

Proposed Plan
North Alcoa (Alcoa Properties) Site - Operable Unit 2



United States Environmental Protection Agency
Region 5

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EJ	Environmental Justice
EPA	U.S. Environmental Protection Agency
ERA	Environmental Risk Assessment
ESD	Explanation of Significant Differences
FS	Feasibility Study
FFS	Focused Feasibility Study
IAC	Illinois Administrative Code
IB	Investigative Block
ICs	Institutional Controls
Illinois EPA	Illinois Environmental Protection Agency
IUECA	Illinois Universal Environmental Covenants Act
MCL	Maximum Contaminant Level
mg/kg	Milligram per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operation and Maintenance
OU	Operable Unit
pCi/g	Picocuries per Gram
pCi/L	Picocuries per Liter
PRPs	Potentially Responsible Parties
RAA	Remedial Action Alternative
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RDA	Residue Disposal Area
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Level
SPL	Spent Pot Liner

INTRODUCTION

This Proposed Plan presents the U.S. Environmental Protection Agency's (EPA) preferred alternative for an interim action to clean up contaminated soils at the North Alcoa Site ("Site"), Operable Unit 2 (OU2), in East St. Louis, St. Clair County, Illinois, and provides the rationale for this preference. In addition, this Proposed Plan summarizes the other cleanup alternatives EPA evaluated for use at the Site. This OU2 interim action is the second of three operable unit actions to be taken at the Site and will address surface contamination in the area shown as OU2 on Figure 1. Operable Unit 1 (OU1) addressed the areas on the interior of the Site and Operable Unit 3 (OU3) will be the final action for the entire Site, including groundwater. As outlined below, EPA recommends Alternative RAA-3 as the preferred alternative for OU2 at the Site. In general, Alternative RAA-3 includes excavation of contaminated soils and waste materials from OU2 to a depth of at least two feet, on-site consolidation of the excavated materials within OU1, placement of at least a two-foot soil cover over both the excavated areas and the OU1 consolidation area(s), and institutional controls (ICs) to protect the constructed remedy components.

EPA, the lead agency for Site activities, in consultation with the Illinois Environmental Protection Agency (Illinois EPA), the support agency, is issuing this Proposed Plan as part of EPA's public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and Section 300.430(f) (2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Section 300.430(f)(2).

The public comment period runs for 34 days from December 2, 2019 through January 5, 2020. EPA and Illinois EPA will hold a public meeting in East St. Louis on December 12, 2019.

This Proposed Plan summarizes Site-specific information such as Site characteristics (including the nature and extent of contamination) that is set forth in greater detail in the Focused Feasibility Study (FFS) report for OU2 and other documents contained in the Administrative Record file for this Site. Members of the public are encouraged to review these documents to get a more comprehensive understanding of the Site, the Superfund activities that have been conducted at the Site to date, and the cleanup alternatives evaluated for OU2. EPA may modify the recommended alternative or select another alternative based on information received during the public comment period. Therefore, EPA encourages members of the public to review and comment on all of the alternatives presented in this Proposed Plan.

After review and consideration of information provided by the public during the comment period and at the public meeting, and in consultation with the Illinois EPA, EPA will select a final cleanup plan for OU2. The final cleanup plan for OU2, which will be announced in local newspaper notices and presented in an EPA document called a Record of Decision (ROD), could differ from this Proposed Plan depending on information or comments EPA receives during the public comment period.

The Administrative Record repositories for this Site can be found at the following four physical locations:

U.S. Environmental Protection Agency, Region 5
Superfund Records Center - 7th Floor
77 West Jackson Boulevard
Chicago, Illinois 60604
Hours of operation 8:00 a.m. – 4:00 p.m. CST (Monday-Friday)

City Clerk's Office
City of East St. Louis
301 River Park Drive
East St. Louis, Illinois 62201

East St. Louis Public Library
5300 State Street
East St. Louis, Illinois 62205

St. Matthew Baptist Church
2908 Louisiana Boulevard
East St. Louis, Illinois 62205

Information about the North Alcoa Site can also be viewed online at:
<http://www.epa.gov/region5/cleanup/northalcoa/>

In addition to the FFS for OU2, the Administrative Record includes, but is not limited to, information summarizing human health and ecological risk assessment calculations as summarized in the FFS, and a previously issued geotechnical report entitled *Field Test Strip and Test Load Program*, summarizing a test strip pilot program that successfully evaluated the stability of a two-foot soil cover (with the cover complying with federal and/or state requirements known as applicable or relevant and appropriate requirements, or ARARs) over Site bauxite waste. Remedial Investigation and Feasibility Study (RI/FS) activities were conducted under the supervision of EPA pursuant to a December 2002 Administrative Order on Consent (AOC).

SITE BACKGROUND

The Site is located in East St. Louis, St. Clair County, Illinois. From approximately 1903 to 1957, Alcoa, Inc. conducted aluminum manufacturing and production operations at the former East St. Louis Works facility on the south side of Missouri Avenue. Alcoa operated the facility primarily for the purpose of refining bauxite into alumina using the Bayer process, which used hot sodium hydroxide in a pressurized digester to separate the aluminate liquor from the insoluble bauxite residue (red mud). In addition, the former East St. Louis Works produced fluoride, as well as bauxite and fluoride-based chemicals, including cryolite, aluminum fluoride and sodium acid fluoride. The residue remaining after alumina extraction during bauxite refining is known as “red mud” or after further processing, “brown mud.” Both forms of bauxite residue were disposed of at the North Alcoa Site.

Beginning in the early 1900s, Alcoa placed the red and brown mud from manufacturing operations in disposal areas north of Missouri Avenue. Initially, the bauxite residue was disposed of at the edges of the former Pittsburg Lake. Over time, Alcoa constructed residue disposal areas (RDAs) at the Site that

were contained within gypsum berms or dikes that were constructed around the RDAs to contain the red and brown mud. The gypsum (calcium sulfate) was generated from Alcoa's hydrofluoric acid production process, which reacted fluorspar with sulfuric acid. Bauxite residue and gypsum are the primary waste products remaining at the Site. There were three RDAs, each approximately 40 acres in size, that were the main disposal areas on-Site.

The dike in RDA 1 was breached historically (likely in the 1930s) and a deeply incised, dendritic drainage pattern developed in this area towards the south, allowing bauxite waste to migrate and accumulate in on-Site areas to the south. Low-lying areas outside of the RDAs consisted of wet areas and uplands with various fill materials at the surface.

The bauxite residue generally consists of fine-grained red or brown clay/silt material. The material has high moisture content, and below the near-surface, it is a semi-solid. The bauxite residue is soft, highly plastic, and not suitable as a sub-grade for building construction or redevelopment without extensive engineering. This material is thick (or viscous) under normal conditions, but thins or liquefies when shaken, agitated, or otherwise stressed. The residue has poor trafficability when wet and can be difficult to access without special equipment, even in dry conditions. The remedy for OU1 involved placement and maintenance of a two-foot ARAR-compliant vegetated soil cover over the RDA areas in the interior of the Site.

Another operation at the Site was the former cryolite recovery process, which involved stockpiling of spent pot liner (SPL), a listed hazardous waste (KO88), within investigative block (IB) 3c (denoted as IB-3c) prior to processing in operations located south of Missouri Avenue. The Site investigation discovered sixteen piles of material in IB-3c containing SPL material, a principal threat waste. Under the additional work provisions of the RI/FS AOC for the Site, Alcoa and the City of East St. Louis conducted an expedited cleanup action to remove and properly dispose of the SPL waste. See *Completion Report – Spent Pot Liner Removal* (2006). Alcoa removed approximately 1,500 tons of SPL-contaminated material for off-Site disposal over an impacted area totaling approximately 1.6 acres. Alcoa placed over the area a geotextile material and then a clean soil cover of approximately six inches. The OU1 ROD selected removing and disposing off-Site these SPL wastes, memorializing this removal action as the final remedial action for this area.

Regional land use in the vicinity of the Site includes residential, industrial, and commercial uses and parks. The properties located north and east of the Site are mapped as residential or urban land use. Frank Holten State Park is located immediately adjacent to the northeast corner of the Site. The area southwest of the Site and south of Missouri Avenue is industrial, consistent with the current City of East St. Louis industrial/commercial land use zoning for this area, while the interior of the Site is generally vacant, consistent with the current City of East St. Louis industrial/commercial land use zoning for the Site.

In December 2002, Alcoa and the City of East St. Louis signed an RI/FS AOC requiring the performance of an RI/FS at the Site. The RI/FS work has been completed for OUs 1 and 2 and is ongoing for OU3 and the Site-wide remedy. EPA and the Illinois EPA have overseen all activities at the Site.

EPA and Illinois EPA held a public meeting on April 7, 2012 at City Hall, at which EPA presented a proposed plan for cleanup of OU1. EPA accepted public comments on the proposed plan at this meeting. At the request of the community, EPA held an additional availability session at the East St. Louis Public Library on June 7, 2012 and extended the opportunity for public comment an additional 30 days.

EPA signed a ROD for OU1 on July 26, 2012. In 2014, a consent decree between the United States, Alcoa, the City of East St. Louis and the Alton and Southern Railroad was entered in federal district court. From 2014 to 2016, in accordance with the consent decree, Alcoa, the City of East St. Louis and the Alton and Southern Railroad completed construction of the OU1 selected remedy, and those parties remain responsible for ongoing operation and maintenance (O&M) of the constructed OU1 remedy, including surface water controls to protect the installed soil cover and properties adjacent to the Site.

As part of the OU1 remedy selection process, EPA screened the Site for environmental justice (EJ) concerns using EPA Region 5's EJ Assist Tool, which applies the interim version of the national EJ Strategic Enforcement Assessment Tool. According to EPA Region 5, census tracts with a score of 1, 2 or 3 are considered to be high priority potential EJ areas of concern. The census tract for the North Alcoa Site area has a score of 2, and EPA Region 5 considers the North Alcoa Site area to be a potential high priority EJ area of concern.

SITE CHARACTERISTICS

The North Alcoa Site consists of an approximate 400-acre parcel of land located in a mixed-use area in East St. Louis, Illinois. The Site is bounded on the north by Lake Drive, on the east by the Alton and Southern Railroad tracks and right-of-way, on the south by Missouri Avenue and on the west by 29th Street. Figure 1 shows the relation between the OU1 and OU2 area. This proposed plan addresses the OU2 area.

The Mississippi River is approximately three miles to the west of the Site. There are no significant surface water features located between the Site and the river. Frank Holten State Park is upgradient of the Site to the northeast and contains several large lakes. The Site RI determined that the surface water features at the state park are not hydraulically connected to the Site.

The existing infrastructure in the area of the Site is not capable of accepting any significant surface water discharge from the Site due to the current conditions of the sewer infrastructure and the inability of these sewers to direct stormwater away from the Site area. Stormwater flow in OU1 is managed on-Site in three stormwater ponds in compliance with the stormwater ARAR, 40 C.F.R. § 122.26. The OU1 remedy designed and constructed on-Site stormwater control ponds to direct stormwater away from the installed soil cover and to minimize Site surface runoff onto adjacent properties. EPA and Illinois EPA inspections of the OU1 remedy confirm that these stormwater ponds are functioning as designed.

As part of the OU1 remedy, Alcoa constructed a vegetated soil berm along a portion of the north and northwestern Site boundaries, addressing stormwater runoff concerns to adjacent properties that may have resulted from several large rain events. These berms have provided flood protection to these adjacent properties and are maintained by Alcoa, pursuant to the OU1 consent decree.

The Site contains the following six main disposal areas, each with a number of subareas, as identified in the FFS reports. The RI refers to individual areas as Investigative Blocks, or IB areas. These disposal areas, along with which OU(s) they are located within, are identified below and shown on Figure 2.

IB-1 Residue Disposal Areas (OU1)

IB-1a RDA 1 (The Old Pond)

IB-1b RDA 2 (The Brown Mud Pond)

IB-1c RDA 3 (The Red Mud Pond)

IB-2 Gypsum Dike Areas (OU1)

IB-3 Other Areas of Alcoa Activities (OU1 and OU2)

IB-3a Brick Works/Childs Property

IB-3b Redevelopment Area

IB-3c SPL Stockpiling Area

IB-4 Areas of no Known Alcoa Activities (OU1 and OU2)

IB-4a North Wet Area

IB-4b Triangle Wet Area

IB-4c Ball Fields

IB-4d Berm Wet Area

IB-4e Active Commercial Area

IB-5a – Residential Area (OU2)

IB-6a – Former US Steel Drum Area (OU2)

Nature and Extent of Contamination

In order to further characterize the nature and extent of contamination in the OU2 area of the Site, Alcoa collected samples of soil (surface and subsurface), sediment, surface water, and groundwater from the Site. RI sampling included monitoring for volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls, pesticides, inorganic compounds and radionuclides.

The samples collected from OU2 were found to contain concentrations of various compounds above EPA's Regional Screening Levels (RSLs). RSLs are typically used as a preliminary screening tool to help focus further characterization efforts and subsequent risk analyses for those contaminants exceeding an RSL.

