in the field develop effective working relationships with local and State responders. They also enhance the understanding of multi-government roles and capabilities during coordinated response actions.



### Region 5 has OSCs stationed in 11 locations:

- Chicago, Illinois
- Des Plaines, Illinois
- Collinsville, Illinois
- Willowbrook, Illinois
- Indianapolis, Indiana
- Ann Arbor, Michigan
- Traverse City, Michigan
- St Paul, Minnesota
- Cincinnati, Ohio
- Westlake, Ohio
- Green Bay, Wisconsin



Region 5 has increased its total number of field offices. It places 26 OSCs in field offices—over half of all OSCs in Region 5. Superfund emergency response and the Region have already benefited from these recent field offices. Over the past several years, local and State governments referred an unprecedented number of response and removal actions to these offices.



## Removal Program in Region 5

Since the program began in 1980, Region 5 has performed or overseen removal actions at 2,234 sites. Over the past 10 years, there were 546 removal cleanups (emergency responses, time-critical removals, and non-time-critical removals). During this time, the program has worked to increase the number of PRPs leading cleanups, increasing the percentage of PRP-lead completions from 23% in the last 10 years.





## USEPA REGION 5 (For Reproduction Use) FIELD EQUIPMENT CATALOG

(IL: Willowbrook, Chicago; RI: Plainfield, Narragansett; ME: Grosse Ile, Traverse City; OH: Westlake, Cincinnati; IN: Indianapolis; WI: Green Bay; MN: St. Paul)



## Region 5 Response Equipment

EPA Region 5 maintains a vast array of specialized emergency response (ER) and removal equipment to support the health and safety of OSCs and the program's overall response mission. Equipment is distributed across hub and outstationed OSC locations throughout Region 5.

Response equipment includes:

- ER health & safety (personal protection equipment)
- Real-time detection instruments for chemicals, dust, mercury
- ER chemical warfare agent/detectors
- Real-time radiation meters
- Weather station
- Air sampling equipment
- Field communication (radios and satellite phones)
- Transportation (mobile command post, ATV, air trailer)
- Specialized equipment such as chemical identifiers, thermal imaging cameras



## Disaster Response and the National Response Framework

The National Response Framework (NRF) is a guide to how the U.S. responds to all types of disasters and emergencies. It is built on scalable, flexible, and adaptable concepts identified in the National Incident Management System (NIMS) to align key roles and responsibilities across the nation. The NRF describes specific authorities and best practices for managing incidents that range from the serious but purely local to large-scale terrorist attacks or catastrophic natural disasters. The NRF provides coordinating mechanisms to bring in additional agencies and components as they are needed.

The NRF's Emergency Support Function Annexes (ESFs) group capabilities and resources into functions most likely needed during an Incident of National Significance. A large-scale natural disaster or significant terrorist incident can require the activation of many ESFs. A localized flood or tornado might only require activation of a few ESFs. Each ESF has one or two coordinating federal agencies that are in charge of orchestrating federal support and managing staff and resources for that functional area, and additional agencies that have supporting roles. For example, during the Hurricane Katrina in 2005, EPA managed ESF #10 (oil and hazardous waste materials recovery) across several states.

