FEASIBILITY STUDY WORK PLAN
for the
NIAGARA FALLS STORAGE SITE

FINAL

Prepared for:
U.S. Army Corps of Engineers
Buffalo District

***Prepared by*:**
Science Applications International Corporation
Dublin, Ohio

Contract: W912QR-08-D-0008

December 2009

This page intentionally left blank.

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

ABBREVIATIONS AND ACRONYMS

AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
ANL	Argonne National Lab
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BNI	Bechtel National, Inc.
BOP	Balance of Plant
BRA	Baseline Risk Assessment
C&D	Construction and Development
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
Ci	Curie
cm	centimeter
COC	Contaminant of Concern
COPC	Chemical of Potential Concern
DOD	Department of Defense
DOE	Department of Energy
EA	EA Engineering, Science, Technology
EIS	Environmental Impact Statement
EM-CX	Environmental and Munitions Center of Expertise
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
EU	Exposure Unit
FAQ	Frequently Asked Question
FS	Feasibility Study
FUSRAP	Formerly Utilized Sites Remedial Action Program
HGL	HydroGeoLogic Inc.
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Headquarters
IEUBK	Integrated Exposure Uptake Biokinetic Model
ILCR	Incremental Lifetime Cancer Risk
ITR	Independent Technical Review
IWCS	Interim Waste Containment Structure
KAPL	Knolls Atomic Power Laboratory
K_d	Distribution Coefficient
L	liter
L/kg	liter per kilogram
LOOW	Lake Ontario Ordnance Works
LRD	Great Lakes and Ohio River Division
LTP	License Termination Plan
LWBZ	Lower Water-Bearing Zone
m	meter
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MED	Manhattan Engineer District
mg/kg	milligrams per kilogram

ABBREVIATIONS AND ACRONYMS (cont.)

mrem/yr	millirems per year
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NFSS	Niagara Falls Storage Site
NPDWR	National Primary Drinking Water Regulations
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
pCi/g	picocuries per gram
PDT	Project Delivery Team
PP	Proposed Plan
ppb	parts per billion
PRG	Preliminary Remediation Goal
QCP	Quality Control Plan
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROD	Record of Decision
ROPC	Radionuclide of Potential Concern
SDWA	Safe Drinking Water Act
SESOIL	Seasonal Soil Compartment
SLERA	Screening-Level Ecological Risk Assessment
SOW	Scope of Work
SRC	Site-Related Constituent
SVOC	Semi-Volatile Organic Compound
TBC	To Be Considered
TCE	Trichloroethene
TEDE	Total Effective Dose Equivalent
TNT	Trinitrotoluene
TPP	Technical Project Planning
TSCA	Toxic Substance Control Act
UMTRCA	Uranium Mill Tailings Radiation Control Act
U.S.	United States
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
UTL	Upper Tolerance Limit
UWBZ	Upper Water-Bearing Zone
VOC	Volatile Organic Compound
WCS	Waste Control Specialists
WOE	Weight-of-Evidence
WWII	World War II
yd^3	cubic yards

GLOSSARY

ACTIVITY - A measure of the rate at which radioactive material is undergoing radioactive decay; usually given in terms of the number of nuclear disintegrations occurring in a given quantity of material over a unit of time. The special unit of activity is the curie (Ci).

AQUIFER - A water-bearing layer of permeable rock or soil that will yield water in usable quantities to wells. Confined aquifers are bounded on top and bottom by less-permeable materials. Unconfined aquifers are bounded on top by a water table.

BACKGROUND CONCENTRATION (soil, groundwater, surface water, or sediment) – A background concentration is a concentration that occurs in an area that is not impacted by site activities and contains characteristics similar to site conditions. Background concentrations for both chemical and radiological constituents were used in the identification of SRCs presented in this RI and in the evaluation of human health risk presented in the BRA. The determination of background concentrations involved the establishment of a background data set for each medium and the calculation of a background value for each analyte within each medium. The background concentration is often expressed using an upper tolerance limit (UTL) that is statistically derived from the background data set.

BACKGROUND RADIATION - In this RI, background radiation includes both the natural and man-made (e.g., fallout) radiation in the human environment. It includes cosmic rays and radiation from the naturally radioactive elements that occur both outside and inside the bodies of humans and animals. For persons living in the United States, the individual dose from background radiation ranges from about 80 to 200 millirems per year**.**

BASELINE RISK ASSESSMENT (BRA) - The BRA evaluates current and potential future risks to human health and the environment from site contamination. It is a decision-making tool for use in determining the need for further investigation or site cleanup based upon present site conditions.

BEDROCK - A solid rock formation usually underlying one or more other loose formations.

BENCHMARK DOSE - A method used to develop allowable residual contaminant levels for post-remedial radioactivity. For soil, allowable residual contaminant levels are averaged over 100 m^2, and if more than one residual radionuclide is present in a 100 m^2 area, the sum-of-the-ratios methodology is applied.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA) - CERCLA was put into place in 1980. It is also known as Superfund. This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites.

CONTAINMENT - Confining the radioactive wastes within prescribed boundaries, e.g., within a waste containment structure.

CONTAMINANT OF CONCERN (COC) – A chemical or radiological parameter that has been identified as posing unacceptable risk to human health and the environment.

CHEMICAL OF POTENTIAL CONCERN (COPC) - SRCs exceeding PRGs, evaluated quantitatively in the BRA.

CURIE (Ci) - A measure of the rate of radioactive decay. One curie is equal to 37 billion disintegrations per second (3.7×10^{10} dis/s), which is approximately equal to the decay of one gram of radium.

CUTOFF WALL - A low-permeability, engineered subsurface structure designed to minimize groundwater flow in a direction perpendicular to the wall.

DISTRIBUTION COEFFICIENT (K_d) - The ratio of concentrations of a compound in the two phases of a mixture at equilibrium. Distribution coefficients are used as an indication of how easily a compound might be taken up in groundwater to model the migration of dissolved hydrophobic organic compounds in soil and groundwater.

DOSE - Total radiation delivered to a specific part of the body, or to the body as a whole.

EXPOSURE UNIT (EU) - A geographic area in which a receptor is assumed to work or live, and where a receptor may be exposed to SRCs detected during the RI.

FEASIBILITY STUDY (FS) – An FS develops, screens, and compares remedial alternatives for a site. The FS incorporates conclusions from the RI, BRA, and groundwater flow and transport modeling.

GROUNDWATER - Usually considered to be the water within the zone of saturation below the soil surface.

GROUNDWATER FLOW AND TRANSPORT MODEL – A groundwater flow and transport model simulates the flow of groundwater and the movement of dissolved constituents present in an aquifer system.

GA GROUNDWATER CLASSIFICATION – Best usage: Existing or potential source of drinking water supply for humans. Chloride concentrations are equal to or less than 250 mg/l. Considered suitable for drinking in its natural state, but may require treatment to improve quality related to natural conditions.

GSA GROUNDWATER CLASSIFICATION – Best usage: Existing or potential source of water supply for potable mineral water and conversion to fresh waters. Chloride concentrations due to natural conditions are in excess of 250 mg/l, but may be considered suitable for use as potable water after treatment to reduce concentrations of naturally occurring substances.

GSB GROUNDWATER CLASSIFICATION – Best usage: As a receiving water for disposal of wastes. Saline groundwater that has a chloride concentration in excess of 1,000 milligrams per liter or a total dissolved solids concentration in excess of 2,000 milligrams per liter.

HYDRAULIC CONDUCTIVITY - The quantity of water that will flow through a unit cross-sectional area of porous material per unit of time under a hydraulic gradient of 100 at a specific temperature.

LEACH - To remove or separate soluble components from a solid by contact with water or other liquids.

PERMEABILITY - The relative ease with which a porous medium can transmit a liquid under a hydraulic gradient. In hydrology, the capacity of rock, soil, or sediment for allowing the passage of water.

PLUME - A line or column of water containing chemicals moving from the source to areas further away.

RADIONUCLIDE - An unstable nuclide that undergoes radioactive decay.

RADIONUCLIDE OF POTENTIAL CONCERN (ROPC) - SRCs exceeding radiological screening levels, evaluated quantitatively in the BRA.

RADIATION - A very general term that covers many forms of particles and energy, from sunlight and radio waves to the energy that is released from inside an atom. Radiation can be in the form of electromagnetic waves (gamma rays, X-rays) or particles (alpha p articles, beta particles, protons, neutrons).

RADIOISOTOPE - An unstable isotope of an element that spontaneously loses particles and energy through radioactive decay.

RADIUM-226 - A radioactive solid produced by the decay of thorium-230. It is an alpha emitter and is hazardous when it gets into the body. Radium-226 has a half-life of 1,600 years and can accumulate in certain parts of the body such as bone.

RADON-222 - A radioactive gas produced by the decay of radium-226. It is hazardous mainly because its solid decay products can be deposited in the lungs where they decay in a matter of minutes, emitting alpha radiation that irradiates nearby tissue. Radon-222 has a half-life of 3.8 days.

REMEDIAL INVESTIGATION (RI) – An RI is a site investigation consisting of a records search, environmental sampling, risk assessment, and groundwater flow modeling to define the identity, amount, and location of contaminants at a site.

RESIDUES - For the NFSS, the K-65, L-30/F-32, and L-50 residues that resulted from the processing of uranium ores.

RISK DRIVER - Contaminants identified by a risk assessment as being those that may actually pose unacceptable human or ecological risks. Risk drivers typically drive the need for a remedial action.

RUNOFF - All rainfall and snowmelt that does not soak into the ground, does not evaporate immediately, or is not used by vegetation, and hence flows over the land surface.

SCREENING LEVEL - A contaminant concentration level, calculated using standard default exposure assumptions for a single environmental medium. Screening levels correspond to a target risk level or hazard coefficient and are typically used to screen chemicals during baseline risk assessments.

SITE-RELATED CONSTITUENT (SRC) - Chemicals or radionuclides that were present in a given medium and EU at concentrations statistically greater than the corresponding background concentrations. SRCs were determined for soil (0 to 10 feet bgs), surface soil (0 to 0.5 feet bgs), sediments, surface water, groundwater, pipeline/utility sediments, and pipeline/utility water.

SOURCE TERM - The quantity of radioactive material (or other pollutant) released to the environment at its point of release (source).

SUBSISTENCE FARMER - A highly conservative exposure scenario based on a farm family that spends a majority of their time at home producing most of what they eat and drink including potable water, produce, milk, beef, poultry and wild game meat. Cleanup levels calculated for a resident farmer exposure scenario allow for unrestricted future use of a site.

THORIUM-230 - A radioactive solid produced by the decay of uranium-238. Thorium-230 has a half-life of 77,000 years.

TILL - Glacial deposits consisting of clay, sand, gravel, and boulders which are intermingled and not arraigned in strata.

URANIUM - A naturally occurring radioactive element that consists of 99.2830% by weight uranium-238, 0.7110% uranium-235, and 0.0054% uranium-234.

VICINITY PROPERTY - Vicinity properties are those properties that were designated by DOE as eligible properties in the FUSRAP and located within the boundaries of the former LOOW but outside the boundaries of what is now the NFSS. Vicinity properties include B, C', D, F, G, N/N' North, P, T, W, E and E'.

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

A multi-phase remedial investigation (RI) was conducted at the federally-owned Niagara Falls Storage Site (NFSS) located at 1397 Pletcher Road in the township of Lewiston, Niagara County, New York. The results were released in the *Remedial Investigation Report for the Niagara Falls Storage Site* (USACE 2007a). The 191-acre parcel is part of the former Lake Ontario Ordnance Works (LOOW) that was used by the War Department beginning in 1942 for the production of trinitrotoluene (TNT). In 1944, the Manhattan Engineer District (MED) began using the site for storage of radioactive residues that resulted from the processing of uranium ores during the development of the atomic bomb. The MED and its successor agencies continued to periodically ship radioactive residues and materials to the NFSS for storage through the early 1950's.

Environmental investigation, and operation and maintenance activities at the NFSS are managed by the United States Army Corps of Engineers (USACE), Buffalo District, under the Formerly Utilized Sites Remedial Action Program (FUSRAP). The Energy and Water Development Appropriations Act for Fiscal Year 2000, Public Law 106-60, requires that USACE comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code 9601 et seq., as amended, in conducting FUSRAP cleanup work.

ES.2 PURPOSE AND OBJECTIVES

USACE is involved with the RI Phase at the NFSS and is currently addressing public comments, identifying additional data needs, conducting additional field efforts and preparing an RI Addendum. While additional efforts are being conducted to finalize the RI Phase, USACE is transitioning to the Feasibility Study (FS) Phase under CERCLA. This work plan was prepared for conducting the NFSS FS Phase in a manner that meets USACE objectives and key objectives established under CERCLA.

The key components of the objectives for the FS Work Plan are to:

- Identify future tasks needed to address site-specific conditions at the NFSS acknowledging the difficulty of how to address the IWCS considering the need to protect the public health and remediation workers,

- Gather information sufficient to support an informed risk management decision regarding remedial alternatives for each Operable Unit,

- Provide the means for public involvement during the development of the FS,

- Provide focus on high priority issues as viewed by both USACE and the Public,

- Allow for a more timely and efficient means for the project technical team to obtain concurrence on decisions regarding wastes contained in the Interim Waste Containment Structure (IWCS), and

- Allow for FS-related activities to begin, to the extent practical, prior to the completion of the RI Addendum.

ES.3 APPROACH

The initial evaluations and approach included in this FS Work Plan accomplish the objectives listed above. The two key components of the approach provided in this work plan are:

- Implementation of a phased, focused CERCLA process addressing three separate NFSS operable units (OUs) (IWCS, Balance of Plant (BOP) and Groundwater); and

- Preparation of technical memoranda at the beginning of the FS process to address technical issues that need resolution and to encourage public involvement in the development of key FS-related issues.

Focused CERCLA Process

USACE has recognized the need to implement a focused CERCLA process. Decisions made regarding the selected remedial alternative for the IWCS OU could determine the viability of alternatives proposed for the BOP OU. Similar impacts on possible Groundwater OU alternatives might occur depending on the selected remedial alternative for the BOP OU. The USACE can apply a focused FS approach to phase FS-related activities and focus initially on the IWCS OU, which is of most importance to the public and to the USACE. FS efforts would then follow for the BOP OU, and finally the Groundwater OU. USACE has defined the three OUs as follows.

<u>IWCS OU</u>

The IWCS OU is defined as waste material (i.e., residues and other remedial action waste) that the Department of Energy (DOE) placed in the disposal cell within the diked area. The scope for the IWCS OU involves development of remedial alternatives for addressing the residues and other waste material only. If all of the waste materials in the IWCS are removed, then the remaining IWCS structure (e.g., remaining cap material, the dike, cut-off walls, residual soil that had waste placed on them, etc.) would be addressed within the scope of the BOP OU, as described below. For any alternatives that involve leaving any waste materials in the IWCS, the FS would have to demonstrate that the alternative is protective of human health and the environment, including surface waters and the groundwater system beneath the IWCS.

<u>BOP OU</u>

The BOP OU is defined as all material not included in the IWCS OU, excluding groundwater. BOP material will include any remaining former building structures within the IWCS, remaining cap material and other soils within the IWCS, the IWCS dike, surface and subsurface soils across the rest of the site, surface water, sediment, railroad ballast, roads, Building 401, and pipelines, etc. Additionally, only structures that need to be removed to obtain access to underlying contamination will be included in the BOP OU. For example, tank cradles may not be removed if they show no risk to human health and the environment from site contaminants, and their removal is otherwise deemed unnecessary. The remaining IWCS structures, subsurface soils and dike are only addressed in BOP alternatives if all of the residues and wastes placed in the IWCS are removed. The impacts, if any, of the BOP OU alternatives on groundwater and surface water will be addressed in the alternative evaluations for the BOP OU.

Groundwater OU

The Groundwater OU is defined as groundwater remaining in both the upper water-bearing zone (UWBZ) and the lower water-bearing zone (LWBZ) after implementation of the selected remedial actions for the IWCS and BOP OUs. As only the UWBZ has been impacted by site contaminants, groundwater contamination may be ultimately addressed by remediation of soils (e.g. by controlling/removing the sources of contaminant migration).

Technical Memoranda

USACE has decided to make use of technical memoranda to address technical issues associated with each of the three OUs discussed above. The results of the technical memoranda will be integrated into the OU FS Reports. This approach allows for:

- Public involvement on key FS-related issues during development of the OU FS Reports, and

- Initiation of FS-related activities while efforts associated with the RI Phase are being completed and finalized.

Public involvement will be initiated through issuance of a fact sheet announcing the development of a specific technical memorandum. The fact sheet will also define the objectives of the technical memorandum and request public input on those objectives. A second fact sheet will be issued to announce the public release of the completed technical memorandum. The fact sheet will also summarize the conclusions of the technical memorandum. At that time, the public will be able to review the technical memorandum and provide comments to USACE. USACE will respond to public comments on each technical memorandum via the public web site for NFSS.

Public comments on the technical memoranda will be considered throughout the technical memoranda development process; and therefore, during the development of the FS Report. Planned technical memoranda include:

IWCS OU TECHNICAL MEMORANDA

1. Radon Assessment
2. IWCS Radiological Exposure Assessment
3. Waste Disposal Options and Fernald Lessons Learned
4. RAOs and ARARs for both the IWCS OU and BOP OU.
5. Alternatives Development and Screening of Technologies

BOP OU TECHNICAL MEMORANDA

1. Land Use Assessment and Groundwater Evaluation
2. Establishment of Radiological and Chemical Cleanup Criteria and Evaluation of Residual Results
3. Alternatives Development and Screening of Technologies
4. Volume Modeling and Results

GROUNDWATER OU TECHNICAL MEMORANDA

1. RAOs and ARARs
2. Establishment of Radiological and Chemical Cleanup Criteria and Evaluation of Residual Results
3. Groundwater Flow and Transport Model Update (Optional)
4. Alternatives Development and Screening of Technologies

1.0 INTRODUCTION

1.1 PURPOSE AND BACKGROUND

The purpose of this work plan is to define a path for the study of the feasibility of remedial activities at the Niagara Falls Storage Site (NFSS). Specifically, the work plan will direct the evaluation and flow of information for achieving consensus on key decision issues that will form the foundation for final Feasibility Study (FS) documents. The work plan will also provide the overall management structure and general schedule for completing FS tasks.

The NFSS is located at 1397 Pletcher Road in Lewiston, NY (Figure 1-1). The site is a remnant of a larger Lake Ontario Ordnance Works (LOOW) site used by the wartime Manhattan Engineer District (MED). The NFSS contains radioactive waste of varying activity and other types of contamination resulting from activities of the MED and Atomic Energy Commission (AEC). The United States Army Corps of Engineers (USACE), as the lead federal agency for implementing the Formerly Utilized Sites Remedial Action Program (FUSRAP), is conducting a Remedial Investigation/Feasibility Study (RI/FS) pursuant to the protocols set forth in the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Completion of the FS will be in accordance with guidance set forth in Environmental Protection Agency (EPA) 540 G-89 004 *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1988).

The FS Phase under CERCLA represents a transition from site investigation activities conducted during the RI to evaluation of options for site remedial activities. The RI, conducted under USACE, began in 1999 with the objectives of defining the identity, amount, and location of chemical and radiological contaminants of concern (COCs) at the NFSS and assessing potential risks to human health & the environment. COCs are parameters that have been identified as potentially posing unacceptable risk to human health and the environment. Since the early 1980's, several investigations have been conducted at this site under Department of Energy (DOE) and predecessor agency sponsorship. RI-related activities are continuing in response to public comments on the RI which was released in 2007. Comments received on the RI were addressed in a Responsiveness Summary to be released to the public. The NFSS project technical team also identified data gaps requiring additional investigations. The additional information collected to fill the identified data gaps will be presented in an RI Addendum. The FS efforts will utilize data from the earlier investigations as well as from the RI, recent RI supplemental activities, and continued Environmental Surveillance activities.

1.2 OBJECTIVES AND SCOPE

The long-term objective of the RI/FS is to address the radiological contamination, attributed to activities of the MED/AEC, in a manner that satisfies CERCLA as set forth in the 1988 guidance document EPA 540 G-89 004, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA 1988). The RI/FS addresses properties associated with the NFSS, including the Interim Waste Containment Structure (IWCS), the National Grid electrical utility right-of-way located west of the NFSS property, and all radiological and chemical contamination in soil, surface water, groundwater and sediment on these properties.

The objective of the FS is to evaluate the feasibility of remedial activities at the NFSS. Detailed information provided in this study will allow for the development of a Proposed Plan (PP) and a Record of Decision (ROD), in which a preferred alternative is chosen. USACE is responsible for ensuring that the FS meets CERCLA criteria, followed by implementation of the PP and development of the ROD.

The USACE has recently issued the Remedial Investigation Report (RIR) (USACE 2007a), the Baseline Risk Assessment (BRA) (USACE 2007b), and the Groundwater Flow and Transport Modeling Report (USACE 2007c) as part of the CERCLA process. Although additional RI-related activities continue in response to public comments on the RI, the USACE is now proceeding with the FS Phase under CERCLA. This work plan, which has been developed to establish a framework and a path forward for implementation of the FS, aims to do the following:

- define key FS elements and tasks,
- provide an approach and rationale for completion of FS tasks,
- develop a schedule and hierarchy of FS tasks,
- provide a means for reaching timely consensus on key FS issues,
- establish a means for public input on FS issues and explain the formats to be used for response to the public,
- establish review cycles for FS documents and identify reviewers,
- introduce the USACE project management team and key contractor personnel, and
- explain available funding and cost assumptions for completion of the FS Report.

1.3 REPORT ORGANIZATION AND CONTENT

The following text represents a brief overview of the contents and layout of this work plan.

Section 1.0 Discusses the purpose of the FS Work Plan and the overall objectives and scope of the FS as related to the history of the site and the CERCLA process.

Section 2.0 Presents a brief site description as well as a brief summary of the site history as previously presented in the RIR (USACE 2007a).

Section 3.0 Presents a brief summary of FS elements as currently understood and that will be used and further developed during the progression of FS tasks defined in this plan. The following information is presented and discussed:

- Types and volumes of waste present within the IWCS,
- Results of the RI, BRA, and groundwater flow and transport modeling,
- Potential pathways of contaminant migration,

- Preliminary identification of operable units,
- Preliminary identification of remedial action objectives and remedial action alternatives, and
- Potential Applicable or Relevant and Appropriate Requirements (ARARs).

Section 4.0 Explains the approach and rationale used in the work plan for directing FS tasks, meeting consensus on decision issues, developing technical memoranda and completing the final FS documents.

Section 5.0 Discusses tasks to be completed for the FS process, including meetings, development of technical memoranda, and FS report development.

Section 6.0 Presents cost assumptions concerning government funding for the FS process and compares expected costs to costs incurred for a similar remediation effort performed at Fernald, OH.

Section 7.0 Discusses a general schedule for completion of the FS at the NFSS.

Section 8.0 Discusses the project management structure and the quality assurance measures to be used during development of the FS documents.

Section 9.0 Explains community relation efforts to be supported by the USACE to promote public awareness and involvement in the FS process.

Section 10 Includes references cited in this work plan.

2.0 SITE BACKGROUND AND SETTING

2.1 SITE DESCRIPTION

The NFSS, a 191-acre parcel that is part of the former LOOW, was used by the War Department beginning in 1942 for the production of trinitrotoluene (TNT). In 1944, the MED began using the site for storage of radioactive residues that resulted from the processing of uranium ores during the nations early atomic weapons program. Former production facilities located on the portion of the LOOW that later became the NFSS included the acid area where nitric acid was known to have been stored; the shops area where machine shops and storage areas were located; an administrative area referred to as the Baker-Smith area; the Power Area which housed the original steam plant for the LOOW; and the Freshwater Treatment Plant which included circular clarifiers and several water storage reservoirs.

The NFSS area, consisting of open grassy areas and forested areas, is fenced and access is limited. Several man-made ditches, installed during construction of the LOOW, drain the site to the north. A layout of the site area with exposure unit (EU) boundaries, as developed for the RIR and BRA, is shown on Figure 2-1.

The NFSS is bordered on the north and northeast by the CWM Chemical Services, LLC. hazardous waste disposal facility, on the east and south by the Modern Landfill, Inc. solid waste disposal facility, on the west by a transmission corridor owned by National Grid (formerly the Niagara Mohawk Power Corporation), and on the northwest by the village of Lewiston (the former LOOW wastewater treatment plant). All of the aforementioned properties were once part of the original LOOW. Current land use surrounding the NFSS is shown on Figure 2-2.

The surrounding regional land use consists primarily of row-crops and orchards, abandoned agricultural fields, and second-growth forests. The nearest building on the Lewiston-Porter public school property is approximately 1.5 miles northwest of the site and a public campground is approximately 0.5 miles west of the site. The nearest residences are located on Pletcher Road approximately 0.5 miles west-southwest of the site.

Drainage at the NFSS is poor because of the flat terrain and the relatively high clay content of surface soils, which significantly minimizes precipitation and surface water from passing through the soils. Much of the NFSS property has the potential to collect and hold standing water for lengthy periods. However, several ditches on site collect surface water runoff. Over most of the site, surface water is conveyed through east-west ditches that empty into the Central Ditch. The Central Ditch flows north and joins Four Mile Creek about 1.5 miles north of the NFSS. Four Mile Creek, in turn, empties into Lake Ontario. Surface water runoff from the western periphery of the site and from the Baker-Smith area in the northwest corner of the site flows to the West Ditch. The West Ditch flows north and joins the Central Ditch approximately 0.5 miles north of the NFSS.

Unconsolidated geologic units present at the NFSS consist mainly of glacial tills containing clay, silt, sand, and gravel. These unconsolidated materials are approximately 40 feet thick at the NFSS and include, in order of shallowest to deepest: surficial soils and fill, the Brown Clay Unit, the Gray Clay Unit, the Middle Silt Till Unit, the Sand and Gravel Unit, and the Red Silt Unit. The Queenston Formation forms the bedrock at the site and consists of brownish red shale, siltstone, and mudstone. The Queenston Formation is over 1,200 feet thick and is typically encountered 32 to 49 feet below ground surface (bgs) (Bechtel National, Inc. (BNI) 1994a, Acres American, Inc. 1981). A geologic column is shown in Figure 2-3.

Within 100 feet of the ground surface, there are two water-bearing zones at the NFSS and surrounding vicinity. The upper water-bearing zone (UWBZ) is present in the Brown Clay Unit. The lower water-bearing zone (LWBZ) is associated with the Queenston Formation and the unconsolidated materials immediately above the bedrock (Red Silt and Sand and Gravel Units). The Gray Clay Unit acts as an aquitard to restrict groundwater flow between the UWBZ and the LWBZ. A regional groundwater divide exists approximately two miles south of the NFSS. Regional groundwater flow north of the divide is toward the northwest, whereas groundwater flow south of the divide is toward the southwest (BNI 1982).

2.2 SITE HISTORY

This section provides a brief summary of the history of the NFSS. A more thorough description of the site history, including a description of residues stored at the site, historic operational areas, and previous investigations and remedial actions, can be found in the RIR for the NFSS (USACE 2007a).

During World War II (WWII), the War Department obtained 7,500 acres of agricultural land in northwestern New York State which became the LOOW site. A plant was constructed at the LOOW to produce TNT (EA Engineering, Science, and Technology 1998). Beginning in 1942, six TNT production lines and support facilities were built in the east-central portion of the LOOW. The LOOW produced TNT for only about eight months before production ceased at the facility at the end of July 1943.

The NFSS was created in February 1944, when the USACE's MED was granted use of a portion of the LOOW for the storage of radioactive residues generated through the processing of uranium ore (BNI 1990). The first residues to be shipped to the NFSS (L-50 and R-10 residues) were from the Linde Air Products facility in Tonawanda, New York. The MED and its successor agencies continued to periodically ship radioactive residues and materials to the NFSS for storage through the early 1950's, which included the K-65 residues from Mallinckrodt Chemical Works in St. Louis, MO. The USACE MED transferred control of the radioactive residues at the NFSS to the AEC in 1946.

An action to remove impacted soil from the NFSS and adjacent properties was conducted in 1972 under the direction of the AEC. In 1975, the AEC was dissolved and the responsibility of the site was transferred to the Energy, Research and Development Administration (ERDA). The ERDA was abolished in 1977 and the responsibility for the site was then transferred to the DOE. During 1979-1980, a radiological and geological characterization of the NFSS was conducted (Battelle 1980). Beginning in 1981, a yearly monitoring program was initiated to assess the radon emissions from the NFSS and the potential for transport of the radiological contaminants to the surface water, sediment, and groundwater. Other remedial actions were performed through the 1980's, culminating with the construction of the IWCS from 1982 to1986.

The IWCS is the dominant site feature, occupying approximately 10 acres in the southwest portion of the site. During the 1980's, the DOE consolidated radioactive wastes and contaminated materials at the NFSS into the IWCS, which was engineered to retard radon emissions, infiltration of water from precipitation, and migration of contamination to groundwater.

The cap is considered ‘interim’ because it does not include an intrusion barrier layer (typically a riprap layer at least three feet thick) and the side slopes of the structure, currently 3:1, were not constructed with a recommended slope of 5:1 to limit side slope erosion. Also, the side slopes do not have a riprap covering, which is required for a long-term cap (BNI 1994b). In September 1986, DOE issued a ROD for remedial actions at NFSS that provided for the construction of a long-term cap over the IWCS; however, regulatory agencies expressed concerns over the DOE plan for long-term management of the residues so construction of the final cap did not occur.

The IWCS currently contains approximately 240,000 yd^3 (183,000 m^3) of residues, wastes, and debris. Material stored within the IWCS contains approximately 1,982 Curies (Ci) of radium-226 and 296 Curies of thorium-230. This material also contains several uranium isotopes and other radionuclides (USACE 2007a). Figure 2-4 shows the plan view of the IWCS and residue storage locations.

In 1991, materials excavated from isolated areas of residual radioactivity and placed in temporary storage were incorporated into the IWCS (BNI 1994b). With the exception of annual monitoring and maintenance, no other activities took place at the NFSS until 1997, when the DOE transferred control of the site back to the USACE. In February of 1999, the USACE issued the first Scope of Work (SOW) directing the performance of the RI and from 1999 to 2000, characterization and removal of a portion of DOE legacy waste was completed. Since that time, the USACE has proceeded with building demolition activities, continued maintenance of the IWCS, and installation of fencing and security measures around the IWCS and the perimeter of the NFSS, including an automatic front gate and new power poles with upgraded electrical service.

The RIR was completed and released to the public in December 2007. The RI was conducted to define the identity, amount, and location of chemical and radiological COCs at the NFSS, and to provide primary data for the FS, which will be used to identify and evaluate various remedial action alternatives and assist in the development of a protective and cost-effective remedy for the site. A BRA and a groundwater flow and transport model were completed in support of RI objectives.

3.0 INITIAL EVALUATION

An initial evaluation of the NFSS RI/FS progress and results was deemed necessary for assisting the USACE in developing an overall approach for completing the FS efforts in an efficient and timely manner that would encourage public involvement during the development of the FS documents. The following sections provide the results of the initial evaluation completed by the USACE for the NFSS. This material, where appropriate, was taken from the recently completed reports for the RI (USACE 2007a), BRA (USACE 2007b) and the Groundwater Flow and Transport Modeling Report (USACE 2007c). Additional details of the RI, BRA and groundwater modeling, beyond what is presented in the following sections, can be found in these report documents.

The primary issue on the NFSS is the presence of the IWCS, its contents, and potential impacts to the public and environment in the event of a release. As such, the initial evaluation of RI/FS elements focused on key areas associated with the on-going RI efforts and was followed by a preliminary evaluation of key elements necessary for the transition to the FS Phase. The key areas on which USACE focused their initial evaluation include:

RI Effort

- The waste volumes and waste types currently present in the IWCS.
- The results of the RI, BRA, and groundwater flow and transport modeling, including a review of chemical and radiological COCs.
- The potential pathways of contaminant migration/preliminary public health and environmental impacts.

FS Phase

- The identification of Operable Units (OUs).
- The preliminary identification of remedial action objectives for the OUs.
- The preliminary identification of potential remedial alternatives for the OUs.

Review of these topics was based on the current results of the RI, BRA and groundwater flow and transport modeling. As further RI-related activities are completed in response to public comments on the RI, the USACE will evaluate the results of those efforts to determine if the conclusions presented in the following sections should be modified.

3.1 TYPES AND VOLUMES OF WASTE PRESENT WITHIN THE IWCS

From 1949 through the early 1950's, several different types of radiologically contaminated wastes and residues were shipped to the NFSS. The volumes of contaminated soil, rubble, and residues at the NFSS, shown in Table 3-1 and discussed in the following paragraphs, resulted from extensive document review. However, it is important to note that volumes given in other documents varied and that the volumes given here are conservative estimates based on this review and site knowledge. Table 3-2 is an operational time line for the NFSS. The storage locations for wastes, after the remedial actions of the 1980's, are shown on Figure 2-4. The curie inventories presented in the following descriptions are only for the isotopes measured and do not include contributions from decay products.

<u>K-65</u>

The K-65 residues currently located in the IWCS originated from the processing of Belgian Congo 'pitchblende' ores of very high uranium concentration (35-60% U_3O_8). The digestion of these high-grade uranium ores provided the feed material (uranium) required for the WWII Manhattan Project. The process used to extract uranium from the ores resulted in precipitation of radium as radium sulfate, which produced residues with high radium content. After most of the uranium had been removed, the waste stream, which consisted of residues containing uranium progeny (thorium and radium), was dubbed K-65.

Prior to 1949, residues of these processes were returned to Africa. The material was considered a "resource" due to the radium and other metals in the residue. In 1949, African Metals, Inc., the owner of the subject ore, ceased accepting the residues and it became necessary to locate storage sites in the U.S. Beginning in 1949, the NFSS was selected as a storage site based on its location near appropriate transportation routes, its situation in an area of low population density, and the availability of concrete structures for storage. Approximately 3,200 yd^3 of K-65 residues (BNI 1986a) were transported to the site in drums. Some of these were stored outdoors along existing roads and rail lines. Others were stored in Building 410. From 1950 to 1952, the K-65 residues were transferred to Building 434 (a renovated concrete water tower) in the northeast corner of the NFSS (BNI 1986b). The K-65 residues account for only about two percent, by volume, of the wastes and residues stored at the NFSS; however, they contain 1,881 Ci of radium-226 and 195 Ci of thorium-230, about 91% of the curie totals of those isotopes present in all the wastes and residues stored at the NFSS. Radium-226 and thorium-230 are the primary contributors of the radioactivity present at the site (DOE 1996). The volume of K-65 residues cited here (3,200 yd^3) differs from the volume reported in the 1986 Environmental Impact Statement (EIS) (DOE 1986; 4,000 yd^3), but is based on internal Bechtel correspondence issued after the EIS was prepared.