The RI determined that bauxite was deposited throughout the Site, including in the OU2 area (see Figures 3 and 4). The RI found surface soil and waste samples in the OU2 area contaminated with a combination of the following radionuclides (see Figure 5): radium-226 (ranging to 13.69 picocuries per gram (pCi/g); radium-228 (ranging to 17.60 pCi/g); and total radium (ranging to 30.67 pCi/g). These concentrations include values that exceed the standards listed at 40 C.F.R. Part 192 for surface and subsurface soil. RI sampling also found surface soil and waste samples in the OU2 area contaminated with the following inorganic constituents: arsenic (ranging to 57 milligrams per kilogram (mg/kg)); chromium (ranging to 359 mg/kg); lead (ranging to 2,170 mg/kg); and thallium (ranging to 3.71 mg/kg). These maximum detections exceed their respective RSLs (arsenic RSL is 3 mg/kg; chromium RSL is 6.3 mg/kg; lead RSL is 800 mg/kg; thallium RSL is 1.2 mg/kg).

The RI found subsurface soil and waste samples in the OU2 area contaminated with a combination of the following radionuclides (see Figure 6): radium-226 (ranging from 0.221 pCi/g to 16.8 pCi/g); radium-228 (ranging from 0.47 pCi/g to 17.6 pCi/g); uranium-238 (ranging from 0.661 pCi/g to 5.46 pCi/g); and total radium (ranging from 0.05 pCi/g to 30.5 pCi/g). Arsenic (ranging to 54 mg/kg), chromium (ranging to 620 mg/kg), lead (ranging to 1100 mg/kg), and thallium (ranging to 3.22 mg/kg) were also detected in subsurface soils at levels that exceed their respective RSLs.

The chemical composition of the bauxite residue and gypsum materials found in the surface and subsurface soil samples at the Site is presented in Table 1.

At the request of EPA, Alcoa conducted radon gas testing at off-Site residential properties (IB-5a) in December 2016, due to the presence of subsurface bauxite in this area. Radon concentrations were measured at four residences within the IB-5a area in accordance with the requirements of Illinois Title 32 Part 22 Regulations for Radon Service Providers. All four residences showed radon concentrations in living spaces less than the EPA action level of 4 picocuries per liter (pCi/L). The test results at one of the locations in an unfinished basement was 5.2 pCi/L. This was the average measured concentration from two units deployed in the basement, which is not currently being used as a living space. At EPA's request, Alcoa offered this homeowner a radon mitigation unit, but the homeowner declined. The presence of radon will be monitored in these homes as part of the OU2 O&M to determine any appropriate follow-up actions.

Groundwater is located approximately 8-16 feet below ground surface in the American Bottoms aquifer. Site data indicates that the groundwater flows to the west/northwest across the Site towards the Mississippi River and does not discharge to on-Site surface water. Groundwater in the City is not used as a drinking water source. Use of groundwater within the City limits is restricted by a groundwater ordinance passed in 1997. A survey completed during the RI found no potable-use wells in the Site vicinity.

Alcoa collected groundwater samples at seven locations (see Figure 7) during three monitoring events conducted during the RI. Preliminary analysis of the groundwater sampling results shows limited impacts from the Site, including inconsistent, sporadic exceedances of federal maximum contaminant levels (MCLs) and Illinois groundwater quality standards (Title 35 Illinois Administrative Code (IAC) 620 for Class I groundwater) at different monitoring locations. Constituents that have been detected at levels slightly exceeding their respective MCLs include gross alpha, lead, antimony, arsenic, thallium, fluoride and radium (see Figure 8). Constituents that have been detected above 35 IAC 620 standards, in addition to the MCLs, include iron, manganese, sulfate and total dissolved solids. Alcoa will continue to collect groundwater quality information on a biannual basis. This additional groundwater data will be used to finalize a future remedy for groundwater contamination at and from the Site (OU3) that will include appropriate monitoring requirements.

Relationship to Other Documents

Alcoa has not completed the final Site-wide risk assessments but completed an OU1 risk assessment to support the OU1 ROD and has completed a risk assessment for the OU2 areas, which is included in the OU2 FFS. Alcoa is developing and will finalize the OU3 and Site-wide RI/FS. After Alcoa completes

the OU3 and Site-wide RI/FS, EPA will select a final remedy for groundwater and the entire Site through a ROD.

EPA directed Alcoa to complete an FFS for OU1 that summarized information regarding the nature and extent of contamination for the OU1 area. EPA approved the OU1 FFS in April 2012 and signed the OU1 ROD in July 2012. EPA also directed Alcoa to complete an FFS for OU2 that summarized information regarding the nature and extent of contamination for the OU2 area. EPA approved the OU2 FFS in September 2019.

SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

EPA's investigation and evaluation of Site cleanup options has been organized by operable units, or OUs. This action is the second of three operable unit actions taken at the Site. OU1 addressed soil contamination in the interior of the Site. The OU1 remedy was constructed from 2014 to 2016 and is currently in O&M. Two Explanations of Significant Differences (ESDs) were signed during the OU1 construction, authorizing Alcoa to implement interim actions at OU2. These interim actions authorized Alcoa to excavate and consolidate surficial waste materials from specified OU2 contaminated soil areas and authorized Alcoa to consolidate these soils under the OU1 two-foot soil and vegetative cover. These ESD interim actions reduced the volume and exposure of contaminated soil remaining in OU2 and cost-effectively enhanced construction of the OU1 cap's grade and slopes. Alcoa also covered these two ESD excavation areas with a barrier layer to distinguish the unexcavated depth from cover materials and covered these OU2 areas with a minimum of two feet of clean soil and a vegetative cover. This OU2 proposed plan discusses EPA's recommendations for an interim remedy for OU2, including the areas within OU2 previously excavated pursuant to the ESD interim actions.

OU2 will address the remaining surface and subsurface soil contamination at the Site. The area covered by this proposed action is shown in Figure 2 and will encompass the actions necessary to address soil contamination in the OU2 area and manage stormwater on-Site in compliance with the stormwater ARAR requirement, 40 C.F.R. § 122.26. Future decision documents for OU3 will finalize the interim actions selected for the Site and will select a final action for groundwater. EPA will announce a separate public comment period in the future during which comments will be accepted for the OU3 and final Site-wide action.

SUMMARY OF SITE RISKS

Human Health Risks

The Site's potentially responsible parties (PRPs) conducted a baseline human health risk assessment (BHHRA) which evaluated risks and hazards to human health and the environment from exposure to contaminants in the OU2 area at the Site, in present and reasonably anticipated future exposure scenarios.

The risk assessment evaluated the following exposure scenarios for contact with contaminated soils and bauxite waste:

- Current/future resident
- Current/future youth trespasser
- Current/future industrial worker
- Future construction worker

EPA's target risk range for Site cleanups is 1×10^{-4} to 1×10^{-6} , which translates to excess cancer risks from the range of one-in-ten-thousand to one-in-a-million. EPA takes action when cancer risks exceed the 10^{-4} level and/or non-cancer hazards exceed a hazard index of 1 based on reasonably anticipated future land use and Site-specific exposure scenarios.

The BHHRA evaluated hazards from exposure to Site soils and waste materials in the OU2 area via inhalation, ingestion and direct contact, and identified unacceptable cancer risks and/or non-cancer hazards for the following exposure scenarios (see Table 2):

- Current and future on-Site resident
- Current and future industrial worker

Exposure to radium-226 and radium-228 presents the majority of the human health carcinogenic risks. Exposure to vanadium presents the majority of the human health non-cancer risk.

Ecological Risks

The PRPs conducted a baseline ecological risk assessment (BERA) in the OU1 FFS that concluded that no unacceptable ecological risk existed at the Site. Since the BERA was completed, the OU1 remedy was implemented, including placement of two feet of ARAR-compliant soil cover over bauxite residue and gypsum. Although the grassy areas created as part of the OU1 remedy can be considered improved habitat, the Site is not currently being managed as ecological habitat, and overall Site closure is not intended to enhance local populations of receptors in the future. These grassy areas are also relatively small compared to grassy areas at the adjacent Frank Holten State Park and other nearby habitat areas; therefore, an increase to local populations of birds and mammals into OU2 from OU1 grassy areas is expected to be minimal. In addition, any minor increase in ecological habitat as a result of the OU1 remedy would likely not affect populations of receptors in OU2, based on current and future industrial/commercial land use activities that are not generally conducive for use by ecological receptors.

The PRPs conducted an evaluation of current ecological risks in OU2 to address the regulatory concern that the OU1 habitat was somewhat improved since the 2010 ERA was conducted and that portions of OU2 may also contain suitable habitat. The PRPs conducted an OU2 evaluation of ecological risks for chemicals detected in surface soil samples collected from IB-3b, IB-4c, and IB-6a and included the results in the OU2 FFS. The PRPs conducted this evaluation because of the potential that the improved habitat in OU1 may attract birds and mammals to the area, and because portions of OU2 also contain suitable habitat for ecological receptors. These are the only OU2 IBs where potential ecological habitats may be present.

The PRPs evaluated ecological risks in the OU1 BERA for wide-ranging receptors on a Site-wide basis and on an IB basis for receptors with small ranges. The OU1 BERA predicted that under the baseline

condition, there was a very low risk to local populations of wide-ranging upland receptors (represented by whitetail deer, coyote, and red-tailed hawk). Also, the OU1 BERA predicted some low-level risks for individual small-home-range receptors, and very low risks were posed to local populations.

Current ecological risks to receptors exposed to the inorganic and organic constituents in OU2 are expected to be similar to or lower than the risks found in the OU1 BERA, because contaminant levels in OU2 sampling results are generally lower than those detected in OU1 sampling. Therefore, risks in OU2 are expected to be low for both wide-ranging upland receptors and small-home-range receptors, based on updating the conclusions from the OU1 BERA.

Basis for Taking Action

It is the lead Agency's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in this Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants or contaminants from this Site, which may present an imminent and substantial endangerment to public health or welfare.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals developed to protect human health and the environment based on unacceptable risks calculated in a risk assessment. The RAOs provide the basis for developing cleanup options that will be protective of human health and the environment at a Superfund Site. The RAOs address Site-related receptor and exposure pathway risk and hazard exceedances based on the results of the BHHRA contained in the OU2 FFS.

EPA has established the following RAOs for this Site as outlined in the OU2 FFS:

- Prevent future human exposure (absorption, inhalation, ingestion, and/or external radiation) from contaminants, including radium and other radionuclides found in bauxite residue waste, by removal and/or placement of an ARAR-compliant soil cover in accordance with 35 IAC 807.305(c).
- Prevent human exposure (through absorption, ingestion and/or external radiation) from contaminants exceeding the EPA baseline risk range of 10⁽⁻⁴⁾ to 10⁽⁻⁶⁾, including radium and other radionuclides and vanadium found in bauxite residue and gypsum waste.

SUMMARY OF REMEDIAL ALTERNATIVES

This section of the proposed plan describes the various remedial alternatives that were developed and evaluated in the OU2 FFS to address the RAOs identified above.

Common elements included in four of the six evaluated alternatives (RAA-2, RAA-3, RAA-4, and RAA-5) are as follows:

- Excavation, consolidation of the top two feet of soils and waste materials within OU2;
- Backfill excavated areas with two feet of ARAR-compliant soil in accordance with 35 IAC 807.305(c) and 807.502;
- Placement of ARAR-compliant soil cover over on-Site consolidation areas; and

- ICs to ensure long-term performance of installed ARAR-compliant covers.

The six remedial alternatives that were evaluated in the OU2 FFS – including a “no action” alternative and five alternatives that include remedial action components – are described below.

RAA-0 – No Action

EPA includes a “No-Action” alternative as a basis for comparison to the other cleanup alternatives. The no further action alternative does not include any physical remedial measures to address any Site-related media. Since no action would be taken, this alternative would not protect human health and the environment from either current or future risk.

Estimated Capital Costs: \$0

Estimated O&M Costs: \$0

Estimated Present Worth Cost: \$0

RAA-1 – Restricted Access

This alternative consists of physical controls and ICs via easement/restrictive covenants to prohibit access to the bauxite disposal areas. A fence restricting access would be constructed around the unfenced areas of OU2 and ICs would be created by implementing durable environmental easements and restrictive covenants compliant with the Illinois Universal Environmental Covenants Act (IUECA) to preclude land uses inconsistent with the remedy and to maintain the installed fencing and other Site access controls to ensure long-term protection. This alternative would not comply with the Illinois solid waste regulation 35 IAC 807.305(c) final-cover ARAR.

Estimated Capital Cost: \$95,000

Estimated Annual O&M Cost: \$42,000

Estimated Present Worth Costs: \$137,000

RAA-2 – Excavation and Containment with Placement of ARAR-Compliant Soil Cover and On-Site Stormwater Management – Off-Site Disposal of Bauxite Residue

This alternative incorporates removal of near-surface bauxite residue to a depth of two feet from IB-3a, IB-3b, IB-4c, IB-4e, IB-5a, and IB-6a (see Figure 9). This alternative would also remove any remaining bauxite from IB-3a and IB-4c, if present. Excavated bauxite would be transported off-Site for disposal at a permitted solid waste landfill. Backfill would be placed in areas where bauxite residue is excavated. All excavated areas would be covered with a minimum two-foot ARAR-compliant cover containing soil meeting the requirements of 35 IAC 807.305(c) and 35 IAC 807.502 and vegetated.

