PUBLIC MEETING MINUTES

Cornhusker Army Ammunition Plant (CHAAP) – Operable Unit (OU1) Background, History of Past Actions, Explosives Plume Extent, Current Program, and Path Forward

Brice Engineering; Contract: W9128F21D0063 | TO: W9128F22F0145

Date: September 9, 2022

Time: 6:00-9:00PM CST

Attendees:

USACE-Omaha District:	Brian Fettin, Tony Sedlacek, Steve Gragert, Jessica Messerschmidt (via phone)
USAEC:	Linda Albrecht, Cathy Kropp
USEPA:	Bill Gresham
NDEE:	Allie Grady, Ed Southwick
Brice Engineering:	Corey Anderson, Gary Carson
AECOM:	Dean Converse
Central Platte Natural Resources District:	Lyndon Vogt
University of Nebraska, Lincoln:	Steve Melvin
Hornady Manufacturing:	Dallas Powell
Members of the Public:	Randy Zmek, Roger Hanke, Don Gulzow

Introductions and Agenda

Brian Fettin (USACE) welcomed the attendees and asked everyone to complete the sign in sheet. Brian also introduced each organization and attendee.

Corey Anderson (Brice) indicated that this presentation covers a lot of material. If anyone would like to receive a copy of this presentation, please let us know on your sign in sheet and we will email the electronic copy or mail a hard copy.

An OU1 fact sheet and Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA) fact sheet are available. After the USACE presentation is complete, Nebraska Department of Environment and Energy (NDEE) will present results of sampling at Archer, NE. A definition of Operable Unit was provided.

Operable Unit 1 Site Background

Slide 5: The former CHAAP was located on an 11,936-acre tract approximately 2 miles west of Grand Island, Nebraska. CHAAP was constructed and became fully operational in 1942. CHAAP operated periodically for 18 years and became inactive in 1974 but maintained in a high state of

readiness until January 1989 when the plant was declared in excess to Army needs. CHAAP includes five former load lines (LL), LL1 through LL5 that were primarily used to load, assemble, and pack 1,000-pound bombs, 2,000-pound bombs, 50-pound fragmentation bombs, 90-pound fragmentation bombs, 105-millimeter projectiles, 90-millimeter projectiles, 3.5-inch high explosive rockets, 4.5-inch high explosive rockets, 155-millimeter high explosive projectiles, A2 fuses, Micro-Gravel Mines XM45, and supplementary charges in support of World War II, the Vietnam Conflict and Korean War. Disposal of wastewater (pink water) in unlined leach pits and cesspools resulted in explosives-contaminated groundwater plumes and source areas.

Slide 5 Comments: It was noted that when water was discharged to leach pits and cesspools, explosives solids would settle to the bottom, but dissolved explosives in solution would leach (infiltrate) into the aquifer causing explosives plumes. Source areas are where explosives contamination is trapped in soil. When source areas remain, the contamination can continue to be released to the groundwater.

Slide 6: Site features were shown on a map including on- and off-post areas, former facility boundary, load lines, plume, groundwater flow direction, extraction wells, feedlot, and city limits. Explained that the feedlot is important and sampling inside the feedlot has shown that explosives are rapidly degrading in the feedlot. This is due to the large amount of organic carbon present underlying the feedlot.

Slide 7: CHAAP became a Superfund Site in 1990 and cleanup is being completed under the authority of the CERCLA. The cleanup at CHAAP is managed and funded by USACE and the U.S. Army Environmental Command (USAEC), with oversight by the U.S. Environmental Protection Agency (USEPA) Region VII and NDEE. OU1 consists of explosives-contaminated groundwater plumes exceeding Action Levels. Action Levels were established in the 1994 Record of Decision (ROD) and the Subsequent 2001 ROD Amendment and approved by the Army, USEPA and NDEE. USEPA Health Advisory Levels (HALs) were established as Action Levels for hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), 2,4,6-trinitrotoluene (TNT), and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX). The HALs for RDX and TNT are 2 micrograms per liter (µg/L) and 400 µg/L for HMX. Note: 1 µg/L is same as 1 part per billion (PPB) or one cent ($0.01) in $10,000,000.00.

