
GROUNDWATER SUPPLEMENT TO

APPENDIX A1

POST REMEDIATION HUMAN HEALTH RISK

ASSESSMENT AT AOC 2

REMEDIAL INVESTIGATION REPORT FOR FORMER

SCHENECTADY ARMY DEPOT - VOORHEESVILLE

AREA (SADVA)

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April 2008

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SECTION A1.1

INTRODUCTION

A1.1.1 PROJECT BACKGROUND

A1.1.1.1 This quantitative human health risk assessment (HHRA) has been prepared for area of concern (AOC) 2 - the Former Bivouac Area/Post Commander's Landfill - by Parsons as part of the remedial investigation (RI) at the former Schenectady Army Depot Voorheesville Area (SADVA). There were several areas within AOC 2 that contained potentially contaminated soil that has been remediated and backfilled in 2005 and 2006. A post-remediation HHRA was completed to assess the potential risk associated with exposure to soil, surface water and sediment after the remediation at AOC 2 and is included as Appendix A1 in the Final RI Report dated September 2007. The HHRA found that the remedial action was effective at mitigating the human health risks formerly posed by the site. The HHRA concluded that no unacceptable cancer risks or non-cancer hazards are posed by the soil, surface water and sediment at AOC 2.

A1.1.1.2 This document addresses the potential risk associated with exposure to groundwater at AOC 2. Groundwater risk was not addressed in the previous post-remediation HHRA because groundwater sampling had not been completed. Therefore, the groundwater risk assessment is being completed as a supplement to the post-remediation HHRA. The specific objective of this supplement to the HHRA is to provide a quantitative post-remediation risk assessment of the groundwater at AOC 2. This groundwater HHRA will determine if there is potential risk to human health associated with exposure to groundwater as an environmental medium.

A1.1.1.3 This HHRA comes under the authority of the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS). The SADVA site is DERP-FUDS site number C02NY0002. This HHRA has been prepared to satisfy internal requirements of the U.S. Army Corps of Engineers (USACE) and DERP-FUDS requirements for risk assessments that are performed for RI projects. This HHRA will be used to assess the effectiveness of the remedial action at AOC 2 and to assess whether groundwater at AOC 2 poses any further risk to human health.

A1.1.1.4 Although the HHRA for AOC 2 has not been required by the State of New York or by the U.S. Environmental Protection Agency (USEPA), there are numerous guidelines and criteria from the State and the USEPA that are relevant to this HHRA. As described further in this HHRA, the assessment uses applicable guidelines, including those provided by the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH), and the USEPA.

A1.1.2 FACILITY AND SITE DESCRIPTION

A1.1.2.1 SADVA is located one-quarter mile southeast of the Village of Guilderland Center, New York (Figure A1.1). The Department of Defense (DoD) held ownership of the

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SADVA property from 1941 through 1969. The site was originally constructed as a regulating station and a holding and reconsignment point, and later became a general Army depot. The principal mission of the installation was the receipt, storage, maintenance, and distribution of supply items for the U.S. Department of the Army.

A1.1.2.2 In 1963, approximately 40 acres on the west side of Route 201 were sold to a private party for use as a residence (Figure A1.1). This area is now considered AOC 2. Historical information indicates the AOC 2 parcel was used as a transit troop bivouac area and officer family housing area in the 1950s and 1960s. After being purchased in 1963, the new owners of the parcel noticed a disposal area (later known as the Post Commander's Landfill), which they ultimately reported to the NYSDEC.

A1.1.2.3 Previous use of AOC 2 included the disposal of drums and other waste in a portion of the 40-acre site. The disposal site has since been remediated and backfilled and has been reseeded. Prior to the remediation, visual evidence of the disposal activities included the presence of small vials containing pills scattered around the area. An area of ground where standing water was observed during rainy periods produced discolored soil and runoff. The disposal area was approximately 1,000 feet west of the onsite residence that formerly utilized a drinking water well adjacent to the house. The residence has been connected to the municipal water supply since approximately 1971 and the well is no longer in use.

A1.1.3 RISK ASSESSMENT PROCESS

A1.1.3.1 Summary of Available Data for AOC 2

A1.1.3.1.1 The RI at AOC 2 began in 2000. The overall RI objective was to assess the presence, nature, and extent of contamination at AOC 2. The activities included locating and characterizing the extent of fill, and sampling the fill, soil, groundwater, surface water, and sediment to assess potential exposure pathways and risks to human health and the environment. The scope of work also included sampling former domestic wells at the site and decommissioning a former groundwater monitoring well. The RI objectives were met as planned.

A1.1.3.1.2 The post-remediation risk assessment for soil has been completed. Details of the fill and soil contamination at AOC 2 were described in that risk assessment for soil (Parsons, 2007).

A1.1.3.1.3 After waste and soil were removed, post-remediation groundwater samples were collected to determine the post-remediation groundwater quality. There were five monitoring wells available for post-remediation sampling. This document assesses the potential risk associated with exposure to groundwater based on the analytical results obtained from sampling those wells.

A1.1.3.2 General HHRA Approach and Guidance Documents

A1.1.3.2.1 Techniques and methods developed or recognized by the USACE and the USEPA were used in this HHRA. This quantitative HHRA is intended to satisfy USACE internal requirements and DERP-FUDS requirements for risk assessments for RI projects. As recommended by USACE, the quantitative HHRA uses a risk ratio approach to quantify potential risk. USEPA Region 6 risk-based human health screening values for residential drinking water were used for the risk ratio analyses. NYSDEC Class GA groundwater (used as drinking water) criteria were qualitatively used in the analyses, but were not used to develop the final risk ratio results (NYSDEC, 1999). The NYSDEC Class GA groundwater criteria are not specifically derived for cancer and non-cancer risk assessments; therefore, the NYSDEC groundwater criteria were only used for comparison purposes in this HHRA.

A1.1.3.2.2 The primary resources for conducting this post-remediation, quantitative risk ratio HHRA for groundwater are listed and described below.

- Standard Scopes of Work for Hazardous, Toxic, and Radioactive Waste (HTRW) Risk Assessments (USACE, 2001).
- USEPA Region 6 Human Health Medium-Specific Screening Levels (USEPA, 2007). These medium-specific screening levels (MSSL) are available for soil, groundwater, and surface water. Drinking water MSSLs were used in this HHRA.
- The USEPA provides the basic background and approach for performing standard HHRA's (e.g., data evaluation, exposure assessments, etc.). General procedures identified in the USEPA's Risk Assessment Guidance for Superfund (RAGS) (USEPA, 1989), were also followed for this HHRA in terms of data evaluation, the exposure assessment, and the toxicity assessment. Supplemental USEPA guidelines were also used in conjunction with RAGS.
- To evaluate vapor intrusion of shallow groundwater contaminants into buildings, the primary resource included the USEPA (2002) OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). That guidance contains target groundwater concentrations calculated to correspond to target indoor air concentrations that are protective of human health if vapor intrusion occurs. There is currently one residence at AOC 2 that is over 1,000 feet from the remediated area, but residential development may occur in the future, and therefore, the vapor intrusion of groundwater contaminants into buildings will be evaluated.

A1.1.4 ORGANIZATION OF HHRA REPORT

The overall risk assessment process consists of four key steps: data evaluation, exposure assessment, toxicity assessment, and risk characterization. These four steps of risk assessment provide the general outline of this HHRA report. Because this HHRA uses the risk ratio approach, the outline and overall format is slightly modified from a traditional HHRA report. This HHRA is generally consistent with USEPA guidelines as presented in *Risk Assessment Guidance for Superfund* (RAGS) (USEPA, 1989) and supporting supplemental guidance

including the *Standard Scopes of Work for HTRW Risk Assessments* (USACE, 2001). This HHRA report is organized into seven sections and an attachment, as outlined below.

- A1.1 Introduction
- A1.2 Data Evaluation and Identification of Chemicals of Potential Concern
- A1.3 Exposure Assessment
- A1.4 Risk Ratio and Screening Criteria Assessment
- A1.5 Risk Assessment Results and Uncertainties
- A1.6 References
- A1.7 Figures, Photographs, and Tables (Data Summary and Risk Calculation Tables)
- Attachment A1.A Groundwater Sample Data

SECTION A1.2

DATA EVALUATION AND IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

A1.2.1 POST-REMEDIATION SAMPLE DATA OVERVIEW

A1.2.1.1 Post-remediation groundwater samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and metals. The two rounds of groundwater samples were collected by Shaw Environmental during April and October 2007. The samples were analyzed by GPL Laboratories and the resulting data were validated by Shaw Environmental. The data summary tables and the data usability report are provided as Tables A1.1 through A1.4 in Attachment A1.A. Five groundwater wells were available to characterize groundwater quality after the remedial action was completed in 2006. Shortly after fill and waste were removed from AOC 2, one round of groundwater sampling occurred (April 2007). To obtain a better estimate of potential contamination after soil remediation, groundwater samples were collected from the five monitoring wells in October 2007. It is assumed that the October 2007 sampling most accurately reflects the post-remediation groundwater conditions.

A1.2.1.2 AOC 2 is considered residential, and exposure to groundwater would be via ingestion as drinking water or inhalation during normal household activities, if groundwater were used for such tasks as showering or dishwashing. The data summary tables in Attachment A1.A summarize the organic compounds and metals that exceed NYSDEC groundwater quality (NYSDEC, 1999) criteria (individual sample concentrations that exceed criteria are in bold text). Table A1.5 presents the field quality control sample results that were used in the data validation process.

A1.2.1.3 To provide a more precise estimate of groundwater contamination for this HHRA, each monitoring well was assessed separately (see Tables A.1.6 through A.1.10 for data summaries and presentations of the HHRA results).

A1.2.2 SCREENING CRITERIA OVERVIEW

A1.2.2.1 Chemicals of potential concern (COPC) at AOC 2 are those that were detected in groundwater samples during the RI. COPCs have the potential to impact human health, particularly if present at concentrations above regulatory criteria. Based on USEPA RAGS guidance (USEPA, 1989) and supplemental guidance for data evaluation, the COPC list was refined. One of the steps was to eliminate essential nutrients, including calcium, iron, magnesium, potassium, and sodium from the list of chemicals evaluated in the HHRA.

A1.2.2.2 The latest round of groundwater sampling (October 2007) was used in the risk assessment, as this is likely to be more representative of post-remediation groundwater conditions at the site. Therefore, if an analyte was detected in the October 2007 sampling event, the detected concentration was used as the exposure point concentration (EPC) for that chemical. Using the latest sampling event also provides a better estimate of the risk associated with post-

remedial conditions. Because no comparative background concentrations were available for groundwater, all chemicals detected in the October 2007 sampling event were included in the risk assessment.

A1.2.2.3 NYSDEC groundwater criteria were qualitatively used in the risk ratio approach but were not used as the final risk ratio calculations. The NYSDEC groundwater criteria are not specifically derived for cancer and non-cancer risk assessments (NYSDEC, 1999). Therefore, the NYSDEC groundwater criteria were only used for comparison purposes. The NYSDEC groundwater criteria are included on the data summary tables for each well.