The IB-5a excavation includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste as is safely possible. This alternative involves excavating bauxite residue in IB-5a to the extent safely possible but not less than two feet and transporting the excavated residue off-Site for disposal at a permitted solid waste landfill. Excavated areas would be backfilled with a minimum two-foot ARAR-compliant soil cover and seeded. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26. This

alternative includes existing stormwater controls installed as part of the OU1 remedy construction. These stormwater controls consist of berms constructed on-Site and regrading of IB-4c, which divert stormwater discharges away from the on-Site IB-5a residential properties, and away from off-Site adjacent properties. These stormwater improvements are complying with the stormwater ARAR 40 C.F.R. § 122.26, currently are providing sufficient stormwater control for the OU1 area and would be updated as necessary in the final OU2 remedy design to comply with the stormwater control requirements for OU2.

Each investigative block would be addressed as follows:

IB-3a. As part of the OU1 remedy construction, Alcoa excavated bauxite from this area to a depth of two feet, consolidated excavated materials on-Site, backfilled the excavated area with a minimum two-foot ARAR-compliant soil cover and seeded the excavated area. Alternative RAA-2 for OU2 would excavate any currently remaining near-surface bauxite residue in IB-3a to a depth of at least two feet and would dispose of the excavated materials off-Site. This alternative would require backfilling of any excavated areas with a minimum two-foot ARAR-compliant soil cover and seeding the excavated area. The previously installed OU1 ARAR-compliant soil cover remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-3b. Alternative RAA-2 would require excavation of near-surface bauxite residue identified in this area to a depth of at least two feet and would require transportation and off-Site disposal of the excavated material. Excavated areas would be backfilled with a minimum two feet of ARAR-compliant cover soil and vegetated. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4c. As part of OU1 remedy construction, Alcoa excavated bauxite residue from IB-4c, consolidated excavated materials on-Site, backfilled the excavation area with a minimum two feet of ARAR-compliant soil cover and seeded the excavated area. Alternative RAA-2 for OU2 would excavate any remaining near-surface bauxite residue in this area to a depth of at least two feet and dispose of the excavated material off-Site. This alternative would backfill the excavation areas with a minimum two feet of ARAR-compliant cover soil and revegetate the area. The previously installed OU1 remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4e. Alternative RAA-2 would excavate near-surface bauxite residue identified on the Bi-State, Hamel and J. Smith properties to a depth of at least two feet, with off-Site disposal of the excavated materials. This alternative would backfill excavated areas with a minimum two feet of ARAR-compliant cover soil. This alternative would surface the Bi-State and J. Smith property excavation areas with aggregate material (aggregate is proposed to replace existing aggregate removed) and would surface the Hamel property with vegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-5a. Alternative RAA-2 would excavate near-surface and subsurface bauxite residue identified on the residential properties adjacent to Louisiana Boulevard to a depth of at least two feet and would dispose of the excavated material off-Site. This alternative includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste

from each property as is safely possible with the goal of complete bauxite waste removal. This alternative includes backfilling excavated areas and covering them with a minimum of two feet of ARAR-compliant cover soil and vegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-6a. Alternative RAA-2 would excavate near-surface bauxite in this area to a depth of at least two feet for off-Site disposal. This alternative would backfill excavated areas with a minimum two feet of ARAR-compliant soil and vegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

All above-listed IB areas. Prior to implementing the remedial actions, Alcoa would work directly with the individual property owners to coordinate remediation activities and obtain appropriate access agreements.

Alternative RAA-2 includes ICs which would establish a durable environmental easement and restrictive covenants compliant with IUECA. ICs would prohibit remedy disturbance and restrict potential receptors from contacting subsurface soils and/or remaining bauxite residue. This alternative also includes monitoring of the installed cover and requires necessary repairs of the cover.

Prior to implementing the soil cover, Site preparation activities would include installing a security fence and preparing access roads and staging areas. A pre-design field investigation to fill in remaining engineering data gaps may be implemented as part of the final design preparation.

Estimated Capital Costs: \$7,831,300

Estimated Annual O&M costs: \$40,000

Estimated Present Worth Costs: \$9,390,000

RAA-3 – Excavation and Containment with Placement of ARAR-Compliant Soil Cover – On-Site Consolidation of Bauxite Residue in OU1 Area (EPA’s Preferred Alternative)

This alternative incorporates removal of approximately 40,000 cubic yards of near-surface bauxite residue to a depth of two feet from IB-3a, IB-3b, IB-4c, IB-4e, IB-5a, and IB-6a (see Figure 10). Excavated bauxite would be transported into the IB-4a portion of OU1 and backfilled (see Figure 11, which shows the proposed waste relocation/consolidation areas). Excavated areas and the bauxite consolidation areas in IB-4a would be covered with ARAR-compliant soil meeting the requirements of 35 IAC 807.305(c) and 35 IAC 807.502 and vegetated.

The IB-5a excavation includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste as is safely possible. This alternative involves excavating bauxite residue in IB-5a to the extent safely possible but not less than two feet and transporting the excavated bauxite material entirely on-Site for consolidation in IB-4a. Excavated areas would be backfilled with a minimum two-foot ARAR-compliant soil cover and seeded. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26. This alternative includes existing stormwater controls installed as part of the OU1 remedy construction. These stormwater controls consist of berms constructed on-Site and regrading of IB-4c, which divert stormwater discharges away from the IB-5a residential properties on-Site and away from off-Site

adjacent properties. These surface water improvements are complying with the stormwater ARAR 40 C.F.R. § 122.26, currently are providing sufficient surface water control for the OU1 area and would be updated as necessary in the OU2 final remedy design.

Each investigative block would be addressed as follows:

IB-3a. As part of the OU1 remedy construction, Alcoa excavated bauxite from this area to a depth of two feet, consolidated excavated materials on-Site, backfilled the excavated area with a minimum two-foot ARAR-compliant soil cover and seeded the excavated area. Alternative RAA-3 for OU2 would excavate any remaining near-surface bauxite in IB-3a to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative would require backfilling of any excavated areas with a minimum two-foot ARAR-compliant soil cover covered by vegetation. The previously installed OU1 ARAR-compliant soil cover remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-3b. Alternative RAA-3 would require excavation of near-surface bauxite residue identified in this area to a depth of at least two feet and includes transporting the excavated materials entirely on-Site for consolidation in IB-4a. This alternative would require backfilling the excavated areas with a minimum two feet of ARAR-compliant cover soil and revegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4c. As part of OU1 remedy construction, Alcoa excavated bauxite residue from this area to a depth of two feet, consolidated excavated materials on-Site, backfilled the excavation area with a minimum two-foot ARAR-compliant soil cover and revegetated the excavation area. Alternative RAA-3 for OU2 would excavate any remaining near-surface bauxite residue to a depth of two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative would backfill the excavation areas with a minimum two feet of ARAR-compliant cover soil and revegetate the excavation area. The previously installed OU1 remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4e. Alternative RAA-3 would excavate near-surface bauxite residue identified on the Bi-State, Hamel, and J. Smith properties to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative would backfill the excavated areas with a minimum two feet of ARAR-compliant soil cover. This alternative would surface the Bi-State and J. Smith property excavation area with aggregate material (aggregate is proposed to replace existing aggregate removed) and would revegetate the surface of the Hamel property excavation area to restore the property to current conditions. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-5a. Alternative RAA-3 would excavate near-surface and subsurface bauxite residue identified on the residential properties adjacent to Louisiana Boulevard to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste from each property as is safely possible with the goal of complete bauxite waste removal. This alternative includes backfilling excavated areas and covering the

excavated areas with a minimum of two feet of ARAR-compliant soil cover soil and vegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-6a. Alternative RAA-3 would excavate near-surface bauxite to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative would backfill excavated areas with a minimum two feet of ARAR-compliant soil cover topped with vegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

All above-listed IB areas. Prior to implementing the remedial actions, Alcoa would work directly with the individual property owners to coordinate remediation activities and obtain appropriate access agreements.

Alternative RAA-3 includes ICs which would establish a durable environmental easement and restrictive covenants compliant with IUECA. ICs would prohibit remedy disturbance and restrict potential receptors from contacting subsurface soils and/or remaining bauxite residue. This alternative also includes monitoring of the installed cover and requires necessary repairs of the cover.

Prior to implementing the soil cover, Site preparation activities would include installing a security fence and preparing access roads and staging areas. A pre-design field investigation to fill in remaining engineering data gaps may be implemented as part of the final design preparation.

Estimated Capital Costs: \$3,400,000

Estimated Annual O&M costs: \$40,000

Estimated Present Worth Costs: \$4,110,000

RAA-4 – Excavation and Containment with Placement of ARAR-Compliant Soil Cover – Capping of IB-3b/IB-6a, and On-Site Consolidation of Bauxite Residue in OU2 Area

This alternative incorporates removal of approximately 20,000 cubic yards of near-surface soils containing bauxite to a depth of two feet from IB-4e and IB-5a (see Figure 12). This alternative would also remove any remaining bauxite from IB-3a and IB-4c, if present, and incorporates placement of an ARAR-compliant soil cover over IB-3b and IB-6a where near-surface bauxite residue is located. Excavated bauxite from IB-4e and IB-5a would be transported into the IB-4c portion of OU2 and backfilled (see Figure 11). All excavated areas and the bauxite consolidation area in IB-4c would be covered with soil meeting the requirements of 35 IAC 807.305(c) and 35 IAC 807.502 and vegetated.

The IB-5a excavation includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste as is safely possible. This alternative involves excavating bauxite residue in IB-5a to the extent safely possible but not less than two feet and transporting the excavated bauxite material entirely on-Site for consolidation in IB-4c. Excavated areas would be backfilled with a minimum two-foot ARAR-compliant soil cover and seeded. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26. This alternative includes existing stormwater controls installed as part of the OU1 remedy construction. These stormwater controls consist of berms constructed on-Site and regrading of IB-4c, which divert stormwater discharges away from the IB-5a residential properties on-Site and away from off-Site adjacent properties. These surface water improvements are complying with the stormwater ARAR 40

C.F.R. § 122.26, currently are providing sufficient surface water control for the OU1 area and would be updated as necessary in the OU2 final remedy design.

Each investigative block would be addressed as follows:

IB-3a. As part of the OU1 remedy construction, Alcoa excavated bauxite from this area to a depth of two feet, consolidated excavated materials on-Site, backfilled the excavated area with a minimum two-foot ARAR-compliant soil cover and seeded the excavated area. Alternative RAA-4 for OU2 would excavate any remaining near-surface bauxite in IB-3a to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative would require backfilling of any excavated areas with a minimum two-foot ARAR-compliant soil cover covered by vegetation. The previously installed OU1 ARAR-compliant soil cover remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-3b. Alternative RAA-4 would involve placement of an ARAR-compliant vegetated soil cover over IB-3b where near-surface bauxite residue is located. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4c. As part of OU1 remedy construction, Alcoa excavated bauxite residue from this area to a depth of two feet, consolidated excavated materials on-Site, backfilled the excavation area with a minimum two-foot ARAR-compliant soil cover and revegetated the excavation area. Alternative RAA-4 for OU2 would excavate any remaining near-surface bauxite residue to a depth of two feet and transport the excavated material entirely on-Site for consolidation in IB-4c. This alternative would backfill the excavation areas with a minimum two feet of ARAR-compliant cover soil and revegetate the excavation area. The previously installed OU1 remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4e. Alternative RAA-4 would excavate near-surface bauxite residue identified on the Bi-State, Hamel, and J. Smith properties to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4c. This alternative would backfill the excavated areas with a minimum two feet of ARAR-compliant soil cover. This alternative would surface the Bi-State and J. Smith property excavation area with aggregate material (aggregate is proposed to replace existing aggregate removed) and would revegetate the surface of the Hamel property excavation area to restore the property to current conditions. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-5a. Alternative RAA-4 would excavate near-surface and subsurface bauxite residue identified on the residential properties adjacent to Louisiana Boulevard to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4c. This alternative includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste from each property as is safely possible with the goal of complete bauxite waste removal. This alternative includes backfilling excavated areas and covering the excavated areas with a minimum of two feet of ARAR-compliant soil cover soil and vegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-6a. Alternative RAA-4 would involve placement of an ARAR-compliant vegetated soil cover over IB-6a where near-surface bauxite residue is located. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

All above-listed IB areas. Prior to implementation of the remedial actions, Alcoa would work directly with the individual property owners to coordinate remediation activities and obtain appropriate access agreements.

Alternative RAA-4 includes ICs which would establish a durable environmental easement and restrictive covenants compliant with IUECA. ICs would prohibit remedy disturbance and restrict potential receptors from contacting subsurface soils and/or remaining bauxite residue. This alternative also includes monitoring of the installed cover and requires necessary repairs of the cover.

Prior to implementing the soil cover, Site preparation activities would include installing a security fence and preparing access roads and staging areas. A pre-design field investigation to fill in remaining engineering data gaps may be implemented as part of the final design preparation.