Slide 7 Comments: Explained that action levels are concentrations that trigger some type of action. Concentration below the action level typically indicates no action is necessary. A ROD is a decision document that selects the remedy (cleanup strategy) for a site, and it is signed by the Army and lead regulatory agency, which at CHAAP is USEPA.

History of OU1 Past Actions

Slide 8: Emergency Response – Supply Drinking Water. The Army provided bottled water to 250 homes with contaminated wells until residences were connected to the city's water supply in 1996. In 2001 to 2002, the Army provided bottled water to additional homes with contaminated wells until residences were connected to the city's water supply. Bottled water was supplied to homes in the Capital Heights area.

Slide 8: Contaminated Soil Removal. From 1987 to 1988, the U.S. Army completed an incineration project designed to excavate and treat soils beneath the unlined leach pits and

cesspools at the CHAAP load lines. Only half of the 58 excavations removed explosives to action levels. Some locations may represent continuous source areas to groundwater. After the load line buildings were removed in the early 2000s, soils under building floor slabs and foundations were excavated and disposed of at an appropriate permitted landfill off-site between 2006 and 2007. Soils were removed to eliminate potential exposure to contaminated soils and to remove potential source areas to groundwater.

Slide 9: Remedial Investigation – 1996. Previously collected data as well as data collected as part of the Remedial Investigation (RI) were used to determine the nature and extent of contamination and to determine the potential impact to human health and the environment. The RI Report is available in the Administrative Records at the Grand Island Public Library, 1124 W 2nd Street, Grand Island, Nebraska. Results of the human health risk assessment indicated only explosives were at unacceptable levels in groundwater at CHAAP. Results of the risk assessment were used in the Feasibility Study to select a cleanup method for the contaminated groundwater. The Army recommended pump and treat as a cleanup method and the USEPA and NDEE concurred. Areas where there was potential discharge of contaminants to the surface were investigated. There were no unacceptable levels of contamination in surface and subsurface soils. There was no documented discharge of contaminants to surface waters, only unlined leach pits and cesspools. There were no unacceptable levels of contamination in surface water and sediment.

Slide 10: Annual Groundwater Monitoring (On- and Off-Post Plume). Initiated in 1994, monitoring includes measuring of site-wide water levels and sampling of monitoring wells throughout the explosives plumes. Results are documented in annual reports and presented at annual stakeholder meetings. Annual reports are available in the Administrative Records at the Grand Island Public Library, 1124 W 2nd Street, Grand Island, Nebraska. It was noted that the annual groundwater monitoring is still occurring today.

Slide 10: Groundwater Extraction and Treatment (On-Post Plume). Operation began in December 1998. The groundwater extraction system included extraction well (EW) 1 through EW6, with a total extraction rate of 750 gallons per minute (gpm). An additional extraction well (EW7) was installed in March 2000. Groundwater is pumped from the ground, run through the treatment system, and the treated water is discharged to the ground so that the water returns to the aquifer. Discharge water is sampled to ensure the water is safe to release.

Slide 10 Comments: Contaminated groundwater is pumped from the ground and treated at the treatment plant. The treatment process removes the explosives from groundwater. Pumping also draws in fresh water from outside the plume causing a flushing effect at the source areas helping to clean up those areas with high concentrations. Pumping also captures the explosive plume and does not allow further migration downgradient. Groundwater is treated in granular activated carbon units, and acts just like a carbon filter on your sink or refrigerator. Contaminants stick to the carbon and once it becomes saturated, the old carbon is removed, and new carbon is added. The old carbon is disposed off-site at a permitted landfill.

Slide 10 Questions: A question was asked about where the treatment plant water is discharged and if it infiltrates or if it flows downstream. It was explained that that water is discharged into two canals, which were shown on a map. Gary Carson (Brice) explained that the majority of the

water was discharged to the east canal, but some water was discharged to the west canal. The water mostly infiltrated except in the wintertime when the ground was frozen.