A1.2.3 RISK RATIO APPROACH

A1.2.3.1 This quantitative HHRA uses a risk ratio approach to quantify potential cancer risk and non-cancer hazard for each COPC in groundwater. The risk ratio approach was applied to each well separately. Therefore, the HHRA characterized risk associated with each well, rather than for the entire AOC 2.

A1.2.3.2 The EPCs used in the HHRA are the detected concentrations of each chemical for the October 2007 sampling event, for each well (as shown in Tables A1.6 through A1.10). If a chemical was not detected in any well, it is not shown on the tables.

A1.2.3.3 In the risk ratio procedure, the EPC was divided by the appropriate USEPA MSSL for groundwater. After calculating the risk ratios for individual chemicals using the USEPA MSSLs, the ratios for the individual chemicals were then summed to calculate the cumulative risk. Risk ratios greater than 1 for non-carcinogenic chemicals indicate a potentially unacceptable risk. For carcinogenic chemicals, the acceptable target risk range for carcinogenic risk is one in ten thousand (1×10^{-4}) to one in one million (1×10^{-6}).

A1.2.3.4 In the first tier, all carcinogenic chemicals were evaluated together, as were all non-carcinogenic chemicals. Where the cumulative non-carcinogenic risk ratio identified in this HHRA is greater than 1, the risk has been further evaluated using specific target organs or organ groupings. To estimate the risk associated with multiple non-carcinogenic chemicals, the risks are considered cumulative only if the chemicals affect the same target organ. Therefore, where necessary, the target organs have been identified for all non-carcinogenic chemicals to assess whether the calculated risks are truly cumulative.

A1.2.3.5 Lead was not quantified using the risk ratio approach. According to USEPA guidance, lead is to be evaluated based on blood lead levels and not the potential for cancer or non-cancer risks. Therefore, lead concentrations detected at the site were directly compared to the treatment technique action level. If lead concentrations within a particular well at the site exceed the criteria, then unacceptable risk may occur. If lead concentrations are lower than the criteria, then there is no unacceptable risk.

A1.2.3.6 Iron was not quantified using the risk ratio approach. Iron is considered an essential nutrient, and USEPA has established secondary water quality standards for some chemicals (including iron and manganese, found in this study) as a guideline to manage drinking

water for aesthetic considerations, such as taste, color, and odor. These secondary contaminants are not considered to present a risk to human health (USEPA, 1992).

A1.2.3.7 Iron and manganese were classified as chemicals of potential concern in the pre-remediation HHRA in groundwater. If iron or manganese concentrations within a particular well at the site exceed the USEPA Region 6 screening criteria, then iron or manganese may cause aesthetic concerns, but are not expected to be toxic to humans at the site.

A1.2.3.8 The risk ratio calculations for AOC 2 groundwater wells are presented in Tables A1.6 through A1.10.

SECTION A1.3

EXPOSURE ASSESSMENT

A1.3.1 OBJECTIVE

A1.3.1.1 The objective of the exposure assessment is to estimate the type and magnitude of potential exposures to COPCs at the site. The exposure assessment includes identification of potential exposure pathways, receptors, and exposure scenarios, as well as quantification of exposure. Characterization of the exposure setting and identification of all potentially exposed receptors and exposure pathways are discussed in this section. A conceptual site model (CSM) showing results of the exposure assessment is shown on Figure A1.3. Quantification of exposure involves quantifying the magnitude, frequency, and duration of exposure for the receptors and exposure pathways of concern.

A1.3.1.2 Groundwater is the only medium of concern at AOC 2 in this supplemental HHRA. A risk assessment for post-remediation soil, surface water and sediment was included in the Final RI Report. The exposure pathways relevant to the site are described below and shown in the CSM.

A1.3.2 CONCEPTUAL SITE MODEL

A1.3.2.1 A CSM is an effective tool for defining site dynamics, streamlining risk assessments, establishing exposure hypotheses, and developing appropriate corrective actions. The CSM for groundwater at AOC 2 is provided graphically on Figure A1.3, and in further detail in matrix form on Figure A1.4. CSMs are useful for identifying completed exposure pathways between the contaminated media and potential receptors. The purpose of the CSM is to aid in understanding and describing a site and presents the assumptions regarding:

- Suspected sources and types of contaminants present;
- Contaminant release and transport mechanisms;
- Affected media;
- Potential receptors that could come in contact with site-related contaminants in affected media under current and future land use scenarios; and
- Potential routes of exposure.

A1.3.2.2 Descriptions of contaminant sources, release mechanisms, and affected media were provided in Sections A1.1 and A1.2. The potential receptors and completed exposure pathways are discussed in the following subsections. Further descriptions of site characterization information are described in Sections 2 and 3 of the Final RI Report (Parsons, 2007).

A1.3.3 POTENTIAL RECEPTORS

A1.3.3.1 Potential human receptors are defined as individuals who may be exposed to site-related contaminants in environmental media. Consistent with USEPA (1989) guidance, current and reasonably anticipated land uses were considered in the receptor selection process.

A1.3.3.2 Based on previous investigations and the site visit by the project team performing the risk assessment for the site, the observations and reasonable assumptions for the potential human receptors for AOC 2 are listed below.

- **Current Receptors** – AOC 2 is currently a residential property. One house is located within AOC 2 and is approximately 1,000 feet from the remediated areas.
- **Future Receptors** – AOC 2 is expected to remain a residential property. It is not known if further residential development will occur in the future; however, potential future residents have been evaluated to provide a conservative estimate of risk (*i.e.*, most health protective).
- **Current and Future Residential Exposure to Groundwater** – The site is currently a residential property. There was a water supply well on the property, but drinking water for the property is now supplied by the Town of Guilderland public water supply. There are two private wells located on adjacent property that are also no longer in use.
 - Groundwater has been used at the Guilderland Central School for irrigation of school grounds/athletic fields. The school, former SADVA, and most residences in the vicinity of AOC 2 are now on the Town of Guilderland public water supply (Town of Guilderland, 2000). The public water supply system was developed after SADVA operations ended. The public used domestic wells before the water system was installed.
 - The exposure pathway of concern is the domestic use of groundwater in the area. Although site groundwater is not currently used as a water supply at AOC 2, homes northwest, west, and southwest of AOC 2 may use private wells. In addition, future groundwater use at, or downgradient of, the site is unknown.

A1.3.4 EXPOSURE PATHWAYS

A1.3.4.1 USEPA (1989) defines an exposure pathway as: “The course a chemical or physical agent takes from a source to an exposed organism. An exposure pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at or originating from a site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium (*e.g.*, air) or media (in cases of intermedia transfer) is also included.”

A1.3.4.2 A review of potential exposure pathways links the sources, locations, and types of environmental releases with receptor locations and activity patterns to determine the significant pathways of concern. The exposure pathways evaluated for groundwater are described below:

- Ingestion of groundwater as drinking water. Although the site drinking water wells are no longer in use, there is a possibility that ingestion of groundwater as drinking water could occur in the future. This pathway is evaluated in the interest of protecting the health of future residents.
- Dermal contact with groundwater through showering, dishwashing, and laundering if groundwater is used for these purposes.
- Inhalation of volatiles through vapor intrusion of groundwater into residences. The current residence is located more than 1,000 feet upgradient of the source area, and there is a small hill between the former source area and the residence that prevents surface water from flowing from the source area to the residence. However, future residential development at the site may occur, and therefore, the residential receptors and pathways are evaluated for vapor intrusion in the event that an occupied building is built on site.

SECTION A1.4

RISK RATIO AND SCREENING CRITERIA ASSESSMENT

A1.4.1 SCREENING AND COMPARISON CRITERIA ASSESSMENT

Four essential nutrients, calcium, magnesium, potassium and sodium were eliminated from further analysis. Iron, although an essential nutrient, is qualitatively evaluated in this HHRA.

A1.4.2 RISK RATIO ASSESSMENT

A1.4.2.1 The risk ratio method considers groundwater risk on a well-by-well basis for five wells sampled following the remedial action at AOC 2. For the risk ratio assessment, the latest (October 2007) detected concentration of each analyte was used as the EPC to calculate risk.

A1.4.2.2 In the risk ratio analysis, the EPC is divided by the MSSL for groundwater.

A1.4.2.3 Following calculation of the risk ratios for individual chemicals, the ratios were summed to determine the cumulative risk. Risk ratios greater than 1 for non-carcinogenic chemicals or greater than 1×10^{-4} for carcinogenic chemicals indicate a potential unacceptable risk. In the first tier, all carcinogenic chemicals were evaluated together, as were all non-carcinogenic chemicals. Where the cumulative non-carcinogenic risk ratio identified in this HHRA is greater than 1, the risk has been further evaluated using specific target organs or organ groupings. To estimate the risk associated with multiple non-carcinogenic chemicals, the risks are considered cumulative only if the chemicals affect the same target organ. Therefore, where necessary, the target organs have been identified for all non-carcinogenic chemicals to assess whether the calculated risks are truly cumulative.

A1.4.3 GROUNDWATER SCREENING CRITERIA

A1.4.3.1 Groundwater results were compared to NYSDEC Class GA groundwater standards (NYSDEC, 1999). Class GA groundwater standards provide protection for groundwater designated as a source of drinking water and all other uses.

A1.4.3.2 Based on the exposure assessment for current and future land use, the groundwater risk-based levels from USEPA Region 6 (*i.e.*, the groundwater MSSLs) are those listed below:

- Current residential receptor – the risk ratio screening levels are the cancer (10^{-6}) and non-cancer (HQ=1) “residential water” values calculated for ingestion of groundwater as drinking water, and inhalation of volatiles from use of groundwater in the home (e.g., showering, laundering, and dish washing). Residential receptors and exposure pathways are considered to provide a conservative estimate of risk for other potential receptors.
- Screening criteria to evaluate vapor intrusion of shallow groundwater VOCs into buildings were based on USEPA (2002) target groundwater concentrations. The

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target groundwater concentrations are calculated to correspond to target indoor air concentrations that are protective of human health if vapor intrusion occurs. As previously discussed, the target groundwater concentrations are derived to ensure protection of a residential receptor, and thus provide a conservative evaluation for residences that may be constructed in the future.

A1.4.4 RISK RATIO EQUATIONS

A1.4.4.1 Cumulative cancer risks were estimated using the following equation:

$$\text{Cumulative Risk} = \sum (TR) \frac{(EPC_i)}{MSSL_{c-i}}$$

where:

Cumulative Risk = Cumulative risk for all carcinogenic COPCs (unitless), where $(TR) \frac{(EPC_i)}{MSSL_{c-i}}$ is the chemical-specific cancer risk for chemical “i”;

TR = Target lifetime excess cancer risk of 1E-06 (unitless);

EPC_i = Exposure point concentration for chemical “i” (ug/L); and

$MSSL_{c-i}$ = USEPA Region 6 (2007) residential cancer-based medium-specific screening level (in ug/L) for chemical “i”.

