U.S. Army Corps of Engineers

F U S R A P

Luckey Site
Luckey, Ohio

Record of Decision for Soils Operable Unit
Final

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Buffalo District

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MWH

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

I.

DECLARATION FOR THE RECORD OF DECISION

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Luckey Site
Luckey, Ohio

STATEMENT OF BASIS AND PURPOSE

This Record of Decision presents the final decisions regarding units investigated by the United States Army Corps of Engineers (USACE) under the Formerly Utilized Sites Remedial Action Program (FUSRAP) at the Luckey site, with the exception of site-wide groundwater. The selected remedy for site-wide groundwater will be documented under a separate Record of Decision. This Record of Decision also presents the selected remedial action to be implemented at the Luckey site at those units impacted by hazardous substances releases as a result of Atomic Energy Commission (AEC)-related activities which are eligible for response under FUSRAP. The following units investigated at the Luckey site are addressed within the scope of this decision document:

- Soils (on-site and off-site contiguous soils);
- On-site Buildings;
- Toussaint Creek (including on-site and off-site drainage ditches);
- France Stone Quarry; and
- Troy Township Dump (landfill).

The process to reach the final decisions and identify the selected remedial action was performed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, 42 United States code 9601 et seq., as amended (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as directed by Congress in the Energy and Water Appropriation Act for Fiscal Year (FY) 2000, PL 106-60, 10 U.S.C. 2701. Information supporting USACE's decisions as the lead agency is contained in the Administrative Record file located at the USACE Public Information Center, 1776 Niagara Street, Buffalo, NY 14207 and the Luckey Public Library, 228 Main Street, Luckey, Ohio 43443.

Comments on the Proposed Plan (USACE 2003a) provided by the Ohio Environmental Protection Agency (Ohio EPA) were evaluated and considered in selecting the final remedy. Ohio EPA supports the selected remedial action, removal of impacted soils to achieve cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site. Although, the Ohio Department of Health (ODH) did not provide specific comments on the June 2003 Proposed Plan, the agency did previously provide USACE a letter indicating their support for the selected soils remedy (ODH 2003).

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an endangerment to public health, welfare, or the environment in the future.

DESCRIPTION OF THE SELECTED REMEDY

Background on Remedy Selection

The Luckey site is comprised of a large production building and warehouse, two abandoned railroad spurs, and several smaller process and support buildings. The area surrounding the site to the west, north, and east is primarily residential farmland. From 1949 to the early 1960s, the Brush Beryllium Company, as a contractor to the AEC, used the Luckey site for beryllium processing to support the national defense program. Beryllium production activities brought different types of source media or potential contaminants to the site. Primary source media at the Luckey site included materials delivered for processing or re-processing: beryl ore from Africa and South America; scrap beryllium; and radiologically-contaminated scrap steel.

Under FUSRAP authority, USACE conducted a CERCLA remedial investigation (RI) of the Luckey site to characterize site conditions and to determine nature and extent of contamination. The scope is limited to addressing radioactivity, beryllium, and other constituents related to the production of beryllium at the Luckey site in support of the nation's early atomic energy program. These constituents are specifically referred to as AEC-related constituents in this decision document. Other constituents not related to AEC activities are not under the purview of USACE at the Luckey site and are not addressed in this decision document. Information on the presence of other non-AEC related contaminants may be used by USACE for worker protection and the proper management of any AEC-related materials to be disposed. The RI report for the Luckey site (USACE 2000a) also includes a baseline risk assessment evaluating risks to human health and the environment posed by site contaminants. The USACE CERCLA feasibility study (FS) (USACE 2003b) identifies cleanup goals and evaluates remedial action alternatives for the Luckey site. The USACE Proposed Plan identifies the remedial action alternative preferred by USACE (USACE 2003a) for the Luckey site.

USACE identified six AEC-related constituents of concern (COCs) in impacted soils posing unacceptable risk to human health: beryllium, lead, radium-226, thorium-230, uranium-234, and uranium-238. Lead was identified as an AEC-related COC since lead oxide was used as an additive in the beryllium production process. All six COCs pose unacceptable risks under a subsistence farmer scenario (i.e., a human health receptor who resides on the site and is self-sufficient from food grown or produced on the site), which has been identified as the reasonable future use scenario (i.e., the critical group) for the Luckey site.

Beryllium production for commercial use also occurred during the timeframe beryllium was being produced for AEC at the Luckey site. Releases resulting from commercial production of beryllium at the site are co-mingled and thus indistinguishable from releases relating to the production of beryllium in support of the nation's early atomic energy program. In order to fully address impacts directly related to AEC-related activities at the Luckey site, it will be necessary for USACE to remediate beryllium and lead in soils associated with beryllium production activities at the Luckey site.

Selected Remedy

USACE determined CERCLA action is not necessary for soils, sediment, or surface waters at Toussaint Creek, France Stone Quarry, or the Troy Township Dump based on the results of the RI completed by USACE (USACE 2000a) (Figure 1.2 of the Decision Summary). USACE also determined that FUSRAP has no CERCLA authority to address the buildings at the Luckey site. After evaluating the results of the RI (USACE 2000a) for the on-site buildings, USACE concluded there is no evidence of a release from the buildings, as defined by CERCLA, nor evidence of a substantial threat of a release of

hazardous substances into the environment from the buildings that would warrant a CERCLA response action. Therefore, the buildings would not qualify to be addressed under CERCLA and USACE has no authority to take any actions associated with the buildings.

For the units warranting remedial action, impacted soils, the remedy selected for the Luckey site includes implementation of Alternative 5, Excavation of Soils and Off-Site Disposal (Soils) – Unrestricted Land Use, as described in the Proposed Plan issued June 7, 2003. Impacted soils will be excavated to achieve cleanup goals for unrestricted use by the critical group for AEC-related COCs associated with beryllium production activities. The critical group has been identified as the subsistence farmer for the Luckey site. The extent of impacted soils (on-site soils and off-site contiguous soils) at the Luckey site is illustrated in Figure 9.1 of the Decision Summary. Cleanup goals will be used as target concentrations (e.g. 95% upper confidence limit of the mean) of AEC-related COCs that may remain. In addition, not-to-exceed concentrations will be developed to ensure no localized areas remain that potentially pose an unacceptable threat.

Excavated soils will be shipped off site for disposal at a licensed/permitted disposal facility. This removal action ensures compliance with the applicable or relevant and appropriate requirements (ARARs), since soils will be removed from the Luckey site to meet cleanup goals for unrestricted use by the critical group. Complete removal also precludes further potential for contamination of the groundwater system.

USACE determined the Nuclear Regulatory Commission (NRC) standards for decommissioning of licensed facilities found in 10 Code of Federal Regulations (CFR) Part 20 Subpart E and Ohio Administrative Code (OAC) 3701:1-38-22 are relevant and appropriate for the remediation of AEC-related COCs in impacted soils at the Luckey site. OAC 3701:1-38-22 contains the same provisions as 10 CFR Part 20 Subpart E.

In compliance with these standards, USACE will:

1) Use cleanup goals stated in Table 1 as mean concentrations of COCs that may remain at the Luckey site. The 95% upper confidence limit of the mean (residual) concentration will conservatively be used to compare to the concentrations in Table 1. In addition, not-to-exceed concentrations (sometimes expressed as elevated measurement criteria or EMC) will be developed to ensure no small, discrete area of elevated activity will produce an unacceptable risk. The confirmation methodology and not-to-exceed concentrations will be developed in the detailed remedial design following finalization of this Record of Decision. Verification of compliance with soil cleanup goals will be demonstrated using surveys developed in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) for radionuclides and a similar, complimentary methodology for beryllium and lead. These methodologies will be developed in accordance with the ARARs and documented in the remedial design;
2) Remove and dispose off site all impacted soils (on site and contiguous to the site) excavated to achieve cleanup goals, as discussed in item 1 above, for AEC-related COCs;

Table 1. COCs and Cleanup Goals for Impacted Soils at the Luckey Site

IMPACTED SOILS			
Receptors	**COC**	**Cleanup Goal** [a]	**Source**
Subsistence Farmer	Beryllium	131 mg/kg	RBC
	Lead	400 mg/kg	ARAR
	Radium-226	2.0 pCi/g[b]	ARAR
	Thorium-230	5.8 pCi/g[b]	ARAR
	Uranium-234	26 pCi/g[b]	ARAR
	Uranium-238	26 pCi/g[b]	ARAR

[a] SESOIL® modeling results indicate risk-based and/or ARAR-based cleanup goals selected for soils are protective of groundwater.

[b] Soil cleanup goals for radionuclides represent activity levels above site background activity corresponding to 25 mrem/yr (10 CFR Part 20 Subpart E and OAC 3701:1-38-22). If a mixture of radionuclides is present, then the sum of ratios applies per MARSSIM and the ratio should not exceed unity. For example, use the 25 mrem/yr cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site, for soil to get the following sum of the ratios equation:

$$SOR = \frac{Radium-226}{2.0\,pCi/g} + \frac{Thorium-230}{5.8\,pCi/g} + \frac{Uranium-234}{26\,pCi/g} + \frac{Uranium-238}{26\,pCi/g}$$

where: SOR = sum of the ratios result
Radium-226 = net Radium-226 soil concentrations (background = 2.97 pCi/g)
Thorium-230 = net Thorium-230 soil concentrations (background = 3.20 pCi/g)
Uranium-234 = net Uranium-234 soil concentrations (background = 2.61 pCi/g)
Uranium-238 = net Uranium-238 soil concentrations (background = 2.63 pCi/g)
Net soil concentrations exclude background stated values.

USACE expects the selected remedy addressing soils to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions that will preclude any future environmental impact to the environment or the groundwater system. Implementation of the selected soil alternative will allow release of the site for unrestricted use with respect to AEC-related impacts to soils. The selected remedy for site-wide groundwater will be addressed under a separate Record of Decision. Release of the Luckey site would only be with respect to AEC-related COCs associated with the beryllium production process. Other contaminants not associated with AEC-related beryllium production activities are not addressed under the CERCLA remedial actions described herein and may preclude specific areas from being released for unrestricted use. The determination of the need for and performance of response actions related to other releases of hazardous substances at this site is not within the authority of USACE under FUSRAP. It is the responsibility of other agencies and parties to undertake any other necessary response actions at this site.

The estimated present value cost of the selected remedy is $36,500,000 (rounded to three significant digits).

STATUTORY DETERMINATIONS

The selected remedy for on-site soils is protective of human health and the environment, complies

with Federal and State requirements that are legally applicable or relevant and appropriate to hazardous substances which are the subject of this response action, utilizes permanent solutions, and is cost-effective. No treatment is included in the selected remedy for soils. Although remedial alternatives involving treatment were identified for impacted soils, they were not selected. Only soil treatment technologies addressing radiological constituents were identified as effective and feasible. No feasible soil treatment technologies were identified to address beryllium, which is widespread across the Luckey site.

Based on the results of the remedial investigation and baseline risk assessment (USACE 2000a), there are no remedies necessary for soils, sediment and surface waters at Toussaint Creek, France Stone Quarry, and the Troy Township Dump to ensure the protection of human health and the environment (Figure 1.2). After evaluating the results of the RI (USACE 2000a) for the on-site buildings, USACE concluded there is no evidence of a release from the buildings, as defined by CERCLA, nor evidence of a substantial threat of a release of hazardous substances into the environment from the buildings that would warrant a CERCLA response action. Therefore, the buildings would not qualify to be addressed under CERCLA and USACE has no authority to take any actions associated with the buildings.

This soils remedy will result in AEC-related hazardous substances, pollutants, and contaminants being reduced to concentrations allowing unlimited use and unrestricted exposure; therefore, there will be no need for conducting five-year reviews with respect to impacted soils. As indicated earlier, the final decisions regarding the site-wide groundwater and any associated five-year reviews will be documented in a separate Record of Decision.

/S/	26 July 2006
BRUCE A. BERWICK Brigadier General, Corps of Engineers Commander Great Lakes and Ohio River Division	Date

II.

DECISION SUMMARY
FOR THE RECORD OF DECISION

TABLE OF CONTENTS

1.0 SITE NAME, LOCATION, AND DESCRIPTION 1
1.1 LUCKEY SITE OVERVIEW 1
1.2 SITE AND VICINITY LAND USE 1

2.0 SITE HISTORY 3
2.1 SITE HISTORY OVERVIEW 3
2.2 PREVIOUS INVESTIGATIONS 4

3.0 COMMUNITY PARTICPATION 8

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION 9

5.0 SUMMARY OF SITE CHARACTERISTICS 10
5.1 GEOLOGY AND HYDROGEOLOGY 10
5.2 CONSTITUENTS OF CONCERN 10
5.3 IMPACTED SOILS 11

6.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES 13

7.0 SUMMARY OF SITE RISKS 14
7.1 HUMAN HEALTH RISK ASSESSMENT 15
7.1.1 Definitions 15
7.1.2 HRA at the Luckey Site 16
7.2 ECOLOGICAL RISK 18
7.3 BASIS FOR ACTION 19

8.0 REMEDIAL ACTION OBJECTIVES 22
8.1 CLEANUP GOALS 23
8.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS 23
8.2.1 Definitions 23
8.2.1.1 10 CFR Part 20 Subpart E – Radionuclides 23
8.2.1.2 OAC 3701:1-38-22 – Radionuclides 24
8.2.1.3 TSCA 403 – Lead in Soil 24
8.3 RISK BASED CONCENTRATIONS 25
8.4 SELECTED CLEANUP GOALS 25

9.0 REMEDIAL ACTION ALTERNATIVES 27
9.1 ALTERNATIVE 1: NO ACTION (SOILS) 28
9.2 ALTERNATIVE 5: EXCAVATION OF SOILS AND OFF-SITE DISPOSAL (SOILS) 28
9.3 ALTERNATIVE 6: EXCAVATION OF SOILS, TREATMENT, AND OFF-SITE DISPOSAL (SOILS) 28

TABLE OF CONTENTS

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES 29
10.1 COMPARISON USING NCP CRITERIA 29
10.1.1 Overall Protection of Human Health And The Environment.....29
10.1.2 Compliance with ARARS 29
10.1.3 Long-Term Effectiveness and Permanence.....29
10.1.4 Reduction in Contaminant Volume, Toxicity, And Mobility Through Treatment 30
10.1.5 Short-Term Effectiveness.....30
10.1.6 Implementability 30
10.1.7 Cost 31
10.1.8 State Acceptance 31
10.1.9 Community Acceptance 31

11.0 SELECTED REMEDY.....33

12.0 STATUTORY DETERMINATIONS 34
12.1 PROTECTION OF HUMAN HEALTH AND ENVIRONMENT.....34
12.2 ATTAINMENT OF ARARS 34
12.3 COST EFFECTIVENESS.....35
12.4 UTILIZATION OF PERMANANT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT POSSIBLE.....35

13.0 EXPLANATION OF SIGNIFICANT CHANGES 36

14.0 REFERENCES 37

LIST OF TABLES

Table 2.1 Timeline of Historical Events and Site Ownership at the Luckey Site
Table 2.2 Timeline of Pertinent Beryllium-related Operational Activities at the Luckey Site

Table 7.1 AEC-Related COCs for the Industrial Worker and Subsistence Farmer
Table 7.2 Subsistence Farmer Maximum Cancer Risk Estimates for the Luckey Site for Carcinogenic COCs
Table 7.3 Industrial Worker Maximum Cancer Risk Estimates for the Luckey Site for Carcinogenic COCs
Table 7.4 Summary Statistics for COCs in Soil at the Luckey Site

Table 8.1 COCs and Cleanup Goals for the Impacted Soils at the Luckey Site

Table 10.1 Summary of Comparative Analysis of Remedial Alternatives

LIST OF FIGURES

Figure 1.1 Site Location
Figure 1.2 Luckey Site near Luckey, Ohio
Figure 1.3 Features at the Luckey Site

Figure 2.1 Pictorial Summary of Historical Operations

Figure 5.1 Conceptual Model of Groundwater
Figure 5.2 Conceptual Site Model of Release and Transport Mechanisms
Figure 5.3 Extent of Impacted Soils ~ Unrestricted Land Use

Figure 9.1 Conceptualization of Alternatives 5 & 6: Excavation of Soils ~ Unrestricted Land Use

LIST OF APPENDICES

Appendix A Responsiveness Summary (Part III)

ACRONYMS, ABBREVIATIONS, & SYMBOLS

ABD	Acute Beryllium Disease
ACGIH	American Conference of Governmental Industrial Hygienists
ADD	average daily dose
AEC	Atomic Energy Commission
ALARA	as low as reasonably achievable
amsl	above mean sea level
ARAR	Applicable or Relevant and Appropriate Requirement
BBC	Brush Beryllium Company
bgs	below ground surface
BRA	baseline risk assessment
CBD	Chronic Beryllium Disease
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	constituent of concern
COPC	constituent of potential concern
CPEC	constituent of potential ecological concern
DPC	Defense Plant Corporation
DOD	Department of Defense
DOE	Department of Energy
EEQ	environmental effects quotient
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
EU	exposure unit
FS	Feasibility Study
FUSRAP	Formerly Utilized Sites Remedial Action Program
FY	Fiscal Year
GSC	General Sciences Corporation
HEAST	Health Effects Assessment Summary Table
HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IEUBK	Integrated Exposure Uptake Biokinetic Model
IRIS	Integrated Risk Information System
K_d	Distribution Coefficient
ILCR	incremental lifetime cancer risk
LDR	Land Disposal Restrictions
LOAEL	lowest observed adverse effect level
LTP	License Termination Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCL	maximum contaminant level
MED	Manhattan Engineer District
mg/kg	milligrams per kilogram
mg/m^3	milligrams per cubic meter
mL/g	Milliliters per gram
MNA	monitored natural attenuation
mrem/yr	millirem per year

ACRONYMS, ABBREVIATIONS, & SYMBOLS (continued)

NCP	National Contingency Plan
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
Ohio EPA	Ohio Environmental Protection Agency
O&M	Operation and Maintenance
ORNL	Oak Ridge National Laboratory
PAH	polycyclic aromatic hydrocarbon
pCi/g	picocuries per gram
PRG	premiliminary remediation goal
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RESRAD	Residual Radiation Computer Code
RfC	reference concentration
RfD	reference dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SDWA	Safe Drinking Water Act
SF	slope factor
SESOIL®	A Seasonal Soil Compartment Model
SOR	Sum of Ratios
TBC	to be considered
TEDE	Total Effective Dose Equivalent
TM	technical memorandum
TOSC	Technical Outreach Services for Communities
TRV	toxicity reference value
TRW	Technical Review Workgroup
TSCA	Toxic Substances Control Act
TWA	time-weighted average
USACE	United States Army Corps of Engineers
$\mu g/m^3$	micrograms per cubic meter

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The site and location being addressed by this Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) action and this decision document is:

Luckey Site
Luckey, Ohio

Details regarding the decision are discussed in the following sections.

1.1 LUCKEY SITE OVERVIEW

From 1949 to the early 1960s, the Brush Beryllium Company (BBC), as a contractor to the Atomic Energy Commission (AEC), used the Luckey site for beryllium processing working under contracts with the AEC. During non-peak use of the production facilities, BBC leased portions of the plant for commercial use. Beryllium production activities resulted in the occurrence of elevated levels of beryllium, lead, and radionuclides in portions of the Luckey site. The Luckey site was designated as eligible for inclusion in Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1991. FUSRAP was established to remediate sites impacted by activities of the Manhattan Engineer District (MED), or the AEC in the early years of the nation's atomic energy program. The scope of the remedial action at the Luckey site is to address beryllium, materials associated with the beryllium production process (including lead), and radioactive residuals. A more detailed discussion regarding the site history and ownership is presented in Section 2.

Currently, the facility is owned by Hayes Lemmerz International, Inc. Until late 2004, approximately 23 acres of the site was leased to Uretech International, Inc. Uretech used the facility to manufacture urethane parts for the automotive, sporting goods, and health care industries.

1.2 SITE AND VICINITY LAND USE

The Luckey site is located at 21200 Luckey Road in Luckey, Ohio. The village of Luckey, Ohio is located 22 miles southeast of Toledo (Figure 1.1) and has a population of approximately 1,500. The property is approximately 40 acres in size and is located near the corner of Gilbert and Luckey Roads in Wood County. South of the Luckey site is the France Stone Quarry and the Troy Township Dump (Figure 1.2). The quarry has an estimated total depth of 70 feet and has been inactive since the 1970s. Figure 1.2 displays an aerial view of the site.

The area is rural in character. Local land use is predominantly agricultural, producing crops such as corn, soybeans, and winter wheat with farm fields to the north, east, and west of the site. Patches of forests and old fields of varying ages are present throughout the area.

The topography of the area is generally flat with shallow surface gradients sloping slightly towards Lake Erie. The Luckey site is generally higher in the northeast corner due to past disposal activities. Toussaint Creek is approximately 634 feet above mean sea level (amsl) where it passes beneath Lemoyne Road.

As shown in Figure 1.3, the Luckey site consists of a large production building and warehouse, two abandoned railroad spurs, and several smaller process and ancillary buildings. Uretech used the two

largest buildings on site, the Production Building and the Annex for manufacturing activities and the remainder of the buildings for administrative activities and storage.

Historically, BBC used the northeastern corner of the site as a disposal area for lagoon sludges, scrap metal, and other waste materials (Figure 1.3). It is possible this area also was used as a landfill and may contain a variety of disposed materials. Spoils piles located in this area consist of excavated soil, process materials, building rubble, and ores.

The site also has three former process waste lagoons, designated Lagoons A, B, and C, located in the southeastern corner of the property. In 1949, the Ohio Department of Health (ODH) approved the use of these lagoons to dispose waste process sludges. No monitoring records have been found. Lagoons A and B were apparently used simultaneously and probably contained various waste sludge generated at different stages of beryllium processing activities. Lagoon C likely received waste similar to that in Lagoons A and B. A fourth lagoon, Lagoon D, was excavated northeast of Lagoons A, B, and C but was never used.

Surface drainage features at the Luckey site include several outfalls (permitted under the National Pollutant Discharge Elimination System [NPDES]), storm sewers, drainage ditches, and wetland areas. Two primary channels convey on-site discharge sources: the main drainage ditch and the western drainage ditch. Toussaint Creek is approximately 0.2 miles north of the Luckey property and eventually empties into Lake Erie approximately 25 miles downstream. The main drainage ditch discharges directly into Toussaint Creek. The western drainage ditch runs along Luckey Road, also eventually draining into Toussaint Creek. There also is a shallow emergent wetland approximately 1.6 acres in size north of Lagoon C. During historical beryllium production operations, when periods of high rainfall or stream flow occurred, Lagoons B and C discharged to the main drainage ditch. Lagoon A drained into the western drainage ditch along Luckey Road. The BBC reported these events to the ODH, which allowed these releases during high flow.

2.0 SITE HISTORY

2.1 SITE HISTORY OVERVIEW

In 1942, the Defense Plant Corporation (DPC) built a magnesium production plant at the Luckey site to produce metallic magnesium. The production of metallic magnesium created residual iron, silicon, and calcium. The government disposed of the residue in a quarry operated by Kelly Island Stone and Limestone (Kelly Island and DPC 1943). In November 1945, the magnesium reduction plant was closed as a war surplus plant.

Custody of the Luckey facility was transferred to the Reconstructed Finance Corporation in 1945. As early as 1946, BBC, as a contractor to the AEC, was allowed to use equipment from the Luckey plant in pilot projects. In 1949, BBC leased the entire site and contracted with the AEC to design, construct, operate, and maintain the Luckey plant for the production of beryllium. BBC also agreed to maintain the former magnesium plant facilities in standby status. The beryllium production facilities were owned by the AEC and operated by BBC from 1949 to 1958. During non-peak use of the production facilities, BBC leased portions of the plant for commercial uses. The plant produced mostly beryllium hydroxide (Powers 1983), in addition to some beryllium metal in vacuum-cast billets and beryllium oxide (from beryllium hydroxide). Employee interviews indicate beryllium waste was not disposed off site during beryllium operations (Cline 1990). BBC transferred beryllium production operations to a new facility located in Elmore, Ohio in 1958. Sintering and powder blending operations, established at the Lucky facility in 1957, continued through the early 1960s, and then were shut down. A summary of the site ownerships and historical events associated with the Luckey site beyond those discussed above is presented in Table 2.1.

The sources of contamination at the Luckey site include raw materials brought to the site for processing and by-products generated during site operations. According to employee interviews, beryl ore purchased from brokers or the AEC was delivered to the site in bags and drums. The ore was stored on both sides of the railroad siding near the railroad scales and on runways adjacent to the production buildings. Lead oxide was used as an additive in the beryllium production process. Figure 2.1 provides a pictorial summary of the historical operations at the Luckey site associated with the beryllium production activities. A timeline of the pertinent beryllium-related operational activities at the Luckey site is presented in Table 2.2, including site closure activities.

Ground beryl ore was obtained from the former Middlesex Sampling Plant in Middlesex, New Jersey (another AEC facility). The rock grinders that crushed the beryl ore also were used to grind uranium ores. The beryl ore may have acquired radiological constituents left behind by the uranium grinding operations. Pegmatites containing beryl ore obtained from South America also may have contained small amounts of naturally occurring radionuclides (United States Army Corps of Engineers [USACE] 2000).

Also, historical records indicate the Luckey site received approximately 1,000 tons of scrap steel from Lake Ontario Storage Area in late 1951. The scrap steel was reported to contain radioactive materials such as radium-226, thorium-230, uranium-234, and uranium-238. It was stored in the yard north of the main building along the railroad tracks. Records also indicate beryllium scrap from other AEC operations were sent to Luckey for reprocessing and some of this scrap was contaminated with radionuclides (Smith 1950).

Waste disposal activities associated with the beryllium production facilities involved the use of

the lagoons (Lagoons A, B and C) and the trenches located in the northeast corner of the site. These locations are shown in Figure 2.1 as well as when they were used by BBC. These disposal areas were used for disposal of process-related wastes during beryllium production as well as for disposal of materials during the plant closing. In 1959, the AEC contracted BBC to close the plant. The burial site used for closure activities is identified as the disposal area in Figure 2.1, located in the northeast corner of the site. Table 2.2 also provides a summary of disposal activities associated with beryllium production at the Luckey site.

During historical beryllium production operations, when periods of high rainfall or stream flow occurred, Lagoons B and C discharged to the main drainage ditch. Lagoon A drained into the western drainage ditch along Luckey Road. The BBC reported these events to the ODH, which allowed these releases during high flow.

As indicated in Table 2.1, other operations were conducted at the Luckey site that were not associated with the nation's atomic energy program. These operations also may have resulted in releases of contaminants similar to the contaminants associated with the AEC-related activities (e.g., lead).

In 1961, the General Services Administration sold the site to the privately owned Aluminum and Magnesium, Inc. The government retained access rights in order to remove any remaining beryllium ore. In 1962, Luckey Industries, Inc. purchased the former beryllium facility, hoping to reclaim magnesium from World War II incendiary bombs. The reclamation process was unsuccessful and the property reverted back to Aluminum and Magnesium, Inc. The facility then was used to recover zinc from byproducts of the steel industry. In 1967, Aluminum and Magnesium, Inc. transferred the property to its parent company, the Vulcan Materials Company.

In 1968, the Goodyear Tire and Rubber Company purchased the site and began producing automotive foam seating and other urethane products. In 1983, Motor Wheel Company leased the property from Goodyear, later purchasing it in 1988. Motor Wheel used the site to coat steel automotive wheels with polyurethane foam and for other automotive products. Hayes Lemmerz International, Inc. is the successor company to Motor Wheel and is the current owner of the site. From 1995 to 2004, Hayes Lemmerz International, Inc. leased about 23 acres of the site to Uretech International, Inc., which manufactured urethane parts for the automotive, sporting goods, and health care industries. The site/facilities are not currently being used nor leased for manufacturing.

2.2 PREVIOUS INVESTIGATIONS

Prior to the Remedial Investigation/Feasibility Study (RI/FS), several other investigations were performed at the Luckey site. A summary is provided below and more detailed information can be found in the RI Report (USACE 2000a).

Connectivity of the lagoons with groundwater was tested in shallow drilled wells in December 1953. The wells were drilled to 20 feet. Most of the wells were dry, except for one drilled in the southeast corner of the "solar evaporation lagoon," which is assumed to be Lagoon C. The sulfate and beryllium results indicated some connectivity between lagoons and groundwater, but the absence of groundwater in most wells indicates little percolation was occurring.