Estimated Capital Costs: \$4,165,700

Estimated Annual O&M Costs: \$40,000

Estimated Present Worth Costs: \$5,022,400

RAA-5 – Excavation and Containment with Placement of ARAR-Compliant Soil Cover – Capping of IB-3b/IB-6a, and On-Site Consolidation of Bauxite Residue in OU1 Area

This alternative incorporates removal of approximately 20,000 cubic yards of near-surface soils containing bauxite to a depth of two feet from IB-4e and IB-5a (see Figure 13). This alternative would also remove any remaining bauxite from IB-3a and IB-4c, if present, and incorporates placement of ARAR-compliant soil cover over IB-3b and IB-6a where near-surface bauxite residue is located. Excavated bauxite from IB-4e and IB-5a would be transported into the IB-4a portion of OU1 and backfilled (see Figure 11). Excavated areas and the bauxite consolidation areas in IB-4a would be covered with soil meeting the requirements of 35 IAC 807.305(c) and 35 IAC 807.502 and vegetated.

The IB-5a excavation includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste as is safely possible. Existing stormwater controls in the area, installed as part of the OU1 remedy construction, consisting of berm construction in, and regrading of, IB-4c to divert stormwater away from the IB-5a residential properties, are included in this alternative. These surface water improvements are complying with the stormwater ARAR 40 C.F.R. § 122.26, currently are providing sufficient surface water control for the OU1 area and would be updated as necessary in the OU2 final remedy design.

Each investigative block would be addressed as follows:

IB-3a. As part of the OU1 remedy construction, Alcoa excavated bauxite from this area to a depth of two feet, consolidated excavated materials on-Site, backfilled the excavated area with a minimum two-foot ARAR-compliant soil cover and seeded the excavated area. Alternative RAA-5 for OU2 would excavate any remaining near-surface bauxite in IB-3a to a depth of at least two feet and transport the

excavated material entirely on-Site for consolidation in IB-4a. This alternative would require backfilling of any excavated areas with a minimum two-foot ARAR-compliant soil cover covered by vegetation. The previously installed OU1 ARAR-compliant soil cover remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-3b. Alternative RAA-5 would involve placement of an ARAR-compliant vegetated soil cover over IB-3b where near-surface bauxite residue is located. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4c. As part of OU1 remedy construction, Alcoa excavated bauxite residue from this area to a depth of two feet, consolidated excavated materials on-Site, backfilled the excavation area with a minimum two-foot ARAR-compliant soil cover and revegetated the excavation area. Alternative RAA-5 for OU2 would excavate any remaining near-surface bauxite residue to a depth of two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative would backfill the excavation areas with a minimum two feet of ARAR-compliant cover soil and revegetate the excavation area. The previously installed OU1 remedy would remain in place with ongoing O&M. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-4e. Alternative RAA-5 would excavate near-surface bauxite residue identified on the Bi-State, Hamel, and J. Smith properties to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative would backfill the excavated areas with a minimum two feet of ARAR-compliant soil cover. This alternative would surface the Bi-State and J. Smith property excavation area with aggregate material (aggregate is proposed to replace existing aggregate removed) and would revegetate the surface of the Hamel property excavation area to restore the property to current conditions. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-5a. Alternative RAA-5 would excavate near-surface and subsurface bauxite residue identified on the residential properties adjacent to Louisiana Boulevard to a depth of at least two feet and transport the excavated material entirely on-Site for consolidation in IB-4a. This alternative includes a pre-design field investigation as part of the final design, to fill in the remaining engineering data gaps for removing as much bauxite waste from each property as is safely possible with the goal of complete bauxite waste removal. This alternative includes backfilling excavated areas and covering the excavated areas with a minimum of two feet of ARAR-compliant soil cover soil and vegetation. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

IB-6a. Alternative RAA-5 would involve placement of an ARAR-compliant vegetated soil cover over IB-3b where near-surface bauxite residue is located. Stormwater controls would comply with the stormwater ARAR, 40 C.F.R. § 122.26.

All above-listed IB areas. Prior to implementation of the remedial actions, Alcoa would work directly with the individual property owners to coordinate remediation activities and obtain appropriate access agreements.

Alternative RAA-5 includes ICs which would establish a durable environmental easement and restrictive covenants compliant with IUECA. ICs would prohibit remedy disturbance and restrict potential receptors from contacting subsurface soils and/or remaining bauxite residue. This alternative also includes monitoring of the installed cover and requires necessary repairs of the cover.

Prior to implementing the soil cover, Site preparation activities would include installing a security fence and preparing access roads and staging areas. A pre-design field investigation to fill in remaining engineering data gaps may be implemented as part of the final design preparation.

Estimated Capital Costs: \$2,993,800

Estimated Annual O&M Costs: \$40,000

Estimated Present Worth Costs: \$3,627,800

EVALUATION OF ALTERNATIVES

As required by the NCP, EPA uses nine criteria to evaluate and compare cleanup alternatives. The nine criteria fall into three groups: “threshold criteria” are requirements that each alternative must meet in order to be eligible for selection; “balancing criteria” are used to weigh major trade-offs among alternatives, and “modifying criteria” are fully considered only after public comment is received on the Proposed Plan. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how each alternative compares to the other alternatives under consideration. The “Detailed Analysis of Alternatives” can be found in the FFS for OU2.

Threshold Criteria

Overall Protection of Human Health and the Environment

This evaluation criterion assesses whether each remedial alternative protects human health and the environment. This assessment focuses on how an alternative achieves protection over time and indicates how each source of contamination would be minimized, reduced, or controlled through treatment, engineering, or institutional controls. The evaluation of the degree of overall protection associated with each alternative is based largely on the exposure pathways and scenarios set forth in the baseline human health risk assessment.

Alternatives RAA-0 and RAA-1 are not protective of human health and the environment because they do not address the risks posed by exposure to Site contamination as presented in the risk assessment. RAA-1 restricts access to the areas containing bauxite residue waste with fencing that must be maintained but does not provide a cover to prevent contact with these materials.

Alternatives RAA-2, RAA-3, RAA-4 and RAA-5 are protective of human health and the environment as they include a combination of excavation of waste materials, placement of an ARAR-compliant soil cover over the waste materials remaining in place, and consolidation or disposal of excavated materials in a manner that eliminates exposure and addresses unacceptable risk.

RAA-2 includes disposal of excavated materials in a permitted solid waste landfill. RAA-3 and RAA-5 include consolidation of excavated materials in the OU1 area, while RAA-4 includes consolidation of

excavated materials in an area of OU2. RAA-4 and RAA-5 include capping of IB-3b and IB-6a with a minimum two feet of ARAR-compliant soil, in addition to excavation in IB-3a, IB-4c, and IB-5a.

Compliance with ARARs

This evaluation criterion addresses whether alternatives meet applicable or relevant and appropriate federal and State requirements known as ARARs.

Stormwater Controls

EPA identified the requirements of 40 C.F.R. § 122.26 as an ARAR, requiring controls and permits for the discharge of surface stormwater flow from a property such as the Alcoa Site. The Site record documents, however, that there is no nearby off-Site surface water body that can receive the Alcoa Site's surface stormwater flow. The Site record also documents that the local sewer system does not have the capacity to accept any of the Alcoa Site's stormwater flow. The Site remedy therefore requires on-Site control of the Alcoa Site stormwater.

The Site remedy controls the flow of Alcoa Site stormwater on-Site through berms and grading, collecting the surface stormwater flow in three surface ponds.

Alternatives RAA-0 and RAA-1 do not comply with the appropriate ARAR for stormwater controls. RAA-5 potentially creates issues with stormwater management in the area by placing two feet of ARAR-compliant soil in IB-3b and IB-6a that could result in issues directing stormwater away from the installed remedy into surrounding properties. RAA-2, RAA-3, and RAA-4 would be designed and implemented to comply with the Site stormwater control ARARs. Specifically, the stormwater controls would comply with 40 C.F.R. § 122.26.

Landfill Requirements

EPA and Illinois EPA determined that the Alcoa Site bauxite residue is a solid waste under the Resource Conservation and Recovery Act (RCRA) and identified and evaluated the landfill closure requirements that may be "applicable or relevant and appropriate requirements" to Alcoa's bauxite residue. As previously outlined in the OU1 FFS, EPA determined that the RCRA Subtitle C hazardous waste landfill requirements are not "applicable" to Alcoa's bauxite residue based on the Bevill Amendment to RCRA. The Bevill Amendment provides that Site solid waste from the extraction, beneficiation, and processing of ores and minerals is excluded from the definition of a listed hazardous waste. See, Section 3001(b)(3)(A)(ii) of RCRA and 40 C.F.R. Section 261.4(b)(7).

The Bevill Amendment exemption does not, however, affect CERCLA jurisdiction over the bauxite residue where this material contains hazardous substances that could pose a threat to human health and the environment, and does not preclude a determination that the RCRA Subtitle C requirements are "relevant and appropriate requirements" for the bauxite residue.

In particular, RCRA provides that Bevill wastes shall be "subject only to regulation under other applicable provisions of Federal or State law in lieu of" Subtitle C. 42 U.S.C. 6921(b)(3)(A).

Even though the RCRA Subtitle C landfill requirements are not “applicable” to Alcoa’s bauxite residue, the requirements found in RCRA Subtitle C may be “relevant and appropriate” on a case-by-case basis. See also, 55 Fed. Reg. 8666 (March 8, 1990). If the bauxite residue area contains hazardous substances that have been or threaten to be released and pose a threat to human health and the environment, then a CERCLA relevant and appropriate analysis may select a RCRA Subtitle C hazardous waste cover requirement as “relevant and appropriate.” Since a release or threat of release of hazardous substances to the environment (e.g., soil, groundwater, and surface water) has been documented at the Site, the RCRA Subtitle C requirements may be “relevant and appropriate” to the OU2 remedy.

Where RCRA Subtitle C is consistent with an EPA-authorized State hazardous waste landfill requirement, EPA identifies the EPA-authorized State requirement for purposes of the ARAR. Illinois has received EPA authorization of its hazardous waste landfill requirements (51 Fed. Reg. 3778, January 30, 1986, as amended). Therefore, the requirements of 35 IAC Part 811, Subpart C would apply if RCRA Subtitle C requirements are found to be relevant and appropriate requirements to a Site.

The RCRA Subtitle C requirements are considered to be relevant to the Alcoa Site bauxite residue but are not considered to be appropriate requirements.

Section 300.400(g)(2) of 40 C.F.R. provides eight criteria to evaluate whether a requirement, such as RCRA Subtitle C, “addresses problems or situations sufficiently similar to the circumstances of the release or remedial action contemplated, and whether the requirement is well suited to the Site, and therefore is both relevant and appropriate.” Based on the criteria of 40 C.F.R. §300.400(g)(2)(i), the RCRA Subtitle C requirement is not well suited to the Alcoa Site. Specifically, a significant purpose of a multilayer RCRA Subtitle C hazardous waste cover is to prevent infiltration of surface waters through the waste to the groundwater. Due to Alcoa Site waste remaining in contact with the groundwater, and the documented necessity for on-Site storm water control, a RCRA Subtitle C cover requirement is not well suited to this Site and would impair the on-Site storm water control. In addition, and consistent with 40 C.F.R. §300.400(g)(2)(viii), there is no current or potential use for subsurface waters at this Site. Based on this analysis, RCRA Subtitle C is relevant but not appropriate for OU2.

The record documents that this Site must provide on-Site storm water control; off-Site storm water control is not viable since there is no nearby direct discharge location and the local sewer system will not accept this flow. The pilot engineering study conducted to support the OU1 FFS and OU1 ROD demonstrated that an alternative landfill cover, 35 IAC 807.305(c), would provide long-term stability, would be sufficiently protective of direct contact threats, and would accommodate on-Site storm-water control.

The ARAR analysis included in the OU2 FFS identified the ARAR requirement for OU2 to be a soil cover complying with the provisions of 35 IAC 807.305(c) over the soils, which includes two feet of suitable material (defined as uncontaminated, cohesive soil that can be compacted) and closure of the Site consistent with 35 IAC 807.502 to minimize further maintenance and control post-closure releases.

Alternatives RAA-0 and RAA-1 do not comply with the appropriate ARARs for the waste material cover. RAA-2, RAA-3, RAA-4 and RAA-5 would be designed and implemented to comply with all

Site ARARs. Specifically, the soil cover over the waste materials and post-closure maintenance would comply with 35 IAC 807.305(c) and 35 IAC 807.502 requirements.

Balancing Criteria

Long-Term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the risk remaining at the Site after response objectives have been met.

RAA-0 and RAA-1 are not effective in the long term nor are they permanent. However, fencing can prevent access to the Site and associated exposure to waste materials.

RAA-2, RAA-3, RAA-4 and RAA-5 are all effective over the long term. RAA-2 is the most effective and permanent due to the disposal of all excavated waste materials off-Site. RAA-3 is more effective and permanent in the long term than RAA-4 because using IB-4a for consolidation of excavated materials is more efficient for O&M and does not adversely impact stormwater management on surrounding properties by capping consolidated waste on extremely flat ground, as would be done under RAA-4. RAA-5 incorporates the benefit of using IB-4a for excavated waste consolidation but also potentially creates issues with stormwater management in the area by placing two feet of ARAR-compliant soil in IB-3b and IB-6a that could result in issues directing stormwater away from the installed remedy into surrounding properties.

Reduction of Toxicity, Mobility or Volume

This evaluation criterion addresses the statutory requirement for selecting remedial actions that employ treatment technologies that reduce the toxicity, mobility, or volume of the hazardous constituents present in the impacted media to the maximum extent practicable.