<u>R-10</u>

The R-10 residues resulted from the processing of ore containing approximately 3.5% U_3O_8 at the Linde Ceramics Plant, in Tonawanda, New York (Battelle 1981a). Approximately 9,400 yd^3 of these residues and an iron cake associated with the same extraction process were shipped to the site sometime between 1944 and 1949 and were stored in a pile on open ground north of Building 411. This location is referred to as the "R-10 pile" (EA 1999, BNI 1986b). The R-10 pile remained uncovered until 1964 when the pile was covered with clean fill and seeded (BNI 1994b).

Later, soil resulting from off-site cleanups was added to the R-10 pile. It was estimated that prior to the incorporation of the R-10 materials into the IWCS, the R-10 pile contained approximately 59,500 yd^3 of contaminated soils and residues. These soils and residues were estimated to contain five Ci of radium-226 and five Ci of thorium-230 (DOE 1996).

<u>L-30</u>

The L-30 residue resulted from the extraction of African pitchblende ore containing approximately ten percent U_3O_8. The ore was extracted at the Linde Ceramics Plant in Tonawanda, New York, from December 1943 to October 1944 (Battelle 1981a). The L-30 residues were transported to the NFSS in 1944 and were stored in the east and west bays of

Building 411 (Battelle 1981a, EA 1999). Approximately 7,960 yd^3 of L-30 residues, containing an estimated 87 Ci of radium-226 and 87 Ci of thorium-230, were stored in Building 411. In addition to these radiological constituents, the L-30 residues also contained 10,000 mg/kg or more of lead, barium, iron, cobalt and nickel (Battelle 1981a).

F-32
This residue resulted from the Linde Ceramics' extraction of Q-20 pitchblende ore from the Belgian Congo. Approximately 440 yd^3 of material was stored in the recarbonation pit west of Building 411 (Battelle 1981a). This residue contained approximately 0.2 Ci of radium-226 and 0.2 Ci of thorium-230 (DOE 1996).

L-50
The L-50 residues resulted from uranium extraction of African pitchblende ores, containing approximately seven percent U_3O_8, at the Linde Ceramics Plant in Tonawanda, New York (Battelle 1981a). Approximately 2,150 yd^3 of these residues were transported to the NFSS starting in 1944 and stored in clarifier tanks at the water treatment plant (Buildings 413 and 414) (EA 1999, BNI 1994b). This residue contained approximately 6 Ci of radium-226 and 6 Ci of thorium-230 (DOE 1996).

Middlesex Sands
Inventory records show approximately 230 yd^3 of sands resulting from sand blasting activities at the Middlesex Sampling Plant, located in New Jersey, were transported to the NFSS sometime prior to 1953 and were stored in a bin in Building 410. The sands were eroded from the bin by precipitation entering through holes in the roof and were spread through a significant portion of the lower floor of Building 410. The original concentration of uranium was reported to be three percent. Measurements made in 1979 showed that the sands contained less than 100 mg/kg of uranium and less than 0.01 µg/kg of radium-226 (Battelle 1981a).

Contaminated Rubble
In the late 1940's, contaminated metal, concrete, lumber and reduction slag from other wartime plants were shipped to the NFSS and stored adjacent to Building 409. These materials were removed in the late 1950's and transferred to the Y-12 Plant at Oak Ridge, Tennessee (National Lead Company 1979).

Other Wastes
In the period from 1952 to 1954, wastes generated at the Knolls Atomic Power Laboratory (KAPL) were shipped to the NFSS. Records indicate that the shipments consisted of approximately 700,000 pounds of contaminated wastes including 676 wooden boxes and 394 slurry drums. The contaminated materials included combustible and noncombustible solids stored in wooden crates and processing wastes stored in 55-gallon drums. The processing wastes contained some residual plutonium and fission product radioactivity (Cs-137, Sr-90) from a low-level processing plant at Schenectady. It is estimated that 408 Ci of mixed fission products and 0.63 Ci of plutonium were shipped to the site during this time period. The KAPL residues were originally stored near a railroad spur north of NFSS. Later, the wastes were moved to Buildings 443, 444, 445, 446, 447 and 448 in the Baker-Smith area. Some of the waste was also stored in Building 401. These materials were transferred to the Oak Ridge Burial grounds during the late 1950's and most of the storage buildings were later destroyed (EA 1998). To reduce the volume of waste to be shipped, some of the low-level combustible KAPL waste stream was incinerated at the LOOW site (DOE 1982). Residual site contaminants from this waste stream could be present at the NFSS.

3.2 RESULTS OF THE REMEDIAL INVESTIGATION, BASELINE RISK ASSESSMENT AND GROUNDWATER FLOW AND TRANSPORT MODELING

3.2.1 Identification of Site-Related Compounds (SRCs) and COCs

To facilitate accurate estimation of exposure and dose in the BRA, the NFSS was divided into 17 EUs and one background EU. An EU is the geographic area in which a receptor is assumed to work or live, and where a receptor may be exposed to SRCs. These EUs provided the geographical framework for the determination of SRCs. SRCs are defined as those compounds that exceed background screening levels in their respective EUs.

The area of investigation considered by the RI, consisting of the NFSS and the neighboring National Grid property, was divided into 14 distinct geographic EUs, numbered 1 through 14 as shown on Figure 2-1. An additional three EUs (EUs 15 through 17) were created to accommodate special circumstances of the site or needs of the BRA. EU 15 encompassed surface water and sediments in on-site drainage ways including the Central, South 16, South 35 and Modern Ditches. EU 16 was the site pipelines and EU 17 was a site-wide EU for all media and data including groundwater. For each EU, site-related constituents were identified as constituents above media specific background concentrations. SRCs were determined for each EU, excluding the IWCS within EU10, for soil (0 to 10 feet bgs), surface soil (0 to 0.5 feet bgs), sediments, surface water, groundwater, pipeline/utility sediments, and pipeline/utility water.

The process of identifying SRCs and COCs is outlined in the BRA. Chemicals and radionuclides that are determined to be site-related are identified as SRCs. Further screening against preliminary remediation goals (PRG) or site-specific radiological risk-based screening levels, as appropriate, is performed to eliminate SRCs that pose negligible risk to human health. SRCs exceeding PRGs or radiological screening levels are identified as chemicals of potential concern (COPC) or radionuclides of potential concern (ROPC), respectively and are evaluated quantitatively in the BRA. COCs are constituents (COPCs and ROPCs) that were determined in the BRA to potentially pose unacceptable risk.

COCs were evaluated in the RI for several potential future use scenarios including the subsistence farmer scenario. The subsistence farmer scenario represents the most conservative risk scenario evaluated in the BRA and generated the highest number of COCs. It should be noted that the subsistence farmer land use scenario is overly conservative for the NFSS and is highly unlikely due to, poor site drainage, and poor yield and quality of on-site groundwater resources. Carcinogenic COCs were identified as constituents that exceed the 10^{-5} risk level. A risk of 10^{-5} is defined as the probability that one additional person in a population of 100,000 people may develop cancer as a result of exposure to contaminants at NFSS. Non-carcinogenic COCs were identified as constituents that show risks exceeding a hazard index (HI) of one. A HI greater than one is defined as the level of concern for potential adverse non-carcinogenic health effects. Risk was determined for the following media pathways: surface soil (0-0.5 feet), soil (0-10 feet), sediment, surface water, groundwater, and food. COCs identified for the food pathway correspond to soil samples collected from 0-10 feet. A sitewide summary of SRCs and COCs identified for the subsistence farmer scenario at each EU is presented in Table 3-3. The majority of COCs identified for the adult/child subsistence farmer pose risk in soil only; however, COCs were also identified for the groundwater and food pathways. No COCs were identified in sediment or surface water. The high concentrations of COCs found in both the sediment and water in pipelines and subsurface utilities could remain as a potential source for migration to groundwater. Additionally, no COCs were identified for EU 10 because it was assumed that the subsistence farmer will not be exposed to the constituents in or around the IWCS. A brief overview of COCs identified for the subsistence farmer is provided in the following sections.

3.2.1.1 Soil COCs

The COCs in soil for the subsistence farmer scenario include:

Metals/Inorganics
- Arsenic
- Boron
- Copper (child only)
- Total Uranium (child only)
- Zinc

Radionuclides
- Actinium-227
- Cesium-137
- Protactinium-231
- Lead-210
- Radium-226
- Radium-228
- Thorium-230
- Thorium-232
- Uranium-234
- Uranium-235
- Uranium-238

Polychlorinated biphenyls (PCBs)/ Pesticides
- Aroclor-1254
- Aroclor-1260
- Heptachlor epoxide

Semi-volatile Organic Compounds (SVOCs)
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Carbazole
- Dibenz(a,h)anthracene
- Di-n-octylphthalate (child only)
- Indeno(1,2,3-c,d)pyrene

Volatile Organic Compounds (VOCs)
- Tetrachloroethene (PCE)

Several radionuclides, polycyclic aromatic hydrocarbons (PAHs), arsenic, boron, and Aroclor-1260 were identified as soil COCs in several EUs. Of these soil COCs, arsenic, benzo(a)anthracene, benzo(a)pyrene, Aroclor-1260 and radium-226 were identified as risk drivers in soil. Additionally, uranium was identified as a soil risk driver to the child subsistence farmer.

COCs were identified for the food pathway, corresponding to soil samples collected from 0 – 10 ft, in several EUs. PAHs, arsenic, boron, copper, zinc, Aroclor-1254 and -1260, tetrachloroethylene, di-n-octylphthalate, carbazole, and heptachlor epoxide were identified as posing risk in the food pathway. Actinium-227, protactinium-231, lead-210, radium-226 and -228, thorium-230 and -232, and uranium-234 and -238 were also identified as food pathway COCs. Section 5.4 of the BRA discusses the soil and food pathway COCs for the subsistence farmer scenario in more detail (USACE 2007b). The RIR recommended that soil COCs identified in the BRA as posing potential risk for the adult/child subsistence farmer be further addressed in the FS at each EU in which they were identified. There are soil COCs that were recommended to be addressed in the FS at all 14 geographical EUs. As stated previously, the subsistence farmer scenario was chosen to conservatively evaluate COCs in the RIR; however, FS efforts will focus on the industrial and residential land use scenarios, which represent more likely land uses for the NFSS.

3.2.1.2 Groundwater COCs

The COCs in groundwater for the subsistence farmer scenario include:

Metals/Inorganics
- Arsenic
- Boron
- Copper
- Lead
- Manganese
- Nickel
- Vanadium

Radionuclides
- Lead-210
- Radium-226
- Radium-228
- Uranium-234
- Uranium-238

SVOCs
- Bis(2-ethylhexyl)phthalate

VOCs
- Cis-1,2-dichloroethene
- Methylene chloride
- PCE
- Trichloroethene (TCE)
- Vinyl chloride

Groundwater COCs were identified in several EUs. Several metals, radionuclides, bis(2-ethylhexyl)phthalate, and several VOCs were identified as groundwater COCs in multiple EUs. Arsenic, PCE, and radium-226 were identified as risk drivers in groundwater. Section 5.4 of the BRA discusses the groundwater COCs for the subsistence farmer scenario in more detail (USACE 2007b). The RIR recommended that no further action or evaluation is needed for COCs in groundwater in EUs 3, 5, 6 and 14. Further evaluation of COCs in the FS was recommended in the RI for all of the other 14 geographical EUs, with the exception of EU 9 where no groundwater samples were collected. Additionally, further evaluation of COCs in sitewide groundwater (EU 17) was recommended.

3.2.1.3 Sediment and Surface Water

Although no COCs were identified in sediment and surface water for the subsistence farmer, the presence of SRCs in sediment and water within pipelines and subsurface utilities was recommended for further consideration in the FS as it pertains to groundwater plume and soil remediation. As mentioned previously, high concentrations of constituents found in sediment and water in pipelines and subsurface utilities could be a potential source for contaminant migration to groundwater.

The BRA indicated that although the potential for standing water at the NFSS is high, none of the constituents detected in surface water or sediment from the interconnected drainage ways (EU 15) were COCs. This was due to the anticipated short duration of exposure for individuals who may come in contact with surface water at NFSS.

3.2.2 Screening-Level Ecological Risk Assessment (SLERA)

A screening-level ecological risk assessment (SLERA) was completed to facilitate decision-making relative to the protection of the habitats and ecological receptors at NFSS (USACE 2007b). Given that this was a screening level process, it may not be conclusive regarding remedial actions. However, the SLERA results indicate that chemicals (mainly metals and SVOCs) are present in every EU at sufficiently high concentrations to produce a hazard quotient (HQ) greater than one for ecological receptors. However, a weight of evidence (WOE) assessment was also completed to weigh the NFSS SLERA quantitative results and other evidence.

The WOE analysis recognizes the mathematically predicted ecological risk for chemicals at the NFSS but contrasts this with field observations showing relatively healthy and functioning terrestrial and aquatic systems. For example, the ecosystems at NFSS are functioning, and site photographs indicate healthy-looking vegetation and wildlife. NFSS EUs exhibit plant growth and animal life interacting successfully with soil and other parts of the ecosystem to result in sustainable habitats year after year. Further, NFSS is in various stages of ecological recovery or succession. Reforestation is occurring in some EUs, which indicates that site contaminants are not inhibiting germination, colonization, distribution, and abundance of common species.

Furthermore, remediation for ecological protection can damage a physical habitat more than chemical risk reduction is worth. Also, any remediation for human health purposes would provide some protection to ecological resources as well. Thus, the mathematical predictions of HQs with their regulatory dire interpretations are checked by the reality of functioning and recovering habitats across the NFSS. In short, one contrary WOE element is balanced by several other WOE elements to result in the recommendation that no further action (NFA) is necessary in the FS to address the relatively productive habitats, vegetation, and wildlife at NFSS. Section 4 of the BRA discusses the SLERA in more detail (USACE 2007b).

3.2.3 Groundwater Flow and Transport Modeling Results

The flow and transport of groundwater at the NFSS is detailed in the modeling report prepared by HydroGeoLogic, Inc. (HGL) (USACE 2007c). The groundwater flow and transport model indicates that organic and metal plumes located outside the area of the IWCS exhibit only minor advection and dispersion due to low permeability of soils in the UWBZ. VOCs in groundwater will continue to degrade and maximum concentrations of metals are not expected to increase above the current concentrations of the plumes (i.e., historically elevated soil sources were removed by the DOE).

The conclusions made regarding the flow and transport of uranium isotopes in site groundwater are highly dependant on the distribution coefficient (K_d) used in the model. The K_d is a transport parameter that relates the adsorbed constituent concentration to the dissolved constituent concentration. Higher values of K_d represent increased contaminant adsorption and therefore, increased retardation of solutes in groundwater. The initial use of a low K_d for the UWBZ (3.6 L/kg) was conservative and simulated uranium contamination in groundwater that is not actually observed. Site investigations have not found radionuclide contamination in groundwater at the levels predicted by the model using the conservative K_d value, therefore the development of K_d value for uranium that is more representative of site soil conditions was proposed. An evaluation of existing on-site soil data collected outside the boundary of the IWCS was used to determine a more representative K_d of 122 L/kg. A K_d of 3.6 L/kg will continue to be used for the 1-D modeling of the residues and wastes inside the IWCS since this value reflects the actual K_d data from the residues. Because the level of contaminant mass in the residues is not present in the BOP soils, the modified K_d (122 L/kg) will be used for any 3-D fate and transport model to more accurately simulate actual soil conditions at the site.

Updated model results using a higher K_d of 122 L/kg predict lower concentrations of uranium and daughter products than previous simulations (HGL 2008). The updated model results indicate that concentrations of uranium and daughter products at the site boundary and on-site due to leaching from soil sources to groundwater are well below background concentrations. Existing groundwater areas of concern for uranium-238 and uranium-234 occur along the EU 1 northern boundary. With the higher K_d, elevated concentrations from IWCS sources are not predicted to reach the western NFSS boundary within 10,000 years.

Groundwater modeling results support the conclusion that no further action or evaluation is needed for COCs in groundwater in EUs 3, 5, 6 and 14. Further evaluation of COCs during the FS was recommended in the RIR for the remaining 10 geographical EUs, with the exception of EU 9 where no groundwater samples were collected. Additionally, further evaluation in the FS of COCs in sitewide groundwater (EU 17) was recommended.

3.3 POTENTIAL PATHWAYS OF CONTAMINANT MIGRATION/PRELIMINARY PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS

Current potential receptors at the NFSS include on-site workers and trespassers. On-site workers may be present at the site while performing general site maintenance activities or sampling activities in support of the environmental surveillance program. Although a trespasser is considered a possible receptor, the presence of a site trespasser is unlikely due to existing security measures at the site (i.e., security fencing). Additionally, the regular presence of maintenance contractors at the site provides another deterrent to trespassers wishing to cross the property boundary and enter the site limits.

Receptors at the NFSS may be exposed to chemicals by direct contact with contaminated source media or as the result of chemical migration away from the source into other media (USACE 2007b). The source media for the NFSS are surface soils (assumed to be 0 – 6 inches below ground surface), which were contaminated through the transport and storage of waste materials to and within the site boundaries. It is probable that initial chemical releases were restricted to surface soils, with various transport mechanisms leading to subsequent contamination of other environmental media such as subsurface soil, biota, surface water, sediment, and groundwater.

Exposure routes that incorporate constituent migration from a source to a secondary medium (subsurface soil, biota, surface water, sediment, and groundwater) or to an off-site receptor are identified as indirect contact pathways. Chemical release mechanisms and transport pathways include the following as well as others:

- airborne release of volatiles and fugitive dust containing organic substances, metals, and/or radionuclides;
- uptake and bioaccumulation by flora and fauna (into the food chain);
- leaching of constituents from soil to groundwater; and
- release of contaminated soil particulates to storm water run-off (sediments and surface water).

The BRA evaluated potential future exposures at the site which included a resident gardener, a subsistence farmer, or an on-site worker. Resident gardeners or subsistence farmers may be exposed to chemicals via contact with site soils, ingestion of plants or game meat obtained from the site, and use of site groundwater. Residents may also build a structure with a basement and thus be exposed to constituents in subsurface soils (typically, up to a depth of 10 ft for structures with a basement). The feasibility study effort for each operable unit will identify and better define the specific exposure scenarios and assumptions that are relevant for that operable unit.

Future on-site workers may be exposed to chemicals in site soils and groundwater while performing remedial activities such as removal or treatment of impacted site soils. On-site receptors may also be exposed to radon released to the environment in the event the integrity of the IWCS cap is compromised as a result of drilling activities, burrowing by an animal, or possible deterioration of the IWCS cap (e.g., development of a crack or fissure in the cap material).

On-site workers who may be involved in future activities associated with removal of the IWCS wastes and residues could experience direct and indirect exposures to chemical and radiological constituents, including radon gas and gamma radiation. On-site and off-site receptors may also experience exposure to gamma radiation that could be released from the IWCS if the integrity of the cap is compromised. Gamma radiation from the IWCS may result in doses to off-site receptors as result of "skyshine" in which gamma radiation is scattered by the atmosphere to off-site locations.

Future risks to hypothetical off-site receptors from groundwater contamination at NFSS could come from two sources: 1) movement of current groundwater contamination off-site, or 2) leaching of contaminants from soil to groundwater, followed by movement of that groundwater contamination off-site. Based on groundwater modeling, little to no additional future risk to off-site receptors is expected. Model results show little lateral migration of existing VOC, SVOC, and metal contaminants. While leaching of contaminants from the IWCS is predicted to occur, model results predict that the leached contaminants will not reach the site boundary within 10,000 years assuming a K_d of 122 L/kg. Uranium contamination currently in the UWBZ in EUs 1 and 11 exceeding the upper tolerance limits (UTLs) of background concentrations is predicted to move off-site over the 1,000-year evaluation period; however, radionuclide concentrations in the plumes are not expected to increase significantly based upon the limited aerial and vertical extent of uranium plumes in other areas of the site.

3.4 PRELIMINARY IDENTIFICATION OF OPERABLE UNITS

A Technical Project Planning (TPP) meeting was held in October 2008 with representatives from various organizations (USACE, Argonne National Labs (ANL), HGL, and SAIC) that have been involved with the NFSS RI activities and scheduled to be involved in the FS activities. A copy of the TPP meeting minutes and conclusions is included in Appendix A. Based on discussions during the meeting and recent public comments and concerns regarding the materials in the IWCS, the USACE decided to address three OUs for the site and complete a focused FS for each OU instead of completing one FS that addresses all three OUs. The OUs are:

- IWCS OU,
- Balance of Plant (BOP) OU, and
- Groundwater OU.

A brief description of each OU is provided below. Figures 3-1, 3-2, and 3-3 show areas of concern used to define the IWCS, BOP, and Groundwater OUs, respectively. Splitting the NFSS into three separate OUs for the purpose of completing the FS allows the USACE to address the IWCS first because the IWCS poses the greatest potential risk due to the nature of the high activity associated with the radioactive residues (specifically the K-65 residues) stored within the structure. The decision to address the FS for the IWCS OU first is supported by conclusions of an independent security evaluation of the NFSS conducted by the U.S. Department of Homeland Security at the request of USACE. The report was provided to USACE on February 20, 2008, and a Fact Sheet regarding the conclusions of this report was published on March 14, 2008 (USACE 2008a). The report supports the concern regarding potential risks in the event of a criminal or terrorist attack at the site, specifically on the IWCS. As stated in the Fact Sheet, "There could be economic, environmental, health, safety, and socio-political adverse impacts to the region if a successful attack on this facility was carried out." (USACE 2008a).

A more detailed discussion of the rationale for identification and evaluation of the three OUs within a focused CERCLA process is presented in Section 4.1 of this work plan.

IWCS OU

The IWCS OU, shown in Figure 3-1, is defined as the waste material (i.e., residues and other remedial action waste) that DOE placed in the disposal cell within the diked area. The remedial scope for the IWCS OU involves development of remedial alternatives for addressing the residues and other waste material only. If all of the waste materials in the IWCS are removed, then the remaining IWCS structure (e.g., remaining cap material, the dike, cut-off walls, residual soil that had waste placed on them, etc.) would be addressed within the scope of the BOP OU, as described below. For any alternatives that involve leaving any waste materials in the IWCS, the FS would have to demonstrate that the alternative is protective of human health and the environment, including surface waters and the groundwater system beneath the IWCS.

BOP OU

The BOP OU, shown in Figure 3-2, is defined as all material not included in the IWCS OU, excluding groundwater. BOP material will include any remaining former building structures within the IWCS, remaining cap material and other soils within the IWCS, the IWCS dike, surface and subsurface soils across the rest of the site, surface water, sediment, railroad ballast, roads, Building 401, and pipelines, etc. Additionally, only structures that need to be removed to obtain access to underlying contamination will be included in the BOP OU. For example, tank cradles may not be removed if they show no risk to human health and the environment from site contaminants, and their removal is otherwise deemed unnecessary. The remaining IWCS structures, subsurface soils and dike are only addressed in BOP alternatives if all of the residues and wastes placed in the IWCS are removed. The impacts, if any, of the BOP OU alternatives on groundwater and surface water will be addressed in the alternative evaluations for the BOP OU.

Groundwater OU

The Groundwater OU, shown in Figure 3-3, is defined as groundwater remaining in both the UWBZ and the LWBZ after implementation of the selected remedial actions for the IWCS and BOP OUs. As only the UWBZ has been impacted by site contaminants, groundwater contamination may be ultimately addressed by remediation of soils (e.g. by controlling/removing the sources of contaminant migration).

3.5 PRELIMINARY IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES AND REMEDIAL ACTION ALTERNATIVES

A remedial action objective (RAO) is a qualitative goal developed to specify the requirements that remedial alternatives must fulfill to be protective of human health and the environment. RAOs provide the basis for selecting applicable remedial technologies, and developing and evaluating remedial alternatives. The RAOs presented in this section are preliminary and should be considered draft until they are presented in the FS.

The RAOs for the NFSS will be designed to provide short- and long-term protection of human health and the environment based on plausible future land uses for the NFSS. To provide this protection, media-specific/operable unit-specific objectives that identify major contaminants and associated cleanup goals are developed. These objectives specify the contaminants of concern and their respective exposure routes and receptors, provide an acceptable contaminant concentration for each receptor as PRGs, and address ARARs.

3.5.1 RAOs for the IWCS OU

The RAOs for the IWCS OU are:

- Remove or prevent exposure/direct contact to the waste materials paced inside the IWCS;
- Minimize/prevent the transport of waste materials within the IWCS to other environmental media (soil, groundwater, surface water, sediment, and air) outside of the IWCS;
- During implementation of the remedial alternatives(s), minimize/prevent releases and other impacts that could adversely affect the public health and the environment, including ecological receptors, and
- Comply with ARARs.

No cleanup criteria development would be necessary for the IWCS OU. Removal of IWCS materials would be based on visual criteria. The scope is limited to removal of waste placed in the IWCS, and does not include the dike and cut-off walls or soils beneath the waste. The residues are located inside physical structures and removal would be limited to the materials inside the structure, the structure itself, and any underground lines incidental to the excavation. If all of the waste materials in the IWCS are removed, then the remaining IWCS structure (e.g., dike and cut-off walls, residual soil that had waste placed on them, etc.) would be addressed within the scope of the BOP OU and its associated cleanup criteria,

3.5.2 RAOs for the BOP OU

The RAOs for the BOP OU are:

- Remove or prevent exposure/direct contact to soil, building foundations, etc. containing concentrations of COCs that exceed cleanup criteria based on ARARs or unacceptable risk to human health in excess of 10^{-4} Incremental Lifetime Cancer Risk (ILCR) and/or a non-cancer HI of 1;
- Minimize/prevent the transport of media-specific COCs at the NFSS to other environmental media (groundwater, surface water, sediment, and air) both on-site and off-site;

- During implementation of the remedial alternatives(s), minimize/prevent releases and other impacts that could adversely affect the public health and the environment, including ecological receptors;

- Remediate the site to a condition consistent with its current and anticipated future use(s); and

- Comply with ARARs.

An informed decision on the BOP OU can only be made in the context of the decision made for the IWCS materials. Hence, the decision for this OU is phased to occur after that for the IWCS OU. Cleanup of the site to an unrestricted use level would only be reasonable if a complete removal remedy is selected for the IWCS materials. Conversely, selection of a remedy in which some or all of the waste materials remain in the IWCS would influence reasonable land uses for the area and the resultant exposure scenarios used to develop cleanup criteria. The scope of this OU addresses all areas of the site excluding the IWCS materials and groundwater.

3.5.3 RAOs for the Groundwater OU

The RAOs for the Groundwater OU are:

- Prevent use of contaminated groundwater exhibiting unacceptable risk, or remediate the water bearing zone/aquifer to a condition consistent with its current and anticipated future use(s);

- Prevent the transport of groundwater COCs at the NFSS to other environmental media (soil, surface water, sediment, and air) both on-site and off-site;

- During implementation of the remedial alternatives(s), minimize/prevent releases and other impacts that could adversely affect groundwater sources and fate-related receptors; and

- Comply with ARARs.

As with the BOP OU, an informed decision on the Groundwater OU can only be made in the context of the decisions made for the IWCS and BOP OUs. Cleanup of the site groundwater to an unrestricted use level would be far more reasonable if a complete removal remedy is selected for the IWCS materials. However, if groundwater is classified as a current or future potable water supply source, cleanup to drinking water standards might be required regardless of remedy selection for the IWCS and BOP OUs.

3.5.4 Preliminary Remedial Action Alternatives

The USACE has identified a number of general remedial alternatives for each of the OUs. These remedial alternatives are briefly described in this section, but will be further developed during the FS for each specific OU. A listing of the preliminary remedial alternatives for each OU is provided below. A summary description of each alternative is contained in the paragraphs following this list.

- IWCS OU
  - Alternative 1: Removal of the Entire IWCS Contents with Off-site Disposal
  - Alternative 2: Removal of all Residues, excluding the R-10 Materials, with Off-site Disposal
  - Alternative 3: Removal of K-65 Residues with Off-site Disposal
  - Alternative 4: Removal of Residues with Placement in a New, Engineered, On-site, Long-term Storage Facility
  - Alternative 5: Limited Action – Enhanced IWCS Containment and Environmental Monitoring
  - Alternative 6: No Further Action
  - Alternative 7: No Action

- BOP OU
  - Alternative 1: Complete Removal with Off-site Disposal
  - Alternative 2: Partial Removal with Land Use Controls and Off-site Disposal
  - Alternative 3: Complete Removal with On-site Disposal
  - Alternative 4: Partial Removal with On-site Disposal
  - Alternative 5: No Further Action
  - Alternative 6: No Action

- Groundwater OU
  - Alternative 1: Source Removal with Groundwater Treatment
  - Alternative 2: Reactive Barriers
  - Alternative 3: Containment
  - Alternative 4: Monitored Natural Attenuation
  - Alternative 5: No Further Action
  - Alternative 6: No Action

3.5.4.1 IWCS OU Preliminary Remedial Action Alternatives

Alternative 1: Removal of the Entire IWCS Contents with Off-site Disposal
This alternative would involve the removal of all wastes placed in the IWCS by the DOE during previous cleanup activities at the site and at vicinity properties. Removal would also include the building structures and associated piping located underneath the former buildings. Slurry transfer lines, once used to transfer and place residues into the IWCS, remain within the containment structure and would also be removed as part of this alternative. As the wastes are being removed, they would be processed and packaged in a manner necessary to meet the appropriate waste acceptance criteria for the disposal facility accepting the waste. Any remaining structures within the IWCS, including the IWCS clay dike and cut-off walls, and the soils on which the DOE wastes were placed will be addressed by the BOP OU FS effort.

Alternative 2: Removal of all Residues, excluding the R-10 Materials, with Off-site Disposal
This alternative would involve the removal of the residues within the IWCS that are located in former Buildings 411, 413 and 414. Removal of all residues and associated building structures and pipelines would proceed as discussed in Alternative 1. Removal of the R-10 materials would not be included in this alternative. As the residues, building structures and associated piping are being removed, the waste would be processed and packaged in a manner necessary to meet the waste acceptance criteria for the selected disposal facility. The IWCS would then be backfilled and the containment system enhanced to provide the necessary level of protectiveness for the waste materials remaining in the IWCS.

Alternative 3: Removal of K-65 Residues with Off-site Disposal
This alternative would involve the removal of only the K-65 residues within the IWCS. As the K-65 residues are being removed, they would be processed and packaged in a manner necessary to meet the waste acceptance criteria for the selected disposal facility. The IWCS would then be backfilled and the containment system enhanced to provide the necessary level of protectiveness for the waste materials remaining in the IWCS.

There is a degree of uncertainty as to whether this alternative will be feasible with respect to meeting the disposal facility waste acceptance criteria. Removal of only the K-65 residues may not be feasible should the transportation or waste acceptance criteria be too restrictive with respect to the allowable radium concentration per unit weight of waste. Removal and consolidation of other IWCS residues and waste materials with the K-65 residues may be required to achieve lower radium concentrations necessary to meet the disposal facility waste acceptance criteria. A determination as to whether additional material would need to be removed from the IWCS will be made during the development of this alternative in the IWCS OU FS. If it is determined that other residues must be removed, as in IWCS OU Alternative 2, this alternative would be identified as being inappropriate during the alternative screening process.

Alternative 4: Removal of Residues with Placement in a New, Engineered, On-site Long-term Storage Facility
This alternative would involve the removal of the residues within the IWCS as discussed in Alternative 2. As the residues are being removed, they would be processed and packaged in a manner necessary to meet anticipated waste acceptance criteria for possible future disposal facilities. Once packaged, the waste container would be placed in a new, engineered, on-site retrievable storage facility. The IWCS would then be backfilled and the containment system enhanced to provide the necessary level of protectiveness for the waste materials remaining in the IWCS. Both the IWCS and the retrievable storage facility would require long-term surveillance and maintenance by the federal government.

Alternative 5: Limited Action – Enhanced IWCS Containment and Environmental Monitoring
This alternative would involve, at a minimum, placement of a new cover over the IWCS. Any necessary enhancements to the vertical containment system surrounding the IWCS (i.e., the clay dike cut-off wall) would be included in this alternative. Enhancements would also be made to the on-going environmental monitoring and surveillance program. Current long-term maintenance controls and security at the site would continue.

Alternative 6: No Further Action
This alternative would involve continuation of current conditions at the site, which consists of the following components:

- Continued federal government ownership of the site,
- Continued long-term environmental monitoring and surveillance of the site,
- Continued long-term maintenance of the site, and
- Continued site security and access restrictions.

This alternative provides for no additional environmental monitoring beyond what is currently performed (i.e., groundwater and surface water monitoring, and monitoring of radon emissions associated with the IWCS).

Alternative 7: No Action

The No Action Alternative is required under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as a baseline scenario against which other alternatives can be compared. The Federal Government is committed to operating, monitoring, and maintaining the IWCS, and although this "no action" alternative is not a realistic scenario, it is being evaluated to understand the risk that may exist if land use controls were not in place to be protective to the public. As such, this alternative would leave the NFSS site, including the IWCS, "as is" with no actions taken regarding access or land use controls beyond those already in place. Physical mechanisms (e.g., IWCS cap and site security fencing) would be left in place, but not necessarily maintained. Environmental monitoring at the site would not be performed. Additionally, no restrictions on land use would be pursued. Components of this alternative include:

- No removal or remediation of contaminated media or structures (i.e. soils, groundwater, IWCS residues, buildings, tank saddles, utility lines, etc.);
- No site security or maintenance of current site access controls;
- Discontinuation of the environmental monitoring program;
- Discontinuation of the IWCS cap maintenance;
- No additional engineering of surface water features; and
- No restrictions on land use.

3.5.4.2 BOP OU Preliminary Remedial Action Alternatives

Alternative 1: Complete Removal with Off-site Disposal

This alternative would involve the removal of all soils, underground lines and contaminated structures that exceed the cleanup criteria developed for release of the site with no restrictions. Structures that are not contaminated, like tank cradles, etc., will not be removed unless removal is necessary to gain access to contaminated materials beneath the structure. This alternative would also involve the removal of the remaining structures associated with the IWCS, including the slurry sidewalls and soils within the IWCS, should the IWCS OU Alternative 3 be selected as the preferred remedy. All remedial action waste will be transported to an off-site disposal facility.