## National Response Framework



Homeland Security







## Emergency Support Function #10 – Oil & Hazardous Materials Response Annex

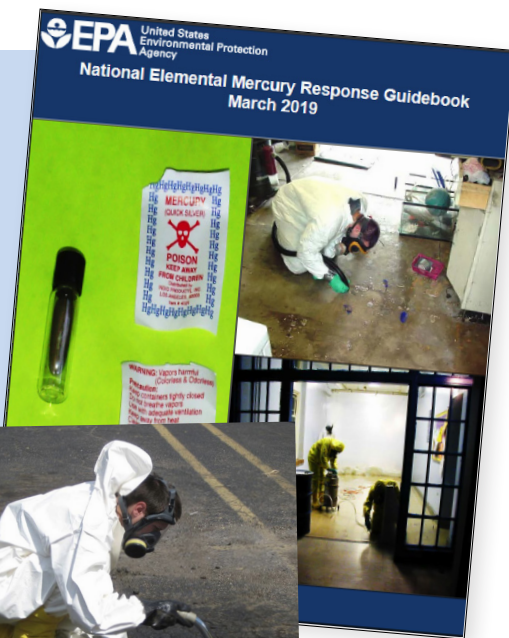
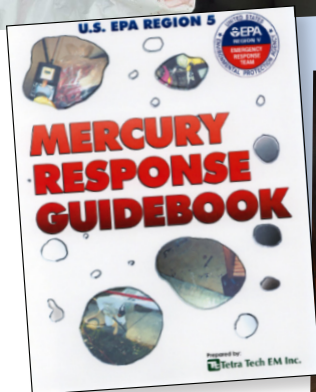
EPA and the Department of Homeland Security/U.S. Coast Guard are the primary agencies for overseeing Emergency Support Function ESF #10- Oil and Hazardous Materials Response Annex under the National Response Framework. ESF #10 provides a coordinated federal response to actual or potential oil and hazardous materials incidents. Response under ESF #10 occurs when there has been a Presidential Disaster Declaration under the Stafford Act or there is a need to support a response under the NCP, with additional resources.

## Does EPA Respond to Mercury Spills?



### Mercury Response

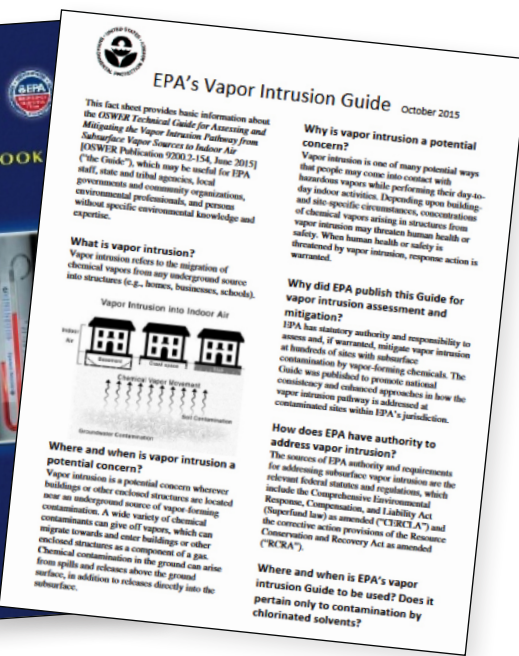
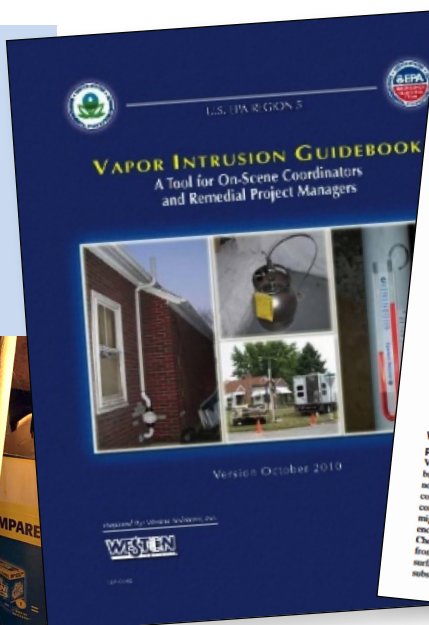
Region 5 OSCs respond to mercury spills in schools, homes and businesses that pose a threat of release to the environment. Our OSCs have developed regional guidance and participated in the development of the National Mercury Response Guidebook.



## What About Vapor Intrusion Sites?

### Vapor Intrusion Response

EPA has responded to Vapor Intrusion sites where an exposure pathway has been documented linking subsurface contamination from a source to residential indoor air. Examples include former dry-cleaners and solvent contaminated sites.





