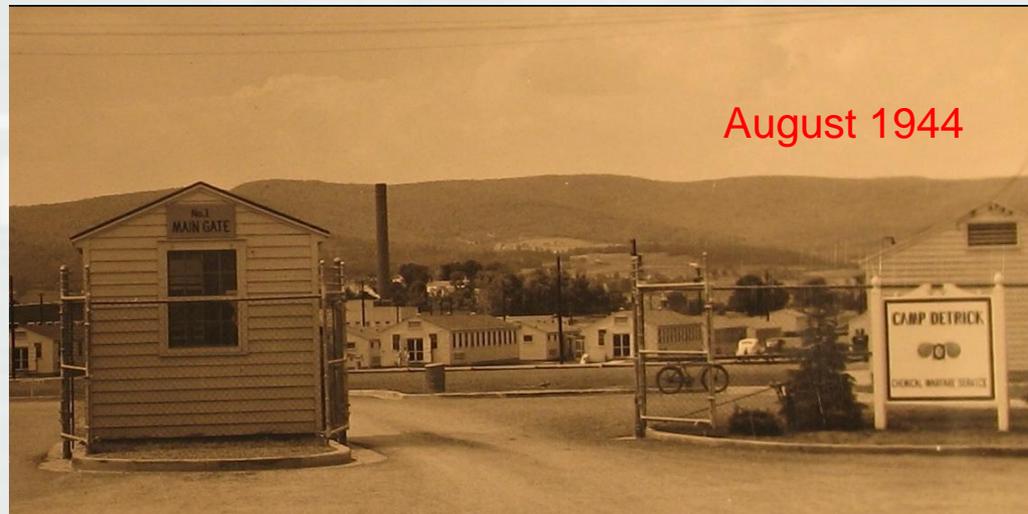


Fort Detrick

Archive Search Report (ASR)

Operational History for Potential Environmental Releases

(non-herbicides or ASR "2")



Randal S. Curtis, P.E., Archival Research & Analysis



Outline

- ASR – Purpose, Scope and Process
- History / Documentation / Safety Program
- BW Potential
- Decontamination methods and chemicals used
- Operations with TCE and PCE
- Radioactive materials
- Petroleum, oil and lubricants (POL) facilities
- Munition Potential (storage, training ranges (conventional munitions) and exterior test grids / ranges)
- Pest control activities



ASR – Purpose and Scope

- **Identify potential environmental impacts of past operations based on archival material**
- **August 2010** – USAEC requested archive search focusing on:
 - ▶ use and testing of 2,4,5-T compounds (half of Agent Orange) due to concern of dioxin (TCDD), a manufacturing byproduct of 2,4,5-T.
 - ▶ broader potential sources of environmental contamination based on past RDT&E activities besides herbicides
- **ASR “1” Findings 2,4,5-T & Herbicides** – preliminary findings based on previously identified reports presented to RAB in February 2011. Final report following more complete research – April 2012
- **ASR “2”** - a companion volume reviewing non-herbicide operations on base
- **Scope** Fence to fence evaluation for Areas A (main post), Area B and Area C Water & Waste Water Treatment Plants.



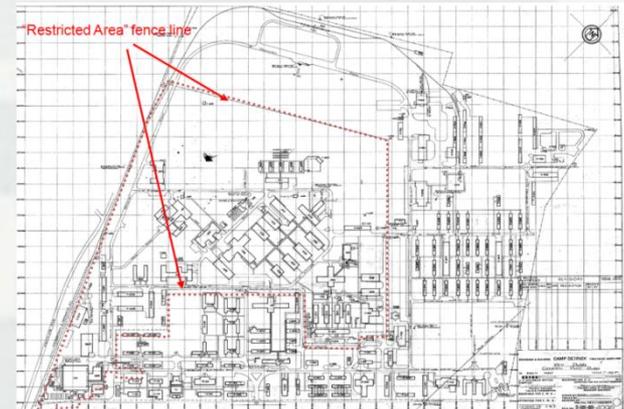
ASR - Process

- Compiles information from historical materials stored at various off-site record storage facilities and analyzes it to determine the location and scope of past activities
- Reviewed thousands of boxes of records - most of which are located in archives and not at Detrick.



