

**TECHNICAL BRIEFING – DRAFT REMEDIAL DESIGN
MID-VALLEY GROUNDWATER (PICA 204) – OCTOBER 2012**

The document reviewed was a remedial design for Mid-Valley Groundwater (PICA 204). The Mid-Valley region includes study areas F, G, H, and L. The Record of Decision (ROD) for the site was signed in September 2012. The remedial action for the site includes the five elements below:

1. Enhanced reductive dechlorination (ERD) using injection of a carbon substrate for the in-situ treatment of the Robinson Run VOC plume.
2. Monitored natural attenuation (MNA) of downgradient volatile organic compound (VOC) plumes, the RDX plume, and groundwater at the Former Defense Reutilization and Marketing Office (DRMO) Yard (PICA 072).
3. Excavation and disposal of explosives-contaminated soil near former Building 1071(PICA 171) at Site 162 (PICA 173).
4. Long-term groundwater monitoring for the Site 5 (PICA 162) and Site 6 (PICA 052) Shell Burial Areas.
5. Implementation and maintenance of land use controls (LUCs) for all components of the groundwater plume.

Groundwater Contaminants

Contaminants in groundwater consist of RDX and volatile organic compounds (VOCs). There are three VOC plumes as follows: the Robinson Run VOC plume, the northern VOC plume, and the western VOC plume.

Within the Robinson Run plume trichloroethene (TCE) concentrations exceed 1,000 micrograms per liter (ug/L) at the plume center which is a zone approximately 200 feet (ft) long, 100 ft wide, and 50 ft in vertical extent starting at a depth of approximately 60 ft below ground surface (bgs). The Robinson Run VOC plume is believed to originate from historical site operations at Building 3109. The Robinson Run VOC plume follows the course of the drainage in the unconfined/weathered bedrock and bedrock aquifers and discharges into glacial sediments near Green Pond Brook (GPB). The relatively low concentration (10 ug/L) TCE detections in Robinson Run are attributed to the discharge from the plume. The source of the northern VOC plume is unknown; the plume appears to originate in the vicinity of Site 6 which is one of the shell burial areas. Both Site 5 (the other shell burial area) and Site 6 are also the subject of investigation as part of the MMRP Remedial Investigation (RI). The plume is in the shallow

bedrock and unconfined/weathered bedrock to the north of the Robinson Run plume. This plume has TCE concentrations of 5 ug/L or less.

The western VOC plume is located in the unconfined and lower semi-confined aquifer west of GPB. The potential source of the plume has been attributed to historical operations at Building 241. TCE concentrations are relatively low – 5 ug/L or less.

The RDX plume is found in the unconfined/weathered bedrock aquifer and in the bedrock aquifer. The plume seems to originate at the area of Buildings 1071 and 1033 which are considered to be the potential sources for the plume. Soil removal has taken place at both buildings in the past and additional soil removal is planned for the area of Building 1071 as part of the remedial action. A groundwater hot spot of 80.4 ug/L is situated at Well 17MW-5 with the remainder of the plume exceedances of less than 20 ug/L. RDX has been detected in surface water samples in Robinson Run and are suspected to result from the discharge of the RDX plume into the stream.

Geological Characterization

Unconsolidated material in the Mid-Valley Area consists of glacial drift that is 10 feet thick or less. Bedrock which consists of quartz-plagioclase gneiss has been characterized into three different zones. Zone 1 is found in the upgradient hot spot area and is competent rock with few fractures. Fracture spacing is high (5 to 7 ft) and the bulk permeability is relatively low (approximately 0.14 ft/day). Zone 2 is highly weathered fractured rock and is found in the central and downstream portions of the Robinson Run valley. Zone 2 is below the water table and is more strongly chemically altered than bedrock in the upgradient hot-spot area. The unit has the highest bulk permeability (6.9 ft/day) of the three zones and behaves more like porous media due to the extensive fracturing. Zone 3 bedrock is found at depths of 25 to 35 ft below ground surface (bgs). It is competent bedrock with only a moderate degree of fractures and low fracture spacing (2 to 3 ft). Zone 3 also has relatively high bulk permeability (5.9 ft/day).

Remedial Action Objectives

There are two objectives as follows:

- To prevent human exposure to contaminated groundwater that would cause unacceptable risk over the duration of the response action; and,
- To achieve the more stringent of the Federal Maximum Contaminant Levels (MCLs) or New Jersey Groundwater Quality Standard (NJGWQS) for the identified contaminants of concern (COCs) in a reasonable timeframe, thereby restoring groundwater to its beneficial use as a drinking water source. For RDX, which has no established MCL or NJGWQS, the Federal Drinking Water Lifetime Advisory Level (HAL) will be used as the cleanup goal.