A series of water analyses reports for the potable water supply at the Luckey facility are available from 1985 until 1990. These results indicate beryllium in the potable water supply at the Luckey facility has generally been below detectable concentrations and/or below the Safe Drinking Water Act (SDWA) maximum contaminant level (MCL). An exception was in late 1985 and early 1986 where beryllium was detected at concentrations up to 8.8 micrograms per liter (µg/L) which exceeded the MCL of 4 µg/L.

In 1988, the Oak Ridge National Laboratory (ORNL) conducted a preliminary radiological survey of the site. This study involved gamma walkover surveys over a large portion of the property and the collection and analyses of surface and subsurface soil and water samples. Gamma exposure rates over the majority of the property ranged from 5 to 9 microroentgens per hour (μR/h). The radioactivity was elevated in the lagoons and landfill areas. Lagoons A, B, and C had elevated beryllium concentrations with Lagoon B beryllium concentrations as high as 6,400 milligrams per kilogram (mg/kg).

Table 2.1. Timeline of Historical Events and Site Ownership at the Luckey Site

Year	Event/Activity
1942	Defense Plant Corporation (DPC) builds magnesium reduction plant.
1945	World War II ends (WWII); magnesium reduction plant is closed. Custody transferred to the Reconstruction Finance Corporation.
1949	Brush Beryllium Company (BBC) leases site and contracts with the Atomic Energy Commission (AEC) to construct, operate, and maintain beryllium production facility.
1951	Korean War begins. Plans are made and dropped to restart the magnesium reduction plant.
1951-1952	Scrap metal is received from Lake Ontario Storage Area (LOSA).
1950-?	Contaminated scrap beryllium is received for reprocessing.
1958	Beryllium production operations are discontinued at Luckey.
1959	Buildings decontamination activities are performed.
1957-1960	Sintering and powder metallurgy activities are conducted at the facility.
1961	Facility is sold to Aluminum and Magnesium, Inc.
1962	Luckey Industries purchases beryllium facility portion of site to recover magnesium.
1967	Aluminum and Magnesium, Inc. transfers ownership to its parent company, Vulcan Materials.
1968	Entire property is purchased by Goodyear Tire and Rubber Company (to make automotive urethane foam products).
1983	Motor Wheel leases property (to make urethane auto products).
1988	Motor Wheel purchases property.
1995-2004	Twenty-three acres of the property are leased by Uretech for continued auto products operations.

Table 2.2. Timeline of Pertinent Beryllium-related Operational Activities at the Luckey Site

Year	Event/Activity
1949	Brush Beryllium Company (BBC) leases site and contracts with the Atomic Energy Commission (AEC) to construct, operate, and maintain beryllium production facility at the Luckey site.
1950-?	Contaminated scrap beryllium is received for reprocessing. Historical records indicate beryllium scrap from other AEC operations was being sent to the Luckey site for reprocessing and some of this scrap was contaminated with radionuclides (Smith 1950).
1951-1952	Korean War begins in 1951. Plans are made and subsequently dropped to restart the magnesium reduction plant. In Late 1951, AEC shipped approximately 1,000 tons of scrap steel containing various radionuclides from the Lake Ontario Storage Area (LOSA) to the Luckey site (③ on Figure 1.3). The steel was to be utilized in the magnesium reduction process. A limited quantity was usable by BBC. Some scrap may have been sold to local scrap dealers and some may have been disposed in trenches 5, 6, or 7.
1950-1958	The sludge from Lagoons A, B, and C was dredged every summer and placed into disposal trenches in the northeast corner of the facility (trenches 1 through 4).
1955?/1959?	Possible excavation of trench 5 to receive scrap metal and/or steel. This trench also was reportedly constructed in 1959 as part of site closure activities.
1958	Beryllium production operations are discontinued at Luckey.
1959	Site closure activities are performed. Decontamination plans for the buildings were developed for the site based on standards applicable at the time and included dismantling/disposing process equipment and steam cleaning building interiors. Process piping and ventilation ducts in the Annex were to be dismantled and sent to Oak Ridge, Tennessee or disposed on site. There is no available documentation indicating how much, if any, of the plan was implemented Historical records indicate scrap metal, building debris, and graphite crucibles with soluble beryllium fluoride, and possibly sludge from Lagoons A, B, and C were placed into excavated trenches (trenches 5, 6, and 7). Sludge dredged from Lagoons A, B, and C also may have been placed in the "disposal area" located in the northeast corner.
1957-1960	Sintering and powder metallurgy activities involving beryllium are conducted at the facility.
1961	Circa 1961, AEC-related beryllium sintering operations ceased. Available historical records are not clear on exact termination of AEC-related activities at the Luckey site; however the facility was sold to Aluminum and Magnesium, Inc in 1961.
1988	Lagoons A and B are capped in 1988 to eliminate wind dispersal of dust.

3.0 COMMUNITY PARTICPATION

Public input was encouraged to ensure the remedy selected for the Luckey site met the needs of the local community in addition to being an effective solution. The administrative record file contains all of the documentation used to support the preferred alternative and is available at the following locations:

U.S. Army Corps of Engineers
FUSRAP Public Information Center
1776 Niagara Street
Buffalo, NY 14207-3199

Luckey Public Library
228 Main Street
Luckey, OH 43443

On June 6, 2003, a letter announcing the release of the Proposed Plan (USACE 2003a) for the Luckey site was sent to 308 individuals including elected officials. Post cards were sent to individuals on the Luckey site mailing list. Individuals wishing to receive the letter announcing the release of the Proposed Plan were instructed to return the post cards.

Legal advertisements announcing the June 19, 2003, public meeting on the Luckey site Proposed Plan were placed in the following local newspapers: The Blade (Toledo) – June 12 & 15, 2003; Sentinel-Tribune (Bowling Green) – June 12 & 17, 2003; West Toledo Herald – June 18, 2003; and Sylvania Herald (Toledo) – June 18, 2003.

The public meeting was held June 19, 2003, from 6:30 p.m. to 8:30 p.m. in the Troy Fire Hall, 313 Krotzer Avenue, Luckey, Ohio. At the meeting USACE explained the history of the Site, studies and investigations of completed areas of contamination, CERCLA evaluation criteria, the remedial action alternatives, and the schedule. A court reporter was available at the meeting to record comments. Four members of the public requested the opportunity to speak at the meeting. Comments received at the public meeting and written comments are addressed in the Responsiveness Summary. All comments received from the public and the State and any other entities have been considered as part of the remedy selection decision process for this remedial action.

Prior to the release of the Proposed Plan, USACE had established in 1999 the Luckey Partnering Team to facilitate the open exchange of information with the community. The members of the Partnering Team include representatives from regulatory agencies, local government entities, and property owners. The Partnering Team has held periodic meetings to receive input on the remediation process and to provide comments on draft technical documents.

In addition to formulating the Partnering Team, USACE contacted the Technical Outreach Services for Communities (TOSC) whose mission is to work directly with communities on hazardous-substance pollution problems. After a number of meetings with the public, TOSC concluded the community seemed satisfied with USACE's efforts and TOSC involvement was no longer needed.

USACE will continue to keep the public informed of the site status and progress through periodic news releases, information meetings, fact sheets, and the public information website. Members of the public may also contact USACE by e-mail addressed to fusrap@usace.army.mil or by calling the Public Information Line (1-800-833-6390).

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

The Luckey site consisted of the following units that warranted investigation and evaluation for determining necessary response actions:

- Soils (on-site and off-site contiguous soils);
- Site-wide Groundwater;
- On-site Buildings;
- Toussaint Creek (including on-site and off-site drainage ditches);
- France Stone Quarry; and
- Troy Township Dump (landfill).

As indicated earlier, the selected remedy for site-wide groundwater will be addressed under a separate Record of Decision.

Based on the results of the remedial investigation and baseline risk assessment (USACE 2000a), remedial action is not necessary for soils, sediment, or surface waters at Toussaint Creek, France Stone Quarry, or the Troy Township Dump to ensure the protection of human health and the environment (Figure 1.2). After evaluating the results of the remedial investigation (RI) (USACE 2000a) for the on-site buildings, USACE concluded there is no evidence of a release from the buildings, as defined by CERCLA, nor evidence of a substantial threat of a release of hazardous substances into the environment from the buildings that would warrant a CERCLA response action. Therefore, the buildings would not qualify to be addressed under CERCLA and USACE has no authority to take any actions associated with the buildings.

This response action is the final remedy for impacted soils, both on-site and contiguous (i.e., adjacent) to the Luckey site where impacted soils have migrated through natural means (e.g., wind and surface water erosion). The scope is limited to addressing radioactivity, beryllium, and other constituents related to the production of beryllium at the Luckey site in support of the nation's early atomic energy program which have been identified as constituents of concern (COCs) at the Luckey site. As stated earlier, these constituents are referred to as AEC-related constituents. Other constituents not related to AEC activities are not under the purview of USACE at the Luckey site and are not addressed in this decision document. Information on the presence of other non-AEC related contaminants may be used by USACE for worker protection and the proper management of any AEC-related materials to be disposed. At the Luckey site, these AEC-related COCs include beryllium, materials associated with the beryllium production process, and radioactive residuals. Lead was identified as an AEC-related COC since lead oxide was used as an additive in the beryllium production process.

Beryllium production for commercial use also occurred during the timeframe beryllium was being produced for AEC at the Luckey site. Releases resulting from commercial production of beryllium at the site are co-mingled and thus indistinguishable from releases relating to the production of beryllium in support of the nation's early atomic energy program. In order to fully address impacts directly related to AEC-related activities at the Luckey site, it will be necessary for USACE to remediate beryllium and lead in soils associated with beryllium production activities at the Luckey site.

The scope of this response action specifically addresses the following AEC-related constituents: beryllium, lead, radium-226, thorium-230, and uranium in soils.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 GEOLOGY AND HYDROGEOLOGY

The uppermost bedrock in the region consists of carbonate bedrock, the Lockport Dolomite, which is approximately 300 feet thick in the Luckey area. Unconsolidated overburden consisting of glacial sediments and soils overlay the bedrock and range in thickness from 15 to 26½ feet. The glacial sediment contains clay and silt with a thin, discontinuous layer of sand and gravel near the bedrock. The soils are derived from the weathering of the glacial sediments and consist of clay and clay loam, which result in poor drainage.

There are two groundwater sources present in the vicinity of the Luckey site, one in the unconsolidated material above the bedrock surface and the other in the bedrock. Groundwater above the bedrock surface is not typically used as a water supply because of the high clay and silt content and low yield. The carbonate bedrock contains a regional aquifer used as a primary source of groundwater by the rural population. Glacial sediment forms a confining layer above the carbonate bedrock aquifer; however, it is not impermeable. As a result, the carbonate bedrock aquifer is semi-confined.

The France Stone Quarry south of the Luckey site appears to act as a local source of groundwater recharge to the carbonate bedrock aquifer. Groundwater in the carbonate aquifer flows from the quarry northward toward the Luckey property and Lake Eire. Residents in Luckey generally depend on wells drilled into the carbonate aquifer. Domestic supply wells are typically completed 50 to 80 feet into the carbonate aquifer and cased to the top of the bedrock, approximately 30 feet below ground surface (bgs). A conceptual model depicting the location of the supply wells and groundwater is provided in Figure 5.1.

5.2 CONSTITUENTS OF CONCERN

The RI/FS identified site features, assessed the nature and extent of constituents, evaluated risks to human health and the environment, and developed remedial alternatives to address constituents associated with beryllium production activities at the Luckey site. The Proposed Plan (USACE 2003a) discussed COCs associated with AEC-related activities.

USACE identified six AEC-related COCs posing unacceptable risks to human health at the Luckey site: beryllium, lead, radium-226, thorium-230, uranium-234, and uranium-238. Hereafter, references to COCs in this document pertains to these six AEC-related constituents. A conceptual site model of release and transport of these COCs is depicted in Figure 5.2.

Beryllium is a silver-gray metallic element that occurs naturally in soils. Exposure to beryllium can cause many types of health problems. A long-term oral study in dogs indicates the gastrointestinal tract is the target organ for ingested beryllium, resulting in intestinal lesions. There are no human data regarding the oral toxicity of beryllium. Data from the dog study were used to develop United States Environmental Protection Agency's (EPA) oral toxicity reference dose for beryllium. Use of this reference dose in the Luckey site risk assessment resulted in the soil ingestion pathway being identified as the pathway with the highest risk for human exposure. The carcinogenic potential of ingested beryllium has not been determined due to limited data.

Short-term exposures when inhaling large concentrations of beryllium can lead to inflammation of the lungs. Long-term exposure to beryllium can result in Acute Beryllium Disease (ABD) and Chronic Beryllium Disease (CBD). Both diseases affect many of the body's organs such as the lymph nodes, skin,

spleen, liver, kidneys, and heart. Both ABD and CBD can be fatal and primarily affect the lungs, causing shortness of breath, cough, fatigue, and even cancer.

Lead's affect on human health is well documented. It is a naturally occurring element that can bind to soil and sediment. Short-term exposure to lead can interfere with red blood cell chemistry, physical and mental development of young children, and cause abdominal pain, vomiting, diarrhea, convulsions, coma, and even death. Long-term exposures to lead can cause strokes, kidney disease, and cancer. High dosages of lead can cause paralysis, brain damage, and death.

Radium is a naturally occurring element, which presents a radiological health concern. It exists naturally in small concentrations in soil, rocks, surface water, groundwater, plants, and animals. Radium is taken into the human body by ingestion and/or inhalation. Although much of the radium is excreted from the body, some of it may remain in the bloodstream or lungs and be carried throughout the body. Radium also is a source of radon gas, which presents an additional radiological hazard. Exposure to radon is known to cause bone and lung cancer.

Thorium also is a naturally occurring element which presents a radiological health concern. Thorium naturally occurs in soil, rocks, surface water, groundwater, and plants. Thorium can be ingested or inhaled and causes cancers. Lung, pancreatic, and hematopoietic cancers occur through inhalation. Thorium also is known to attach to the skeletal system and cause bone cancer.

Uranium is a naturally occurring element which presents both a toxic and radiological health concern. Uranium is found naturally throughout the world in soils, geologic formations, water, animals, and even some natural foods. The element consists primarily of three isotopes: uranium-234, uranium-235, and uranium-238 at approximately 0.006%, 0.7%, and 99.3% by weight, respectively. It is one of the more mobile radioactive elements and can percolate through soils into groundwater. As with the other COCs, uranium can be ingested or inhaled. The most prevalent human health concerns of uranium exposure occur through ingestion and can lead to bone cancer and kidney damage.

5.3 IMPACTED SOILS

On-site soils were investigated, focusing on features known or believed to have been impacted by past AEC-related activities at the site (Figure 1.3). Brief summaries of these features are provided below. More detailed information is available in the FS Section 2.3 (USACE 2003b).

The total *in situ* volume of soil exceeding cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site, is estimated at 55,400 cubic yards. This represents the *in situ* volume and does not include any additional volume that may occur during excavation or expansion typically associated with soil removal. These factors are taken into account in cost estimates for remedial alternatives. The extent of impacted soils to be excavated to meet unrestricted land use cleanup goals for AEC-related COCs is delineated in Figure 5.3.

Trenches and Pits (disposal areas): At least four disposal trenches and pits are located in the northeast corner of the site. Two or three additional disposal trenches were dug west and south of the disposal area. These trenches and pits were used for the disposal of lagoon sludges, scrap metal, and other waste materials. Beryllium, lead, radium-226, thorium-230, uranium-234, and uranium-238 were detected above background in soil samples collected from the disposal trenches and pits.

Lagoons: Four waste lagoons were constructed in the southeast portion of the Luckey site. Lagoon A received waste from the conversion of beryllium hydroxide to beryllium metal. Lagoon B and C received discharges from the conversion of beryl ore to beryllium hydroxide through a sulfate process.

Lagoon D does not appear to have been used. Beryllium, lead, radium-226, uranium-234, and uranium-238 were the most commonly detected COCs above background in soil samples from the lagoons. Lead was not detected above background at Lagoon A. Radionuclides at Lagoon B appear to be primarily associated with soils.

Areas Devoid of Vegetation and Stressed Vegetation Areas: Areas either lacking vegetation or displaying stressed vegetation are located in the north-central portion of the facility near the propane tanks and in the northeastern section of the site near the trenches. The soils in these areas had a number of constituents detected above background, including beryllium, lead, and uranium-234. A weight-of-evidence analysis compared surface soil concentrations of constituents to field observations of stressed vegetation. Elevated concentrations of beryllium and lead were found to be associated with areas devoid of vegetation. Past practices also may have affected the soil structure in these areas and some areas exhibit unusual accumulations of coarse material.

Filter Bed Area and Debris Piles: At the filter bed area and debris piles, beryllium and lead most commonly exceeded background. Radium-226, thorium-230, uranium-234, and uranium-238 also were detected above background.

Existing Buildings and Associated Areas: Around the existing buildings, beryllium and lead most commonly exceeded background. Several radionuclides were detected in soils at low activities or activities slightly exceeding background.

Contiguous Soils: The northern farm field and the abandoned railroad bed (eastern edge) showed elevated concentrations of beryllium and lead. The main drainage ditch flows through the northern farm field toward Toussaint Creek. The northern farm field was most likely impacted by constituents dredged and placed on the field alongside the ditch. The soils at the northern property boundary also may have been impacted by windblown deposits or storm water runoff from the Luckey site. Beryllium and radionuclides were detected in soils just east of the site in the vicinity of the abandoned railroad bed. AEC-related COCs may have been deposited there by wind blowing across the bare areas from the disposal trenches or from storm water runoff that collected in the low-lying area.

6.0 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

Current land use at the Luckey site is industrial and is expected to remain industrial for the near future. The property is currently zoned light industrial. Wood County has a comprehensive plan (Wood County 1998) for Troy Township that acts as a guide for zoning and future use. It states the property is an expansion area for the Village of Luckey, indicating the village is slated to grow into the area. Given the current zoning designation, the most likely future expansion use for the property is industrial or commercial use. However, it is possible the future use could be residential or agricultural for several reasons. Surrounding land use on three sides of the Luckey site is agricultural and residential. Agricultural and residential are the dominant land uses throughout Troy Township. There is no other industry in the immediate area and industrial facilities at the site are aging. The most recent deed to the property (a quitclaim deed from Goodyear on April 1, 1987) lists no specific restrictions or easements that would preclude residential or agricultural land use. Therefore, the reasonable future site use identified for the Luckey Site is subsistence farming and is considered to be the critical group for further evaluations.

7.0 SUMMARY OF SITE RISKS

The baseline risk assessment (BRA) (USACE 2000a, USACE 2003b) provides a quantitative estimate of potential risks to human health and the environment from chemical and radiological constituents at the Luckey site. In accordance with EPA guidance, the primary health risks investigated were cancer and other chemical-related illnesses (non-cancer), as well as risks to ecological receptors. The purpose of the risk assessment was to determine the need for remedial action and to provide a baseline to compare remedial alternatives. The complete risk assessment is contained in the administrative record file. A brief summary of the radiological and chemical health risks, as well as the ecological risks is provided herein. In the FS, potential risks to an additional receptor, the subsistence farmer, were evaluated as a supplement to the BRA. This subsistence farmer receptor is a more conservative assessment of site risks than any other scenario evaluated in the BRA for human receptors.

The objectives of the Luckey site risk assessment were to:

- Identify areas that do not pose unacceptable risks to human health or the environment, and thus require no further action.
- Develop a list of COCs for each exposure unit, which contribute to unacceptable risks to human health or the environment.
- Estimate potential risks to human health and the environment associated with the Luckey site if no remedial action occurs, assuming no controls (e.g., fencing, maintenance, protective clothing, etc.) are, or will be, in place.
- Develop risk-based concentrations (RBCs) and radionuclide action levels for the identified COCs to provide the basis for preliminary media-specific cleanup goals, in order to focus remedy selection on constituents that are the significant contributors to potential risk.

The risk assessment performed an exposure assessment to identify current and future populations that may reasonably be anticipated to be exposed to constituents of potential concern (COPCs). For purposes of the BRA, the Luckey site was divided into exposure units (EUs). The results of the BRA, combined with an evaluation of applicable or relevant and appropriate requirements (ARARs), were used to identify preliminary COCs at each EU. The following EUs were not impacted and require no action necessary for protection:

- EU 4: Toussaint Creek, north of the site
- EU 5: France Stone Quarry, south of the site
- EU 6: Landfill (Troy Township Dump), south of the site.

Toussaint Creek includes both the on-site and off-site drainage ditches. As discussed in the FS (USACE 2003b), there were no unacceptable risks to human health or the environment due to AEC-related constituents for Toussaint Creek. Based on these results and discussions presented in the FS, this unit requires no actions.

The France Stone Quarry and Troy Township Dump are located just south of the Luckey site (Figure 1.2). As discussed in the RI (USACE 2000a), analytical results do not indicate any impacts at either location as a result of AEC-related activities at the Luckey site. Consequently these units are not impacted and require no action.

Impacted soils encompass the following EUs evaluated in the BRA:

- EU 1: On-site undisturbed soil within the current fenced boundaries of the site
- EU 2: On-site disturbed soil within the current fenced boundaries of the site
- EU 3: Off-site land surrounding the facility currently used for residential/agricultural purposes including the former railroad bed (contiguous with site)

For EU 2, the term "disturbed soil" refers to the eastern portion of the Luckey site where historic operational and disposal activities occurred (e.g., the lagoons and disposal in excavated trenches). "Undisturbed soil" refers to the remainder of the property (i.e., EU 1).

Environmental media that may transport contaminants to receptors were identified (e.g., soil), as well as the route of uptake in the receptor (e.g., ingestion, inhalation, or absorption). The concentration of each COPC that the receptor was potentially exposed to was estimated. This is known as the exposure point concentration (EPC). The toxicity of the various COPCs was estimated using the latest data from state, federal, and other appropriate sources such as the National Center for Environmental Assessment and the Agency for Toxic Substances and Disease Registry. The EPC, exposure assessment, and toxicity data all utilize conservative assumptions that build in additional safety factors for the public.

A summary of the BRA and the process for determining COCs, including comparisons to ARARs, are discussed in more detail below. Table 7.1 lists the COCs identified in the human health risk assessment (HHRA).

7.1 HUMAN HEALTH RISK ASSESSMENT

7.1.1 Definitions

The BRA identified the means by which people and the environment may be exposed to preliminary COCs present at the Luckey site. When ARARs are not available or not sufficiently protective because of the presence of multiple pathways of exposure, risk-based concentrations are developed. Human health risks were evaluated against risk-based goals established by CERCLA (EPA 1989a, b). In this evaluation, USACE considered two types of risk: non-cancer risk and cancer risk.

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated from the following equation:

Risk = CDI x SF

where: risk = a unitless probability (e.g., 2×10^{-5}) of an individual's developing cancer
CDI = chronic daily intake averaged over 70 years (mg/kg-day)
SF = slope factor, expressed as (mg/kg-day)-1.

These risks are probabilities usually expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual's developing cancer from all other causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site-related exposures is 10^{-4} to 10^{-6}.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., life-time) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level an individual may be exposed to that is not expected to cause any deleterious effects. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ<1 indicates a receptor's dose of a single contaminant is less than the RfD, and toxic noncarcinogenic effects from that chemical are unlikely. The Hazard Index (HI) is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI<1 indicates, based on the sum of all HQ's from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI>1 indicates site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-cancer HQ = CDI/RfD

where:

CDI = Chronic daily intake
RfD = reference dose.

CDI and RfD are expressed in the same units and represent the same exposure period (i.e., chronic, subchronic, or short-term).

In 1991 EPA issued a memorandum to clarify the *Role of the BRA in Superfund Remedy Selection Decisions* (EPA 1991b). This Office of Solid Waste and Emergency Response Directive states that where cumulative carcinogenic site risk to an individual based on reasonable maximum exposure is less than 10^{-4}, and the non-carcinogenic HI is less than 1, action is generally not warranted unless the potential for adverse environmental impacts exists. Therefore, the use of target risk levels of total pathway cancer risks not to exceed 10^{-4} (and individual constituent risks not to exceed 10^{-5}) or a non-cancer risk threshold of an HI not to exceed 1 are believed to be protective of human health.

7.1.2 HHRA at the Luckey Site

The HHRA evaluated risks to several current and future receptor populations. For current land use, these receptors included industrial workers (on-site), resident farmers (off-site), and adolescent trespassers (off-site). For future land use, these receptors included those identified as current receptors and resident farmers (on-site) and subsistence farmers (on-site). The subsistence farmer scenario is not contained in the BRA (USACE 2000a). Subsequent meetings between site planners and stakeholders resulted in the introduction of this additional, more conservative receptor based on the requirements of 10 Code of Federal Regulations (CFR) Part 20 Subpart E and Ohio Administrative Code (OAC) 3701:1-38-22, to evaluate the "critical group" for radionuclides. The critical group is defined based on the reasonable future use of a site, which for Luckey site has been identified as the subsistence farmer. Risk calculations and revised cleanup goals resulting from the evaluation of the subsistence farmer scenario are presented in Appendix 3A of the FS (USACE 2003b). Although not required by either 10 CFR Part 20 Subpart E or OAC 3701:1-38-22, chemical constituents also were evaluated using the subsistence farmer scenario. Both the subsistence farmer and residential farmer may be exposed to site-related constituents in soil, groundwater, surface water, and sediment. The subsistence farmer is more conservative than the residential farmer because this scenario also includes the consumption of food grown or produced on site.

The risk assessment procedures follow EPA's *Risk Assessment Guidance for Superfund* (RAGS) (EPA 1992). The EPA guidance requires modeling also include what is called a Reasonable Maximum

Exposure (RME) scenario. These calculations assume an individual would be exposed to the constituents on the properties for prolonged periods of time. Lead was evaluated using EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) for Lead in Children (EPA 2001). For current and future land uses, the residual radioactivity model software, Residual Radiation Computer Code (RESRAD) (Version 6.1) was used for radiological constituents in soil (Yu 1993).

Chemical and radiological constituents are identified as preliminary COCs if they contribute significantly to total risk (i.e., the concentration or activity must be reduced in order to reduce total incremental lifetime cancer risk [ILCR] below target levels). All exposure pathways evaluated in the BRA are considered in the FS, which include ingestion, dermal contact, external gamma, inhalation of fugitive dust and volatiles, in addition to food intake pathways for the subsistence farmer. However, risks were evaluated separately for non-radiological and radiological constituents because the cancer slope factors used to quantify cancer potential were developed differently for the two classes of compounds (USACE 1999).

For non-cancer risk, constituents that contribute an HI of 1 or greater (individually or in combination with other constituents) for a particular target organ are considered preliminary COCs. Results indicate beryllium in soil exceeded the HI limit with a value of 5.8 for the future land use including subsistence farming for EU 2, and lead exceeded the risk-based standards for both the subsistence farmer and the industrial worker.

For beryllium, non-cancer toxicity criteria from EPA's Integrated Risk Information System (IRIS) were used to calculate the HI of 5.8. A reference dose is available for oral exposure and a reference concentration is available for inhalation exposures. Therefore, the beryllium HI is based on oral exposure (ingestion of soil and homegrown produce) and inhalation of dust. Dermal exposure was evaluated; however, there is insufficient toxicity data to fully assess this pathway and it was not included in the HI calculation. Exposure to beryllium can cause intestinal lesions and berylliosis, a disease of the lungs.

There are no EPA toxicity criteria for lead for conducting risk assessments. Instead, there are EPA guidance and lead-specific exposure models for evaluating exposures. These include the *Revised Interim, Soil Lead Guidance for CERCLA sites Resource Conservation and Recovery Act (RCRA) Corrective Action Facilities* (EPA 1994), the EPA's IEUBK for Lead in Children (EPA 2001), the EPA's lead model developed by the Technical Review Workgroup (TRW) (EPA 1996a) for non-residential exposure. Exposure of children and fetuses to lead can cause significant neurological damage.

For cancer risks, the BRA selected preliminary COCs based on a cancer risk limit of 10^{-6} per pathway, where total risk per exposure unit was greater than 10^{-5}. These target risk limits were used to identify preliminary COCs in the BRA, as per guidance from Ohio Environmental Protection Agency (Ohio EPA). In the FS, a risk management decision was made to consider COCs that contributed the most to risk. For cancer risk, constituents that contribute greater than 10^{-5} ILCR for any receptor (within an exposure unit where cumulative cancer risks are greater than 10^{-4}) are considered significant and therefore are the COCs addressed in this Record of Decision.