Alternative 2: Partial Removal with Land Use Controls and Off-site Disposal

This alternative would involve the removal of all soils and contaminated structures located at or near the surface (actual depth to be established during the development of the alternative) that exceed the cleanup criteria developed for use of the site with restrictions. All remedial action waste will be transported to an off-site disposal facility.

Alternative 3: Complete Removal with On-site Disposal

This alternative would involve the removal of all soils, underground lines and contaminated structures that exceed the cleanup criteria developed for release of the site with no restrictions, as discussed in BOP Alternative 1. However, the remedial action waste would not be shipped off-site for disposal. Instead, the waste would be placed in a new disposal facility to be constructed on the NFSS site. Land use controls would be necessary only for the area of the new disposal facility and not for the remainder of the site that has been remediated for free release.

Alternative 4:Partial Removal with On-site Disposal
This alternative would involve the removal of all soils and contaminated structures located at or near the surface (actual depth to be established during the development of the alternative) that exceed the cleanup criteria developed for use of the site with restrictions, as discussed in BOP OU Alternative 2. However, the remedial action waste would not be shipped off-site for disposal. Instead, the waste would be placed in a new disposal facility to be constructed on the NFSS site. Land use controls would be necessary.

Alternative 5: No Further Action
This alternative would involve continuation of current conditions at the site, which consists of the following components:

- Continued federal government ownership of the site,
- Continued long-term environmental monitoring and surveillance,
- Continued long-term maintenance of the site, and
- Continued site security and access restrictions.

This alternative provides for no additional environmental monitoring beyond what is currently performed (i.e., groundwater and surface water monitoring, and monitoring of radon emissions associated with the IWCS).

Alternative 6: No Action
The No Action Alternative is required under the NCP as a baseline scenario against which other alternatives can be compared. This alternative would leave the NFSS site, including the IWCS, "as is" with no actions taken regarding access or land use controls beyond those already in place. Physical mechanisms (e.g., IWCS cap and site security fencing) would be left in place, but not necessarily maintained. Environmental monitoring at the site would not be performed. Additionally, no restrictions on land use would be pursued. Components of this alternative include:

- No removal or remediation of contaminated media or structures (i.e. soils, groundwater, IWCS residues, buildings, tank saddles, utility lines, etc.);

- No site security or maintenance of current site access controls;

- Discontinuation of the environmental monitoring program;

- No additional engineering of surface water features; and

- No restrictions on land use.

3.5.4.3 Groundwater OU Preliminary Remedial Action Alternatives

The development of remedial action alternatives for the Groundwater OU will be influenced by remedial actions completed for the IWCS and BOP OUs. Depending on the remedial actions completed for the IWCS and BOP OUs, there might not be any unacceptable groundwater impacts or concerns remaining (e.g., all contamination sources were removed along with any contaminated groundwater encountered during remedial actions). If this is the case, then there would be no need for development of remedial alternatives other than the No Further Action alternative discussed below. Not knowing what the final remedial actions will be for the IWCS and BOP OUs, USACE has identified the following preliminary remedial action alternatives should groundwater remediation be necessary after completion of the IWCS and BOP OUs remedial actions.

Alternative 1: Source Removal with Groundwater Treatment
This alternative would involve the removal of any groundwater contaminant sources remaining following implementation of IWCS and BOP remedial alternatives. Contaminated groundwater will be treated using an ex-situ treatment system designed to address the COCs for that area. The scope of the groundwater system is limited to the UWBZ since the RI, BRA and Groundwater Modeling results all indicate that there are no impacts to the LWBZ. Furthermore, the Groundwater Model predicts that the combined IWCS and underlying Glacio-Lacustrine Clay unit will safeguard the LWBZ for 1,000 years. Groundwater monitoring would need to be performed under this alternative until the contaminant sources have been removed. After the contaminant sources have been removed and contaminated groundwater treatment has been completed, no restrictions on groundwater use at the site would be needed.

Alternative 2: Reactive Barriers
This alternative would involve the placement of reactive barriers around any remaining groundwater plumes in the UWBZ that could potentially migrate off site and/or pose an unacceptable risk to human health and the environment. Reactive barriers would be designed to provide site-specific, in-situ treatment of contaminated groundwater flow to ensure groundwater no longer poses an unacceptable off-site threat to human health and the environment. Surface water flowing off site may also be treated if simulations show groundwater and surface water are hydraulically connected and pose a receptor risk. Under this alternative, some sources contributing to groundwater contamination may remain on site; consequently, groundwater monitoring of remedy performance and land-use controls would continue to be necessary.

Alternative 3: Containment
This alternative would involve the in situ containment of groundwater flow to limit off-site groundwater migration. A low-permeability, engineered subsurface structure would be constructed in the UWBZ at the site boundary to minimize off-site groundwater flow in the direction perpendicular to the structure and to ensure there are no off-site contaminant releases above levels that would pose an unacceptable risk to human health and the environment. If groundwater and surface water are hydraulically connected, use of barriers to capture surface water flowing off-site may be necessary. Groundwater removal and rerouting of surface water features to achieve containment objectives may also be necessary. Under this alternative some sources contributing to groundwater contamination may remain on-site; therefore, land use controls and groundwater monitoring would be required to maintain restricted land use and to ensure the protection of off-site groundwater.

Alternative 4: Monitored Natural Attenuation
Should a remedy for the IWCS and BOP OUs be selected that results in groundwater COCs remaining at the site, this Groundwater OU alternative would require monitored natural attenuation as a remedial action and would, at a minimum, consist of the following components:

- Long-term environmental monitoring specific to the requirements for evaluating monitored natural attenuation at the site,
- Continued federal government ownership,
- Continued long-term maintenance of the site, and
- Continued site security and access restrictions.

Alternative 5: No Further Action
This alternative is dependent on the remedial alternatives selected for the IWCS and BOP OUs. Remedial actions implemented for the IWCS and BOP OUs may result in groundwater contaminant source removal resulting in acceptable groundwater concentrations at the site. In such a case, a No Further Action alternative for the Groundwater OU may be appropriate for consideration during the development of Groundwater OU alternatives.

This alternative provides for no additional environmental monitoring beyond what is already currently performed (i.e., groundwater and surface water monitoring and monitoring of radon emissions associated with the IWCS).

Alternative 6: No Action
The No Action Alternative is required under the NCP as a baseline scenario against which other alternatives can be compared. This alternative would leave the NFSS site "as is" with no actions taken regarding access or land use controls beyond those currently in place. Physical mechanisms (e.g., site security fencing) would be left in place, but not necessarily maintained. Environmental monitoring at the site would not be performed. Additionally, no restrictions on land use would be pursued. Components of this alternative include:

- No removal or remediation of contaminated groundwater or contamination sources,
- No maintenance of current site access controls or site security,
- Discontinuation of the environmental monitoring program,
- No additional engineering of surface water features, and
- No restrictions on land use.

3.6 POTENTIAL ARARS

The final remedial action selected for each OU needs to satisfy ARARs, as defined by CERCLA, 42 United States Code (U.S.C.) 9601 et seq. in Section 121, or a waiver needs to be obtained for them under conditions allowed by CERCLA. This requirement is in accordance with 40 Code of Federal Regulations (CFR) § 300.430(f) of the NCP and USACE Headquarters guidance, as conducted under CERCLA. The potential ARARs identified in this section include only federal environmental or more stringent state environmental or facility siting laws/regulations. Additionally, per 40 CFR § 300.405(g)(3), other to-be-considered (TBCs) advisories, criteria, or guidance may be incorporated into the development of remedial alternatives, if appropriate.

The set of ARARs will be further evaluated and defined during the FS process for each OU, after a range of remedial alternatives has been identified. This section presents an initial review of constituent-specific ARARs that may be considered when establishing cleanup goals. Because remedial alternatives have not yet been developed for the NFSS, any ARAR presented in this section should be considered preliminary. ARAR guidance is presented here to address several anticipated remedial alternatives ranging from no action to the excavation and removal of all FUSRAP-related contaminated media at the site.

An ARAR is considered "applicable" if it imposes a requirement that specifically addresses the hazardous substance, remedial action, or location found at the CERCLA site. An ARAR is considered "relevant and appropriate" if, though not applicable, it addresses problems or situations sufficiently similar to the release of the hazardous substances at the site to be well suited for the particular site. A proposed rule or guidance may be considered as a TBC, at the discretion of the lead agency decision maker, if no ARARs are available and if it is scientifically reliable and helpful.

COCs identified in the BRA include radionuclides in soil and groundwater; SVOCs in soil and groundwater; VOCs in groundwater; PCBs in soil, sediment, groundwater, and surface water; heavy metals in soil and groundwater; and other miscellaneous chemicals in soil and groundwater.

Potential ARARs set forth in this section contain specific numerical standards for constituents that have been identified as COCs at the NFSS. Constituent-specific ARARs provide health or risk-based concentration limits or discharge limitations in various environmental media (i.e., surface water, groundwater, soil, and air). The limits, detailed for specific hazardous substances, pollutants, or contaminants, are protective of human health and the environment.

3.6.1 Rules/Guidance Included as Potential ARARs or TBCs for Chemical COCs

Rules or regulations identified as potential ARARs or TBCs are listed below. A description of each rule or regulation is provided in the following sections.

- 6 New York Codes, Rules and Regulations (NYCRR) Part 375 Environmental Remediation Programs,

- EPA: Lead; Identification of Dangerous Levels of Lead, 66 Fed. Reg. 1206, January 5, 2001,

- EPA: Disposal of PCBs, 63 Federal Regulation 35384, June 29, 1998, which explained and published in final form the main rule for disposal of PCB remediation waste: 40 CFR § 761.61, and

- 6 NYCRR Part 703, Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations.

3.6.1.1 Promulgated Soil Cleanup Objectives for the New York State Brownfields Cleanup Program

<u>Rule/Regulation</u>
6 NYCRR Part 375 Environmental Remediation Programs

The rule provides for the orderly and efficient administration of New York State's Environmental Conservation Law. The requirements set forth in this rule apply to the development and implementation of remedial programs for inactive hazardous waste disposal sites, specifically under subpart 375-2, including, but not limited to, sites which are either on the national priorities list (NPL) or are being addressed by the Department of Defense (DOD) or the DOE. 6 NYCRR Part 35 develops soil cleanup objectives for specific land use categories, including sites where no restrictions would be placed on use (unrestricted), as well as for sites where land use restrictions or engineering controls may limit possible exposures (commercial and industrial).

In addition to the protection of health, soil cleanup objectives were developed to be protective of groundwater and ecological resources. The background levels of Priority List contaminants in rural soils of New York State, and maximum acceptable soil contaminant concentrations are based on visual considerations (appearance), olfactory impacts (odor), and saturation levels (Csat), among other considerations.

The New York State Department of Environmental Conservation (NYSDEC) soils cleanup objectives are promulgated regulations, and may therefore be applicable standards that are protective of human health and the environment. Soil cleanup objective levels would apply to COCs in soil. Other promulgated standards exist for remediation of PCBs in soil and for lead, and are described below.

3.6.1.2 Promulgated Standards for Lead in Soil

Rule/Regulation
EPA: Lead; Identification of Dangerous Levels of Lead, 66 Fed. Reg. 1206, January 5, 2001.

This rule establishes a hazard standard of 400 mg/kg lead in bare residential play areas and an average of 1,200 mg/kg lead in bare soil in the remainder of the yard based on an average of all other samples collected (40 CFR § 745.65(c)). If determined to be an ARAR, this rule would be used to help determine the cleanup level of lead in soil at the NFSS.

In the preamble to the rule, EPA explained the relationship of this soil hazard standard to CERCLA soil cleanup standards. Both the Toxic Substance Control Act (TSCA) and the Office of Solid Waste and Emergency Response (OSWER) programs seek to protect the health of the most susceptible population (children under 6 years of age) and to promote a program that assesses and addresses risk. Guidance for the OSWER programs is provided by the 1994 *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities* (OSWER Directive # 9355.4-12, 1994) and *Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Correction Action Facilities* (OSWER Directive # 9200.4-27P, August 27, 1998). Both OSWER and TSCA programs rely on the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) model for relating environmental levels to blood lead levels in children (U.S.EPA 2007). The IEUBK model supports use of the 400 mg/kg screening level specified in the OSWER soil lead guidance.

3.6.1.3 Promulgated Standards for PCBs in Soil

Rule/Regulation
EPA: Disposal of Polychlorinated Biphenyls (PCBs), 63 Federal Regulation 35384, June 29, 1998, which explained and published in final form the main rule for disposal of PCB remediation waste: 40 CFR § 761.61.

A spill to soil of less than or equal to 50 mg/kg that occurred before 1978 is not regulated by the PCB disposal requirements. If it cannot be determined whether all PCB waste present is pre-1978, then the waste must be managed as post-1978 waste. Also, if the Regional Administrator finds that the PCB contamination may pose a threat to human health or the environment, they may require that the waste be cleaned up.

Remediation waste includes any environmental media that contains spilled or released PCBs at any concentration. This rule provides three options for disposal of PCB remediation waste: a self-implementing option, use of existing disposal, or a risk-based disposal. Existing cleanup or disposal options include incineration, disposal in a chemical waste landfill, decontamination, and coordinated approval. Where the self-implementing option is available and the responsible party chooses to follow it, they must stop the cleanup and comply with all the requirements of §761.61(a), including notification and certification.

The self-implementing disposal option sets forth a cleanup standard of less than or equal to 1 mg/kg for unrestricted use for a high occupancy area. If remediation waste remains at concentrations of between greater than or equal to 1 mg/kg and less than or equal to 10 mg/kg, then the site must be covered with a cap. For a low-occupancy area, the cleanup level is less than or equal to 25 mg/kg. If the site is secured with a fence, remediation wastes may remain at the site at concentrations of 25 mg/kg to 50 mg/kg. Soil containing <1 mg/kg PCBs is unregulated for disposal under TSCA whether left on site or removed from the site. Alternatively, the site can follow the PCB spill cleanup policy, 40 CFR §§ 761.120 – 135, for remediation of facilities.

As a promulgated regulation, this rule would be potentially applicable to Aroclor-1254 and Aroclor-1260 in soil and sediment. Surface water and groundwater are not covered by the rule, although the rule establishes a standard for PCBs in liquids, referring to decontamination liquids.

3.6.1.4 6 NYCRR Parts 700 through 703: Water – Classes and Standards of Quality and Purity

<u>Rule/Regulation</u>
6 NYCRR Part 703, Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations.

The surface water and groundwater standards set forth in this regulation are derived from MCLs, among other values. These rules establish two kinds of specific numeric standards for groundwater quality; ambient water quality standards, and effluent limits. Effluent limits are intended to apply at the point of discharge, as an "end-of-the-pipe" standard. They are the values that will protect the uses of water for which the ambient water quality standards have been established. For purposes of potential cleanup standards, we are interested in the level of cleanliness that will allow certain uses of water. Ambient water quality standards provide that level, so they are the standards cited as potential ARARs for remediation of groundwater.

Both surface water and groundwater in New York are classified according to their best uses. Standards are developed to protect those best uses. Criteria included in 6 NYCRR Part 700 for the classification of groundwater are based on saline or total dissolved solids (TDS) content. Fresh groundwaters are those that have a chloride concentration equal to or less than 250 mg/L or a TDS concentration equal to or less than 1,000 mg/L. Another criterion for classification is potability. Fresh groundwaters are designated as class GA groundwaters and are considered to be potential sources for potable water. Saline groundwaters are designated as class GSA or GSB. GSA groundwaters can be a source of potable mineral waters, or converted to fresh potable waters through treatment, or as raw material for manufacture of sodium chloride. GSB groundwaters can be receiving waters for disposal of wastes.

All of the groundwater COCs identified at the NFSS have ambient groundwater quality standards developed for them. All of the heavy metals, as well as boron, have ambient groundwater quality standards developed for them, except for vanadium, which has a surface water quality standard established for certain uses, but no groundwater standard. Three of the radionuclide contaminants, Ra-226, Ra-228, and uranium, have ambient groundwater quality standards developed for them.

As promulgated state standards, the ambient surface water and groundwater quality standards could be considered as potential ARARs for remediation of the surface water and groundwater. No COCs were identified in surface water or sediment at the NFSS.

3.6.2 Federal and State Maximum Contaminant Levels for Chemical and Radionuclide COCs

Rules or regulations identified as federal and state MCLs are listed below. A description of each rule or regulation is provided in the following sections.

- 40 CFR§141.61, MCLs for Organic Contaminants,
- 40 CFR § 141.62, MCLs for Inorganic Contaminants,
- 40 CFR § 141.11, MCLs for Inorganic Chemicals (arsenic),
- 40 CFR § 141.66, MCLs for Radionuclides
- 40 CFR § 141.80, Control of Lead and Copper: General Requirements,
- 40 CFR § 143.3, National Secondary Drinking Water Regulations,
- 10 NYCRR Part 5, Subpart 5-1, Rules 5-1.51 and 1.52, MCLs, and
- 10 NYCRR Part 5, Subpart 5-1, Rule 5-1.41, Lead and Copper Action Levels.

3.6.2.1 Federal Maximum Contaminant Levels and Action Levels

Rule/Regulation
40 CFR§141.61, MCLs for Organic Contaminants,
40 CFR § 141.62, MCLs for Inorganic Contaminants,
40 CFR § 141.11, MCLs for Inorganic Chemicals (arsenic),
40 CFR § 141.66, MCLs for Radionuclides
40 CFR § 141.80, Control of Lead and Copper – General Requirements, and
40 CFR § 143.3, National Secondary Drinking Water Regulations.

Under the Safe Drinking Water Act (SDWA), enforceable standards are set by the National Primary Drinking Water Regulations (NPDWRs). NPDWRs include either MCLs or treatment technique requirements that are promulgated as action levels. Both an action level and an MCL are enforceable NPDWRs under the SDWA.

Secondary MCLs are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards.

In the preamble to the NCP, EPA sets forth its policy that MCLs or Maximum Contaminant Level Goals (MCLGs) above zero should generally be considered relevant and appropriate requirements for groundwater that is, or may be, used for drinking. MCLs are relevant and appropriate, rather than applicable requirements, because they were developed to apply at the tap, for water coming from a community water system. This is not the situation for groundwater, so the requirements would not be applicable.

In the State of New York, the NYSDEC has promulgated ambient water quality standards specifically to protect the quality of water for drinking. Under CERCLA, more stringent state values may be the more relevant and appropriate requirements for target cleanup levels.

3.6.2.2 State Maximum Contaminant Levels and Action Levels

Rule/Regulation
10 NYCRR Part 5, Subpart 5-1, Rules 5-1.51 and 1.52, MCLs
10 NYCRR Part 5, Subpart 5-1, Rule 5-1.41, Lead and Copper Action Levels

In the State of New York, the MCLs are promulgated and administered by the Public Water Supply section of the New York State Department of Health.

3.6.3 Potential ARARs for Radionuclide Contamination

Rules or regulations identified as potential ARARs for radionuclide contamination that are being considered and evaluated by USACE are listed below. A description of each rule or regulation is provided in the following sections.

- 10 CFR Part 20 Subpart E, Radiological Criteria for License Termination,

- 10 CFR Part 40 Appendix A: Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Waste Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content, and

- 40 CFR Part 191 Subparts A, B, and C, Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-level, and Transuranic Radioactive Wastes and

- 40 CFR Part 192 Subparts A, B, and C, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings.

3.6.3.1 Radiological Criteria for License Termination

Rule/Regulation
10 CFR Part 20 Subpart E, Radiological Criteria for License Termination

This Nuclear Regulatory Commission (NRC) rule applies to the decommissioning of NRC-licensed facilities: source, special nuclear, and byproduct material, except for uranium and thorium mill tailings already subject to 10 CFR Part 40 Appendix A. This rule provides for unrestricted site use or for release of site under restricted use conditions, which allows material to remain on site. Standards established by the rule are:

Cleanup standards:

- Unrestricted use: 25 mrem/y total effective dose equivalent (TEDE) with As Low As Reasonably Achievable (ALARA) radiation protection practices;

- Restricted use: 25 mrem/y TEDE, with ALARA radiation protection practices, durable institutional controls, license termination plan (LTP), public input, and 100 mrem/yr or 500 mrem/yr if institutional controls fail; and

- Alternate criteria: 100 mrem/yr, with ALARA radiation protection practices, LTP, and EPA and public input.

Groundwater standard:

- Groundwater is included in the 25 mrem/yr TEDE standard; the amount of radiation from all media, cumulatively, is included when calculating cleanup levels for each medium.

Radiological COCs addressed by this rule include uranium, thorium-230, radon, radium-226 and -228, and cesium-137 in both soil and groundwater. This NRC regulatory program addresses situations sufficiently similar to the circumstances of the remedial action at the NFSS that it could be relevant to the site, except for the regulatory exclusion contained in the rule for uranium/thorium mill tailings and facilities. Inactive milling sites covered by the remedial action program of the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, as amended do not require a license pursuant to 10 CFR Chapter I for possession of residual radioactive materials. This requirement would not be relevant for any material at the NFSS that would not be classified as uranium/thorium mill tailings.

3.6.3.2 *Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Waste*

Rule/Regulation
10 CFR Part 40 Appendix A: Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Waste Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content

This NRC rule applies to residual radioactive materials and materials specified in 11(e)(2) at closed, inactive, or active uranium or thorium processing facilities, as listed in the UMTRCA, added by the DOE, or under an NRC license for mill tailings management. Materials specified in 11(e)(2) are the tailings or wastes produced by the extraction or concentration of uranium or thorium from ore processed primarily for its source material content. The rule includes long-term stabilization as a design standard requirement:

(1) To be effective for up to 1,000 years to the extent reasonably achievable, and in any case for at least 200 years, and

(2) To limit average Rn-222 release rate to 20 pCi/m^2-sec or increase average concentration of Rn-222 outside disposal site by more than 0.5 pCi/L.

Cleanup criteria for unrestricted use of a property are not expressly specified in the rule, but can be extrapolated from the 5/15 pCi/g exclusion [i.e., property that does not contain levels of radium above 5 pCi/g in the first 15 centimeters (cm) of soil or 15 pCi/g in each subsequent 15 cm of soil are excluded from the requirements of this rule]. Uranium/thorium and other radionuclide soil standards are calculated in reference to a benchmark dose using levels of radium after cleanup to the 40 CFR Part 192 standards (5/15 pCi/g).

Groundwater protection standards are:

- Combined Ra-226 and Ra-228: 5 pCi/L, and
- Gross alpha particle activity (excluding radon and uranium): 15 pCi/L.

The goal of the standard is to dispose of tailings so that no active maintenance is required to preserve the conditions of the site, although waste materials remain. The standard would apply to all radionuclide contaminants at the NFSS.

The NRC regulatory program specified in 10 CFR Part 40 Appendix A addresses situations sufficiently similar to the circumstances of the remedial action contemplated at the NFSS that it could be considered relevant. However, 10 CFR Part 40 Appendix A was written for the management of mill tailings at active uranium processing facilities operated under an NRC license.

Radiological COCs addressed under this rule are uranium, Th-230, radon, and Ra-226 and -228. This rule is often used to expand on 40 CFR Part 192 criteria for active or closed mill tailings facilities, described next.

3.6.3.3 Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-level and Transuranic Radioactive Wastes

Rule/Regulation
40 CFR Part 191 Subparts A, B, and C. Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-level, and Transuranic Radioactive Wastes,

40 CFR Part 191 specifies environmental radiation protection standards for management and disposal of spent nuclear fuel, high-level and transuranic radioactive wastes, which are materials containing concentrations greater than 100 nanocuries per gram of waste of alpha-emitting transuranic isotopes, with half-lives of greater than 20 years. Subpart A of the rule sets forth management and storage standards; Subpart B of the rule sets forth disposal standards; and Subpart C of the rule sets forth groundwater standards. These three subparts will be evaluated as potential ARARs.

Subpart A does not provide for cleanup standards but stipulates that the storage of spent nuclear fuel or high-level or transuranic radioactive wastes be conducted in such a manner as to assure that the annual effective dose equivalent to any member of the public not exceed:

- 25 mrem whole body;
- 75 mrem to the thyroid; and
- 25 mrem to any other critical organ.

Subpart B specifies that disposal systems for spent nuclear fuel or high-level or transuranic radioactive wastes be designed to be effective for 10,000 years after disposal and that the annual committed effective dose to any member of the public from the disposal system not exceed 15 millirems/year. Performance assessments are required to identify processes or events that may affect the integrity of the storage system. Subpart B also requires active and passive institutional controls to indicate the dangers of the wastes and their location.

Subpart C specifies that disposal systems for spent nuclear fuel or high-level or transuranic radioactive wastes be designed to be effective for 10,000 years after disposal such that the disposal system will not cause the levels of radioactivity in any underground source of drinking water to exceed the limits specified by the national primary drinking water standards.

3.6.3.4 Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings

Rule/Regulation

40 CFR Part 192 Subparts A, B, and C, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings

This rule applies to uranium mill tailings at inactive facilities listed in Title I of UMTRCA; also called residual radioactive material. Cleanup standards in rule are:

- Radium concentrations in soil cannot exceed background by more than 5 pCi/g in the upper 15 cm of soil or 15 pCi/g in any 15 cm layer below the upper layer, averaged over an area of 100 m^2;

- Uranium in soil is calculated using a risk assessment approach. The rule includes long-term containment standards as a design performance standard;

- Remedy needs to be effective for up to 1,000 years to the extent reasonably achievable, and in any case for at least 200 years; and

- Limit average Rn-222 release rate to 20 pCi/m^2-sec or increase average concentration of Rn-222 outside disposal site by more than 0.5 pCi/L.

Groundwater protection standards are:

- Combined Ra-226 and Ra-228: 5 pCi/L,
- Gross alpha particle activity (excluding radon and uranium): 15 pCi/L.

Other requirements of the rule are that long-term surveillance and maintenance of (Title I) sites are conducted under an NRC license. Radiological COCs addressed by this rule are uranium, radon, and Ra-226 and -228.

4.0 WORK PLAN APPROACH AND RATIONALE

This work plan is intended to direct work tasks and the flow of information required for achieving consensus on decision issues, developing technical memoranda, and completing the final FS documents for the three OUs (IWCS, BOP, and Groundwater). The following sections present the rationale for developing focused FS Reports on an OU basis, technical memoranda to be developed in support of activities for each of the focused FS Reports, and specific objectives to be completed as part of the technical memoranda development process.

4.1 DISCUSSION OF OPERABLE UNITS AND THE FOCUSED FEASIBILITY STUDIES FOR THE IWCS, BOP AND GROUNDWATER OUS

As previously discussed, the following three OUs have been identified for the NFSS:

- IWCS OU,
- BOP OU, and
- Groundwater OU.

The OUs represent areas or features at the NFSS that have been grouped together for assessment, and for which:

- similar media is present (i.e., soil, groundwater, residues, wastes, etc.),
- similar evaluation methods will be used to develop remedial alternatives,
- similar cleanup criteria will be applied to the alternatives, and
- similar remediation methods are expected to be recommended.

The overall scope for each of the OUs identified above was provided in Section 3.4.

During the TPP meeting in October 2008, discussions focused on the fact that decisions made regarding the contents of the IWCS would have a direct impact on the preferred alternatives for the BOP and Groundwater OUs. For example, should it be decided to remove all of the materials from the IWCS, the preferred alternatives for the BOP and GW OUs would most likely be removal actions; possibly even complete removal actions so that there would be no need for the federal government to continue site ownership. However, should only the residues be removed from the IWCS and shipped off-site for disposal, federal ownership and land use controls would still be necessary for the IWCS. Should such an alternative be selected, the most likely alternative for the BOP OU would be one that included land use controls and continued federal government ownership. In this case, the complete removal alternative for the BOP OU would most likely not be considered practicable considering that land use controls and government ownership will be necessary due to the selected remedy for the IWCS OU.

Similarly, should the IWCS OU selected remedy involve removal and on-site storage of IWCS residues and wastes, the BOP OU complete removal alternative would most likely not be considered practicable. Likewise, decisions made for the BOP OU will have an impact on whether any further action is warranted for the Groundwater OU.

This assessment during the TPP meeting lead to the conclusion that separate focused CERCLA efforts need to be conducted for the three OUs. The IWCS OU will be addressed first since (1) this OU presents the most risk potential due to the nature of the high-activity residues stored within the IWCS and (2) the decisions made regarding the remedial actions associated with the IWCS residues and waste materials may impact the selection of viable alternatives considered for the BOP and Groundwater OUs, as discussed above. Figure 4-1 provides a schematic of the NFSS Focused CERCLA Process for the three OUs and shows how decisions from one OU will be factored into the CERCLA efforts for the other OUs. It also illustrates how the technical memoranda, as discussed later for each of the three OUs, will be integrated into each OU FS.

As illustrated in Figure 4-1, a separate, focused FS, PP and ROD will be completed for each of the three OUs. The focused FS, PP and ROD for the IWCS OU will be followed by the FS, PP and ROD for the BOP OU and then by the FS, PP and ROD for the Groundwater OU. As indicated earlier, addressing the IWCS OU prior to addressing either the BOP or Groundwater OUs will:

- allow USACE to focus initial CERCLA efforts (i.e., FS, PP and ROD) on concerns regarding the ultimate disposition of the wastes, particularly the high-activity residues, stored in the IWCS, and

- direct the selection of final alternatives for the BOP and Groundwater OUs, and determine the course for the remainder of site cleanup efforts.

All attempts will be made to streamline the schedule (document preparation and review cycle) by overlapping CERCLA phase documents for different OUs, as possible.

4.2 DOCUMENTATION OF KEY ELEMENTS IN TECHNICAL MEMORANDA AND PUBLIC ENGAGEMENT ON KEY FS REPORT ELEMENTS

USACE decided to develop technical memoranda to address specific technical areas associated with the three OUs. This allows for (1) FS efforts to begin while RI-related activities continue and (2) early public input and involvement on key technical issues that have impacts on the selection and evaluation of remedial alternatives. In the past, the public would have had to wait for the completed FS documents to be released before having an opportunity for review and comment. As shown in Figure 4-1, development of the FS Report for each of the OUs will be accomplished through the completion of technical memoranda that will document and evaluate key elements that must be addressed in the FS. Several technical memoranda will be developed to provide information necessary for addressing the protection of remediation workers, the environment and public health. This information will be used in other technical memoranda which address the development and screening of remedial alternatives and screening of technologies. Practices and procedures implemented to protect workers and the public from unacceptable exposure to ionizing radiation are likely going to be complicated and expensive, particularly for the IWCS OU. The information from these technical memoranda will assist USACE in developing a better understanding and estimate of the degree of complexity, costs and effectiveness, both short-term and long-term, for each alternative. Without this information, USACE would not be able to do a comprehensive evaluation of alternatives against the CERCLA criteria when the FS for an OU is developed.

The technical memoranda will provide a means for achieving consensus on fundamental issues necessary for the development and evaluation of remedial alternatives for the three OUs. Figure 4-2 provides an illustration of the Technical Memorandum Development Process that will be used for any technical memoranda completed for the NFSS. As shown in this figure, there are three phases and the public has opportunities for review and comment at the initiation of the technical memorandum (initiation phase) as well as when the technical memorandum has been completed (publication phase).

As illustrated in Figure 4-1, technical memoranda pertaining to the IWCS OU will be the first to be completed, followed by technical memoranda for the BOP OU and lastly, technical memoranda for the Groundwater OU. If a technical memorandum for the IWCS OU also addresses the BOP OU, the technical memorandum will not be redeveloped for the BOP OU since that technical memorandum will already exist. Several of the technical memoranda will address more than one related topic, as appropriate. The order in which technical memoranda will be completed for each of the OUs is defined as follows:

IWCS OU TECHNICAL MEMORANDA

1. Radon Assessment
2. IWCS Radiological Exposure Assessment
3. Waste Disposal Options and Fernald Lessons Learned
4. RAOs and ARARs for both the IWCS OU and BOP OU.
5. Alternatives Development and Screening of Technologies

BOP OU TECHNICAL MEMORANDA

1. Land Use Assessment and Groundwater Evaluation
2. Establishment of Radiological and Chemical Cleanup Criteria and Evaluation of Residual Results
3. Alternatives Development and Screening of Technologies
4. Volume Modeling and Results

GROUNDWATER OU TECHNICAL MEMORANDA

1. RAOs and ARARs
2. Establishment of Radiological and Chemical Cleanup Criteria and Evaluation of Residual Results
3. Groundwater Flow and Transport Model Update (Optional)
4. Alternatives Development and Screening of Technologies

The list of technical memoranda may be revised as the FS process progresses. A more detailed description of the currently envisioned objectives of each of the technical memoranda is presented in Section 5.2 of this work plan.

Because the formulation of one technical memorandum may be dependent on the conclusions of another technical memorandum, the order of completion reflects a hierarchy that has been established for the development and release of each planned technical memorandum. For example, RAOs and ARARs need to be established prior to the selection of cleanup criteria, thus the "RAOs and ARARs" technical memorandum will be completed prior to the development of the "Establishment of Radiological Cleanup Criteria and Evaluation of Residual Results" technical memorandum. The technical memoranda will be released in the order presented in this section and in Section 5.2 of this work plan. A generic schedule for the three phases of the technical memoranda development process is shown in Figure 4-3. The actual durations associated with development of the first draft of each technical memorandum will be dependent on the scope and complexity of the technical memorandum.

As shown in Figure 4-2, technical memoranda will be released to the public as they are completed to obtain stakeholder opinions concerning the topics covered by the technical memoranda. In this way, USACE will seek to consider public concerns in the evaluation of fundamental decisions prior to development of the focused FS Reports. Public comments and concerns will be integrated into the technical memoranda as appropriate. Completion of draft technical memoranda is dependent on USACE direction concerning public input. Responses to public comments on each technical memorandum will be made available on the project web site. Completed technical memoranda will be revised only if USACE determines it is necessary based on public comment. Additionally, technical memoranda will not be submitted as part of any of the OU-specific FS documents. Rather, the technical memoranda will be used as references for the FS.