## Emergency Response Training for Railroad Incidents

EPA Region 5 OSCs, working with U.S. Department of Transportation, U.S. Coast Guard, local, State and Tribal responders, and Class I railroads have updated and delivered the Transportation Rail Incident Preparedness and Response (TRIPR) training course to first responders in 15 locations since 2016. The new TRIPR training curriculum includes discussion of risk-based incident response principles, use of Incident Command System (ICS) at responses, recent railroad case studies of crude-by-rail incidents, and an interactive panel discussion involving responders and railroads. Since 2016, over 1,600 local and State emergency managers, firefighters, hazmat technicians, public health professionals, and law enforcement officials have participated in the 8-hour training sessions.



### TRANSPORTATION RAIL INCIDENTS PREPAREDNESS AND RESPONSE TRAINING

**JANUARY 25, 2017**

WAYNE COUNTY  
COMMUNITY COLLEGE DISTRICT  
DOWNRIVER CAMPUS AUDITORIUM  
21000 NORTHLINE ROAD  
TAYLOR, MI 48180

The Transportation Rail Incidents Preparedness and Response (TRIPR), Flammable Liquid Unit Trains event was developed to provide critical information on best practices related to rail incidents involving hazard class 3 flammable liquids, such as crude oil and ethanol. A key component of this initiative is to learn from past experiences and to leverage the expertise of public safety agencies, rail carriers, and industry subject matter experts in order to prepare first responders to safely manage incidents involving flammable liquids unit trains. More information is available at: <http://www.epa.gov/region5/tripr>

To attend this training event, please RSVP using this link: <http://www.epa.gov/region5/tripr> by January 13, 2017.

Logistics and additional registration information will be provided in advance of the training date.

**FREE TRAINING**  
FOR FIRE  
DEPARTMENT,  
LEPC, EMA AND  
FIRST  
RESPONDERS

**FIRST OFFERING**  
OF NATIONALLY  
DEVELOPED  
TRAINING IN MI

**8 HOUR TRAINING**  
FOR FIRST  
RESPONDERS IN  
COMMUNITIES  
WITH RAIL  
TRAFFIC

**TRAINING  
DEVELOPED AND  
PROVIDED BY:**

## Homeland Security/Counter-Terrorism

Since 1998, EPA Region 5 has been acquiring assets and developing tactical approaches to respond to incidents involving intentional chemical, biological, radiological, and nuclear (CBRN) releases. In addition, EPA has developed a Homeland Security program to assist local and State partners prepare for potential incidents through research, planning, and pre-deployments. EPA Region 5 has extensive experience in cleaning up and assisting with the recovery of CBRN, nationally significant events, and high-hazard incidents.

### EPA CBRN and Homeland Security activities and resources

#### CBRN Preparedness and Response:

- Specialized equipment including multi-media monitoring and laboratory assets
- Cleanup guidance
- Treatment and disposal guidance
- Emerging research

#### Homeland Security Preparedness:

- Integrated planning between Federal agencies and EPA regions
- Participation in local, statewide, and nationwide exercises
- Pre-deployment support to key events (political conventions, major sporting events)





## National Special Teams available to support EPA and stakeholders



### Environmental Response Team

The Environmental Response Team (ERT) is a national group of EPA technical experts who provide around-the-clock assistance at the scene of hazardous substance releases. ERT offers expertise in such areas as oil spill response, air monitoring, hydrology, geology, and engineering. ERT can

provide support to the full range of emergency response actions, including unusual or complex emergency incidents. In such cases, ERT can bring in specialized equipment and experienced responders, and can provide an EPA On-Scene Coordinator or lead responder with experience and advice. The ERT Warehouse is in the Cincinnati, Ohio area.



### Radiological Emergency Response Team

The Radiological Emergency Response Team (RERT) is a specialized unit that responds to emergencies requiring the cleanup of radioactive substances. RERT provides onsite and lab-based radiation risk monitoring services.



### Consequence Management Advisory Division

The Chemical, Biological, Radiological, and Nuclear Consequence Management Advisory Division (CBRN CMAD) provides scientific support and technical expertise for decontamination of buildings, public infrastructure, and agriculture. CMAD also provides specialized expertise, such as health physics, toxicology, HVAC engineering, and industrial hygiene.

