EXECUTIVE SUMMARY

This report presents the Groundwater Feasibility Study (FS) documenting the development and evaluation of remedial alternatives to address groundwater contamination at the Colonie Site. Cleanup of the Colonie Site is being performed by the U.S. Army Corps of Engineers (USACE), New York District under the Formerly Used Site Remedial Action Program (FUSRAP). For this phase of the work, the USACE, Baltimore District is providing technical support to the New York District. URS Group, Inc. (URS) prepared this FS under Baltimore District Contract No. DACA31-00-D-0011, Delivery Order 66.

Background information for this FS is contained in the Final Groundwater Remedial Investigation (RI) Report [Shaw Environmental, Inc., (Shaw), 2003a], the Final Risk Assessments Report (URS, 2004) which incorporates the Human Health Risk Assessment (HHRA) and Screening Level Ecological Risk Assessment (SLERA), and data from semi-annual groundwater monitoring events conducted between June 2003 and July 2005 by Shaw. The Final RI was conducted to determine the nature and extent of groundwater, surface water, and sediment contamination resulting from historical operations at the Site, and documents contamination that existed at the Site through 2002. The HHRA and SLERA were performed to evaluate actual and potential effects on human and ecological receptors based on the RI data set.

The purpose of the FS is to serve as a risk management decision tool for use in the selection of the most appropriate remedy to eliminate, reduce, or control risks to human health and the environment at the Site. The FS presents a range of remedial alternatives to address Site constituents and evaluates these alternatives with respect to criteria defined in the National Contingency Plan (NCP).

The Colonie Site is located at 1130 Central Avenue (New York State Route 5) in the Town of Colonie, Albany County, New York. The 11.2-acre Site was owned and operated by National Lead Industries from 1937 to 1984. The Department of Energy (DOE) took title to the Site in 1984 in support of the FUSRAP work DOE planned to

undertake at the Site. The surrounding area consists of residential and commercial properties.

The National Lead facility was used for electroplating and manufacturing various components from uranium and thorium. As a result of historical waste handling operations at the Colonie Site, volatile organic compounds (VOCs) were released and have been detected in groundwater. The primary VOC contaminants of concern in groundwater are trichloroethene (TCE), tetrachloroethene [commonly referred to as perchloroethene (PCE)], cis-1,2-dichloroethene (DCE), and vinyl chloride. Radiological constituents are also elevated in groundwater in one monitoring well bordering the Site, but they do not pose a concern because there is no complete pathway for human exposure to these constituents.

The DOE and then USACE have performed extensive cleanup at the Site, including the razing and removal of the manufacturing plant building, and the excavation and removal of contaminated soils and debris, the excavation of soils beneath the former plant building, and the restoration of excavated areas with backfill and vegetative cover as part of soil removal actions. The main site has been cleaned up and any remaining contaminated soils have been placed on a concrete lined pad. In addition, the cleanup of the CSX Vicinity Property was completed, and excavated soils were backfilled in the Fall of 2006. A benefit of the soil excavation under this response action has been the significant reduction of VOCs in the groundwater. Therefore, contaminant data developed for the Groundwater RI and evaluated in the Risk Assessments Report is now largely obsolete. This FS is based primarily on contaminant profiles developed from semi-annual groundwater monitoring conducted concurrently with the USACE soil removal action from 2003 through 2005, and a re-evaluation of the potential contaminant exposure pathways that could reasonably become complete in the future and cause risks to human receptors above threshold levels. An additional round of post-excavation groundwater monitoring data collected in June 2007 was also considered in the detailed analysis of alternatives, which preliminarily suggests that significant reductions in VOC contamination has occurred as a result of source area removal during the soil removal action.

The re-evaluation of potential exposure pathways identified only one complete pathway associated with the groundwater medium. This pathway is potential inhalation of VOC vapors that could volatilize from the water table and migrate into hypothetical new homes on the Site via vapor intrusion. Johnson & Ettinger modeling was performed to calculate constituent groundwater concentrations associated with a $1x10^{-6}$ risk level. Constituents detected at concentrations above these levels in onsite groundwater were identified as contaminants of concern (COCs), and remedial action objectives (RAOs) were developed for remediation of these chemicals to the $1x10^{-6}$ risk level concentrations. The COCs and corresponding RAO concentrations are presented in Table ES-1.

A wide range of potentially applicable remedial technologies were identified and screened with respect to their suitability for use to remediate groundwater VOCs at the Site. Based on the technologies passing the screen, five remedial alternatives were developed for detailed analysis. The five remedial alternatives evaluated for the Site are:

- **Alternative 1** No Action
- **Alternative 2** Land Use Controls (LUCs)
- **Alternative 3** Monitored Natural Attenuation (MNA)
- **Alternative 4** Enhanced Anaerobic Bioremediation (EAB)
- **Alternative 5** Chemical Oxidation (CHEM OX)

Some form of land use control is included for each alternative except Alternative 1. Alternatives 2 through 5 include land use controls, and Alternatives 3 through 5 also include groundwater monitoring.

These remedial alternatives were evaluated against seven criteria: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; short-term effectiveness; implementability; and cost. The performance of the alternatives with respect to the seven evaluation criteria is summarized in Figure ES-1. The discussion below provides a general comparison of the five alternatives.