For cancer risks, the total pathway (inclusive of soil, groundwater, surface water, sediment consumption of food and produce) to the receptor is first identified when the total risk is greater than 10^{-4}. The COCs are then defined as any individual constituents having a total risk (across all pathways) greater than 10^{-5}. Results indicate total risks for radionuclides exceed the 10^{-4} threshold for the subsistence farmer in all soil exposure units. The risk estimates for cancer risks in soils 0 to 2 feet and 0 to 10 feet are provided for the subsistence farmer in Table 7.2 and the industrial worker in Table 7.3. For the subsistence farmer, COCs identified in soils include beryllium, lead, radium-226, thorium-230, uranium-

234, and uranium-238. Only lead in soils was identified as posing unacceptable non-cancer risk to the industrial worker. Summary statistics for COCs in soil are presented in Tables 7.4.

Non-cancerous effects are the primary concern for exposures to beryllium and lead. The BRA determined child receptors, due to their smaller body size, were susceptible to these effects at lower concentrations than adults. In addition, lead is well-known for causing neurological problems in children. The subsistence farming future land use scenario includes child receptors; therefore, protection of child receptors is necessary to ensure overall protection of human health. As a result, cleanup goals for lead and beryllium were developed to be protective of child receptors under the subsistence farming scenario.

In the HHRA, all radionuclides are evaluated as carcinogens. Only uranium is considered both a carcinogenic and non-carcinogenic hazard. As discussed previously, uranium can cause kidney damage from toxicity affects. Consequently, the non-carcinogenic properties of uranium were addressed in the HHRA for non-radiological constituents.

Cancer slope factors from the Health Effects Assessment Summary Table (HEAST) were utilized by the RESRAD code to calculate carcinogenic risk from exposure to radionuclides. While the original site assessments (i.e., in the RI) utilized the factors published in 1995, HEAST and, as a result, RESRAD were updated in 2001. These updates were incorporated into the FS and subsequent documented risk estimates as presented in this Record of Decision. 2001 HEAST slope factors for radionuclides are based on age and gender distributions and the mortality characteristics from 1989 through 1991 data and are used by RESRAD as estimates of the average probability of morbidity (fatal plus non-fatal cancers) per unit activity of a given radionuclide inhaled or ingested for internal exposures, or per unit time-integrated concentration in soil for external exposures. Different cancer slope factors for ingestion of water, food, and soil, inhalation suspended particulars, and external exposure were used by RESRAD in risk calculations. Slope factors for dermal contact are not available for radionuclides thus the dermal pathway was not evaluated.

The potential for COCs to leach from soils to the deep groundwater system, the system below the bedrock, was evaluated using a Seasonal Soil Compartment Model (SESOIL®) (General Sciences Corporation [GSC] 1998). Results indicate concentrations of COCs detected in soils should not leach through the clay-rich tills to groundwater above ARAR-based or risk-based cleanup goals (USACE 2003b).

Consideration of the cumulative effect of all exposure pathways on risk (and subsequent RBCs) is addressed in several ways for AEC-related COCs. For radionuclides, the RESRAD program was used to look at exposures to constituents in soils and groundwater (and other pathways such as inhalation) simultaneously. For lead, the IEUBK model was used which examines lead exposures from multiple pathways including soil, water, and food ingestion. For beryllium, the soil cleanup goal is an RBC for a child based on an HI of 1 and includes exposure to potentially contaminated produce.

7.2 ECOLOGICAL RISK

The Ecological Risk Assessment (ERA) included in the 2000 BRA follows EPA's general procedures for ecological assessments in the Superfund Program. The ecological assessment endpoints evaluated potential effects using environmental effects quotients (EEQs) for the constituents of potential ecological concern (CPECs). The EEQs form the quantitative basis of the risk characterization (EPA 1989a). EEQs are computed as the ratio of the total average daily dose (ADD) to the toxicity reference value (TRV). An EEQ greater than 1 indicates there is a potential concern, making the CPEC subject for further investigation. Several preliminary ecological COCs (EEQ >1) were identified in various media at the Luckey site. The majority of the preliminary ecological COCs were identified in soils at EU 1 and EU

2. The ERA calculated HIs for the ecological receptors from radionuclides in soils. The evaluation showed there is no credible risk of harm to these receptors because the HI values were below 0.03 for individual EUs and below 0.05 on a site-wide basis.

The screening ERA, as discussed in the RI (USACE 2000), indicated the benthic macroinvertebrate community may be at risk from several preliminary ecological COCs in sediment and surface water in Toussaint Creek and its tributaries. A few constituents, including beryllium, are present in sediments, but have no TRVs with which to calculate EEQs. Rapid Bioassessment Protocol results from stations upstream of the Luckey site, and in three segments downstream, indicated benthic communities at all sampling stations in Toussaint Creek are impacted, but that conditions improve downstream. Qualitative conclusions from the screening ERA contained uncertainties that prevented a final resolution for the site. Additional field work and studies (i.e., a baseline ERA) using Ohio EPA's protocols for bioassessment of surface waters were conducted in June and August 2001. The results and conclusions are contained in the *Biological and Water Quality Study of Toussaint Creek and Select Tributaries in Support of the Luckey Site Remedial Investigation/Feasibility Study* (USACE 2002a).

The 2001 study results indicate benthic macroinvertebrate and fish communities in Toussaint Creek are in relatively poor condition. The results also indicate the AEC-related constituents, beryllium and lead, are not strong factors in the observed poor conditions of the aquatic communities. The major factors affecting biological communities in Toussaint Creek appear to be regional or landscape-level factors including: poor instream habitat, inadequate riparian zones, relatively small drainage areas, non-point source runoff resulting from intensive agriculture and historic deforestation, and periodic low flow/high flow conditions exaggerated by channelization of the stream. In addition, both treated and untreated sewage outfalls from the Village of Luckey, in combination with low flow conditions, likely cause low dissolved oxygen conditions at downstream sites, potentially for several miles. Measured dissolved oxygen concentrations were, at times, threatening to aquatic life. Based on these conclusions, no AEC-related constituents in Toussaint Creek and select tributaries were retained as ecological COCs, therefore no action by USACE is necessary for Toussaint Creek and select tributaries.

In the future, the Luckey site may remain industrial or become completely agricultural similar to surrounding land uses. These current and future land uses allow minimal habitat for ecological receptors and thus minimal exposure to ecological receptors. Terrestrial areas at the site are not currently managed for ecological purposes, nor are there any plans to manage these areas for such purposes in the future. Therefore, COCs have been identified for the protection of human health only. In addition, measures will be taken to prevent releases to the environment and to prevent impacts such as habitat disturbance during remedial alternative implementation.

7.3 BASIS FOR ACTION

The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Table 7.1. AEC-Related COCs for the Industrial Worker and Subsistence Farmer

IMPACTED SOILS	
Receptors	**COCs**
Industrial Worker (0-2 feet)	Lead
Subsistence Farmer (0-10 feet)	Beryllium, Lead, Radium-226, Thorium-230, Uranium-234, and Uranium-238

Table 7.2. Subsistence Farmer Maximum Cancer Risk Estimates for the Luckey Site for Carcinogenic COCs

	Location		
Parameter	**EU 1**	**EU 2**	**EU 3**
Medium: (0-2 feet) Soil			
Radium-226	1.99×10^{-3}	1.34×10^{-3}	3.29×10^{-4}
Thorium-230[(1)]	6.07×10^{-4}	7.37×10^{-4}	
Uranium-234	5.61×10^{-5} [(1)]	3.94×10^{-5} [(1)]	8.34×10^{-6} [(1)]
Uranium-238	7.18×10^{-5} [(1)]	4.92×10^{-5}	
Total Risk[(2)]	2.0×10^{-3}	1.4×10^{-3}	3.3×10^{-4}
Medium: (0-10 feet) Soil			
Radium-226	8.6×10^{-4}	1.1×10^{-3}	3.1×10^{-4}
Thorium-230[(1)]	2.5×10^{-4} [(1)]	3.4×10^{-4} [(1)]	
Uranium-234	2.4×10^{-5} [(1)]	2.2×10^{-5} [(1)]	8.3×10^{-6} [(1)]
Uranium-238	3.1×10^{-5} [(1)]	2.8×10^{-5} [(1)]	
Total Risk[(2)]	8.8×10^{-4}	1.1×10^{-3}	3.1×10^{-4}

Notes: -- Beryllium and lead were identified as non-carcinogenic COCs for this receptor at the site.
-- Radium-226 Risk to Source Ratio includes contributions from lead-210 assuming equilibrium conditions
-- COCs shown in bold; identified for radionuclides with risk > 10^{-5} when total risk > 10^{-4}
Source: FS Report ~ Appendix 3A (USACE 2003b)
[(1)] Maximum risk for individual radionuclides generally occur at Year 0 except where noted with (1), where maximum risk occurs at Year 1000
[(2)] Maximum total risk occurs at Year 0

Table 7.3. Industrial Worker Maximum Cancer Risk Estimates for the Luckey Site for Carcinogenic COCs

Parameter	Location		
	EU 1	EU 2	EU 3
Medium: (0-2 feet) Soil			
Radium-226	5.65×10^{-5}	3.78×10^{-5}	9.31×10^{-6}
Thorium-230[(1)]	1.71×10^{-5} [(1)]	2.07×10^{-5} [(1)]	
Uranium-234	4.35×10^{-6} [(1)]	3.06×10^{-6} [(1)]	6.47×10^{-7} [(1)]
Uranium-238	5.55×10^{-6} [(1)]	3.80×10^{-6} [(1)]	
Total Risk[(2)]	6.3×10^{-5} [(1)]	5.2×10^{-5} [(1)]	9.4×10^{-6}
Medium: (0-10 feet) Soil			
Radium-226	2.4×10^{-5}	3.1×10^{-5}	8.7×10^{-6}
Thorium-230[(1)]	7.1×10^{-6} [(1)]	9.6×10^{-6} [(1)]	
Uranium-234	1.9×10^{-6} [(1)]	1.7×10^{-6} [(1)]	6.5×10^{-7} [(1)]
Uranium-238	2.4×10^{-6} [(1)]	2.1×10^{-6} [(1)]	
Total Risk[(2)]	2.7×10^{-5} [(1)]	3.3×10^{-5} [(1)]	8.8×10^{-6}

Notes: -- Beryllium and lead were identified as non-carcinogenic COCs for this receptor at the site.
--Radium-226 Risk to Source Ratio includes contributions from lead-210 assuming equilibrium conditions
-- COCs shown in bold; identified for radionuclides with risk > 10^{-5} when total risk > 10^{-4}
Source: FS Report ~ Appendix 3A (USACE 2003b)
[(1)] Maximum risk for individual radionuclides generally occur at Year 0 except where noted with (1), where maximum risk occurs at Year 1000
[(2)] Maximum total risk occurs at Year 0

Table 7.4. Summary Statistics for COCs in Soil at the Luckey Site

Parameter	Detection Frequency	Minimum Value	Maximum Value	Average Value	Background	Background Exceed	CG*	CG** Comp Value	CG Exceed	Units
Metals										
Beryllium	902/903	0.07 B	13300	227.96	1.13	547/902	131	131	126/902	mg/kg
Lead	437/438	1.1	28900 J	198.88	23.2	174/437	400	400	21/437	mg/kg
Radiological Parameters										
Radium-226	476/477	0.0744	4000	17.62	2.97	107/476	2	4.97	94/476	pCi/g
Thorium-230	435/440	0.162 J	88.5	4.27	3.2	66/435	5.8	9.0	45/435	pCi/g
Uranium-234	432/436	0.0967	52.3	2.9	2.61	69/432	26	28.61	6/432	pCi/g
Uranium-238	474/477	0.0977	280	6.85	2.63	107/474	26	28.63	27/474	pCi/g

*CG = Media-specific Cleanup Goal

**CG Comp Value is represented by the sum of the background and CG values for radionuclides

8.0 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) specify the requirements remedial alternatives must fulfill to protect human health and the environment from site-related contaminants. Essentially, they provide the basis to identify and evaluate remedial alternatives. The RAOs for the Luckey site are intended to provide long-term protection of human health and the environment. These objectives specify COCs, exposure routes and receptors, and acceptable constituent concentrations for long-term protection of receptors.

As discussed in Section 6, the BRA includes baseline risk calculations for a number of receptors including a subsistence farmer and an industrial worker. Current land use at the Luckey site is industrial and is expected to remain industrial for the near future. However, it is possible the future land use could be residential or agricultural for several reasons. Surrounding land use on three sides of the site is agricultural and residential. Agricultural and residential are the dominant land uses throughout Troy Township. There is no other industry in the immediate area and industrial facilities at the site are aging. Based on those facts it was determined subsistence farming is a reasonable future use for the site.

Because subsistence farming is considered a reasonable future use for the site, the subsistence farmer is assumed to represent the critical group at the Luckey site for unrestricted land use. Accordingly, the risk calculation and cleanup goals were based on the evaluation of the subsistence farmer scenario. More information can be found in Appendix 3A of the FS (USACE 2003b) regarding risk calculations and cleanup goals.

RAOs are presented for Impacted Soils (on-site and off-site soils/EUs 1, 2, and 3). Impacted off-site (EU 3) soils requiring remediation are generally contiguous with impacted on-site soils (EUs 1 and 2). Therefore, for the identification and evaluation of RAOs and remedial alternatives, they have been combined into one unit collectively named "Impacted Soils."

The RAOs for impacted soils for the Luckey site are as follows:

- Restore impacted soils at the Luckey site to a condition consistent with unrestricted use by the critical group (identified as the subsistence farmer at the Luckey site) for AEC-related COCs.
- Achieve the following ARAR-based cleanup goals for impacted soils (detailed in Section 8.2):
    - An unconditional release total effective dose equivalent (TEDE) standard of 25 millirem per year (mrem/yr) and as low as reasonably achievable (ALARA) for radionuclides in soil (reference 10 CFR Part 20 Subpart E and OAC 3701:1-38-22).
    - A standard of 400 milligrams per kilogram (mg/kg) for lead in bare soil in children's play areas.
- Achieve risk-based cleanup goals for beryllium in impacted soils (detailed in Section 8.3).
- Cleanup goals will be used as target concentrations (e.g. 95% upper confidence limit of the mean) of the AEC-related COCs that may remain at the Luckey site. Not-to-exceed concentrations will be developed to ensure no localized areas remain that potentially pose an unacceptable threat.
- Minimize transport of soil COCs (beryllium, lead, etc.) to other environmental media (groundwater, surface water, sediment, and air) during implementation of the remedial action.
- Prevent releases and other impacts that could adversely affect ecological receptors during implementation of the remedial alternative(s).

8.1 CLEANUP GOALS

The identification of COCs is presented in Section 6. For these COCs, there were two potential sources of cleanup goals: concentrations based on ARARs or RBCs. The numeric concentrations, or criteria, specified in the ARARs or RBCs are discussed in the following sections. The resulting selected cleanup goals are summarized in Section 8.4 and tabulated in Table 8.1.

8.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Agencies responsible for remedial actions under CERCLA must ensure selected remedies meet ARARs. The following sections describe the ARARs adopted for remedial action at the Luckey site.

8.2.1 Definitions

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under the federal environmental or state environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. An applicable requirement is one that is promulgated under a law or regulation that is legally enforceable with regard to the hazardous substance or pollutant or contaminant released at the site.

Relevant and appropriate requirements are those cleanup or control standards, and other substantive environmental protection requirements, criteria or limitations promulgated under federal environmental or state environmental or facility citing laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, nonetheless address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is suited to the particular site. In addition, only those state standards that are promulgated (specifically stated in laws or regulations adopted pursuant to laws), are identified by the state in a timely manner, and are more stringent than federal requirements that may be applicable or relevant and appropriate.

USACE determined that ARARs for remedial activities at the Luckey site include 10 CFR Part 20 Subpart E, OAC 3701: 1-38-22, and Lead Hazard Rule.

8.2.1.1 10 CFR Part 20 Subpart E – Radionuclides

10 CFR Part 20 Subpart E is applicable to Nuclear Regulatory Commission (NRC) licensed facilities. The regulation was promulgated by the NRC to ensure consistent standards for determining the extent to which lands must be remediated at facilities before remediation can be considered complete and the NRC license terminated. The Luckey site does not have an NRC license. Therefore, the rule does not apply.

The regulation applies to any facility licensed by the NRC to manage special nuclear, source, or byproduct radionuclide material undergoing decontamination and remediation for release of the property for reuse. The Luckey site is an industrial facility undergoing decontamination in order to remove radioactive residuals so the property may be released for reuse. The radioactive residuals at the Luckey site are residuals of uranium ore, naturally occurring uranium in the beryllium ore, and/or residuals from contaminated scrap metal sent to the site during AEC activities. These radiological constituents are included in the radiological constituents addressed by 10 CFR 20 Subpart E. In addition, the type and size of the facility at the Luckey site is consistent with the type and size of facilities regulated by 10 CFR

Part 20 Subpart E. The media to be remediated and the radiological COCs at the Luckey site are generally the same or similar to those found at sites subject to the regulation. The standards in the 10 CFR Part 20 Subpart E are:

- Unrestricted use: TEDE limited to 25 mrem/yr to the average member of the critical group, and as low as reasonably achievable.
- Restricted use: Durable land use controls that ensure the TEDE to the critical group does not exceed 25 mrem/yr, ALARA, license termination plan (LTP), public input, and 100 mrem/yr or 500 mrem/yr, under specific regulatory conditions, to the critical group if land use controls fail.
- The critical group is defined based on the reasonable future use of a site, which for Luckey site has been identified as the subsistence farmer.

In summary, 10 CFR Part 20 Subpart E is both relevant and appropriate for use in the development of media-specific cleanup goals at the Luckey site. The rule addresses situations sufficiently similar to the circumstances of the release at the Luckey site and is appropriate and well suited to the circumstances of the release. The rule requires evaluation of the "critical group" which is based on the reasonable future land use. Table 8.1 defines cleanup goals for radionuclides based on 10 CFR Part 20 Subpart E. Activities listed in the table correspond to a dose of 25 mrem/yr for unrestricted land use by the critical group which has been determined to be subsistence farmers. If a mixture of radionuclides is present, then the sum of ratios applies.

8.2.1.2 OAC 3701:1-38-22 – Radionuclides

OAC 3701:1-38-22 contains limitations for AEC-related radionuclides that are the same as those found in 10 CFR Part 20 Subpart E. The requirement has been promulgated by the State of Ohio, as an agreement state, to ensure consistent standards for determining the extent to which lands in Ohio must be remediated before decommissioning of a site can be considered complete and the state license can be terminated. OAC 3701:1-38-22 is applicable to state-licensed facilities. The Luckey site has no state license; therefore, the regulation is not applicable at the Luckey site.

OAC 3701:1-38-22 is also relevant and appropriate for the same reasons that 10 CFR Part 20 Subpart E is relevant and appropriate. The regulation addresses situations sufficiently similar to the circumstances of the release at the Luckey site and its use is appropriate and well suited to the circumstances of the release. OAC 3701:1-38-22 establishes a standard for unrestricted release of property of 25 mrem/yr plus ALARA, as the total effective dose equivalent to an average member of a critical group. "Critical group" is defined as "the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances" (OAC 3701:1-38-01(A)(35).

8.2.1.3 TSCA 403 – Lead in Soil

On January 5, 2001, EPA issued a final rule under Section 403 of the Toxics Substances Control Act (TSCA) (40 CFR Part 745, Lead Identification of Dangerous Levels of Lead; Final Rule). Under the new standards, lead is considered a hazard if there are greater than: 40 micrograms of lead in dust per square foot on floors; 250 micrograms of lead in dust per square foot on interior window sills and 400 mg/kg of lead in bare soil in children's play areas or 1200 mg/kg average for bare soil in rest of the yard. This final rule was effective on March 6, 2001. The lead hazard standards were developed to aid in setting priorities to address the risks from lead at residential and child occupied facilities affected by lead-based paint. As noted above, it does set a standard for levels of lead in bare soil for children in play areas

and in yards considered to be hazardous. The rule would not be considered applicable since the source of lead impacts at the Luckey site are not from the presence of lead-based paint. However, the constituent (lead) and the exposure scenario (residential exposure to children) are the same as those being addressed at the Luckey site. Therefore, this rule should be considered to be relevant and appropriate for use at the Luckey site for lead concentrations in soil because the reasonably foreseeable use of the property is for a resident farmer who may have children playing on bare soil. There are two allowable concentrations of lead in soils specified in the rule. USACE chose to use the more restrictive concentration of 400 mg/kg of lead in bare soil in children's play areas. Thus, 400 mg/kg was selected as the media-specific cleanup goal for lead in soil at the Luckey site.

8.3 RISK BASED CONCENTRATIONS

The RBCs for the human health chemical COCs originally were developed in Section 6 of the RI Report in accordance with to the *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part B* (EPA 1991a). These RBCs were developed to be protective of receptors under the resident farmer scenario, but have been modified to be protective of the subsistence farmer. Appendix 3A of the FS presents an evaluation of RBCs for beryllium and lead with respect to food intake pathways that could be present under this scenario (i.e., a subsistence farmer scenario). These pathways were not evaluated quantitatively in the RI Report. The RBC for lead in soil is no longer necessary for consideration as a soil cleanup goal since there is an ARAR-based concentration as discussed in Section 8.2.1.3.

The cleanup goal for beryllium, 131 mg/kg, is an RBC. The following exposure pathways were used to calculate the RBC: ingestion of home-grown produce, soil ingestion, dermal contact, and inhalation of fugitive dust. The RBC is based on the non-carcinogenic risk posed by this compound. For non-carcinogenic compounds, EPA has determined acceptable exposure levels are concentrations that do not exceed an HI of 1. If multiple COCs have similar toxic effects or target the same organ, then the total HI for these compounds must not exceed 1. Exposure to beryllium can cause intestinal lesions and berylliosis, a disease of the lungs. No other COCs have similar toxic effects or target the same organs; therefore the RBC for beryllium corresponds to an HI of 1. The cancer risk from exposure to beryllium at the RBC of 131 mg/kg is approximately 10^{-8}.

8.4 SELECTED CLEANUP GOALS

Table 8.1 presents the cleanup goals for impacted soils. Where multiple receptors existed, the selected cleanup goal corresponds to the most sensitive receptors, (which corresponds to the lowest of the potential cleanup goals for the constituent). These goals were used to develop the volume estimates for impacted media and also will form the basis for confirmatory sampling.

Cleanup goals selected for impacted soils also were evaluated in the FS using a SESOIL® (GSC 1998) and RESRAD to assess their protectiveness of groundwater. SESOIL® and RESRAD modeling results indicate when using realistic input parameters (e.g., distribution coefficients [K_d], hydraulic parameters), AEC-related constituents do not leach through the clay-rich tills at concentrations exceeding their respective risk- or ARAR-based cleanup goals FS (USACE 2003b). For example, the models indicate uranium will leach to groundwater at concentrations above the cleanup goal when a K_d of 15 milliliters per gram (mL/g) is used. Further evaluation indicates background concentrations of uranium in soil also would leach to groundwater above the uranium cleanup goal when a K_d of 15 mL/g is used. Therefore, widespread concentrations of uranium in groundwater above its cleanup goal should occur if this were a realistic K_d value. Since widespread contamination does not occur, a K_d of 15 mL/g is not realistic for the site. The SESOIL® and RESRAD evaluation indicates concentrations in soils, at or below

cleanup goals, do not leach to groundwater at concentrations exceeding drinking water standards and thus are protective of groundwater.

ARAR-based cleanup goals presented in Table 8.1 for radionuclides in soil correspond to a TEDE of 25 mrem/yr for unrestricted land use by the critical group, identified as the subsistence farmer for the Luckey site. When multiple radionuclides are present, activities need to be adjusted so the total activity does not exceed the TEDE. In other words, soil cleanup goals presented in Table 8.1 assume only one of the radionuclides is present. USACE utilizes the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (Department of Defense [DOD] 2000) to ensure exposure to combined radiological COCs will not exceed the respective dose limit.

During implementation of the selected soil remedial alternative (including confirmatory sampling), cleanup goals will be used as mean concentrations of the COCs that may remain. The 95% upper confidence limit of the mean (residual) concentration will conservatively be used to compare to cleanup goals. In addition, not-to-exceed concentrations (sometimes expressed as elevated measurement criteria or EMC) will be developed to ensure no small, discrete area of elevated activity will produce unacceptable risk. Presentation of this remedy confirmation methodology will be detailed in the remedial design following approval of this Record of Decision.

Table 8.1. COCs and Cleanup Goals for Impacted Soils at the Luckey Site

IMPACTED SOILS			
Receptors	**COC**	**Cleanup Goal** [a]	**Source**
Subsistence Farmer	Beryllium	131 mg/kg	RBC
	Lead	400 mg/kg	ARAR
	Radium-226	2.0 pCi/g[b]	ARAR
	Thorium-230	5.8 pCi/g[b]	ARAR
	Uranium-234	26 pCi/g[b]	ARAR
	Uranium-238	26 pCi/g[b]	ARAR

[a] SESOIL® modeling results indicate risk-based and/or ARAR-based cleanup goals selected for soils are protective of groundwater.

[b] Soil cleanup goals for radionuclides represent activity levels above site background activity corresponding to 25 mrem/yr (10 CFR Part 20 Subpart E and OAC 3701:1-38-22). If a mixture of radionuclides is present, then the sum of ratios applies per MARSSIM and the ratio should not exceed unity. For example, use the 25 mrem/yr cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site, for soil to get the following sum of the ratios equation:

$$SOR = \frac{Radium-226}{2.0\,pCi/g} + \frac{Thorium-230}{5.8\,pCi/g} + \frac{Uranium-234}{26\,pCi/g} + \frac{Uranium-238}{26\,pCi/g}$$

where: SOR = sum of the ratios result
Radium-226 = net Radium-226 soil concentrations (background = 2.97 pCi/g)
Thorium-230 = net Thorium-230 soil concentrations (background = 3.20 pCi/g)
Uranium-234 = net Uranium-234 soil concentrations (background = 2.61 pCi/g)
Uranium-238 = net Uranium-238 soil concentrations (background = 2.63 pCi/g)
Net soil concentrations exclude background stated values.

9.0 REMEDIAL ACTION ALTERNATIVES

This section summarizes remedial alternatives developed for the Luckey site. The remedial alternatives were constructed by combining general response actions, technology types, and process options. Remedial alternatives should assure adequate protection of human health and the environment, achieve RAOs, meet ARARs, permanently and significantly reduce the volume, toxicity, and/or mobility of site-related contaminants, and be cost-effective.

The remedial alternatives presented in the FS and Proposed Plan address soil and groundwater contamination at the Luckey site. The soils remedial alternatives encompass a range of potential actions:

- Alternative 1: No Action (Soils)
- Alternative 2: Limited Action (Soils) ~ Restricted Land Use
- Alternative 3: Consolidation and Capping (Soils) ~ Restricted Land Use
- Alternative 4: Excavation of Soils and Off-site Disposal (Soils) ~ Industrial Land Use
- Alternative 5: Excavation of Soils and Off-site Disposal (Soils) ~ Unrestricted Land Use
- Alternative 6: Excavation of Soils, Treatment, and Off-site Disposal (Soils) ~ Unrestricted Land Use

Alternative 1 is the no-action response required under the National Contingency Plan (NCP). Alternative 2 relies on limited site improvements and land use controls. No source control or removal actions are implemented with Alternative 2.

Alternatives 5 and 6 address soils and utilize short-term monitoring in combination with other removal and/or treatment technologies. Removal technologies are included in both Alternatives 5 and 6. Alternative 5 relies primarily on off-site disposal, while Alternative 6 utilizes removal and off-site disposal combined with soil treatment.

Current land use at the Luckey site is industrial and is expected to remain industrial for the near future. However, it is possible future use could be residential or agricultural since surrounding land use is primarily agricultural and residential and these are the dominant land uses throughout Troy Township. In addition, there is no other industry in the immediate area and the most recent deed to the property lists no specific restrictions or easements that would preclude residential or agricultural land use. Therefore, the subsistence farmer has been identified as the critical group in developing cleanup goals for the site. Since Alternatives 2, 3, and 4 do not meet the unrestricted land use criteria for the identified critical group for the Luckey site, these Alternatives are not considered further in this Record of Decision. Only Alternatives 5 and 6 are considered further to address impacted soils.

The two remaining remedial alternatives are described below. Time periods for environmental monitoring are specific to each alternative. The length of time depends upon the relevant ARARs and the specific technologies employed under each alternative. For the no action alternative, the assumed length of time is zero. For Alternatives 5 and 6, where soil contamination is removed from the Luckey site, the length of time for environmental monitoring is assumed to be zero years after the 3-year remediation period. All estimates of time to implement remedial alternatives presented below are based on the availability of appropriated funds. The ability of USACE to meet these estimates is directly dependent on timely availability of funds. The issuance of this Record of Decision does not commit the United States to making future appropriations for this purpose.