4.3 DEVELOPMENT OF THE FOCUSED FS REPORTS BASED ON KEY ELEMENTS ADDRESSED IN TECHNICAL MEMORANDA

A screening of remedial action alternatives will be performed in the FS Report for each of the three OUs. However, the remedial actions alternatives cannot be developed or evaluated until certain fundamental issues are addressed, and consensus has been reached on key FS elements that will become the foundation for the detailed analysis of alternatives in the FS Report. As described in the previous section, evaluation of these key elements will be performed and the results will be presented in a series of technical memoranda to be released to the public. Specific tasks to be completed in these technical memoranda include:

- Evaluation of risk from radon exposure under various scenarios associated with the IWCS (e.g., removal of residues, earthquake, damage due to heavy equipment, burrowing animals, etc.),
- Evaluation of potential gamma doses for various scenarios associated with the IWCS (e.g., various removal scenarios, damage due to heavy equipment, etc.),
- Evaluation of current and future land use of the NFSS and surrounding properties,
- Development of RAOs,
- Determination of ARARs,
- Establishment of radiological and chemical cleanup criteria,
- Evaluation of expected residual contamination following site cleanup to specific criteria,
- Estimation of the volumes of waste generated during remediation activities,
- Screening and evaluation of remedial technologies,
- Development of remedial alternatives,
- Evaluation of disposal options,
- Assessment of lessons learned from the Fernald site remediation process, and
- Options for transporting the waste to an off-site disposal facility.

As shown in Figure 4-1, the results of the technical memoranda will be applied to the formulation of a focused FS for each OU. By completing the technical memoranda in a step-by-step process that establishes key elements and fundamental concepts for remedial action alternative analysis at the NFSS, a specific path forward will be defined for completion of the FS.

5.0 FEASIBILITY STUDY TASKS

There are a number of key FS tasks that are necessary for each of the three focused FS efforts for the NFSS. These key tasks are:

- TPP Meetings
- Technical Memoranda
- Document Reviews
- FS Report Completion

The following sections provide further details associated with each of these key tasks.

5.1 TECHNICAL PROJECT PLANNING MEETING

The USACE will conduct internal TPP Meetings when necessary to address a number of specific technical issues affecting the overall development of a specific FS effort. A TPP meeting is part of the USACE TPP Process that seeks to identify project objectives and design data collection programs at hazardous, toxic, and radioactive waste sites. The TPP process helps ensure that the requisite type, quality, and quantity of data are obtained to satisfy project objectives that lead to informed decisions (USACE 1998).

The TPP process requires a multi-disciplinary team of personnel to represent the planning perspectives of decision-making, data use, and data implementation. Attendees of the TPP meetings generally include staff members of the USACE and its contractors. The TPP process includes a deliberate effort to determine and consider concerns and interests of stakeholders. The TPP process also encourages the preparation and distribution of fact sheets, when appropriate, for communicating the data collection program to stakeholders (USACE 1998). The planned use of technical memoranda and fact sheets for communicating NFSS FS information to stakeholders is presented later in this section.

A TPP meeting was held in Buffalo, New York on October 15-16, 2008 to discuss issues that impact the overall FS effort and the approach for transitioning from the RI Phase to the FS Phase. Topics included, but were not limited to the following :

- Definition of Operable Units and Associated Scope
- Definition of "Restricted” and "Unrestricted" Land Use
- Definition of "Complete Removal"
- Land Use and Associated Impacts
  - Industrial
  - Residential
  - Limited/Restricted Residential
- Residual Risk Management
- Agreement on Soils ARARs
- Minimum Requirements Needed to Address On-site and Off-site Exposure to Groundwater Contaminants

A summary of discussion topics and decision issues from the TPP meeting is included as Appendix A to this plan. The agenda for the two-day meeting is included as Attachment 1 to this appendix and the list of attendees for each day is tabulated and included as Attachment 2.

The USACE has used the results of the October 2008 TPP to develop this work plan and will use it as the basis for further FS-related efforts and discussions. As FS efforts proceed, some of the conclusions stated in Appendix A might be modified and if so, the rationale and justification for doing so will be documented. Other TPP meetings might be conducted should the need arise during the FS efforts for each of the OUs.

5.2 TECHNICAL MEMORANDA

A list of planned technical memoranda for each OU as well as the purpose for developing technical memoranda during the FS process was presented and discussed in Section 4.2. Information included in the technical memoranda will be integrated into the focused FS Reports, as illustrated in Figure 4-1. Figure 4-2 shows that the Technical Memorandum Development Process consists of three phases: (1) Initiation Phase; (2) Development Phase; and (3) Publication Phase. The first and last phases involve the development of fact sheets, and are also the phases where public input is encouraged. Approved technical memoranda will be entered into the Administrative Record for NFSS and will be released to the public as part of the publication phase.

To ensure that the public is aware of the release of fact sheets and technical memoranda, USACE will regularly place blocks in the local newspapers (e.g., the Buffalo News, Sentinel, etc.) that announce the release dates of such documents. Availability of fact sheets and technical memoranda will also be announced through USACE's electronic list service "News from the Corps".

The development of the facts sheets and the process to be used to respond to public input during the technical memoranda initiation and publication phases are described in Sections 5.2.1 and 5.2.2, respectively. A detailed description of the objectives for each of the planned OU technical memoranda is presented later in Sections 5.2.3 (IWCS OU), 5.2.4 (BOP OU) and 5.2.5 (Groundwater OU).

5.2.1 Development of Fact Sheets

In support of the public outreach efforts, a fact sheet will be prepared for each technical memorandum during the technical memorandum initiation and publication phases, as shown in Figure 4-2. Prior to the development of a technical memorandum, the USACE will first release a fact sheet as part of the initiation phase to:

- announce the intent to issue the technical memorandum,
- state the purpose and objective of the technical memorandum, and
- request public input concerning the purpose and objective of the technical memorandum.

Fact sheets to announce the intent to develop a technical memorandum will include enough detail so that the public and stakeholders will understand the scope of the document.

A second fact sheet will be developed during the publication phase to:

- summarize key findings of the technical memorandum, and
- announce release of the technical memorandum to the public.

As previously discussed, USACE will regularly place blocks in the local newspapers (e.g., the Buffalo News, Sentinel, etc.) that announce the release of fact sheets and technical memoranda.

In addition to the fact sheets described above for the technical memoranda, an initial fact sheet will be released to the public to present the approach for completing the FS process. This fact sheet will announce the transition from the RI Phase to the FS Phase under CERCLA. The fact sheet will also introduce the intent to provide the public with greater opportunities for input on key decisions made during the FS process (via technical memoranda and public workshops). The fact sheet will describe the technical memoranda development and review process, during which public comments will be accepted and considered.

5.2.2 Response to Public Input

As indicated earlier, USACE has chosen to complete technical memoranda to encourage public input during the early phases of development for each OU FS. The opportunity for public input will be associated with the initiation phase and publication phase of the technical memorandum process, as illustrated in Figure 4-2. During the initiation phase, public input regarding the objectives of the technical memorandum will be considered by USACE. USACE will then determine if any changes to the technical memorandum objectives are necessary. The public will have another opportunity to provide input to USACE when the technical memorandum is published and released to the public. Any comments received on the published technical memorandum will be considered by USACE. USACE will then determine if any revisions to the technical memorandum are necessary or if specific issues in the development of the FS for that specific OU need to be addressed.

USACE, with assistance from its contractors, will document all comments received and the actions taken by USACE in response to the comments. The comment responses and actions taken by USACE will be made available to the public via the NFSS web site. Formal responses to the specific commenter will also be provided by USACE.

5.2.3 Development of Technical Memoranda for the IWCS OU

The rationale for development and release of technical memoranda for each of the FS OUs was presented in Section 4.2. The following sections discuss the preliminary scope and objectives for the planned technical memoranda for the IWCS OU. In some cases, a technical memorandum will address both the IWCS and BOP OUs. As stated previously, if a technical memorandum for the IWCS OU also addresses the BOP OU, the technical memorandum will not be redeveloped for the BOP OU. The following descriptions are preliminary and may differ from what will appear in fact sheets or completed technical memoranda.

5.2.3.1 Radon Assessment

The technical memorandum will present an evaluation to predict potential radon concentrations from the NFSS under various scenarios. The primary focus of this evaluation will be the estimation of radon levels emanating from residues currently stored in the IWCS under various scenarios. Predicted radon levels will be compared to federal radon standards and guidelines to assess potential health impacts from human exposures.

Scenarios associated with the IWCS that will be assessed and incorporated into the technical memorandum include:

- Removal of the K-65 residues,

- Removal of all residues (includes the K-65, F-32, L-50, and L-30 residues),

- Removal of the entire contents of the IWCS,

- Hypothetical residential habitation,
  - Construct structure on slab on top of IWCS
  - Disturb IWCS cover over K-65 residues and construct a home with a basement

- IWCS damage due to heavy equipment (both with and without corrective actions associated with stopping further radon releases),

- Earthquake damage (both with and without corrective actions associated with stopping further radon releases),

- Drilling into the residues (both with and without corrective actions associated with stopping further radon releases), and

- Burrowing animal (both with and without corrective actions associated with stopping further radon releases).

5.2.3.2 IWCS Radiological Exposure Assessment

A technical memorandum will be developed for the IWCS OU to assess potential gamma radiation exposures associated with various alternatives and failures associated with the IWCS operable unit. Potential receptors will include both remediation workers and members of the general public, including fence-line and on-site receptors. The computer codes MicroShield and/or MicroSkyShine will be used for performing the external gamma dose assessment, as appropriate, and will address scenarios similar to those identified for the Radon Assessment Technical Memorandum.

5.2.3.3 Waste Disposal Options and Fernald Lessons Learned

A technical memorandum will be developed to address the following two topics: (1) the latest waste disposal options available for the various NFSS waste streams and (2) lessons learned from the Fernald activities associated with the removal, material handling, packaging and shipment of the K-65 residues from that site.

The technical memorandum will identify the various waste disposal facilities, the latest waste acceptance criteria for each facility that may impact shipment of NFSS wastes, an estimate of disposal costs associated with various waste types for each facility, and transportation modes available for shipment of waste to the facilities. The assessment of disposal options will also include an evaluation of the recent Waste Control Specialists (WCS) license allowing for the disposal of the Fernald K-65 residues at the WCS facility. The assessment would identify whether the NFSS materials could also be disposed of at this same facility and if so, the waste acceptance criteria would be determined, particularly with respect to radiological concentrations in a given container and the acceptable waste form. The results would then be factored into any IWCS FS alternative involving the off-site disposal of the high-activity residues. The Fernald lessons learned component will, at a minimum, discuss lessons learned associated with (1) material excavation, (2) material handling and transfer, (3) packaging, (4) transportation, (5) waste disposal, (6) personnel exposures and associated controls, (7) radon abatement, and (8) radiological exposures to the public and environment. The technical memorandum will identify components that would need to be addressed in any FS IWCS alternative involving the removal of the residues from the IWCS.

5.2.3.4 RAOs and ARARs

A technical memorandum will be developed to present RAOs and ARARs <u>for both the IWCS and BOP OUs</u>. RAOs specify the requirements that remedial alternatives must fulfill in order to protect human health and the environment and provide the basis for identifying and evaluating remedial alternatives. The RAOs for the NFSS will be ARAR-based when possible, and will provide for long-term protection of human health and the environment. In order to provide this protection, media-specific objectives will be developed based on future land use, exposure routes, and receptors.

The human health risk assessment (HHRA) evaluated risks to future receptors from constituents in soils from 0-0.5 ft (surface soil) and 0-10 ft bgs (soil). The evaluation of the depth interval from 0-10 ft bgs assumed that soil at depth could be brought to the surface during future excavation. Final COCs identified in either interval will be addressed in the FS Report. Preliminary RAOs for the IWCS and BOP OUs were presented in Section 3.5 of this plan.

A list of ARARs will be developed for use in selection of potential remedial alternatives. These ARARs will also be used as a starting point for discussions with the regulatory agencies for establishing cleanup goals for all future receptors evaluated in the BRA. Paragraph 6.2.3 of the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* and the NCP (40 CFR 300.430(d)(3) & (4)) will be used as guidance for addressing the relationship of ARARs and future receptors identified in the BRA.

An ARAR matrix will be developed that will identify the citation, regulation, and a brief explanation of why a regulation is (or is not) applicable, relevant and appropriate, or "to be considered" (TBC).

5.2.3.5 Alternatives Development and Screening of Technologies

A technical memorandum will be developed to identify and detail various remedial alternatives for the IWCS OU. It is anticipated that through development of this technical memorandum, a list of alternatives to carry forward for detailed analysis in the FS Report will be finalized. The alternatives will be screened on a general basis with respect to their effectiveness, implementability, and qualitative cost. The technical memorandum will not include a detailed cost estimate for each alternative, nor perform an assessment of each alternative to the nine CERCLA criteria or a comparative analysis of the various alternatives against each other. These evaluations will be performed in the Feasibility Study document. <u>Alternatives selected for</u>

detailed analysis will have the prior approval of the USACE before implementation of the analysis.

As part of the alternative identification process, the following tasks will be completed:

- Develop waste volumes associated with each of the alternatives using the volumes of residues and waste materials known to have been placed in the IWCS by the DOE.
- Compute residual risks for each alternative.
- Evaluate groundwater flow and transport associated with each IWCS removal alternative.

The technical memorandum will also present the identification and screening of waste treatment technologies. The screening process will ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics are considered. The screening will be based primarily on a technology's ability to effectively address the contaminants at the site, but will also take into account a technology's implementability and cost. The technical memorandum will identify treatability studies and/or additional modeling that may be warranted for technologies that represent probable candidates for consideration during the detailed analysis of alternatives. The technical memorandum will document the results of the technology screening effort and the basis for which technologies will be considered for each of the identified alternatives.

5.2.4 Development of Technical Memoranda for the BOP OU

The rationale for development and release of technical memoranda for each of the FS OUs was presented in Section 4.2. The following sections discuss the preliminary scope and objectives for the planned technical memoranda for the BOP OU. The technical memorandum, RAO and ARARs, to be developed for the IWCS OU will also address the BOP OU and thus, will not be discussed in the following technical memoranda descriptions for the BOP OU. A description of the RAO and ARARs technical memorandum is presented in Section 5.2.3.4 of this plan.

5.2.4.1 Land Use Assessment and Groundwater Evaluation

A technical memorandum will be developed for the BOP OU to evaluate plausible future land uses for the NFSS and to evaluate the possible uses, if any, of groundwater at the site. Future land uses will, in part, be determined on the basis of current surrounding land uses, local zoning ordnances, etc. A future land use checklist has also been developed for the former LOOW (including the NFSS), which will be utilized for the determination of future land use. However, to adequately evaluate future land use and to clearly develop cleanup criteria for the site, consensus needs to be reached on whether the groundwater associated with the UWBZ should be treated as a viable source of drinking water. The sustained yield of the UWBZ and the NYSDEC classification of the groundwater in the UWBZ will be addressed in this technical memorandum. If the UWBZ is considered to be a viable source of drinking water, then the development of cleanup criteria will need to account for the protection of groundwater in the UWBZ.

5.2.4.2 Establishment of Radiological and Chemical Cleanup Criteria and Evaluation of Residual Results

A technical memorandum for the BOP OU will be developed to establish radiological and chemical cleanup criteria and evaluate the residual results. The technical memorandum will summarize regulatory requirements, present modeling assumptions, describe target receptors, and document results related to the benchmark dose and concentration-based standards for the radiological COCs. In developing the radiological cleanup criteria, the K_d for uranium may need to be updated to reflect more recent RI findings. The K_d is a transport parameter that relates the adsorbed constituent concentration to the dissolved constituent concentration. Higher values of K_d represent increased contaminant adsorption and therefore, increased retardation of solutes in groundwater. The initial use of a low K_d for the UWBZ (3.6 L/kg) was conservative and simulated uranium contamination in groundwater that is not actually observed. A K_d of 3.6 L/kg will continue to be used for the 1-D modeling of the residues and wastes inside the IWCS since this value reflects the actual K_d data from the residues. Because the level of contaminant mass in the residues is not present in the BOP soils, a more representative K_d will be used for any 3-D fate and transport model to simulate actual soil conditions at the site. The updated K_d value will be greater and will better reflect observed site conditions. The percentage of water to be used by potential receptors will need to be determined and will be accomplished in the technical memorandum addressing land use and groundwater. Cleanup criteria for chemical COCs will be based on ARARs, or will be risk-based where ARAR numeric standards are not available.

Soil cleanup levels for the BOP OU will be developed to ensure that there will be no unacceptable future impacts to the environment, including the surface water and groundwater systems. Potential human exposure to residual chemical and radiological concentrations remaining after the hypothetical removal of contaminated environmental media will be addressed. This assessment will present expected residual concentrations after removal to satisfy ARARs, and will assess compliance with dose-based, risk-based, and concentration-based standards and guidelines, as appropriate. Both residential and industrial worker receptors will be considered, utilizing modeling parameters consistent with the FS. This technical memorandum will include an assessment of changes to the SESOIL fluxes and impacts on groundwater fate and transport after remediation to residential and industrial cleanup criteria as discussed above.

Additionally, this technical memorandum cannot be completed until resolution or completion of the following decision issues and technical memoranda.

- Consensus on "Restricted" versus "Unrestricted"
- Definition of "Complete Removal"
- Land Use Assessment and Groundwater Evaluation
- Remedial Action Objectives and ARARs

5.2.4.3 Alternatives Development and Screening of Technologies

A technical memorandum will be developed to identify and detail various remedial alternatives for the BOP OU. It is anticipated that through development of the technical memorandum, a list of alternatives to carry forward for detailed analysis in the FS Report will be finalized. The alternatives will be screened on a general basis with respect to their effectiveness, implementability, and qualitative cost. The technical memorandum will not include a detailed cost estimate for each alternative, nor perform an assessment of each alternative to the nine

CERCLA criteria or a comparative analysis of the various alternatives against each other. These evaluations will be performed in the Feasibility Study document. Alternatives selected for detailed analysis will have the prior approval of the USACE before implementation of the analysis.

The technical memorandum will also present the identification and screening of waste treatment technologies. The screening process will ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics are considered. The screening will be based primarily on a technology's ability to effectively address the contaminants at the site, but will also take into account a technology's implementability and cost. The technical memorandum will identify treatability studies and/or additional modeling that may be warranted for technologies that represent probable candidates for consideration during the detailed analysis of alternatives. The technical memorandum will document the results of the technology screening effort and the basis for which technologies will be considered for each of the identified alternatives.

5.2.4.4 Volume Modeling and Results

A technical memorandum will be developed for the BOP OU to document volume modeling efforts. The technical memorandum will present:

- features of the site conceptual model that are relevant to volume calculations,
- methods utilized to develop volume estimates,
- data inputs,
- volume estimate and uncertainty thereof, and
- recommendations for actions to reduce unacceptable uncertainties.

Considerable progress on the volume modeling for NFSS was made under a previous contract as described below.

- A conceptual model document was developed.

- A methodology document was developed.

- Draft radiological and chemical cleanup criteria were developed and discussed with USACE; however, consensus on the cleanup criteria has not yet been reached.

- Substantial progress was made in developing preliminary volume estimates by analyzing available site data using the agreed-upon methodologies and various sets of draft cleanup criteria.

Major outstanding items from these previous efforts include 1) reaching consensus upon radionuclide and chemical cleanup criteria, 2) continuing data analysis to develop volume and uncertainty estimates (using agreed-upon methodologies, cleanup criteria, etc.), and 3) developing a volume modeling technical memorandum that will capture all the elements of the volume modeling process.

The technical memorandum will be developed using selected chemical and radiological cleanup criteria.

5.2.5 Development of Technical Memoranda for the Groundwater OU

The rationale for development and release of technical memoranda for each of the FS OUs was presented in Section 4.2. The following sections discuss the preliminary scope and objectives for the planned technical memoranda for the Groundwater OU.

5.2.5.1 RAOs and ARARs

A technical memorandum will be developed to present RAOs and ARARs for the Groundwater OU. RAOs specify the requirements that remedial alternatives must fulfill in order to protect human health and the environment and provide the basis for identifying and evaluating remedial alternatives. The RAOs for the NFSS will be ARAR-based when possible, and will provide for long-term protection of human health and the environment. In order to provide this protection, media-specific objectives will be developed based on future land use, exposure routes, and receptors. Preliminary RAOs for the Groundwater OU was presented in Section 3.5.3 of this plan.

A list of ARARs will be developed for use in selection of potential remedial alternatives. These ARARs will also be used as a starting point for discussions with the regulatory agencies for establishing cleanup goals for all future receptors evaluated in the BRA. Paragraph 6.2.3 of the *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* and the NCP (40 CFR 300.430(d)(3) & (4)) will be used as guidance for addressing the relationship of ARARs and future receptors identified in the BRA will be.

An ARAR matrix will be developed that will identify the citation, regulation, and a brief explanation of why a regulation is (or is not) applicable, relevant and appropriate, or "to be considered" (TBC).

5.2.5.2 Establishment of Radiological and Chemical Cleanup Criteria and Evaluation of Residual Results

A technical memorandum for the Groundwater OU will be developed to establish radiological and chemical cleanup criteria and evaluate the residual results. The technical memorandum will summarize regulatory requirements, present modeling assumptions, describe target receptors, and document results.

Potential human exposure to residual chemical and radiological concentrations remaining after the hypothetical removal of contaminated environmental media will also be addressed. This assessment will present expected residual concentrations after removal to satisfy ARARs, and will assess compliance with dose-based, risk-based, and concentration-based standards and guidelines, as appropriate. Both residential and industrial worker receptors will be considered, utilizing modeling parameters consistent with the FS.

5.2.5.3 Alternatives Development and Screening of Technologies

A technical memorandum will be developed to identify and detail various remedial alternatives for the Groundwater OU. It is anticipated that through development of the technical memorandum, a list of alternatives to carry forward for detailed analysis in the FS Report will be finalized. The alternatives will be screened on a general basis with respect to their effectiveness, implementability, and qualitative cost. The technical memorandum will not include a detailed cost estimate for each alternative, nor perform an assessment of each alternative to the nine CERCLA criteria or a comparative analysis of the various alternatives against each other. These evaluations will be performed in the Feasibility Study document. Alternatives selected for detailed analysis will have the prior approval of the USACE before implementation of the analysis.

The technical memorandum will also present the identification and screening of waste treatment technologies. The screening process will ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics are considered. The screening will be based primarily on a technology's ability to effectively address the contaminants at the site, but will also take into account a technology's implementability and cost. The technical memorandum will identify treatability studies and/or additional modeling that may be warranted for technologies that represent probable candidates for consideration during the detailed analysis of alternatives. The technical memorandum will document the results of the technology screening effort and the basis for which technologies will be considered for each of the identified alternatives.

5.2.5.4 Groundwater Flow and Transport Model Update (Optional)

The need for this technical memorandum is dependent on which remedial actions are selected for the IWCS and BOP OUs. Should groundwater concerns continue to be an issue after selecting remedies for the IWCS and BOP OUs, USACE will decide on the necessity and scope of this technical memorandum.

5.2.6 Document Review Cycles

During the FS Phase for each of the OUs, there will be a number of documents that will require various levels of reviews and approvals before they are considered final, released to the public and placed into the administrative record. Some documents will require reviews and approvals at all levels within USACE (i.e., Buffalo District, Environmental and Munitions Center of Expertise (EM-CX), Great Lakes and Ohio River Division (LRD), and Headquarters (HQ)), some will require limited USACE reviews and approvals (i.e., District and EM-CX), and some will require only USACE District review and approval. Additionally, some documents will require independent technical reviews (ITRs) prior to submittal to USACE. Key documents requiring formal reviews and approvals prior to release to the public, and their associated review and approval levels are:

- Fact Sheets – USACE Buffalo District review and approval,
- Technical Memorandum – ITR and limited USACE (i.e., District and EM-CX) review and approval,
- FS Report – ITR and all levels of USACE review and approval, and
- Responses to Public Comments - USACE Buffalo District review and approval.

The duration and scheduling of reviews will be dependent on the specific document and the level of complexity associated with that document. A typical review cycle duration is 30-60 days for each USACE review. Further details regarding the level of reviews and approvals for the FS-related documents and other FS-related efforts (e.g., Frequently Asked Questions database, Poster Displays, etc.) are presented in Section 8.2.1 and 8.2.2.

As indicated above, ITRs will be performed on certain documents. The ITR process and forms to be used are described in Section 8.2.3. For each USACE review of draft documents, the comments received will be tabulated and specific responses to each comment will be documented in a response package. The USACE reviewer will then determine if the response adequately addresses their comment. All comments must be completely resolved before the revised draft of the document is released for the next level of review. Responses to all USACE comments will be included in the Project Records file and will not be placed in the Administrative Record. Responses to any public comments will be reviewed and approved by the USACE Buffalo District. These responses will be provided back to the commenter as well as being posted on the NFSS web site. Only responses to public comments will be placed in the Administrative Record.

5.2.7 FS Report Development

The information presented in the proposed technical memoranda will form the basis for completion of the focused FS reports for the IWCS, BOP, and Groundwater OUs. The FS reports will be developed according to the document, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (U.S. EPA 1988).

5.2.7.1 FS Report Outline

A generic, preliminary outline for the focused FS report has been developed and is provided in Appendix B of this plan. Each focused FS report for the IWCS, BOP, and Groundwater OUs will, at a minimum, address the following main topics:

- RAOs and future land use,
- COCs,
- ARARs,
- Cleanup criteria, if applicable,
- Extent and volume of wastes,
- Screening of technologies,
- Development and analysis of remedial alternatives,
- Agency coordination and public involvement, and
- Conclusions and recommendations.

5.2.7.2 Alternative Screening Process

Remedial alternatives for each NFSS OU will be identified as part of a technical memorandum developed for each OU. Under the CERCLA remedy selection process, identified remedial alternatives will be initially screened to determine which, if any, represent potentially viable options for addressing site remediation. Alternatives that pass this screening step will be retained for further evaluation. A detailed evaluation of each alternative will be performed to provide the basis and rationale for identifying a preferred remedy. A comparative analysis of alternatives will follow to evaluate the performance of the alternatives relative to each other.

Each focused FS report will evaluate alternatives for a single OU (i.e., IWCS, BOP, or Groundwater). One alternative for each OU will ultimately be chosen as a remedy for the NFSS. The preferred remedial alternative for each OU will be suggested in a PP and set forth in final form in a ROD.

Detailed Analysis of Alternatives

The detailed analysis of alternatives will consist of the review and presentation of the relevant information needed to ensure the selection of an appropriate site remedy for each NFSS OU. Individual detailed analysis of each alternative will be performed through the use of nine evaluation criteria presented in the NCP. These nine criteria are grouped into threshold criteria, balancing criteria, and modifying criteria.

Threshold Criteria

Two threshold criteria must be met by any remedy in order for that remedy to be selected. These criteria are:

1. Overall protection of human health and the environment
2. Compliance with ARARs (or provide grounds for invoking an ARAR waiver)

Alternatives that do not protect human health and the environment or comply with ARARs will be eliminated from further consideration.

Balancing Criteria

Five balancing criteria represent primary criteria used during the detailed analysis and comparison of alternatives. These criteria are:

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

Modifying Criteria

Two modifying criteria will be evaluated as part of the PP and ROD. Although assessment of state concerns may not be complete until comments on the RI/FS are resolved, they will be discussed to the extent possible in the PP issued for public comment. The two modifying criteria are:

1. State acceptance
2. Community acceptance

The individual analysis will include:

- a technical description of each alternative that outlines the waste management strategy involved and identifies the ARARs associated with each alternative, and

- a discussion profiling the performance of that alternative with respect to each of the evaluation criteria.

A table summarizing the results of this analysis shall be prepared and included in each OU FS Report.

Comparative Analysis of Alternatives

After the individual analysis is complete, alternatives will be compared and contrasted to one another with respect to each of the evaluation criteria. In the comparative analysis of alternatives, results of the individual detailed analyses will be arrayed so as to evaluate the relative performance of each alternative in relation to each specific evaluation criterion. The comparative analysis will seek to identify advantages and disadvantages of each alternative relative to the other alternatives. Differences among the alternatives may be evaluated both quantitatively and qualitatively.

All alternatives will be evaluated to determine the best alternative for this site. The outcome of the evaluation will support selection of a remedy that is protective of human health and the environment, meets ARARs, and can be implemented in a reasonable period of time.

5.2.7.3 Supporting Information

All data, information, and calculations used in support of a specific OU FS effort will be included as appendices to the focused FS Reports, as appropriate, unless previously released as part of a technical memorandum. Each FS Report will be prepared in the following standard format:

- All site drawings should be of engineering quality with sufficient detail to show interrelations of major features on the site map (i.e., north arrows, keys, scales, etc.). When drawings are required, data shall consist of 8-1/2" by 11" pages with drawings folded, if necessary, to this size.

- A decimal paragraphing system will be used. The reports will be submitted in three-ring hardcover binders. A report title page shall identify the report title, name of the Contractor, USACE - Buffalo District, and the date. The Contractor identification will not dominate the page. Also, the contractor's logo will not appear on the page.

- Documents should be screened for potential violation of the 1974 Privacy Act prior to submittal.

- The Contractor will prepare any necessary data sets required for this project in accordance with USACE document *Policies, Guidance, and Requirements for Geospatial Data and Systems*, ER 1110-1-8156 (USACE 2005). Such files will become property of (and delivered to) USACE Buffalo District on optical media at the conclusion of the FS Report efforts.

6.0 COSTS AND KEY ASSUMPTIONS

Funding for the NFSS Project comes from the national FUSRAP budget appropriated by Congress each year. Various districts of USACE implement FUSRAP at multiple sites across the country. Historically, the annual national FUSRAP budget has been approximately $140 million. This budget supports approximately 25 FUSRAP projects distributed over three USACE Divisions and six USACE Districts. The Buffalo District receives a percentage of that total budget to address CERCLA activities on 11 FUSRAP sites, including NFSS. The percentage of the annual FUSRAP budget allocated for the NFSS is dependent upon national priorities within FUSRAP and priorities within the Buffalo District. The annual funding levels allocated to the NFSS are used to support Environmental Surveillance activities, site operations and maintenance, and contractor and USACE personnel labor to conduct the RI/FS and community outreach activities. The priority for available funding is given to maintaining and monitoring the site to ensure the protection of human health and the environment. The remaining funds are used to advance progress on the RI/FS. For example, USACE gives project sites in active remediation (or environmental cleanup) priority to receive funding. Using the focused CERCLA approach discussed earlier in Section 4 will allow for the USACE to address the site in phases and focus on the main area of concern at the site, the IWCS.

As indicated above, the past annual FUSRAP budget appropriated by Congress has been approximately $140 million and only a portion of this budget will be allocated annually to the USACE Buffalo District for the NFSS remedial efforts. Should removal actions be selected as the preferred remedy in the IWCS ROD, congressional action would be required to secure additional funding. When FUSRAP efforts were transferred to USACE in October 1997, USACE evaluated past DOE estimates for remedial actions at the site and in 1999 established their own estimates ranging from $285 million to $435 million for removal of highly radioactive residues only to removal of all waste, respectively (USACE 1999). Escalating the costs associated with removal of all waste to 2009 costs would result in the estimate being approximately $687 million, which far exceeds any past annual FUSRAP budget, or any portion of this budget granted to the USACE Buffalo District for the NFSS. There are uncertainties with these estimates, therefore USACE evaluated the actual costs associated with the DOE experiences at the Fernald site in Ohio where K-65 residues were removed from silos, processed, packaged and shipped off-site for disposal.

Actual costs for the design, construction, and operation of the facilities (including the radon control system) necessary for the removal, treatment, packaging and transportation of the Fernald K-65 residues in Silos 1 and 2 totaled $488.6 million versus the estimate in the ROD of approximately $55.6 million (DOE 2006). This cost did not include the final additional disposal costs nor did it include the costs associated with the disposition of the buildings and equipment used for processing the K-65 residues. Considering these additional costs, the total costs for handling the K-65 residues at Fernald is approximately $0.5 billion or more. The actual treatment operations and transport to the disposal facility and associated storage costs ran for approximately one year with an associated cost of $111.4 million ($49 million for Operations & Maintenance / $62.4 million for Transportation & Disposal/Storage) (DOE 2006). Based on these results, a more realistic estimate for the removal of the residues and other waste from the IWCS would be expected to be much greater than the actual costs at Fernald associated with removal of the residues from Silos 1 and 2. These silos were above the ground surface and were easily accessible for retrieving the residues from the silos. Also, the residues were not co-mingled with other waste and debris as is the case at NFSS. Retrieval of the residues from the IWCS will be much more complicated than the effort at Fernald since the residues are at the bottom of building structures with other waste and debris placed over them. More detailed cost estimates for each alternative will be developed during the feasibility study efforts for the specific operable unit. However, based on the actual costs for the removal of the K-65 residues at Fernald, the costs associated with removal of only the residues could be as much as $1 billion or more.

The total cleanup costs for the entire Fernald site was $4.4 billion (Fluor Fernald 2006). DOE was able to accomplish this by obtaining additional funding through their budgeting and appropriations process (e.g., line item funding, etc.) and were not limited to an annual program budget of approximately $140 million for multiple sites as is the case for FUSRAP.

The remediation effort at the NFSS will have some of the same components of the Fernald cleanup program (i.e., contaminated structure removal, soil and groundwater remediation, possible removal of radioactive residues and associated waste); however, as indicated above, the K-65 wastes at Fernald were stored in aboveground silos and were much more accessible than wastes and residues stored in the IWCS. Excavation of the NFSS residues from the IWCS will require careful removal of the landfill cap and overburden materials. The Fernald remediation also involved removal of a large number of structures, which would not be the case at the NFSS. As a result the overall budget for the NFSS project is expected to be similar to that of Fernald. Cost estimates for the NFSS will be developed following "*A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*" (U.S. EPA 2000). Obtaining the necessary funding for the complete remediation of the NFSS will ultimately require congressional action if the annual allocation from the FUSRAP budget for the NFSS remains as it has been historically, which is insufficient for implementation of selected remedial actions at the NFSS.

7.0 SCHEDULE

The overall schedule for the three focused FS activities will span many years and is dependent on available funding. Although USACE is still involved in finalizing the RI Phase for the NFSS, transition to the FS Phase is underway. Initial FS efforts involve addressing technical matters (i.e., technical memoranda) that are not dependent on the final RI results.

Technical memoranda that cannot be completed without final RI results include the *Establishment of Radiological and Chemical Cleanup Criteria and Evaluation of Residual Results* for both the BOP and Groundwater OUs, the *Volume Modeling and Results* for the BOP OU, and the *Groundwater Flow and Transport Model Update* for the Groundwater OU. The completion of all other planned technical memoranda is not dependent on the schedule for completion of the RI.

Upon initial implementation of this work plan and the proposed approach for completing a separate focused FS for each of the three OUs, an overall project schedule will be developed to reflect (1) the focused FS approach and (2) current and projected FS funding. Most of the current NFSS funding is being utilized to further address public concerns on the RI and to finalize the RI Phase for the NFSS. After RI efforts are complete, additional funding should be available for FS-related efforts. The FS schedule will be updated accordingly to reflect any funding changes. The project schedule for the various focused FS activities will be updated internally on a quarterly basis, at a minimum. The project schedule will also reflect two planned public information workshops per year that will be conducted as part of the USACE public outreach efforts discussed in Section 9.0. The public will be updated on the project schedule during these public workshops.