Slide 11: March 2000 RDX Plume Map. Showed the locations of extraction wells with the March 2000 RDX plume. Showing the year 2000 because that is when the last extraction well (EW7) was installed and became operational. EW7 made a huge impact on remediation. Extraction wells were installed near the source areas and the former facility boundary to capture the plume and not allow any further downgradient plume migration.

Slide 12: Implement Monitored Natural Attenuation (Off-Post Plume). In 2000, Monitored Natural Attenuation (MNA) remedy for the off-post plumes was proposed by the Army in the OU1 ROD document and was approved by the Regulators. MNA is a passive treatment which includes a variety of natural processes that degrade the explosives without any human interaction.

Slide 12: Implement Institutional Controls (On- and Off-Post Plumes). In 2000, to eliminate the possibility of the contamination affecting human health, institutional controls (ICs) were implemented as part of the OU1 ROD document. Controls will remain in place until groundwater cleanup is completed. On-post controls include restrictions to prevent the consumption of groundwater and deed restrictions to prevent the property's use for non-industrial purposes. Off-post controls include restrictions to prevent the consumption of groundwater and prevent the installation and use of new private drinking water wells.

Slide 12 Comments: The Army works with the City of Grand Island to monitor and enforce institutional controls by denying plumbing permits to connect residences to private wells near the previous explosives plume.

Slide 13: Subsurface Injection. Beginning in the spring of 2007, subsurface injection was performed through 2016 and again in 2019 and 2020 as part of the Rebound Study. Research has shown that certain natural microorganisms will feed off certain contaminants and cleanup [remediate] contaminated groundwater. By injecting an amendment in the aquifer, the microorganisms flourish and consume the contamination. Based on several studies, the Army injected a molasses-based food grade amendment. These injections remediated the explosive plumes 5 to 10 times faster than the pump and treat system. This saved time and taxpayer dollars and resulted in the shutdown of the treatment system as the plume shrunk substantially.

Slide 13 Comments: The Army looked at why explosives concentrations were decreasing at a much faster rate in the feedlot compared to the rest of the surrounding areas. Samples were collected inside the feedlot and a plan was developed to perform injections throughout the entire on-post plume that mimicked the conditions underlying the feedlot and rapidly degrade the explosives. The injections, which contain molasses, are inexpensive, readily available, and locally sourced. Injections saved years in remediation time and millions of dollars.

Slide 14: Rebound Study. Decreasing explosives concentration trends and numerical modeling simulations suggested that on-post groundwater extraction/treatment was no longer needed to prevent off-post plume migration. A common issue when you stop pumping is plume concentrations increase over time and the plume begins to migrate. To ensure these things did

not occur, a Rebound Study was initiated in Oct 2019. It included eight (8) quarterly Groundwater Monitoring Events. The baseline event was completed in October 2019 and final quarter 8 event was completed in February/March 2022. Temporary shutdown of all extraction wells and the pump and treat system occurred in Nov 2019 and remains in standby status. Rebound Study results indicated the plume core is shrinking, statistical analysis (Mann-Kendall Test) show concentrations are declining, and there has been no further plume migration downgradient (further off-post). All permanent off-post wells sampled as part of the OU1 Rebound Study remain below the USEPA HALs of 2 µg/L. In the Quarter 8 Technical Memorandum, the Army recommended continued annual groundwater monitoring and proceeding to the next phase of the cleanup process. USEPA and NDEE concurred.

Slide 14 Comments: At CHAAP, a groundwater flow and contaminant fate and transport model are used to predict long-term remediation outcomes. The modeling scenarios showed that the pump and treat system was no longer needed to capture plume and prevent plume migration.

Slide 15: March 2022 (Q8) Rebound Study Results Drawing. Rebound Study results indicate the plume is stable and not migrating. The plume is currently only about 2,000 feet long and contains very low concentrations.

Historical Explosives Concentrations

Slide 16: Maximum historical On-Post explosives concentrations were between 1,000 and 5,000 µg/L (1980s) due to proximity to source areas.