9.1 ALTERNATIVE 1: NO ACTION (SOILS)

This alternative would provide no further remedial action at the Luckey site and is included as a baseline against which other alternatives can be compared. Although land use controls are in place at the site, these would be left in place, but not necessarily maintained under this alternative. However, the site is assumed to operate in compliance with existing regulations that impose limitations on occupational exposures. Five-year reviews would be conducted in accordance with CERCLA 121(c).

9.2 ALTERNATIVE 5: EXCAVATION OF SOILS AND OFF-SITE DISPOSAL (SOILS)

This alternative would involve the removal and off-site disposal of impacted soils above cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site. These soils would be transported to an off-site disposal facility licensed or permitted to accept these wastes. Clean backfill would be placed in excavated areas. Remedial action would require approximately three (2.9) years to complete. There is no operation and maintenance (O&M) associated with this alternative because impacted soils are removed from the site.

9.3 ALTERNATIVE 6: EXCAVATION OF SOILS, TREATMENT, AND OFF-SITE DISPOSAL (SOILS)

This alternative is similar to Alternative 5 with respect to the excavation and transportation of soils, cleanup goals, and off-site disposal of impacted soils. However, this alternative incorporates treatment to reduce the volume of impacted soils requiring disposal. Soil washing has been selected as the treatment technology for radiological contamination and is the basis for the cost of this alternative. No feasible soil treatment technologies were identified for addressing lead and beryllium. Treatability studies would need to be performed to evaluate and confirm the effectiveness, implementability, and cost of various soil washing options. Materials could be processed using a variety of techniques to remove contamination. The fact that soil washing was selected for this alternative does not preclude the addition or use of any viable technologies that might become available in the future. Soils successfully treated to meet cleanup goals would be used as backfill in excavated areas. Impacted soils and treatment residuals above cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site, would be transported to an off-site disposal facility licensed or permitted to accept these wastes; remedial action would require approximately three years to complete. There is no O&M associated with this alternative because impacted soils are removed from the site.

10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, the alternatives undergo a comparative analysis for the purpose of identifying relative advantages and disadvantages of each on the basis of the detailed analysis above. The comparative analysis provides a means by which remedial alternatives can be directly compared to one another with respect to common criteria. Overall protection and compliance with ARARs are threshold criteria that must be met by any alternative for it to be eligible for selection. The other criteria, consisting of short- and long-term effectiveness; reduction of contaminant toxicity, mobility, or volume through treatment; ease of implementation; and cost are the primary balancing criteria used to select a preferred remedy among alternatives satisfying the threshold criteria. A summary table illustrating the comparative analysis is provided as Table 10.1. Public comments have been evaluated by USACE officials in making the decisions reflected in this Record of Decision.

10.1 COMPARISON USING NCP CRITERIA

10.1.1 Overall Protection of Human Health and the Environment

Alternatives are evaluated for achieving this threshold criterion, overall protection of human health and the environment, based on whether exposure to site COCs presenting an unacceptable threat to human health would be eliminated, reduced, or controlled. Each of the alternatives, except Alternative 1, is protective of human health and the environment. Alternative 1 is not considered protective for the long term because no actions would be taken to eliminate, reduce, or control the current unacceptable threat at the site from AEC-related COCs. The excavation and off-site disposal alternatives (Alternatives 5 and 6) rank highest in overall protection of human health and the environment because impacted materials will be excavated to achieve the cleanup goals (unrestricted land use for identified critical group) and shipped off-site for disposal. The alternatives will reduce concentrations of COCs remaining at the site to acceptable levels, which are the soil cleanup goals stated in Table 8.1.

For Alternatives 5 and 6, a mitigation action plan would be developed during remedial design to specify measures that would be taken during implementation of the remedial action to control releases from the area and access to the area to provide for adequate protection of human health and the environment (e.g., environmental controls and contingency response actions).

10.1.2 Compliance with ARARs

A summary of the proposed ARARs is presented under the ARARs discussion in Section 8.2 of this Record of Decision. Alternatives 5 and 6 satisfy all ARAR-based cleanup goals in soils. Alternative 1 does not achieve cleanup goals established by the ARARs.

10.1.3 Long-Term Effectiveness and Permanence

Human health risks remaining after remediation give an indication of the long-term effectiveness of an alternative. Human health risks due to exposure to contaminated materials will be reduced from the existing levels of risk by varying degrees, depending on the extent of remediation provided by the alternatives.

Alternative 5 or 6 provides the greatest long-term effectiveness because they would remove, for permanent off-site disposal, all soils above cleanup goals for unrestricted use by the critical group, which

has been identified as the subsistence farmer for the Luckey site. Alternative 1 would not be effective in the long term, since impacted soils would remain and would not be controlled.

Pursuant to CERCLA, site remedy reviews would be conducted every five years for alternatives where contaminants would remain on site above the cleanup goals. Because concentrations of some contaminants remain on site above the cleanup goals under Alternative 1, a review would be conducted at least once every five years. These reviews would not be necessary for Alternatives 5 and 6 since verification sampling would be performed at the time of remedy implementation verifying impacted soils above cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site, were removed.

10.1.4 Reduction in Contaminant Volume, Toxicity, and Mobility through Treatment

Alternative 6 is the only alternative that incorporates treatment of soils, and would affect a reduction in volume of radiologically-impacted soils. This reduction was estimated for costing purposes to be 50% of the affected volume's throughput. Although technically feasible to wash impacted soils, the potential volume reduction is expected to be minimal because of the geotechnical characteristics of the soils at the Luckey site. Alternative 6 is more costly, may be more technically difficult to implement, and may result in additional waste streams that will need to be managed.

10.1.5 Short-Term Effectiveness

The biggest difference in short-term effectiveness is due to the potential for accidents from the excavation and transportation of soil. Increased potential for exposure to contaminated media also increases under the soil treatment scenario, Alternative 6. Under Alternatives 5 and 6, short-term risks due to accidents for workers and the public are increased because of the excavation and off-site transportation involved. Under Alternative 6, there are additional short-term risks due to the treatment of soil.

Short-term negative impacts to the environment are likely to occur with soil excavation considered as part of Alternatives 5 and 6. Excavations potentially destroy animals and plants and existing features of the environment providing habitat or food to plants and animals. The degree of short-term damage to the environment increases with the amount of surface area subjected to disturbance.

10.1.6 Implementability

This criterion addresses the ability to technically accomplish the remedy; the ability to obtain approvals and coordinate with other authorities (i.e., administrative feasibility); and the availability of materials and services required to implement the remedy. Materials and services for removal of contamination and environmental monitoring activities for the various alternatives are readily available. The degree of difficulty in implementing alternatives increases with the amount and type (i.e., accessible soils) of impacted soils to be excavated, the level of the design/transportation required to dispose of soils in accordance with regulations, and the time/coordination involved in completing the alternative.

All action alternatives are considered implementable on a technical and an availability-of-services basis. Alternatives 5 and 6 involve excavation and off-site disposal, and also use readily available technology and equipment. Alternative 6 also is considered implementable, although it involves greater uncertainties with respect to treatment performance. The proposed soil treatment process (soil washing) is available from commercial sources, and has been effectively demonstrated in other applications. The soil washing treatment technology has uncertainties, addresses only the radiological constituents, and still

results in material requiring disposal as well as equipment requiring decontamination and disposal. No feasible treatment technologies were identified to address beryllium, the most widespread COC in soils.

Alternatives 5 and 6 are most easily implemented on an administrative basis. These alternatives forgo the need to meet substantive disposal permit requirements and land use controls for soil remediated areas.

10.1.7 Cost

The estimated present value cost (in Fiscal Year [FY] 2002 dollars with a 7% discount factor) to complete each of the alternatives is as follows:

- Alternative 1: $ 0.0 million
- Alternative 5: $36.5 million
- Alternative 6: $42.8 million

10.1.8 State Acceptance

The Ohio EPA has stated its support for Alternative 5, Excavation and Off-site Disposal (Soils) – Unrestricted Land Use. A letter from Ohio Environmental Protection Agency concerning the *Proposed Plan for the Luckey Site* is included in Appendix A. USACE's response to Ohio EPA's letter is included in Appendix A of this Record of Decision.

10.1.9 Community Acceptance

At the public meeting conducted on June 19, 2003, support for the selected remedy, Alternative 5, Excavation and Off-Site Disposal (Soils) – Unrestricted Land Use, was voiced by the public. The details of comments at the public meeting for the project, written comments and USACE's responses to comments, are included in Appendix A of this Record of Decision.

Table 10.1 Summary of Comparative Analysis of Remedial Alternatives

NCP Evaluation Criteria	Alternative 1 No Action(Section 8.2.1)	Alternative 5 Excavation and Off-site Disposal (Unrestricted Land Use) (Section 8.2.2)	Alternative 6 Excavation, Treatment, and Off-site Disposal (Unrestricted Land Use) (Section 8.2.3)
(1) Overall Protection of Human Health and the Environment (8.4.1.1)	Low	High	High
(2) Compliance with ARARs (8.4.1.2)	Low	High	High
(3) Long-Term Effectiveness and Permanence	Low	High	High
(4) Reduction of Toxicity, Mobility, or Volume through Treatment (8.4.1.4)	Low	Low	Medium
(5) Short-Term Effectiveness (includes potential for environmental impacts) (8.4.1.5) Time to complete[1] O&M Period.	Low 0 years 0 years	Medium 2.9 years 0 years	Medium 3 years 0 years
(6) Implementability (8.4.1.6)	High	High	Medium
(7) Cost[2] (8.4.1.7)	$0	$36.5 million	$42.8 million
Preliminary Evaluation of Regulatory and Public Input			
(8) State / Agency Acceptance	Low	High	High
(9) Community Acceptance	Low	High	Medium

[1] Time to complete remedial action after remedial design, is dependent upon timely project funding - does not include O&M.
[2] Estimated costs calculated as net present value in FY 02 dollars using a seven percent discount factor.

11.0 SELECTED REMEDY

USACE determined no CERCLA action is necessary for soils, sediment, and surface waters at Toussaint Creek, France Stone Quarry, and the Troy Township Dump based on the results of the RI completed by USACE (USACE 2000a) (Figure 1.2). USACE also determined they have no CERCLA authority to address the buildings at the Luckey site. After evaluating the results of the RI (USACE 2000a) for the on-site buildings, USACE concluded there is no evidence of a release from the buildings, as defined by CERCLA, nor evidence of a substantial threat of a release of hazardous substances into the environment from the buildings that would warrant a CERCLA response action. Therefore, the buildings would not qualify to be addressed under CERCLA and USACE has no authority to take any actions associated with the buildings.

For impacted areas warranting remedial action at the Luckey site, USACE has selected Alternative 5, Excavation of Soils and Off-site Disposal (Soils) – Unrestricted Land Use, to address impacted soils. Impacted soils, both on-site and those adjacent to the site where contamination has migrated through natural means, such as wind and surface water erosion, will be excavated to achieve cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site, for AEC-related COCs associated with beryllium production activities: beryllium, lead, radium-226, thorium-230, uranium-234, and uranium-238. Cleanup goals for each of these COCs are stated in Table 8.1. The extent of impacted soils (on-site soils and off-site contiguous soils) at the Luckey site is illustrated in Figure 9.1. Excavated soils will be shipped off site for disposal at a licensed/permitted disposal facility.

Alternative 5 is considered to be the most protective both in the short and long term and is permanent because it eliminates all potential human exposure pathways for AEC-related COCs at the Luckey site. Excavation of impacted soils also precludes further potential for contamination of the groundwater system. Alternative 5 ensures compliance with the ARARs, since all impacted soils will be removed from the Luckey site to achieve the standards of the designated ARARs for AEC-related COCs. Cleanup goals will be used as mean concentrations of AEC-related COCs that may remain. The 95% upper confidence limit of the mean (residual) concentration will conservatively be used to compare to cleanup goals. In addition, not-to-exceed concentrations (sometimes expressed as elevated measurement criteria or EMC) will be developed to ensure no small, discrete area of elevated activity will produce an unacceptable risk.

Verification of compliance with soil cleanup goals and criteria will be demonstrated using surveys developed in accordance with the MARSSIM for radionuclides and a similar, complimentary methodology for beryllium and lead. These methodologies will be developed in accordance with the ARARs, where applicable, and documented in the remedial design.

12.0 STATUTORY DETERMINATIONS

Based on the results of the remedial investigation and baseline risk assessment (USACE 2000a), there are no remedies necessary for soils, sediments, and surface waters at Toussaint Creek, France Stone Quarry, and the Troy Township to ensure the protection of human health and the environment. After evaluating the results of the RI (USACE 2000a) for the on-site buildings, USACE concluded there is no evidence of a release from the buildings, as defined by CERCLA, nor evidence of a substantial threat of a release of hazardous substances into the environment from the buildings that would warrant a CERCLA response action. Therefore, the buildings would not qualify to be addressed under CERCLA and USACE has no authority to take any actions associated with the buildings.

USACE expects the selected remedy for the on-site soils to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions that will preclude any future environmental impact to the environment or the groundwater system. Implementation of the alternative will allow unrestricted release of the site. Release of the Luckey site would only be with respect to AEC-related COCs in soils associated with the beryllium production process. Threats associated with the release of any other hazardous substances, pollutants, or contaminants at this site are not addressed in this remedial action. As indicated earlier, the selected remedy for site-wide groundwater will be documented in a separate Record of Decision. The manner in which the selected remedy satisfies each of these statutory requirements is discussed in the following sections.

12.1 PROTECTION OF HUMAN HEALTH AND ENVIRONMENT

Upon completion, the selected remedy for impacted soils at the Luckey site will be fully protective of human health and the environment and meet cleanup criteria based on ARARs. The selected remedial action will address the pathways of human exposure to site COCs that present an unacceptable threat to human health, by preventing exposure of all potential site users including the subsistence farmer and child from exposure to AEC-related COCs in soils. During remedial activities, engineering controls as well as land use controls will be put in place as required and environmental monitoring and surveillance activities maintained to ensure protectiveness, so no member of the public will receive exposures to COCs above the exposure guidelines.

There are no short-term threats associated with the selected remedy for impacted soils that cannot be readily controlled and mitigated. In addition, no adverse impacts to site-wide groundwater are expected from the soils remedy.

12.2 ATTAINMENT OF ARARs

The selected remedy requires removal of AEC-related COCs from soils so the standards of the ARARs are met. Impacted soils will be excavated to achieve cleanup goals for unrestricted use by the critical group, which has been identified as the subsistence farmer for the Luckey site, specified in Table 8.1. Cleanup goals will be used as mean concentrations of COCs that may remain. The 95% upper confidence limit of the mean (residual) concentration will conservatively be used to compare to cleanup goals. In addition, not-to-exceed concentrations (sometimes expressed as elevated measurement criteria or EMC) will be developed to ensure no small, discrete area of elevated activity will produce an unacceptable risk. Verification of compliance with soil cleanup goals, standards, and criteria will be demonstrated using MARSSIM for radionuclides and a similar, complimentary methodology for beryllium and lead, as well as what may be required by ARARs. Complete removal also precludes any

further groundwater contamination.

12.3 COST EFFECTIVENESS

A cost-effective remedy is one whose costs are proportional to its overall effectiveness. The overall effectiveness of a remedial alternative is determined by evaluating the following three of the five balancing criteria used in the detailed analysis of alternatives: (1) Long-term effectiveness and permanence; (2) Reduction in toxicity, mobility and volume through treatment; and, (3) Short-term effectiveness. Overall effectiveness is then compared to cost to determine whether a remedy is cost-effective. The two alternatives that met the threshold criteria were Alternatives 5 and 6. Both alternatives are considered effective for the long-term because threats are reduced to acceptable levels. Increased short-term risks for both alternatives to workers, the public and the environment may occur during implementation of the remedial action, but these risks will be minimized by appropriate mitigative measures, including use of site access controls. Although the selected remedial action (Alternative 5) does not involve treatment of impacted soils, it achieves the same objectives as the soil treatment alternative (Alternative 6) – excavation and off-site disposal of impacted soils. However, the soil treatment alternative, there were uncertainties associated with the overall effectiveness of the treatment to reduce the volume of impacted soils since the treatment only addressed radiological COCs. No feasible soil treatment technologies were identified to address beryllium, the most widespread AEC-related COC in soils. Thus the overall effectiveness of Alternative 5 is better than Alternative 6. Also, the selected alternative (Alternative 5) is less costly than Alternative 6 with the total present value costs being $36.5M and $42.8M, respectively. Therefore, since Alternative 5 is less costly than Alternative 6 and provides a better overall effectiveness, the selected remedy (Alternative 5) is the most cost effective and is reasonable considering all the long-term cost elements, and the resulting remedy will be effective and offers a reasonable cost in comparison to the other alternative.

12.4 UTILIZATION OF PERMANANT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT POSSIBLE

The selected remedy (Alternative 5) for the Luckey site provides a permanent solution to soil contamination that currently exists at the site. The removal of impacted soils removes the source impacting groundwater. The selected remedy does not present higher short-term risks than those associated with the other alternatives considered.

The selected remedy for the on-site soils is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to hazardous substances which are the subject of this response action, utilizes permanent solutions, and is cost-effective. No treatment is included in the selected remedy for soils. Although a remedial alternative involving active treatment was identified for impacted soils at the Luckey site, it was not selected. Only soil treatment technologies addressing radiological constituents were identified as effective and feasible. No feasible soil treatment technologies were identified to address beryllium, which is widespread across the Luckey site.

With respect to the on-site soils, this remedy will result in AEC-related hazardous substances, pollutants, and contaminants being reduced to concentrations allowing unlimited use and unrestricted exposure. Therefore, there will be no need for conducting five-year reviews. As indicated earlier, the final decisions regarding site-wide groundwater and associated five-year reviews will be documented in a separate Record of Decision.

13.0 EXPLANATION OF SIGNIFICANT CHANGES

There were no significant changes to the Proposed Plan based on comments received. Decisions regarding site-wide groundwater will be documented in a separate Record of Decision.

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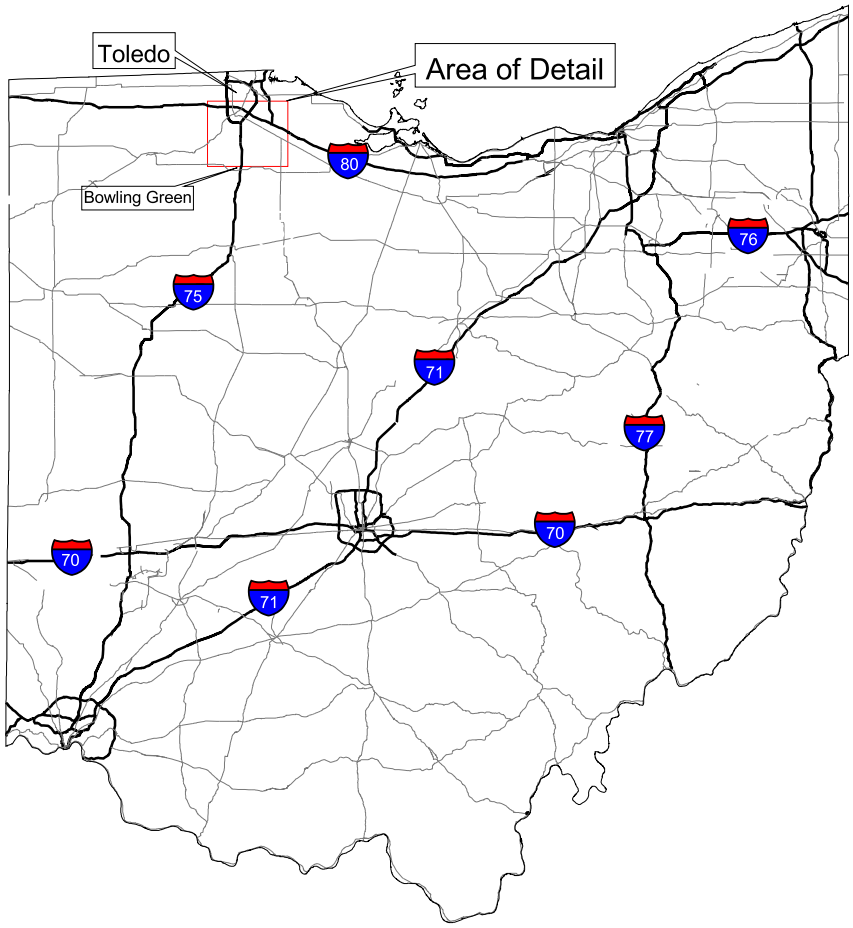

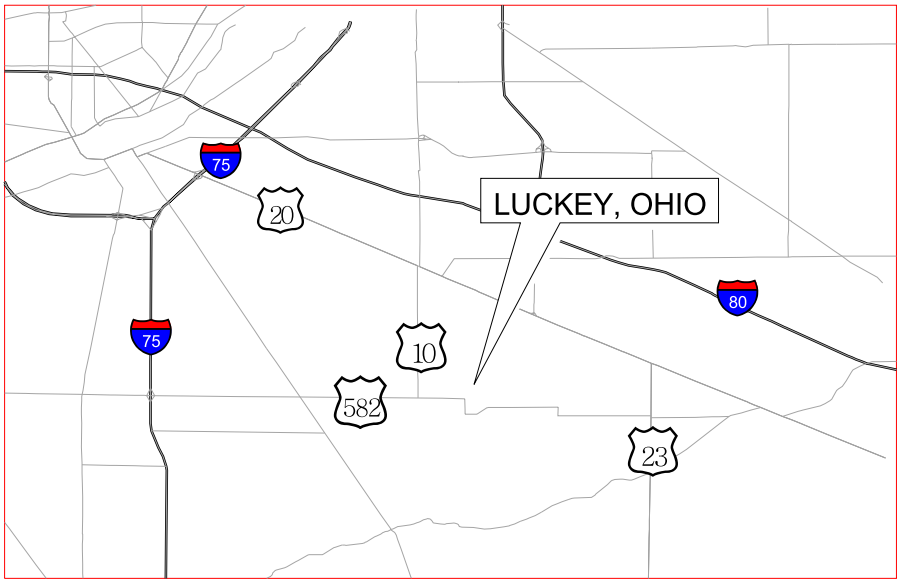

Primary road with limited access
Primary road

60 0 60 Miles

N W E S

U.S. Army Corps of Engineers
Buffalo District

LUCKEY SITE

Site Location

Science Applications International Corporation Columbus, Ohio

Drawn By	Date	Scale	Project No.	Figure No.
LMA	04-02-01	As Shown	04-1612-533	1.1

S:ARCVIEW LUCKEY/C01748/801/SITE LOCATION FS Report Fig No. 2.1

SITE BOUNDARY

N
W E
S

0.05 0 0.05 0.1 Miles

U.S. ARMY CORPS OF ENGINEERS
BUFFALO DISTRICT
LUCKEY SITE

Luckey Site near Luckey, Ohio

Science Applications International Corporation

Columbus, Ohio

DRAWN BY	DATE	Scale	PROJECT NO.	Figure NO.
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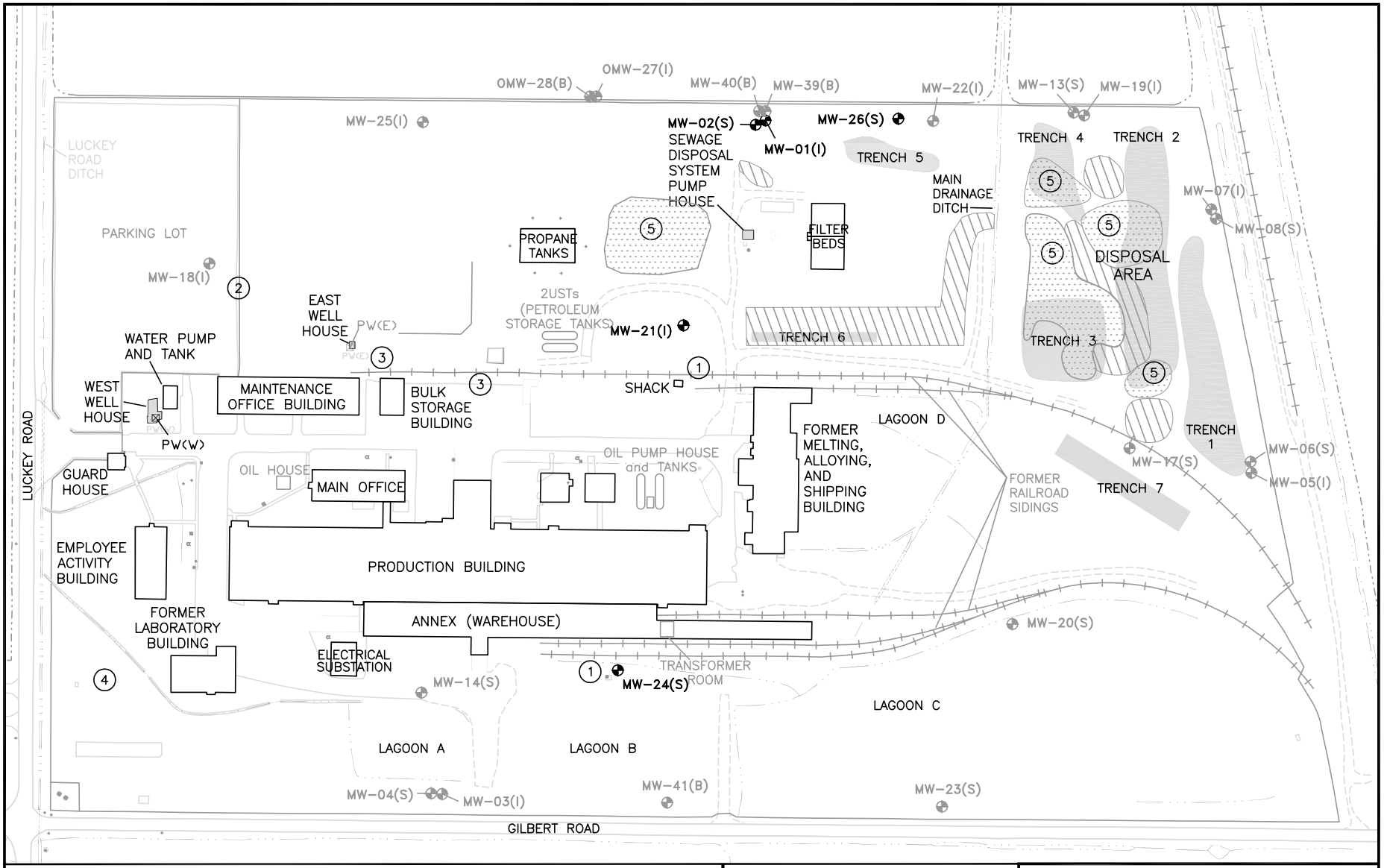
S:\LUCKEY/GIS/PROJECT3.APR LAYOUT: Luckey Site FS Report Fig No. 2.2



BUILDING
TRENCH
SPOILS PILES
MONITORING WELL
PRODUCTION WELL
FENCE LINE
STREAMS & CREEKS

ABANDONED RAILROAD GRADE
1 FORMER ORE STAGING AREA
2 FORMER LIME PIT
3 FORMER SCRAP STEEL STORAGE SITES
4 FORMER ENGINEERING BLDG. CISTERN
5 AREAS DEVOID OF VEGETATION