Based near Dallas Texas, and able to deploy within one hour of notification, ASPECT is the nation's only airborne real-time chemical and radiological detection, infrared and photographic platform available to assist local, national, and international agencies. ASPECT is available 24/7/365 and can collect data at any site in the continental U.S. within 9 hours.



### National Criminal Enforcement Response Team

The Office of Criminal Enforcement, Forensics, and Training's National Criminal Enforcement Response Team (NCERT) supports environmental crime investigations involving chemical, biological, or radiological releases to the environment. NCERT's specially trained law enforcement officers collect forensic evidence within contaminated zones, serve as liaisons with other agencies, and provide protective escorts to EPA's OSCs, contractors, and other EPA special teams during national emergencies.



## Region 5 Emergency Operation Center

The Region 5 Emergency Operations Center (EOC) is the central command and control hub responsible for managing emergency preparedness and emergency response at a strategic level. Located at EPA's R5 Chicago office, the EOC is designed to ramp up when warranted by emergency circumstances.

The EOC assists with disseminating information, and deploying and tracking field assets, including EPA Region 5 personnel. The EOC also collects, gathers, and analyzes data; and disseminates information to all responders, agencies, and communities involved in the emergency response.

## Incident Command System/Incident Management Team

The Incident Command System (ICS) provides a standardized incident management approach used by all levels of government—local, State, Tribal, and Federal. ICS integrates resources and provides a coordinated response among jurisdictions to hazardous incidents of regional or national scope. EPA has used ICS for response actions under its CERCLA, OPA, and Stafford Act authorities (i.e., hazmat incidents, oil spills, and natural disaster response).

EPA Region 5's Regional and sub-area contingency plans identify a National Incident Management System-type ICS as the response management system to be implemented.

EPA Region 5 maintains a fully staffed Incident Management Team (IMT) that may be mobilized to any point within the Region within 12 to 24 hours. In addition, most Region 5 OSCs have been trained and exercised as Division/Group Supervisors.





EPA conducts inspections at oil storage facilities to determine compliance with the Clean Water Act's Spill Prevention, Control, and Countermeasure (SPCC) regulation. SPCC helps facilities prevent oil releases from reaching navigable waters and adjoining shorelines. The SPCC team works with facilities to ensure that they correct violations identified during inspections.



The Region 5 Regional Response Team (RRT5) is comprised of members from State and Federal agencies and Tribes committed to working collaboratively to minimize oil and chemical incidents that affect human health and safety, as well as the environment. RRT5 ensures coordinated, efficient, and effective support of local, State, Tribal, and Federal responders to significant oil and hazardous substance incidents across the six Great Lakes states.



**RRT5**  team

- The Standing RRT meets twice yearly in varying locations in Region 5 to develop working relationships, exchange information, and develop regional response policies and procedures. The Standing RRT provides a regional mechanism for developing and coordinating preparedness and planning activities.
- The incident-specific RRT provides assistance to OSCs and other responding agencies during a major event. The role of the Incident-Specific RRT is determined by the circumstances of the incident, but key responsibilities can include: monitoring the response, providing advice to the OSC on the use of chemical countermeasures and in-situ burning, and assisting the OSC in mobilizing resources available from RRT members within Region 5. Participation by RRT members will depend on the specific nature of the incident, including location.