The containment technologies identified in all alternatives are not treatment technologies and therefore, do not reduce toxicity, mobility or volume within the soil matrix. Treatment technologies are not included in any of the alternatives because treatment of high volume, low toxicity soils is not feasible at the Site. Alcoa's 2006 removal work removed the principal threat SPL listed hazardous waste from IB-3b for off-Site disposal. Treatment of the wastes currently remaining at the Site to reduce toxicity, mobility or volume is not practicable. However, excavation and consolidation of bauxite waste materials with construction of an ARAR-compliant soil cover and stormwater controls would reduce the potential mobility of contaminants leaching from the bauxite, reduce the overall footprint of surficial bauxite at the Site and control the flow of stormwater from the Site to adjacent parcels and to on-Site residential properties.

Short-Term Effectiveness

This evaluation criterion addresses the effects of the alternatives during the construction and implementation phases (i.e., remediation risks) until the RAOs are met.

RAA-1 could be implemented in the shortest time frame without any adverse impacts from the installation of access restrictions such as fencing and could be completed in a matter of months. The construction work for RAA-2, RAA-3, RAA-4 and RAA-5 could be completed in approximately eight months. Any adverse impacts to workers or to the surrounding area from excavation and consolidation of waste materials and installation of the soil cover can be properly managed through Site-specific health and safety planning and compliance with standard cover installation practices.

RAA-2 is the least effective in the short term due to the potential impact to the community during off-Site transportation of excavated waste materials.

RAA-4 would not be as short-term-effective as RAA-3 and RAA-5 due to the potential for increased stormwater impacts in the IB-4c area from the consolidation of excavated waste materials over IB-4c's extremely flat current grade and the lack of sufficient area to manage stormwater issues. In contrast, RAA-3 and RAA-5 use IB-4a as the consolidation area for excavated soils, allowing the use of existing ponds for stormwater management. RAA-4 also involves consolidating and constructing an ARAR-compliant cover over the extremely flat current grade in IB-3b and IB-6a with similar stormwater management issues.

Like RAA-4, RAA-5 would have adverse stormwater impacts associated with installing an ARAR-compliant cover over areas IB-3b and IB-6a. RAA-4 is therefore not as short-term-effective as RAA-3, which doesn't place a cover over those areas.

RAA-3 involves the least impact to areas receiving excavated waste materials and remedy cover, and the use of IB-4a as the consolidation area for excavated soils allows use existing ponds for stormwater management.

Implementability

This evaluation criterion considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

All alternatives are readily implementable. Installation of fencing is a typical construction activity. Development of and implementation of enforceable restrictive covenants is also a typical activity. The existing Site restrictions can be readily updated and appended as part of this criterion and the City of East St. Louis has indicated a willingness to complete this task quickly.

Most of the tasks in RAA-2, RAA-3, RAA-4 and RAA-5 are common, reliable construction activities that do not entail any significant technical difficulties. Some aspects of these alternatives, such as negotiations with property owners, may impact the overall implementability but are expected to be resolved expediently.

Alternatives that involve excavating and removing bauxite residues in select locations to the extent feasible beyond the minimum two feet of excavation, such as at specified residential properties in IB-5a, may present a challenge. This concern is equally applicable to RAA-2, RAA-3, RAA-4 and RAA-5. Under any of these alternatives, excavations would proceed to the extent feasible.

Cost

The estimated capital, O&M, and present worth costs for the remedial alternatives are as follows:

Alternative	Capital Cost	O&M Cost	Present Worth Cost
RAA-1 Restricted Access	\$95,000	\$42,000	\$137,000
RAA-2 Excavation and Capping -- Off-Site Disposal	\$7,831,300	\$40,000	\$9,390,000
RAA-3 Excavation and Capping -- On-Site Consolidation in OU1	\$3,400,000	\$40,000	\$4,110,000
RAA-4 Excavation and Capping -- On-Site Consolidation in OU2	\$4,165,700	\$40,000	\$5,022,400
RAA-5 Excavation and Capping -- On-Site Consolidation in OU1	\$2,993,800	\$40,000	\$3,627,800

Modifying Criteria

State/Support Agency Acceptance

Illinois EPA's support for EPA's Preferred Alternative, RAA-3, is pending.

Community Acceptance

Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the OU2 ROD. EPA encourages public comment on all of the alternatives presented in this Proposed Plan.

PREFERRED ALTERNATIVE

CERCLA Section 121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, comply with applicable or relevant and appropriate requirements, and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable.

EPA's Preferred Alternative for cleaning up OU2 at the North Alcoa Site is Alternative RAA-3. RAA-3 addresses the impacted OU2 areas by clearing vegetation and other debris, excavating the top two feet of bauxite waste materials, consolidating all excavated bauxite waste in IB-4a within OU1, regrading soil and constructing an ARAR-compliant two-foot soil cover complying with solid waste landfill requirements over all excavation areas and the IB-4a consolidation area. RAA-3 provides ARAR-compliant enhancement and control of surface stormwater by maintaining the current interim controls as well as determining during the remedial design if additional controls are necessary. RAA-3

also includes the potential for removal of most of the bauxite residue waste on the residential properties in IB-5a, dependent on accessibility and constructability, which will aid the process of establishing the proper ICs for long-term permanence and effectiveness.

Based on the information currently available, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Preferred Alternative, RAA-3, was selected over the other alternatives because it is expected to prevent future exposure to contaminated soils through the excavation and consolidation of surficial bauxite waste materials in IB-4a and the installation and maintenance of an ARAR-compliant cover over excavated areas and the IB-4a consolidation area, management of on-Site stormwater to minimize the risk of flooding of adjacent properties and on-Site residential properties, and installation of appropriate fencing around OU2. The Preferred Alternative also reduces risk within a reasonable time frame and provides for long-term reliability of the selected remedy.

EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA 121(b): be protective of human health and the environment; comply with ARARs; be cost-effective; and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

It is important to note that the Preferred Alternative can change in response to public comment or new information.

COMMUNITY PARTICIPATION

EPA and Illinois EPA are providing information to the public regarding the investigation and cleanup of the North Alcoa Site through public meetings, the Administrative Record file for the Site, and announcements through the local news media. Additional public outreach will be conducted for nearby residents prior to any public meeting by Agency personnel, including the use of the expanded mailing list developed for outreach for OU1 remedy selection. EPA and Illinois EPA encourage the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted at the Site by attending public meetings and reviewing the information available in the Administrative Record repositories for the Site (identified earlier in this Proposed Plan).