Detrick & BW RDT&E Program

- Biological Warfare (BW) Research, Development, Test and Evaluation (RDT&E) Program
- Agents used (anti-personnel, anti-animal and anti-crop)
 - pathogenic bacteria, rickettsia, viruses, fungi and toxins derived from living organisms
- Restricted Area – buildings and locations where agents in use separate from rest of post
- Facilities including
 - Laboratories
 - enclosed test chambers (e.g. “8-ball”)
 - pilot plants
 - incinerators
 - sanitary and contaminated sewage systems
 - solid waste disposal and landfills



History of Fort Detrick

- ASR includes a short history complementing: *Cutting Edge*, Cochrane's 1947 WWII BW history & others
- Significant points potentially not appreciated:
 - Importance of Safety Program
 - Documentation of RDT&E facility



Safety Program

- Sept. 1943 - Safety Division activated
- Responsible for developing, testing, and implementation of safety requirements for all aspects of military BW operations
- Aug. 1944 - 86 people in Safety Division (1 of every 25 people on post); 1 of 3 Divisions commanded by Colonel, 1 of 5 Colonels on post including commander
- Personnel reduced post war but in 1950s to ~40
- Controlled removal of all equipment and material from potentially contaminated area

Biological and Radiological

Safety Regulations

for the

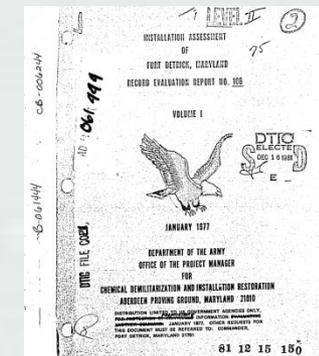
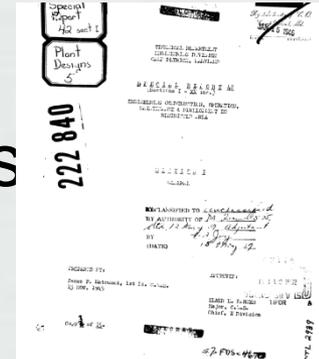
Limited Areas



Detrick Documentation

(beyond correspondence, orders and regulations)

- Test Plans and Test Reports
- Laboratory Notebooks - ~6,150 notebooks used 1943-1971 with ¾ remaining
- Published Reports
 - ▶ 1943-58 Special Reports Nos. 1-289 and Interim Reports 1-168
 - ▶ 1957- 71 Technical Memo, Study, Manual, Notes & Manuscripts
- Status Reports (Monthly, Quarterly Annual)
- Environmental Investigations



BW Agents Potential - General

- **No field or open air anti-personnel or anti-animal tests** with BW agents; limited to enclosed facilities
- open air or **field tests with simulants (SM & BG*)** that mimicked pathogens (Area B)
- **field tests with anti-crops biological pathogens** in Area A (e.g. Southern Blight, cereal grain rust & rice blast)

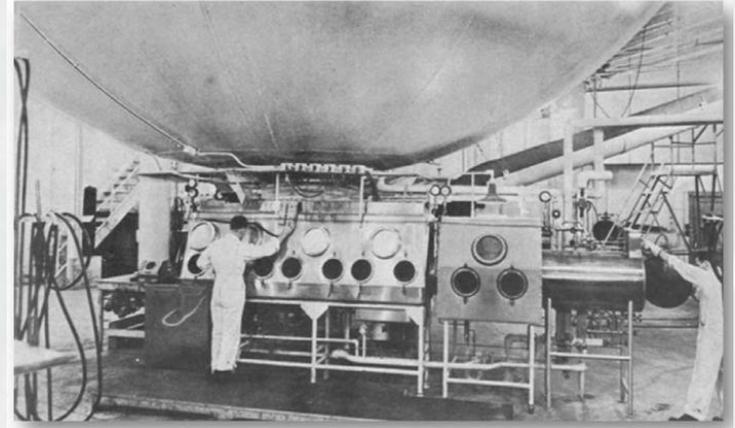


**Serratia marcescens* (SM) & *Bacillus globigii* (BG),



BW Agents Potential - Buildings

- RDT&E facilities including
 - ▶ laboratories
 - ▶ enclosed test chambers
 - ▶ pilot plants
 - ▶ incinerators
- 79 structures demilitarized in 1971-73 (decontamination of building & equipment); all certified for reuse except four (1 razed & 3 in use) due to concerns with *Bacillus anthracis* spores
- ~25 tons sludge in the bottom of the sewage plant holding tanks that showed the presence of *Bacillus anthracis* spores; buried in Pit 12 of Area B after being treated with hypochlorite



