

**TECHNICAL BRIEFING – PROPOSED PLAN FOR  
MID-VALLEY GROUNDWATER (DRAFT FINAL) – JANUARY 2012**

The document reviewed was a draft final Proposed Plan for Mid-Valley Groundwater (Areas F, G, H and L) submitted by the Army to regulators on January 6, 2012. This technical briefing will provide an overview of the contents of the proposed plan. The proposed plan is the culmination of the remedy selection process and provides a description of the remedial alternatives along with a preferred remedial alternative. In the cover letter to regulators the Army stated their intent to issue a public notice of the proposed plan in Spring 2012. According to the letter the Army's goal is to implement the remedial action this fiscal year.

Background

The proposed plan briefly summarizes the remedial alternatives that were studied in the detailed analysis phase of the Remedial Investigation/Feasibility Study (RI/FS). The U.S. Environmental Protection Agency (USEPA) has specific guidance for the format and contents of the proposed plan. The document contains the following sections: introduction and purpose, site and area background, current and future use, identification of environmental contamination, remedial action objectives, a summary of response action alternatives, and a summary of the preferred response actions. Presentation of the proposed plan to the public is to be followed by a minimum 30-day public comment period.

The Mid-Valley Groundwater Site has followed a somewhat different sequence of investigation and reports than typical sites. The Final Feasibility Study (FS) was submitted to regulators in April 2009 and subsequently approved by the USEPA in July 2009. During pre-design monitoring well installation subsurface conditions were found to be markedly different than those upon which the Conceptual Site Model (CSM) was based. As a result additional field investigation was completed between April 2009 and October 2010 to fill data gaps and refine the CSM; that revised CSM also necessitated a reformulation of some of the remedial alternatives that were being considered as possibilities. An FS Addendum dated June 2011 described the revised CSM and was the basis upon which the ultimate remedy selection was predicated.

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The Mid-Valley Groundwater site is expansive and includes the following areas: Area F (includes 17 sites), Area G (includes the Former DRMO Yard and six sites surrounding the Former DRMO Yard), Area H (known as the Munitions Assembly Area of the 200 Building Area with 13 sites), and Area L (contains several different former explosives production, and storage and testing areas). In addition to TCE, several other VOCs exceeded the level of concern (LOC) as follows: benzene, carbon tetrachloride, and tetrachloroethene (PCE), and 1,2 –dichloroethane (1,2-DCA). Benzene, carbon tetrachloride, and 1,2-DCA were detected at low concentrations (less than 5 ug/L) in only a few wells. PCE and TCE were detected most frequently and were mapped as the VOC plumes referred to above. The Robinson Run plume has the highest VOC concentrations with maximum concentrations in the parts per million range. Bis(2-ethylhexyl)phthalate is the sole semi-VOC that exceeded the LOC in a single sample. In addition to RDX, four other explosive compounds exceeded the LOCs as follows: 2-nitrotoluene, 4-amino-2,6-dinitrotoluene, 4-nitrotoluene, and 2,4,6-trinitrotoluene (TNT). Exclusive of pre-1999 detections in the Former DRMO Yard nine metals were detected at concentrations exceeding the LOC as follows: aluminum, cadmium, iron, lead, manganese, nickel, sodium, vanadium, and zinc. Aluminum, iron, and manganese exceedances are attributed to local geologic conditions and turbidity of the analyzed

groundwater samples. Sodium is believed to originate from storage and usage of salt for roadways. Nickel, vanadium, and zinc were detected infrequently and determined to result from sample turbidity and/or to be isolated detections not associated with a plume. Cadmium and lead were detected at the Former DRMO Yard and considered to be associated with a plume in that area.

TCE and RDX have also been detected in surface water samples from Green Pond Brook and Robinson Run. TCE detections above the LOC occurred in both water bodies whereas RDX exceedances of the LOC were only in Robinson Run.

The groundwater of the area is characterized as "Class IIA" wherein primary use is for potable water or rendered potable water through conventional treatment. Groundwater currently extracted from the Arsenal is treated and two supply wells in Area F are not in use.

#### Human Health Risks

Human health risks were evaluated as part of the RI/FS. For exposure to groundwater, the cancer risk was  $6 \times 10^{-5}$  for the current industrial/research worker but exceeded  $1 \times 10^{-4}$  for other potential receptors using potable water including the industrial/research worker, the future adult resident and future child resident. The hazard index was below 1 for the current industrial/research worker but ranged from 2 to 10 considering potable water use for the industrial/research worker, and future adult and child residents. Evaluation of cancer risk due to inhalation of VOCs from off-gassing of groundwater to indoor air showed a risk within the  $1 \times 10^{-5}$  to  $1 \times 10^{-4}$  range. Exposure to surface water via incidental ingestion and dermal contact while wading did not yield any unacceptable risks and the hazard index for the current/youth visitor, future adult resident, and future child resident was well below 1. Exposures were considered for Robinson Run at Sites 114 and 169. The child lead model was used to calculate the risk of lead exposure in hypothetical future residential children with a resultant probability that 0.002 percent of those exposed would have a blood level above the recommended threshold of concern; USEPA's recommended percentage is 5 percent.

### Ecological Risks

Screening for ecological risk was performed for TCE, RDX, and 2,4,6-TNT by comparing concentrations detected in surface water to ecological LOCs that were derived in several ecological assessments related to Picatinny Arsenal. Surface water concentrations of the three compounds were lower than the ecological LOCs. Furthermore the compounds were not detected in sediment. It was concluded that the three compounds discharging from groundwater to surface water would not have adverse effects on aquatic life in Robinson Run.