The Army and the USEPA have agreed on an SCL of 2.0 ug/L for RDX and 2,4,6-TNT based on the HAL, as this criterion is being used for RDX and 2,4,6-TNT consistently across numerous USEPA regions. While the HAL of 2.0 ug/L is the selected SCL for RDX and 2,4,6-TNT at Picatinny Arsenal, the Army recognizes that the State of New Jersey has non-promulgated Interim Groundwater Quality Standards of 0.5 ug/L for RDX and 1.0 ug/L for 2,4,6-TNT. The RD states that the LOC will be re-evaluated as part of a Five-Year Review if New Jersey promulgates their interim groundwater standard.

In addition to groundwater actions, additional soil removal is planned near Building 1071.

Enhanced Reductive Dechlorination (ERD) Remedy Component

An organic carbon source will be injected into the groundwater to form an in-situ reactive zone (IRZ) which will create favorable conditions for reduction of chlorinated VOCs. The same process has been used at other Picatinny Arsenal sites. In the case of the Mid-Valley Area a number of injection wells will be used to create multiple reactive zones at different locations within the plume and at different depths in the ground. The carbon substrate for the Mid-Valley will be emulsified vegetable oil (EVO) as has been used at other Picatinny Arsenal remedial action sites. Vegetable oil mixed with surfactant or an emulsifying agent is diluted with water and delivered via injection well. Three sets of injection well transects are proposed with the well transects configured to target areas of highest concentration. The IRZ will be oriented perpendicular to the groundwater flow direction. An “adaptive design approach” is to be utilized to allow for changes in design parameters as dictated by actual conditions observed.

The highest concentration area of the VOC plume will be targeted with two injection well transects consisting of three new wells per transect. The wells will be constructed to a depth of 120 ft bgs with open borehole intervals between 30 and 120 ft bgs. Further downgradient the 13th Street area will be addressed with one transect consisting of six shallow injection wells and six deep injection wells. The shallow injection wells will be constructed with stainless steel well screens from 20 to 90 ft bgs. The deep wells will be constructed with open boreholes from 90 to 190 ft bgs.

Monitored Natural Attenuation (MNA) Component

Another component of the remedy is MNA for the western VOC plume, the northern VOC plume, and the RDX plume. The monitoring specified in the RD is related not only to the performance of the ERD component but to the MNA portion of the remedy.

Groundwater and Surface Water Monitoring

There are several elements to the monitoring program as follows:

- Performance monitoring for the Robinson Run VOC plume
- MNA monitoring for the three VOC plumes
- MNA monitoring for the RDX plume
- Surface water monitoring related to the MNA remedy
- Potable supply well monitoring related to the MNA remedy
- Long-term groundwater monitoring for Site 5 and Site 6 Shell Burial Areas

Performance monitoring analyses consist of field parameters, VOCs, dissolved gases, and dissolved organic carbon. Baseline sampling will be performed prior to injection of the EVO. The sampling frequency for the first year is quarterly, and then semi-annually thereafter for active remediation which is anticipated to be approximately 35 years. Other parameters (dissolved iron and organic carbon) may also be added as required in some of the wells.

MNA monitoring is to continue until attainment of RAOs. Time periods are estimated to be 35 years for the Robinson Run plume, western VOC plume, and RDX plume; and 20 years for the northern VOC plume.

The MNA monitoring network for the three VOC plumes consists of 44 existing wells and two new wells (also part of the performance monitoring for the ERD remedy). VOCs and biogeochemical indicator parameters will be analyzed along with field parameters. Samples will be collected on an annual frequency after two years of more frequent monitoring.

The MNA monitoring network for the RDX plume consists of 23 wells including 20 wells monitoring the RDX plume and six wells at the Former DRMO Yard. Samples will be analysis for explosives (including RDX, 2,4,6-TNT, and breakdown products) and biogeochemical parameters. Annual monitoring will resume after two years of more frequent monitoring. In addition, the six wells in the former DRMO Yard will be analyzed for total and dissolved arsenic, cadmium, and lead; and total sodium.

Five locations have been designated in Robinson Run for the collection of surface-water samples as part of MNA monitoring for the VOC and RDX plumes. Surface water samples will be analyzed for VOCs and explosives “until groundwater response actions result in COC concentrations within Robinson Run that are below the New Jersey Surface Water Criteria for VOCs and the HAL of 2.0 ug/L for RDX. After two years of quarterly sampling, the frequency will be reduced to annual.

The potable well (pumping well 302D) will be sampled for VOCs and explosives on an annual basis.

Three other potential supply wells are located in the area but are not currently in use; should they become operational they will also be sampled on an annual basis.

Five monitoring wells are included in the network for the Site 5 Shell Burial Area and six monitoring wells for the Site 6 Shell Burial Area. The purpose of the long-term monitoring for the shell burial areas is to detect evidence of a release from items such as munitions and drums suspected to be discarded in the areas. Wells are located both upgradient, side gradient, and downgradient of the shell burial areas and with open intervals varying in depth to shallower, same elevation, or deeper than the suspected burial depth of the fill material. Samples will be analyzed for field parameters, VOCs, explosives, and total and dissolved metals. After semi-annual sampling for two years sampling will revert an annual frequency for the next 28 years.