A1.4.4.2 Cumulative non-cancer risks were estimated using the following equation:

$$HI = \sum (THQ) \frac{(EPC_i)}{MSSL_{nc-i}}$$

where:

HI = Cumulative hazard index for non-cancer all COPCs (unitless), where $(THQ) \frac{(EPC_i)}{MSSL_{nc-i}}$ is the chemical-specific non-cancer hazard quotient (HQ) for chemical “i”;

THQ = Target hazard quotient of one (unitless);

EPC_i = Exposure point concentration for chemical “i” (ug/L); and

$MSSL_{nc-i}$ = USEPA Region 6 (2007) residential cancer-based medium-specific screening level (ug/L) for chemical “i”.

SECTION A1.5

RISK ASSESSMENT RESULTS AND UNCERTAINTIES

A1.5.1 OBJECTIVE

The primary objective of this HHRA was to quantitatively characterize the human health risk associated with current and reasonably expected future exposure to groundwater following the remedial action at AOC 2. Groundwater is a potentially complete exposure pathway evaluated in the HHRA as described in Section A1.3 and shown on the CSM (Figure A1.3). The results of the risk ratio quantification are presented in this section.

A1.5.2 ESTIMATED RISKS FOR GROUNDWATER USED AS DRINKING WATER

A1.5.2.1 The calculated risks for groundwater were evaluated for each individual well. There were no background concentrations available for groundwater, so the results are qualitatively compared to NYSDEC Class GA criteria prior to the risk ratio calculations. Four essential nutrients (calcium, magnesium, potassium, and sodium) were eliminated from consideration in the screening level risk assessment (SLRA). No other detected chemicals were eliminated from consideration in the SLRA.

A1.5.2.2 Lead was not included in the cumulative risk calculated in the SLRA. As the screening value for lead is based on the treatment technique action level, rather than on a carcinogenic risk or non-carcinogenic hazard quotient, lead was simply compared to the appropriate screening value. Therefore, to determine human health risk due to lead in groundwater, the detected concentration of lead in each well was compared to the USEPA risk-based MSSL. If the detected concentration of lead was lower than the screening level, lead is not expected to have human health risks. If the detected concentration of lead was higher than the screening level, there is a potential for human health risk due to lead in the groundwater. In each case, the concentration of lead in the well was less than the MSSL.

A1.5.2.3 Iron was not included in the cumulative risk calculated in the SLRA, because iron is an essential nutrient, and as such is not expected to pose an unacceptable risk to human health. However, iron was previously identified as a COPC in groundwater at the site, and was qualitatively assessed in the SLRA, since the USEPA Region 6 MSSLs include a MSSL for iron. For this risk assessment, the detected concentration of iron from each well was compared to the USEPA Region 6 MSSL, and assessed separately from the carcinogenic and non-carcinogenic cumulative risk estimates. Additionally, the USEPA has not promulgated a primary maximum contaminant level (MCL) for iron, but only considers iron as a secondary contaminant (USEPA, 1992). Secondary contaminants are those compounds that do not have toxic effects, but are considered nuisance chemicals. That is, these secondary contaminants may affect the color or taste of drinking water. Iron is one such secondary contaminant, and iron in drinking water will oxidize when exposed to air, and the precipitates cause the water to be a red-brown rust color and have a metallic taste. The water may also cause staining of pipes, clothing, dishes, and porcelain. Finally, iron is not a listed CERCLA hazardous substance per CFR 302.4, and the

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FUDS program is limited in its authority to respond to contamination by non-CERCLA hazardous substances.

Monitoring Well MW-01:

A1.5.2.4 Table A1.6 presents the results of the risk ratio calculations for MW- 01. There were no unacceptable cumulative non-carcinogenic risks ($HI = 0.62$) associated with contaminants in MW-01. The cumulative carcinogenic risk at MW-01 was 5.4×10^{-5} , which is within USEPA's acceptable risk range of 1.0×10^{-4} to 1.0×10^{-6} .

A1.5.2.5 Lead and iron are not assessed in the cumulative risk ratios as described above, but these analytes are assessed individually. There was lead detected in MW-01, but the detected concentration ($0.71 \mu\text{g/L}$) was less than the USEPA MSSL ($15 \mu\text{g/L}$). Therefore, there is no expected human health risk due to lead in groundwater at MW-01. There was also iron detected in MW-01, but the detected concentration ($16,800 \mu\text{g/L}$) was less than the USEPA MSSL ($25,550 \mu\text{g/L}$). However, iron was detected at concentrations higher than the USEPA secondary MCL ($300 \mu\text{g/L}$), which indicates that the water may be subject to aesthetic problems, including staining and a metallic taste.

Monitoring Well MW-02:

A1.5.2.6 Table A1.7 presents the results of the risk ratio calculations for MW-02. There were no unacceptable cumulative non-carcinogenic risks ($HI = 0.62$) associated with contaminants at MW-02. The cumulative carcinogenic risk at MW-2 was 6.2×10^{-7} , which is less than USEPA's acceptable risk range of 1.0×10^{-4} to 1.0×10^{-6} . There is no unacceptable cancer risk associated with MW-02.

A1.5.2.7 Lead and iron are not assessed in the cumulative risk ratios as described above, but these analytes are assessed individually. Lead was detected in MW-02, but the detected concentration ($0.84 \mu\text{g/L}$) was less than the USEPA MSSL ($15 \mu\text{g/L}$). Therefore, there is no expected human health risk due to lead in groundwater at MW-02. Iron was detected at MW-02, but the detected concentration ($1,440 \mu\text{g/L}$) was less than the USEPA MSSL ($25,550 \mu\text{g/L}$). However, iron was detected at concentrations higher than the USEPA secondary MCL ($300 \mu\text{g/L}$), and the water may be stained or have a metallic taste.

Monitoring Well MW-3:

A1.5.2.8 Table A1.8 presents the results of the risk ratio calculations for MW-3. There were no unacceptable cumulative non-carcinogenic risks ($HI = 0.96$) associated with contaminants at MW-03. The cumulative carcinogenic risk as MW-3 was 2.9×10^{-5} , which is within USEPA's acceptable risk range of 1.0×10^{-4} to 1.0×10^{-6} .

A1.5.2.9 Lead and iron are not assessed in the cumulative risk ratios as described above, but these analytes are assessed individually. Lead was detected in MW-3, but the detected concentration ($0.26 \mu\text{g/L}$) was less than the USEPA MSSL ($15 \mu\text{g/L}$). Therefore, there is no expected human health risk due to lead in groundwater at MW-03. Iron was detected in MW-3,

but the detected concentration (1,620 µg/L) was less than the USEPA MSSL (25,550 µg/L). However, iron was detected at concentrations higher than the USEPA secondary MCL (300 µg/L), and the water may be stained or have a metallic taste.

Monitoring Well MW-5:

A1.5.2.10 Table A1.9 presents the results for the risk characterizations for MW-5. MW-5 has a cumulative non-carcinogenic risk ratio (HI = 1.06) that is slightly above USEPA's acceptable value of 1.0, primarily due to the presence of manganese. The individual HQ value for manganese is 0.94, which is approximately 93 percent of the total risk. The manganese concentration in MW-5 is less than the USEPA MSSL (1,703 µg/L).

A1.5.2.11 To conservatively evaluate the risk associated with this site, all non-carcinogens were assumed to act cumulatively. However, non-carcinogens generally act on specific target organs and only those non-carcinogens that affect the same target organs may result in a cumulative risk. The target organ for manganese, which is the basis of the MSSL, is the central nervous system. An evaluation of the target organs for the top three contributors to non-carcinogenic risk at MW-5 (thallium, antimony, and cadmium) indicates that none of those chemicals also affect the central nervous system. Therefore, when target organs are considered, an unacceptable non-carcinogenic risk is not expected at this site. The cumulative carcinogenic risk at MW-5 is 3.5×10^{-7} , which is less than USEPA's acceptable risk range of 1.0×10^{-4} to 1.0×10^{-6} . There is no unacceptable cancer risk associated with MW-5.

A1.5.2.12 Lead and iron are not assessed in the cumulative risk ratios as described above, but these analytes were assessed individually. Lead was detected at MW-5, but the detected concentration (0.82 µg/L) is less than the USEPA screening concentration (15 µg/L). Therefore, there is no expected human health risk due to lead in groundwater at MW-5. Iron was detected in MW-5, but the detected concentration 1,100 µg/L was less than the USEPA screening concentration (25,550 µg/L). Iron was detected at MW-5 at a concentration higher than the secondary MCL (300 µg/L), and manganese was also detected (1,600 µg/L) at a concentration higher than the USEPA secondary MCL (50 µg/L). Both chemicals in the water may affect the color and taste of the drinking water.

Monitoring Well MW-7:

A1.5.2.13 Table A1.10 presents the results for the risk characterizations for MW-7. There were no unacceptable cumulative non-carcinogenic risks (HI = 0.32) associated with contaminants at MW-7. The cumulative carcinogenic risk as MW-7 was 1.5×10^{-7} , which is less than USEPA's acceptable risk range of 1.0×10^{-4} to 1.0×10^{-6} . There is no unacceptable cancer risk associated with MW-7.

A1.5.2.14 Lead and iron were not assessed in the cumulative risk ratios as described above, these chemicals were assessed individually. Lead was detected in MW-7, but the detected concentration (0.62 µg/L) was less than the USEPA screening concentration (15 µg/L). Therefore, there is no expected human health risk due to lead in groundwater at MW-7. Iron was detected in MW-7, but the detected concentration (432 µg/L) was less than the USEPA screening

concentration (25,550 µg/L). However, iron was detected at concentrations higher than the USEPA secondary MCL (300 µg/L), and the water may be stained or have a metallic taste.

A1.5.3 ESTIMATED RISKS FOR VAPOR INTRUSION OF GROUNDWATER INTO INDOOR AIR

A1.5.3.1 Groundwater beneath the site is shallow and there is potential for vapor intrusion of contaminants into indoor air. Thus, future buildings that may be constructed on site or possibly homes/businesses located near the site may be susceptible to vapor intrusion.

A1.5.3.2 Although there is one residence present in AOC 2, and residences may be constructed in the future, none of the samples from the October sampling event contained any volatile chemicals. Therefore, unacceptable human health risks due to vapor intrusion from volatile chemicals in groundwater into indoor air are not anticipated. The metal mercury is potentially volatile and was detected in MW-02 at a concentration of 0.076 µg/L. According to the USEPA guidance for vapor intrusion (USEPA, 2002), the target groundwater concentration corresponding to target indoor air concentration is 0.68 µg/L. Therefore, the detected concentration of mercury at MW-02 is less than the vapor intrusion screening value. Unacceptable human health risks due to vapor intrusion for mercury in groundwater into indoor air are not anticipated.

A1.5.4 UNCERTAINTIES

A1.5.4.1 These risk estimates are designed to be very conservative and likely overestimate potential risk. An uncertainty associated with the groundwater risk ratio results is that there are only two sampling events following remediation. Only the second sampling event was used in this risk assessment, as it was determined to most accurately represent post-remediation conditions. Since the source of contamination has been removed, it is unlikely that concentrations in groundwater would continue to increase.

A1.5.4.2 Another uncertainty associated with the groundwater risk ratio results is that the residential exposure pathway is extremely unlikely. The home in AOC 2 has connected to the Town of Guilderland public drinking water supply. Future development on this land would also likely use public drinking water.