N True North

100 0 100 200 FEET

31 0 31 62 METERS

U.S. Army Corps of Engineers
Buffalo District

LUCKEY SITE
RECORD OF DECISION

Features at the Luckey Site

SAIC Science Applications International Corporation Columbus, Ohio

DRAWN	DATE	SCALE	PROJECT NO.	FIGURE NO.
BJW	03-19-01	AS SHOWN	08-1724-003	1.3

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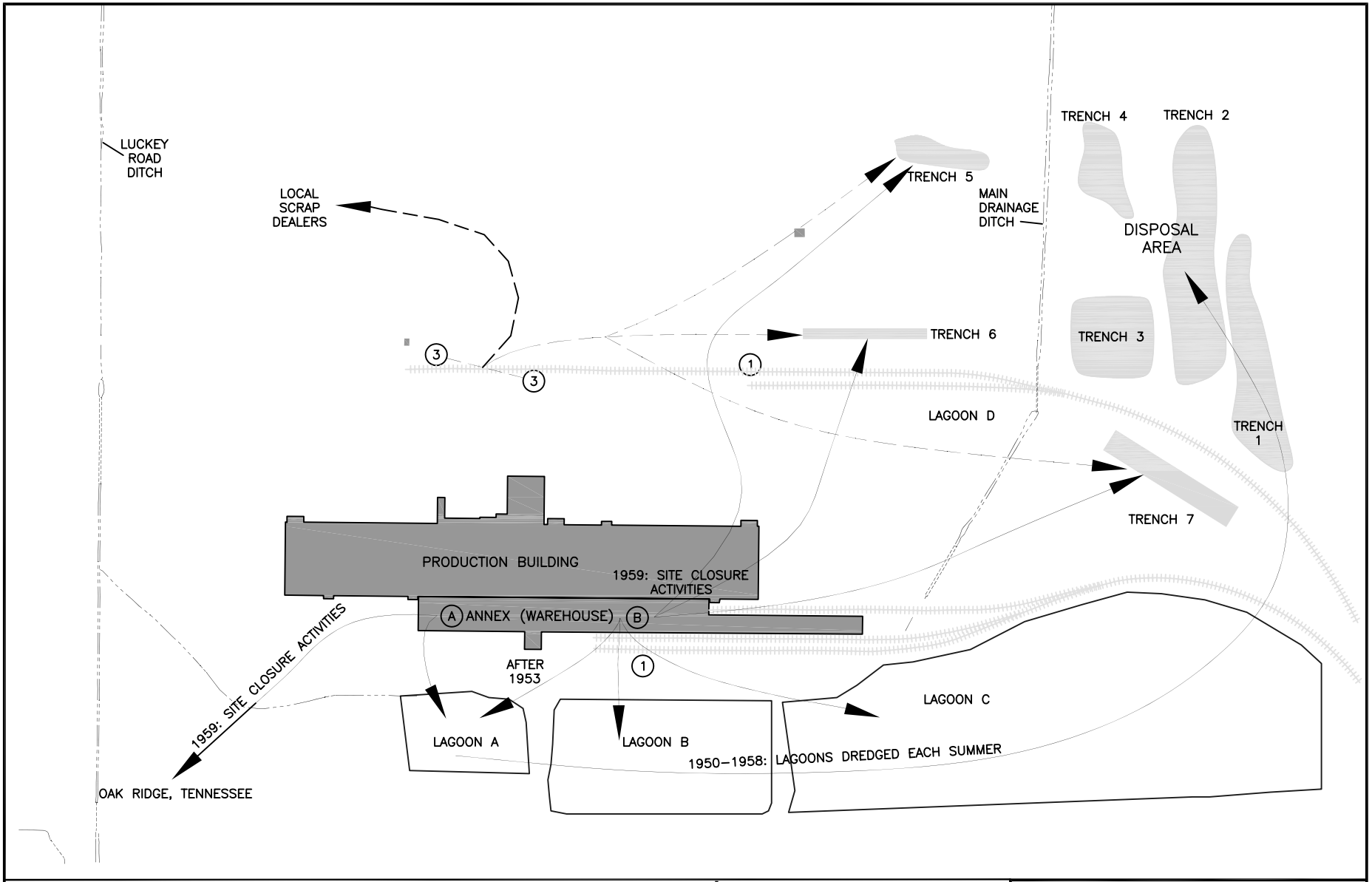

TRENCH
DITCH
ABANDONED RAILROAD GRADE

(A) 1950–1953: BERYLLIUM FLUORIDE
(B) 1950–1958: BY–PRODUCTS OF BERYLLIUM PROCESSES
(1) FORMER ORE STAGING AREA
(3) FORMER SCRAP STEEL STORAGE SITES

N True North

100 0 100 200 FEET

31 0 31 62 METERS

U.S. Army Corps of Engineers
Buffalo District

LUCKEY SITE
FS REPORT

Pictorial Summary of
Historical Operations

SAIC. Science Applications International Corporation — Columbus, Ohio

DRAWN	DATE	SCALE	PROJECT NO.	FIGURE NO.
BJW	03–19–01	AS SHOWN	04–1612–503	2.1

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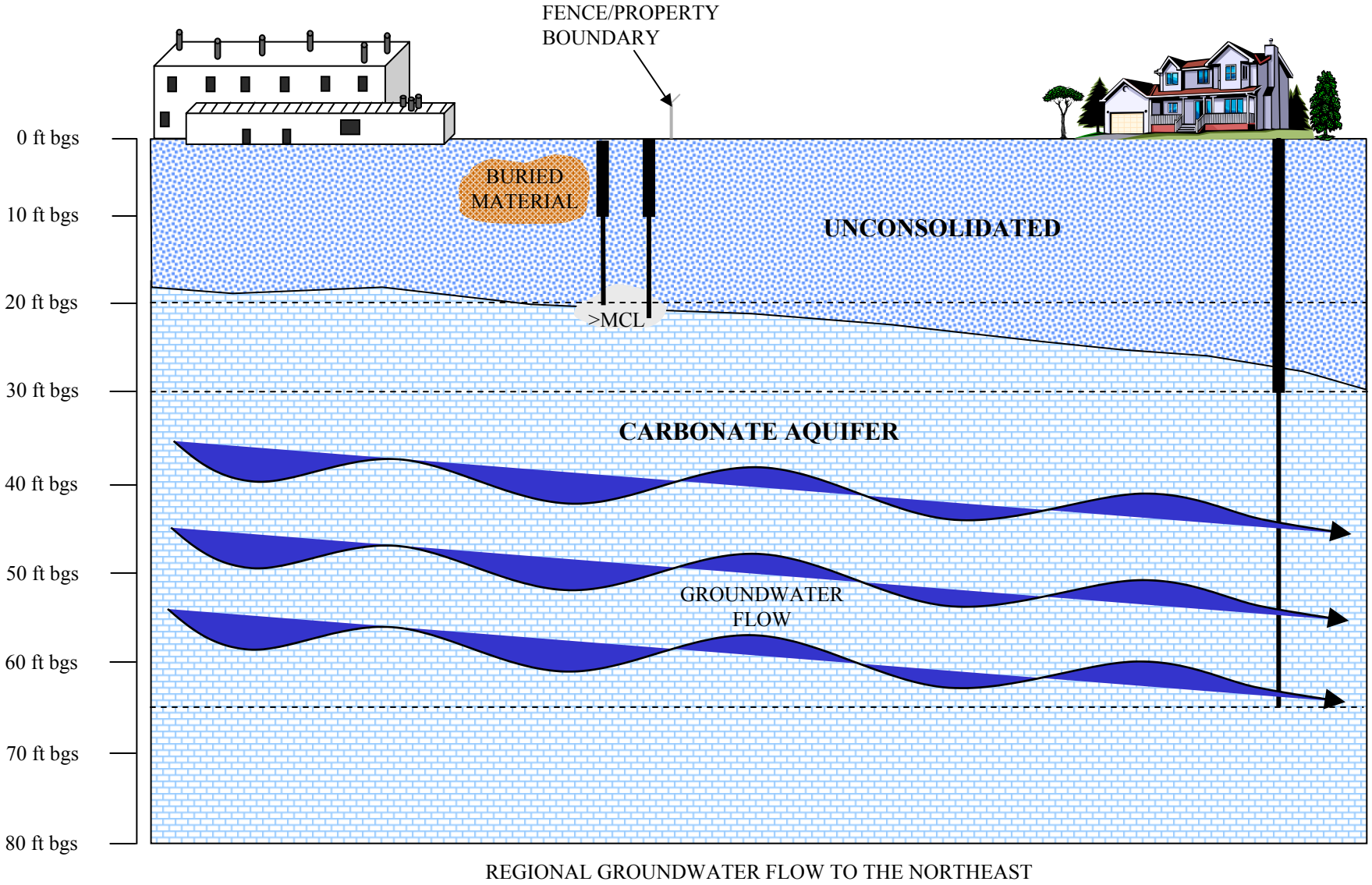
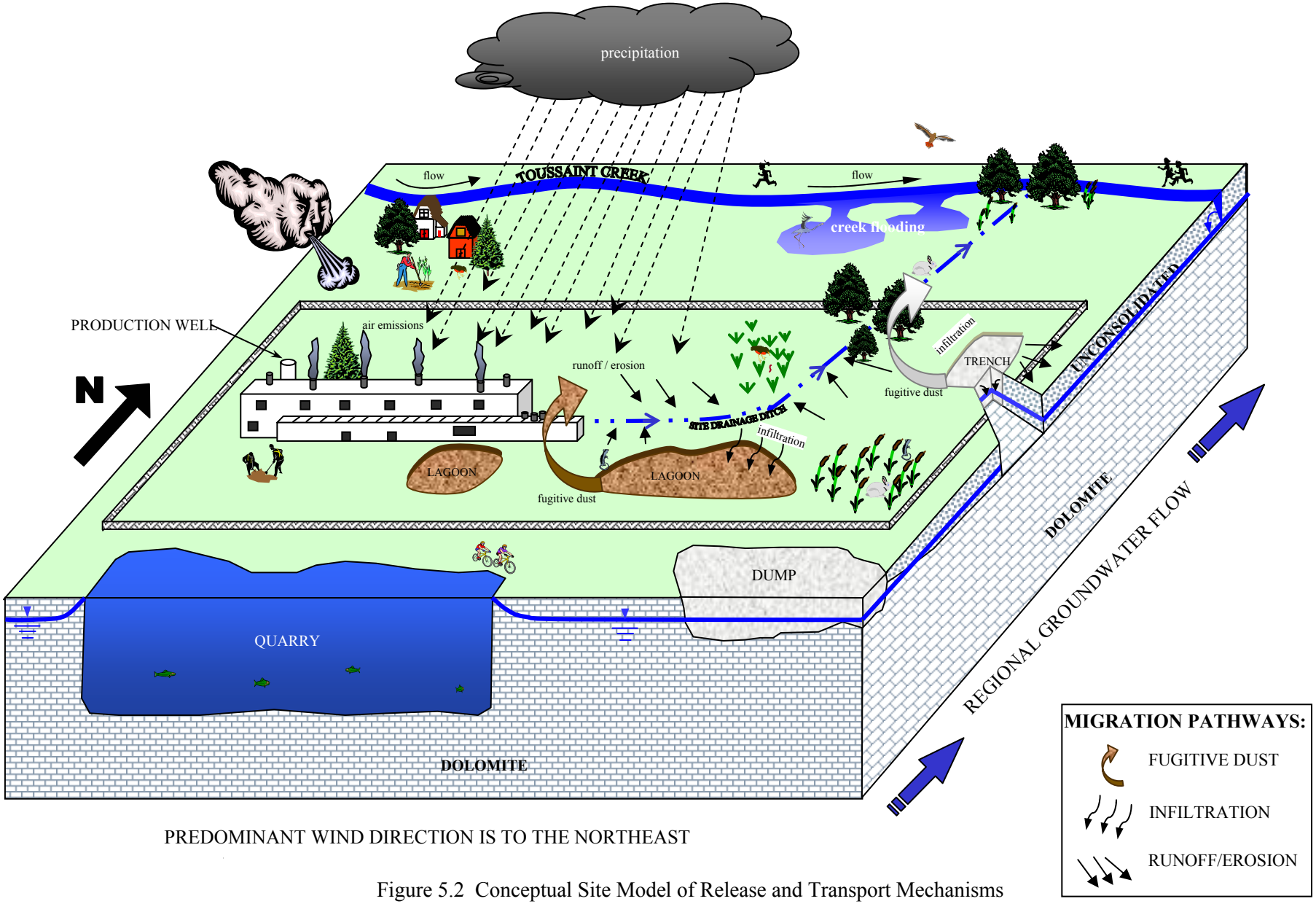
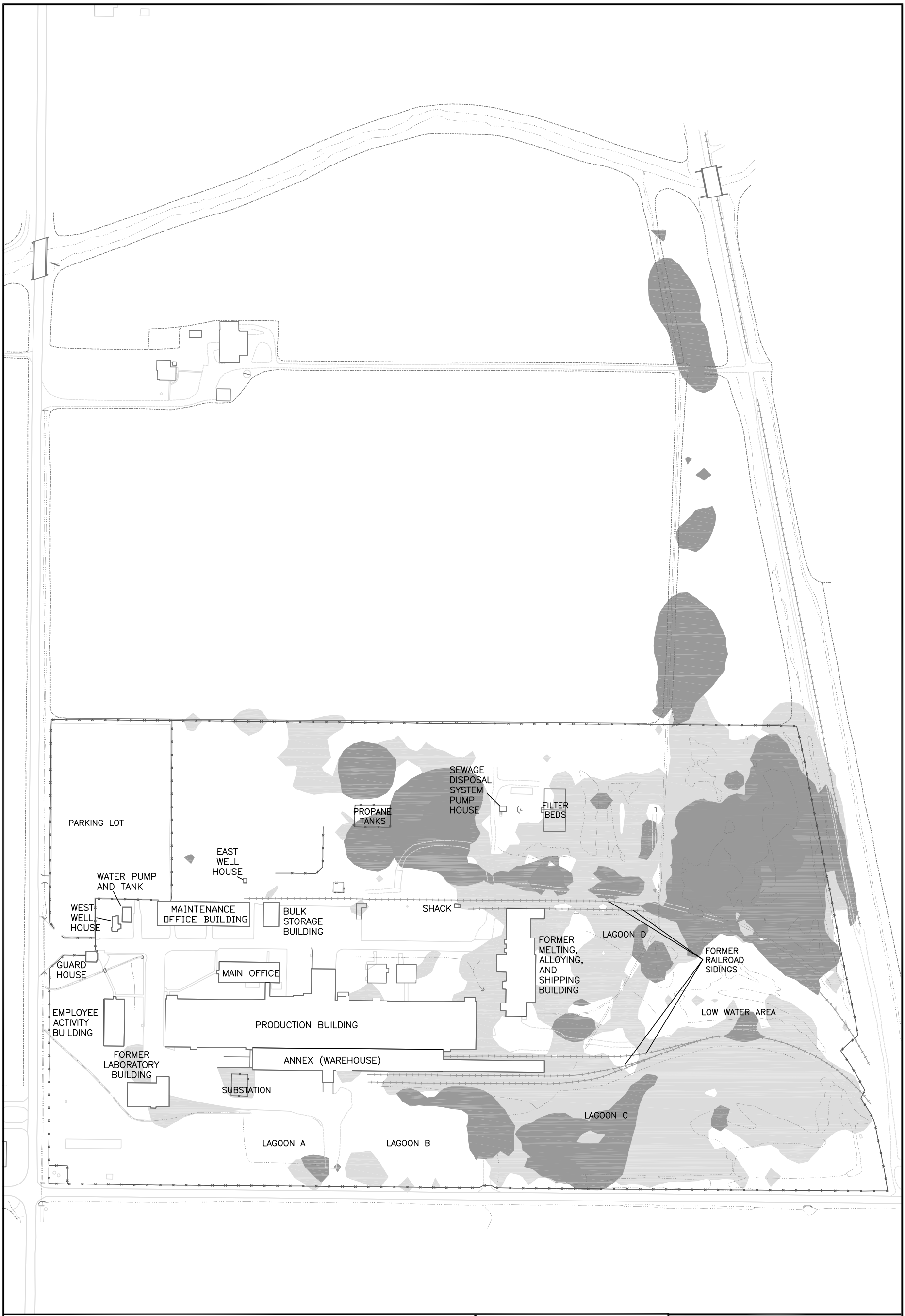


Figure 5.1 Conceptual Model of Groundwater



PREDOMINANT WIND DIRECTION IS TO THE NORTHEAST

Figure 5.2 Conceptual Site Model of Release and Transport Mechanisms



BUILDING
LOW LYING AREAS
FENCE LINE
STREAMS & CREEKS
ABANDONED RAILROAD GRADE
VOLUME ESTIMATE BASED ON LIBs DATA (ASSUMES 6 INCH DEPTH)
VOLUME ESTIMATE BASED ON ANALYTICAL DATA FROM SOIL BORINGS (GREATER THAN 6 INCH DEPTH)

N True North

100 0 100 200
FEET

31 0 31 62
METERS

U.S. Army Corps of Engineers
Buffalo District

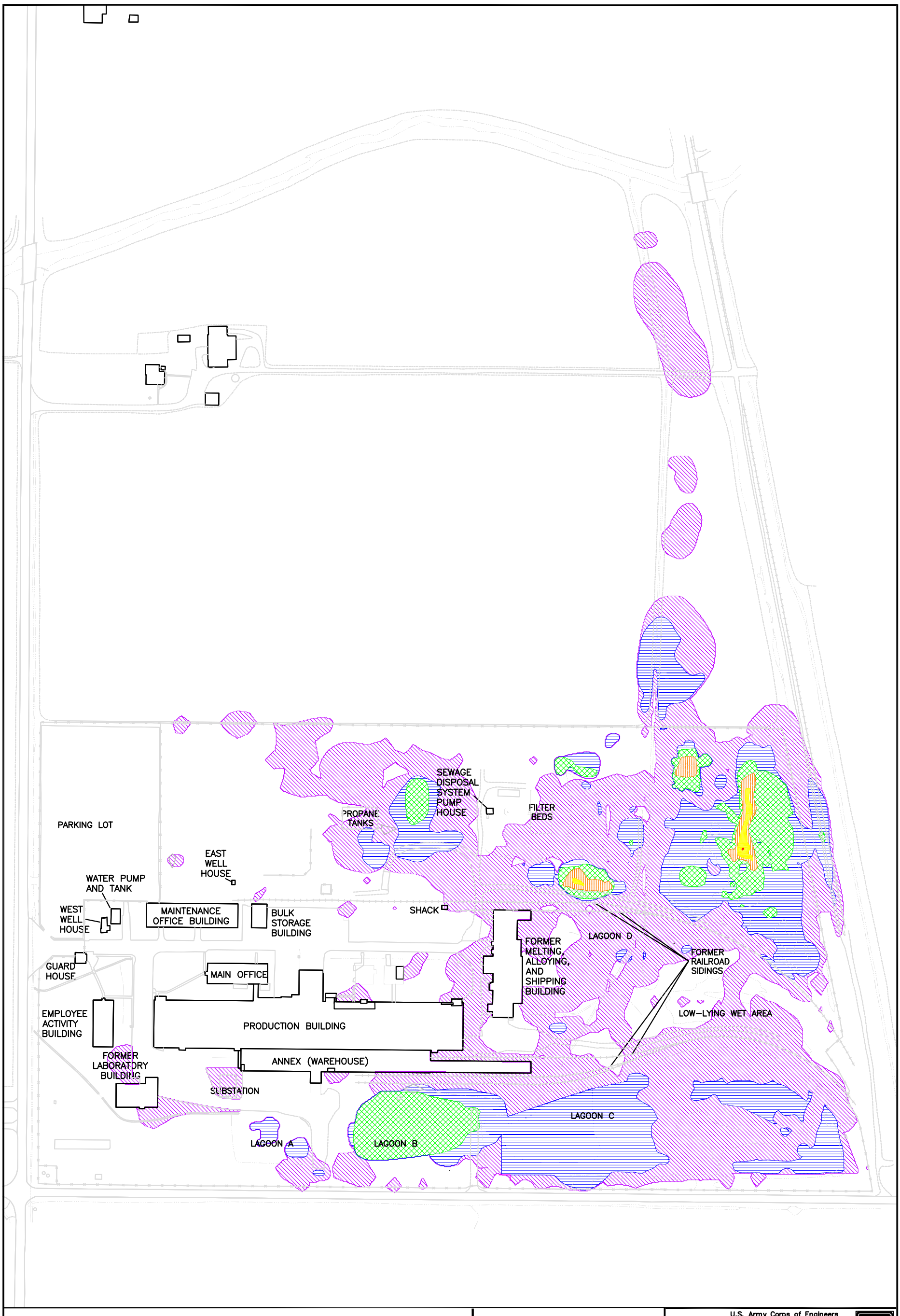
LUCKEY SITE
RECORD OF DECISION

Extent of Impacted Soils
Unrestricted Land Use

SAIC Science Applications International Corporation Columbus, Ohio

DRAWN	DATE	SCALE	PROJECT NO.	FIGURE NO.
BJW	03-19-01	AS SHOWN	08-1724-003	5.3

NAME: LAYOUT1-W:\CAD GOV\LUCKEY\RECORD OF DECISION\DWG\ROD_VOLUME_FIG 5.3.DWG DATE: MAR 23, 2004 TIME: 2:39 PM CTB: W:\CAD SUPPORT\CTB PLOTTING\LUCKEY_GRAY1.CTB



BUILDING
DITCH
LOW-LYING WET AREAS
FENCE LINE
STREAMS & CREEKS
ABANDONED RAILROAD GRADE

0-2 FEET DEPTH
2-5 FEET DEPTH
5-10 FEET DEPTH
10-15 FEET DEPTH
15-20 FEET DEPTH
20+ FEET DEPTH

N
True North

100 0 100 200
FEET

31 0 31 62
METERS

U.S. Army Corps of Engineers
Buffalo District

LUCKEY SITE
RECORD OF DECISION

Conceptualization of Alternatives 5 & 6:
Excavation of Soils~Unrestricted Land Use

SAIC. Science Applications International Corporation Columbus, Ohio

DRAWN	DATE	SCALE	PROJECT NO.	FIGURE NO.
BJW	03-19-01	AS SHOWN	08-1724-003	9.1

NAME: LAYOUT1-W:\CAD GOV\LUCKEY\RECORD OF DECISION\DWG\ROD_EXCAVATION_FIG 8.1.DWG DATE: MAR 16, 2004 TIME: 11:09 AM CTB: W:\CTB PLOTTING\FULLCOLR.CTB

ATTACHMENT 1

PUBLIC MEETING TRANSCRIPT
Public Meeting June 19, 2003

Please note the following corrections of misspelled names contained in the attached transcript:

Transcript Spelling:	Correct Spelling:
Jim Burns	Tim Byrnes
Jim Carston	Jim Karsten
Steve Dekey	Steve Buechi
Michelle Marzak	Michelle Barczak
Karen Kyle	Karen Keil

BEFORE THE CITY OF LUCKEY
IN RE: PUBLIC COMMENT PERIOD
BEFORE: Lieutenant Jeff Hall
Pat Jones, Chief of Public Affairs
Joe Baker, Public Affairs
Jim Burns, Product Manager
Jim Carston, Program Manager
Tony Capella, Industrial Hygienist
Steve Dekey - Project Organizer
Michelle Marzak, Counsel
Karen Kyle, Risk Assessor
HEARING: Thursday, June 19, 2003
6:30 p.m.
LOCATION: Troy Fire Hall
1313 Krutzer Avenue
Luckey, OH
WITNESSES: Rick Brogin, Eric Jacobs, Gary Brown
Reporter: Stephanie L. Pregi
Any reproduction of this transcript is prohibited without authorization

I N D E X

DISCUSSION AMONG PARTIES 3 - 52
CERTIFICATE 53

P R O C E E D I N G S

MR. HALL:

Good evening and welcome. My name is Lieutenant Jeff Hall and I'm the commander. Thank you for coming out tonight to listen to our presentation on the proposed plant for the Luckey site. Your participation in the decision making process is welcomed and appreciated.

The purpose of this meeting is to present to you the proposed plan, but most importantly, is to get your input.

Here's the agenda that we will follow tonight. Before I move ahead into the introductory remarks, I would like to lay out a few ground rules we have established to make this meeting organized and

fair to everyone that has come out tonight.

First, when you came in, you should have received a sign in card. If anyone needs a card, please raise your hand and we will get you one.

On the card is a box to mark, if you wish to mark --- excuse me. On the card is a box to mark, if you wish to make a statement or ask a question.

Anyone who wishes to speak should indicate that on their sign in card and pass them to our assistants.

Second, I ask that everyone be courteous and allow us to make our presentation before asking any questions. We will provide everyone an opportunity to first make their comments on a proposed plan for the record. We'll limit your

time to no more than five minutes per individual. After all comments have been received about the proposed plan, we will conclude the formal meeting.

My staff and I will remain to answer any questions that you may have and we will be here until we've answered them all. Your cooperation is deeply appreciated.

Third, please keep in mind we will continue to accept written comments up to the close of business on July the 9th, 2003.

Back to the agenda. After some additional introductory remarks and a brief look at the proposed plan, there will be a technical presentation and then we will address questions and comments. We will review how the comments

will be accepted following the technical presentation.

This is our mission. I want everyone to know what that mission is. The U.S. Army Corp of Engineers is committed to protecting you and the environment, while executing our program in the most safe, effective and efficient manner and in compliance with the Comprehensive Environmental Response, Compensation and Liability Act, otherwise known as CERCLA.

CERCLA is the law that gives us the authority to clean at the site and it establishes the process we will follow.

This slide shows where the proposed plan is in the CERCLA process. We reviewed from the assessment of alternatives in the feasibility study to the preferred remedy

and its formal review in the proposed plan. Following the formal review, we will be issuing the record a decision on the remedial action, which is otherwise known as the cleanup.

To do all of this, the Corp of Engineers, the lead federal agency, brings together its multi-disciplinary team of Corp Employees from here in the Toledo area, from Buffalo and across the nation, along with its contractors. This team has a wealth of experience addressing FUSRAP sites throughout the nation.

The Corp team is really a subset of a much larger team, as shown here on the slide. We call that the Luckey team. You are part of that team. We do not operate alone and we depend upon the input from others. We

have and will continue to solicit input from the Luckey team or work with all the parties to come to a synergistic solution for addressing the Luckey site's needs.

Much of the broad team I just showed to you have participated along the way in the development of the proposed plan. We have conducted extensive internal reviews. Now is the time to get formal comments from you. The primary purpose of this meeting is to listen to and record comments from the public on this plan. Your input is very important to us.

I'd like to highlight no decision has been made. The final remedy will not be selected until the Corp has received and considered all

public and regulatory comments obtained during the 30 day comment period. Again, that ends on the 9th of July, 2003.

This is the preferred plan from the proposed plan, which includes a combination of excavation and disposal of impacted soils and monitored, natural attenuation of impacted groundwater.

The process we follow to get to this point, in a more descriptive explanation, will follow. At this point, I will turn the presentation over to Jim Burns, who is our project manager, and he will lead us through the technical presentation of tonight's proposed plan. Jim.

MR. BURNS:

Thank you, sir.

Welcome. First of all, I'd like to introduce the rest of

the Corp of Engineers team. I have people in --- contractors. First of all, I'd like to point out Jim Carson, our program manager for FUSRAP. Tony Capella, industrial hygienist.

Steve Dekey, in the back here, is going to stick his head out the door there a minute. He's the project engineer. Michelle Marzak right up front here, our counsel. Karen Kyle, our risk assessor. Joe Baker, in the back, is with our public affairs and Pat Jones, our chief of public affairs in the back.

We also have our prior contracts Doug Bach with Montgomery, Watson, Harza (phonetic) and we have Laura Oakloy (phonetic) with Scientific Applications International.

Again, I'd like to welcome you. We're going to take you through some of these items. Briefly, take you through this history. Many of you may have much more history than I do. We'll go through a little history for those of you who haven't been here before. Go through the problem identification of the nature and extent. Go through the processing criteria, cover the alternatives and then move into the preferred plan or preferred alternative.

I'd like to first of all, for those who may not be as familiar with this, I'd like to point out some things here. Here is essentially the Luckey site. Running north and south right here is Luckey Road. Gilbert Road here. The industrial part of the site,

shown here in a older picture.

Also, we have Toussaint Creek to the north. The old railroad back here to the east. And as you can see, the site is industrial for the most part here. Agricultural land to the north.

With the history, a Formerly Utilized site Sites Remediation Action Program was developed to address the legacy left by the early Atomic Energy Program that was authorized in 1974. At the Luckey site, the Atomic Energy Commission began beryllium processing back in 1949 and finished with that and ceased sometime in the early '60s.

Part of that beryllium process also is that at one time in the '50s, contaminated scrap steel was brought to the site, which may be the reason

why the radio-nuclides are out on this particular site.

The Luckey site entered the program in 1992 under the designation by the Department of Energy. The FUSRAP program itself was turned over to the Department of --- the Corp of Engineers, rather, in 1997. We have been running with the program since that time.

In more recent history, we completed the Remedial Investigation or most of the study work back in September 2000. At that time, we had a public workshop with you and we presented primarily a focus on the groundwater modeling that we were doing at the time.

In March of 2001, we completed tap water sampling, which was a request of yours at the September 2000 meeting that we look at and evaluate the

water relative --- surrounding the site. We did so and completed that without Wood County Health Department and Brad Esten (phonetic). We thank him for that assistance.

The next item along the lines of our investigation, we completed the groundwater model in May of 2002, along with the Toussaint Creek investigation. The groundwater model was thoroughly coordinated with the state regulators as was the Toussaint Creek investigation.