- Overall protection of human health and the environment – The overall protection criterion is a combination of other evaluation criteria, especially short-term effectiveness, long-term effectiveness and compliance with ARARs. Alternatives 1 (No Action) does not provide adequate overall protection of human health and the environment because groundwater contamination and the potential for onsite human exposure to VOC vapors will not be addressed in any manner. It is rated poor relative to this criterion. Alternative 2 (LUCs) is considered to be protective of human health because the land use controls that will be implemented will prevent exposure to VOCs by future on-site receptors via the vapor intrusion pathway. It is rated adequate relative to this criterion. Although protective, Alternative 2 is rated lower than treatment alternatives because the use of treatment to clean up contamination is more desirable than reliance upon administrative controls to prevent exposure from a public policy perspective. Alternatives 3 (MNA), 4 (EAB), and 5 (CHEM OX) are all considered to be protective of human health because they utilize treatment to address the VOC contamination present and employ land use controls to prevent exposure until cleanup levels are achieved. Alternative 3 (MNA) relies strictly on intrinsic processes, the productivity of which are still being evaluated. Although the efficiency with which MNA will proceed has not been completely established, the source area removal of VOCs in soils is expected to realize long-term reductions of groundwater VOC contamination. Thus, Alternative 3 receives a rating of good. Alternatives 4 (EAB) and 5 (CHEM OX) provide more aggressive treatment of the VOC contamination, and would be expected to achieve cleanup levels in a shorter time period than Alternative 3. Thus they are rated excellent by this criterion.

- Compliance with ARARs – The remediation of groundwater at the Site is not ARAR driven. Therefore, no chemical-specific ARARs are unmet under any of the five alternatives. In addition, no location-specific ARARs are unmet under any of the five alternatives. For Alternatives 4 (EAB) and 5 (CHEM OX), compliance with the substantive technical requirements of the

underground injection permit process will be necessary. They are rated excellent for compliance with this action-specific ARAR.

- Long-term effectiveness and permanence – Alternatives 1 (No Action) is rated poor by this criterion because it neither reduce the magnitude of residual risk nor provides any controls to reduce the hypothetical onsite human risk from exposure to VOCs via vapor intrusion. Alternative 2 (LUCs) does provide a mechanism to prevent or limit potential exposure to VOC contaminants, and thus is rated adequate relative to the other alternatives. Alternatives 3 (MNA), 4 (EAB), and 5 (CHEM OX) address all the factors that make up this criterion to greater or lesser degrees. The three treatment alternatives each reduce the magnitude of residual risk and the treatment provided is permanent. The magnitude of residual risk under Alternative 3 will be dependent on performance of MNA, which will be established during the demonstration period. Alternative 3 is rated good. For Alternatives 4 and 5, dissolved phase VOCs of concern are expected to be degraded or destroyed by the treatment processes employed and are rated excellent.

- Reduction of toxicity, mobility, and volume through treatment – Neither Alternative 1 (No Action) nor Alternative 2 (LUCs) provides any documented reduction in contaminant toxicity, mobility, or volume through treatment, and they receive a poor rating. Alternatives 3 (MNA), 4 (EAB), and 5 (CHEM OX) all reduce the toxicity of the groundwater over time, resulting in receding plume areas. However, there are varying degrees of uncertainty regarding performance of these alternatives based on the geochemical conditions at the Site, which drives the comparative ratings of these alternatives. Because of this uncertainty, Alternative 3 receives an adequate rating, while Alternatives 4 and 5 receive excellent ratings.

- Short-term effectiveness – None of the alternatives will have significant short-term effects on worker or community health. Alternative 1 (No Action) neither achieves the RAOs nor provides any controls to reduce the hypothetical onsite human risk from exposure to VOCs via vapor intrusion.

Thus, Alternative 1 receives a poor rating for this criterion. Alternative 2 (LUCs) does provide a control measure to prevent exposure, though it does not directly address the groundwater contamination or meet the RAO concentration endpoints. Thus, Alternative 2 only receives an adequate rating for this criterion. Alternatives 3 (MNA), 4 (EAB), and 5 (CHEM OX) all address the groundwater contamination, and all have estimated timeframes for achieving the RAO endpoint concentrations. The estimated timeframe for Alternative 3 is 15 years, assuming reductive dehalogenation processes are demonstrated to have become re-established following completion of the soil removal action. Based on this estimated timeframe to achieve RAOs, Alternative 3 receives a rating of good. Alternative 4 (EAB) is estimated to require about 6 years if degradation rates typical or "average" for chlorinated sites can be attained. For Alternative 5 (CHEM OX), source area remediation should be complete in 1-2 years, though reapplications of chemical oxidant may be necessary that would extend the remediation time for one or more additional years. Alternatives 4 and 5 both receive ratings of excellent.

- Implementability – There are three main factors considered for this criterion: administrative feasibility, availability of services and materials, and technical feasibility. Because all five alternatives are administratively feasible and the required services and materials are available, technical feasibility will be the focus of the implementability analysis. Alternatives 1 (No Action) and 2 (LUCs) have no constructability considerations to consider and do not impact future actions. They each receive ratings of excellent. Alternative 3 (MNA) also has little or no constructability considerations, but requires active monitoring that increases the difficulty of implementing over Alternatives 1 and 2, and receives a rating of good. Alternatives 4 (EAB) and 5 (CHEM OX) include significant amounts of drilling, which requires proper precautions and health and safety protocols. Alternatives 4 and 5 both require a pilot test to optimize their designs, and injection of the materials will need to be performed by a trained subcontractor using mobile equipment. Under Alternatives 4 and 5, if the technology does not perform adequately, the cost

to implement another alternative remedy might be higher than if the technology had not been attempted in the first place. Alternatives 4 and 5 both receive adequate ratings.

- Cost – Alternative 1 has no costs associated with it and Alternative 2 has an estimated present worth cost of $29,000. Alternatives 3 (MNA) and 4 (EAB) have estimated present worth costs of $430,000 and $980,000, respectively. Alternative 5 (CHEM OX) has an estimated present worth cost of $2,100,000.