The key components and sequence of activities for the overall FS schedule are illustrated in Figure 4-1. The IWCS OU FS activities would be scheduled first, followed by the BOP OU FS activities and then the Groundwater OU FS activities. As USACE begins development of the IWCS OU FS, the FS efforts (e.g., technical memoranda) for the BOP OU could begin if funding is available. The BOP OU FS efforts could continue while the IWCS OU FS efforts were being completed; however, the BOP OU PP development could not be completed until there is an approved ROD for the IWCS OU. The same is true for the scheduling of the Groundwater OU FS activities. As USACE begins development of the BOP OU FS, the FS efforts (e.g., technical memoranda) for the Groundwater OU could begin if funding is available. The Groundwater OU FS efforts could continue while the BOP FS efforts were being completed; however, the Groundwater OU PP development could not be completed until there is an approved ROD for the BOP OU.

8.0 PROJECT MANAGEMENT AND QUALITY ASSURANCE

The following sections provide an overview of the project management structure and quality assurance process that will be used to direct completion of the NFSS FS and ensure that defensible technical documents are produced.

8.1 PROJECT MANAGEMENT STRUCTURE

In 1997, Congress designated the USACE as the lead Federal agency for implementing the FUSRAP according to protocols set forth in CERCLA. The NFSS is one such designated FUSRAP site. Environmental investigation and remediation activities at the NFSS are managed by the USACE Buffalo District.

USACE Buffalo District has assembled a Project Delivery Team (PDT) to conduct the FS process and complete the FS Reports for NFSS. The PDT consists of USACE personnel and its contractors who hold expertise in key disciplines necessary to address FS issues related to the NFSS. Key roles to be filled by USACE personnel include the NFSS-LOOW Program Manager and the NFSS Project Manager, among other USACE Buffalo District personnel. Key roles and disciplines within the USACE PDT are listed below.

USACE Personnel Key Disciplines/Roles
NFSS-LOOW Program Manager
NFSS and LOOW Project Managers
NFSS and LOOW Project Engineers
FUSRAP Program Manager
Risk Assessor
Hydrogeologist
Health Physicist
Chemist
Legal Counsel
Site Superintendent
Industrial Hygienist
Contracting Officer
A-E Contractor Program Manager
Outreach Program Specialist
Real Estate
Environmental Engineering Team Leader
Chief, Environmental Branch
Senior Technical Specialist

USACE has contracted with SAIC and HGL to provide technical expertise in the fields of environmental science and remediation, and groundwater modeling, respectively. Completion of FS tasks and compilation and presentation of all related FS information will be prepared by USACE and its contractors; however, release of information to the public will proceed only as directed by USACE. USACE will also utilize the resources of companies with the expertise and experience associated with handling high activity residues similar to those stored within the IWCS.

Additionally, the USACE EM-CX Legal, LRD and HQ will be consulted as necessary in support of the FS process and will review major document submittals to ensure compliance with regulations and legal issues, and provide consistency with other USACE projects.

8.2 PROJECT QUALITY ASSURANCE

During the FS process, adequate document review will be performed to assure the accuracy, quality, and completeness of information used to report FS findings to stakeholders. Consistent with the RI, this process will meet the requirements for an FS as described in the directive *"Guidance for conducting Remedial Investigations and Feasibility Studies Under CERCLA"* (U.S. EPA 1998). A brief summary of the document review hierarchy, documents requiring review, and the ITR process is included in the sections below.

8.2.1 Document Review Cycles

Documents generated during the FS Phase for each of the OUs will be reviewed and approved at various levels. The necessary levels of review are dependent on the document being reviewed. The levels of review and approval, designated L1 through L3 in order from first to last, are as follows:

1. USACE Buffalo District PDT Review and Approval (L1)
2. USACE EM-CX Review and Approval (L2)
3. USACE LRD/HQ Review and Approval (L3)

The duration for each of these levels of review and approval will be dependent on the document being reviewed. For example, the more complex technical documents will require a longer review and approval cycle than would be necessary for a fact sheet.

Although most documents will require all three levels of review and approval, some documents will be reviewed and approved by only the USACE Buffalo District PDT (L1). For documents requiring more than one level of review and approval, documented comments and response packages will be required for each review. Before a document can proceed to the next level of review and approval, all comments must be addressed, and the USACE commenter(s) must concur with the comment response(s). Upon completion of the final review and approval level, the document will be finalized and published.

8.2.2 Documents Requiring Review

The following documents will be formally reviewed during the NFSS FS process. The level of review(s) is also noted.

- FS Work Plan (L1, L2, L3),
- Fact sheets (L1),
- Technical memorandums (L1, L2, L3),
- Transcripts of public meetings (L1),
- Poster displays (L1),
- Responsiveness summaries to public comments (L1),

- Frequently Asked Questions database updates (L1), and
- Feasibility Study report for each OU (L1, L2, L3).

8.2.3 Independent Technical Reviews

An ITR will be performed for each major deliverable. The ITR submittal to USACE will include a response package detailing review comments and resolution of those comments.

The review will be accomplished by an ITR team composed of an individual or individuals having experience in disciplines involved in the type of product being developed and reviewed, and who were not directly involved in the product's development. Also, personnel performing the ITR must have different supervision than those individuals producing the product. This is to ensure that a truly independent technical review is accomplished. The ITR team for the NFSS FS is designated in the most recent QCP Addendum (USACE 2008b). Representatives from companies used for the Fernald project who have expertise and experience handling the K-65 residues will be performing independent technical reviews of select NFSS FS deliverables.

An ITR will be performed on all specified products, including, but not limited to, work plans, technical memoranda, and reports. An ITR Certification will be attached to submittals when they are submitted to USACE for review. The ITR will focus primarily on conformance to the approved design and appropriate technical criteria for function, reliability, and safety.

8.2.3.1 Response Packages

ITR response packages will include a review form that lists reviewer comments and resolution of those comments. Following resolution of all comments, the ITR personnel responsible for review of the document signs the completed ITR form indicating acceptance of the comment resolutions. The signed ITR form will be submitted to USACE with the reviewed document. A copy of a representative ITR form to be used for all ITRs for this project is included in Appendix C of this plan. Both forms in Appendix C must be completed for a required ITR, even if the individual performing the ITR has no comments.

9.0 COMMUNITY RELATIONS

During the FS Phase, USACE will seek to respond to public and stakeholder concerns in a timely and professional manner. To promote acceptable and beneficial community relations and to provide the public with greater opportunities for input, USACE will be approaching the development of the FS so as to encourage public involvement and input at various stages of decision-making and data evaluation. In support of this effort, dissemination of information to the public will be in the form of fact sheets, technical memoranda, public workshops, and a Frequently Asked Questions (FAQ) database, as described in the following sections.

9.1 FACT SHEETS AND PUBLIC REVIEW OF TECHNICAL MEMORANDA

The USACE will release fact sheets during the FS process for several situations including:

- to announce the intent to develop a technical memorandum and to present the objectives of the technical memorandum,
- to announce the completion of a technical memorandum, and
- to announce the release of a major FS report submittal (i.e, work plans, final reports, etc.) to the public.

A fact sheet that announces the intent to develop a technical memorandum will be specific enough to ensure that the public understands the scope of the proposed document. Public input will be sought concerning the objectives of the proposed technical memorandum. The date when input from the public is due will be noted in the fact sheet.

During development of each technical memorandum, the USACE will consider the comments received on the objectives. A second fact sheet will be released to announce the completion of a technical memorandum. The public will again be provided the opportunity to comment on each completed technical memorandum. Responses to public comments on each technical memorandum will be made available on the project website. In this manner, the public will be given the opportunity for review and comment during development of the FS.

To ensure that the public is aware of the release of fact sheets and technical memoranda, USACE will regularly place blocks in the local newspapers (e.g., the Buffalo News, Sentinel, etc.) that announce the release dates of such documents. Availability of fact sheets and technical memoranda will also be announced through USACE's electronic list service "News from the Corps".

9.2 PUBLIC INFORMATION WORKSHOPS

To promote stakeholder involvement in the FS process and provide information on the progress of the FS, USACE will schedule several public information workshops. These public information workshops will include a brief presentation of the status of the FS, but will mainly provide a forum for USACE to address public questions concerning the progress of the FS including the development of technical memoranda. Each workshop will include a round-table discussion session where the public will be engaged in a dialog with the USACE technical team regarding key FS issues.

9.3 RESPONSIVENESS SUMMARY AND FAQ DATABASE

A Responsiveness Summary for the FS will be compiled that will record responses to all questions and comments submitted by the public. Questions from the public may be submitted by mail or during public meetings or workshops as direct questions or from comment cards. Recorded transcripts from all public meetings and workshops will also be reviewed to identify public concerns requiring a response from USACE.

The Responsiveness Summary will be updated following each public information workshop. USACE will review each response to the public for consistency, accuracy, and clarity. Upon USACE approval of the responses to public comments and questions, the Responsiveness Summary will be made available to the public through the FAQ database. The FAQ database can be easily accessed and searched by the public using key words.

10.0 REFERENCES

Acres American, Inc. 1981. Hydrologic and Geologic Characterization of the DOE-Niagara Falls Storage Site. Prepared for NLO, Inc., September 30, 1981

Battelle 1980. *Interim Summary Report on the Comprehensive Radiological Survey of the DOE-Niagara Falls Storage Site.* Prepared by B.S. Ausmus, J.F. Dettorre, and T.L. Anderson for the USDOE Remedial Action Program, August 1980.

Battelle 1981a. *Final Report on a Comprehensive Characterization and Hazard Assessment of the DOE-Niagara Falls Storage Site.* Prepared for USDOE, June 1981

Battelle 1981b. *Comprehensive Characterization and Hazard Assessment of the DOE-Niagara Falls Storage Site.* Prepared for USDOE, May 1981.

Bechtel National, Inc. (BNI). 1982. Niagara Falls Storage Site Long-Range Planning Study, Phase II. Prepared for USDOE, September 1982.

BNI 1986a. "Internal Memorandum for K-65 Waste Volume", From M.G. Jones to W.C. Borden. April 1986.

BNI 1986b. *Niagara Falls Storage Site Annual Site Environmental Monitoring Report, Lewiston, New York, Calendar year 1985.* Prepared for USDOE, April 1986.

BNI 1986c. *Closure/Post-Closure Plan for the Interim Waste Containment Facility at the Niagara Falls Storage Site.* Prepared for USDOE-Oak Ridge, May 1986.

BNI 1990. Preliminary Assessment for Niagara Falls Storage Site, Lewiston, New York. Prepared by J.F. Gonzales and L.A Martin for USDOE, May 1990.

BNI 1994a. Geologic Report, Niagara Falls Storage Site, Lewiston, New York. Prepared for USDOE, June 1994.

BNI 1994b. *Failure Analysis Report, Niagara Falls Storage Site, Lewiston, New York.* Prepared for USDOE, Oak Ridge Operations Office, November 1994

Department of Energy (DOE). 1982. Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works. Prepared by the Aerospace Corporation. November 1982.

DOE 1986. *Final Environmental Impact Statement, Long-Term Management of the Existing Radioactive Wastes and Residues at the Niagara Falls Storage Site.* DOE/EIS-0109F. April 1986.

DOE 1996. *Evaluation Report on Remediation of the NFSS Residues, Niagara Falls, New York, First Draft.* September 1996.

DOE 2006. Fernald Closure Project: Final Remedial Action Report for Operable Unit 4 – Silos 1 through 4. September 2006.

EA Engineering, Science, Technology (EA) 1998. *History Search Report, Lake Ontario Ordnance Works (LOOW), Niagara County New York.* 1998

EA 1999. *Final Report for Phase I Remedial Investigation at the Former Lake Ontario Ordnance Works (LOOW) Niagara County, New York.* Prepared for U.S. Army Corps of Engineers-Baltimore District, Sparks, Maryland, July 1999.

Fluor Fernald 2006. News Release: Fluor declares Fernald Cleanup Complete - Awaiting DOE Concurrence. October 30, 2006.

HydroGeoLogic, Inc. (HGL) 2008. Updated Baseline Simulation Results. Electronic mail from HGL (D. DeMarco) to USACE (M. Rhodes). June 30, 2008.

Miscellaneous Property Information of Lake Ontario Ordnance Works. [circa 1942-1981].

National Lead Company 1979. *Informational Report on the Department of Energy-Niagara Falls Site (rough draft).* From the Feed Materials Production Center, July 1979.

United States Army Corps of Engineers (USACE) 1998. Technical Project Planning (TPP) Process. Engineer Manual. EM 200-1-2. August 1998.

USACE 1999. Nuclear Waste: Corps of Engineer' Progress in Cleaning Up 22 Nuclear Sites. Report to the Chairman, Committee on Commerce, House of Representatives. February 1999. GAO/RCED-99-48.

USACE 2005. Policies, Guidance, and Requirements for Geospatial Data and Systems, ER 1110-1-8156. September 2005.

USACE 2007a. Remedial Investigation Report for the Niagara Falls Storage Site. Prepared for USACE Buffalo District. December 2007. Prepared by SAIC and Tetra Tech, Inc.

USACE 2007b. Baseline Risk Assessment Report for the Niagara Falls Storage Site. December 2007. Prepared by SAIC.

USACE 2007c. Groundwater Flow and Contaminant Transport Modeling. Niagara Falls Storage Site. Lewiston, New York. December 2007. Prepared by HGL.

USACE 2008a. Fact Sheet. Re: Site Assistance Visit (SAV) Report, Niagara Falls Storage Site, Lewiston, NY, February 18, 2008. Prepared by the U.S. Department of Homeland Security.

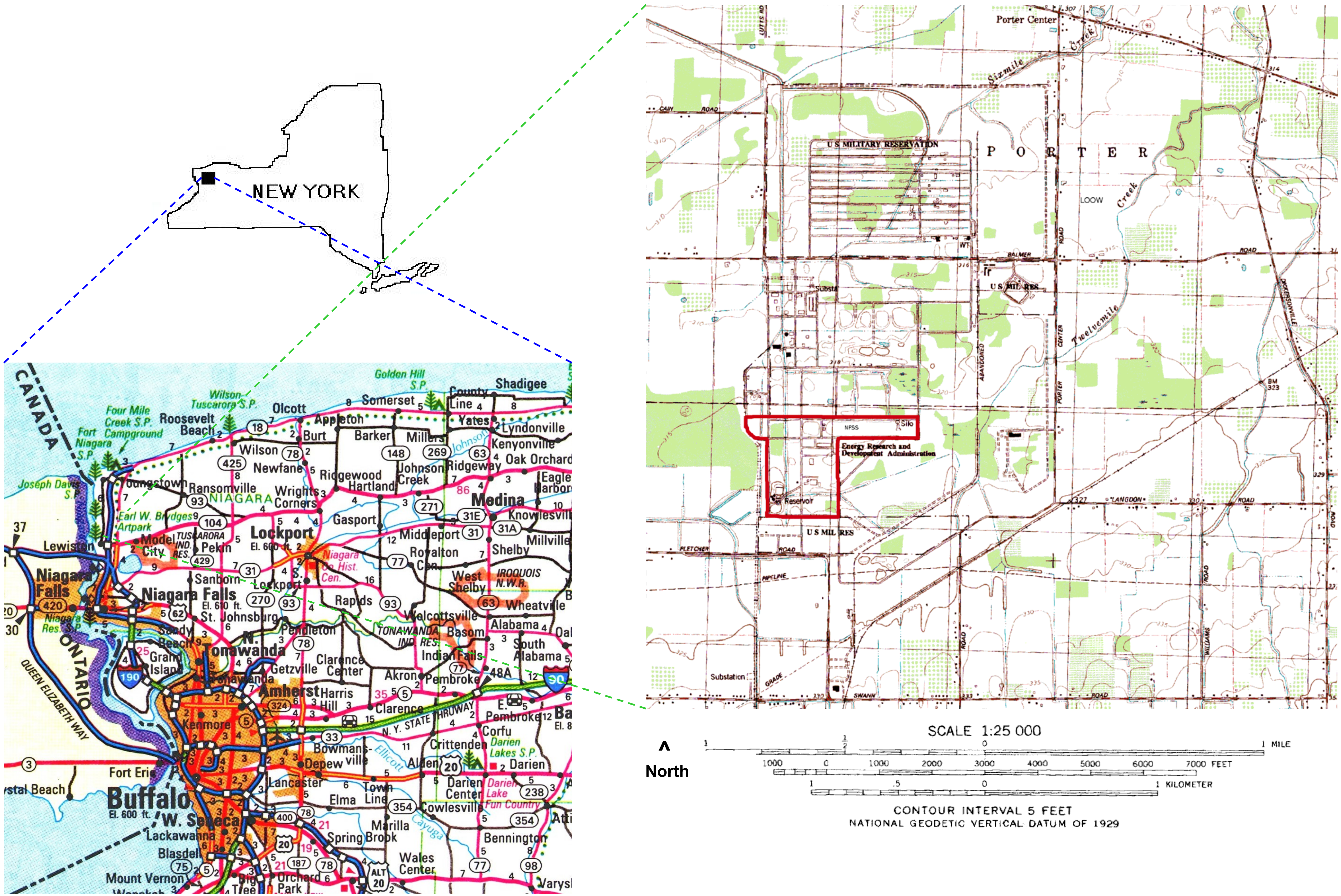
USACE 2008b. Quality Control Plan Addendum for the Feasibility Study. Revision 3. November 21, 2008.

United States Environmental Protection Agency (U.S. EPA) 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA – Interim Final.* Office of Emergency and Remedial Response, EPA/540/G-89/004, OSWER Directive 9355.3-01. October 1988.

U.S. EPA 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. EPA -540-R-00-002. OSWER Directive 9355.0-75, July 2000.

U.S. EPA 2007. Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Version win VI.O Build 264 and Guidance Manual for Integrated Exposure Uptake Biokinetic Model for Lead in Children. EPA 9285.7-42, 540-K-01-005, May 2007.

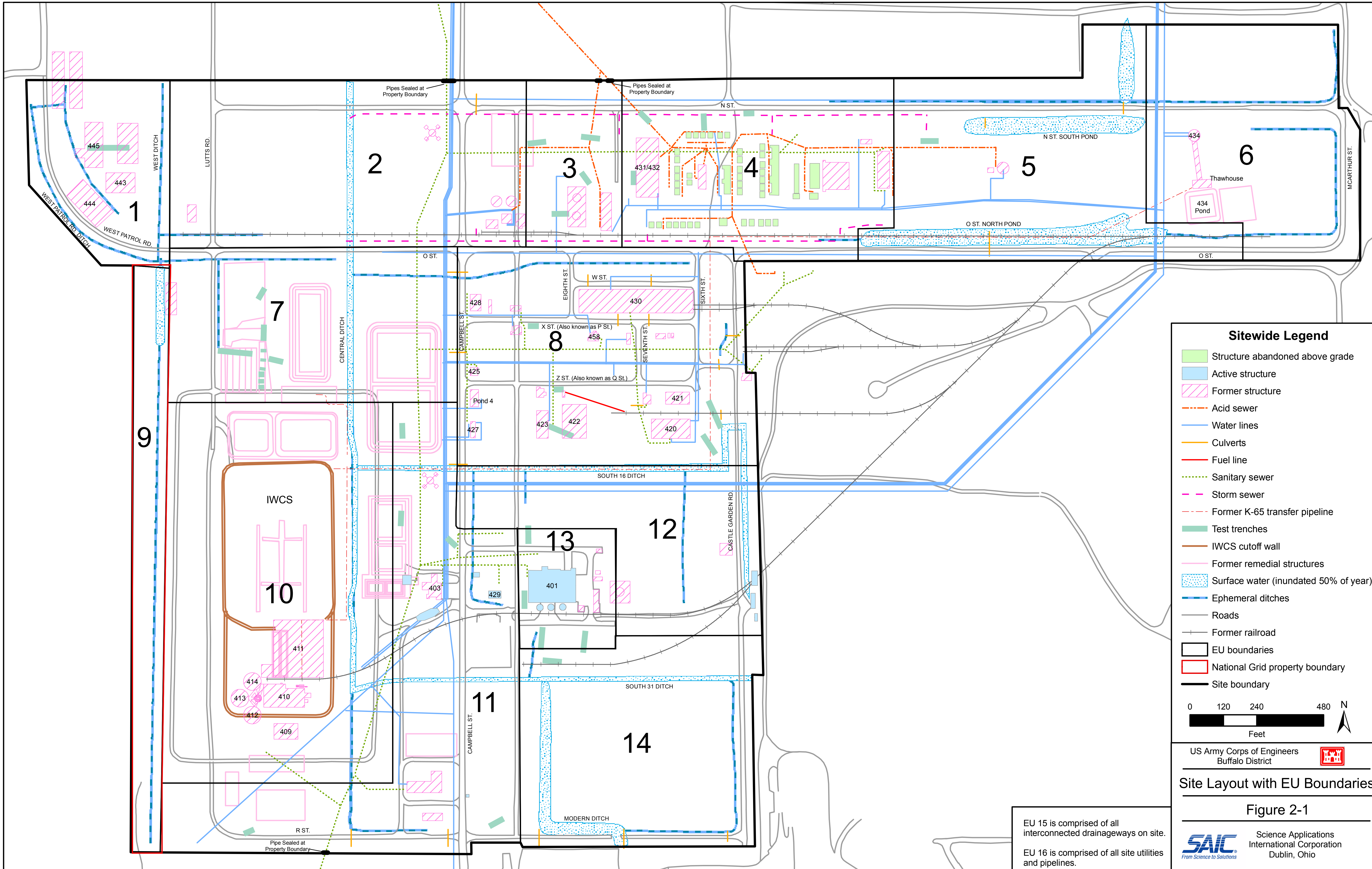
FIGURES

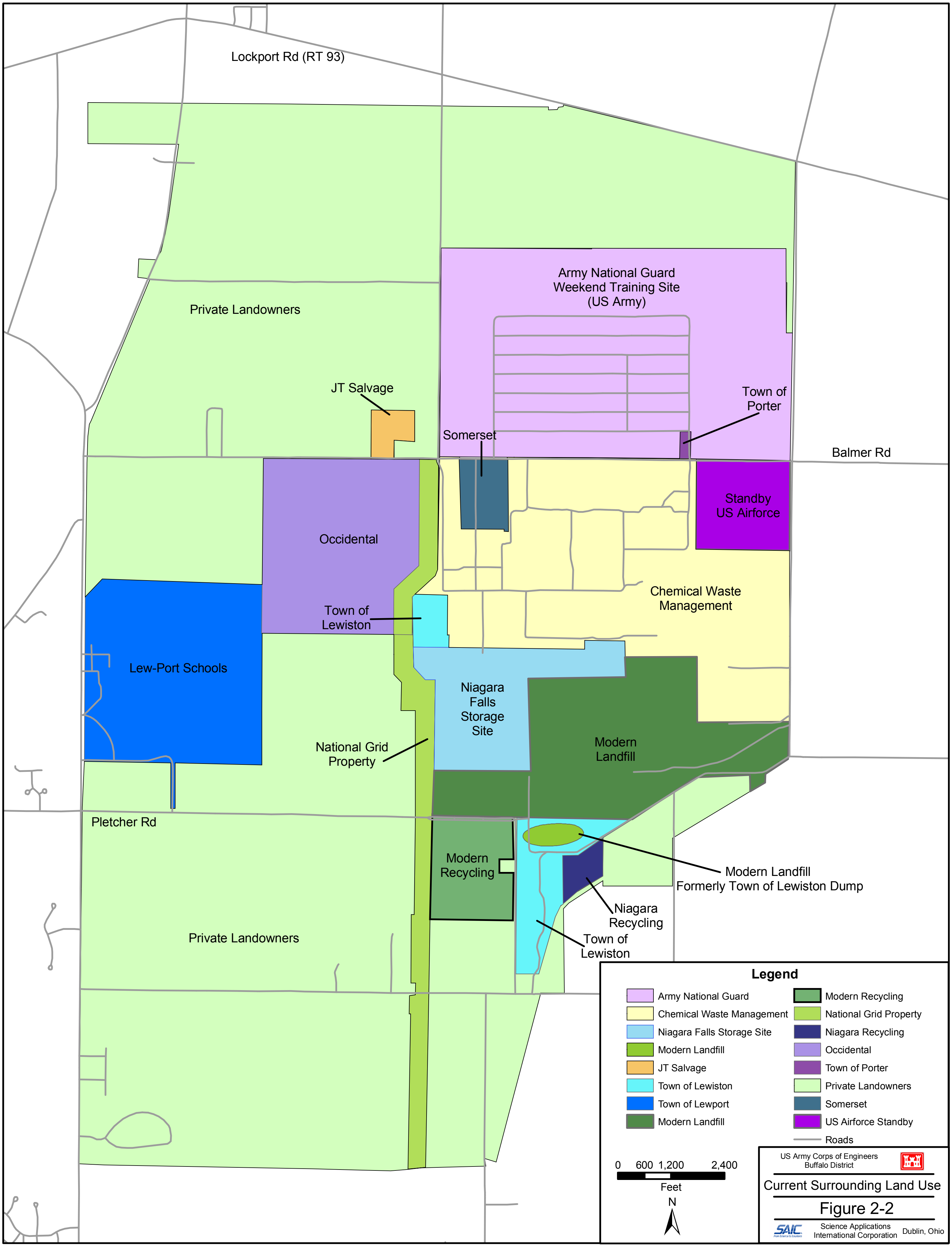


Source: USACE 2007a

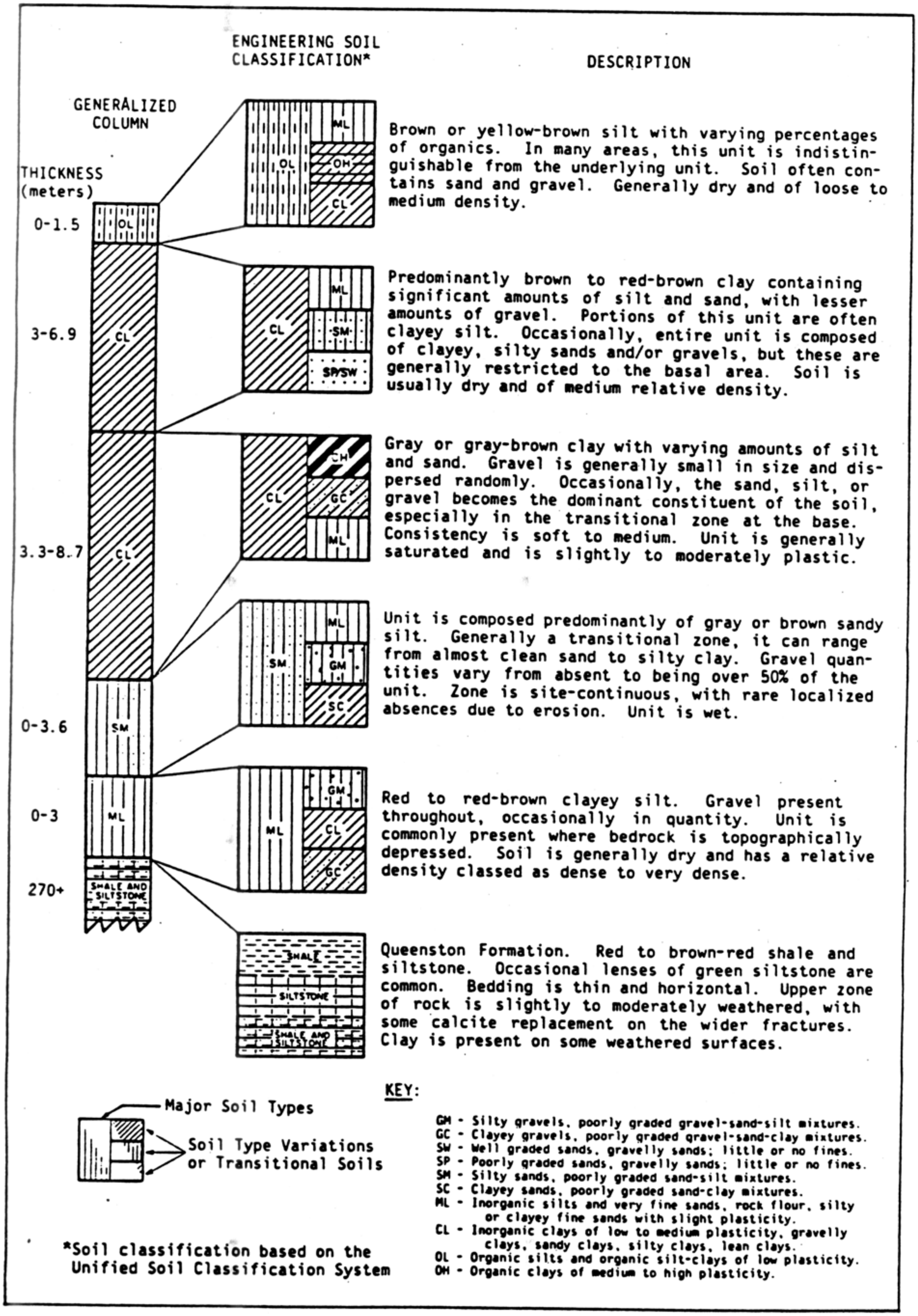
Site Vicinity Map Niagara Falls Storage Site Lewiston, New York			
Drawn By: DWC	Reviewed By: DEG	Date: 3/02/2004	Figure No.: 1-1
Checked By: DWG	Approved By: DEG	Project No.: 15892	File Name: Site Map

Tetra Tech


Sitewide Legend
Structure abandoned above grade
Active structure
Former structure
Acid sewer
Water lines
Culverts
Fuel line
Sanitary sewer
Storm sewer
Former K-65 transfer pipeline
Test trenches
IWCS cutoff wall
Former remedial structures
Surface water (inundated 50% of year)
Ephemeral ditches
Roads
Former railroad
EU boundaries
National Grid property boundary
Site boundary
0 120 240 480
Feet
N
US Army Corps of Engineers
Buffalo District
Site Layout with EU Boundaries
Figure 2-1
SAIC
From Science to Solutions
Science Applications
International Corporation
Dublin, Ohio
EU 15 is comprised of all interconnected drainageways on site.
EU 16 is comprised of all site utilities and pipelines.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
IWCS
Pipes Sealed at Property Boundary
Pipes Sealed at Property Boundary
Pipe Sealed at Property Boundary
N ST.
N ST. SOUTH POND
O ST. NORTH POND
O ST.
O ST.
W ST.
X ST. (Also known as P St.)
Z ST. (Also known as Q St.)
R ST.
WEST PATROL RD.
WEST PATROL RD. DITCH
WEST DITCH
LUTTS RD.
CENTRAL DITCH
CAMPBELL ST.
CAMPBELL ST.
EIGHTH ST.
SEVENTH ST.
SIXTH ST.
CASTLE GARDEN RD
MCARTHUR ST.
SOUTH 16 DITCH
SOUTH 31 DITCH
MODERN DITCH
Thawhouse
434
434 Pond
445
443
444
431/432
428
430
458
425
Pond 4
427
423
422
421
420
401
403
429
411
414
413
412
410
409



Lockport Rd (RT 93)
Private Landowners
JT Salvage
Army National Guard
Weekend Training Site
(US Army)
Town of
Porter
Somerset
Balmer Rd
Standby
US Airforce
Occidental
Chemical Waste
Management
Town of
Lewiston
Lew-Port Schools
Niagara
Falls
Storage
Site
Modern
Landfill
National Grid
Property
Pletcher Rd
Modern
Recycling
Modern Landfill
Formerly Town of Lewiston Dump
Niagara
Recycling
Town of
Lewiston
Private Landowners
Legend
Army National Guard
Chemical Waste Management
Niagara Falls Storage Site
Modern Landfill
JT Salvage
Town of Lewiston
Town of Lewport
Modern Landfill
Modern Recycling
National Grid Property
Niagara Recycling
Occidental
Town of Porter
Private Landowners
Somerset
US Airforce Standby
Roads
0 600 1,200 2,400
Feet
N
US Army Corps of Engineers
Buffalo District
Current Surrounding Land Use
Figure 2-2
SAIC
Science Applications
International Corporation
Dublin, Ohio



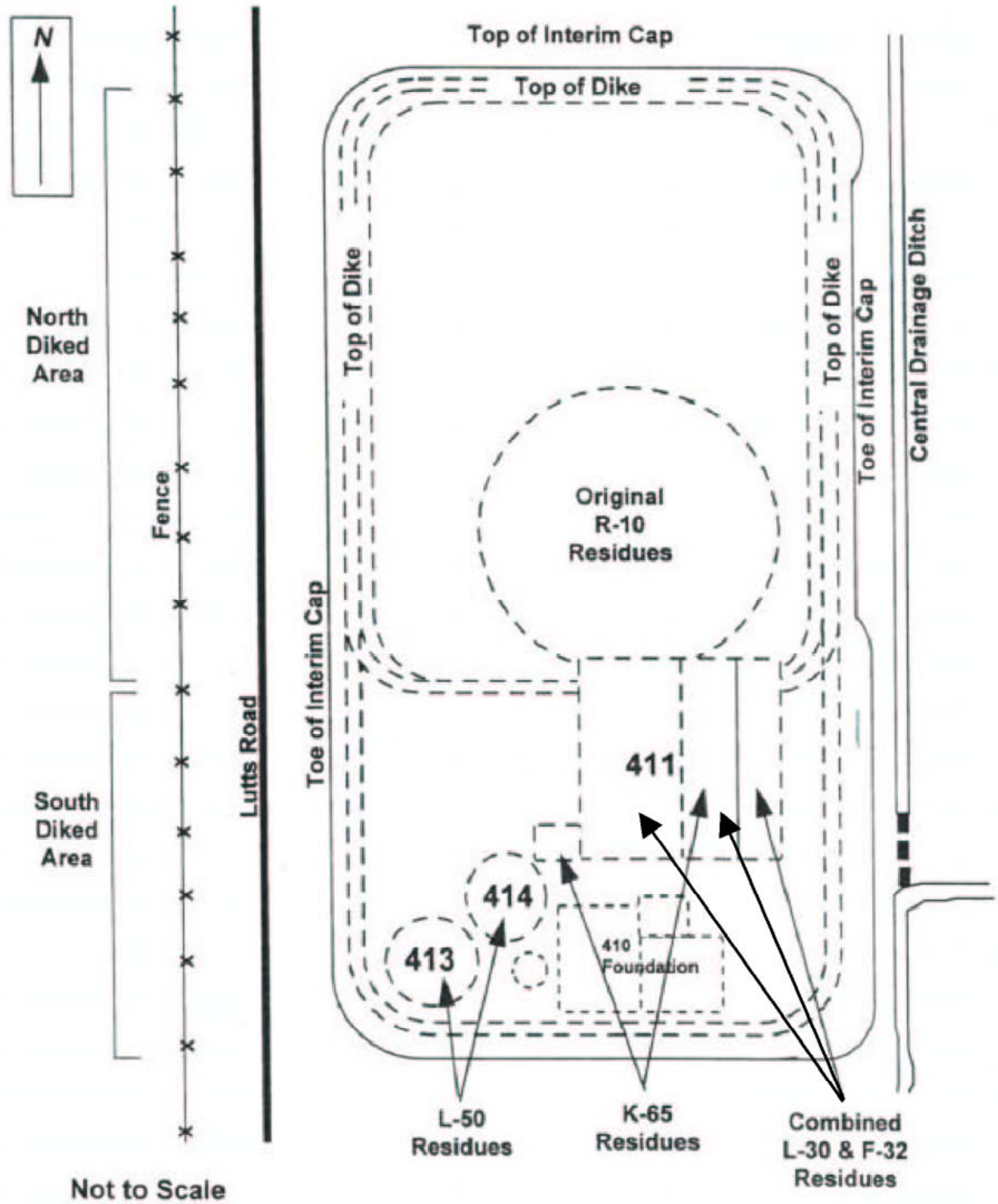
Generalized Geologic Column of Formations Under the Niagara Falls Storage Site

Source: USACE 2007a

Adapted from Acres American, Inc. 1981

MAXIM TECHNOLOGIES INC.
ST LOUIS, MO.