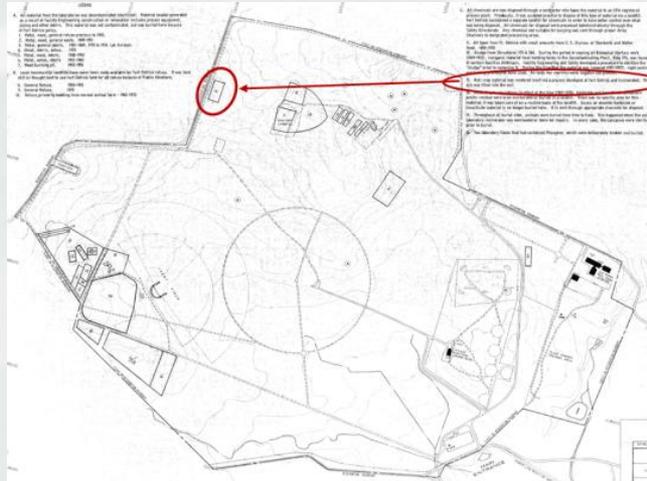
BW Agents Potential - Landfill

- Viable biological material in vials of medical waste comingled with other hazardous waste in the excavation at Area B-11 during a 2001-2004 interim removal action. IRP FTD 49 Long Term Monitoring (LTM)



Demilitarization of Rice Blast

- Beginning in 1966, anti-crop agent *Piricularia oryzae*, causal agent of Rice Blast, in cold storage
- Spores inactivated with Carboxide gas, incinerated and ash disked into soil early 1970s



Decontamination

- methods of sterilizing personnel, facilities and equipment was central to operations, whether working involves highly infectious biological agents or simulants
- Heat is primary method; typically steam applied directly to the surface, or enclosing the item within steam chamber (i.e. autoclaving). If the material is no longer required, incineration is an option.



Decontamination - Chemicals

- When high heat could destroy delicate and valuable items decontamination primarily used chemicals for sterilization:
 - ▶ Beta (β)-propiolactone (BPL)
 - ▶ Calcium hypochlorite (as HTH (high-test hypochlorite) and bleaching powder)
 - ▶ Ethylene imine
 - ▶ Ethylene oxide as Carboxide gas (10% ethylene oxide and 90% CO_2) and as 19% ethylene oxide and 81% Freon 12)
 - ▶ Formaldehyde (formalin, a 37% solution of formaldehyde in water and paraformaldehyde)
 - ▶ Sodium hypochlorite (aka. Liquid bleach or “Clorox”)
- Plus ~20 more used to a lesser extent



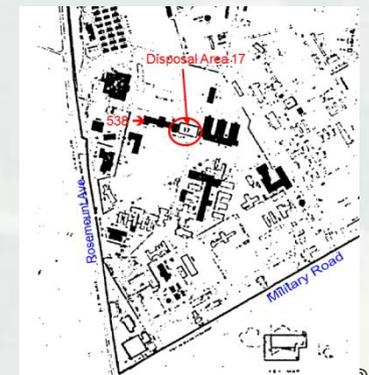
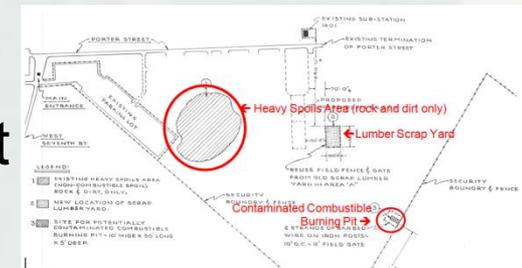
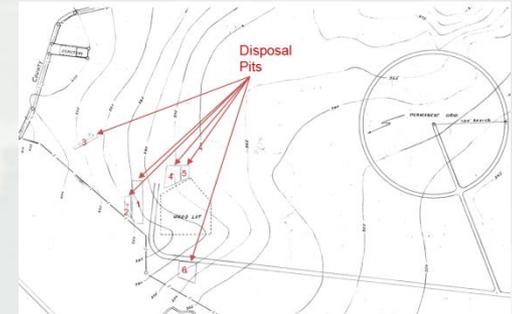
Solid Waste Disposal

- Initially followed Army SOP of time regarding separating non-salvageable material:
 - ▶ burnable waste → incinerator
 - ▶ non-burnable waste → landfill
- In 1947, ~3,000 pounds of refuse a day from within the Restricted Area: 2/3 → incinerated & 1/3 → City of Frederick incinerator + additional 1,500 pounds daily from rest of post. Two loads of non-combustible material → city dump daily
- In Jan. 1948, opened Incinerator at the Monocacy to incinerate noncontaminated rubbish. Operated until replaced by current Incinerator in 1975