### Remedial Action Objectives (RAO)

Remedial action objectives were identified for the site as follows:

- To prevent human exposure to contaminated groundwater that would cause unacceptable risk over the duration of the response action;
- To achieve the more stringent of the maximum contaminant levels (MCLs) or new Jersey Groundwater Quality Standards (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 Health Advisory Level (HAL) will be used as the cleanup goal. (Note: The NJDEP commented that there is an NJDEP interim specific groundwater quality criterion for RDX - 0.5 ug/L. The NJDEP has “requested that the interim criteria be identified as an RAO and the timeframes to achieve such a goal [be] identified within the Proposed Plan.” The NJDEP also noted the existence of an interim criterion of 1 ug/L for 2,4,6-TNT and requested that value be identified as an RAO and be used to derive cleanup timeframes.)

### Response Action Alternatives

The following alternatives were developed. Estimated costs for capital, operation and maintenance (O&M), and present worth are cited for each alternative.

VOC Plumes:

Alternative TCE-1: No Action

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Capital: \$0  
O&M: \$0  
Present worth: \$0

Alternative TCE-2: Monitored Natural Attenuation (MNA) of groundwater and land use controls (LUCs) for all three VOC plumes  
Capital: \$89,000  
O&M: \$381,000  
Present worth: \$527,000

Alternative TCE-3: For Robinson Run plume – Groundwater extraction in the hot-spot area from an enhanced permeability trench, above ground treatment, and reinjection, with MNA and LUCs for the downgradient portion of the plume. MNA and LUCs only for the northern and western VOC plumes.  
Capital: \$679,000  
O&M: \$1,781,000  
Present worth: \$2,460,000

Alternative TCE-4: For Robinson Run plume – groundwater extraction via pumping wells in the hot-spot area, above ground treatment, and reinjection, with MNA and LUCs for the downgradient plume. MNA and LUCs only for the northern and western VOC plumes.  
Capital: \$1,123,000  
O&M: \$1,648,000  
Present worth: \$2,772,000

Alternative TCE-5: Robinson Run plume – enhanced reductive dechlorination (ERD) in the hot spot area, with MNA and LUCs for the downgradient plume. MNA and LUCs only for the northern and western VOC plumes.  
Capital: \$880,000  
O&M: \$898,000  
Present worth: \$1,779,000

RDX plume:

Alternative RDX-1: No action

Capital: \$0  
O&M: \$0  
Present worth: \$0

Alternative RDX-2: MNA of groundwater and LUCs

Capital: \$54,000  
O&M: \$481,000  
Present worth: \$535,000

Alternative RDX-3: In site treatment using anaerobic bio-stimulation, MNA, and LUCs

Capital: \$244,000  
O&M: \$1,229,000  
Present worth: \$1,474,000

#### Evaluation and Comparison of Response Actions

Response actions are evaluated against nine criteria as follows:

##### *Threshold Criteria*

1. Overall protectiveness of human health and the environment
2. Compliance with ARARs

##### *Primary Balancing Criteria*

3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume of contaminants through treatment
5. Short-term effectiveness
6. Implementability
7. Cost

##### *Modifying Criteria*

8. State/support agency acceptance
9. Community acceptance

#### Preferred Response Actions

The Army has indicated a preference for Alternative TCE-5 and Alternative RDX-2.

#### State Acceptance

The NJDEP has provided comments regarding the use of the State of New Jersey interim specific groundwater quality criteria for RDX and for 2,4,6-TNT and requested that the interim criteria be identified as RAOs. As such the timeframes to achieve cleanup would change significantly. The

preferred alternative of MNA and LUCs for the RDX plume has a cleanup timeframe ranging between 15 and 35 years. It is possible that the preferred response action could be approved even without state concurrence.

#### Closing Remarks

The current preferred alternative for TCE combines both an active remedy (enhanced reductive dechlorination - ERD) for the hot spot and a passive one (MNA and LUCs for downgradient of the higher concentration plume and the two lower concentration plumes). Of the alternatives featuring an active TCE remedy the present worth cost is the lowest of the three. Of the three active TCE alternatives, the cleanup timeframe for the northern and western VOC plumes (20 years and 35 years, respectively) is the same because dissipation of those plumes is predicated on MNA. Differences exist in the cleanup timeframe for the Robinson Run plume primarily related to whether or not the bedrock plume can be addressed and whether rebound is expected to occur after the application of the active remedy. The main advantage of the preferred alternative is: "No longer-term operation after cleanup goals are initially met would be required under this alternative as the EVO [emulsified vegetable oil] will address TCE concentrations that have diffused into the bedrock thereby eliminating any rebound following completion of the action." This advantage comes from treatment of the deep bedrock hot spot via injection wells installed to 200 feet below ground surface. Other active remedies either do not treat the bedrock hot spot or have rebound occurrence which boosts the anticipated cleanup timeframe to 200 years for MNA to achieve cleanup.

As for RDX, the NJDEP has requested that the interim specific groundwater quality criteria of 0.5 ug/L for RDX be used to calculate cleanup time frames. The value of 2 ug/L was used to calculate current time frames of 15 to 35 years for MNA and LUCs (the shorter time frame being for the unconfined/weathered bedrock aquifer and the longer for the bedrock aquifer) and 20 years for both aquifers for ERD. Use of a significantly lower attainment value would result in a longer cleanup timeframe.

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**Subsurface Solutions LLC**

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