Figures

Figure 1: Site Operable Unit Map



Figure 2: Investigative Block Map

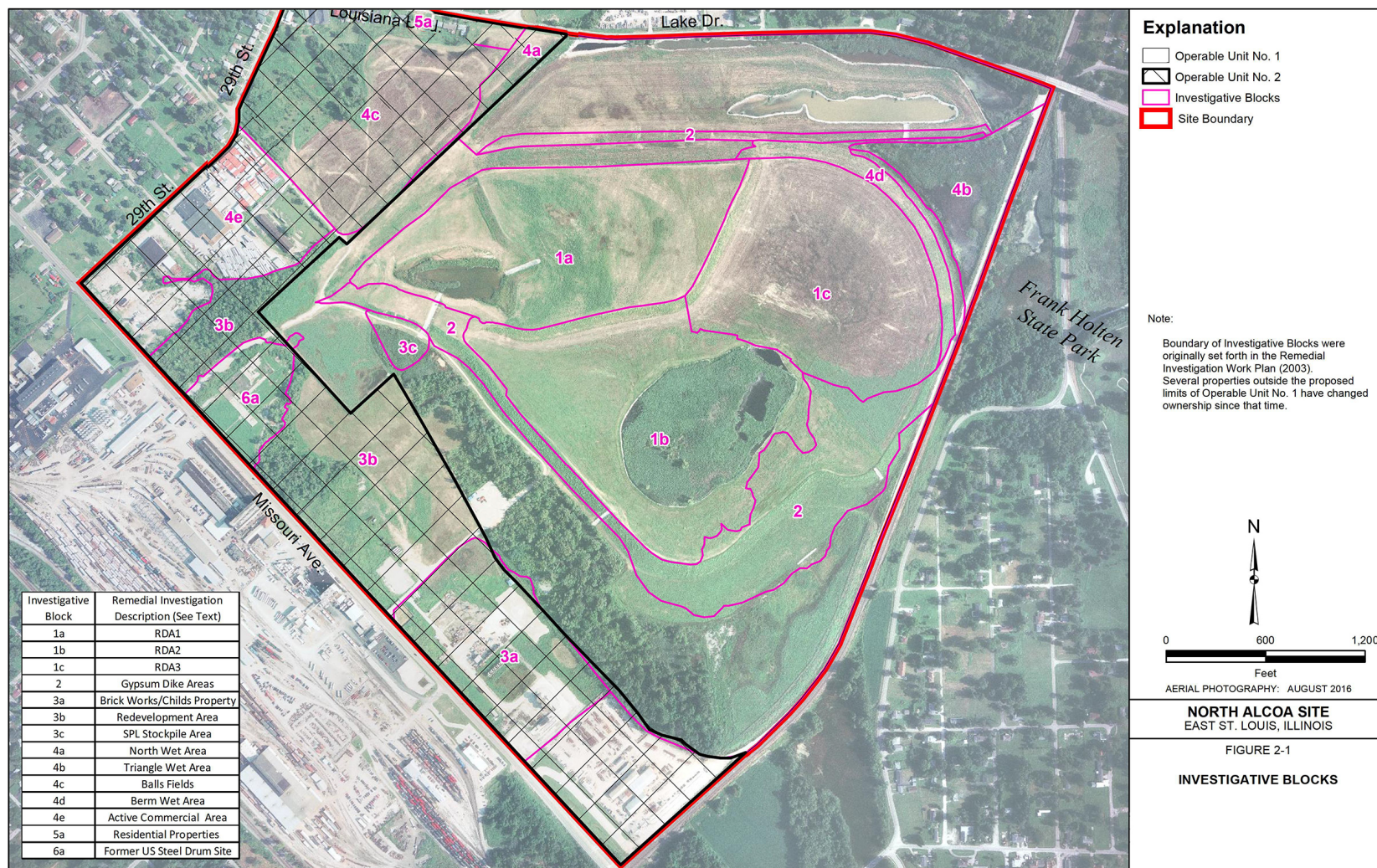


Figure 3: Extent of Surficial Bauxite in OU2

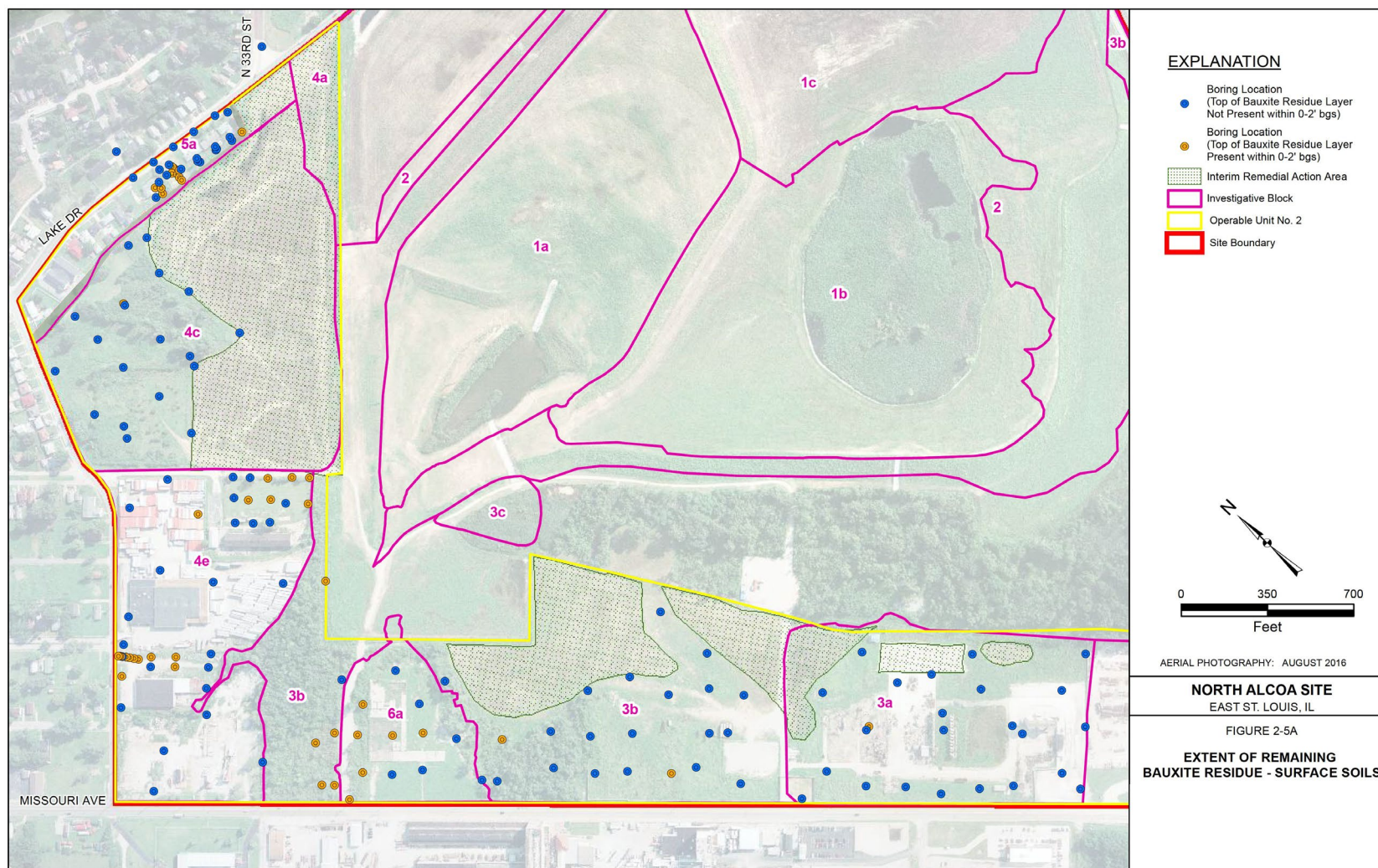


Figure 4: Extent of Subsurface Bauxite in OU2

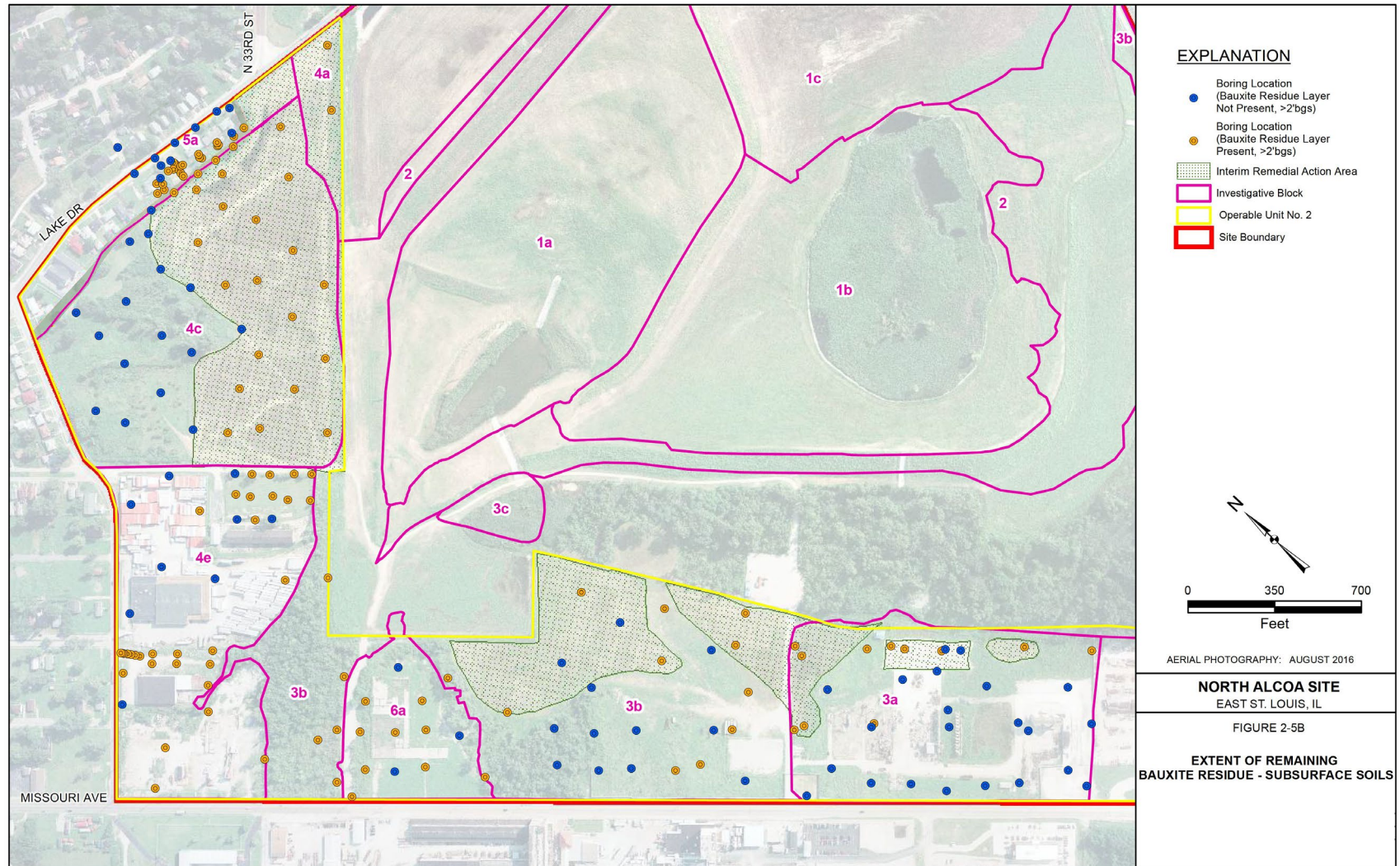


Figure 5: Total Radium in Surface Soils OU2

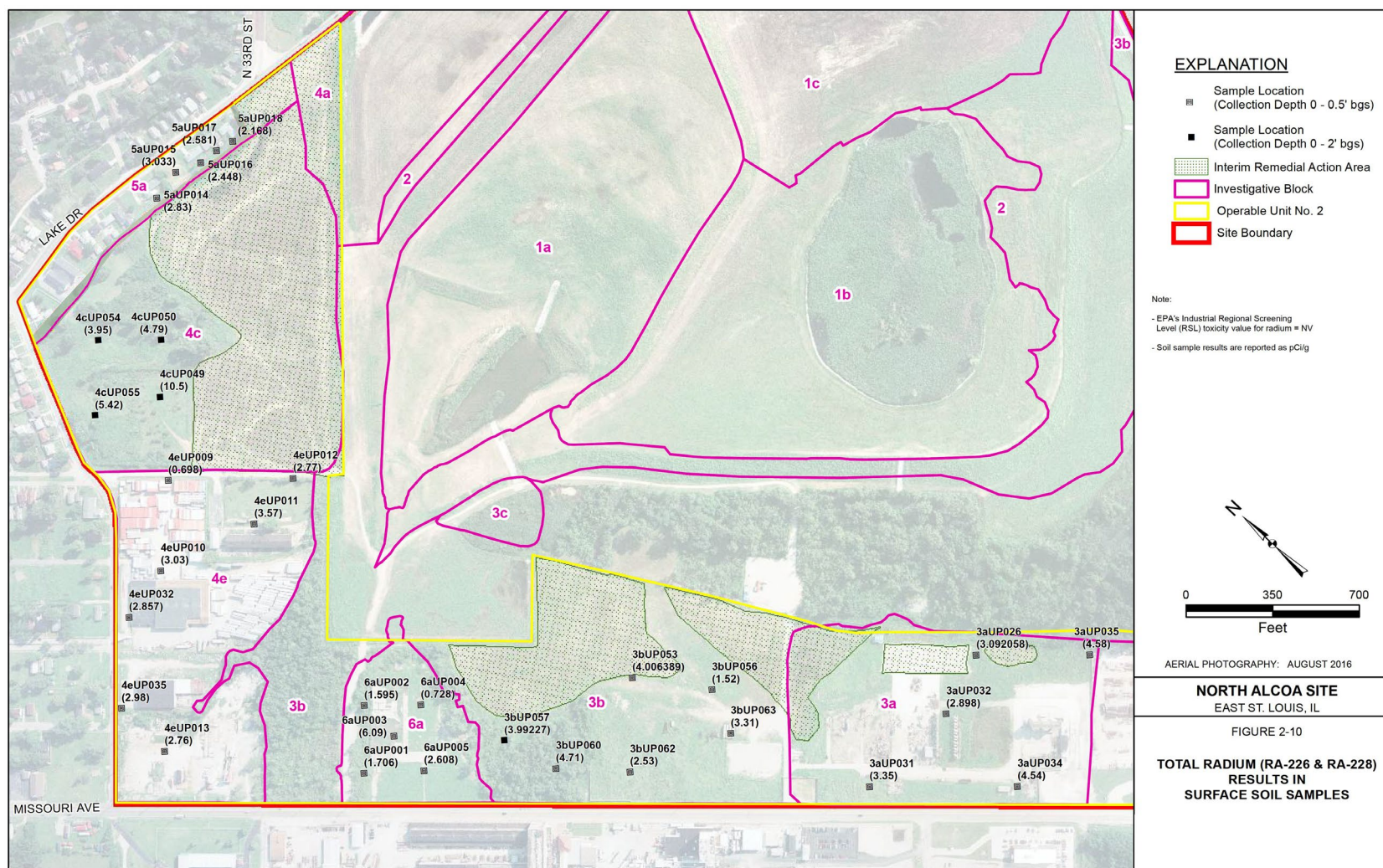


Figure 6: Total Radium in Subsurface Soils – OU2

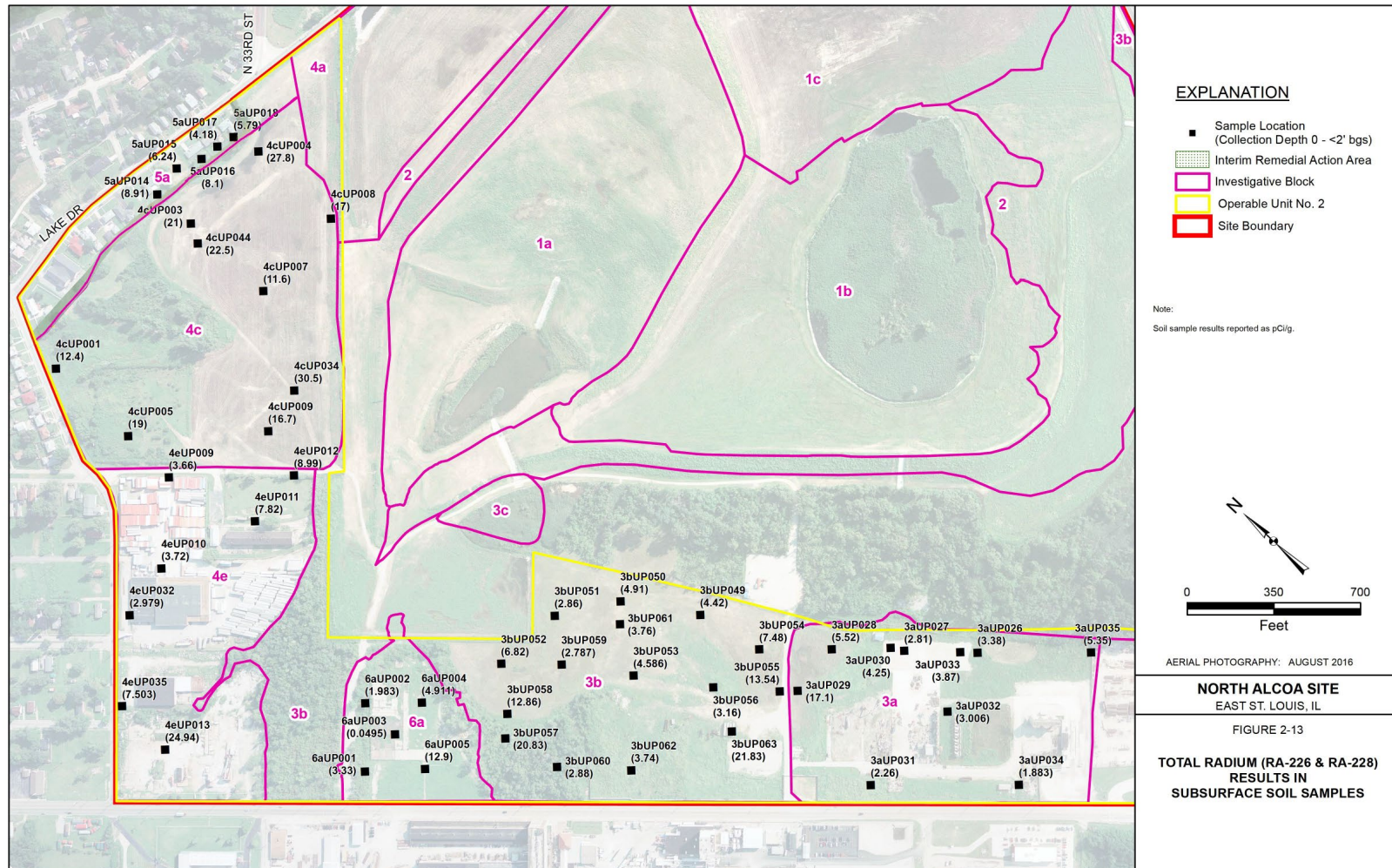


Figure 7: Groundwater Monitoring Locations



Figure 8: Historical Groundwater Exceedances

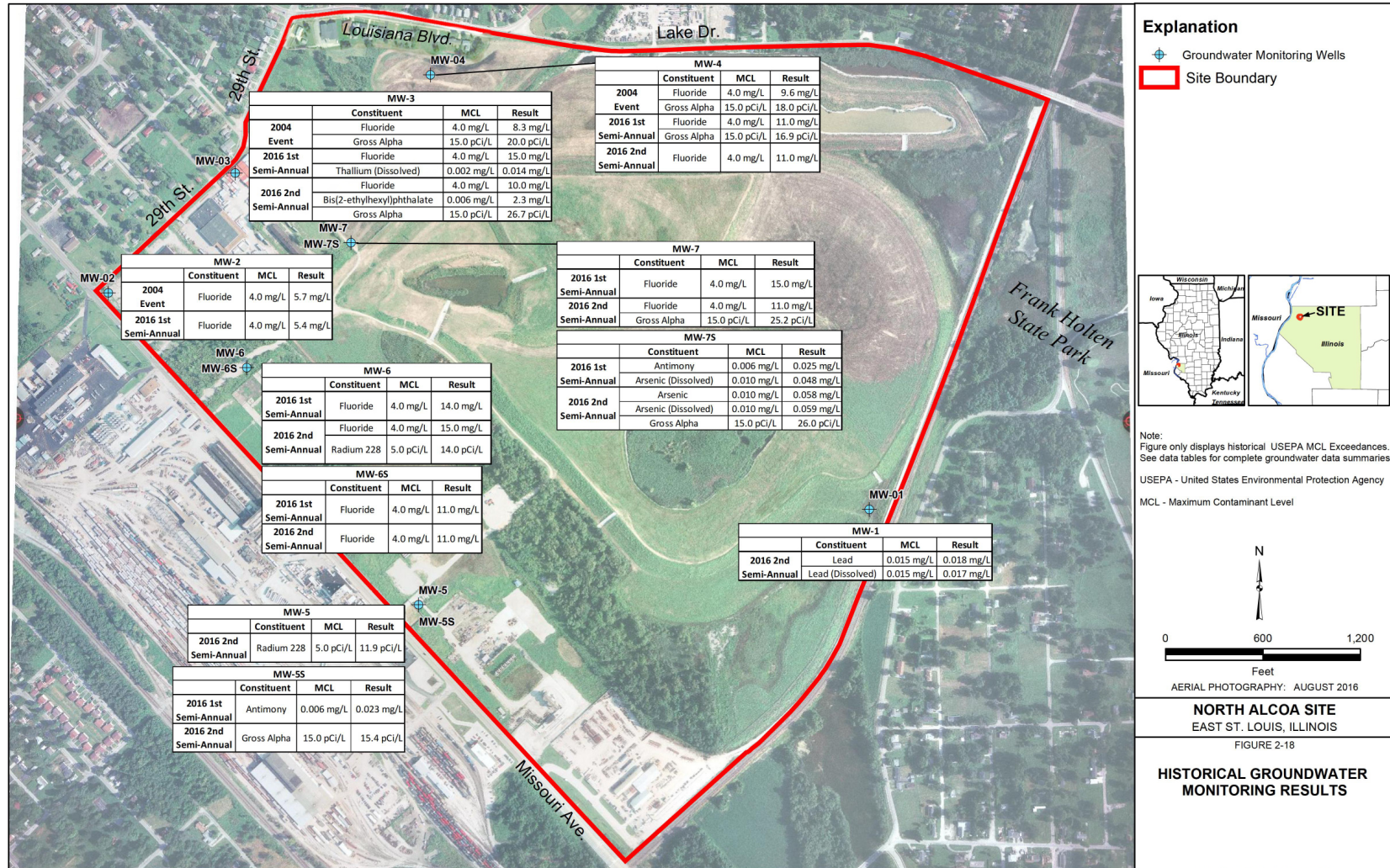


Figure 9: RAA-2 – Proposed Excavation/Consolidation/Capping

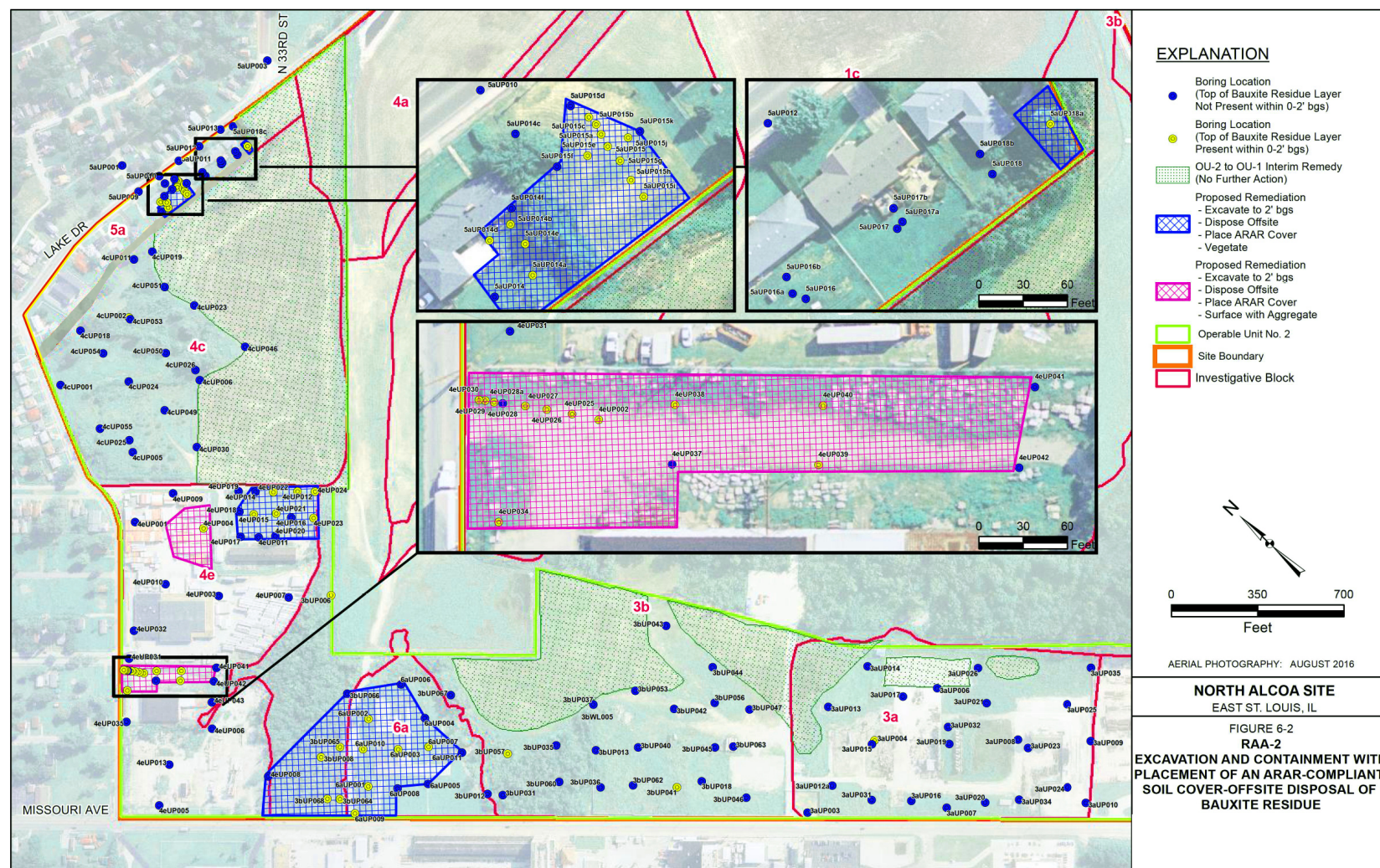


Figure 10: RAA-3 Proposed Excavation/Consolidation/Capping



Figure 11: OU2 Waste Relocation Areas

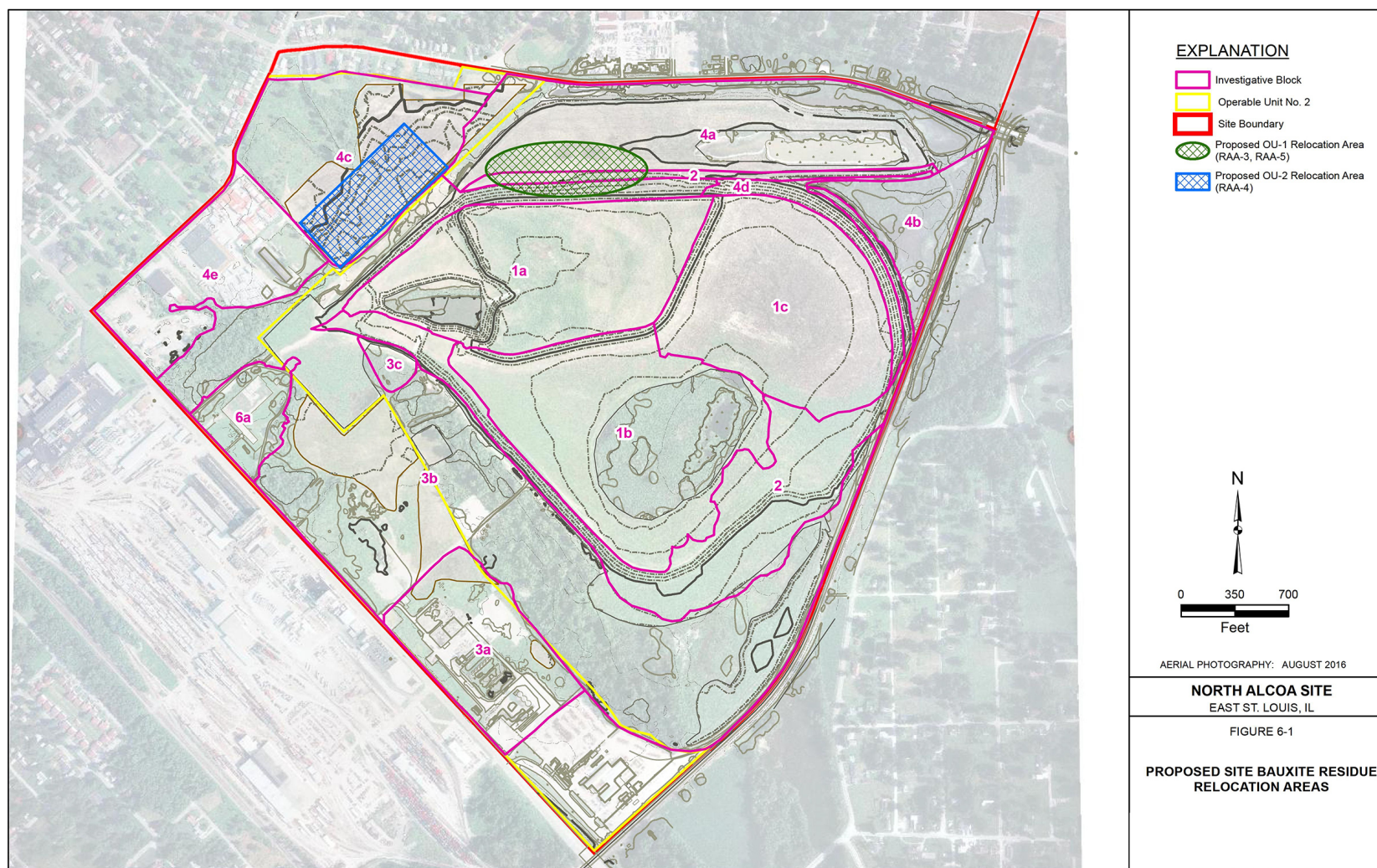


Figure 12: RAA-4 Proposed Excavation/Consolidation/Capping

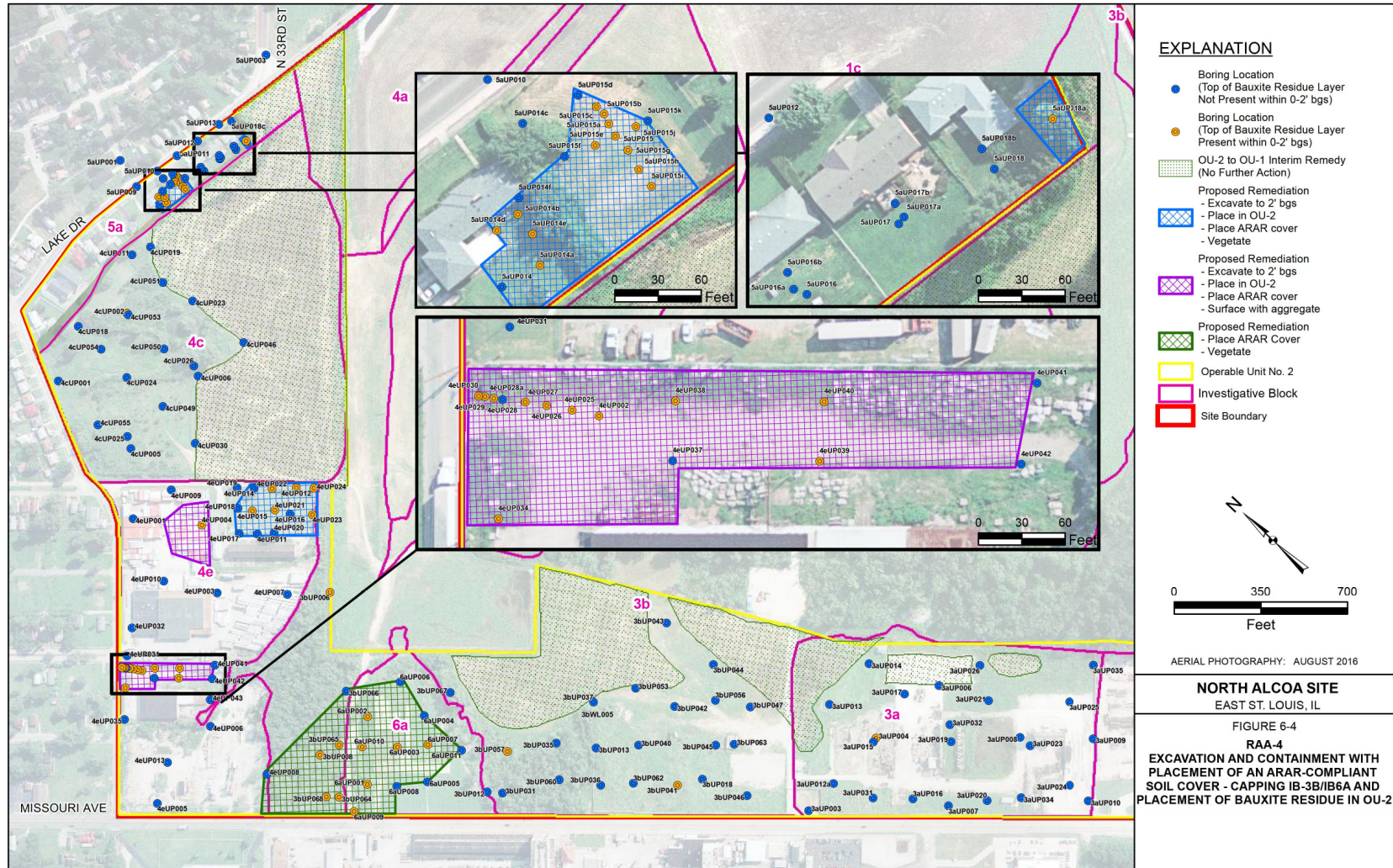
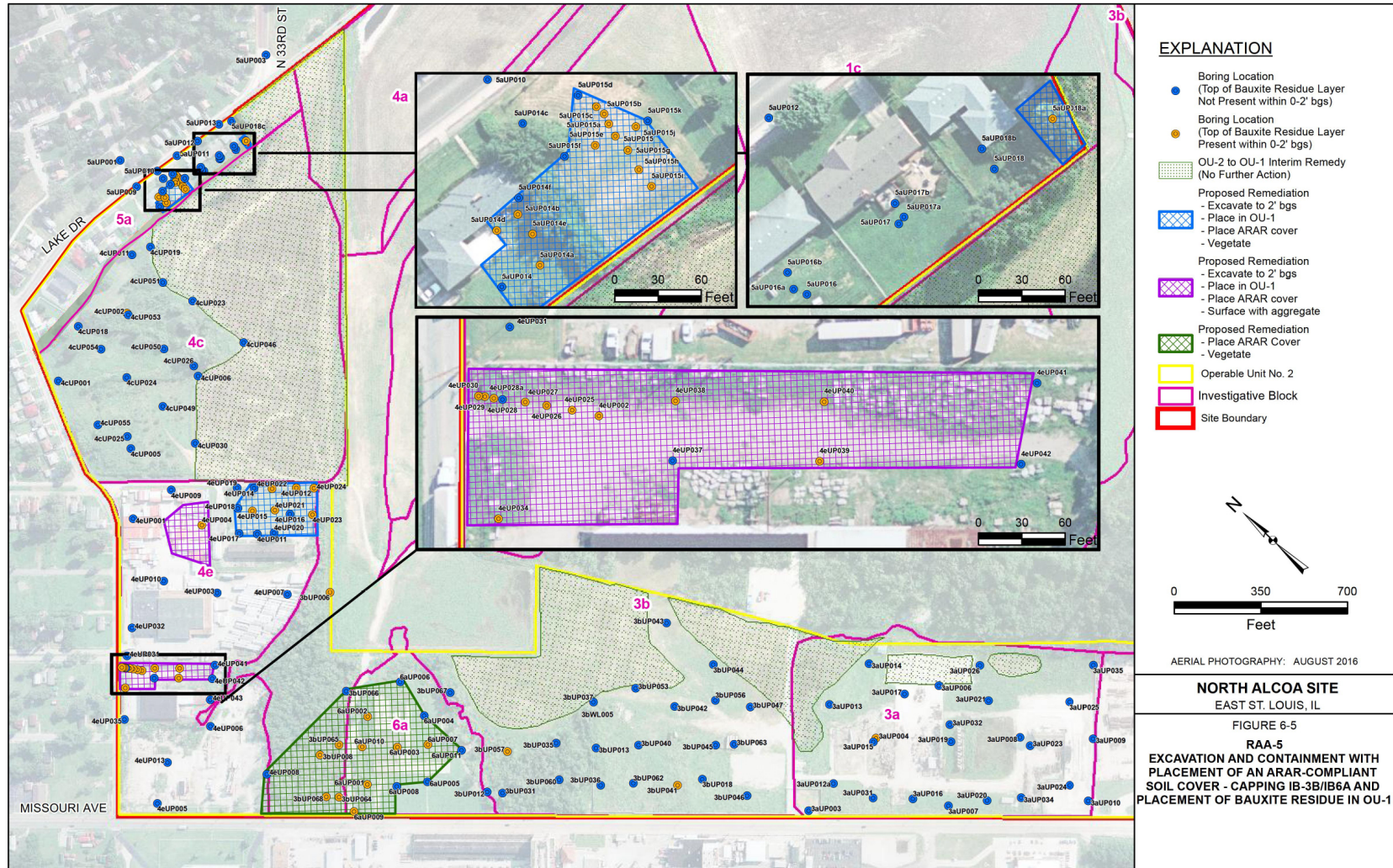


Figure 13: RAA-5 Proposed Excavation/Consolidation/Capping



Tables

Table 1: Chemical Composition of Bauxite and Gypsum

**SUMMARY OF THE CHEMICAL COMPOSITION OF BAUXITE RESIDUE AND GYPSUM
NORTH ALCOA SITE, EAST ST. LOUIS, ILLINOIS**

Detected Chemical	Surface Soil Samples						Subsurface Soil Samples					
	Bauxite Residue (IB-1) (mg/kg)			Gypsum (IB-2) (mg/kg)			Bauxite Residue (IB-1) (mg/kg)			Gypsum (IB-2) (mg/kg)		
	No.	Avg	Max	No.	Avg	Max	No.	Avg	Max	No.	Avg	Max
Aluminum	56	62,370	127,000	18	7,513	61,100	61	64,868	96,200	11	9,665	32,200
Antimony	38	3.74	9.46	4	3.06	4.62	35	4.2	31.4	1	4.07	4.07
Arsenic	56	23.7	76.2	9	11.9	43.7	60	32.8	170	9	13	66.7
Barium	56	101	794	18	129	292	61	116	274	11	125	273
Cadmium	39	4.0	23.7	17	0.982	7.25	40	1.63	9.52	7	0.484	1.61
Chromium	56	479	1,100	18	34.4	306	61	361	947	11	14.6	42.6
Cobalt	52	2.0	12.8	6	1.14	2.69	57	2.52	48.2	8	3.56	14.5
Copper	56	14	41.7	18	12.7	138	61	19	243	11	11.4	33.4
Lead	56	143	1,290	18	690	1,230	61	103	1,280	11	603	2,250