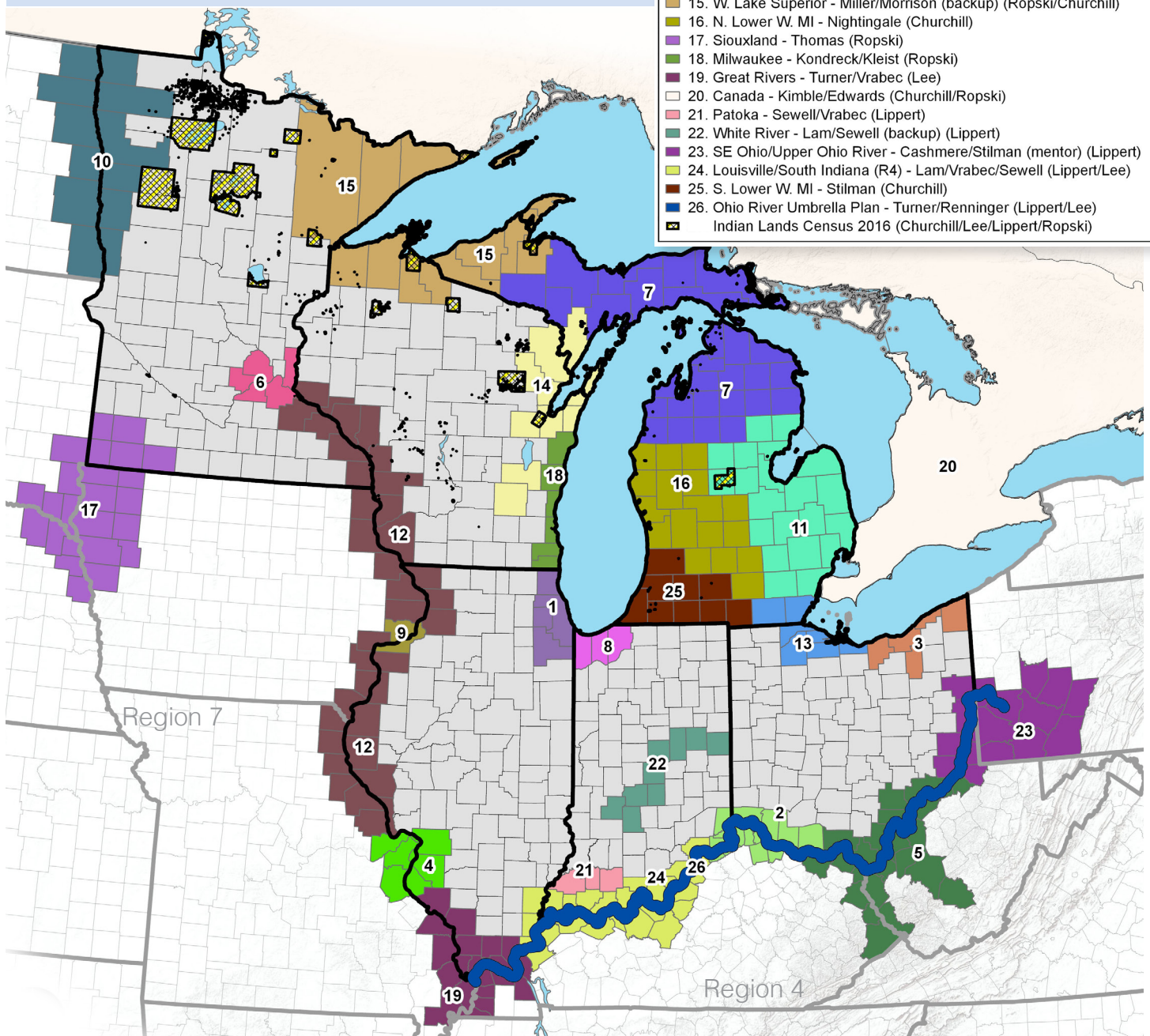
## Spill Response Planning Areas

The Regional Contingency Plan (RCP) describes response protocols and assists in providing a coordinated response capability in the event of a release or spill that poses a threat to the environment or to human health and welfare.