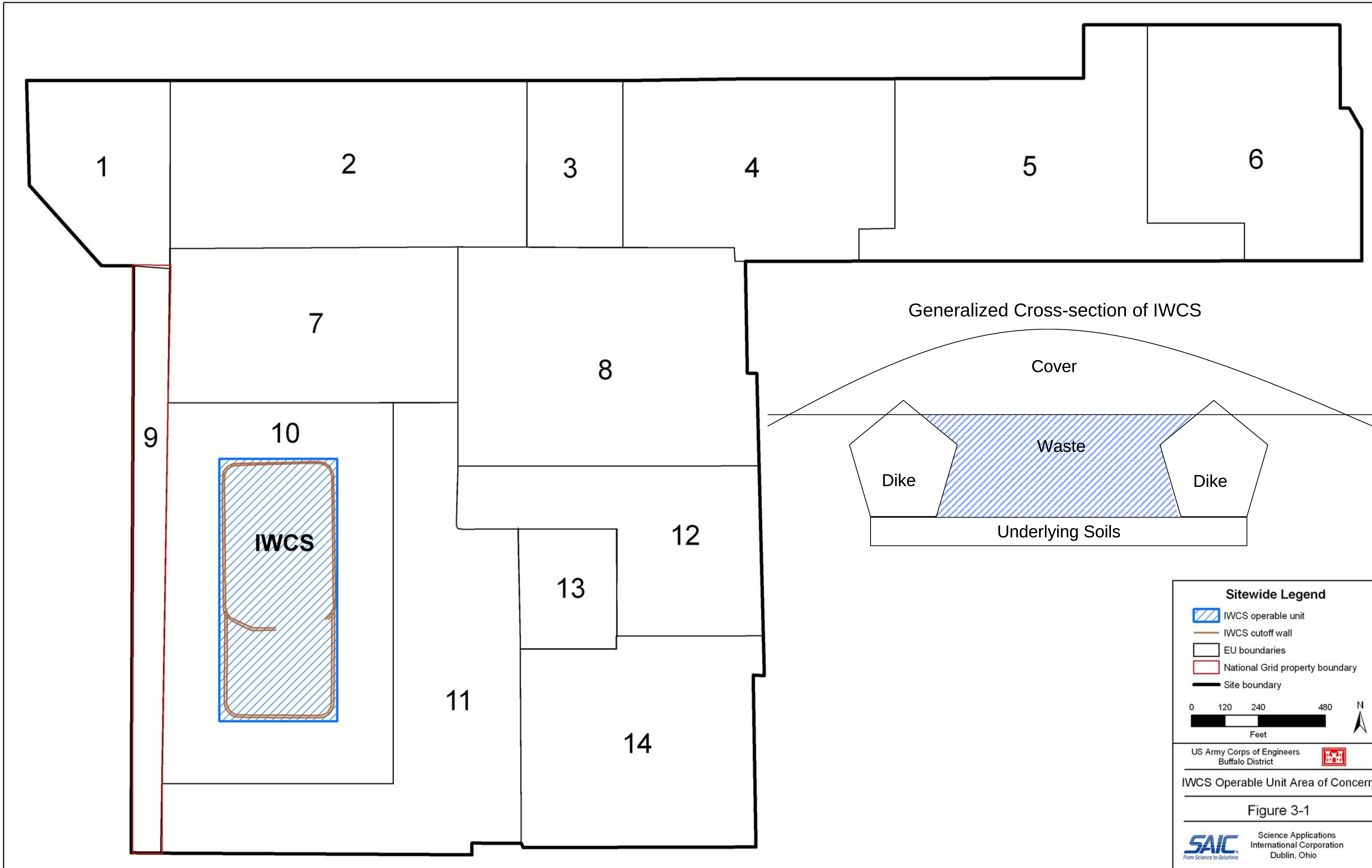
PROJECT NO.	15892	FIGURE #:	2-3
SCALE:	Not to Scale	DATE:	11/13/2006
DRAWN BY:	DWC	CHECKED BY:	DEG



Plan View of the Interim Waste Containment Structure (IWCS), Showing Locations of Foundations of Cellars of Buildings 410, 411, 413, and 414 that Contain Residues (Source: USACE 2007a, modified from DOE 1986)

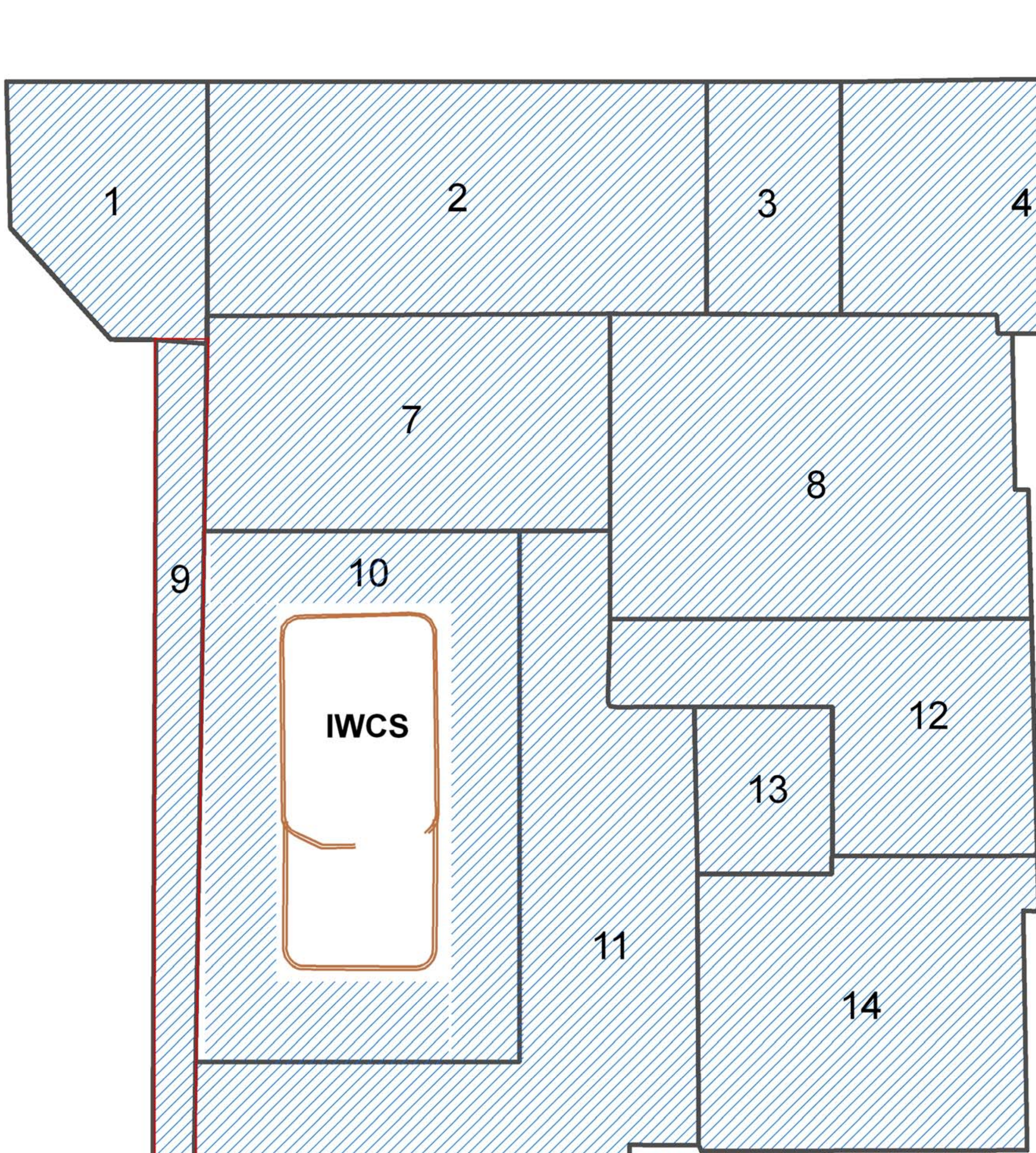
MAXIM TECHNOLOGIES INC.
ST LOUIS, MO.

PROJECT NO. 15982	FIGURE #: 2-4
SCALE: As Indicated	DATE: 11/10/2006
DRAWN BY: DWC	CHECKED BY: DEG

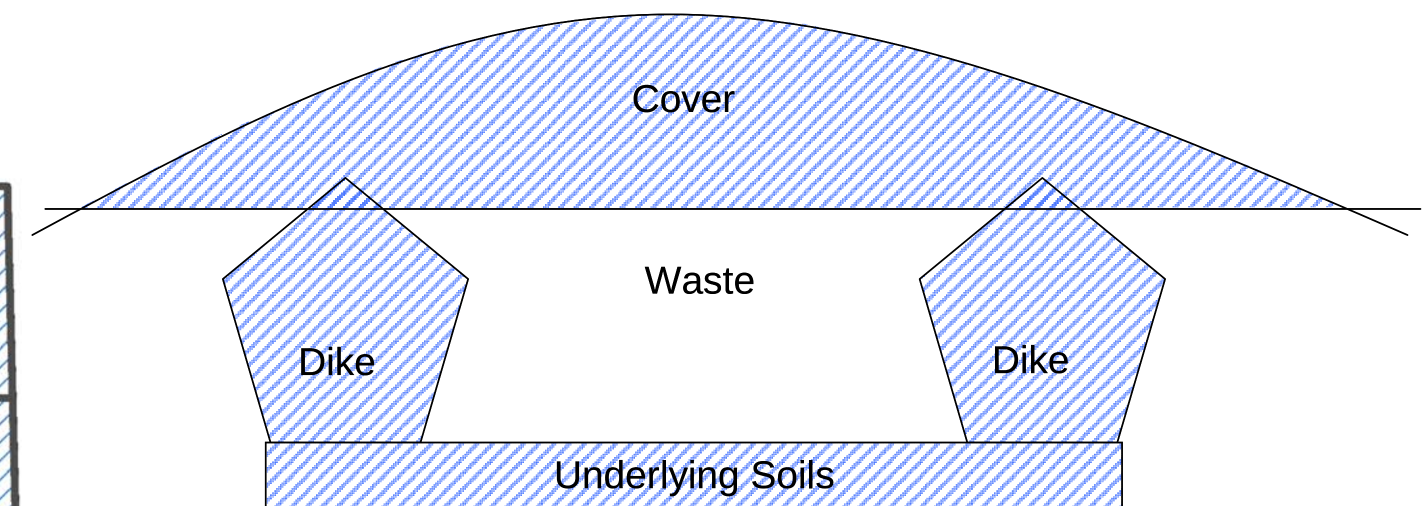


IWCS Operable Unit Area of Concern

Figure 3-1



Generalized Cross-section of IWCS



These areas would be included in the Balance of Plant Operable Unit only if all wastes are removed from the IWCS.

Sitewide Legend

- Balance of plant operable unit
- National Grid property boundary
- IWCS cutoff wall
- Site boundary
- EU boundaries

0 120 240 480
Feet

N

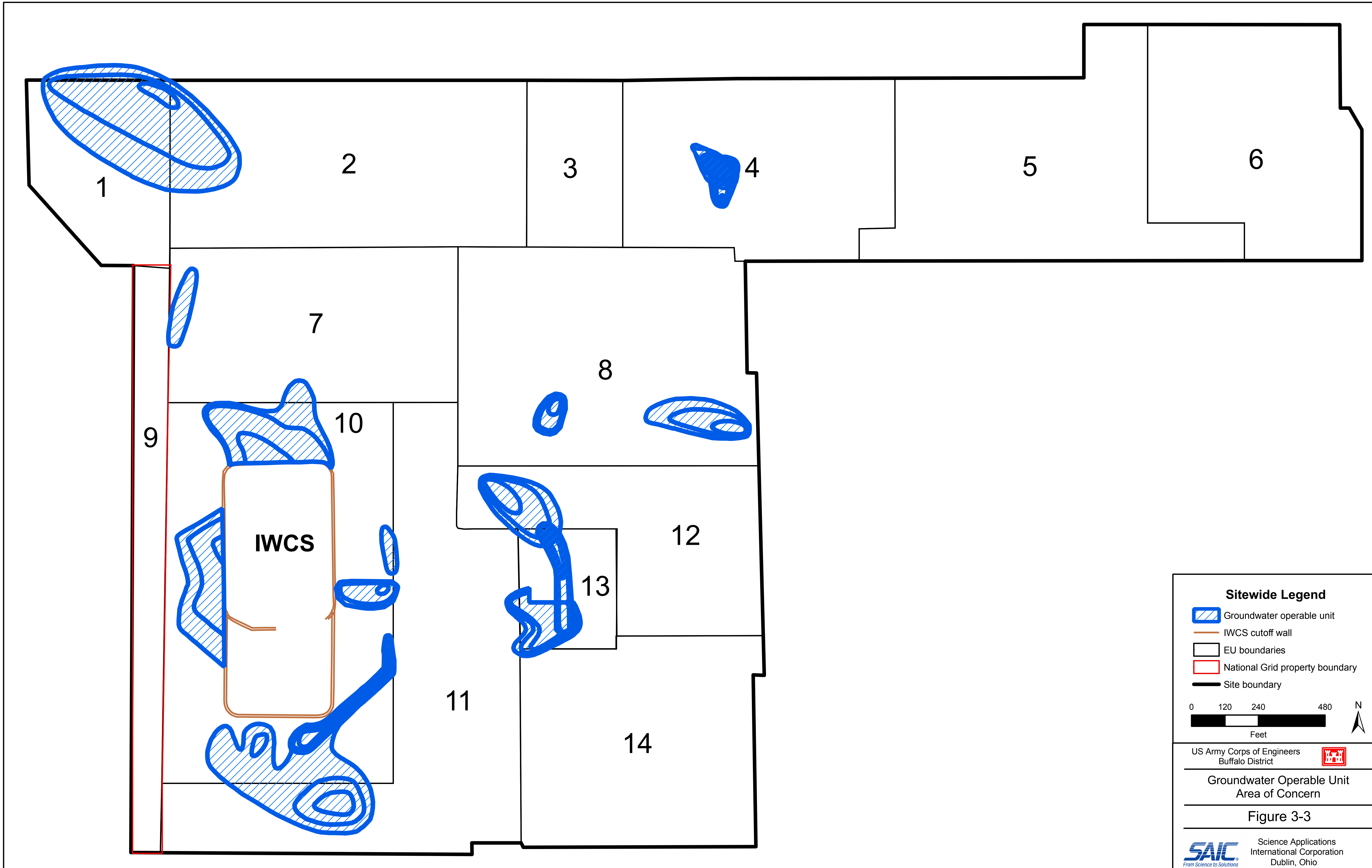
US Army Corps of Engineers
Buffalo District

Balance of Plant
Operable Unit Area of Concern

Figure 3-2

SAIC
From Science to Solutions

Science Applications
International Corporation
Dublin, Ohio



US Army Corps of Engineers
Buffalo District

Groundwater Operable Unit
Area of Concern

Figure 3-3

Science Applications
International Corporation
Dublin, Ohio

Figure 4-1: Niagara Falls Storage Site Focused CERCLA Process and Feasibility Study Approach by Operable Unit

IWCS OPERABLE UNIT

SCOPE

The residues and other waste materials placed inside the IWCS by DOE during previous remediation efforts.

BALANCE OF PLANT OPERABLE UNIT

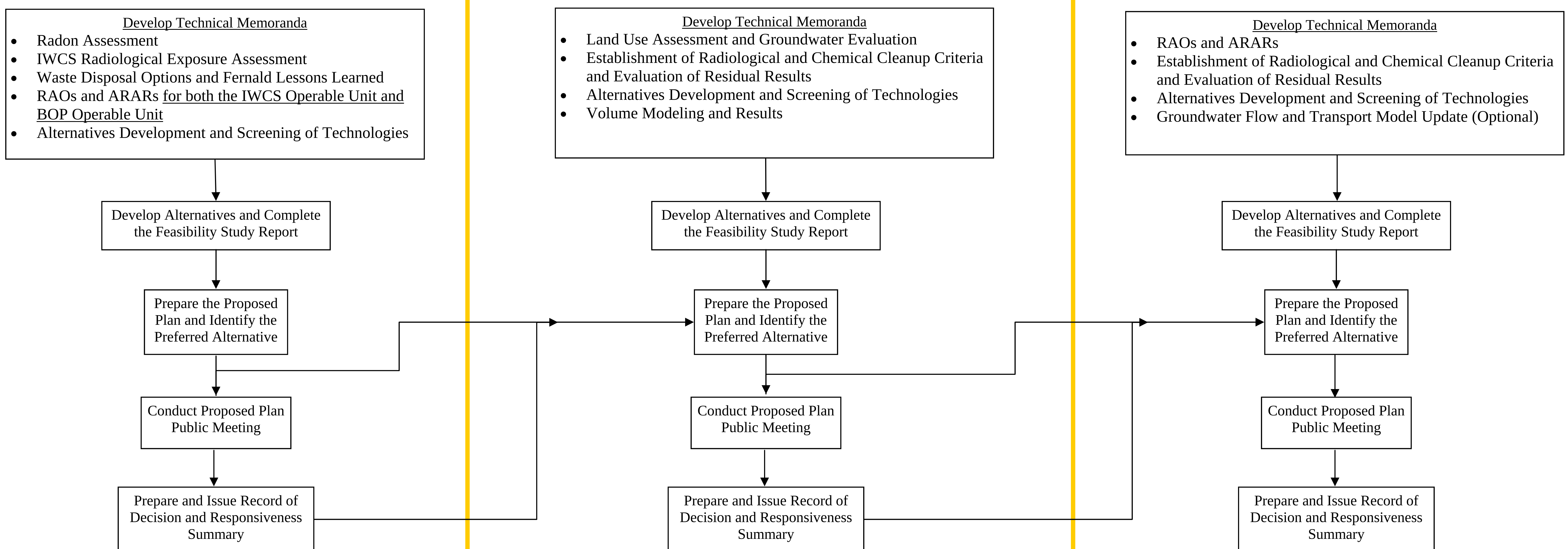
SCOPE

The balance of plant soils and surface/subsurface features. Also includes the remaining IWCS structures and soils should all residues and waste be removed from the IWCS.

GROUNDWATER OPERABLE UNIT

SCOPE

Any remaining groundwater contamination issues associated with the Upper Water Bearing Zone after remedy selection for the IWCS and BOP Operable Units.



CLEANUP CRITERIA (IWCS Operable Unit)

No numeric cleanup criteria necessary. Any removal would be limited to waste materials placed in the IWCS and the building structure where the residues are located.

CLEANUP CRITERIA (Balance of Plant Operable Unit)

Numeric cleanup criteria will be necessary and included in the Record of Decision.

CLEANUP CRITERIA (Groundwater Operable Unit)

Numeric cleanup criteria will be necessary and included in the Record of Decision.

Figure 4-2: Technical Memorandum Development Process

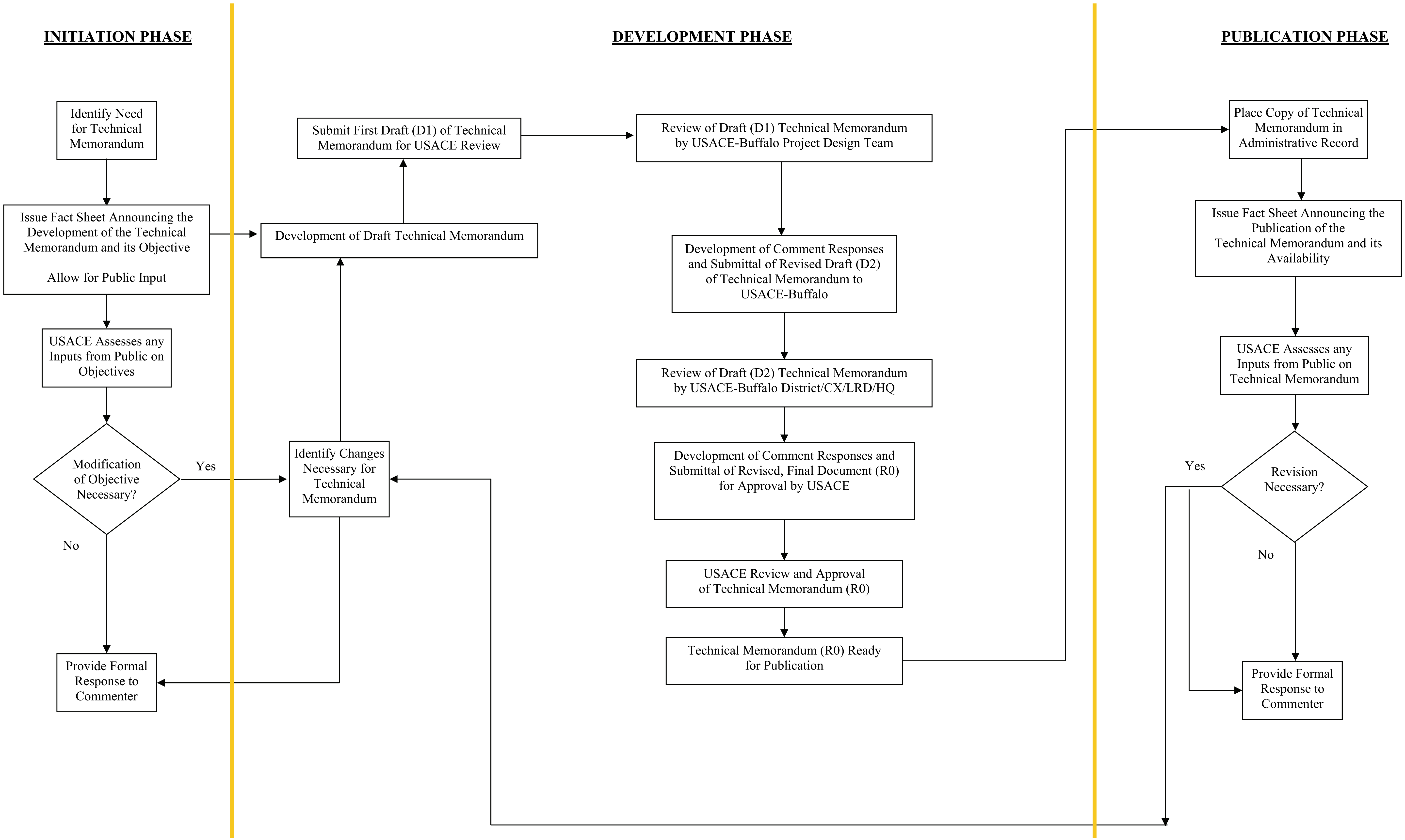
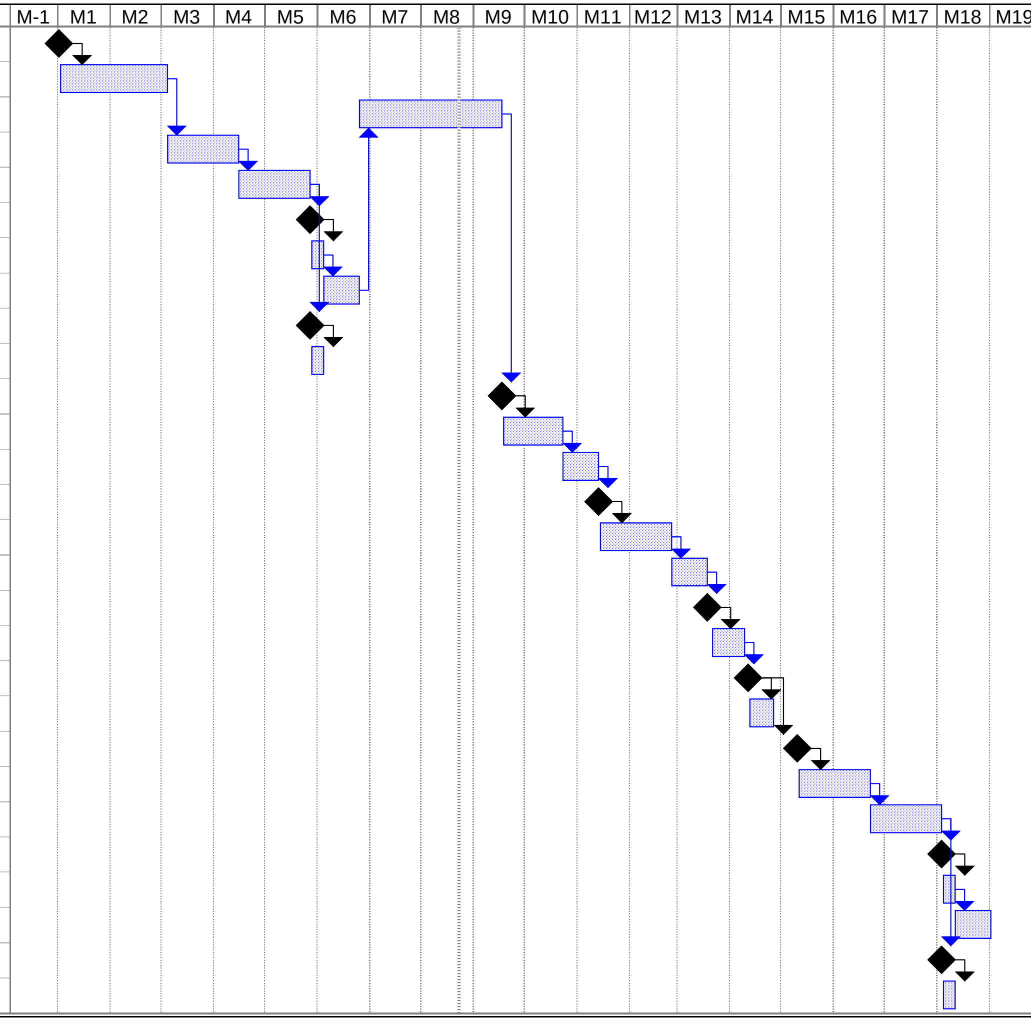


Figure 4-3. Generalized Technical Memorandum Schedule

ID	Task Name	Duration
1	Identify Need for Technical Memorandum	1 day
2	Issue Fact Sheet Announcing Development of Technical Memorandum	45 days
3	Development of Draft Technical Memorandum	60 days
4	Public Review of Fact Sheet	30 days
5	USACE Assesses Input from Public on Objectives	30 days
6	Modification of Objective is Necessary	1 day
7	Provide Formal Response to Commenter	5 days
8	Identify Changes Necessary for Technical Memorandum	15 days
9	Modification of Objective is Not Necessary	1 day
10	Provide Formal Response to Commenter	5 days
11	Submit First Draft (D1) to USACE	1 day
12	USACE Review of D1 (PDT)	25 days
13	Development of Comment Responses	15 days
14	Submit Revised Draft (D2)	1 day
15	USACE Review of D2 (District/CX/LRD/HQ)	30 days
16	Development of Comment Responses	15 days
17	Submit Revised Final (R0)	1 day
18	USACE Review and Approval of R0	15 days
19	Technical Memorandum (R0) Ready for Publication	1 day
20	Place Technical Memorandum in Administrative Record	10 days
21	Issue Fact Sheet Announcing Publication	1 day
22	Public Review of Technical Memorandum	30 days
23	USACE Assesses Input from Public on Technical Memorandum	30 days
24	Revision of Technical Memorandum is Necessary	1 day
25	Provide Formal Response to Commenter	5 days
26	Identify Changes Necessary for Technical Memorandum	15 days
27	Revision of Technical Memorandum is Not Necessary	1 day
28	Provide Formal Response to Commenter	5 days



Task | Milestone | Summary

Although durations associated with this figure are accurate, the continuous nature associated with the development of the FS TMs is dependent on the Corps' commitments.

TABLES

Table 3-1
Wastes and Residues
Niagara Falls Storage Site

Classification	Volume (yd^3)	Total Uranium (ppm)	Concentration of U_3O_8 in Ore	Ra-226 Inventory (Ci)	Th-230 Inventory (Ci)
K-65	3,200[a]	Estimates range from 500 to 30,000	35-60%	1,881	195
L-30	7,960[b]	Estimates range from 830 to 1,950	~10%	87	87
F-32	440[c]	Estimates range from 4,000 to 6,500	unknown	0.2	0.2
L-50	2,150[d]	Estimates range from 1,000 to 1,300	~7%	6	6
R-10 residues and soil	59,500[e]	Residues: 2,300	~ 3.5%	5	5
Middlesex Sands	230	<100	-	< 0.01 µg/kg	Not reported
Remaining Contaminated Soils	116,900[f]	Unknown	-	3	3

a. Different volumes are presented by different documents: Battelle lists 4,074 yd^3 in the May 1981 (Battelle 1981b) document and 4,030 yd^3 in the June 1981(Battelle 1981a) document. The DOE 1986 lists 4,000 yd^3. Internal documentaion (presented in Appendix A) by Bechtel personnel (BNI 1986a) indicate that the volume was 3,200 yd^3 based on visual observation inside Building 434 during the slurrying process. This amount is supported by calculations of residue volumes using the dimensions of Building 411.

b. Different volumes are presented by different documents: Battelle lists 7,960 yd^3 in the May 1981 (Battelle 1981b) document and 7,873 yd^3 in the June 1981 (Battelle 1981a) document. DOE 1986 lists 7,848 yd^3.

c. Different volumes are presented by different documents: Battelle lists 440 yd^3 in the May 1981 (Battelle 1981b) document and 439 yd^3 in the June 1981 (Battelle 1981a) document. DOE 1986 lists 654 yd^3.

d. Different volumes are presented by different documents: Battelle lists 2,148 yd^3 in the May 1981 (Battelle 1981b) document and 2,124 yd^3 in the June 1981 (Battelle 1981a) document. DOE 1986 lists 1,962 yd^3.

e. The EIS indicates that the R-10 spoils pile consists of 9,500 yd^3 residues and 15,000 yd^3 contaminated soils from 1972 remedial actions placed on top of the R-10 pile. The resulting R-10 spoil pile subsequently leached into the underlying soil, contaminating an additional 35,000 yd^3 of below grade soils for a total of 59,500 yd^3 (DOE 1986).

f. DOE 1996.

Table 3-2
Operational Timeline
Niagara Falls Storage Site

Date	Activities
1/8/1942	Construction at the LOOW started
10/1/1942	Initial operation of the LOOW
ca. 1/1/43	LOOW starts full scale production of TNT
3/28/1943	Construction at the LOOW completed
8/1/1943	Manufacture of TNT ceases
1944	L-30 Residues stored in Building 411. L-50 Residues stored in Buildings 413 and 414
1944-49	R-10 Residues stored in an open pile north of Building 411
1949	K-65 wastes shipped to NFSS. Waste shipped in drums and the drums were initially stored along roads and rail lines and in Building 410. The Middlesex Sands were shipped to the NFSS and stored in Building 410.
1950-52	K-65 wastes transferred to Building 434, a water tower located in the northeast portion of the site.
1952	First shipments of KAPL waste to LOOW. Some stored in Bldg 401.
1953-59	Boron-10 produced in Building 401
1955-58	Approximately 1297 acres of offsite surplus properties remediated. Wastes transferred to the R-10 pile. KAPL waste repackaged and sent to Oak Ridge for burial. Some combustible KAPL waste was burned on the LOOW site.
1964-65	R-10 pile covered with soil and seeded in grass.
1965-71	Boron-10 produced in Building 401
1972	Additional offsite properties are remediated. Approximately 15,000 cubic yards of contaminated soil are transferred to the R-10 pile.
1979	Buildings 413 and 414 sealed to reduce randon emanation.
1980	Vent on Building 434 capped to reduce radon emission. Pipes penetrating walls of residue stroage buildings sealed or resealed.
1981	Site fence relocated approximately 500 feet to the west. 450 cubic yards of contaminated soils excavated frm property adjcacent to the site and placed on the R-10 pile.
1982	Buildings 413 and 414 upgraded and sealed. 16,000 cubic yards of soil near the R-10 pile moved onto the pile and a dike and cutoff wall constructed. R-10 pile covered with an EPDM liner.
1983-84	54,000 cubic yards of contaminated soil excavated from onsite and offsite ditches and placed on the R-10 pile. These materials were stored north of Building 411 and later interred in the IWCS. Cutoff dike extended around building 411 and roof and exterior wall removed. EPDM liner removed from R-10 pile 75% of the K-65 residues transferred through a 4-inch pipeline from Building 434 to the eastern half of Building 411, where the slurried residues were dewatered. Buildings 410, 412, and 415 demolished. 27,900 cubic yards of contaminated soil excavated from vicinity properties, some onsite areas and a portion of the central ditch excavated and stored north of Building 411.
1985	Transfer of K-65 residues to Building 411 completed; demarcation layer installed to identify the location of the K-65 residues. Buildings 423 and 424 demolished 9300 cubic yards of conatminated materials excavated from onsite and offsite areas are transferred to the the IWCS. 1450 cubic yards of building rubble transferred to IWCS
1986	Cap over the residues in the IWCS closed. Buildings 409 and 430 demolished. Buildings 431 and 432 decontaminated and demolished.
1987	Buried drums from vicinity property excavated and placed in temporary storage
1988	Several isolated offsite areas of residual radioactiviy excavated and placed in temporary storage
1990	Limited chemical characterization study performed on NFSS
1991-1992	One localized onsite area was remediated; this material, the material generated in 1989 and the 60 drums of radioactvely contaminated materials were consolidated into the IWCS.
1997	Congress transfers control of FUSRAP to the USACE.
1999	Phase 1 of the NFSS remedial investigation performed.
2000	Phase 2 of the NFSS remedial investiation performed.
2000	Gamma walkover survey of the NFSS performed.
2001 - 2003	Phase 3 of the NFSS remedial investigation performed.
2001	Geophysical survey of the NFSS performed.
2006	NFSS remedial investigation report completed.