Solid Waste Disposal (cont)

- 1948 - non-burnable trash pit established in Area B, various Disposal Areas over time, including current landfill (lots of maps in ASR)
- ~1957 thru 1960s - contaminated combustible Burn Pit & rubble disposal pit operated - previously investigated under DERP (IRP FTD 09 & 11 NFA)
- no clear evidence of a disposal, or landfill operation, relating “Disposal Area 17” in Area A used until 1947 (IRP FTD 08 NFA)



Liquid Waste Disposal – Contaminated Sewer

- effluent from within the Restricted Area where infectious agents work occurred contained in contaminated sewer system **separate** from regular sanitary sewer system
- piped effluent to holding tanks, regulating the flow rate to run treatment plants in batch mode that used heat to kill any live biological agents
- Original 1940s Decontamination treatment plants replaced by current one (IRP FTD 01 NFA)



Liquid Waste Disposal – Contaminated Sewer (cont)

- Treatment and sterility ensured → regular sanitary sewer system
- City of Frederick municipal system for handled sanitary sewage, but switched to Monocacy River plant.
- Sludge from the sewage disposal plant used as fertilizer on-post and off by the 1960s
- Not well documented but appears decontamination chemicals → contaminated sewer via floor drains

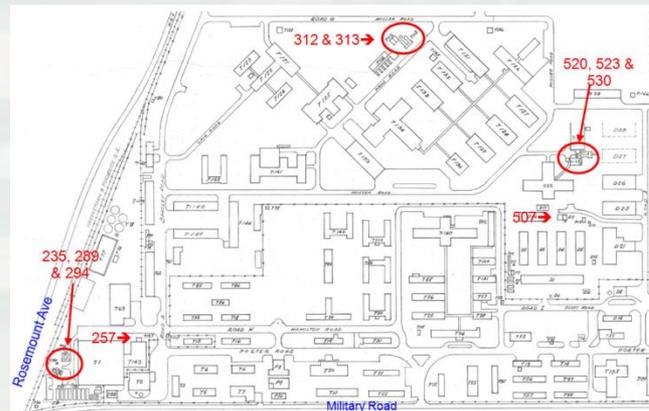


Liquid Waste Disposal

- By 1952, large quantities of acid, used cleaning solution or contaminated flammable liquids were not to be poured down building drains but rather stored in carboys for removal and disposal
- Unclear how final disposal made, though later site plans indicated that disposal pits in Area B were used and have been investigated under DERP (IRP FTD 49, 50, 51, 69, 70 & 71 LTM)



Incinerators



- used for:
 - ▶ disposal of solid combustible waste included 1940s era incinerators on post, the one at the Monocacy River, and the current one. Frederick City Incinerator used in the past too.
 - ▶ decontaminate vent or exhaust gases
- Ash disposal procedures for the WWII era unclear, Later ash disposal locations (e.g. burial pits in Area B and near former Incinerator 1112) previously investigated under DERP (IRP FTD 49, 50, 51, 54, 69, 70 & 71 LTM) .



TCE potential

- TCE use at Detrick
 - ▶ industrial solvent for degreasing parts
 - ▶ refrigerant in the freeze-drying process & as a brine or secondary refrigerant for test chambers
- Refrigeration volume over 400 gallons in one storage tank location
- TCE based refrigeration systems in Bldgs 376, 470, 568, and 1412
- TCE near 568 apparent result of leaking drums stored outside
- Disposal of eight 55-gallon drums of TCE in Area B, apparently Pit 11
- PCE - limited amounts used as a solvent and degreaser and not as a dry cleaning fluid



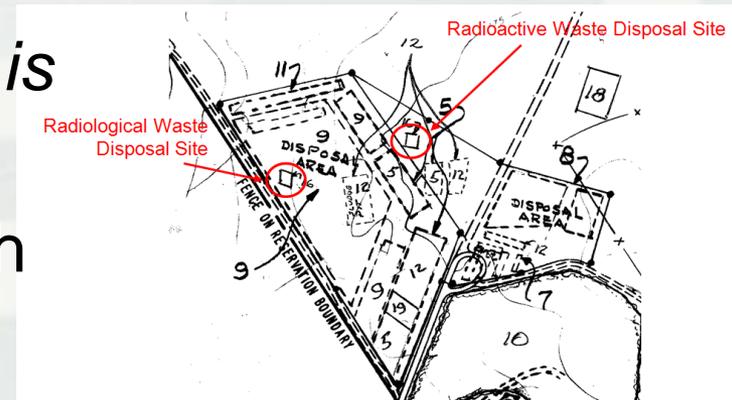
Radioactive Activities in Buildings

- Use began in 1948, amounts and location uncertain
- Radiological activities under licenses 19-01151-01 and 19-01151-02 occurred in Buildings:
 - ▶ 201, 236, 321, 427, 432, 433, 459, 467, 470, 524, 525, 538, 539, 550, 560, 567, 568, 600, 601, 605, 607, 1301 and 1412.
 - ▶ Only Buildings 201, 459, 568, and 1301 indentified in the 2002 decommissioning plan.