- Maximum historical Off-Post explosives concentrations were much lower:
  - RDX –70 µg/L (1985); Heath Advisory Level = 2 µg/L
  - TNT –53 µg/L (1985); Heath Advisory Level = 2 µg/L
  - HMX –10.2 µg/L (1992); Heath Advisory Level = 400 µg/L
- Current (2022) maximum Off-Post explosives concentrations:
  - RDX –0.7 µg/L; Heath Advisory Level = 2 µg/L
  - TNT –21 µg/L; Heath Advisory Level = 2 µg/L
  - HMX –0.2 µg/L; Heath Advisory Level = 400 µg/L
- Estimate of explosives degradation rate (half-life) in groundwater:
  - RDX –7.3 years
  - TNT –5.7 years

Slide 16 Comments: Maximum concentrations were in the 1980s when groundwater monitoring began. High concentrations were located near source area. Currently, concentrations are much lower. Off-post RDX and HMX are less than HALs, only TNT is greater than the HAL. Concentrations have declined due to removal of source areas, from on-post treatment (pump and treat and injections) and through natural attenuation. Different explosives degrade at various rates. We have measured the degradation rates (or half-lives) of explosives to be 7.3 years for RDX and 5.7 years for TNT. Half-live was explained.

Setting and Explosives Properties

Slide 17: Aquifer Beneath CHAAP. Soils underlying CHAAP are sands and gravel. Groundwater flow velocity is fast (approximately 300 feet/year). It is a shallow aquifer (10 to 15 feet below

ground surface) underlying CHAAP (Ogallala). The natural attenuation processes is slow but can be enhanced by adding organic carbon to the aquifer (e.g., subsurface injection). The feedlot directly west of CHAAP has high amounts of organic carbon so the natural attenuation process is enhanced.

Slide 17: Physical Properties of Explosives Chemicals. RDX, TNT and HMX are soluble, but attach to soil and degrade (naturally attenuate) regularly. Therefore, these compounds do not migrate long distances. RDX is the most mobile, which is why only RDX migrated approximately 5 miles off-Post. TNT and HMX did not migrate beyond the adjacent feedlot.

Slide 17 Comments: Discussed why there was an off-post plume, primary comprised of RDX (very little TNT and trace HMX) and why the RDX plume migrated 5 miles off-post and no further, but TNT never migrated past the adjacent feedlot. The aquifer beneath CHAAP consists of sands and gravel, groundwater flow velocity is fast. The aquifer is shallow so surface contamination can easily leach down and impact the groundwater, natural attenuation process is slow, but adding organic carbon can enhance the natural attenuation process. Explosives do not migrate 10, 20, 30 miles, only a few miles, and in this case 5 miles.

Historical Extent of OU1 Explosives Plume

Slide 18: The extent of the explosives plume has been significantly impacted over the years by previous actions including (soil) source removal, pump and treatment of groundwater, and subsurface injections, resulting in the following:

- Cleanup of the off-post plume
- Shrinking of the on-post plume
- Declining explosives concentrations in groundwater throughout the entire site
- Shut down of the pump and treat system
- Resume use of on-post groundwater for irrigation purposes
- Property transfer for industrial use
- Reduced taxpayer dollars being spent on remediation efforts.

Slide 19: 1994 RDX Off-Post Plume Figure. The figure shows the maximum length and width measured. The RDX plume traveled 5 miles off-post. The figure is showing only the off-post portion, the on-post plume extends back to the load lines. This plume is based on samples collected from monitoring wells; no drinking water wells. Residents with wells impacted inside the plume were provided with drinking water until they were connected to city water. Wells downgradient at the end of the plume show the plume migrated no further.

Slide 20: 2000 RDX Plume Figure. In 2000, EW7 was installed, capturing the plume and not allowing off-post migration. The adjacent feedlot is rapidly degrading explosives as the plume passes through. The plume has narrowed, concentrations down the centerline are highest, and lower concentrations at the edges of the plume start to degrade below the HALs.