Toussaint Creek investigation indicated that there was no need for further action. As we had pointed out to you the last time we met you back in December of 2001, it may be some time before we get back with you, as we were taking and assessing the information for the feasibility

study.
That feasibility study was completed in May of this year, May 2003, and is now in the administrative record in your Luckey public library and at our offices should you care to examine that.
Right now, where we are is the Luckey proposed plan, which was released this June and we are now in the public comment period as the Commander said.
That's essentially the history of the Luckey site. The next slide will take you into the first activities we had --- basically examining the site for the nature and extent of the problem relative in four primary areas; the soil, groundwater, sediments and buildings.
The soils, contaminated

with --- such concern that we looked at were the radio-nuclides, mainly radium, thorium and uranium, and also the chemicals beryllium and lead.

For the groundwater, the contaminants of concern were one radiological, that is uranium --- one radio-nuclide rather, it's uranium and two chemicals; beryllium and lead.

It's key to point out here that of the four examined, only the first two soils and groundwater had impacts that exceeded guidelines. And the proposed plan that we are talking to tonight addresses these with alternatives.

The other two, namely Toussaint Creek sediments, where the beryllium and lead was found, pose no threat to human health or the

environment. The beryllium and radio-nuclides were found to pose no unacceptable risk to human health and the environment. Those are without the examined --- alternatives presented here tonight.

Regarding the nature and extent of contamination, this slide here shows --- is meant to show the extent of contamination. And primarily the outline that you see here, is showing you the beryllium contamination at the surface. The other coloring, which can be better shown on this graph, where --- if you have an opportunity later to examine, shows you the different depths of contamination, which basically run from surface to 20 feet.

The beryllium contamination, the soils here

--- this was meant to cover soils. Again, it is the primary contaminant, essentially 60 percent of the volume is beryllium alone contamination. There may be, as we mentioned, chemicals of lead --- chemical lead and beryllium as that contamination is commingled, for the most part, by the lead and uranium, the radio-nuclides.

Regarding groundwater, groundwater impacts are limited. Here are the locations of seven wells. Primarily, you can see them to the northeast quadrant of the industrial portion of the site. Based upon our analysis, impacts are limited, very limited areas around these wells.

Lead and uranium are not predicted to migrate off the

site in the near future. I will address these northern wells here conceptually in the next slide.

Here's a conceptual drawing of the site, the industrial part of the site, the northern fence or boundary of the site and the properties to the north or the agricultural area.

Basically, a breakdown here of two types of strata; the unconsolidated strata here, which provides some groundwater, but generally not usable in any significant quantity. And here, where generally speaking, at some greater level, serves as the groundwater source or drinking water source to may in the area.

Where we found the contamination is narrowing in

this unconsolidated area here, from two to 20 feet. When we found contamination in the groundwater in the sustained area, which is generally not sufficient to supply continuous water for drinking water.

The deeper bedrock here, where most --- the groundwater is drawn from, is not impacted by our modeling predictions. The contamination is unlikely to reach this deep aquifer or natural attenuation will take place, as the groundwater moves through the system and the concentrations of contaminants decrease from physical --- from natural, physical and chemical processes.

So there, we've covered is through the --- given you a conceptual model of what's going on with groundwater.

As we move from

identification of the problem, we're up to the nature and extent that's been identified that leads us to development of the cleanup guide criteria. Regulations were examined for constituents of concerns in soils as I mentioned namely, radio-nuclides beryllium and lead. The radio-nuclide --- these two regulations, one federal, one Ohio, cited here, establish the dose criteria for the critical group of receptors for unrestricted land-use. That group is the subsistence farmer. Subsistence farmer is a possible future. That means if this land became vacant, the site --- industrial site, it essentially means someone would live off produce, vegen sources that would come right off of this site.

So those two regulations

provided us that information developed as the cleanup guidelines for the radio-nuclides in the soils.

Now, for the beryllium and lead, there's a different situation. There are not regulations to address this. So risk based guidelines were developed.

Moving to the cleanup criteria, next slide, for groundwater, regulations were examined for the constituents of concern. Namely, the uranium, beryllium and lead.

The maximum contamination levels, shown here, are essentially standards developed to protect you and I or human health from identified adverse effects to drinking water.

The first federal regulation or cite here

addresses uranium. The second two, both the federal and Ohio, address beryllium. Again, addressing these establish the cleanup criteria for beryllium and uranium in groundwater. The next, relative to lead, the national primary drinking water regulations again address drinking water contaminants. In this case, lead. You can see the code cites here, federal regulation and another Ohio regulation. These are the cleanup guidelines.

Based upon the use of those, we came up with some cleanup guidelines. Mainly here, as you see down this column, contaminants of concern from beryllium down to uranium. Actually, I'll go through that. Beryllium, lead, radium, thorium and the two uraniums. In the groundwater; beryllium,

lead and uranium.

These numbers --- it's not so important that you get relative these numbers, but subsistence farmer, that's what we have to cleanup. That's our cleanup guidelines. These are the maximum detects that we've shown in the field. In our next slides, I'll try to show you a comparison of what we have to reach to be protective of human health and the environment versus the maximum. Now, this is not the average, but the maximum that we've had.

In comparison in soils, as you can see, you have a condition for a subsistence farmer and then for the different --- beryllium and lead. As you can see, the comparison is just a number down to where we need to see where the units are. You can

see there's considerable reductions as opposed to some of what the maximum levels were that we've encountered in the field. That's soils.

For groundwater, a similar situation. For a subsistence farmer condition, we have these levels. For maximum detects, we have considerably different levels.

Having taken that into account --- the next slide, please. We've taken you from examination of the problem into looking at the regulations, getting to what the cleanup goals will be and then taking those cleanup goals, we developed them into a series of alternatives or a number of alternatives.

Here, we have six alternatives. Nine alternatives were examined as

part of the feasibility investigation. However, alternatives two, three and four, if you notice, are missing. They did not achieve our unrestricted land-use. Therefore, they are not evaluated in the proposed plan.

I'm going to go through a brief of each one of these. Primarily, on this slide, I'd like to address, this is a no action plan. A no action plan is essentially a plan that remains --- things remain as they are. As you can see --- point out in this, things remain as they are two criteria that are investigated under CERCLA, namely protectiveness and do they meet the regulations, you see nos there.

This plan is carried forward as a part of --- solely as a part of --- for comparison

purposes. It's not anything that we would propose.

Going through the alternatives. First we have those dealing with soils. We're going to have two. Both of them, which in this case, alternative five is focused on an excavation. Excavation of soils and off-site disposal. Here, we address the soils by removal of the impact soils and the potential source for any groundwater contamination, along with off-site disposal and backfill.

Essentially 88,000 cubic yards of material will be shipped off-site at a total cost of about $36 and a half million.

Alternative six, again, excavation of soils. The essential difference here from the previous alternative

regarding excavation regarding --- this alternative addresses treatment of radio-nuclides in the soils, which are only a small portion of the expected waste stream. That treatment adds over $6,000,000 to the cost.

Alternative seven, here is the first of three groundwater alternatives. Now, any groundwater alternative includes source removal or must be combined with one of these soils alternatives that I just mentioned.

This alternative, mainly monitoring natural attenuation, relies on natural, physical and chemical processes, reaching cleanup goals. Until they are achieved, land-use controls will be in place to prevent use of contaminated groundwater.

The time to achieve the

cleanup from 40 to 150 years is based upon achievement of the goals in the unconsolidated, overburden or areas that I previously mentioned as generally not used as a drinking water supply.

Land-use controls, if I may, are measures to warn and/or legal means that would be used to protect the groundwater while the remediation is underway or the cleanup is underway.

Alternative eight, again, active groundwater treatment, we're addressing groundwater. This alternative relies on putting in wells and extracting the groundwater. Treatment of contamination and discharging the water until cleanup goals are reached or achieved, land-use controls will be in place to prevent use

of contaminated groundwater. The time to achieve cleanup here is 40 to 80 years based again on achievement of goals in shallow overburden or unconsolidated material. Land-use controls, cost $3,600,000.

This alternative --- again, electrokinetic treatment of groundwater, relies on putting in an electronic field with wells and extracting groundwater, treating the contamination and discharging the water. Again, until cleanup goals are achieved, land-use controls will be in place to prevent use of contaminated groundwater. The time to achieve the ground cleanup will be 40 years. It's based upon again, achievement of --- in the shallow or unconsolidated material, which is not currently used for

drinking water.

Having taken all those alternatives and developing all the alternatives, the process, in the next slide please, under CERCLA, into the nine criteria to evaluate alternatives.

In the one slide I've shown you relative to no action, we talked about these two professional criteria which must be met. That means, there must be protection. There must be protection for you and I and that of the environment, in compliance with regulations.

As I had pointed out before, the no action plan did not meet those conditions. All the other alternatives carried into the proposed plan did. What I'd like to do now, is lead you into the next criteria, the next five in blue. The evaluation criteria,

mainly their effectiveness, both long and short term; their impacts in reduction in toxicity, mobility or volume; their implimentablity in the cost.

The two reasons why we're here right now, that we talked about and the commander mentioned is we're seeking your comments. These are the last two criteria; community acceptance and state acceptance. Although I say last, not least in importance. Those criteria is what we're here to get your comments on tonight and through the comment period.

I'd like to now move on to the five criteria and go through the different balancing criteria or comparative analysis of all alternatives.

Here, we have a focus on

soils. Down this column here, we have the five criteria; long term effectiveness, reduction in toxicity, short-term effectiveness. We have another item, time to complete, to show you something there. Implimentability and cost.

Remember the no action plan is not protected, so this is showing here the different data on here. Ranking is shown for comparison purposes. The two other plans include excavation. In other words, material leaves the site.

Alternative five here, excavation and off-site disposal, implementability is more certain than treatability or alternative six. Because of that, a pilot study would be needed regarding treatability. However, if the treatability did work or would work, it

would result in reduced volume shipped off the site.

This is a comparative analysis of the alternatives regarding groundwater. Again, for groundwater, alternatives must consider a soil removal or a source removal.

The difference showing here is in long term effectiveness between the plans. Because of a potential longer time to obtain cleanup of the groundwater and the overburden or alternative seven, monitored natural attenuation versus the high ranking.

Again though, that is in the strata that has --- is not productive or is less productive and likely to be used for drinking water.

Monitored natural attenuation of it has a greater

short term effectiveness.
There are less risks due to the
alternative and potential
exposure.
Also, there is
uncertainty with the treatment
and electrokinetics, whether
they will work. Pilot studies
are called for. If they would
work, they would reduce the
mobility and volume of the
materials shipped off-site.
After going through the
comparison of alternatives,
both for the soils and for the
groundwater, we arrive at the
preferred alternative. It's
upon a comparison of the
alternatives, alternative five,
excavation and off-site
disposal and followed by site
restoration addressing the
soils as --- doesn't address
the source for groundwater.
Furthermore, alternative

seven, monitored natural attenuation of the impacted groundwater, along with land-use controls as we mentioned, which would have --- be in place, either warnings or legal means to prevent --- while that gets underway from people using groundwater.

That plan that could cost roughly $37 and a half million is the preferred alternative. This plan, again, would result in essentially 88,000 cubic yards of material removed from the site.

Some of the benefits regarding the preferred alternative. One, most important, it's fully protective of you and I or human health and the environment. It also meets the requirements of relevant regulations and guidelines.

It's permanent in that once the groundwater portion of it is done, there should be no further and unrestricted use of the land made available.

It can be initiated in a timely manner. We believe it's responsive to community concerns, which we are eliciting from you.

Project schedule. Here is where we are at, 30 day public review. We will consider each and every comment received during the 30 day public review. We will prepare a formal response to each comment. Responses will be issued in a responsiveness summary that will become a part of the administrative record.

The comments will be considered, where applicable, in the development of the record of decision. As you can

see here, it's scheduled for December of this year.

Then we will have a decision regarding the remedy. However, we will have to await funding before proceeding with any remedy. Currently, there are a number of ongoing cleanups at other FUSRAP sites that are utilizing a substantial portion of the program funds.

Given those ongoing cleanups, it appears program funds will not become available until fiscal year 2006 for this project site.

The comments portion. Again, I'm taking you through the presentation. If there's anyone who desires to make any oral comment, if they would fill out one of those yellow sheets. After the comments, we will dispense with the formal

meeting procedures and adjourn and the staff, myself, the commander, all of the staff here will answer any questions until we're done.

I'd like you to remember also that you may still write or submit your comments in the mail to us until July 9th. You'll still have time to send us comments.

We'll respond to your comments. We'll consider each comment received during the 30 day public review comment period and prepare a formal response to each comment. Again, the responses will be issued in the responsiveness summary. They will be put into the evident record. It will be placed in the Luckey public library and it's also back in our office at Buffalo.

When the record of

decision is issued, we will post it on our website and also place a copy of it in the official record. We will send out a postcard to everyone on our mailing list. I understand on the card, you have an opportunity to give or, if you sign it on the back, identify for us if you'd like to be on the mailing list, if you're not already on it.

We will let you know the record of decision or when it has been issued.

I'd like to review for you the ground rules. A restatement of that. One person speaks at a time. Again, we'd like you to come up here, please and if you would, come up here for the --- we have a microphone here. If you come up so our recorder can hear your comments, state your

affiliation, if that is so required.

We'd also like to limit you to five minutes. I want everyone to be given an opportunity to speak. If you have comments a lot --- if you feel it will last longer than five minutes, please give us written comments. You can hand those to us. You can write comments, I understand, on the sheets that have been passed out and hand it to them.

You do not have to come up here and speak. That's not a requirement. You can give us written comments. Again, remember that we will be recording this and we'd like you to come up here, if you can. Speak clearly so the audience may hear you and we may get your comments recorded here.

This is my last thing. If you don't want to speak tonight, you still have opportunity to mail them in. This is the address up here. I'll leave this up here in case anyone wants to copy that down, that information.

We have cards in the back with the information, our website and information. If you would like to present any comments during the comment period.

With that, I'd like to move us right into comments. Joe, if you would, he'll take from the list, establish order and call you up if you mention --- marked on your card that you'd like to talk. We'll go from there. Anyone? If you can get people --- I'm not going to make anybody sweat it out, so to speak here, but I

guess I want to make sure that everyone has an opportunity.

We'll give you a minute to think about if they have any comments or questions. Again, if you have any comments or questions, we'll put them on the record. You will receive a formal response.

Well, if they're not any questions, I guess I will close the formal portion of the --- yes, sir.

MR. BROWN:

I have a question. The 88,000 cubic yards ---.

MR. BURNS:

Excuse me, could you come up. We need to have your comments recorded, dually recorded. You will have a formal response to it. We need your name and ---.

MR. BROWN:

My name is Gary Brown.

I've been a maintenance man out at the plant for about 30 years. I've been out there for about 30 years. I understand a lot of what you're talking about, but I don't understand when you say 88,000 cubic yards you're going to pull out. Is that just in one general area or is that going to be all around the plant?

There is, if I remember --- I've seen the print, the plot out there. There was two on the south side, one in the northeast corner, two on the north side. But also, back in the early '80s, when I was in the union as the vice president --- Boarder Wheel, it was Boarder Wheel at that time, Corporation got a letter from the DOE, the Department of Energy. They said they may have very contaminated steel

out there.
There wasn't anything after that. But I asked some people that used to work out there and they said, yes, there was truckload after truckload of contaminated steel that was brought in there and they were suited up and buried in the northeast corner. That went beyond, according to the brush print, beyond the fence, in the northeast corner.
That's the kind of stuff I want answered on. I've heard nothing about this. I'd like to know how much you're digging up and where you're digging up at. Because there's a lot of pits out there. A lot of pits.
MR. HALL:
As I was going to point out, we'll take your questions and your comments. I'm not going to respond to them right

here. Thank you for you comment. We will give you a written and formal response. Is there anyone else that would like to raise a question, make a comment?

MR. JACOBS:

Yes, I have one. I have a lot of questions. I'm Eric Jacobs from the village of Luckey. Most of the comments I have with the --- how are they going to be transported, by our local road, by rails? How are they going to transport or what roads will they be on, township roads? That's the questions I have.

The biggest question I have concerning it is will there be a danger of the trucks going past your house, an accident or something.

MR. HALL:

Thank you.

MR. BROGIN:
I'm Rick Brogin. My questions would be the TSD site. You mentioned those 88,000 yards, $36 and a half million I think it was. That's quite a chunk of change. So there must be something they're doing with it when it leaves here. That would also indicate to me that there's something seriously wrong with the material that's in there.
I'd also like to know what the flow, direction of the groundwater is, in the area. I'd like to know around the wells that we have checked in area, what kind of contamination we have now, including all of the metals.
I'd like to know who the third party firm is that's going to ensure that you're doing this as your plan is put

forth.

MR. HALL:

Thank you. Are there any others who would like to comment, question? I want to point out again, we're going to give you every opportunity to make a comment or raise a question. Yes, sir.

MR. PLAGLEY:

My name is Wayne Plagley. My question has to do with the two wells out there, the east well and the west well. I understand that the west well is contaminated with beryllium.

Generally, I use the east well for all our processing and drinking needs. Occasionally, the pump has gone bad and we've had to use the west well, which is contaminated with beryllium. When that happens, we switch

over and we do not allow drinking of that water, but we use it for process water and still discharge.

I understand that discharge eventually makes its way up the creek. I don't see in your presentation anything about that well out there, if that would still be allowed to continue to be used or if someone will provide another well.

As people in town know, we have a fire system out there that the township comes out and fills their trucks up occasionally. That has been filled up with beryllium water while the east well was out. I think you should be aware of that. Thank you.

MR. BROGIN:

I have another question. I guess at this point, I didn't

realize there was contamination in the well west of the property.

MR. HALL:

Excuse me, can you restate your name?

MR. BROGIN:

I'm sorry. I'm Rick Brogin. At this point, I didn't realize there was contamination to the west of that. I'd like to know what it's contaminated with and the results that we've had on that since the testing period began.

I also would like to know what the --- another gentleman mentioned where it was --- how it was going to be shipped from Luckey to wherever. I'd like to know the method of shipment. Is it going to be something in a bulk form or is it going to be containerized as in drums. I

guess that would be it for now.
MR. HALL:
Anyone else? I'll give you a couple more minutes. I'm now trying to make you at ease --- but I want to give you every opportunity in case something comes to your mind so you can state it on the record.
Anyone? Without any additional comments, I'd like to close the formal portion of this meeting, I guess, and let you know that we will stay around here to answer your questions. We have a number of sources here in the back that you can look at.
I wanted to point out again that if you're computer savvy, we have out a website where you can get the various documents and data that we summarized in today's presentation. If you have any

additional comments, please
submit them to our offices.
The address --- put it back up
there again. Please submit
them to us by the close of
business on the 9th of July.
Otherwise, I thank you
for coming. We appreciate your
input. Thank you very much.
* * * * * * * *
MEETING CONCLUDED AT 7:30 P.M.
* * * * * * * *

ATTACHMENT 2

L. D. SHERMAN COMMENTS
June 16, 2003

International Environmental Technologies Inc

P.O. Box 797 Perrysburg, Ohio 43551 419-466-2276

6/16/03

U.S. Army Corps of Engineers, Buffalo District
FUSRAP Information Center-Luckey
1776 Niagara Street
Buffalo, New York 14207-3199

Sirs,

After reviewing your public notice, we at IET would like to be placed on record stating that you should seriously reconsider the selection of "natural attenuation of groundwater" for the Luckey site. In similar settings in Ohio at the DOE remediation of the Ashtabula site, it has been found to be a failure. At Ashtabula the remediation goal was 22 mg/kg for TCE and its daughter products. At the Ashtabula site DOE selected accelerated natural attenuation with the injection of HRC compound a co-metabolite.

Attached is the April 2003 sampling results and the evaluation that the system will not meet the remediation goals. Natural Attenuation will leave a significant number of monitoring point at concentrations 2 to 4 times the EPA standard. This is not success.

Please read the following information that should be available within DOE and considered during your selection process.

In-situ remediation is still a viable and cost effective tool when conducted properly. Your plan to leave the contamination in place and then in sum unknown manner attenuate the contaminants is little more than wishful thinking. If over the past 30 to 40 years the site has not "Naturally Attenuated" itself how will things differ now. This type of thinking is not logical.

IET has successfully remediated 10 sites in Fostoria, Ohio (clay similar to Luckey), Youngstown, Ohio (clay similar to Ashtabula) and at 8 other sites in mixed geology. Why do we succeed when others fail, we hold the patent for in-situ treatment in soils. We have experience in all types of monitoring and remediation in clay were others only have failures and do not understand contaminant/water flow in tight formations. Attached is a White paper on our work in Youngstown. We are the only group in the US that has remediated to background levels in clay to a depth of 40 feet, in 22 months, for $87,000. We know what we are doing.

Respectfully,

L. D. Sherman, VP Technical Services

mg/kg, additional samples taken from this location should be watched closely to determine if this increasing trend continues.

Soil samples are beginning to show increases of DCE concentrations, the step-wise degradation product of TCE. These increases in TCE daughter products tend to confirm that the dechlorination of TCE is occurring in the subsurface. SEC has not modeled the predicted increases in DCE or VC concentrations as a function of time or TCE dechlorination, because the production of these byproducts is anticipated to be transient as TCE is dechlorinated. SEC would anticipate an increase in DCE concentrations that corresponds directly with the decrease in TCE concentrations and then an increase in VC concentration that corresponds directly with the subsequent decrease in DCE concentrations. However, sampling data do not confirm these increases in transient daughter products. Several explanations for this discrepancy may be relevant and are presented below:

- The high levels of TCE in many of the samples cause the laboratory to perform significant sample dilution. These high dilutions may be masking the presence of detectable levels of daughter products.

- The step-wise dechlorination of TCE results in DCE, VC, and finally ethane gas, respectively. The laboratory has had difficulty in the analyses of dissolved gases. The complete degradation of TCE into ethane gas could be occurring, resulting in non-detectable concentrations of the transient daughter products. Dissolved gas analyses would enable this hypothesis to be confirmed.

The current site information indicates that the three zones of the original six need substantial additional remediation. The primary purpose of using HRC was to accelerate natural attenuation via reductive dechlorination. The current groundwater chemistry indicates that the core of the contamination is extremely aerobic which will inhibit dechlorination. Despite this condition, annual and confirmation sampling events have shown decreases in the sorbed phase contamination of 17 to 78 percent. If this phenomenon continues with renewed injections (as currently planned), it cannot be expected that an improvement beyond another 25 to 50 percent is possible. The mass of HRC currently slated for injection is not stoichiometrically sufficient to satisfy the competing electron acceptor demand and to reductively dechlorinate the contaminants.

Although the current strategy could bring a number of soil horizons to the target level, there are a significant number of sampling areas where the current sampling shows concentrations much greater than the average 200 mg/kg. The overall effect of a dose(s) that cannot negate the extreme concentration of competing electron acceptors may only reduce the average soil concentration to two to four times the planned target of 22.6 mg/kg.

SEC has developed revised injection designs aimed at overcoming these high-than-anticipated conditions. The new injection designs were developed to meet the following goals:

- Remediation of the site by May 2005
- Remediation of the site by May 2004

The new designs were provided under separate cover. As discussed above, the current bioremediation model used to predict contaminant concentrations over time is no longer valid. Because competing electron acceptor demand, dissolved-phase TCE concentrations, and sorbed-phase TCE concentrations were higher than anticipated, the initial design and model did not include enough HRC to satisfy these demands and stimulate remediation. Additionally, the model did not include the retarding effect that overcoming these factors would have on remediation progress. The Q3 Groundwater Monitoring Report provides a more detailed description and bases of the assumptions used in the model, the model itself, and the reasons the model is no longer valid.

correction factor?

SEC has developed revised soil and groundwater models based on actual site conditions and sampling data. The results of this model (including predictions of TCE concentrations as a function of time) are attached to this report. Because site data collected during the baseline, Q1, Q2, and Q3 sampling events were used to develop the model, the revised groundwater model is applicable for future monitoring events.

As assessment of the initial model and revised model predictions for the A1 sampling versus actual A1 sampling results is presented below in Table 3. Data from the baseline and A1 soil sampling indicate significantly higher levels of contamination than predicted in the initial remediation model, as shown below. As discussed above, site data collected during recent sampling events make the initial model obsolete because of the large differences between predicted and actual site conditions (as discussed in the Q3 report).

Table 3. Actual sampling results compared to predicted results (from the performance models).

	Initial Model (Predicted)*		Revised Model (Predicted)*		Actual*	
	Baseline (mg/kg)	**A1 (mg/kg)**	**Baseline (mg/kg)**	**A1 (mg/kg)**	**Baseline (mg/kg)**	**A1 (mg/kg)**
A1	62	17	203	132	203	110
A2	37	10	91	59	91	206
A3	262	74	151	98	151	125
A4	19	7	2.16	1.4	2.16	9.68
A5	96	29	305.18	198	305.18	248.8
A6	346	111	1669.2	1085	1669.2	272
C4	NA	NA	739.2	480	739.2	164
C6	NA	NA	320.2	208	320.2	138
Site Average	137	41	435	283	435	159

*Soil TCE levels represent average concentration in the 1-6 meter bgs range.

The extreme heterogeneity of the data collected during the sampling events makes it very difficult to generalize and to predict remediation progress. Data from the A1 soil sampling event show remediation is occurring quicker than anticipated by the revised model in several sample locations, including the A1 (B-1 zone), A6 (M-1 zone), C4 (R-1 zone), and C6 (M-1 zone). Again these areas are those zones where the highest mass of HRC was injected. In some areas, remediation is occurring more slowly than predicted,

ATTACHMENT 3

ROBERT EMANS COMMENTS
June 19, 2003

US Army Corps of Engineers®

Former Luckey Site
Public Comment Meeting
June 19, 2003

Do you wish to make a public comment? Yes ✓ No ___

Name: ROBERT EMANS - TRUSTEE

Address: 112 MAIN ST. LUCKEY OHIO 43443

Question: why not TAKE DOWN ALL BUILDINGS NOW ?

ATTACHMENT 4

JEFF GOLDIN COMMENTS
June 23, 2003

Sent: Monday, June 23, 2003 4:03 PM
To: Fusrap
Subject: Luckey FUSRAP Site Inquiry

Dear USACE:

Regarding the subject site, I assume from advertised material that the impacted soil will be disposed of as a mixed-waste. Was there any consideration given to stabilizing the heavy metals in the impacted soil and sending the treated soils to a rad landfill? I believe the savings to the government could be substantial in disposing of the impacted soils as a rad waste versus a mixed waste. Please let me know.

Regards,

Jeff

Jeff Goldin
Vice President, Sales & Marketing
Metals Treatment Technologies, LLC.

Phone: 303-456-6977 Ext: 28

ATTACHMENT 5

GRAHAM MITCHELL COMMENTS
July 2, 2003

OhioEPA
State of Ohio Environmental Protection Agency
Southwest District

401 East Fifth Street
Dayton, Ohio 45402-2911

TELE: (937) 285-6357
FAX: (937) 285-6249

July 2, 2003

U.S. Army Corps of Engineers ~ Buffalo District
FUSRAP Information Center ~ Luckey
1776 Niagara Street
Buffalo, NY 14207-3199

To whom it may concern:

Ohio EPA has been actively involved in the Luckey FUSRAP Site since designation into the program in the mid 1990s. Through cooperative interaction during implementation of the CERCLA process with both DOE and USACE , Ohio EPA has assisted in the development of the Remedial Investigation, Feasibility Study and Proposed Plan for this site. Because of this extensive participation, Ohio EPA is comfortable with the supporting documents to the Proposed Plan and agrees with the recommended preferred alternative contained therein to remedy the site. The following comments are being submitted for the public record to memorialize extant issues related to this project:

1. The on-site buildings in their present condition have been determined by USACE to require no further action. However, should conditions change whereby the buildings are substantially modified or even razed, further evaluation will be necessary to ascertain whether these modification activities, the resulting debris and the soils contained beneath the foundation footprint exceed the established cleanup goals for the site. Ohio EPA recommends that a deed restriction be negotiated with the current property owners and other responsible parties to ensure that further characterization activities are implemented under such circumstances that may result in a future release to the environment. It is our goal to make certain the property continues to meet unrestricted use criteria in the event future modifications or demolition of these structures occurs.

2. An off-site noncontiguous residential property was investigated during this project for AEC related contaminants and it was found to contain concentrations of beryllium from the Luckey FUSRAP site that exceed the established cleanup goal. Ohio EPA encourages USACE to limit future exposure to AEC chemicals of concern at this property by taking appropriate actions while implementing the selected remedy at the Luckey FUSRAP site.