Radioactive Material Disposal - Landfill

- In 1951, trench in Area B with solid and liquid radioactive wastes
- Rad disposal locations moved over time in Area B
- In 1956 “two separate holes 15x15x15 feet...in an area that is fenced”
- On post burial ends in 1957 with activation Radioactive Material Disposal Facility (RMDF) at Edgewood Arsenal



Radioactive Material – Temporary Holding

- Stored and packaged waste for shipment elsewhere in Building 261
- By 1952, four 100 gallon tanks in Bldg 270 used to store liquid waste until natural decay (i.e. half life aging-out) allowing disposal in the sanitary sewer system, or allowed it to be diluted to the radiation level allowed by regulations of the time, continued through December 1999 when ceased.



Radioactive Material Disposal - Sludge

- By mid-1950s, sludge from sewage disposal plants as fertilizer on-post (@1948 start?) continued through the 1960s.
- From at least 1975 until 1997, sludge containing radioisotopes disposed at the post landfill in Area B.
- Subsequently, sludge sent low-level radioactive waste facility in Utah between 1998 and 2004.



POL Potential

- potential additional ASTs and USTs containing gasoline, diesel, and No. 6 Fuel Oil not yet investigated under DERP:
 - ▶ Original “Gas” fuel tanks / Fuel Oil Storage (271)
 - ▶ vehicle gas dispensing station (705) north of Porter Street
 - ▶ former oil drum storage (513)
 - ▶ oil storage Building (365)



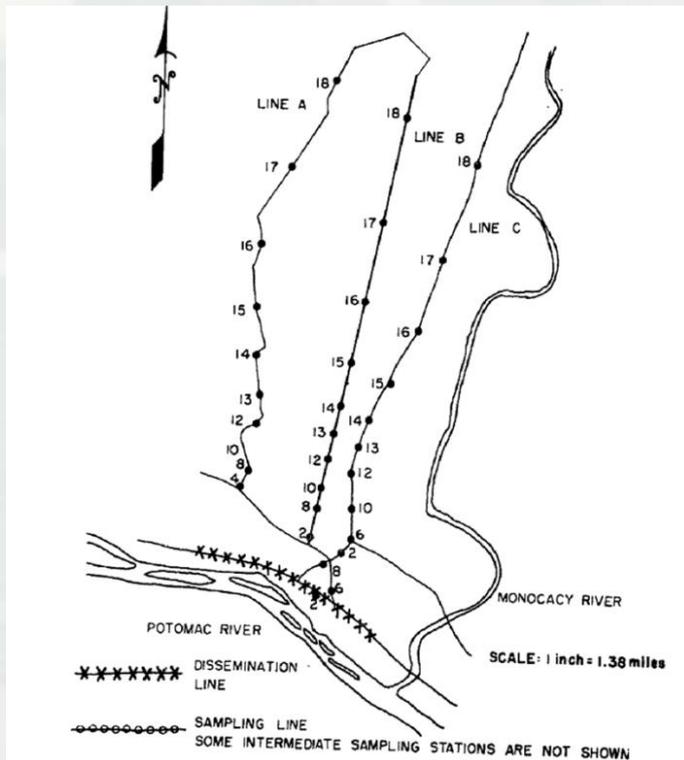
Military Munitions Response Program (MMRP) MRS

- Army previously Identified 4 Munition Response Site (MRS)
 - ▶ Permanent Circular Test Grid
 - ▶ Gun Emplacement, Building 1222
 - ▶ Demolition Pit
 - ▶ Ammunition Storage Area
- Other exterior grids do not warrant inclusion into MMRP as they are included 4 MRS or do not have ordnance & explosive hazard potential (e.g. temporary grid in Area A).
- Former interior small arms ranges (2) excluded and skeet range remediated (IRP FTD 29, NFA DD).