Two other types of sampling will also be conducted as part of the program. Pre-excavation sampling will be conducted in the area of former Building 1071 where soil removal is to take place. Four borings will be installed in targeted locations associated with historical operations and/or soil exceedances for RDX. Borings will be installed to bedrock or the water table, whichever is encountered first, and samples will be collected at 2-ft intervals and analyzed for explosives. Waste characterization sampling will also be

performed in conjunction with the soil removal action. Analytes will be accordance with requirements of intended waste disposal sites. Waste characterization samples will be collected during pre-excavation sampling.

Land Use Controls (LUCs)

LUCs are to include institutional restrictions, access restrictions, and public education. LUC performance objectives are similar to other sites as follows:

- Control access or use of the groundwater and surface water until cleanup levels are met
- Maintain the integrity of any current or future remedial monitoring system
- Maintain the integrity of any components of the remedy
- Maintain the existing Classification Exception Area (CEA)
- Prohibit excavation without safeguards in all areas below the water table where groundwater contaminants exceed SCLs.

Picatinny Arsenal has unexploded ordnance (UXO) clearance procedures in place. The base also has master plan regulations in place. A base-wide Geographic Information System (GIS) database is also maintained. The GIS contains descriptions of existing land and environmental restrictions along with locations of known contamination on the base. Furthermore access to the base is restricted with a perimeter fence and secured access locations. Also noted is that several portions of the VOC and RDX plume areas are within additional fenced areas with locked gates. Other LUC-related elements are the base Safety Program and pre-construction environmental survey procedures under the Army Military Construction Program.

The Army's responsibilities with respect to LUCs include inspections, reporting, and enforcement. The following actions will relate to the LUCs:

- Engineering Controls. The perimeter fence is intended to provide a secure boundary. Additional measures may be required if land use were to change.
- Employee/Picatinny Resident Awareness. Broadcast e-mail and the Picatinny newspaper ("The Voice") will be used to notify employees, military personnel, and military residents of the LUCs related to the remedy.
- Inspections, Reporting, and Enforcement. Annual inspections are required including an evaluation of land use and well inspections. An annual LUC Compliance Certificate will need to

be submitted to the NJDEP and the USEPA. CERCLA Five-Year Reviews are required for all remedial action sites and the Mid-Valley Groundwater Area will be added to the roster.

- Notifications. Any exceedances detected in water supply wells will trigger confirmatory sampling and notification to the NJDEP and the USEPA followed shortly thereafter by an action plan regarding future operation of the well.

The State of New Jersey has specific requirements related to the use of engineering and institutional controls as remedial measures, many of which duplicate federal requirements. However, the requirements for a deed notice and a groundwater Classification Exception Area (CEA) are unique to New Jersey. At U.S. Department of Defense sites where there is no deed, the NJ requirements specify that “an amendment to the Base Master Plan or Land Use Control Assurance Plan worded pursuant to the substantive requirements” of the regulation suffice in lieu of a deed notice. A CEA for Picatinny Arsenal was approved by the NJDEP in 2002. The existing CEA will be updated to reflect the Mid-Valley Groundwater remedy. The monitoring and inspections that will take place will comply with the substantive requirements of the New Jersey Technical Requirements for Site Remediation. The NJDEP requires biennial certification of engineering/institutional controls; this requirement will be covered during annual LUC certification.

Exit Strategy

Active treatment is expected to take place for 35 years in the high concentration area of the Robinson Run plume. However, actual treatment time will depend on how the plume reacts to treatment. The concentration of VOCs in the hot spot area will be compared to concentrations in the diffuse plume; changes in injection frequency may be made based on results attained during active treatment. Statistical analysis of monitoring results will be completed to assess when treatment and when monitoring may be discontinued; such analysis will also be used to assess whether modifications of the remedy should be considered. Long-term monitoring in the Shell Burial Areas will continue until constituents in network wells reach closure criteria. The final stage in the exit strategy will be monitoring well abandonment.

Reporting

Results of MNA monitoring, remedial action operation, and Shell Burial Area long-term monitoring will be combined into a single report submitted on the following frequency:

- Quarterly – year 1

- Semi-annually – years 2 and 3
- Annually – thereafter.

A Remedial Action Report (RAR) will be submitted after the ERD treatment system is in place and the first injection completed, along with baseline and performance monitoring; and LUCs implementation. A separate RAR for soils will be submitted after the completion of the soil excavation action. The first Five-Year Review in which the Mid-Valley Groundwater remedy will be addressed is 2016. Thereafter the site will be included every five years.