A1.5.4.3 The cumulative risk assessment conservatively assumes that all non-carcinogens have cumulative effects. However, it is generally assumed that only those non-carcinogens that affect the same target organ have cumulative effects. If target organs are considered, the cumulative effects for each well would be lower. In the case of MW-5, consideration of target organs reduces the cumulative non-carcinogenic risk to below the target hazard index of 1.

A1.5.4.4 Finally, there are uncertainties associated with the toxicity of iron. The oral RfD used to calculate the iron hazard quotients was 0.3 mg/kg-d, a provisional value that was originally proposed in 1993 and revised in 1996 (USEPA, 1996). As stated in the issue paper (USEPA, 1996):

Iron is an essential element, and deriving a risk assessment value for such chemicals poses a special problem in that the dose adversity curve is 'U-shaped.' Thus, the risk value must be protective against deficiency as well as toxicity.

A1.5.4.5 It has been well established that a chronic daily intake of iron ranging from 0.15 to 0.27 mg/kg-d is protective of iron deficiency in the population, and this intake is insufficient to cause iron toxicity from iron overload (ATSDR, 1996). None of the iron toxicity studies evaluated in the issue paper have yielded adequate information to quantify with any certainty the oral toxicity of iron from a chronic standpoint. The issue paper (ATSDR, 1996) concludes:

Thus, although toxicity associated with iron overload due to chronic oral intake can be demonstrated qualitatively or even semiquantitatively, assignment of a precise LOAEL [lowest-observed-adverse-effect-level] for normal individuals consuming western diets is compromised by studies containing confounding factors, inadequate endpoint assessment, too short a duration of exposure or too few subjects.

A1.5.4.6 In spite of this uncertainty, the National Center for Environmental Assessment (NCEA) has used the high end of the chronic intake range (i.e., 0.27 mg/kg-d) as a no-observed-adverse-effect level (NOAEL with an uncertainty factor of 1 to yield an oral RfD of 0.3 mg/kg/day). This dose is protective against iron deficiency based on a sample size of over 20,000 people ranging in age from 6 months to 74 years (NHANES II study). However, the chronic intake level that produces toxicity is not known with any certainty and may be many times greater than the protective dose.

A1.5.4.7 It is reasonable to suggest that the chronic adverse effect dosage of iron in humans may be higher than 0.3 mg/kg-d, perhaps significantly higher. This is supported by the Recommended Dietary Allowances (RDAs) for iron established by the National Academy of Science (NAS) (as cited in ATSDR, 1996). The RDAs are equivalent to or bracket the chronic oral RfD of 0.3 mg/kg-d:

- 10 mg/day (0.13 mg/kg-d) for male adults;
- 15 mg/day (0.24-0.33 mg/kg-day) for females aged 11-50 years;
- 6 mg/day (1 mg/kg-d) for nonbreastfed infants aged 0-6 months;
- 10 mg/day (0.36-1.11 mg/kg-d) for children aged 6 months to 10 years;
- 12 mg/day (0.18-0.27 mg/kg-d) for males aged 11-14 years.
- 30 mg/day (0.443 mg/kg-d) for pregnant women; and,
- 15 mg/day (0.25 mg/kg-d) for women who are lactating.

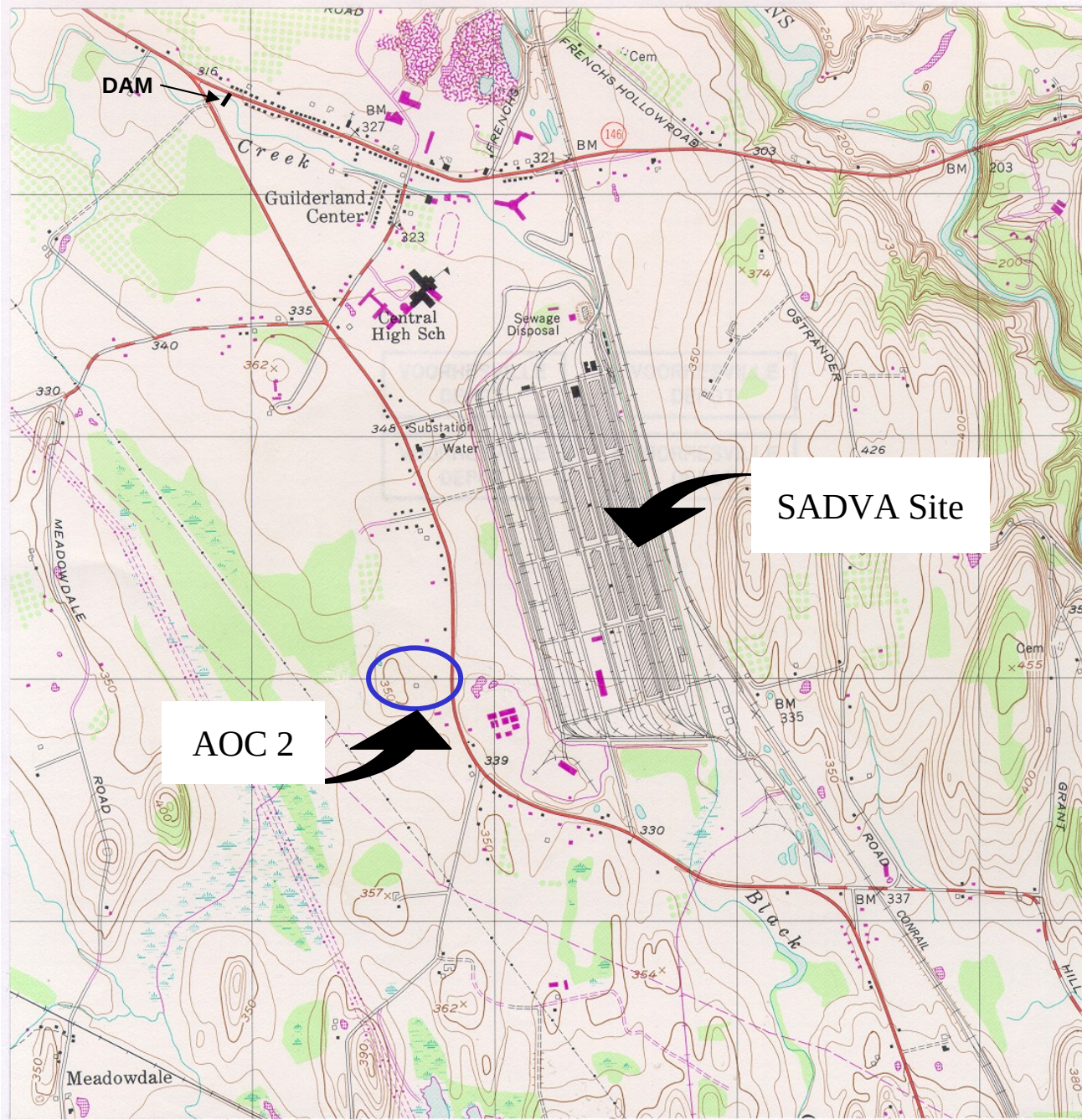
A1.5.4.8 The RDA recommended for pregnant women is 1.5 times the RfD, although this might be considered a subchronic exposure. NCEA indicates that adverse neurodevelopmental effects in humans have not been associated with the ingestion of supplemental iron during pregnancy (ATSDR, 1996). Animal studies have been negative as well (ATSDR, 1996).

SECTION A1.6

REFERENCES

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- .

FIGURES



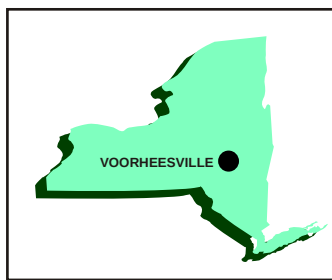
SADVA Site

AOC 2

FIGURE A1.1

SADVA
GUILDERLAND, NEW YORK

SITE VICINITY



New York
Quadrangle



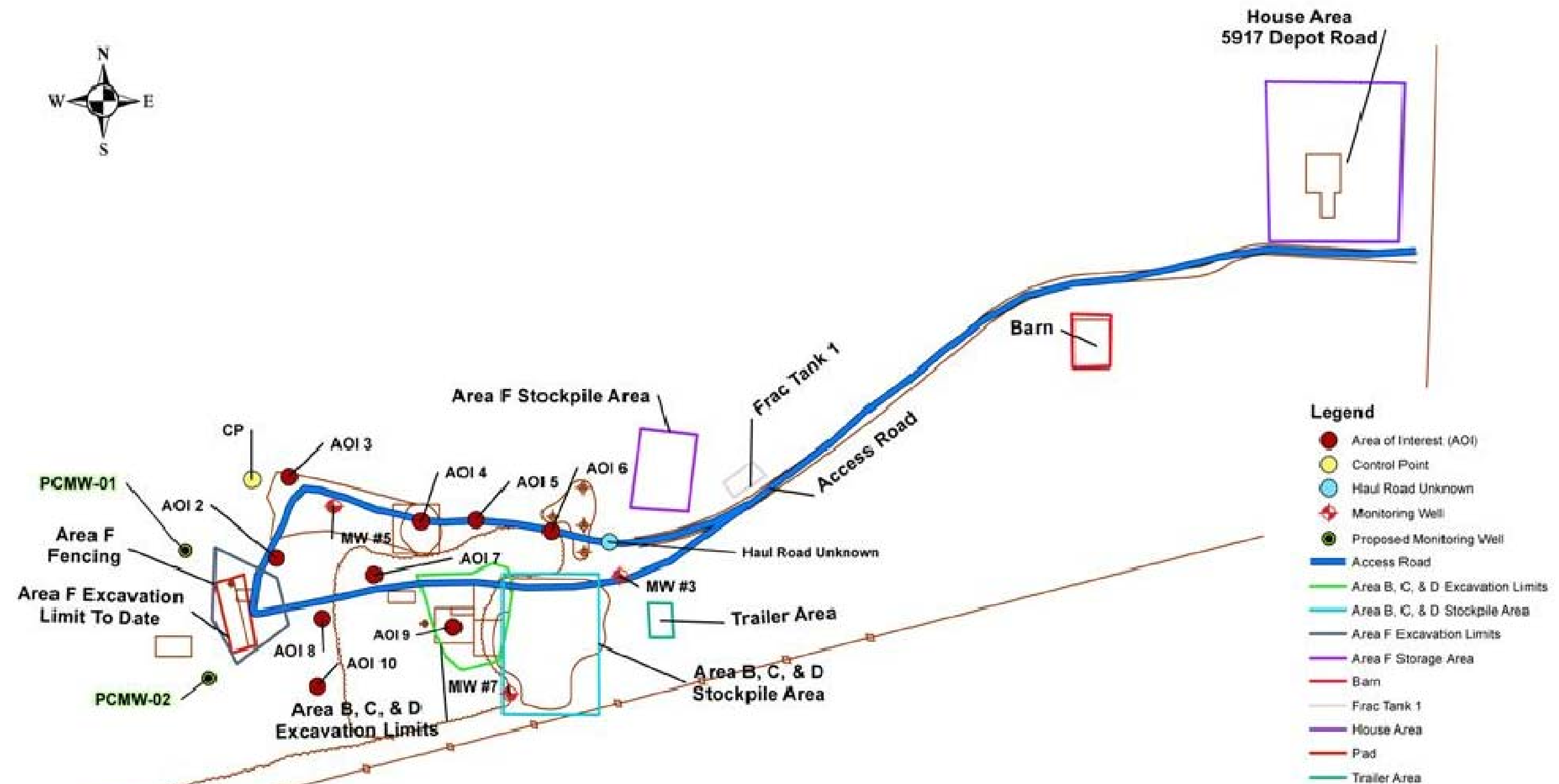
LATITUDE: N42° 15' 20"
LONGITUDE: W75° 14' 38"

2000 1000 0

Approximate Scale in Feet

PARSONS

290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, NY 13088 PHONE: (315) 451-9560



Notes:

1. Map is based upon a field sketch, as such, all locations and dimensions are approximate.
2. Map depicts excavation areas as of December 2005.
3. Proposed well locations are approximate. Actual locations will be based upon field conditions (e.g., access).