Manganese	56	328	1,480	18	37.5	259	61	435	2,380	11	263	1,660
Mercury	56	0.293	0.91	18	0.209	0.657	60	0.315	0.757	11	0.129	0.61
Nickel	56	7.37	23.2	15	3.21	25	61	7.66	52.1	10	8.37	35.6
Selenium	20	5.44	16	3	3.12	3.58	38	7.8	181	3	5.22	13.3
Silver	37	1.85	3.23	12	0.323	0.597	41	2.44	7.52	4	0.482	0.819
Thallium	28	5.82	19.8	1	10.4	10.4	34	10.2	195	4	3.08	7.09
Vanadium	56	637	1,220	17	91.3	950	61	531	1,190	11	50.3	326
Zinc	53	49	227	18	73	370	60	21.0	88.7	11	35.3	92.5
Wet Chemistry												
pH (s.u.)	56	7.3	12.0	18	4.6	7.6	61	7.6	12.2	11	4.8	8.3
Fluoride	56	55.7	419	18	49	156	61	78.3	624	11	46.5	148
Cyanide	23	4.65	29.4	4.0	9.1	21.4	22	32.1	143	5	1.47	3.8

Notes:

1. Volatile and semi-volatile organic compounds were only sporadically detected in these materials.
2. Data from RI Report Section 4.0.

Table 2: Cumulative Risks for OU2

**CUMULATIVE RISK, CHEMICAL AND RADIOLOGICAL
NORTH ALCOA SITE, EAST ST. LOUIS, ILLINOIS**

Risk Screening Results			IB-3a >Industrial Risk- based Values	IB-3b >Industrial Risk- based Values	IB-4c ⁽¹⁾ >Industrial Risk- based Values	IB-4e >Industrial Risk- based Values	IB-6a >Industrial Risk- based Values	IB-5a >Residential Risk- based Values
Timeframe	Exposure Scenario	Type of Risk						
Current (Surface Soil)	Industrial Worker	Chemical Cancer Risk	9.34E-06	9.77E-06	1.06E-05	6.44E-06	5.26E-06	Not Applicable
		Radiological Cancer Risk	1.61E-04	1.56E-04	3.28E-04	1.47E-04	1.89E-04	Not Applicable
		Chem. + Rad. Cancer Risk	1.70E-04	1.66E-04	3.39E-04	1.53E-04	1.94E-04	Not Applicable
		Noncancer HI	0.04	0.05	0.06	0.04	0.03	Not Applicable
	Youth Trespasser	Chemical Cancer Risk	1.07E-06	8.69E-07	6.53E-07	4.41E-07	4.02E-07	Not Applicable
		Radiological Cancer Risk	1.38E-06	1.33E-06	2.86E-06	1.27E-06	1.62E-06	Not Applicable
		Chem. + Rad. Cancer Risk	2.45E-06	2.20E-06	3.51E-06	1.71E-06	2.02E-06	Not Applicable
		Noncancer HI	0.005	0.007	0.009	0.005	0.004	Not Applicable
	Residential Scenario (or Surface Soil for Hypothetical Resident)	Chemical Cancer Risk	6.36E-05	5.43E-05	4.08E-05	2.72E-05	2.49E-05	4.E-06