Monocacy Valley Simulant Tests

- July 1953 - dissemination tests using zinc cadmium sulfide (florescent particles) mixed with lycopodium spores (a flash powder), as a simulant for dry biological agent.



Pest Control Activities

- No indication Detrick used or developed exotic pesticides but rather depended on the use of those pesticides developed by others groups elsewhere

“...The usual consideration of property damage and loss, while important, are secondary to the BW hazard which is two- fold. Vermin gaining entrance to laboratories, animal buildings, and such facilities can destroy laboratory control by bringing in contamination. Conversely, if permitted to go out again alive, in their natural migrations they could carry whatever BW agent they had been in contact with to non-immunized post personnel and to the public.”

- Disposal in Area B Pit 14



Copies of ASR “2” & “1”

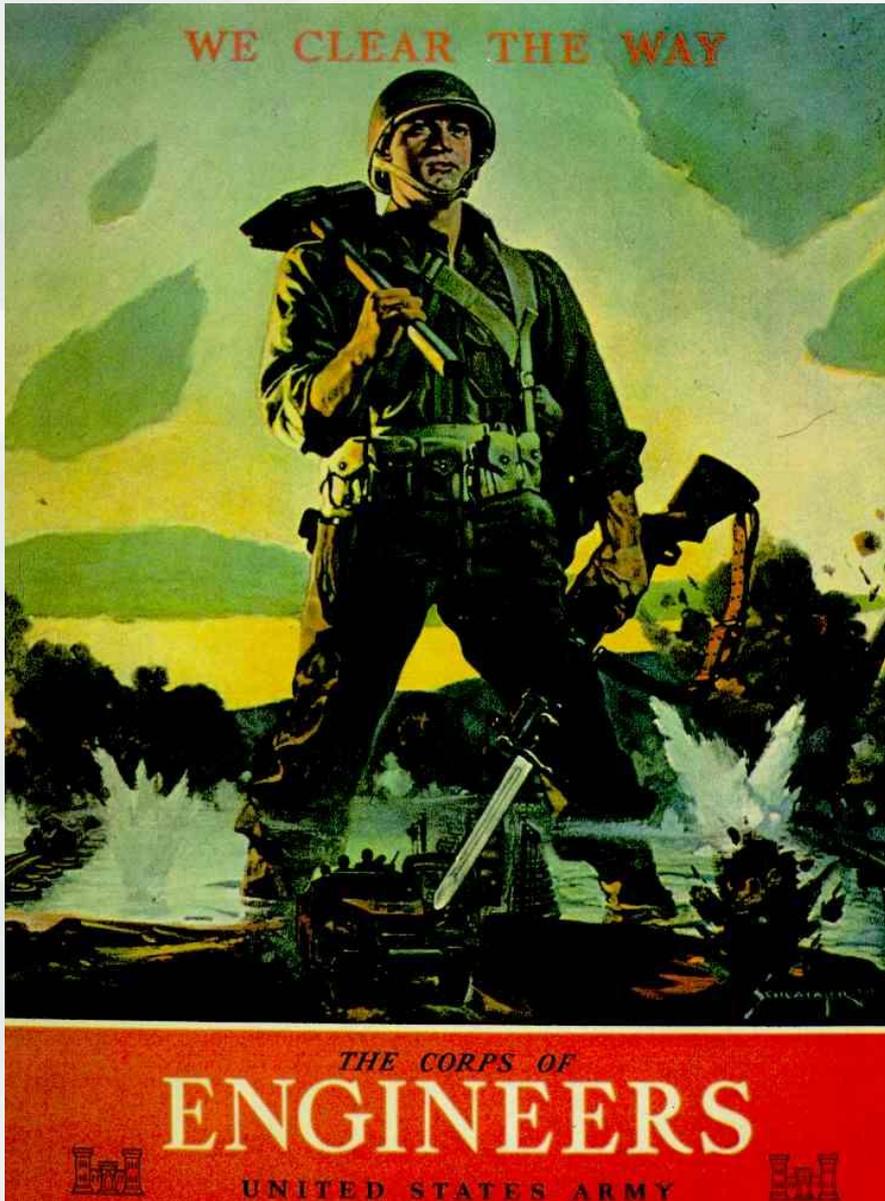
ASR Operational History for Potential Environmental Releases, 16 June 2014:

<http://www.detrick.army.mil/responsible/repository/asr16June2014.pdf>

Companion volume: **ASR Findings for Field Testing of 2,4,5-T and Other Herbicides, 4 April 2012**

<http://www.detrick.army.mil/responsible/ArchivalReport2012.pdf>





Questions?