SOURCE: SHAW ENVIRONMENTAL

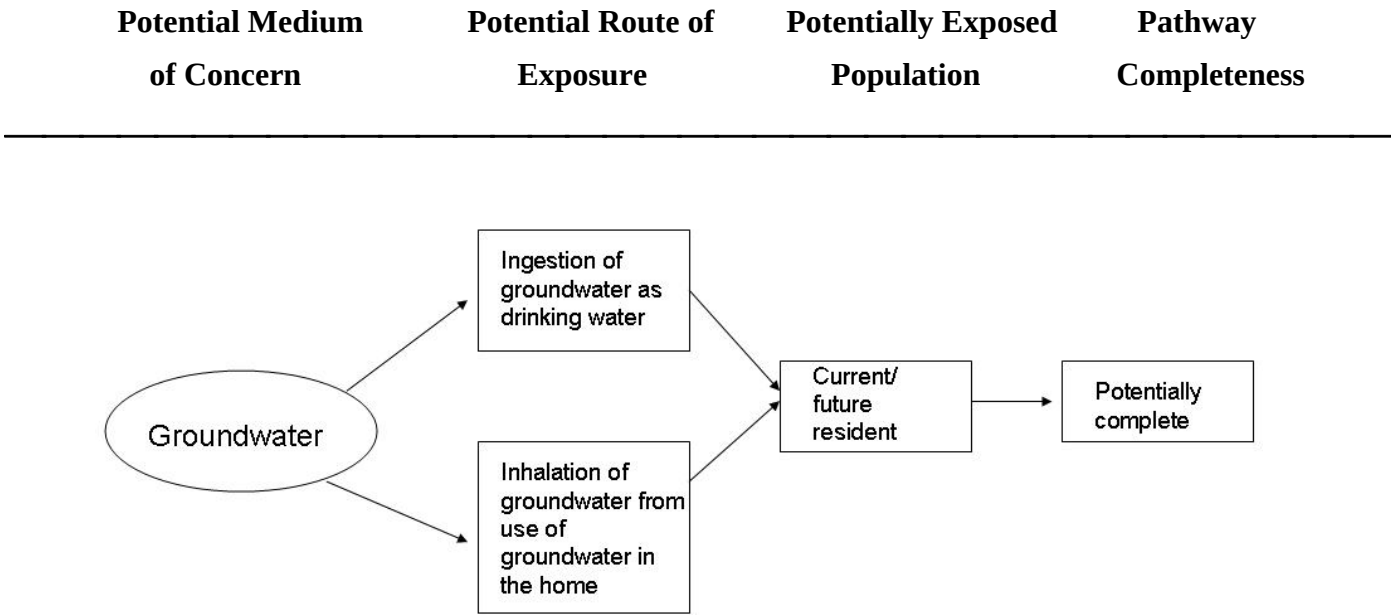
FIGURE A1.2

SADVA
GUILDERLAND, NEW YORK
AOC 2 – SITE PLAN

PARSONS

290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

Figure A1.3 Human Health Conceptual Site Model



**Figure A1.4 Human Health Conceptual Site Model Exposure Pathway
Completeness and Assumptions**

Potential Medium of Concern	Potential Route of Exposure	Potentially Exposed Population	Pathway Completeness and Assumptions
Groundwater	• Ingestion of groundwater as drinking water • Inhalation of groundwater from use of groundwater in the home (e.g., showering, laundering, and dish washing)	• Current/future resident	• Current and/or future resident is a potentially complete pathway. Additional groundwater sampling at the site is underway. Pending additional data, groundwater is not evaluated in the HHRA.

TABLES

Table A1.1
AOC-2
Water Monitoring
VOC Results

NYDEC MCL														
Compound	(ug/l)	RL (ug/L)	MW-01	MW-02	MW-3	MW-5	MW-7	SURFACE H2O		MW-01	MW-02	MW-3	MW-5	MW-7
Date Collected			4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007		10/10/2007	10/10/2007	10/10/2007	10/10/2007	10/10/2007
1,1,1,-Trichloroethane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,1,2,2-Tetrachloroethane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,1,2-Trichloroethane	1	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,1-Dichloroethane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,1-Dichloroethene	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,2-Dichlorobenzene	3	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,2-Dichloroethane	0.6-ADL	1.0	BQL	3.5	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,3-Dichlorobenzene	3	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,3-Dichloropropane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
1,4-Dichlorobenzene	3	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2-Butanone (MEK)	50	5.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4-Methyl-2-Pentanone (MIBK)	NS	5.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Acetone	50	5.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Benzene	1	1.0	0.37	2.9	1.5	0.4	0.4	0.17		BQL	BQL	BQL	BQL	BQL
Bromochloromethane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Bromomethane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Carbon Disulfide	NS	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Carbon Tetrachloride	5	1.0	BQL	BQL	BQL	0.44	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Chlorobenzene	5	1.0	0.42	2.3	1.2	BQL	BQL	0.24		BQL	BQL	BQL	BQL	BQL
Chloroethane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Chloroform	7	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Chloromethane	NS	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Dibromochloromethane	50	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Ethylbenzene	5	1.0	BQL	3.8	0.16	BQL	0.25	BQL		BQL	BQL	BQL	BQL	BQL
Freon 113	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Methylene Chloride	5	1.0	BQL	1.4	BQL	BQL	1.5	0.78		BQL	BQL	BQL	BQL	BQL
Styrene	930	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Tetrachloroethene	5	1.0	0.41	17	7.5-JM	0.36	0.29	0.18		BQL	BQL	BQL	BQL	BQL
Toluene	5	1.0	0.14	0.94	0.45	0.16	1.0	BQL		BQL	BQL	BQL	BQL	BQL
Xylenes (total)	5	1.0	BQL	2.3	1.1	BQL	1.0	BQL		BQL	BQL	BQL	BQL	BQL
Trichloroethene	5	1.0	BQL	0.51	0.24	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Trichlorofluoromethane	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Vinyl Chloride	2	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
trans -1,2 Dichloroethene	5	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL

MCL from NYDEC TOGS 111- Groundwater Effluent Standards Class GA
Results in **bold** type are >MCL
ADL - not detectable at the analytical detection limit
JM-flagged as "estimated minimum value" due to poor QC Matrix recovery

Table A1.2
AOC-2
Water Monitoring
SVOC Results

NYDEC MCL														
Compound	(ug/l)	RL (ug/L)	MW-01	MW-02	MW-3	MW-5	MW-7	SURFACE H2O		MW-01	MW-02	MW-3	MW-5	MW-7
Date Collected			4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007		10/10/2007	10/10/2007	10/10/2007	10/10/2007	10/10/2007
2,4,5-Trichlorophenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2,4-Dichlorophenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2,4-Dinitrophenol	2	2.6	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2,4-Dinitrotoluene	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2,6-Dinitrotoluene	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2-Chlorophenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	NS	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2-Nitroaniline	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2-Nitrophenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
2-methylphenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
3-Nitroaniline	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4-Chloroaniline	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4-Nitroaniline	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4-Nitrophenol	2	2.6	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4-chloro-3-methylphenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4-methylphenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Acenaphthene	20	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Acenaphthylene	NS	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Aniline	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Anthracene	50	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Benzo(a) anthracene	0.002-ADL	0.21	BQL	BQL	BQL	0.078-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Benzo(a) pyrene	ADL	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Benzo(b) fluoranthene	0.002-ADL	0.21	BQL	BQL	BQL	0.067-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Benzo(g,h,i)perylene	NS	0.21	BQL	BQL	BQL	0.078-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Benzo(k) fluoranthene	0.002-ADL	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Butyl benzyl phthalate	50	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Chrysene	0.002-ADL	0.21	BQL	BQL	BQL	0.067-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Dibenz(a,h) Anthracene	NS	0.21	BQL	BQL	BQL	0.056-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Dibenzofuran	NS	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Diethyl Phthalate	50	0.21	0.22	0.13-J	0.12-J	0.4	0.13-J	BQL		0.10-J	BQL	BQL	BQL	BQL
Dimethyl Phthalate	50	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Fluoranthene	50	0.21	BQL	BQL	BQL	0.067-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Fluorene	50	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Hexachlorobenzene	0.04-ADL	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Hexachlorocyclopentadiene	5	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Indeno(1,2,3-c,d) Pyrene	0.002-ADL	0.21	BQL	BQL	BQL	0.067-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Isophorone	50	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Naphthalene	10	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Nitrobenzene	0.4	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Pentachlorophenol	2	2.6	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Phenanthrene	50	0.21	0.17	0.18	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Phenol	2	1.1	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Pyrene	50	0.21	BQL	BQL	BQL	0.056-J	BQL	BQL		BQL	BQL	BQL	BQL	BQL
bis(2-ethylhexyl) phthalate	5	0.21	2.8	4	1.7	2.7	5.4	3		1.6	3	1.8	1.7	0.72
di-n-Butyl Phthalate	50	0.21	0.16-J	0.16-J	0.23	0.21	0.24	0.18-J		1	0.86	0.62	0.63	0.29
di-n-Octyl Phthalate	50	0.21	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL

MCL from NYDEC TOGS 111- Groundwater Effluent Standards Class GA
Values in **bold** type are above MCL, including MCLs established at ADL
ADL - not detectable at the analytical detection limit
J-value is >MDL<RL, estimated

Table A1.3
AOC-2
Water Monitoring
Pesticide Results

Compound	NYDEC		MW-01	MW-02	MW-3	MW-5	MW-7	SURFACE H2O		MW-01	MW-02	MW-3	MW-5	MW-7
	MCL (ug/l)	RL (ug/L)												
			4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007		10/10/2007	10/10/2007	10/10/2007	10/10/2007	10/10/2007
4,4-DDD	0.3	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4,4-DDE	0.2	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
4,4-DDT	0.2	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Aldrin	ADL	0.052	0.028-J	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
alpha-BHC	ADL	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
beta-BHC	0.04	0.052	0.075	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Chlordane	0.05-ADL	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
delta-BHC	ADL	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Dieldrin	0.004-ADL	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Endosulfan I	NS	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Endosulfan II	NS	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Endosulfan Sulfate	NS	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Endrin	ADL	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Gamma-BHC (Lindane)	0.05	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Heptachlor	0.04	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Heptachlor Epoxide	0.03	0.052	BQL	BQL	BQL	BQL	BQL	0.068		BQL	BQL	BQL	BQL	BQL
Methoxychlor	35	0.052	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL
Toxaphene	0.06	1.0	BQL	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL

MCL from NYDEC TOGS 111- Groundwater Effluent Standards Class GA
J-value is >MDL<RL;estimated
ADL - not detectable at the analytical detection limit

Table A1.4
AOC-2
Water monitoring
Metals Results

Metal	NYDEC MCL (ug/l)	RL (ug/L)	MW-01	MW-02	MW-3	MW-5	MW-7	SURFACE H2O		MW-01	MW-02	MW-3*	MW-5*	MW-7	
Date Collected			4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007	4/12/2007		10/10/2007	10/10/2007	10/10/2007	10/10/2007	10/10/2007	
Aluminum	2000	100	27000	2424	107	1560	104	398		397	804	53.3	471	352	
Antimony	6	1	0.56	BQL	BQL	BQL	BQL	0.3		BQL	BQL	BQL	0.28	BQL	
Arsenic	50	5	11	2.2	BQL	BQL	BQL	1.3		2.4	BQL	1.3	BQL	BQL	
Barium	2000	5	178	33.9	13	22.2	7.8	14.9		524	25.4	14.7	18.4	9.6	
Beryllium	3	0.2	1.1	0.11	BQL	0.059	BQL	BQL		0.056	0.13	BQL	0.037	BQL	
Cadmium	10	0.5	0.49	0.39	BQL	0.16	0.68	0.17		BQL	1.3	BQL	0.27	0.1	
Calcium	NS	1000	104000	90700	555000	444000	550000	14700		136000	41000	570000	469000	551000	
Chromium	100	2	39	3.4	BQL	2.6	BQL	BQL		3.7	2.5	BQL	3	BQL	
Cobalt	NS	1	13	5.8	0.87	3.4	BQL	0.46		0.28	6.9	0.71	3.1	0.54	
Copper	1000	2	44.9	5.3	1.9	3.2	2.5	2.8		2.4	6.3	3	3.6	3.3	
Iron	600	50	71800	4830	557	2280	134	819		16800	1440	1620	1100	432	
Lead	50/15	2	25.8	1.3	0.46	1.7	0.49	0.71		0.71	0.84	0.26	0.82	0.62	
Magnesium	35000	100	43600	46300	210000	418000	56200	6100		53100	22800	226000	453000	75900	
Manganese	600	2	1310	1350	1240	1630	271	66.3		222	697	1540	1600	348	
Mercury	1.4	0.2	BQL	BQL	BQL	BQL	BQL	BQL		BQL	0.076	BQL	BQL	BQL	
Nickel	200	1	35.1	11.1	4.5	8.2	2.5	4		1.6	11.4	3.4	8.2	2.4	
Potassium	NS	1000	27700	1440	9810	15800	3890	790		16500	900	11200	18400	5100	
Selenium	20	5	1.6	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL	
Silver	100	0.3	0.24	BQL	BQL	BQL	BQL	BQL		BQL	BQL	BQL	BQL	BQL	
Sodium	NS	1000	45000	32800	50200	215000	1550	3360		109000	43600	59400	255000	2000	
Thallium	0.5	2	0.46	0.22	0.096	0.14	0.12	BQL		0.27	0.14	0.1	0.099	0.23	
Vanadium	NS	10	52	4.1	BQL	3.7	BQL	BQL		52	2.4	BQL	2.2	BQL	
Zinc	5000	10	82.8	15.6	5.2	8.2	6.4	8.2		82.8	29.4	9.9	14.2	10.9	

MCL for Lead also reflects current drinking water value of 15ug/l
MCL from NYDEC TOGS 111- Groundwater Effluent Standards Class GA
Values in **bold** type are above MCL
Lead values in *italics* are above DW MCL but below NYDEC TOGS 111 limit
* result from Shaw requested re-analysis performed on 11/7/2007 after original data indicated a potential for improperly reported data

Values in *italics* exceed one or more criteria
Values in **bold** face exceed all criteria

Table A1.5
AOC-2
Water Sampling
Field QC

Apr-07							Oct-07			
Metal	NYDEC MCL (ug/l)	RL (ug/L)	Trip Blank	MW-7	B. DUP	RPD	Trip Blank	MW-3	DUPE	RPD
1,1,1,-Trichloroethane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,1,2,2-Tetrachloroethane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,1,2-Trichloroethane	1	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,1-Dichloroethane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,1-Dichloroethene	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,2-Dichlorobenzene	3	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,2-Dichloroethane	0.6	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,3-Dichlorobenzene	3	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,3-Dichloropropane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
1,4-Dichlorobenzene	3	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
2-Butanone (MEK)	50	5.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
4-Methyl-2-Pentanone (MIBK)	NS	5.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Acetone	50	5.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Benzene	1	1.0	BQL	0.4	0.20	66.7	BQL	BQL	BQL	INDETER
Bromochloromethane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Bromomethane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Carbon Disulfide	NS	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Carbon Tetrachloride	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Chlorobenzene	5	1.0	BQL	BQL	0.20	INDETER	BQL	BQL	BQL	INDETER
Chloroethane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Chloroform	7	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Chloromethane	NS	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Dibromochloromethane	50	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Ethylbenzene	5	1.0	BQL	0.25	BQL	INDETER	BQL	BQL	BQL	INDETER
Freon 113	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Methylene Chloride	5	1.0	1.5	1.5	1.1	30.8	BQL	BQL	BQL	INDETER
Styrene	930	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Tetrachloroethene	5	1.0	BQL	0.29	0.20	36.7	BQL	BQL	BQL	INDETER
Toluene	5	1.0	0.13	1.0	0.41	83.7	BQL	BQL	BQL	INDETER
Xylenes (total)	5	1.0	BQL	1.0	0.46	74.0	BQL	BQL	BQL	INDETER
Trichloroethene	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Trichlorofluoromethane	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Vinyl Chloride	2	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
trans-1,2 Dichloroethene	5	1.0	BQL	BQL	BQL	INDETER	BQL	BQL	BQL	INDETER
Aluminum	2000	100	NA	104	BQL	INDETER	NA	54.1	69.5	24.9
Arsenic	50	5	NA	BQL	33.1	INDETER	NA	1.2	1	18.2
Barium	2000	5	NA	7.8	52.6	148.3	NA	14.8	15.7	5.9
Cadmium	10	0.5	NA	0.68	BQL	INDETER	NA	BQL	BQL	INDETER
Calcium	NS	1000	NA	550000	558000	1.4	NA	546000	586000	7.1
Cobalt	NS	1	NA	BQL	6	INDETER	NA	1	1.1	9.5
Copper	1000	2	NA	2.5	1.3	63.2	NA	2.7	2.6	3.8
Iron	600	50	NA	134	20400	197.4	NA	1670	1750	4.7
Lead	50/15	2	NA	0.49	BQL	INDETER	NA	0.29	0.37	24.2
Magnesium	35000	100	NA	56200	34900	46.8	NA	224000	243000	8.1
Manganese	600	2	NA	271	1820	148.2	NA	1500	1510	0.7
Nickel	200	1	NA	2.5	6.4	87.6	NA	3.6	3.8	5.4
Potassium	NS	1000	NA	3890	4520	15.0	NA	10900	11100	1.8
Sodium	NS	1000	NA	1550	4040	89.1	NA	57300	58200	1.6
Thallium	0.5	2	NA	0.12	0.19	45.2	NA	0.12	0.22	58.8
Zinc	5000	10	NA	6.4	5.3	18.8	NA	7.9	10.8	31.0
Diethyl Phthalate	50	0.13	NA	0.13	BQL	INDETER	NA	BQL	BQL	INDETER
bis(2-ethylhexyl) phthalate	5	0.21	NA	5.4	3	57.1	NA	1.8	2.9	46.8
di-n-Butyl Phthalate	50	0.21	NA	0.24	0.16	40.0	NA	0.62	0.43	36.2

Field Duplicate data reflects hits only-no hits for Pesticides in either sample or Duplicate sample

Table A1.6
Risk Ratio Calculations
AOC 2 Well Number MW-01
Groundwater Former SADVA

MW-01

CAS NUMBER	Compound	Exposure Point Concentration (µg/L)	NYSDEC Ambient Water Quality Standards (Class GA) (µg/L) ^a	EPC exceed NYSDEC screening value?	USEPA Region 6 Risk Based Screening Level (µg/L) ^b	Carcinogenic?	Non-Carcinogenic Risk Ratio (EPC/USEPA)	Carcinogenic Risk Ratio (EPC/USEPA)
SEMIVOLATILES								
117-81-7	bis(2-ethylhexyl) phthalate	1.6	5	no	4.80	yes	--	3.3E-07
84-66-2	Diethyl Phthalate	0.1	50	no	29200.00	no	0.000003	--
84-74-2	di-n-Butyl Phthalate	1	50	no	3650.00	no	0.0003	--
METALS								
7429-90-5	Aluminum	397	2000	no	36500.00	no	0.01	--
7440-36-0	Antimony	ND	3	no	14.60	no	ND	ND
7440-38-2	Arsenic	2.4	25	no	0.045	yes	--	5.4E-05
7440-39-3	Barium	524	1000	no	7300.00	no	0.07	--
7440-41-7	Beryllium	0.056	3	no	73.00	no	0.001	--
7440-43-9	Cadmium	ND	5	no	18.25	no	ND	ND
7440-70-2	Calcium	136000	--	no	NA	--	--	--
7440-47-3	Chromium	3.7	50	no	NA	--	--	--
7440-48-4	Cobalt	0.28	NS	no	730.00	no	0.0004	--
7440-50-8	Copper	2.4	200	no	1355.71	no	0.002	--
7439-89-6	Iron	16800	300	yes	25550.00	no	0.66	--
7439-92-1	Lead	0.71	15	no	15.00	no	0.05	--
7439-95-4	Magnesium	53100	35000	yes	NA	--	--	--
7439-96-5	Manganese	222	300	no	1703.09	no	0.13	--
7439-97-6	Mercury	ND	0.7	no	10.95	no	ND	ND
7440-02-0	Nickel	1.6	100	no	730.00	no	0.002	--
7440-09-7	Potassium	16500	--	no	NA	--	--	--
7782-49-2	Selenium	ND	10	no	182.50	no	ND	ND
7440-22-4	Silver	ND	50	no	182.50	no	ND	ND
7440-23-5	Sodium	109000	--	no	NA	--	--	--
7440-28-0	Thallium	0.27	0.5	no	2.56	no	0.11	--
7440-62-2	Vanadium	52	NS	no	182.50	no	0.28	--
7440-66-6	Zinc	82.8	2000	no	10950.00	no	0.01	--

Cumulative Risk Ratio ^c 0.62 5.4E-05

a - MCL from NYDEC TOGS 111- Ambient Water Quality Standards (Class GA). Table 1, available at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

b - USEPA Region 6 screening levels, Residential drinking water, available at: http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm

c - Cumulative Risk Ratio does not include lead and iron.