Sources: Reconstruction Finance Corporation circa 1945
BNI 1994a
BNI 1986c

Table 3-3. Sitewide SRC Summary and COC Identification (Subsistence Farmer Scenario)

	EU1				EU2			EU3			EU4				EU5					EU6				EU7				EU8				EU9				EU10				EU11				EU12				EU13			EU14			EU15		EU16			EU17				
	GW	SB	SS	SW	GW	SB	SS	GW	SB	SS	GW	SB	SS	SW	GW	SB	SD	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	SB	SD	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	GW	SB	SS	SD	SW	SB	SD	SW	GW	SB	SD	SS	SW
Explosives																																																															
1,3,5-Trinitrobenzene	•																						•					•																																			
2,4-Dinitrotoluene																																																		•													
2,6-Dinitrotoluene																															•																																
2-Amino-4,6-dinitrotoluene																							•								•																																•
2-Nitrotoluene																														•																																	
HMX	•																																																														
RDX																												•																																			
Tetryl																																																•															
Metals																																																															
Aluminum	•	•			•	•	•	•			•	•	•	•	•			•	•	•			•	•				•	•	•		•		•		•	•	•		•	•	•		•	•	•		•	•		•	•	•		•	•		•	•	•		•	•
Antimony	•	•			•	•	•	•	•			•	•	•	•	•			•	•	•				•	•		•	•		•					•		•		•	•	•			•				•	•	•	•	•		•		•	•	•	•		•	•
Arsenic					•						•		•							•	•			•				•								•				•				•		•		•	•			•		•	•		•	•	•	•	•	•	•
Barium	•				•	•	•	•			•	•	•	•	•			•		•				•				•								•		•		•		•		•				•	•		•	•	•		•		•	•	•	•		•	•
Beryllium	•				•	•	•	•			•	•		•	•	•		•	•	•				•				•	•	•				•		•	•	•		•	•	•		•	•	•		•	•		•	•	•		•				•	•		•	•
Boron		•	•			•	•		•	•	•	•	•	•		•		•							•	•			•	•		•		•			•	•			•	•			•	•		•	•	•		•	•	•	•		•	•	•	•	•	•	•
Cadmium		•	•		•		•					•	•	•		•		•	•		•	•	•						•	•	•			•		•		•	•		•	•			•	•			•	•		•	•	•	•		•	•	•	•	•	•	•
Calcium			•		•		•			•	•	•	•	•		•		•		•	•	•		•		•		•		•				•		•		•	•		•	•		•		•		•	•	•		•	•		•		•	•	•	•		•	•
Chromium	•				•	•	•	•		•	•	•	•	•	•			•	•	•			•	•	•			•	•	•				•		•	•	•		•	•	•	•	•	•	•		•	•	•	•	•	•		•		•	•	•	•		•	•
Cobalt	•			•	•			•			•			•	•				•	•			•	•				•			•					•				•				•				•			•				•		•	•	•				•
Copper		•	•		•		•			•	•	•	•	•	•			•	•	•		•	•			•		•	•	•	•	•		•		•		•		•		•		•		•		•	•	•	•	•	•		•	•	•	•	•	•		•	•
Iron	•	•			•			•			•	•	•	•	•				•	•			•	•				•	•		•					•	•	•		•	•			•	•			•	•					•	•		•	•	•	•	•	•	•
Lead	•				•		•	•		•	•	•	•	•	•				•	•			•				•	•	•						•				•				•				•	•	•			•	•	•		•	•	•	•	•	•	•
Lithium			•				•					•		•				•	•	•				•		•		•	•	•				•		•		•		•	•	•				•						•	•		•	•		•	•	•		•	•
Magnesium	•		•		•		•			•	•	•	•					•						•		•		•	•	•	•			•		•	•	•	•		•	•	•						•	•			•		•			•	•	•		•	•
Manganese			•		•		•	•			•				•					•				•				•								•		•		•				•				•			•			•			•	•	•		•		
Mercury		•	•	•		•	•					•		•					•		•	•	•													•			•		•	•							•	•				•	•		•	•	•	•	•	•	•
Nickel	•		•		•		•	•			•	•	•	•	•				•	•			•	•	•			•	•	•	•					•	•	•		•				•				•	•	•	•			•	•		•	•	•	•	•	•	•
Potassium			•			•	•		•	•	•	•	•	•				•		•					•	•			•	•		•		•		•	•	•			•	•			•	•			•	•		•	•		•		•	•	•	•		•	•
Selenium	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•		•		•	•	•		•	•	•		•	•	•		•		•		•	•	•		•	•	•		•	•	•		•	•	•	•	•	•	•			•	•	•	•	•	•	•
Silver	•		•		•		•	•		•	•		•	•	•				•	•				•				•			•			•		•				•				•		•		•			•		•		•		•	•	•	•		•	•
Sodium						•	•		•			•	•					•		•								•	•	•																			•	•		•	•				•		•	•		•	
Thallium		•	•	•	•	•	•	•	•	•		•	•			•		•	•		•	•		•	•	•		•	•	•		•		•		•	•	•			•	•			•	•			•	•		•	•	•		•	•	•	•	•	•	•	•
Vanadium	•	•			•	•	•	•	•		•	•	•	•	•				•	•			•	•	•			•	•	•	•	•		•		•	•	•		•	•	•		•	•	•		•	•	•	•	•			•		•	•	•	•		•	•
Zinc	•				•		•	•			•		•	•	•			•		•		•	•			•		•		•	•					•	•	•	•	•				•		•		•	•	•			•		•		•	•	•	•	•	•	•
Metals, Dissolved																																																															
Aluminum, Dissolved				•				•			•								•	•			•					•			•					•							•												•			•	•				•
Antimony, Dissolved	•				•			•							•													•								•				•				•							•				•			•	•				•
Arsenic, Dissolved																								•												•																						•	•				
Barium, Dissolved					•			•			•				•					•				•				•								•				•				•				•											•				
Beryllium, Dissolved	•				•										•					•								•								•				•				•				•										•	•				
Boron, Dissolved											•																				•																	•							•			•	•				•
Cadmium, Dissolved															•					•																																						•	•				
Calcium, Dissolved																				•																																							•				
Chromium, Dissolved																				•								•															•												•			•	•				•
Cobalt, Dissolved	•										•				•					•								•								•												•											•				
Copper, Dissolved																			•				•								•					•																						•	•				
Iron, Dissolved								•																																				•														•	•				
Lead, Dissolved								•															•													•			•																•			•	•				•
Lithium, Dissolved																				•								•												•															•				•				•
Magnesium, Dissolved	•				•																							•								•																						•	•				
Manganese, Dissolved								•			•									•								•																•				•										•	•				
Mercury, Dissolved																																																							•			•					
Nickel, Dissolved	•		•								•				•			•	•								•			•					•												•			•				•			•	•				•
Potassium, Dissolved																				•																•				•															•			•	•				•
Selenium, Dissolved															•					•								•								•				•											•				•			•	•				•
Silver, Dissolved				•															•				•				•				•								•				•												•			•					•
Sodium, Dissolved																				•								•																															•				
Thallium, Dissolved				•	•			•							•			•					•												•				•				•				•							•			•	•				•
Vanadium, Dissolved											•				•					•								•			•					•															•				•			•	•				•
Zinc, Dissolved																							•								•					•			•																•			•	•				•

Table 3-3. Sitewide SRC Summary and COC Identification (Subsistence Farmer Scenario)

	EU1				EU2			EU3			EU4				EU5					EU6				EU7				EU8			
	GW	SB	SS	SW	GW	SB	SS	GW	SB	SS	GW	SB	SS	SW	GW	SB	SD	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW
PAHs																															
Acenaphthene							•	•				•																		•	
Acenaphthylene						•	•					•	•					•													
Anthracene							•	•			•	•							•						•				•	•	
Benzo(a)anthracene					•		•						•						•						•				•	•	
Benzo(a)pyrene							•					•	•																•	•	
Benzo(b)fluoranthene							•					•	•					•							•				•	•	
Benzo(g,h,i)perylene			•			•	•			•		•	•					•								•			•	•	
Benzo(k)fluoranthene					•		•					•	•																•	•	
Chrysene							•					•	•						•						•				•	•	
Dibenzo(a,h)anthracene					•		•																			•				•	
Fluoranthene							•	•			•	•													•				•	•	
Fluorene						•	•	•				•	•												•				•	•	
Indeno(1,2,3-cd)pyrene							•			•		•	•					•							•				•	•	
Naphthalene			•			•	•				•	•	•													•			•	•	
Phenanthrene							•	•			•	•													•			•	•	•	
Pyrene							•	•			•	•	•						•						•				•	•	
PCBs																															
Aroclor-1242						•																									
Aroclor-1254						•			•			•	•					•			•	•			•				•		
Aroclor-1260		•	•			•	•		•	•		•	•			•		•			•	•	•	•	•	•			•	•	
Pesticides																															
4,4'-DDD	•		•			•	•		•			•													•				•		
4,4'-DDE		•	•			•	•		•	•	•	•	•					•			•	•			•	•		•	•	•	
4,4'-DDT		•	•			•	•		•	•	•	•	•			•		•			•				•	•			•	•	
Aldrin																															
alpha-BHC												•																•			
alpha-Chlordane																															
beta-BHC												•																			
delta-BHC												•										•									
Dieldrin		•				•	•		•													•			•				•		
Endosulfan I																															
Endosulfan II	•																														
Endosulfan sulfate	•								•			•													•						
Endrin																															
Endrin aldehyde									•			•													•						
Endrin ketone									•																•						
gamma-BHC (Lindane)												•																			
gamma-Chlordane																				•											
Heptachlor																													•		
Heptachlor epoxide								•																					•		
Methoxychlor									•			•													•						
Radionuclides																															
Actinium-227		•	•			•	•			•								•			•	•			•	•			•	•	
Americium-241		•											•																		
Cesium-137		•	•		•	•	•				•	•	•			•	•	•		•	•	•			•	•			•	•	
Lead-210																															
Plutonium-239/240																													•		
Potassium-40		•															•														
Protactinium-231																					•										
Radium-226	•	•	•	•	•	•	•		•	•	•	•	•		•	•		•		•	•	•	•	•	•	•	•	•	•	•	
Radium-228		•	•			•	•				•									•					•						
Strontium-90																															
Thorium-228	•	•	•		•	•		•	•		•	•	•		•	•				•	•			•	•		•	•	•	•	
Thorium-230		•	•			•	•		•	•	•	•	•			•		•			•	•		•	•	•	•	•	•	•	
Thorium-232	•	•	•		•				•		•	•			•				•				•	•	•	•	•	•		•	
Total Activity																															
Total Uranium	•	•	•		•	•	•	•	•	•	•	•	•			•	•	•		•	•	•		•	•	•		•	•	•	
Uranium-234	•	•	•		•	•	•		•	•	•	•	•			•		•		•	•	•		•	•	•	•	•	•	•	
Uranium-235	•	•	•		•	•	•		•	•	•	•			•	•		•		•	•	•		•	•	•		•	•	•	
Uranium-238	•	•	•		•	•	•	•	•	•	•	•	•		•	•		•		•	•	•		•	•	•	•	•	•	•	

	EU9				EU10				EU11				EU12				EU13			EU14			EU15		EU16			EU17				
	SB	SD	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	GW	SB	SS	SD	SW	SB	SD	SW	GW	SB	SD	SS	SW
PAHs																																
Acenaphthene							•				•								•							•					•	
Acenaphthylene											•																					
Anthracene							•				•				•				•						•	•	•				•	
Benzo(a)anthracene							•				•				•			•	•	•						•	•		•		•	
Benzo(a)pyrene							•				•				•			•	•	•						•			•		•	
Benzo(b)fluoranthene							•				•				•			•	•							•	•		•		•	
Benzo(g,h,i)perylene							•				•				•				•	•						•			•		•	
Benzo(k)fluoranthene											•				•					•						•	•		•		•	
Chrysene							•				•				•				•							•	•		•		•	
Dibenzo(a,h)anthracene							•				•									•						•					•	
Fluoranthene							•				•		•		•		•		•							•	•		•		•	
Fluorene							•				•								•						•	•					•	
Indeno(1,2,3-cd)pyrene							•				•				•				•	•						•					•	
Naphthalene											•			•	•			•	•			•			•	•					•	
Phenanthrene							•				•				•		•		•							•	•		•		•	
Pyrene							•				•								•							•	•		•		•	
PCBs																																
Aroclor-1242											•																					
Aroclor-1254			•			•				•	•							•	•							•	•		•	•	•	
Aroclor-1260			•				•				•				•			•	•							•	•		•		•	
Pesticides																																
4,4'-DDD																	•									•						
4,4'-DDE					•	•	•		•	•	•			•	•		•	•	•						•	•		•	•		•	
4,4'-DDT	•		•		•	•	•		•	•	•			•	•			•	•		•					•	•	•	•		•	
Aldrin																										•						
alpha-BHC																										•	•					
alpha-Chlordane																									•	•						
beta-BHC																										•						
delta-BHC																									•	•						
Dieldrin							•										•	•							•	•						
Endosulfan I																										•						
Endosulfan II																	•															
Endosulfan sulfate																										•						
Endrin																	•									•						
Endrin aldehyde																		•								•						
Endrin ketone																		•								•						
gamma-BHC (Lindane)																										•	•					
gamma-Chlordane																																
Heptachlor										•	•														•	•						
Heptachlor epoxide																									•	•	•					
Methoxychlor																									•							
Radionuclides																																
Actinium-227										•	•				•				•			•							•		•	
Americium-241																																
Cesium-137					•		•			•	•				•		•			•	•	•	•			•	•	•	•	•	•	
Lead-210																																
Plutonium-239/240																		•											•			
Potassium-40		•																								•			•	•		
Protactinium-231																																
Radium-226	•		•	•	•	•	•	•	•	•	•		•	•	•		•	•	•	•	•	•		•		•	•	•	•		•	•
Radium-228	•	•	•		•				•		•		•	•												•		•	•		•	
Strontium-90																										•						
Thorium-228	•	•			•	•			•	•			•	•	•		•	•		•	•		•			•	•	•	•	•	•	•
Thorium-230	•		•		•	•	•		•	•	•		•	•	•		•	•	•	•	•	•				•	•	•	•		•	•
Thorium-232	•		•	•	•	•	•		•	•	•		•	•	•		•	•	•	•	•			•	•	•	•	•	•		•	•
Total Activity						•																				•						
Total Uranium	•		•	•	•	•	•		•	•	•	•	•	•	•		•	•	•	•	•	•		•		•	•	•	•	•	•	•
Uranium-234	•		•	•	•	•	•		•	•	•		•	•	•		•	•	•	•	•	•		•		•	•	•	•		•	•
Uranium-235	•		•	•	•	•	•		•	•	•		•	•	•		•	•	•		•	•			•	•	•	•	•		•	•
Uranium-238	•		•	•	•	•	•		•	•	•		•	•	•		•	•	•	•	•	•				•	•	•	•		•	•

Table 3-3. Sitewide SRC Summary and COC Identification (Subsistence Farmer Scenario)

	EU1				EU2			EU3			EU4				EU5					EU6				EU7				EU8				EU9				EU10				EU11				EU12				EU13			EU14			EU15		EU16			EU17				
	GW	SB	SS	SW	GW	SB	SS	GW	SB	SS	GW	SB	SS	SW	GW	SB	SD	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	SB	SD	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	SW	GW	SB	SS	GW	SB	SS	SD	SW	SB	SD	SW	GW	SB	SD	SS	SW
Radionuclides, Dissolved																																																															
Americium-241, Dissolved																																			•																												•
Cesium-137, Dissolved																																																•															
Potassium-40, Dissolved																																								•																				•				
Radium-226, Dissolved																								•												•				•																		•	•				
Radium-228, Dissolved																				•																•																						•	•				
Thorium-228, Dissolved					•						•																	•							•					•								•			•								•				•
Thorium-230, Dissolved											•													•				•								•				•								•										•	•				
Thorium-232, Dissolved																																								•																		•					
Total Activity, Dissolved																																																										•					
Total Uranium, Dissolved	•				•						•									•				•				•								•				•				•				•			•							•	•				
Uranium-234, Dissolved	•				•						•													•				•							•	•				•				•				•			•							•	•				•
Uranium-235, Dissolved	•				•						•													•				•							•	•				•				•				•			•							•	•				•
Uranium-238, Dissolved	•				•						•													•				•							•	•				•				•				•			•							•	•				•
Semivolatile Organics																																																															
2-Chlorophenol																												•						•																													
2-Methylnaphthalene			•									•																	•	•												•			•	•			•	•			•				•					•	
Benzoic Acid													•																																	•																	
bis(2-Ethylhexyl)phthalate	•				•		•				• (M)									•								•								•												• (M)			•						•	•	• (M)			•	
Butylbenzylphthalate																																										•															•						
Carbazole							•				•																		(F)	•								•				•															•					•	
Dibenzofuran																																										•			•	•			•								•						
Diethylphthalate																																									•	•																					
Di-n-butylphthalate											•																	•												•				•							•						•	•	•				
Di-n-octylphthalate			•																																																	(F)	•										
Isophorone											•																																																				
m,p-Cresols												•																						•																	•											
o-Cresol																																															•																
p-Cresol																																																									•						
Pentachlorophenol																																												•																			
Phenol	•				•															•								•						•		•								•				•			•								•				
Volatile Organics																																																															
1,1,1-Trichloroethane																		•										•													•																						
1,1,2-Trichloroethane											•																																																				
1,1-Dichloroethane																												•																																			
1,1-Dichloroethene			•						•		•	•	•			•		•								•		•	•	•				•			•	•			•								•			•					•			•		•	
1,2-Dichloroethane																																																•															
1,2-Dichloroethene											(M)																	•																															•				
2-Butanone	•		•		•	•	•				•	•						•		•		•			•	•		•	•							•		•				•			•	•		•	•			•					•	•	•	•		•	
2-Hexanone							•															•																																									
4-Methyl-2-pentanone											•																																												•								
Acetone		•	•			•	•		•		•	•	•			•		•			•	•			•	•			•	•						•		•			•	•			•	•			•	•		•				•	•	•	•	•		•	
Benzene			•			•	•				•					•		•				•				•								•								•													•		•			•		•	
Carbon disulfide			•			•	•	•			•	•						•				•				•		•												•	•											•					•			•		•	
Chloroform	•										•																		•	•		•																															
Chloromethane																																																•															
cis-1,2-Dichloroethene											• (M)	•																																				• (M)	•								•	•					
Ethylbenzene			•			•					•														•																																•						
Methylene chloride						•					• (M)	•					•				•	•			•			•	•							•									•	•		•	•	•				•			•		• (M)	•	•		
Styrene											•																																																				
Tetrachloroethene					•						• (M)	• (F)	•					•										•	•	•																		•	•	•		•					•	•	• (M)	• (F)		•	
Toluene			•			•	•		•			•	•			•		•			•	•			•	•			•	•		•		•				•			•	•			•				•	•		•					•	•		•		•	
trans-1,2-Dichloroethene											•	•																																					•								•						
Trichloroethene											• (M)	•	•					•										•																				• (M)	•	•		•					•	•		•			
Vinyl chloride											• (M)																																																				
Xylenes (total)			•			•	•				•					•		•	•			•							•													•																					•	

• Constituent identified as SRC

• (M) [shaded] Constituent identified as SRC and media COC

• (F) [hatched] Constituent identified as SRC and food pathway COC

[dark hatched] Constituent identified as SRC, media COC and food pathway COC

(M) [shaded] Constituent not identified as SRC but as media COC

(F) [hatched] Constituent not identified as SRC but as food pathway COC

Note: SB SRCs identified based on 0-10' UTL; however, SB represents 0.5-10' interval only (i.e. SS exceedances are not inlcuded)

GW - Groundwater SB - Subsurface Soil SS - Surface Soil SW - Surface Water

APPENDIX A

CONCLUSIONS FROM THE NIAGARA FALLS STORAGE SITE OCTOBER 2008 TECHNICAL PROJECT PLANNING MEETING

FEASIBILITY STUDY EFFORTS

ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
BOP	Balance of Plant
BRA	Baseline Risk Assessment
CFR	Code of Federal Regulations
COC	chemicals of concern
DCGL	Derived Concentration Guideline Level
DOE	Department of Energy
DSR	dose to source ratio
EPA	Environmental Protection Agency
EPC	exposure point concentration
EU	exposure unit
FS	feasibility study
FUSRAP	Formerly Utilized Sites Remedial Action Program
IWCS	Interim Waste Containment Structure
LOOW	Lake Ontario Ordnance Works
LWBZ	lower water bearing zone
MCL	Maximum Contaminant Level
NFSS	Niagara Falls Storage Site
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
PRG	Preliminary Remediation Goal
RI	remedial investigation
ROC	radionuclide of concern
ROD	Record of Decision
SOR	sum of ratios
TBC	To Be Considered
TCE	trichloroethene
TDS	total dissolved solids
TPP	Technical Project Planning
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
UMTRCA	Uranium Mill Tailings Radiation Control Act
UWBZ	upper water bearing zone
WDD	West Drainage Ditch

**CONCLUSIONS FROM THE NIAGARA FALL STORAGE SITE
OCTOBER 2008 TECHNICAL PROJECT PLANNING MEETING
FEASIBILITY STUDY EFFORTS**

INTRODUCTION

This document serves to summarize the discussions and conclusions from the Technical Project Planning (TPP) Meeting held in Buffalo, New York on October 15-16, 2008. The primary purpose of the meeting was to reach a consensus on issues that impact the overall Feasibility Study (FS) effort, which included, at a minimum, the following:

- Definition of "Restricted" and "Unrestricted"
- Definition of "Complete Removal"
- Definition of Operable Units and Associated Scope
- Agreement on Applicable Relevant and Appropriate Requirements (ARARs) for Soils
- Identification of the minimum requirements needed to address on-site and off-site exposure to groundwater contaminants
- Land Use
  - Industrial
  - Residential
  - Limited/Restricted Residential

The agenda for the two-day meeting is included as Attachment 1 to this appendix. The meeting was attended by representatives from the U.S. Army Corps of Engineers (USACE), SAIC, Argonne National Labs, and HGL. The list of attendees for each day is tabulated and included as Attachment 2 to this appendix.

RESULTS

A summary of the discussions and conclusions for each of the agenda items was prepared. These summaries are contained in Tables A-1 through A-10 for Agenda Items 1 through 10, respectively. USACE will use these results in the development of the FS and associated support efforts.

Table A-1: AGENDA ITEM NO. 1: Definition of Operable Units
Discussion Points
▪ Identification of Operable Units (OUs) for the Niagara Falls Storage Site (NFSS) FS ▪ Vertical and horizontal extent of the Interim Waste Containment Structure (IWCS) ▪ Use of a focused FS for each OU
Discussion and Conclusions
<u>*Identification of OUs for the NFSS FS*</u> While discussing the identification and definition of possible OUs (e.g., vertical and horizontal extent of the IWCS), the Team considered the approach used successfully at Fernald for addressing the handling and disposition of waste residues. The Team proposed that a similar approach could be used to address the NFSS residues and the balance of plant (BOP) wastes at the NFSS. A consensus was reached to consider the materials placed in the IWCS (K-65, L-30, F-32, L-50 residues, R-10 waste materials, and other DOE remediation waste) as an OU, and various alternatives associated with actions necessary to address the waste placed into the IWCS will be evaluated. If the waste materials in the IWCS are removed, then the remaining IWCS structure (e.g., dike walls, soils that had waste placed on them, etc.) would be addressed within the scope of the BOP OU. Using this approach allows the disposition of the waste placed within the IWCS, particularly the K-65 and other residues, to be the primary and initial focus of the FS effort. Focus on the remainder of the site could then follow. Therefore, the conclusion was that there would be three OUs for the NFSS; the IWCS OU, the BOP OU, and the Groundwater OU. The IWCS OU is to be defined as the residues and waste material that the Department of Energy (DOE) placed in the disposal cell within the diked area. The scope for the IWCS OU involves the development of remedial alternatives for addressing the residues and waste material only. For cost estimating purposes, the IWCS "complete removal" alternative will assume that the concrete building structures containing the residues (Buildings 410, 411, 413, and 414) and drainage lines associated with those structures will need to be removed with the residues and waste material to ensure all residues have been removed. The complete removal option would include removing everything DOE put into the cells, plus a one (1)–meter buffer zone of soil beyond the defined residue/waste material boundary. The additional soil volume would be for cost estimating purposes only to account for the over-excavation of materials beyond the boundary of waste placed in the IWCS. The additional soil volume will be accounted for in the costs associated with transportation and disposal of materials removed from the IWCS. Alternatives that propose leaving some or all of the waste in the IWCS will need to show that the alternative is protective of human health and the environment. The BOP OU is to be defined as all material not included in the IWCS OU, excluding groundwater. BOP material will include any remaining former building structures within the IWCS; remaining soils within the IWCS, the IWCS dike; soils across the remainder of the site; surface water; sediment; railroad ballast; roads; Building 401; and pipelines. Only pipelines on the exterior side of the dike (away from the IWCS) will be addressed as part of the BOP OU. The impacts, if any, of the BOP OU alternatives on groundwater and surface water will be addressed in the alternative evaluations. The Groundwater OU is to be defined as groundwater in the upper and lower water bearing zones (UWBZ and LWBZ) that will be addressed after implementation of the selected remedial actions for the IWCS and BOP OUs. Current groundwater issues might be dealt with by addressing BOP soils (i.e., the plumes or source area(s) may be remediated by remediating the soils). With the approach presented here, the Groundwater OU would not be conducted until the first two OU remedial actions have been completed. <u>*Use of a focused FS for each OU*</u> The Team concluded that a focused FS will be completed for each of the three OUs, rather than completing one FS that would address all of the OUs. The focused FS's will be completed in a sequence. The IWCS OU will be addressed first since (1) this OU is of the most interest and presents the most risk potential as viewed by the public and (2) the decisions made regarding the remedial actions associated with the IWCS residues and waste materials may impact the selection of viable alternatives considered for the BOP and Groundwater OUs. The next focused FS will address the BOP OU. Completion of the FS for the BOP OU could resolve a number of the current groundwater issues should BOP remedial actions involve the removal of plumes and/or source areas. The soil cleanup levels for the BOP OU would be developed to ensure that there will be no unacceptable future impacts to the environment, including the surface water and groundwater systems. The last focused FS would address any remaining groundwater issues at the site.

Table A-2: AGENDA ITEM NO. 2: Definition of "Restricted" and "Unrestricted"

Discussion Points

General Definitions

- "Unrestricted" – No need for any restrictions, land use controls, or 5-year reviews.
- "Restricted" – Restrictions needed on land use; prepare and maintain a Land Use Control Plan; conduct 5-year reviews.

Discussion and Conclusions

"Unrestricted" Land Use

- The unrestricted land use scenario will allow the federal government to continue to own or relinquish the property with no land use restrictions.
- This scenario will be represented by the resident gardener due to insufficient water resources for a subsistence farmer. This scenario may include the construction worker for subsurface soil if this represents a more conservative scenario for this media.
- No operation and maintenance or environmental surveillance will be required under this scenario.
- A 5-year review will not be required and no differentiation will be made between surface and subsurface cleanup criteria; only surface soil cleanup criteria will be used at all depths for the unrestricted land use scenario.
- Under this scenario, it is assumed that a certain percentage of water for the resident gardener is from the UWBZ. Soil cleanup criteria that are also protective of groundwater will be established. This assumption will ensure that groundwater is protected from potential future impacts due to soil leaching.
- Even if industrial is the most likely land use, an unrestricted land use scenario still needs to be assessed under Formally Utilized Sites Remedial Action Program (FUSRAP), which would require a post-remedial dose assessment to show that the resident gardener is protected.

"Restricted" Land Use

- The restricted land use scenario is represented by industrial/construction use and requires land use restrictions and 5-year reviews.
- A Land Use Control Plan would need to be developed, implemented and maintained.
- Under a restricted land use scenario, the federal government may maintain ownership of the site.
- 6 New York Codes, Rules and Regulations (NYCRR) 375 gives New York State Department of Environmental Conservation (NYSDEC) access to restricted sites for follow-up sampling.

Notes:

- The Environmental Protection Agency (EPA) Office of Solid Waste and Emergency Response (OSWER) Directive equates a risk level of $1x10^{-4}$ with a 15 mrem/year radiation dose. The EPA does not generally use the 10 Code of Federal Regulations (CFR) 20 limit of 25 mrem/year. Using the 40 CFR 192 value of 5 pCi/g as the cleanup goal for radium-226, the dose to a resident gardener from the residual concentration after cleanup to this level is estimated to be 17 mrem/year.
- Cs-137 is identified as a radionuclide of concern (ROC) because it has a soil risk level > $1x10^{-4}$, but it is never greater than 25 mrem/year.
- Using 10 CFR 20 cleanup criteria, the radium-226 concentration in soil for the adult subsistence farmer scenario would have to be 1.3 pCi/g above the background value to meet the criteria of 25 mrem/year. Likewise, the radium-226 concentration in soil would have to be 4.1 pCi/g for the adult resident. The 40 CFR 192 cleanup goal for radium-226 is 5 pCi/g regardless of land use.
- Using 10 CFR 40, Appendix A, Criterion 6(6), the associated SOR values for the benchmark dose for a construction worker are lower than those for the subsistence farmer for some radionuclides.
- Content of 5-year review document needs to be defined.

Table A-3: AGENDA ITEM NO. 3: Definition of Complete Removal

Discussion Points

- What constitutes a complete removal?
- What is the end-point objective of a complete removal scenario?

Discussion and Conclusions

- Two options were discussed for the complete removal scenario:
  - Complete Removal, Unrestricted Land Use: With agreement from the regulators, the federal government would be able to relinquish the site with no need for land use controls and no need to conduct 5-year reviews.
  - Complete Removal with an Industrial Land Use Restriction: The site would be remediated to allow for industrial use. Land use controls would be needed and 5-year reviews would be required.

- The consensus of the Team was to select the first option: Complete Removal, Unrestricted Land Use with No Restrictions.

- Complete removal for the FS is associated with an unrestricted scenario with no land use restrictions. For NFSS, this will be based on the resident gardener due to insufficient water resources for a subsistence farmer. Instituting a scenario with no land use restrictions requires compliance with 6NYCRR Part375 Table (a) (Unrestricted Use – Soil Cleanup Standards), should this regulation be adopted as an ARAR. Site-specific cleanup goals would be developed for radionuclides and compounds not included in Table (a).

- A complete removal scenario, as defined above, needs to be included in the focused FS documents for the BOP and GW OUs only, as it is not relevant for the IWCS OU. The scope for the IWCS OU involves the development of remedial alternatives for addressing the residues and waste material only. The IWCS containment system and any residual contamination after complete removal of the residues and wastes would be addressed by the BOP OU focused FS.

- A resident gardener scenario will receive a dose from radium through direct exposure, which may include incidental ingestion of groundwater, ingestion of food grown in the garden, and ingestion of game meat. It is assumed that there will be residual radium contamination in the soil that is uptaken by the plants that are grown. Uranium may contribute to the dose through groundwater ingestion. RESRAD runs will include the groundwater pathway but will not be used for groundwater fate and transport evaluations.

Other scenarios that should be considered in the various FS efforts

- Industrial future use may be allowed under restricted future use with soil removal down to a defined depth (e.g., 5 feet).

- Proposed scenario: Apply industrial cleanup standard to surface and subsurface levels. Subsurface contaminants above industrial cleanup levels could remain below a specified depth. This scenario would require land use restrictions, no use of groundwater, and no excavation below a defined depth.

Table A-4: AGENDA ITEM NO. 4: Land Use and Associated Impacts
Discussion Points
▪ What are appropriate future land uses at the NFSS?
Discussion and Conclusions
Numerous discussions were held regarding the current land uses surrounding the site and planning by the local planning commissions. Discussions also focused on the fact that there are a number of groundwater wells in the area being used mostly for non-drinking applications (e.g., gardens, washing vehicles, etc.). The Team identified two future land uses for the NFSS: ▪ Resident gardener with incidental use of groundwater from the UWBZ and ingestion of game meat. ▪ Industrial/construction worker

Table A-5: AGENDA ITEM NO. 5: Residual Risk Management
Discussion Points
▪ Is there a need for an appendix to the FS or a separate technical memorandum to address what the residual concentrations and associated risks would be using various cleanup levels? ▪ ARARs 10 CFR 20 and 40 CFR 192 – What is the difference in the level of protectiveness using each of these criteria under various scenarios?
Discussion and Conclusions
▪ The Team concluded that there is a need for looking at the estimated residual concentrations and the risk associated with such concentrations using various cleanup criteria. The Team agreed that it should not be an appendix to the overall work plan; instead, it should be a separate document, either as a technical memorandum or as an appendix to the BOP FS. ▪ To evaluate the difference in protectiveness between 10 CFR 20 and 40 CFR 192, the groundwater pathway in the RESRAD runs would need to be included in the evaluation. The goal is to determine if there is a significant difference between radiological ARARs. Residual chemical concentrations will be evaluated using each ARAR to see if the residuals are significantly different. ▪ RESRAD will be used to compute cleanup levels for different scenarios (adult and child resident gardener, industrial worker, construction worker, and maintenance worker). It would be assumed that the resident gardener gets some small portion of drinking water (i.e., incidental drinking) from groundwater, eats the plants from the garden irrigated with groundwater from the UWBZ, and ingests some game meat. ▪ The subsistence farmer will be included for evaluation of residual risk only. Cleanup levels will not be developed for the subsistence farmer. Dose-source ratios from the risk assessment will be used for the subsistence farmer. Under this scenario, the groundwater component for RESRAD will be the same as for the resident gardener. The K_d may need to be updated to more recent RI findings. The K_d is a transport parameter that relates the adsorbed constituent concentration to the dissolved constituent concentration. Higher values of K_d represent increased contaminant adsorption and therefore, increased retardation of solutes in groundwater. The initial use of a low K_d for the UWBZ (3.6 L/kg) was conservative and simulated uranium contamination in groundwater that is not actually observed. A K_d of 3.6 L/kg will be used for the 1-D model in the FS because this value reflects the actual K_d data from the residues. Because the level of contaminant mass in the residues is not present in the BOP soils, a more representative K_d will be used in the 3-D fate and transport model to simulate actual soil conditions at the site. The updated K_d value will be higher and will better reflect observed site conditions. The percentage of water to be used by the subsistence farmer and resident gardener will need to be determined. ▪ The residual risk management document will present residual concentrations (minimum, maximum, mean, 95% upper confidence limit (UCL), exposure point concentration (EPC)). The DSR (dose to source ratio) for each radionuclide will also be presented, as will the summary dose. Residual concentrations and doses will be calculated assuming cleanup to the two ARARs. The data will be presented on an exposure unit (EU) basis using all of the ROCs. Chemical residuals will be presented assuming removal of all radiological contaminants to cleanup criteria.