Slide 21: 2004 RDX Plume Figure. Shows EW7 running for 4 years, and plume starts to break apart at the feedlot due to natural attenuation. Slightly narrower plume exists.

Slide 22: 2008 RDX Plume Figure. Four years later, downgradient plume also starts to break up due to natural attenuation.

Slide 23: 2012 RDX Plume Figure. By 2012, only a small, very narrow plume exists downgradient.

Slide 24: 2013 RDX Plume Figure. In 2013, only one well at the end of the former plume is above HAL.

Slide 25: 2014 RDX Plume Figure. By 2014, all permanent off-post wells are less than HALs.

Geologic Cross-Section – March 2000

Slide 26: RDX Plume Centerline March 2000 Drawing – The centerline drawn down the axis of the plume, show concentrations vertically. Site features were shown including LL1, CHAAP boundary, feedlot, city limits and HWY 281. The geology was explained: Shallow water table is shown as a blue dashed line. The geology includes a shallow sand and gravel unit, a tight blue clay layer that water doesn't penetrate, and a lower sand and gravel unit below. The plume is contained in the upper sand and gravel. Testing below the clay has been clean. RDX is a sinker – the plume rides along the bottom of the clay layer.

Geologic Cross-Section – March 2013

Slide 27: RDX Plume Centerline March 2013 Drawing – The extraction well continues to pump and restrict the plume from going off site, feedlot degraded explosives, and natural attenuation has reduced the plume to one small area at the bottom of the aquifer.

Geologic Cross-Section – March 2014

Slide 28: RDX Plume Centerline March 2014 Drawing – By 2014, all off-post permanent wells are below HALs.

Current OU1 Program:

Slide 29: Actions Completed from 2019 to 2022:

- OU1 Rebound Study
- OU1 Subsurface Injection
- Annual OU1 Groundwater Long-Term Monitoring (LTM)
- Evaluate Effectiveness of Remedy
- Focused Feasibility Study (FFS)

Slide 29: Up Next for 2023 and Beyond:

- Annual OU1 Groundwater LTM
- Evaluate Effectiveness of Remedy
- Proposed Plan (PP) and Public Meeting
- Record of Decision (ROD) Amendment

OU1 Path Forward

Slide 30: Next phase of cleanup for on-post plumes includes the preparation of the following documents:

- Focused Feasibility Study: develops and evaluates various remedial alternatives (cleanup strategies) to make sure they are protective of human health.
- Proposed Plan: selects the preferred remedial alternative (cleanup strategy) for the on-post plume and includes a public meeting and public comment period. The Army invites and encourages public participation. The Proposed Plan phase provides an opportunity for the public to voice their support or concerns of the Army's proposed actions. If you provide your name and email address, the Army will let you know when the public comment period begins and where the documents can be reviewed. Otherwise, the announcement will be published in the local newspapers.
- Record of Decision Amendment: officially modifies the remedial alternatives (cleanup strategies). This document is signed by Army and USEPA.
- These three documents are part of the CERCLA process to change the remedy for OU1 from on-site pump and treat to another remedy.

The CHAAP OU1 Presentation ended at approximately 7:00PM CST. At the end of the Public Meeting, NDEE presented results of their sampling activities completed near Archer, Nebraska. The NDEE presentation will be submitted separately.

Questions

- Randy Zmek (member of the public) inquired if the water in Archer was safe to drink due to other potential contamination not related to CHAAP. He asked what the treatment options were for his well. The group discussed options including redevelopment and working with a licensed well driller/pump installer to come up with a plan. Deeper wells may be an option.
- Randy Zmek (member of the public) also inquired about pumping of water from CHAAP to the nearby creeks that was performed in 1980. Randy indicated that he knew several individuals in the community who spoke to him about the contaminated water being pumped. The Army indicated that a search for documentation of the 1980s pumping will be performed.
- Additional discussions (not related to CHAAP) included City of Grand Island water surge, drains on private property shut by property owners, dewatering operations in Grand Island, and increased cancer rates in Merrick County.