NS - Analyte not sampled, Groundwater effluent standard not available.

"--" - Risk Ratio for analyte not calculated

ND - Analyte not detected in sample

MCL for Lead also reflects current drinking water value of 15ug/l

Table A1.7
Risk Ratio Calculations
AOC 2 Well Number MW-02
Groundwater Former SADVA

MW-02

CAS NUMBER	Compound	Exposure Point Concentration (µg/L)	NYSDEC Ambient Water Quality Standards (Class GA) (µg/L) ^a	EPC exceed NYSDEC screening value?	USEPA Region 6 Risk Based Screening Level (µg/L) ^b	Carcinogenic?	Non-Carcinogenic Risk Ratio (EPC/USEPA)	Carcinogenic Risk Ratio (EPC/USEPA)
	SEMIVOLATILES							
117-81-7	bis(2-ethylhexyl) phthalate	3	5	no	4.80	yes	--	6.2E-07
84-66-2	Diethyl Phthalate	ND	50	no	29200.00	no	ND	ND
84-74-2	di-n-Butyl Phthalate	0.86	50	no	3650.00	no	0.0002	--
	METALS							
7429-90-5	Aluminum	804	2000	no	36500.00	no	0.02	--
7440-36-0	Antimony	ND	3	no	14.60	no	ND	ND
7440-38-2	Arsenic	ND	25	no	0.045	yes	ND	ND
7440-39-3	Barium	25.4	1000	no	7300.00	no	0.003	--
7440-41-7	Beryllium	0.13	3	no	73.00	no	0.002	--
7440-43-9	Cadmium	1.3	5	no	18.25	no	0.07	--
7440-70-2	Calcium	ND	--	no	NA	--	ND	ND
7440-47-3	Chromium	2.5	50	no	NA	--	--	--
7440-48-4	Cobalt	6.9	NS	no	730.00	no	0.01	--
7440-50-8	Copper	6.3	200	no	1355.71	no	0.005	--
7439-89-6	Iron	1440	300	yes	25550.00	no	0.06	--
7439-92-1	Lead	0.84	15	no	15.00	no	0.06	--
7439-95-4	Magnesium	22800	35000	no	NA	--	--	--
7439-96-5	Manganese	697	300	yes	1703.09	no	0.41	--
7439-97-6	Mercury	0.076	0.7	no	10.95	no	0.01	--
7440-02-0	Nickel	11.4	100	no	730.00	no	0.02	--
7440-09-7	Potassium	900	--	no	NA	--	--	--
7782-49-2	Selenium	ND	10	no	182.50	no	ND	ND
7440-22-4	Silver	ND	50	no	182.50	no	ND	ND
7440-23-5	Sodium	43600	--	no	NA	--	--	--
7440-28-0	Thallium	0.14	0.5	no	2.56	no	0.05	--
7440-62-2	Vanadium	2.4	NS	no	182.50	no	0.01	--
7440-66-6	Zinc	29.4	2000	no	10950.00	no	0.003	--

Cumulative Risk Ratio ^c 0.62 6.2E-07

a - MCL from NYDEC TOGS 111- Ambient Water Quality Standards (Class GA). Table 1, available at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

b - USEPA Region 6 screening levels, Residential drinking water, available at: http://www.epa.gov/earth16/6pd/rcra_c/pd-n/screen.htm

c - Cumulative Risk Ratio does not include lead and iron.

NS - Analyte not sampled, Groundwater effluent standard not available.

"--" - Risk Ratio for analyte not calculated

ND - Analyte not detected in sample

MCL for Lead also reflects current drinking water value of 15ug/l

Table A1.8
Risk Ratio Calculations
AOC 2 Well Number MW-3
Groundwater Former SADVA

MW-03

CAS NUMBER	Compound	Exposure Point Concentration (µg/L)	NYSDEC Ambient Water Quality Standards (Class GA) (µg/L) ^a	EPC exceed NYSDEC screening value?	USEPA Region 6 Risk Based Screening Level (µg/L) ^b	Carcinogenic?	Non-Carcinogenic Risk Ratio (EPC/USEPA)	Carcinogenic Risk Ratio (EPC/USEPA)
SEMIVOLATILES								
117-81-7	bis(2-ethylhexyl) phthalate	1.8	5	no	4.80	yes	--	3.7E-07
84-66-2	Diethyl Phthalate	ND	50	no	29200.00	no	ND	ND
84-74-2	di-n-Butyl Phthalate	0.62	50	no	3650.00	no	0.0002	--
METALS								
7429-90-5	Aluminum	53.3	2000	no	36500.00	no	0.001	--
7440-36-0	Antimony	ND	3	no	14.60	no	ND	ND
7440-38-2	Arsenic	1.3	25	no	0.045	yes	--	2.9E-05
7440-39-3	Barium	14.7	1000	no	7300.00	no	0.002	--
7440-41-7	Beryllium	ND	3	no	73.00	no	ND	ND
7440-43-9	Cadmium	ND	5	no	18.25	no	ND	ND
7440-70-2	Calcium	570000	--	no	NA	--	--	--
7440-47-3	Chromium	ND	50	no	NA	--	ND	ND
7440-48-4	Cobalt	0.71	NS	no	730.00	no	0.001	--
7440-50-8	Copper	3	200	no	1355.71	no	0.002	--
7439-89-6	Iron	1620	300	yes	25550.00	no	0.06	--
7439-92-1	Lead	0.26	15	no	15.00	no	0.02	--
7439-95-4	Magnesium	226000	35000	yes	NA	--	--	--
7439-96-5	Manganese	1540	300	yes	1703.09	no	0.90	--
7439-97-6	Mercury	ND	0.7	no	10.95	no	ND	ND
7440-02-0	Nickel	3.4	100	no	730.00	no	0.005	--
7440-09-7	Potassium	11200	--	no	NA	--	--	--
7782-49-2	Selenium	ND	10	no	182.50	no	ND	ND
7440-22-4	Silver	ND	50	no	182.50	no	ND	ND
7440-23-5	Sodium	59400	--	no	NA	--	--	--
7440-28-0	Thallium	0.1	0.5	no	2.56	no	0.04	--
7440-62-2	Vanadium	ND	NS	no	182.50	no	ND	ND
7440-66-6	Zinc	9.9	2000	no	10950.00	no	0.001	--

Cumulative Risk Ratio ^c 0.96 2.9E-05

a - MCL from NYDEC TOGS 111- Ambient Water Quality Standards (Class GA). Table 1, available at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

b - USEPA Region 6 screening levels, Residential drinking water, available at: http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm

c - Cumulative Risk Ratio does not include lead and iron.

NS - Analyte not sampled, Groundwater effluent standard not available.

"--" - Risk Ratio for analyte not calculated

ND - Analyte not detected in sample

MCL for Lead also reflects current drinking water value of 15ug/l

Table A1.9
Risk Ratio Calculations
AOC 2 Well Number MW-5
Groundwater Former SADVA

MW-05

CAS NUMBER	Compound	Exposure Point Concentration (µg/L)	NYSDEC Ambient Water Quality Standards (Class GA) (µg/L) ^a	EPC exceed NYSDEC screening value?	USEPA Region 6 Risk Based Screening Level (µg/L) ^b	Carcinogenic?	Non-Carcinogenic Risk Ratio (EPC/USEPA)	Carcinogenic Risk Ratio (EPC/USEPA)
SEMIVOLATILES								
117-81-7	bis(2-ethylhexyl) phthalate	1.7	5	no	4.80	yes	--	3.5E-07
84-66-2	Diethyl Phthalate	ND	50	no	29200.00	no	ND	ND
84-74-2	di-n-Butyl Phthalate	0.63	50	no	3650.00	no	0.0002	--
METALS								
7429-90-5	Aluminum	471	2000	no	36500.00	no	0.01	--
7440-36-0	Antimony	0.28	3	no	14.60	no	0.02	--
7440-38-2	Arsenic	ND	25	no	0.045	yes	ND	ND
7440-39-3	Barium	18.4	1000	no	7300.00	no	0.003	--
7440-41-7	Beryllium	0.037	3	no	73.00	no	0.001	--
7440-43-9	Cadmium	0.27	5	no	18.25	no	0.01	--
7440-70-2	Calcium	469000	--	no	NA	--	--	--
7440-47-3	Chromium	3	50	no	NA	--	--	--
7440-48-4	Cobalt	3.1	NS	no	730.00	no	0.004	--
7440-50-8	Copper	3.6	200	no	1355.71	no	0.003	--
7439-89-6	Iron	1100	300	yes	25550.00	no	0.04	--
7439-92-1	Lead	0.82	15	no	15.00	no	0.05	--
7439-95-4	Magnesium	453000	35000	yes	NA	--	--	--
7439-96-5	Manganese	1600	300	yes	1703.09	no	0.94	--
7439-97-6	Mercury	ND	0.7	no	10.95	no	ND	ND
7440-02-0	Nickel	8.2	100	no	730.00	no	0.01	--
7440-09-7	Potassium	18400	--	no	NA	--	--	--
7782-49-2	Selenium	ND	10	no	182.50	no	ND	ND
7440-22-4	Silver	ND	50	no	182.50	no	ND	ND
7440-23-5	Sodium	255000	--	no	NA	--	--	--
7440-28-0	Thallium	0.099	0.5	no	2.56	no	0.04	--
7440-62-2	Vanadium	2.2	NS	no	182.50	no	0.01	--
7440-66-6	Zinc	14.2	2000	no	10950.00	no	0.001	--

Cumulative Risk Ratio ^c 1.06 3.5E-07

a - MCL from NYDEC TOGS 111- Ambient Water Quality Standards (Class GA). Table 1, available at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

b - USEPA Region 6 screening levels, Residential drinking water, available at: http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm

c - Cumulative Risk Ratio does not include lead and iron.

NS - Analyte not sampled, Groundwater effluent standard not available.