To enhance the integration of other Area Plans which fosters a local/State/Federal relationship, EPA Region 5 created Sub-Area Contingency Plans. There are 26 sub-areas identified in EPA Region 5. A planner and OSC(s) are assigned to work in each sub-area. For more information on a specific sub-area, <http://www.rtt5.org/SubAreas.aspx>

### R5 Planning Areas (OSC/Planner Assignments)

1. Chicago - Ruesch/Mitchell (Lee)
2. Cincinnati - Renninger (Lippert)
3. Cleveland/E. Lake Erie - Pohl/Justice (mentor) (Lippert)
4. St. Louis - Hassan/Vrabec (Lee)
5. SE Ohio/Huntington - Kocher/Wolfe (mentor) (Lippert)
6. Minneapolis/St. Paul - Morrison (Ropski)
7. N. Michigan - Dollhopf (Churchill)
8. NW Indiana - Haag (Ropski/Lippert)
9. Quad Cities - Mendoza (Lee)
10. Red River - Mendez/Morrison (backup) (Ropski)
11. Detroit/SE Michigan - Kimble/Edwards (Churchill)
12. Upper Mississippi River - Maguire/Morrison (backup) (Lee/Ropski)
13. W. Lake Erie - Gulch (Churchill/Lippert)
14. Green Bay/Horicon - Kleist/Kondreck (mentor) (Ropski)
15. W. Lake Superior - Miller/Morrison (backup) (Ropski/Churchill)
16. N. Lower W. MI - Nightingale (Churchill)
17. Siouxland - Thomas (Ropski)
18. Milwaukee - Kondreck/Kleist (Ropski)
19. Great Rivers - Turner/Vrabec (Lee)
20. Canada - Kimble/Edwards (Churchill/Ropski)
21. Patoka - Sewell/Vrabec (Lippert)
22. White River - Lam/Sewell (backup) (Lippert)
23. SE Ohio/Upper Ohio River - Cashmere/Stilman (mentor) (Lippert)
24. Louisville/South Indiana (R4) - Lam/Vrabec/Sewell (Lippert/Lee)
25. S. Lower W. MI - Stilman (Churchill)
26. Ohio River Umbrella Plan - Turner/Renninger (Lippert/Lee)
- Indian Lands Census 2016 (Churchill/Lee/Lippert/Ropski)





## Chemical Emergency Preparedness

Region 5 Superfund Emergency Response includes the Chemical Emergency Preparedness and Prevention Section (CEPPS), which works to prevent chemical and oil spills and assist local preparedness efforts.

The CEPPS team includes staff who conduct outreach and inspections—

and where necessary, pursue enforcement actions—involving CERCLA 103 (chemical releases), EPCRA 311/312 (chemical storage reporting to State and local officials), CWA 311 (oil spill prevention, control, and countermeasures) and CAA 112r (preparedness and prevention for highly hazardous chemicals).



### CEPPS Outreach Support Tools:

- Presentations at State, industry and education-specific conferences, meetings, and classes
- Coaching and capacity building for local, State, and Tribal organizations
- Webinars focusing on current topics such as chlorine management for water systems
- Outreach efforts to help develop an understanding of the reporting requirements and best practices under EPA's chemical and oil preparedness and prevention regulations

In addition, CEPPS provides contractor support to assist Local Emergency Planning Committees (LEPCs) exercise their emergency response plans. Exercising these plans is critical to test and evaluate a local preparedness plan's effectiveness. Exercises identify and eliminate planning and procedural problems and highlight successes.

LEPC exercises also enable stakeholders from local, State, Tribal and Federal, law enforcement, emergency, civil support, healthcare, and industry to interact and learn more about their respective roles in chemical incidents.



LEPC exercises can be either tabletop or full-scale exercises.

Tabletop exercises are discussion-based sessions, often on a weeknight, where members meet in an informal classroom setting to discuss roles during an emergency and responses to a particular emergency situation. A full-scale exercise is a multi-agency, multi-jurisdictional, multi-discipline exercise involving functional (e.g., joint field office, emergency operation centers) and "boots on the ground" response (e.g., testing equipment or decontaminating mock victims) scenarios. Full-scale exercises are generally more elaborate, time-consuming, and resource intensive.



## EPA Region 5 SEMD Response Capabilities Contact Information

To learn more about EPA Region 5 response capabilities or to discuss removal support, contact Jason El-Zein ([el-zein.jason@epa.gov](mailto:el-zein.jason@epa.gov), 734-214-4900), or Sam Borries ([borries.samuel@epa.gov](mailto:borries.samuel@epa.gov), 312-353-8360).