3. The west production well is contaminated with beryllium at levels exceeding the maximum contaminant level (MCL) for this compound of 4.0 micrograms per liter (ug/l). The beryllium now exists in the deep bedrock aquifer at the site, which also serves as the regional potable drinking water aquifer, due to the depth of pumping of the west production well. Currently, it is believed that the contamination is being retained on site by the pumping of the east production well. However, if this pumping should cease or if capture is not being provided by the east production well's cone of influence, then the contamination could migrate downgradient and offsite and eventually arrive at a potable drinking water well. The renovation of the west production well or the plugging and abandonment of this well and the drilling of a new well would constitute a primary form of addressing the contamination since the probable entry point of the contamination is the west production well itself. This potentially would remedy the problem and remove the possibility of the contamination migrating offsite in the future.

4. The performance monitoring program will be designed to determine the effectiveness of the Monitored Natural Attenuation (MNA) remedy. The effectiveness review of the MNA remedy based on the results of the performance monitoring program should occur at five years from completion of the source removal.

Ohio EPA appreciates the opportunity to provide comments on this project during the public comment period. We look forward to finalizing this portion of the CERCLA process through issuance of the Record of Decision for the site and moving forward with the actual cleanup.

Sincerely,

Graham Mitchell
Chief, Office of Federal Facilities Oversight

cc: Steve Snyder, DERR, NWDO
Geoff Leking, DDAGW, NWDO
Joe Crombie, ODH
File

GM/sdj

ATTACHMENT 6

JERRY GREINER COMMENTS
July 3, 2003

NORTHWESTERN
WATER & SEWER
DISTRICT

July 3, 2003

U.S. Army Corps of Engineers
Buffalo District
FUSRAP Information Center – Luckey
1776 Niagara Street
Buffalo, NY 14207-3199

RE: Luckey, Ohio Proposed Plan and FUSRAP Site

Gentlemen:

Let me introduce our organization – the Northwestern Water and Sewer District. We provide potable water and sanitary services to approximately 17,000 users in Wood County.

We have followed the Army Corps' efforts in Luckey, Ohio for the last several years. As recently as 2002 we completed an extension to our water system which brings Toledo water from Lake Erie to within 1-1/2 miles of Luckey's corporate limits.

We are prepared to extend our system to Luckey if the environmental need and financial support is there to do so. We propose a meeting to discuss this further if it could mitigate any concerns for that area in regard to their drinking water.

Please call us to discuss further.

Sincerely,

Jerry Greiner
Executive Director

JG/cj

12560 Middleton Pike • P.O. Box 348 • Bowling Green, Ohio 43402
FAX: (419) 354-9344 • (877) 354-9090 • (419) 354-9090 • www.nwwsd.org • E-mail: district@nwwsd.org

ATTACHMENT 7

LINDA BINIKER COMMENTS
July 5, 2003

TROY TOWNSHIP TRUSTEES

LUCKEY, OHIO 43443

July 5, 2003

Timothy E. Byrnes
Luckey Project Manager
Department of the Army
Buffalo District
1776 Niagara Street
Buffalo, NY 14207-3199

Dear Mr. Byrnes:

Subject: Luckey Formerly Utilized Sites Remedial Action Program (FUSRAP) Site

The Troy Township Trustees reviewed your correspondence dated June 6, 2003 at their last regular meeting. The correspondence discussed proposed plan of Excavation and Off-site Disposal for soils and Monitored Natural Attenuation for groundwater for the Luckey Site.

The Trustees are concerned with the safety of the citizens which includes their health and welfare. The Trustees would like the site completely cleaned including the buildings and any contaminates in Troy Township and neighboring boundaries.

The Trustees invite you or your designate to attend a Township meeting to discuss the issues. Our meetings are the 2nd and last Wednesday of each month. Please contact me at 419-833-3401 to confirm when you would be able to attend.

Sincerely,

Linda F. Biniker

Linda F. Biniker
Clerk

Robert S. Emans, Trustee
Michael R. Hoelter, Trustee
James R. Jacobs, Trustee

ATTACHMENT 8

STANLEY BROWN COMMENTS
July 9, 2003

U.S. ARMY CORPS OF ENGINEERS
PROPOSED PLAN FOR THE LUCKEY SITE ~ LUCKEY, OHIO

Your input to the PROPOSED PLAN for the Luckey Site is important to USACE. You may use the following space to write your comments, then fold, and mail. Comments must be postmarked by July 7, 2003. If you have any questions about the comment period, please contact USACE at 1-716-879-4410 or 1-800-833-6390.

Please write your comments below.

Although Alternative(5) for soils would allow release of the site for unrestricted use in a reasonable period of time; ~~the~~ this Alternative would create another contaminated site. Alternative (6) would provide a treatment for these soils, hence, no further contamination.

Moreover, this present Case Preparation Monitoring, together with Ambient Trend Monitoring, should provide for successive generations of new instruments or monitoring devices.

Stanley Brown
S.J. Brown & Associates, LLC
649 Bruns Drive
Rossford, Ohio 43460
Tel: 419-661-0941
Fax: 419-662-9832

ATTACHMENT 9

DON BATES COMMENTS
July 9 and September 9, 2003

From: Don Bates [mailto:dbates@uretech.com]
Sent: Wednesday, July 09, 2003 4:41 PM
To: Byrnes, Timothy E LRB
Subject: Luckey FUSRAP issues

Tim, I just want to reiterate again on our position of the west well. This well is still in use on a regular basis(in fact it is the one running right now) by the plant. It is contaminated with Be and should be "fixed". We believe that this well is clearly a FUSRAP responsibility and should be addressed by the Corp of Engineers ASAP, as it is a "release" whenever it is used.
Don Bates

From: Don Bates [mailto:dbates@uretech.com]
Sent: Tuesday, September 09, 2003 4:58 PM
To: Byrnes, Timothy E LRB
Subject: Luckey FUSRAP site

Tim, as I discussed with Jim Karsten and Bruce Smith a week ago, they recommended that I ask you to add my un-resolved issues(West Well & Buildings) to the public record for comments.
Thanks, Don Bates

ATTACHMENT 10

STEVE SHAFFER COMMENTS
July 20, 2003

Dept. of the Army - Buffalo District
1776 Niagrara St.
Buffalo, NY
14207-3199

July 20, 2003

Dear Dept. of the Army - Buffalo District,

As a resident living within a ¼ of a mile of the Luckey Site, I have many concerns with the health and safety of my family and others in the area. We have lived here for 15 years and only recently found out the magnitude of the hazards that exist down the road from our home, which we built. Drinking the water and raising fruits and vegetables from of which we feed our family on.

I am concerned with the long-term impact to the aquifer and possible contamination to the drinking water from this site. I believe in time, these contaminants will eventually appear at some diluted level but none the less will appear. Yes, the beryllium is an airborne hazard, but the remaining other 5 COC's appearing in the ground water will pose a health hazard.

A close friend worked for this facility at the time it was operated by Brush Wellman and explained the activities that went on there in the sixties. One that I was most concerned with was the burial of "Hot" contaminated items such as barrels and tools within the ground. Bull dozing a pit down to the bedrock and dumping these items in the pit to be covered up achieved this. As you know, the bedrock is very close to the surface in this area, thus putting the aquifer closer to this material. In addition to the bedrock is the close proximity of a deep quarry within a few hundred feet of the site.

The "Right thing to do" would be for the US Army Corps of Engineers to step up and clean up this site. The town of Luckey, area farmers and homeowners rely on the clean, safe ground water for survival. What will these people do if this hazard is left to remain and eventually poisoning the water in the future? It would be even more costly to the government in the future not to mention the lives ruined by the actions of others in the past. My opinion is to implement alternative #5 or #6 and return the land to its original natural state prior to Brush Wellman's tainting and protecting the generations of residents to come.

Sincerely,

Steve Shaffer
5315 Middelton Pk.
Luckey, Ohio 43443

ATTACHMENT 11

ROBERT EMANS COMMENTS
July 24, 2003

U.S. ARMY CORPS OF ENGINEERS
PROPOSED PLAN FOR THE LUCKEY SITE ~ LUCKEY, OHIO

Your input to the PROPOSED PLAN for the Luckey Site is important to USACE. You may use the following space to write your comments, then fold, and mail. Comments must be postmarked by July 7, 2003. If you have any questions about the comment period, please contact USACE at 1-716-879-4410 or 1-800-833-6390.

Please write your comments below.

7-24-03

In the proposed Plan for remediation the buildings are not involved.
If you are going to reclaim the property for any future use the buildings will have to come down.
The buildings were built in the early 40's and are inefficient with the cost of utilities today.
The buildings will soon be abandoned and left to rot and fall in. In fact the large building to the northeast is contaminated has been abandoned and is rotting and will fall in.
I suggest you negotiate with the owner and lease to discontinue use of the site and clean it up right the first time.
The buildings eventually will have to come down.

Thanks you

Robert Emans
Troy Township Trustee
112 Main St
Luckey Ohio
43443

ATTACHMENT 12

MARC KOLANZ COMMENTS
September 9, 2003

September 9, 2003

Mr. James W. Karsten
U.S. Army Corps of Engineers, Buffalo District
FUSRAP Information Center - Luckey
1776 Niagara Street
Buffalo, NY 14207-3199

Reference: Brush Wellman comments on the FUSRAP Luckey Ohio site proposed cleanup plan.

Dear Mr. Karsten:

Brush Wellman Inc. (Brush Wellman) appreciates this opportunity to submit comments on the documents associated with the remedial investigation report, proposed plan and feasibility study report for the Luckey, Ohio FUSRAP site. Brush Wellman is the leading international supplier of high performance engineered materials containing beryllium and is headquartered in Cleveland, Ohio, USA. It is the only fully integrated supplier of beryllium, beryllium-containing alloys and beryllia ceramic in the world.

Since its founding in 1931, Brush Wellman has concentrated its operations and skills on advancing the unique performance capabilities and applications of beryllium-based materials. As a world leader in beryllium production and technology, Brush Wellman strives to remain a leader in medical knowledge of beryllium and in the environmental, health and safety aspects of the material as well. Brush Wellman has sponsored basic research concerning the environmental and health effects of beryllium and has assisted government agency studies. Brush Wellman supports continuing efforts to prevent chronic beryllium disease (CBD). Brush Wellman's current model to prevent CBD is based on our knowledge and understanding of the potential health risks posed by different types of exposure to beryllium such aschemical form, processing method, and particle size.

Brush Wellman appreciates the effort made by the USACE to extend the comment date for the Luckey Site Proposed Plan to September 9, 2003. However, despite this extension of time, the volume of information and the complexity of the project did not allow Brush sufficient time to completely and thoroughly review all the documents, cross-check the regulatory references and double check the calculations related to risk assessment and cost.
We are submitting the following comments based on a limted review of the Remedial Investigation, Feasibility Study and Proposed Plan reports and attachments made available to Brush by USACE. The Remedial Investigation report appears to be well written with good documentation of the sampling plan and results. However, the Feasibility Study and Proposed Plan reports read as if they contained conflicting arguments and conclusions. Brush Wellman often found it difficult and sometimes impossible to sort out the logic used because the

discussion tended to jump between legal requirements and best practice justifications. Brush Wellman found the Proposed Plan particularly confusing.

Most of the information presented in the Proposed Plan is available in the Remedial Investigation and Feasibility Study. To improve understanding by the reader the proposed plan could have been a short section of the Feasibility Study. Though our comments about the structure of the reports may appear to be grousing, Brush Wellman's primary concern is that the report is likely unintelligible to the residents of Luckey, Ohio. Brush Wellman does not believe the report is written in a fashion suitable for understanding by the community residents. For example, Brush Wellman believes that the community take away message from the public meeting was that the USACE is going to clean-up the Luckey site to a level safe to be farmed by a resident subsistence farmer. This belief is based on the fact that USACE's proposed plan to address only AEC materials was not covered in the PowerPoint presentation during the public meeting. Brush Wellman does not believe the community understands that considerable contamination will remain from non-AEC constituents of concern such as poly-aromatic hydrocarbons (PAH's). The existence of these remaining non-AEC constituents of concern leaves open an on-going National Contingency Plan requirement to further evaluate and remediate the site. In addition, the existence of on-going manufacturing at the site and in buildings which contain both AEC and non-AEC constituents of concern, may result in drag-out from the buildings. The fact that the areas beneath the footprint of the buildings were not sampled for constituents of concern raise questions as to the completeness of the remediation.

Brush Wellman believes the USACE should evaluate the effectiveness of their communications to municipal leaders and the public to ensure their understanding of the proposed plan.

The attached document summarizes Brush Wellman's comments based on its review of the three reports. If you have any questions, please feel free to contact me at 216-383-6848.

Respectfully submitted,

Marc Kolanz, CIH
Vice President,
Environmental Health & Safety

MEK/elm

COMMENTS OF BRUSH WELLMAN INC.
ON THE JUNE 2003 PROPOSED PLAN
AND
MAY 2003 FINAL FEASIBILITY STUDY REPORT
FOR THE LUCKEY SITE

Submitted to U.S. Army Corps of Engineers
Buffalo District

September 9, 2003

Brush Wellman Inc.
17876 St. Clair Avenue
Cleveland, Ohio 44110

Brush Wellman Inc. supports the remediation of the Luckey site through the Corps of Engineers' preferred approaches: excavation and off-site disposal of impacted soils and monitored natural attenuation of groundwater (Alternative 7).

For reasons more fully explained below, Brush Wellman believes the site should be remediated to an industrial land use rather than unrestricted land use. Additionally, contamination from the past, current and future non-AEC operations that is not included in the AEC cleanup renders the site non-suitable for agricultural, residential, or subsistence farmer use. Although the reports clearly state that the scope and extent of the studies together with cleanup goals are pertinent only to AEC-materials, the public may not fully understand the implications of these constraints and limited goals. As a result, the public could assume (with potential adverse health consequences) that the site is clean because USACE has declared it clean (within the scope of the proposed clean-up plan).

The following observations demonstrate that contaminants may still be present on the site and may not be suitable for unrestricted land use after the AEC cleanup is concluded:

1. Section 2.1.1.5 (Post AEC Operations), page 2-5 of the Remedial Investigation report shows that post-AEC owners/operators include Aluminum and Magnesium (a subsidiary of Vulcan Materials), Luckey Industries, Goodyear Tire and Rubber Co., Motor Wheel and Uretech. These facilities generated hazardous wastes not subject to AEC investigation and cleanup.

2. At one point, the facility was a treatment, storage and disposal facility (TSDF) which was later changed to a large quantity generator. However, the report did not indicate if the change from a TSDF was accomplished with the appropriate investigation and cleanup.

3. Section 2.1.2.3 (Other Contaminants) states that Motor Wheel submitted a RCRA closure plan for waste streams that include toluene diisocyanate (U223) and methylene chloride (F002). However, the report did not actually state if the closure was implemented. The report further states that USACE has authority only for the wastes other than AEC-materials when they are intermingled with AEC materials. The report also states that indicators (contaminants) from the Motor Wheel wastes are assumed to be site-wide. The report went on to say that *"Characterization of the non-AEC indicator compounds was limited to areas where beryllium or radionuclides were thought to be above acceptable limits."* Furthermore, the report states that Uretech currently manages operations similar to its predecessor.

All these imply that after the site is cleaned up to unrestricted land use from AEC materials, hazardous materials from "other contaminants" will still be on site and unaddressed.

Current and future operations could re-contaminate the remediated areas after USACE has concluded its cleanup.

Under section ES.1 (Scope), page ES-1 of the Feasibility Report, USACE has limited the scope to *"addressing radioactivity, beryllium, and other constituents related to the production of beryllium at the Luckey site…"*. However, no evidence was presented in the reports to show that the "other constituents" have been thoroughly identified. USACE appears to have not identified or evaluated the potential impact of support and maintenance materials that were used during the

AEC operations. The Feasibility Study report states on page 2-18, second full paragraph, that *"the highest cancer risk from soil is from exposure to PAHs."* USACE does not appear to have investigated if AEC could have contributed to these PAHs through the use of production support materials or maintenance materials known to contain PAHs such as asphalt and roofing tars. Degreasers, solvents and lubricants are still utilized extensively in the metals industry and were typically used with minimum controls prior to the advent of USEPA regulations. It is likely that the AEC operations contributed to the PAH contaminants. Also, the impurities that were inherent in the raw materials and other materials brought to the site should have been considered in the investigation.

For the reasons stated above and following, Brush Wellman believes with respect to the excavation and off-site disposal of impacted soils, Alternative 4 should have been selected and that Alternatives 4 and 5 should be modified in the following ways in order to produce a more precise and cost-effective remediation:

(1) The remedial action objective should be based on an industrial use scenario in light of the site's long-standing current and potential future use.

(2) The baseline ingestive risk calculations should recognize the safety and uncertainty factors contained in the MCL and RfD for beryllium and should not add unnecessary or duplicative safety factors.

(3) The baseline risk calculations should recognize the high degree of conservatism in the MCL and RfD for beryllium and the absence of any adverse health effects demonstrated to have resulted from the ingestion of beryllium by humans.

(4) The baseline inhalation risk values used to calculate the overall risk based concentration should use the most appropriate scientific study and recognize the safety factors underlying the current USEPA ambient air standard for beryllium.

(5) The estimated volume of soil to be removed and the associated cost are unreasonably high.Through careful project management the amount of soil that has to be removed can be substantially reduced under any remediation scenario.

(6) . The potential for drag-out from inside the buildings to the outside and the potential releases from below the footprint of the existing building may not have been adequately assessed.

Selection of Alternative 4 still would require a relatively substantial soil excavation and off-site disposal; however, the costs would be substantially less because the depth of soil excavation and the total amount of soil excavated would be less. Selection of Alternative 4 would have no significant impact on Alternative 7.

The following comments are specific to, and supportive of, the above six points.

I. An Industrial Use Scenario Should Be Selected As The Remedial Action Objective And Should Be Used In the Baseline Risk Assessment.

The Proposed Plan is based on a post-remediation land use scenario of subsistence farming. Accordingly, baseline risk assessment has been based on protecting the child of a subsistence farmer who lives on the site. The reasoning used to select this hypothetical scenario is flawed. Proper consideration of the relevant factors, including the Wood County Comprehensive Plan, demonstrates that an industrial land use scenario should be employed.

The Proposed Plan recognizes: "Current land use at the Luckey site is industrial and is expected to remain industrial for the near future" (p. 6-1). The Proposed Plan also notes that the property is zoned for light industry (p. 4-1). The Proposed Plan could have stated, as does the Feasibility Study, that the site has been used for industrial purposes for over 60 years (FS 2-5). The Feasibility Study presents these points more strongly than does the Proposed Plan:

> *"The Luckey site is zoned light industrial and is expected to remain industrial for the near future. Given the current zoning designation and published expansion plans for the Village of Luckey (Wood County 1998), the most likely future use for the property is industrial or commercial use."*

FS 2-17.

However, instead of developing a remediation plan based on this long-standing current and expected future use, the Proposed Plan selects a hypothetical future use of subsistence farming for its remedial objectives. In justifying the selection of this hypothetical future use, the Proposed Plan overlooks key facts relating to future land use and unfairly diminishes the value of the site as industrial or commercial property and its anticipated future use for such purposes.

The Proposed Plan states that there are several reasons why *"it is possible that the future land use could be residential or agricultural."* These reasons are:

(1) "*Surrounding land use on three sides of the site is agricultural and residential*";

(2) "*Agricultural and residential are the dominant land uses throughout Troy Township*"; and

(3) "*There is no other industry in the immediate area and industrial facilities at the site are aging"* (p. 6-1).

The Proposed Plan's analysis omits several important facts which show that the site is almost certainly the least likely 40-acre parcel in Troy Township to be converted to residential or agricultural use. The chief omitted fact is that the proposed remediation will affect less than half of the surface area of the site, and remaining on the site will be a large manufacturing facility. There will continue to be a complex of large buildings used for manufacturing, with over 100,000 square feet under roof. Also remaining will be the web of above-ground and underground utilities lines and pipes that serve this complex, as well as paved roadways and a

parking lot for hundreds of cars. It would take a very rich and foolish subsistence farmer to demolish these massive buildings, remove all the pavement and unneeded utility lines and pipes and remediate, as may be necessary, the soil under these areas, which are not being excavated under the Proposed Plan.

Even if one were to focus on the future use of just the eastern third of the property, most of which is to be remediated under the Proposed Plan, it is unreasonable to predict that someone would elect to build a house there and engage in subsistence farming. It would probably be the most undesirable 10-12-acre location for such a farm in Troy Township. The existing manufacturing complex would be along the entire west boundary of this hypothetical farm and during the late afternoon much of the land would literally be in the shade of the tall manufacturing buildings (not conducive to crop growth). To the south and southeast, across the road, would be the France Stone Quarry and the Troy Township Dump. Along the entire eastern side of the hypothetical farm would be the railroad tracks. Only on one side of the hypothetical farm, the north, would it be bordered by agricultural land.

In contrast to the unlikelihood of the subsistence farm scenario, continued use of the site for industrial purposes is likely, as the Proposed Plan states. While it is true that some of the manufacturing facilities are old, the site remains in use and has shown a remarkable adaptability for different industrial uses over its 61-year history. The site has many characteristics, which are not noted by the Proposed Plan, that encourage its future industrial use:

- A variety of buildings (office, production, warehouse, maintenance),
- Zoning for industrial use,
- Utilities needed for industrial use,
- Adjacent railroad with potential rail access, and
- Highway access (State Route 582) and proximity to a number of major highways (U.S. 20/23 and Interstate 75, 80 and 90) which run north, south, east and west.

Increasingly, factories are being located in rural areas because of cheaper land prices and the ability to recruit loyal employees with a good work ethic who appreciate the ability to continue to live in their community without having to move away to find employment.

The absence of the land zoned and used for industrial purposes in Troy Township (and neighboring Webster township) makes the future industrial use of the site more likely, not less likely as indicated in the Proposed Plan.

There is also a strong and growing land use ethic and public economic planning policy that industrial properties (a.k.a. "Brownfields") should be maintained in productive industrial or commercial use rather than disturbing "greenfields" for new factories and stores. This ethical policy is reflected in the Wood County Comprehensive Plan which names as one of its four goals: *"preserve prime land for agricultural purposes"* (Wood Plan, p. 13). Indeed, the Wood County Plan states that its land use goal is *"to utilize a land use plan that maximizes the*

efficiency of existing and future infrastructure, agricultural resources, community facilities, and services throughout Wood County." Accordingly, with respect to industrial developments, the Wood County Plan recognizes the need for industrial development to occur or as extensions to *"pre-existing land use pattern"* (Wood Plan, p. 169).

Also recognizing the value of the industrial development in terms of meeting a community's employment needs, the Wood County Plan encourages local communities to identify locations suitable for industrial development. (*Id.*) Hence, identifying the site as having a future use as subsistence farming is inconsistent with the site's future value and with sound community planning, like the Wood County Plan, which recognizes the need to preserve prime farmland, avoid urban sprawl and utilize existing industrial land for continued industrial use.

In light of the facts that indicate the future use of the site will be industrial or commercial, the absence of an existing deed restriction precluding the site from being used as residential or agricultural property, which the Proposed Plan asserts, does virtually nothing to increase the possibility that the site will be used for residential or agricultural purposes. With extremely rare exceptions, no land in Ohio is prevented from future residential or agricultural use by deed restrictions. However, if it were important to the Corps of Engineers in its remedy selection that the remediated portion of the site be deed-restricted against residential or agricultural use, obtaining such a restriction should be pursued and can in all probability be obtained.[1]

The Proposed Plan seems to have backed into selection of the subsistence farm future land use scenario, which was not analyzed in the Remedial Investigation Report, via the consideration of Ohio Administrative Code 3701:1-3822 (FS p. 3A-1). This Ohio rule does not dictate the selection of the future land use scenario. With respect to the subsistence farmer risk assessment, the Ohio rule is improperly identified as an Applicable or Relevant and Appropriate Requirement (ARAR); and even if it were an ARAR for this particular purpose, it would not dictate the selection of future land use scenario. At most, the Ohio rule is a chemical-specific goal for remediation of radionuclides.

As noted in the Proposed Plan, OAC: 3701:1-38-22(B) establishes as an unrestricted property release level *"a total effective dose equivalent to an average member of the critical group that does not exceed twenty-five million per year"* plus As Low as Reasonably Achievable (ALARA). OAC 3701:1-38-01(A)(35) defines "critical group" as the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

[1] If the Corps intends to pursue such an investigation, it should consider whether there are any land use restrictions or easements in the chain of title prior to the April 1, 1987 Goodyear quitclaim deed, as the Proposed Plan implies that this deed was the only document examined. *See* p. 4-1. If any land use restrictions or easements were filed before April 1, 1987, these documents would bind future use of the property according to their terms.

Without citation to authority or explanation of reasoning, the Proposed Plan states: *"In Ohio, the critical group has been consistently defined as the subsistence farmers"* (p. 6-3).[2] Clearly, what the Proposed Plan is referring to is not a state "requirement" within the meaning of 40 CFR § 300.430(e)(2)(i)(A) but a state interpretation which does not have the force of law as to what a "critical group" is. Hence, Ohio's interpretation of "critical group" meaning "subsistence farmers," consistent or otherwise, is not an ARAR. CERCLA Section 121(d)(2)(A) requires compliance with "promulgated" state standards. State guidance is not a "promulgated" standard. 52 Federal Register 32496, 32498 (August 27, 1987).

Turning to what is the Ohio requirement—the definition of "critical group"—it is clear from the foregoing analysis of the future land use that the "group of individuals reasonably expected to receive the greatest exposure to radioactivity for any applicable set of circumstances" is industrial workers.[3] In other words, in order to apply to Ohio rule, one has to determine what the reasonable future use is, as that use is not predetermined by the rule, as incorrectly suggested by the Proposed Plan. Furthermore, regardless as to whether the critical group is deemed to be industrial workers or anyone else, the Ohio rule is an ARAR only with respect to radioactivity and not as to other chemicals of concern.

II. The Baseline Risk Assessment Calculation for Ingestion Risks Fails To Recognize The MCL And RfD For Beryllium Reflect A High Degree Of Conservatism And Contain Several Safety And Uncertainty Factors.

The baseline risk assessment employs ARAR drinking water standard (maximum contaminant level or MCL) for beryllium and the IRIS Reference Dose (RfD) for beryllium. The MCL is based on a lifetime oral ingestion study of rats conducted by Schroeder, Mitchner, *Life - term Effects of Mercury, Methyl Mercury, and Nine Other Trace Metals on Mice*, Journal of Nutrition 421-427, 452-458 (1975). The IRIS RfD for beryllium is based on a long-term oral ingestion study of dogs by Morgareidge, Gallo, and Cox, *Chronic Feeding Studies with Beryllium in Dogs* (1976 There are no known studies regarding human ingestion of beryllium. ATSDR Toxicological Profile for Beryllium 7 (Sept. 2002) *("Swallowing beryllium has not been reported to cause effects in humans because very little beryllium can move from the stomach or intestines into the blood stream.").* There is no reported association between ingestion of beryllium and chronic or acute beryllium disease, which are risks associated with inhalation of beryllium. *Id.* at 74.

Both the MCL and RfD for beryllium are highly conservative, as can be demonstrated in several ways. First, the media-specific cleanup goals adopted by the Proposed Plan are more restrictive for beryllium in soils and groundwater than for lead, despite the fact that well-documented adverse human health effects exist for ingestion of lead but not for beryllium. Second, the beryllium MCL is so low that it overlaps with the range of naturally occurring levels

[2] It may be that Ohio law "consistently" interpreted "critical group" to be subsistence farmers; however, the question has to be raised whether Ohio has in the past considered all possible circumstances or even the particular circumstances of this site. If the Ohio rule were to be applied to a Lake Erie beach, Maumee River sediment remediation project, or City of Toledo property, clearly a subsistence farmer could not possibly be the critical group.

[3] It should be noted that OAC 3701:1-38-22 requires that the total effective dose be calculated to be protective of the "average member" of the critical group, not the most vulnerable member.

of beryllium in water. *See* ATSDR Toxicological Profile for Beryllium 6.4.2 (September 2002). Third, the RfD-derived soil-specific cleanup goal in the Proposed Plan overlaps with the range of naturally occurring levels of beryllium in the earth's crust. *Id.* at 6.4.3. Fourth, both the MCL and RfD are calculated by the safety and uncertainty factors applied to NOAEL and LOAEL studies.

In the case of the drinking water standards, over conservatism resulted chiefly from the use of the Schroeder and Mitchner study and the application of the largest possible safety factor *"for possible carcinogenic potential of this contaminant via ingestion"* despite the fact that a Morgareidge rat study reported a substantially higher NOAEL and all animal ingestion carcinogenicity studies were negative. *Id.* at 3.2.2:1 through .7.[4] In the RfD excessive conservatism is due chiefly to the selection and multiplier effect of a series of safety or uncertainty factors. In computing the drinking water standard, EPA used an uncertainty factor of 100. In computing the RfD, EPA has increased the uncertainty factor to 300. This increase is unwarranted as will be demonstrated by the following comments.