"--" - Risk Ratio for analyte not calculated

ND - Analyte not detected in sample

MCL for Lead also reflects current drinking water value of 15ug/l

Table A1.10
Risk Ratio Calculations
AOC 2 Well Number MW-7
Groundwater Former SADVA

MW-07

CAS NUMBER	Compound	Exposure Point Concentration (µg/L)	NYSDEC Ambient Water Quality Standards (Class GA) (µg/L) ^a	EPC exceed NYSDEC screening value?	USEPA Region 6 Risk Based Screening Level (µg/L) ^b	Carcinogenic?	Non-Carcinogenic Risk Ratio (EPC/USEPA)	Carcinogenic Risk Ratio (EPC/USEPA)
SEMIVOLATILES								
117-81-7	bis(2-ethylhexyl) phthalate	0.72	5	no	4.80	yes	--	1.5E-07
84-66-2	Diethyl Phthalate	ND	50	no	29200.00	no	ND	ND
84-74-2	di-n-Butyl Phthalate	0.29	50	no	3650.00	no	0.0001	--
METALS								
7429-90-5	Aluminum	352	2000	no	36500.00	no	0.01	--
7440-36-0	Antimony	ND	3	no	14.60	no	ND	ND
7440-38-2	Arsenic	ND	25	no	0.045	yes	ND	ND
7440-39-3	Barium	9.6	1000	no	7300.00	no	0.001	--
7440-41-7	Beryllium	ND	3	no	73.00	no	ND	ND
7440-43-9	Cadmium	0.1	5	no	18.25	no	0.01	--
7440-70-2	Calcium	551000	--	no	NA		--	--
7440-47-3	Chromium	ND	50	no	NA		ND	ND
7440-48-4	Cobalt	0.54	NS	no	730.00	no	0.001	--
7440-50-8	Copper	3.3	200	no	1355.71	no	0.002	--
7439-89-6	Iron	432	300	yes	25550.00	no	0.02	--
7439-92-1	Lead	0.62	15	no	15.00	no	0.04	--
7439-95-4	Magnesium	75900	35000	yes	NA		--	--
7439-96-5	Manganese	348	300	yes	1703.09	no	0.20	--
7439-97-6	Mercury	ND	0.7	no	10.95	no	ND	ND
7440-02-0	Nickel	2.4	100	no	730.00	no	0.003	--
7440-09-7	Potassium	5100	--	no	NA		--	--
7782-49-2	Selenium	ND	10	no	182.50	no	ND	ND
7440-22-4	Silver	ND	50	no	182.50	no	ND	ND
7440-23-5	Sodium	2000	--	no	NA		--	--
7440-28-0	Thallium	0.23	0.5	no	2.56	no	0.09	--
7440-62-2	Vanadium	ND	NS	no	182.50	no	ND	ND
7440-66-6	Zinc	10.9	2000	no	10950.00	no	0.001	--

Cumulative Risk Ratio ^c 0.32 1.5E-07

a - MCL from NYDEC TOGS 111- Ambient Water Quality Standards (Class GA). Table 1, available at: http://www.dec.ny.gov/docs/water_pdf/togs111.pdf

b - USEPA Region 6 screening levels, Residential drinking water, available at: http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm

c - Cumulative Risk Ratio does not include lead and iron.

NS - Analyte not sampled, Groundwater effluent standard not available.

"--" - Risk Ratio for analyte not calculated

ND - Analyte not detected in sample

MCL for Lead also reflects current drinking water value of 15ug/l

ATTACHMENT A1.A

GROUNDWATER SAMPLE DATA



Shaw Environmental & Infrastructure, Inc.

Data Usability Report

16406 U.S. Route 224 East • Findlay, Ohio 45840

Findlay Ohio Office

PROJECT NUMBER:	115215	SAMPLE RECEIPT DATE:	10/12/2007
PROJECT MANAGER:	Tom Mathison	LABORATORY SDG:	710089
PROJECT NAME:	USACE-Schenectady		

The Findlay Ohio Federal Applied Sciences Group has performed a QA evaluation of the data report from GPL Laboratories, LLLP, Frederick, MD. The results are for seven [7] water samples, including a Blind Duplicate and a Trip Blank collected on October 10, 2007, at the Former Schenectady Army Depot (AOC 2), Voorheesville Area, New York by on-site Shaw E & I personnel. The samples were analyzed for the parameters listed in the Sample Summary Table.

Sample Summary Table			
Sample Number	Collection Date	Matrix	Analysis Requested
MW-2, MW-1, MW-5, MW-7, MW-3, DUPE(MW-3)	10/10/2007	Water	VOC – SW-8260B LL SVOC – SW-8270C PEST – SW-8081A METALS – SW-6020A MERCURY – SW-7470A
Trip Blank	10/10/2007	Lab water	VOC- SW-8260B LL

All samples were received at the laboratory intact and properly preserved. The cooler was submitted under proper Chain of Custody and received with an internal temperature of 3°C, within the requisite 2-6 degree range. All samples met hold-times at their first analyses. The hard copy report was received on November 5, 2007. Shaw requested re-analysis of one sample (MW-5) following receipt of preliminary data and this revised metals package was received on December 3, 2007. The following describes the overall QA/QC indicators.

Volatile Analysis by SW-8260B

The samples were analyzed within hold on October 16th and 17th in two separate QC batches (100919 and 100926).

All analyses and QC runs were completed within valid 12- hour tune clocks. The GC/MS system was tuned and calibrated for the target analytes and surrogate compounds in accordance with method requirements.

Method Blanks: The method blank results are below reporting limits for the target analytes in both batches

LCS: The LCS recoveries are within acceptance criteria for all target analytes in both QC batches.

MS/MSD: A site sample (MW-7) was utilized for QC Matrix analysis. Recovery and precision values were within limits for all but two analytes.

Bromomethane was recovered high. However since this analyte was not reported in any of the samples no data qualification is warranted.

Acetone was recovered with a low bias (avg. %R of 46.5) and excellent precision. Normally a recovery below fifty percent would require qualification. However, since this analyte was not reported in any of the samples and its TOGS 111 criteria is 10X the RL there is no need to qualify the reported BQL results.

ISTD: The ISTD areas were within criteria for all sample and QC runs.

Surrogates: All surrogate recoveries were within limits for each sample and all QC runs.

Field QC: No target analytes were reported in the Trip Blank. Both the duplicate (DUPE) and sample (MW-3) were BQL for all analytes.

Target VOC data should be utilized without qualification.

Semi-Volatile Analysis by SW-8270C

All analyses and QC runs were completed within valid 12- hour tune clocks. The GC/MS system was tuned and calibrated for the target analytes and surrogate compounds in accordance with method requirements. The samples were originally extracted on October 15th and analyzed on the 17th. Surrogate recovery was poor in two of the samples (MW-5 and MW-7) and these were re-extracted on the 19th (2 days out of hold) and analyzed on October 22-23rd with similar results.

Method Blanks: The method blank results are below reporting limits for the target analytes in both the original and re-extracted QC batches.

LCS: The laboratory only spikes the 8-analyte limited method spiking solution. LCS recoveries are within project acceptance criteria for the original QC batch, extracted on October 15th. In the re-extraction batch (Oct-19th) recoveries were below the lab limits for six compounds and outside the project criteria for one (4-nitrophenol). Results for this analyte in both MW-5 and MW-7 should be R-flagged.

MS/MSD: Sample MW-7 was utilized for QC Matrix spiking. Recovery and precision performance met project criteria for seven of the eight spiked analytes. Performance for 4-nitrophenol failed for both recovery and precision (RPD) and this analyte should be R-flagged for sample MW-7.

ISTD: All ISTD recoveries are within control limits for each sample and all associated QC runs with the exception of the re-extraction of MW-5. The last two ISTDs were above limits and this was verified by re-

injection to be a potential matrix interference issue. Since only one analyte; bis-2-ethylhexyl phthalate was reported which utilizes these ISTDs for quantitation and the re-extraction was performed out of hold for poor acid surrogate performance, the original results for phthalate esters should be utilized for TOGS 111 comparison.

Surrogates: One surrogate was recovered poorly in sample MW-3. However, since the method allows for one of each surrogate type to be outside limits the sample was not re-extracted and no qualification is required. As stated previously, samples MW-7 and MW-5 required re-extraction due to poor acid surrogate performance. The samples were re-extracted out of hold with acceptable surrogate performance and similar results. Therefore, the original results, with values for some analytes, should be utilized. All other surrogate data was within criteria.

Field QC: Both the duplicate (DUPE) and sample (MW-3) were BQL for all analytes except two phthalate esters. Precision as RPD for both analytes was outside limits, with RPD values above 35. However, since the highest reported values when "adjusted" for the RPD differences would still be below TOGS 111 criteria there is no data qualification required.

Target SVOC data should be utilized with the stated qualification for 4-nitrophenol of samples MW-7 and MW-5.

Pesticide Analysis by SW8081A

The GC system was calibrated for the target analytes and surrogate compounds in accordance with method requirements for both front and rear columns. The integrity of the primary standards was validated through analysis of a second source standard. Calibration check samples verified instrument calibration.

Method Blanks: The method blank results are below reporting limits for the target analytes. This is indicative of proper sample handling and for ensuring a contaminant free analytical system.

LCS: The LCS recoveries are within acceptance criteria for the target analytes. This is indicative of acceptable method accuracy and verifying proper instrument control.

MS/MSD: The MS/MSD recoveries were within control limits with the exception of high biased values for Beta-BHC. The average % recovery value for Beta-BHC is within the acceptance criteria and since this analyte was not detected in any samples no data qualification is warranted.

Surrogates: All surrogate recoveries are within acceptable criteria with the exception of the surrogate TCMX for the MS and MSD which were high biased and do not effect data usability.

Field QC: Both the duplicate (DUPE) and sample (MW-3) were BQL for all analytes.

The QC indicators are within acceptance criteria and target Pesticide analysis data should be utilized without qualification.

Total Metals Analysis by SW-6020A (ICP/MS) and SW-7470A (CVAA)

The ICP/MS and CVAA systems were set-up and calibrated for the target analytes in accordance with method requirements. All instrument interference check samples were within control limits. The initial (ICV) and continuing (CCV) calibration check samples were within control limits. The initial calibration blank (ICB) results were below reporting limits. While a few analytes were detected in the continuing calibration blank samples (CCB), these results were less than 10 times the IDL and therefore no qualification is necessary.

Method Blanks: The method blank results are below reporting limits for most analytes. Trace levels of Barium, Lead, Potassium, Silver, Sodium and Thallium were quantitated with each being less than the RL and below 5X the MDL. Therefore, no data qualification is warranted.

LCS: The LCS recoveries are within acceptance criteria for the target analytes.

Matrix QC: Sample MW-7 was chosen for MS/MSD analysis. Recovery and precision values are within limits for all analytes not present in the sample at concentrations greater than 4X the spike level. Both the replicate analyses and serial dilution QC checks met criteria

Field QC: All reported analytes in the sample (MW-3) and duplicate (DUPE) were within precision limits except for Thallium; J-flagged at a level below 1/10 the RL and 1/2 the TOGS 111 criteria. No flagging is necessary due to the low levels detected.

As stated previously, the laboratory re-analyzed MW-5 after review by Shaw of the results found inconsistencies in the data. Specifically, the reported values in the report for this sample varied significantly from the instrument results of the first analysis run, for which Cobalt failed the CCV check. In fact, based upon the reported results and the values of the "valid" run it actually appeared to be a spike of some sort and not the sample. The laboratory after being made aware of the discrepancy reviewed the raw data and instrument sequence and determined that there was a definite possibility of an improperly labeled analysis run. GPL then re-analyzed the digestate for MW-5 and also that of MW-3 on November 7th to provide evidence of consistency in results. The results confirmed the suspicion for MW-5 and the correct data was submitted along with all results in a revised Trace Metals report, received by Shaw on December 3rd.

Target Metals analytical data should be utilized without qualification.

Summary of Analysis

The overall Quality Control data provided in the laboratory report is representative of adequate method accuracy and precision with regard to project objectives. The reported , as qualified should be utilized without reservation in the intended project decision making processes.


Guy Gallella, Jr - Project Chemist

12/5/2007
Date