		Radiological Cancer Risk	5.26E-04	5.08E-04	1.07E-03	4.81E-04	6.18E-04	4.3E-04
		Chem. + Rad. Cancer Risk	5.90E-04	5.62E-04	1.11E-03	5.08E-04	6.43E-04	4.4E-04
		Noncancer HI	1	2	2	1	1	0.7
	Residential Background	Radiological Cancer Risk	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	4.6E-04 ⁽²⁾
Future (All Soil)	Construction Worker	Chemical Cancer Risk	8.04E-07	1.19E-06	6.67E-07	1.33E-06	9.80E-07	Not Applicable
		Radiological Cancer Risk	9.70E-06	1.14E-05	1.01E-05	1.30E-05	9.12E-06	Not Applicable
		Chem. + Rad. Cancer Risk	1.05E-05	1.26E-05	1.08E-05	1.43E-05	1.01E-05	Not Applicable
		Noncancer HI	0.5	0.2	0.4	0.4	0.4	Not Applicable
	Industrial Worker	Chemical Cancer Risk	8.37E-06	1.23E-05	7.17E-06	1.48E-05	1.04E-05	Not Applicable
		Radiological Cancer Risk	3.12E-04	3.74E-04	3.28E-04	4.30E-04	2.96E-04	Not Applicable
		Chem. + Rad. Cancer Risk	3.20E-04	3.86E-04	3.35E-04	4.45E-04	3.06E-04	Not Applicable
		Noncancer HI	0.09	0.05	0.10	0.2	0.1	Not Applicable
	Youth Trespasser	Chemical Cancer Risk	8.74E-07	1.35E-06	4.82E-07	1.56E-06	8.64E-07	Not Applicable
		Radiological Cancer Risk	2.75E-06	3.21E-06	2.86E-06	3.67E-06	2.58E-06	Not Applicable
		Chem. + Rad. Cancer Risk	3.62E-06	4.56E-06	3.34E-06	5.23E-06	3.44E-06	Not Applicable
		Noncancer HI	0.01	0.007	0.01	0.03	0.03	Not Applicable
	Residential Scenario (or Surface/Subsurface Soil for Hypothet. Resident)	Chemical Cancer Risk	5.22E-05	8.19E-05	2.98E-05	9.96E-05	5.27E-05	2.E-05
		Radiological Cancer Risk	1.02E-03	1.22E-03	1.07E-03	1.40E-03	9.64E-04	8.E-04
		Chem. + Rad. Cancer Risk	1.07E-03	1.30E-03	1.10E-03	1.50E-03	1.02E-03	9.E-04
		Noncancer HI	2	2	1	2	2	1

⁽¹⁾ No Current Industrial Worker, but a Future Industrial Worker with contact only with surface soil COPCs is included.

⁽²⁾ The IB-5a surface soil RME radionuclide concentrations are lower than the average background concentration for Ra-226, Ra-228, and Th-232, leading to a risk less than that from background for IB5a surface soil.