A. Database Adequacy—Reference Dose

In computing a reference dose for beryllium, EPA inappropriately applied an uncertainty factor of 3 for the completeness of the database. Using beryllium sulfate (a water soluble beryllium compound), the Morgareidge chronic rat study showed no toxic effects at up to 500 ppm (25 mg/kg/day) for 2 years and the dog study resulted in no systemic toxicity at up to 50 ppm for 3.5 years. Site of contact irritation/corrosion resulted in termination of the dogs exposed to 500 ppm after 33 weeks, and the study director and pathologist concluded that even in these dogs, the minor systemic effects observed were the result of systemic bacterial infection because of the damaged gastrointestinal tract. The systemic effects were not attributed to absorbed beryllium. This should be of no surprise since the commercial form of beryllium sulfate has a pH of 1, meaning it is highly corrosive. As a sulfated compound, the corrosive nature alone can account for the gastrointestinal lesions. It is illogical to implicate beryllium as the source of toxicity under such circumstances.

Although no "developmental toxicity studies" meeting the EPA guidelines have been reported, no abnormal pups or increased neonatal deaths were reported in the Morgareidge et al. dog study. In that study, there was no effect of long-term beryllium exposure of both males and females on reproduction. In the epidemiological study, no effect on reproduction as a result of maternal or paternal occupational exposure was reported (Savitz et al., 1989, cited in TERIS). In a single generation study of rats, a single intratracheal administration of beryllium oxide (0.6 mg/kg prior to mating) had no effect on pregnancy outcome (Clary et al., 1975, cited in ATSDR Toxicology Profile for Beryllium). In addition, no effect on reproductive organs was seen in either dogs exposed to beryllium for 50 ppm for 3.5 years or in rats exposed to 500 ppm for 2 years.

[4] Schroeder and Mitchener concluded that beryllium was "virtually innocuous" by ingestion and is not tumorogenic. Indeed "beryllium was noted for its lack of toxicity," and the authors concurred with previous studies indicating "that beryllium is poorly absorbed through the gut, and that ingestion is not a hazard."

Uncertainty does not exist with respect to immunological effects from oral exposure. There are no specific immunologic assays of beryllium or its salts by oral administration; however, such testing is not necessary. Chronic studies of beryllium sulfate in rats and dogs did not reveal any evidence of immunologic effects. There was no difference in spleen or thymus, and no hematologic differences suggestive of immunologic effects. Intestinal absorption of orally administrated beryllium is very low; and there is no evidence that orally administered beryllium would reach sensitive cells in the lung where sensitization could occur. Therefore, immunologic testing by the oral route would be wasteful of animals and would not add to the understanding of beryllium toxicity.

In sum, the database for oral administration of beryllium is adequate to assess the reference dose; there is little uncertainty that could be reduced by additional studies. Therefore, the uncertainty factor for the completeness of the database should be 1 not 3, which is used by IRIS.

B. Interspecies Extrapolation—Reference Dose

In computing the RfD, IRIS uses the highest possible uncertainty factor (10) for inter-species variation. This is unreasonable because the Morgareidge dog study was long-term (3+ years); because the rat data obtained by both Morgareidge and Schroeder and Mitchner were negative despite exposure at higher doses, and because dog studies are considered more representative of metal toxicity to humans than are rodent studies.

The nature of the feeding study and critical effect observed also warrant a lower uncertainty factor. The absorption of beryllium salts administered to the intestinal tract is very low. It is very unlikely that the intestinal effects in the Morgareidge et al. dog study occurred from systemic toxicity of beryllium. Instead, this appears to be a site of contact irritation/corrosive response to the beryllium salt. The gastrointestinal effects of minerals are normally due to corrosive properties of the salts. Indeed, the veterinary pathologist who reviewed the study for EPA concluded that one cannot discern if lesions are due to a local toxic or irritant effect of beryllium (sulfate). For site of contact effects, humans are not more sensitive than dogs. Thus, there should not be an uncertainty factor of 10 for extrapolation from dogs to humans. A factor of 1 is more appropriate.

C. Intraspecies Extrapolation—Reference Dose

The highest possible uncertainty factor of 10 was also applied by IRIS for intra-species variation. This is unreasonable because it appears that the one dog in the Morgareidge study considered to be affected at 50 ppm dose already represents a sensitive population. Thus, there is no reason to assume the greatest uncertainty and apply the maximum uncertainty factor for intraspecies extrapolation, when the data shows that the administered dose did not affect 90 percent of the test species. In addition, the database uncertainty is reduced because the Morgareidge dog study is supported by a chronic rat study at three dose levels approaching the practical limit for dietary administration.

D. Conclusion

The stringency of both the drinking water standards and the reference dose for beryllium is startling in light of absence of human information on oral toxicity. There is, of course, an abundant amount of data on human oral exposure to beryllium, as beryllium is commonly found in foods and water supplies. *See e.g.*, ATSDR Toxicological Profile for Beryllium pp. 97-93 (beryllium concentrations in water, soil and food). Indeed, such exposure has occurred since the origin of the human species. Against this exposure data, the lack of oral toxicity evidence in humans speaks volumes, yet this point is ignored in computing both the IRIS RfD and the drinking water standards for beryllium. This approach is not only scientifically near-sighted but perverse, as the resulting drinking water standards dictate that trivial reductions be achieved in water supplies or soils of all types at significant costs. These standards are lower than necessary to protect the public from beryllium toxicity and can result in clean-up standards that are lower than the naturally occurring level of beryllium in many water sources and soils. Hence, they result in increased costs with no benefit to humans.

III. The Baseline Risk Assessment Should Be Revised For Beryllium.

The Proposed Plan and Feasibility Study fail to communicate the degree of conservatism of the beryllium drinking water standards and reference dose and they fail to take this into effect in computing the baseline risk assessment.

The chief failure of the risk assessment is the development of a risk-based concentration (RBC) for beryllium in soil ingested by resident farmer's child and the use of a safety factor of 10 to compute that RBC. As discussed above, EPA in computing the RfD for beryllium has employed a series of safety factors so that the use of an additional safety factor in computing the RBC is unnecessary and duplicative. The long-term Morgareidge study included reproduction by the subjects and a safety factor of 3 was added for uncertainty as to completeness of the database, which would take into account exposure to children. In addition, EPA computed the RfD by adding on an additional uncertainty factor of 10 to account for possible intra-species variation. This uncertainty factor addresses the possibility of a more susceptible population, such as children. Hence, it was unnecessary for the Proposed Plan to compute an RBC for children, because the RfD was designated to protect them, and using an additional safety factor to do so duplicated the safety factors employed by the RfD.[5]

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[5] Brush Wellman participated in that rulemaking and ultimately filed for judicial review of the drinking water standards. Brush Wellman contended that research conducted by Morgareidge and his colleagues in the 1970s provided a more appropriate scientific basis for developing drinking water standards for beryllium. Judicial review of the 1992 standards has been stayed while Brush Wellman pursued further discussions with EPA. These discussions led to the selection of beryllium as one of the candidates for IRIS Pilot Study for revising IRIS health assessments. 64 Federal Register 14570 (April 12, 1996). In the revised IRIS health assessment for beryllium issued on April 3, 1998, an oral reference dose or RfD was established for beryllium using a 1976 chronic feeding study of dogs conducted by Morgareidge et al.

Brush Wellman's interest in the drinking water standards and reference dose for beryllium is not surprising. Brush Wellman is the only fully integrated supplier of beryllium, beryllium alloys and beryllia ceramic in the world. Since its founding in 1931, Brush Wellman has concentrated its operations on advancing the unique performance capabilities and applications of beryllium-based materials. Beryllium is a unique material exhibiting physical and mechanical properties unmatched by any other metal. It is one of the lightest structural materials known, yet has specific stiffness six times greater than steel. It possesses high heat absorbing capability and has dimensional

IV. The Baseline Inhalation Risk Values Used To Calculate The Overall Risk Based Concentration Should Use The Most Appropriate Science And Recognize The Underlying Safety Factors.

The use of the Integrated Risk Information System (IRIS) value for calculating non-cancer inhalation risks is ill founded. First, the IRIS value is higher than the current USEPA NESHAPS ambient air standard. Second, IRIS inappropriately uses the Kreiss[6] occupational exposure study and discounts the Eisenbud study on which the USEPA standard is based. The Eisenbud study[7] is a study of actual community exposure to beryllium using the most appropriate health end-point and is the basis for the current standard.

Not only is the IRIS value higher than the current USEPAS ambient air standard, it inappropriately considers sensitization to beryllium as a health effect. Sensitization is an inappropriate end point because in and of itself, sensitization is not a health effect or a health risk[8]. Sensitization is not simply or accurately determined and has a low positive predictive value for CBD[9]. Sensitization has been shown to reverse and has been measured in a non-occupationally exposed group at levels of 1-2%[10]. The non-cancer inhalation health effect end-point that should be used is clinical CBD (symptomatic)[9].

(continued…)

stability over a wide range of temperatures. Equipment used in fields such as medicine, aerospace, national defense, computers and telecommunications all rely on beryllium-containing materials.

Brush Wellman has sponsored basic research concerning the environmental and health effects of beryllium, including the impact of beryllium exposure on animals and freshwater organisms. Brush Wellman's current research work is focused on understanding and preventing chronic beryllium-disease—an obstructive lung disease caused by inhalation of beryllium. Much of this cutting-edge research is being conducted in close collaboration with NIOSH. Two Brush Wellman employees along with a colleague from NIOSH were awarded the 2002 Alice Hamilton Award from NIOSH for their efforts to identify an appropriate measure for assessing potential risk of chronic beryllium disease in workers. Their award-winning paper is published in the May 2001 edition of *Applied Occupational and Environmental Hygiene*.

Brush Wellman's research efforts are a testament to its belief that standards for exposure to beryllium should be protective of human health and environment. However, being heavily engaged in such research, Brush Wellman is sensitive to the adverse consequences of risk-based standards that are set well below levels necessary for such protection. Brush Wellman believes that the current drinking water standards and reference dose for beryllium fall into this category.

[6] Kreiss K., Mroz M.M., Newman L.S., et al. Machining Risk of Beryllium Disease and Sensitization with Median Exposures Below 2 $\mu g/m^3$. Am J Ind Med 30: 16–25 (1996).

[7] Eisenbud M., Berghout C.F., Steadman L.T. Non-Occupational Berylliosis. J Ind Hyg Toxicol 31:282–294 (1949).

[8] American Conference of Governmental Industrial Hygienists. Biological Exposure Index Feasibility Assessment for Beryllium and Inorganic Compounds (2002).

[9] Deubner D., Goodman M, Iannuzzi J. Variability, Predictive Value, and Uses of the Beryllium Blood Lymphocyte Proliferation Test (BLPT): Preliminary Analysis of the Ongoing Workforce Survey. Appl Occup Environ Hyg 16(5): 521-526 (2001).

[10] Kolanz, M. Introduction to Beryllium: Uses, Regulatory History, and Disease. Appl Occup Environ Hyg 16(5) 559-567 (2001).

The USACE should use in its calculations the established community exposure limit that has been shown to be effective over several decades in preventing chronic beryllium disease in the general population (the current exposure limit is lower than the IRIS value). The United States ambient air standard for beryllium was originally recommended by Eisenbud of the Atomic Energy Commission in 1949 and it has been a federally enforceable United States Environmental Protection Agency (USEPA) regulation since 1973. Brush Wellman is aware of no cases of clinical CBD due to air pollution attributable to exposures after about 1960. The current ambient air standard for beryllium is 0.01 $\mu g/m^3$ as a 30-day average and incorporates a 20-fold safety factor[11].

The Eisenbud study also noted that the Lorain study population was exposed to levels of beryllium well above the current standard which had been set using safety factors. For example, in 1948 the levels of airborne beryllium within one-quarter mile of the Lorain plant averaged about 1 $\mu g/m^3$ and in some instances exceeded 2 $\mu g/m^3$. Eisenbud estimated that ambient air levels of beryllium during the 10 years preceding 1948 were determined to likely be no more than 8 times higher than the 1948 levels.

It is also important to note that the 0.01 $\mu g/m^3$ ambient air standard incorporated data which accounted for child health risks. A x-ray health survey was conducted in 1948 in the neighborhood surrounding a beryllium manufacturing facility in Lorain, Ohio. Approximately 10,000 persons were surveyed (20% of the population in the survey area). Nine thousand satisfactory films were obtained. Of those films, 2000 were of children. The report of this study was designed to detect clinical CBD, the appropriate health end-point. The study did not identify any cases of clinical CBD among the children x-rayed in the survey.

In Appendix 3A section 3A.2.1.3 and elsewhere the USACE chooses to use a conservative Risk Based Concentration based on the child receptor (as representing the sensitive subgroup) and the *"uncertainties surrounding the beryllium sensitization process"*. The USACE claim that the *"uncertainties surrounding the beryllium sensitization process"* as justification for a more conservative Risk Based Concentration is unfounded based on the above comments that sensitization is not a health effect.

The USACE should reevaluate the beryllium inhalation non-cancer risk factors based on the scientific facts that:

1. children were accounted for in actual studies of community health risk due to beryllium exposure.

2. sensitization is not a health effect and can occur normally in occupationally unexposed persons.

[11] Eisenbud,M.: The Standard for Control of Chronic Beryllium Disease. Appl Occup Environ Hyg 13(1):25–31 (1998).

V. The Estimated Volume Of Soil Should Be Reduced.

The volume and costs for remediating the soil, Alternative 5, appear excessive as demonstrated by the following:

1. There appears to be too much factoring in the volume estimation. The volume of soil that needs to be excavated increased dramatically when estimated for disposal. Table 3.4 (Estimated Volume of Impacted Soils - Unrestricted Land Use) of the Feasibility Study shows a modeled volume of 42,200 cu.yd. After adding several factors, the ex-situ volume amounted to 87,754 cu.yd. Table 3.5 (Estimated Volume of Impacted Soils – Industrial Land Use) shows a modeled volume of 8,540 cu.yd. and an ex-situ volume of about six times to 47,599 cu.yd. Since modeling is typically conservative to start with, the safety factors that caused the volume to dramatically increase, appear to have been overly utilized.

2. The remediation cost appears to be excessive. This is demonstrated in the appendix to the Feasibility Study, Alternative 5 (Excavation and Offsite Disposal-Unrestricted Land Use), pages 3 and 4 of 14. The two pages show escalation costs for overhead, design and technical support, project management, construction management and owner costs. According to the report, the owner cost (presumably USACE's) includes program management, project management, construction management, etc., with a cost of $1 million per year for 5 years. Table 6.1 (Estimated Completion Time Frames for Alternatives) of the Feasibility Study report breaks down the activities for the "owner cost" over the 5-year period as follows: Remedial design for 1 year, Remedial Action for 2.9 years and Post Remedial Action for 1 year. Realistically, there cannot be a construction management during the design period. Likewise, ownership costs from the Remedial Action should be different than for Post Remediation Action. Furthermore, the USACE people assigned to this project cannot be 100% tied to the project due to the natural slack in the activities (and should be working on other FUSRAP projects). Thus, uniformly distributing a $1 million expense each year for 5 years appears excessive in light of the above factors and Brush Wellman's remediation experience.

3. While it may be necessary to calculate "budget" estimates for the various remedial scenarios presented, the cost for the actual proposed method should be based on bid proposals to make it realistic.

VI. The Buildings And The Area Beneath The Buildings Should Be Included In The Remediation.

The USACE decision to exclude the existing buildings based on the CERCLA guidance which excludes *"…any release which results in exposure to persons solely within a workplace"* does not appear to be a decision which supports the protection of the current building occupants from potential health risk to the current building occupants.

In addition, the exclusion of the existing buildings from remediation does not appear consistent with the proposed clean-up level to a subsistence farmer, nor does it support the prevention of recontamination of the remediated areas from AEC materials of concern currently

inside the existing buildings. The presence of AEC materials of concern in and beneath existing buildings as it relates to the future use by a subsistence farmer should be more thoroughly addressed by the USACE proposed plan.

Brush Wellman offers the following in support of its above comments.

The Proposed Plan states on page 1-2, that *"After evaluating the results of the Remedial Investigation for the on-site buildings, USACE has concluded there is no evidence of a release from the buildings, as defined by CERCLA, nor evidence of a substantial threat of a release of hazardous substances into the environment from the buildings."* The following appear to contradict this statement.

1. On page 4-32 of the Remedial Investigation report, Section 4.3.7 (Summary Discussion), the first bullet states that *"The direct radiation reading data clearly shows that there are several areas within the Annex and two isolated locations in the Production Building that have activity above NRC guidelines for release to the public."*

2. The second bullet states that "Beryllium swipes show significant contamination in the Annex, Production Building, Former Laboratory, and Maintenance Building."

3. The fourth bullet states that "The building materials samples indicate that there is significant concentrations of beryllium in the paint, brick, concrete and other materials in the structure of the buildings."

> Note: Brush Wellman agrees that the wipe or bulk settled dust samples from inside the buildings may contain residual beryllium from the AEC activities, and that there is no health based standard upon which to compare the beryllium surface sample results or settled dust results obtained by USACE .

USACE should investigate whether current occupants of the buildings have programs and procedures in place to deal with the potential health hazards of the AEC-materials currently in the buildings. It is not prudent to leave these materials unremediated just because the CERCLA requirement excludes them. The CERCLA requirement should be used as guidance and the government's responsibility to the people should be paramount.

If the buildings will be left "as is," then the site should certainly be remediated to an industrial land use clean-up level. If the site is to be remediated to unrestricted land use, then the current operations should be terminated, the buildings razed and all past and current waste management units (WMUs) remediated to unrestricted land use in conjunction with the USACE cleanup to prevent worker exposure and further site contamination. However, remediating to unrestricted land use really does not make sense in light of the long-term current zoning of this property and zoning and use of surrounding properties.

In addition, the CERCLA exclusion guidance seems to infer that once the buildings are abandoned, USACE will be coming back to remediate the buildings. It would appear less costly to address the building issues in conjunction with the soil issues.

Additional Comments

Following are additional comments indirectly related to the selection of the appropriate remediation plan.

I. The Proposed Plan incorrectly states that the Brush Beryllium Company "leased" the Luckey site (p. 2-2).

Brush Beryllium was at the Luckey site as a contractor to the United States Atomic Energy Commission (AEC) and not as a lessee, as noted in the contract between these two entities. As a contractor, Brush Beryllium operated and maintained the plant and later prepared the plant for closing, all at the direction of the AEC pursuant to the contract.

II. The Protectiveness, Implementability and Acceptability of Alternative Are Ranked Too Low.

Alternative 4 requires excavation of soils to industrial land use and off-site disposal. Under Alternative 4, an estimated 30.050 cubic yards of in-situ soil would be removed from the site at a cost of $29.3 million. Alternative 4 is most comparable to Alternative 5, which would remove 55,400 cubic yards of in-situ soil at a cost of $36.5 million. The main differences in the soil to be removed in these two alternatives are that (1) no off-site soil would be removed under Alternative 4 and (2) soil would be removed to a greater depth in the Lagoon C and disposal areas under Alternative 5 than under Alternative 4. Despite their comparability in terms of soil remvoval, the Acceptability of Alternative 4 is ranked as "Low/Medium," whereas the Acceptablity of Alternative 5 is ranked as "High." Perhaps this difference is because Alternative 4 does not contemplate soil excavation in the off site area. In any event, removal of off-site soils to a level protective of farming use would be an appropriate modification for Alternative 4, as the off-site area is not an industrial area. If this modification were made there would be very little difference between Alternatives 4 and 5 with respect to their Protectiveness, Implementability and Acceptabilty. Even without this modification, Alternative 4 should be ranked more closely to Alternative 5 in terms of Acceptablity than to the No Action Alternative, as was done in the Feasibilty Study. See FS Table 6.3. In contrast, the Feasibility Study ranks Alternative 4 as virtually the same as Alternative 3, an excavate and cap remedy with no soil removal.

III. The Protectiveness And Acceptability Of Alternative 7 Are Ranked Too Low.

The Proposed Plan has inaccurately categorized the protectiveness of Alternative 7 as Low/Medium and consequently has unfairly concluded that the acceptability of this alternative is low. There is no significant difference between the protectiveness of Alternative 7 and that of Alternatives 8 and 9, whose protectiveness is ranked as "High." The principal way of addressing groundwater contamination will be via soil excavation,

which is common to Alternatives 7, 8 and 9. The time required to complete these three remedial alternatives are somewhat rough estimates, and there is substantial overlap in these estimates:

Alternative 7 — 40 to 150 years
Alternative 8 — 80 years
Alternative 9 — 40 years

Furthermore, time is not a critical element in the remedy selection because as noted by the Proposed Plan: *"Currently there is not unacceptable exposure to groundwater."* (p. 8-13). All three alternatives reduce groundwater concentration below the MCL (which as noted above is highly conservative). Hence, there are no differences in the protectiveness of these alternatives that would justify labeling Alternative 7 as "Low/Medium" and Alternatives 8 and 9 as "High." Properly described and understood, there would be no significant difference in the acceptability of these alternatives. Hence, the Proposed Plan is erroneous in placing acceptability of these alternatives at opposite ends of the spectrum.

IV. There is conflicting information provided in the reports:

For example, page 2-10, first full paragraph of the Feasibility Study report states that *"Although building decontamination plans are documented, no subsequent documentation was found to indicate AEC actually implemented decontamination."* However, page 2-5 of the Remedial Investigation report states that *"Buildings were decontaminated by dismantling equipment, disposing of equipment as surplus, and steam-cleaning the building interiors."* While documents may no longer exist containing sampling data as to the level of decontamination achieved, there is no question that "AEC actually implemented decontamination."

Also, the existence of numerous conflicting statements in the reports would indicate a lack of peer review (outside of USACE and SAIC) prior to finalizing the reports and making them available to the public.

V. Beryllium Exposure via Inhalation and Potential Cancer Risks

The USACE did not find significant inhalation cancer risk as part of its Remedial Investigation. However, in any future assessment, the USACE should reconsider its calculations to evaluate cancer risk from beryllium exposure via inhalation.

The American Conference of Governmental Industrial Hygienists (ACGIH) and the International Agency for Research on Cancer (IARC) currently classify beryllium as a human carcinogen. However, these organizations were unable to consider the evidence presented in the scientific paper written by Paul S. Levy and his colleagues entitled,

"Beryllium and Lung Cancer: A Reanalysis of the NIOSH Cohort Mortality Study"[12]. The paper, which was officially released in the November 2002 edition of Inhalation Toxicology, reanalyzes the data and conclusions of the 1992 study by Ward[13] and her colleagues which was used to substantiate a causal relationship between beryllium exposure and lung cancer. The 1992 Ward study itself was not definitive in its conclusion regarding beryllium exposure stating only that:

"occupational exposure to beryllium compounds is the most plausible explanation for the increased risk of lung cancer observed in the study."

Levy reevaluated the Ward data using more sophisticated methods to adjust for smoking, calculate appropriate expected lung cancer rates, and perform meta-analysis on the data. Levy concludes that

"there is no statistical association between beryllium exposure in these workers and lung cancer when using the most appropriate population cancer rates."

Notwithstanding the new findings of Levy, both IARC and the ACGIH had both recognized that any association which may exist between beryllium and cancer exists only at the extremely high levels of exposure which existed in the 1940s. IARC states:

"the greater excess was in workers hired before 1950 when exposures to beryllium in the work place were relatively uncontrolled and much higher than in subsequent decades," and "the highest risk for lung cancer being observed among individuals diagnosed with acute beryllium-induced pneumonitis, who represent a group that had the most intense exposure to beryllium."

IARC further noted that:

"Prior to 1950, exposure to beryllium in working environments was usually very high, and concentrations exceeding 1 mg/m^3 [1000 micrograms per cubic meter] were not unusual."

The ACGIH has made a similar statement.

There is no scientific basis to conclude that very low concentrations can result in cancer. In fact, both the Ward and the Levy study found no cancer risk in the five "modern plants" which first started operations after 1950. Inhalation exposures in these "modern plants" were typically 10 to 100 times lower than that experienced in the two oldest

[12] Levy P., Roth H., Hwang P., Powers T. Beryllium and Lung Cancer: A Reanalysis of a NIOSH Cohort Mortality Study. Inhalation Toxicology 14: 1003-1015 (2002).

[13] Ward, E., et al. A Mortality Study of Workers at Seven Beryllium Processing Plants. Am J Ind Med 22: 885-904 (1992).

plants. However, beryllium concentration in air exposures were still experienced above the current Occupational Exposure Limit of 2 micrograms per cubic meter in these "modern plants", especially in the 1950s and 1960s.

In summary, the most recent analysis of the available beryllium data finds an absence of an association between beryllium and cancer. Also, all agencies reviewing the carcinogenicity of beryllium had previously found that any link to cancer exists only at the very high occupational exposures which typically have not been seen for over 50 years. The extensive reviews of beryllium carcinogenicity over the years make it very evident that the high beryllium exposures which could be linked to cancer have not and do not occur to the general public.

Based on these scientific findings, the USACE should revisit the basis for it calculations involving cancer inhalation risks.

VI. Beryllium Exposure via Ingestion and Potential Cancer Risks

There have been several oral feeding studies using beryllium compounds. None of the studies have resulted in the formation of cancerous tumors beyond those found in the control populations. There are no scientific studies implicating beryllium as an oral cancer hazard. There is no scientific basis for the USACE to estimate beryllium cancer risks as a result of ingestion. All such calculations used in the estimates for potential cancer risks are unfounded and should be removed.

VII. The USACE assumption that beryllium uptake via food poses a health risk is ill founded.

The USACE's assumption that beryllium uptake through growing of food is founded on the supposition that the mere presence of beryllium in food poses a health risk. The USACE itself identified the fact that beryllium present in soils is expected to chemically bind to soils. The chemical binding of the beryllium would seek a neutral state (i.e. less corrosive). Based on the previous discussion of the potential health risk of beryllium in soil, the chemical form of the beryllium in a plant could not pose the corrosive characteristics evident in the dog feeding studies. On this basis alone, the USACE should remove its estimated risk of beryllium exposure via foods due to the absence of scientific evidence that beryllium in food poses a health risk. In fact, the below table demonstrates that beryllium is naturally found in food stuffs throughout the world.

FOODSTUFF (dry weight)	MICROGRAMS PER KILOGRAM (ppb)
CABBAGE	0.24
MUSHROOMS	1.58
CRABS	15.4 - 26.2
OYSTER FLESH	2.00
POLISHED RICE	80
POTATOES	170
TOMATOES	240
HEAD LETTUCE	330
EGGPLANT	370
GREEN PEPPER	400
KIDNEY BEANS	2,500
RAW CARROTS	25
FIELD CORN	25

Source: ATSDR, Toxicological Profile for Beryllium 2002

VIII. USACE's use of a Bulk Dust Preliminary Remediation Goal (PRG) is scientifically unsupportable.

The USACE creation of a Bulk Dust PRG on page 3-44 of the Remedial Investigation is scientifically unsupportable. The USACE's attempt at deriving a concentration of beryllium in settled dust which equates to a inhalation risk is unscientific. Though the calculation invented by USACE for this purpose shows some real imagination, there is no science that supports the estimation of airborne beryllium concentrations from settled dust concentrations. In addition, the calculation used is so erroneous that the units used do not even cancel properly as a mathematical computation.

The idea of inventing such a correlation has been explored for years, however, no one has been successful at developing an approach which is scientifically viable. This is the

reason the USACE did not find a formal standard for bulk dust. The primary variables which make such a computation impossible include particle size, shape and density along with air currents (or absence thereof). These variables affect particle settling rates thereby affecting concentration. In addition, the amount of dust which becomes airborne along with room volume are critical factors to possibly estimating an airborne concentration even if settling rate was not a consideration. For example, the USACE's "safe concentration" for beryllium is 20 mg/kg or 20 ppm. Assume one could disperse and hold in the air for eight hours one kilogram of beryllium-containing dust containing 20 mg Be/kg of dust in a room 10x10x3 meters. If this is possible, the airborne concentration of beryllium would be 66.7 micrograms beryllium per cubic meter or 33 times the current OSHA standard (330 times the proposed ACGIH limit). Therefore, whether 20 mg/kg is a "safe concentration" is highly dependent on the uncontrolled variables of room volume and dust quantity.

The USACE needs to abandon its use of a Bulk Dust PRG as scientifically unsupportable.