Table A-6: AGENDA ITEM NO. 6: Soil ARARs
Discussion Points
▪ Potential chemical ARARs ▪ Potential radiological ARARs
Discussion and Conclusions
<u>*Chemical ARARs*</u> ▪ Discussions were held regarding whether the recently promulgated Brownfield regulations in 6 NYCRR 375 would be ARARs or To Be Considered (TBC) criteria. USACE indicated that LRB and CX Legal are evaluating this issue and will communicate their conclusion to the Buffalo District. ▪ The following observations were made when comparing the Brownfield regulations to other promulgated criteria that might be ARARs for the chemicals of concern (COCs): – Per 40 CFR 745, the TSCA criterion for lead abatement in soil is 400 mg/kg , which would be lowered to 63 mg/kg based on 6NYCRR 375 for unrestricted land use. Site background is 36.1 mg/kg. – Per 40 CFR 761, the TSCA criterion for PCBs in soil is 25 mg/kg by weight. The 6NYCRR 375 criterion is 0.1 mg/kg for unrestricted land use. ▪ The Team concluded that should 6 NYCRR 375 be included as an ARAR, the following would be applied: – the criteria specified in Table 375-6.8(a), “Unrestricted Use Soil Cleanup Objectives” would be used for any unrestricted alternatives where there would be no need for any land use controls and the regulators are in agreement with that conclusion; – the criteria specified in Table 375-6.8(b), “Restricted Use Soil Cleanup Objectives” would be used for any alternatives where there would be the need for land use controls; and – the most restrictive criteria in Table 375-6.8(b) for the protection of public health, ecological resources and groundwater will be used for the reasonably expected scenarios associated with a specific alternative. ▪ Five COCs identified during the remedial investigation (RI) do not have cleanup objectives. For unrestricted use alternatives, the resident gardener cleanup objectives will be applied for chemicals without ARARs. For restricted use alternatives, construction, maintenance and industrial scenarios need to be considered as well. (Review Region 3 Preliminary Remediation Goals (PRGs) and PRGs in Appendix A of the Baseline Risk Assessment (BRA). <u>*Radiological ARARs*</u> ▪ Uranium Mill Tailings Radiation Control Act (UMTRCA) – 40 CFR 192 and 10 CFR Part 40, Appendix A, CRITERION 6(6) ▪ Non-UMTRCA – 10 CFR 20 ▪ See discussions regarding these regulations in Agenda Item #2. ▪ Need to do further evaluations of these two potential ARARs to assess which one is the most relevant and appropriate. Several comments on the RIR focused on transuranic and fission product contamination, thus the need to consider 10 CFR 20. ▪ The dose-based limits, not the chemical toxicity value, will be used for uranium in any dose-based sum of ratios (SOR) calculations. Chemical toxicity values will be a separate criteria should those values be less than the dose-based values. This is a potential concern for uranium.

Table A-7: AGENDA ITEM NO. 7: Identification of the Minimum Requirements Needed to Address On-site and Off-site Exposure to Groundwater Contaminants
Discussion Points
▪ Groundwater classification ▪ Need for further investigation of groundwater plumes ▪ Additional well installation/groundwater sampling
Discussion and Conclusions
Groundwater classification ▪ Groundwater at NFSS is classified as "GSA" as previously determined by CX. GSA classified groundwater is saline, but potable with treatment. ▪ Both the UWBZ and the LWBZ are included in this classification. ▪ NYSDEC standards for GSA groundwater systems are based on a narrative description only, no numeric criteria are used. ▪ All receiving surface waters from a GSA cannot be adversely impacted or degraded. Action Items: ▪ USACE will check with NYSDEC to determine if a "Groundwater Use and Values Plan" is required to establish GSA classification. The plan is generally prepared by the state and lists criteria based on water use. ▪ USACE will review Niagara County groundwater data to verify groundwater classification. ▪ A groundwater data set exists for LOOW covering the last 10 years or more. Need to check the Lake Ontario Ordnance Works (LOOW) database as to whether sodium, magnesium, iron, chromium and total dissolved solids (TDS) data exist for the background wells. *Need for further investigation of groundwater plumes/Additional well installation and groundwater sampling* ▪ Temporary well points will be installed east of the West Drainage Ditch (WDD) and west of the IWCS to investigate the possible connection between groundwater and surface water. Flow hydraulics will also be evaluated in the WDD to identify depositional zones due to flow patterns. Three collocated surface water and sediment sample locations in the WDD have been added to the Environmental Surveillance Program. ▪ Temporary well points will be installed within EU 1 and to the north and west to better define the contaminant source area(s) and associated groundwater impacts. ▪ Good well coverage exists on the CWM property. This data may be used to further define the EU 4 plume. Uranium data already exists for these wells. ▪ The trichloroethene (TCE) concentration in Well 201 (9,580 ppb) will be re-examined as this appears to be an isolated hit. ▪ Pending the progress with GSA classification efforts and best use evaluations, any groundwater flow off-site may need to meet maximum contaminant levels (MCLs). The unrestricted scenario as represented by the resident gardener assumes some use of groundwater, so any treatment of groundwater might require meeting MCLs.

Table A-8: AGENDA ITEM NO. 8: Draft Feasibility Study Work Plan Outline
Discussion Points
▪ Draft FS Work Plan Outline
Discussion and Conclusions
General ▪ Put "Generic" on the title of the FS Report Outline that is included in the FS Work Plan as an attachment. ▪ The outline for the FS Work Plan was based on U.S. EPA guidance for work plans, but tailored to address the FS stage. *Sect. 1 Introduction* ▪ No comments. *Sect. 2 Site Background and Setting* ▪ A good reference is the LOOW History Search Report (1998). USACE will forward a copy of this to SAIC. *Sect. 3 Initial Evaluation* ▪ Add activities as appropriate. Be specific as to OUs: IWCS, BOP, or groundwater. ▪ Use this section to define terms for the reader. ▪ Alternatives will be updated based on decisions made during this TPP meeting. Alternatives will be OU-specific. Explain most conservative actions first and end with No Further Action. ▪ Work plan will show decision trees to explain the integrated approach, i.e., the IWCS FS will guide the BOP FS, and then the groundwater FS will be completed. ▪ When defining the BOP make it clear what is included in the OU and what is not. Tank cradles will not necessarily be removed. Only structures that need to be removed to get at underlying contamination will be included in the BOP. ▪ By addressing the IWCS first we are demonstrating responsiveness to public concerns. ▪ Remove section "Residual Dose Assessment Summary" – this will be stand-alone. *Sect. 4 Work Plan Rationale and Approach* ▪ Change title of section to "Work Plan Approach and Rationale" ▪ The sub-bullets will be revised. The first will explain the three OUs, the phased approach, and how they are inter-related. Explain that Building 401 is included in the BOP OU but could be handled as a separate action. ▪ If a structure is not contaminated and the soil around it is clean and you don't need to access the area around it, then it can stay. ▪ The groundwater revision using the higher K_d will be included in the FS. The K_d used in the RI (3.6 L/kg) was considered to be too conservative. A more realistic value will be used for the FS. This could be included as part of the "Land Use Assessment and Groundwater Evaluation" Technical Memorandum. *Sect. 5 Feasibility Study Tasks* ▪ There will be no revision to the completed technical memoranda. Submit comment responses and incorporate the comments into the FS. This approach allows for agency input and approval prior to submitting the FS. ▪ Technical memoranda will not be submitted as part of any of the OU-specific FS documents. The technical memoranda will be used as references for the FS, and need to be segregated into the various OUs (i.e., some apply to the IWCS; some apply to the BOP, etc.). ▪ A matrix will be developed to demonstrate which technical memorandum pertains to which OU. Re-sequence order in which technical memoranda are completed so that IWCS technical memoranda are completed first. Follow with technical memoranda for BOP and then groundwater. ▪ The IWCS ROD needs to be completed before the BOP proposed plan is released for public review.

Table A-8: AGENDA ITEM NO. 8: Draft Feasibility Study Work Plan Outline
Sect. 6 Costs and Key Assumptions ▪ USACE will prepare this section with respect to costs and potential funding issues. ▪ Define scenarios for restricted and unrestricted. (Alternative descriptions in Section 3 will describe action briefly, not key assumptions. Describe in order from most conservative to least conservative.) ▪ Five-year reviews are required 5 years after initiation of remedial action or seven years after documentation of site closeout. ▪ Current funding: $140-160M annually. Current program funding is inadequate. Range of costs for IWCS would be between $500M based on DOE's estimate (expanding the cap and enhanced surveillance) and $4.6B based on actual cost for Fernald. (This does not include disposal fees.) ▪ The Land Use Assessment and Groundwater Evaluation Technical Memorandum may not be needed for the IWCS Record of Decision (ROD). Since the K_d in the IWCS doesn't change and we have already shown groundwater is protected, this evaluation may not be needed. Short-term impacts to adjacent communities would need to be evaluated. *Sect. 7 Schedule* ▪ Show generic schedule for technical memoranda, possibly a preliminary schedule for the IWCS FS. *Sect. 8 Project Management* ▪ Identify individuals on the project team and their roles. *Sect. 9 Community Relations* ▪ Change "Information Sessions" to "Public Workshops" (see Draft FS Work Plan Outline). *Appendices* ▪ Remove Residual Dose Assessment, PRG Document, and FS Alternative Descriptions ▪ Keep FS WP Outline – Keep the Groundwater Model. Various alternatives will be modeled, so change to "Groundwater Contaminant Fate and Transport Model in Support of Remedial Alternatives". – Delete sub-bullets from Section 2 and Section 4. – Delete the list of appendices for the FS Report Outline and add “Appendices: added where warranted if material is not covered by a technical memorandum.”

Table A-9: AGENDA ITEM NO. 9: Fact Sheet Formats and Content
Discussion Points
▪ Draft Radon Assessment Fact Sheet using recent fact sheet for Seaway project
Discussion and Conclusions
Revisions to Seaway fact sheet example: ▪ Be specific to ensure public understands content of what is in the technical memoranda. ▪ Keep the technical memoranda focused and bulletize items. ▪ Add a title to the fact sheet to identify which technical memorandum the fact sheet addresses. ▪ Move the project description towards the back or decrease the size of the project description. ▪ Put captions on photos. ▪ Include a date when input from the public is due. ▪ USACE will place a block in the Buffalo News, Sentinel, etc., regularly and will have it in the same place each time. ▪ Add Groundwater Contaminant Fate and Transport Model Report to the listing of documents included on Page 2 of the fact sheet. *Other:* ▪ Consider using alternative methodologies than given in RESRAD to compute radon flux and for groundwater contaminant transport which is complicated at NFSS. ▪ For radon flux, suggest using the methodology (or an equivalent methodology) as provided in RAECOM, a computer code written for the UMTRA program. This methodology is now available on the Internet.

Table A-10: AGENDA ITEM NO. 10: Feasibility Study Roll-out Plan
Discussion Points
▪ What is the purpose of a roll-out plan? ▪ Who prepares the roll-out plan? ▪ When is the roll-out plan released?
Discussion and Conclusions
▪ The roll-out plan is an internal USACE document that is laid out prior to the commencement of a large project. ▪ The USACE division commander requires a roll-out plan prior to the release of any document that could be controversial. Since we are submitting technical memoranda, much of the concern will have already been addressed. ▪ USACE will prepare a roll-out plan to be issued with each focused FS Report. ▪ Roll-out plans will not be prepared for technical memoranda.

APPENDIX A - ATTACHMENT 1

AGENDA FOR THE
OCTOBER 2008 TECHNICAL PROJECT PLANNING MEETING

PROPOSED NFSS AGENDA ITEMS FOR WEDNESDAY AND THURSDAY
OCTOBER 15 -16, 2008

LOCATION: USACE Buffalo District, Conference Room F

OBJECTIVE
Reach a consensus on issues that impact the overall Feasibility Study (FS) effort, which include, at a minimum, the following:

- Consensus on "Restricted" versus "Unrestricted"
- Definition of "Complete Removal"
- Definition of Operable Units and Associated Scope
  - Specifically, what constitutes the IWCS Operable Unit
- Agreement on Soils ARAR(s)
- Identification of the minimum requirements needed to address on-site and off-site exposure to groundwater contaminants
- Land Use
  - Industrial
  - Residential
  - Limited/Restricted Residential
    - Limitations include, for example:
      - No basement
      - No garden
      - Use of municipal drinking water
      - No wells

WEDNESDAY (8:00 – 4:00)

1. DISCUSS/DEFINE OPERABLE UNITS
   a. IWCS
      i. What constitutes the IWCS Operable Unit?
         1. Both Vertically and Horizontally
   b. BALANCE OF PLANT SOILS
      i. Include underground lines or include with groundwater?
      ii. Stream beds and surface waters here or in groundwater
   c. GROUNDWATER
      i. UWBZ
      ii. LWBZ

2. DISCUSS “RESTRICTED” VERSUS “UNRESTRICTED”
   a. “Unrestricted” – Federal government walks away from the site with no need for any restrictions, land use controls, or 5-year reviews.
   b. “Restricted” – Federal government must place restrictions on land use, maybe maintain ownership of the site, prepare and maintain a Land Use Control Plan, and conduct 5-year reviews.

3. DISCUSSION ON COMPLETE REMOVAL
   a. See attached (Summary of Teleconference Discussion on the NFSS Complete Removal Alternative Oct 9 2007 (R0)(10-15-07).pdf)

4. DISCUSS LAND USE AND ASSOCIATED IMPACTS
   a. Discuss areas impacted by decision
      i. Alternatives
      ii. ARARs
      iii. Clean-up criteria
      iv. Volume estimates
   b. Current status within USACE
      i. Future Land Use Checklist

5. RESIDUAL RISK MANAGEMENT APPENDIX
   a. Start with the attached Residual Risk Management Appendix Approach (dated 10/05/07)
      i. Does USACE want to follow this approach?
      ii. Do we include chemical constituents (if NYS Brownfield regulation is not an ARAR per CX Counsel)?
   b. Include as an appendix to the Work Plan or as a separate Technical Memorandum?

6. SOILS ARARS
   a. Summary of potential radiological ARARs
   b. Summary of potential chemical ARARs

THURSDAY (8:00 – 4:00)

7. IDENTIFICATION OF THE MINIMUM REQUIREMENTS NEEDED TO ADDRESS ON-SITE AND OFF-SITE EXPOSURE TO GROUNDWATER CONTAMINANTS
   a. Groundwater classifications per NYSDEC regulations
   b. CX assessment of what the NFSS groundwater classification is - GSA
   c. Groundwater classification standards
   d. Three identified areas of concern (AOC) based on RIR comments
      i. National Grid (Uranium)
      ii. Town of Lewiston (Uranium)
      iii. Chemical Waste Management (Uranium/Organics)
   e. Status of Vicinity Properties
   f. CWM Extraction Wells
   g. NYSDOH Land Use Restriction
   h. Zoning and future land use

8. DRAFT FEASIBILITY STUDY WORK PLAN OUTLINE
   a. Include list of recommended appendices, such as the following:
      i. Residual risk for radiological
      ii. Residual risk for chemicals
      iii. FS alternative descriptions
      iv. Decision Document

PROPOSED NFSS AGENDA ITEMS FOR WEDNESDAY AND THURSDAY
OCTOBER 15 -16, 2008

9. FACT SHEET FORMATS/CONTENT
   a. Draft Radon Technical Memorandum Fact Sheet (copy attached)

10. DISCUSSION OF FS ROLL-OUT PLAN
   a. Technical memoranda
   b. Public meetings
   c. Scope of Work
   d. Schedule

11. CLOSING

Summary of Teleconference Discussion on the NFSS Complete Removal Alternative, Residual Appendix Methodology, and Overall FS Path Forward
October 9, 2007

Attendees included:
SAIC – George Butterworth, Deb Engelgau, Dave Kulikowski, Dave King, Becky Hoey
USACE – Michelle Rhodes, Karen Keil
Argonne - John Peterson

SUMMARY OF DISCUSSIONS

The purpose of the conference call was to discuss the proposed Residual Risk Management Appendix in support of the Complete Removal Alternative in the FS. It became apparent that there were different expectations/understandings as to the overall objective of the Complete Removal Alternative.

Originally, during the February 2007 Startup Meeting, it was defined to be an unrestricted use alternative where the federal government would be able to walk away from the site without any restrictions and be in compliance with the CERCLA evaluation criteria, particularly protectiveness and compliance with ARARs. Having not established whether there were ARARs for all COCs, the use of risk-based cleanup criteria was envisioned. For the unrestricted complete removal discussed in February, the assumption was that risk-based criteria would be developed for a resident gardener. Since that time, USACE has decided on the following key items, which were discussed during the call:

- The FS should not address different land use scenarios, but focus on the most probable future land use. As such, the alternatives developed for the FS should be based on industrial land use, as this represents the most probable future land use of the site.
- The unrestricted (i.e. residential) scenario, which would represent a "free release" scenario and would not require land use controls as envisioned in February 2007, was to be evaluated and presented separately (as a separate deliverable or as an appendix to the FS).
- Cleanup criteria are to address industrial scenarios for the radionuclides and three chemicals COCs associated with the industrial scenario (PCBs, benzo(a)pyrene, dibenz(a,h)anthracene), even in the Complete Removal Alternative.
- Cleanup criteria for evaluating radionuclide contamination are specified in 10 CFR 40, Appendix A, Criterion 6(6) – they are not land use dependent since radium and thorium are the key drivers and the cleanup criteria for these two radionuclides are the same regardless of land use.
    - Note: NY State may argue that 10 CFR 40, Appendix A, Criterion 6(6) is not protective for a "free release" scenario.
- Cleanup criteria for evaluating chemical contamination is 6 NYCRR Part 375, which has two tables, one for unrestricted land use (Table (a)) and one for multiple restricted land uses (Table (b)). This promulgated regulation was evaluated after the February

meeting and has since been determined to be an ARAR, thus no risk-based cleanup criteria appears to be necessary for evaluation of the FS alternatives.

    - **NOTE**: 6 NYCRR Part 375 presents cleanup objectives for unrestricted land use (Table (a)) and multiple restricted land uses (Table (b)). As defined by 6 NYCRR Part 375, if the unrestricted land use cleanup objectives are achieved at a site, no land use restrictions are required for public health, groundwater, and ecological resources due to the presence of contaminants in the soil. All constituents present (COPCs or SRCs?) at the site (not just COCs identified in the BRA) would need to meet criteria listed on Table (a) and Table (b), as appropriate. Which table to use is dependent on the overall objective of the Complete Removal Alternative.
- No groundwater alternatives are being included in the FS because groundwater does not pose risk to the industrial worker. The industrial worker is not expected to drink site groundwater.

The group also discussed the fact that groundwater would need to be addressed in some manner should the objective of "Complete Removal" be to walk away with no restrictions.

REQUIRED ACTION

USACE Lead: To proceed with the FS, the decision needs to be made as to what is the objective of the Complete Removal Alternative that is to be included and addressed in the FS. There are two options for defining the objective:

1. Removal of all contaminants to levels that would allow the federal government to "walk away" from the site without imposing restrictions of any kind to meet the two CERCLA screening criteria of protectiveness and compliance with ARARs.
2. Removal of all contaminants to levels that would meet the two CERCLA screening criteria of protectiveness and compliance with ARARs for the most likely land use, which for the NFSS is considered to be industrial. In this case, the federal government would be required to place a restriction on the future use of the site ensuring that the land will be used for industrial purposes only.

Key assumptions and elements for addressing each option in the FS are outlined below.

Option 1 (Complete Removal, "Walk Away" – No Restrictions)

- Cleanup criteria for evaluating radionuclide contamination is 10 CFR 40, Appendix A, Criterion 6(6) using the industrial scenario.
- Cleanup criteria for evaluating chemical contamination is 6 NYCRR Part 375, Unrestricted Use (Table (a)).
- At a minimum, the chemical COCs to be included in the site cleanup criteria are those COCs associated with the industrial scenario as identified in the BRA.
- The radiological COCs to be included in the site cleanup criteria are those COCs associated with the industrial scenario as identified in the BRA.
- Groundwater will need to be evaluated (which represents a deviation from the current path forward). This evaluation is proposed to be addressed in the Residual Risk Management appendix.

- An appendix to address residual risk would be added to the FS.
    - See attached as to all elements to be addressed in the appendix, which include, at a minimum:
        - Assessment of whether residual chemical contamination on the site exceeds the cleanup criteria in Part 375 Table (a) and therefore, should be added to the COC list for consideration in the Final Status Surveys.
        - Assessment of remaining groundwater plumes, if any, and potential threats to the public or environment.
- NY State may argue that 10 CFR 40, Appendix A, Criterion 6(6) is not protective for a "free release" scenario.
- There would be no need for 5-year reviews.
- There would be no need to generate a separate document addressing the volumes and costs associated with free release of the site.

Note:

- Preliminary evaluations of COPCs identified in the BRA indicate that following remedial efforts that target radionuclides and the 3 industrial chemical COCs identified in the BRA, 3 chemicals (TCE, indeno(1,2,3-cd)pyrene, and zinc) would remain in site soil at concentrations that would exceed Table (a) unrestricted land use criteria.

Option 2 (Complete Removal – Industrial Land Use Restriction)

- Cleanup criteria for evaluating radionuclide contamination is 10 CFR 40, Appendix A, Criterion 6(6) using the industrial scenario.
- Cleanup criteria for evaluating chemical contamination is 6 NYCRR Part 375, Restricted Use (Table (b), Industrial).
- The only chemical COCs to be included in the site cleanup criteria are those COCs associated with the industrial scenario as indentified in the BRA.
- The radiological COCs to be included in the site cleanup criteria are those COCs associated with the industrial scenario as identified in the BRA.
- No groundwater evaluations would be performed (i.e., groundwater presents no risk when evaluating the industrial land use scenario).
- A restriction regarding land use would have to be included in the alternative as well as the need for 5-year reviews.
- There would be a need to generate a separate document for delivery to HQ addressing the volumes and costs associated with free release of the site.
- No Residual Risk Management appendix would be necessary.

The different expectations as to what the Complete Removal Alternative should include have already impacted the overall schedule and level of effort. Delays in the decision on what the objective of the Complete Removal Alternative is to be and which of the above outlined options are to be used in the FS will have continued impacts to overall schedule and level of effort.

RESIDUAL RISK MANAGEMENT
APPENDIX

PURPOSE

The purpose for this appendix is to provide for the assessment of conditions at the site after application of the proposed clean-up criteria. This assessment would evaluate residual soil concentrations and site conditions and determine what, if any, additional efforts would be deemed necessary by USACE for the complete removal alternative to be considered protective and meet ARARs. This assessment would address both chemical and radiological contaminants of concern (COCs).

METHODOLOGY

The methodology will address radiological and chemical COCs, as stated above, and will consist of the following steps:

1. Discussion of the clean-up criteria used for estimating the residual concentrations.
2. Presentation of the residual soil concentration results.
    a. Relative to baseline conditions (i.e., current conditions)
    b. Relative to remedial action objectives (e.g., clean-up criteria/ARARs)
3. Presentation of post-remedial action site conditions.
4. Identification of areas with elevated levels of contaminants of potential concern (COPCs) not impacted by remedial actions.
    a. Existing groundwater plumes, if any
    b. Soils
5. Evaluation of areas with elevated levels of COPCs to determine if additional measures are warranted to provide the desired level of protectiveness and/or to meet ARARs.
6. Presentation of summary results.

<u>Approach for Evaluating Residual Radiological Concentrations</u>

1. Present three sum of ratio (SOR) formulae, based on 10 CFR Part 40, Criterion 6(6), and use to compute the estimated residual concentrations.
    a. Allows an evaluation of which isotopes are the key drivers in terms of clean-up
2. Compute doses for the scenarios used in the BRA and compare results to the results associated with baseline concentrations.
3. Identify the Min/Max/Ave residual concentrations for each of the radionuclides using each of the three formulae.
4. Identify any radiological groundwater plumes not addressed by the remediated areas.

a. Remediated areas are considered to be areas excavated in order to meet both the chemical and radiological proposed clean-up criteria.
b. If any, evaluate to determine if it poses an unacceptable threat to the public or environment. If it does, propose a methodology to address the uncertainties associated with that area.
    i. Assume solid media is contaminated within the area of the plume shape (uncertainty volume)
    ii. Assume that any groundwater encountered would be treated using the on-site water treatment system necessary for treating water removed from contaminated excavation areas.

Chemical

1. Present clean-up criteria for the three chemical COCs associated with the most likely land use, industrial.
    a. Criteria will be ARAR-based and will allow for the unrestricted use of the site (i.e., USACE can walk away after remediation without the need to pose any site restrictions).
    b. Criteria will be taken from 6 NYCRR Part 375, Table 375-6.8(a), *Unrestricted Use Soil Cleanup Objectives*.
2. After performing the radiological residual evaluation, identify the Min/Max/Ave residual concentrations for each of the chemical COPCs identified in the BRA using the chemical clean-up criteria discussed above.
3. Compare these residual concentrations to the clean-up criteria in Table 375-6.8(a) to determine if any additional chemicals need to be addressed (i.e., there is a chemical contaminant that exceeds the criteria in Table 375-6.8(a), thus the public and NYSDEC would argue that you cannot walk away from the site with no restrictions.).
4. Identify any chemical groundwater plumes not addressed by the remediated areas.
    a. Remediated areas are considered to be areas excavated in order to meet both the chemical and radiological proposed clean-up criteria.
    a. If any, evaluate to determine if it poses an unacceptable threat to the public or environment. If it does, propose a methodology to address the uncertainties associated with that area.
        i. Assume solid media is contaminated within the area of the plume shape (uncertainty volume)
        ii. Assume that any groundwater encountered would be treated using the on-site water treatment system necessary for treating water removed from contaminated excavation areas.

DRAFT

US Army Corps of Engineers®
Buffalo District

NFSS FUSRAP Site

Fact Sheet

U.S. Army Corps of Engineers, Buffalo District • November 2008

This fact sheet has been prepared to address community outreach needs and is consistent with provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Fact sheets are one part of an effort to provide public information on environmental restoration and waste management.

Project Description

The Niagara Falls Storage Site (NFSS) is a 191-acre federal property containing a 10-acre interim waste containment structure (IWCS). The IWCS holds radioactive residues and wastes brought to the site by the Manhattan Engineering District (MED) and the Atomic Energy Commission (AEC) during the 1940s and 1950s. During the 1980's, the U.S. Department of Energy consolidated these radioactive materials into the IWCS. The IWCS is covered with a clay cap designed to inhibit the release of radon gas and restrict the infiltration of rainwater.

The US Army Corps of Engineers is the lead federal agency addressing environmental issues at the site under the authority of the Formerly Utilized Sites Remedial Action Program (FUSRAP) and in accordance with the provisions of CERCLA. In addition to the environmental investigations at the site, the USACE operates and maintains the site and conducts an environmental surveillance program to sample air, water, and streambed sediment to ensure that onsite wastes do not pose a threat to human health and the environment. The Corps has recently issued the Remedial Investigation Report and Baseline Risk Assessment as part of the CERCLA effort. The Corps is now proceeding with efforts associated with the development of the Feasibility Study (FS) Report. These efforts involve the development of technical memoranda that will be made available to the public prior to the development and release of the FS.

Purpose

The purpose of this fact sheet is to announce that the Corps will be developing a Radon Assessment Technical Memorandum as part of the efforts in

developing the FS. The Corps would also like any feedback from the public on the objective of this effort so that the technical memorandum can address any public concerns during the development and finalization of this technical memorandum. The Corps is currently scheduled to have this technical memorandum completed and available to the public by May 2009.

Radon Assessment Technical Memorandum Objective

The objective of this technical memorandum is to predict current and potential future radon levels across the NFSS including the IWCS, and compare them to federal radon standards and guidelines to assess potential health impacts from human exposures. The primary focus of this technical memorandum, however, is the estimation of radon levels emanating from residues currently stored in the IWCS under various situations such as (1) a breach in the IWCS cover over the cells where the residues are stored and (2) the removal of protective layers of the IWCS during potential

DRAFT

remedial actions. Results will be used in the FS for remedial planning (i.e., for engineering design) or simply to predict potential environmental impacts using a range of exposure conditions.

Public Feedback Regarding the Technical Memorandum

The Corps would like any feedback from the public as to what this specific technical memorandum should address. Any feedback should be provided to the Corps by December 1, 2008, so as to allow the Corps to consider the feedback and make any adjustments to the analyses being included in the technical memorandum. Feedback can be sent via e-mail at the address listed in the box to the right (please be sure to note "Radon Assessment Technical memorandum" in the subject of the e-mail) or written feedback sent to the FUSRAP Public Information Center address noted in the box to the right.

Administrative Record File

The Administrative Record File for the NFSS FUSRAP Site contains the Remedial Investigation Report and Baseline Risk Assessment and all supporting documents. It is available for your review at the following locations:

U.S. Army Corps of Engineers
1776 Niagara Street
Buffalo, New York 14207

Town of Lewiston Public Library
305 South 8th Street
Lewiston, NY 14092

Youngstown Free Library
240 Lockport Street
Youngstown, NY 14174

For More Information

For more information, please call the
FUSRAP toll-free public access line.

Toll-free Telephone Number: 1-800-833-6390

FUSRAP also has a home page on the Internet.

Buffalo District Web Page Address
for the Niagara Falls Storage Site is:
http:/www.lrb.usace.army.mil/fusrap/nfss/index.htm

Electronic mail can be sent to us at:
fusrap@usace.army.mil

Please let us know if you would like to be included
on the mailing list for the Seaway Site.

You may also contact the:
U.S. Army Corps of Engineers
FUSRAP Public Information Center
1776 Niagara Street
Buffalo, NY 14207

APPENDIX A - ATTACHMENT 2

LIST OF ATTENDEES

LIST OF ATTENDEES AT THE OCTOBER 2008 TECHNICAL PROJECT PLANNING MEETING REGARDING NIAGARA FALLS STORAGE SITE FEASIBILITY STUDY EFFORTS	
ATTENDEES ON WEDNESDAY, OCTOBER 15, 2008	
Name	**Agency**
Michelle Rhodes	USACE
Peter Lorey	USACE
Bill Kowalewski	USACE
Judy Leithner	USACE
Harold Spector	USACE
Karen Keil	USACE
Mat Masset	USACE
David Frothingham	USACE
Bill Frederick	USACE
Margaret MacDonell	ANL
John Peterson	ANL
Eric Evans	HGL
Dave Kulikowski	SAIC
Hallie Serazin	SAIC
George Butterworth	SAIC
ATTENDEES ON THURSDAY, OCTOBER 16, 2008	
Name	**Agency**
Michelle Rhodes	USACE
Peter Lorey	USACE
Bill Kowalewski	USACE
Judy Leithner	USACE
Harold Spector	USACE
Karen Keil	USACE
Arleen Kreusch	USACE
Bill Frederick	USACE
Margaret MacDonell	ANL
John Peterson	ANL
Eric Evans	HGL
Dave Kulikowski	SAIC
Hallie Serazin	SAIC
George Butterworth	SAIC

APPENDIX B

GENERIC FEASIBILITY STUDY REPORT OUTLINE

GENERIC FEASIBILITY STUDY REPORT OUTLINE

EXECUTIVE SUMMARY

1. 0 INTRODUCTION

- PURPOSE AND BACKGROUND
- OBJECTIVES AND SCOPE
- REPORT ORGANIZATION AND CONTENT
- SITE DESCRIPTION
- SITE HISTORY
- NATURE AND EXTENT OF CONTAMINATION (Summary from RIR/BRA/Fate and Transport Modeling)

2.0 REMEDIAL ACTION OBJECTIVES

3.0 TECHNOLOGY TYPES AND PROCESS OPTIONS

- GENERAL RESPONSE ACTIONS
- INITIAL SCREENING OF TECHNOLOGIES
- DETAILED SCREENING OF TECHNOLOGIES (will include Disposal Options and WAC)
- RETAINED PROCESS OPTIONS

4.0 DEVELOPMENT OF ALTERNATIVES

5.0 ANALYSIS OF ALTERNATIVES

- INTRODUCTION
- DETAILED ANALYSIS OF ALTERNATIVES
- COMPARATIVE ANALYSIS OF ALTERNATIVES

6.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

- STATE ACCEPTANCE
- COMMUNITY ACCEPTANCE

7.0 RECOMMENDATIONS AND CONCLUSIONS

8.0 REFERENCES

FIGURES

TABLES

APPENDICES (will be added where warranted when not addressed by previously released technical memoranda)

APPENDIX C

REPRESENTATIVE INDEPENDENT TECHNICAL REVIEW FORM

CERTIFICATION OF INDEPENDENT TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows:

Item	Technical Concerns	Possible Impact	Resolution

As noted above, all concerns resulting from independent technical review of the project have been considered.

____________________________________ ______________________

(Signature) (Date)

(Study/Design Task Manager)

STATEMENT OF INDEPENDENT TECHNICAL REVIEW

SAIC has completed the **<Document Title>** This plan details the approach for conducting the characterization of the IDW drums remaining at the NFSS and includes, as an attachment, the **<Document Title>** for addressing the removal of materials remaining from the remedial investigation activities.

Notice is hereby given that an ITR has been conducted on the **<Document Title>**, as defined in the preceding paragraph, and is appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan. During the ITR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

______________________________ _______________

(Signature) (Date)

Study/Design Team Leader or Task Manager

______________________________ _______________

(Signature) (Date)

Independent Technical Review