REMEDIAL DESIGN WORK PLAN

WEST LAKE LANDFILL SUPERFUND SITE OPERABLE UNIT-1

Prepared For:
The United States Environmental Protection Agency Region VII

Prepared on Behalf of:
The West Lake Landfill OU-1 Respondents

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CERTIFICATION STATEMENT

REMEDIAL DESIGN WORK PLAN
OPERABLE UNIT 1
WEST LAKE LANDFILL SUPERFUND SITE

I, Raymond D'Hollander, certify that I am currently a Missouri State registered professional engineer and that this Remedial Design Work Plan was prepared under my direction and supervision in accordance with generally accepted practice. This document was prepared to fulfill the requirements of the Third Amendment to Administrative Settlement Agreement and Consent Order for the West Lake Landfill Superfund Site OU-1.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Raymond D. D'Hollander, P.E. Date
Missouri Professional Engineer
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LIST OF ACRONYMS

ACRONYM	Definition
AEC	U.S. Atomic Energy Commission
ALTA	American Land Title Association
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirements
ASAOC	Administrative Settlement Agreement and Order of Consent
ASTM	American Society for Testing & Materials
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Constituent of Concern
CQAP/CQCP	Construction Quality Assurance Plan/Construction Quality Control Plan
DCC	Dose Compliance Concentrations
DCR	Design Criteria Report
DI	Design Investigation
DIWP	Design Investigation Work Plan
DMP	Data Management Plan
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EDD	Electronic Data Deliverable
EPCRA	Emergency Planning and Community Right-to-know Act
ERP	Emergency Response Plan
FS	Feasibility Study
FSP	Field Sampling Plan
GIS	Geographic Information System
HASP	Health and Safety Plan
HI	Hazardous Index
ICIAP	Institutional Controls Implementation and Assurance Plan
ICs	Institutional Controls
LBSR	Leached Barium Sulfate Residues
LTODP	Loading, Transportation and Off-Site Disposal Plan
IMP	Incident Management Plan
MDHSS	Missouri Department of Health & Senior Services
MDNR	Missouri Department of Natural Resources
NCC	Non-Combustible Cover
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDEDS	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
O&M	Operation & Maintenance Plan
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
pCi/g	picoCurie/tram
POTW	Publicly Owned Treatment Work
QAPP	Quality Assurance/Quality Control
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAO	Remedial Action Objective
RAR	Remedial Action Report
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDWP	Remedial Design Work Plan
Respondents	West Lake Landfill OU-1 Respondents
RI	Remedial Investigation
RIM	Radiologically Impacted Material
ROD	Record of Decision
RODA	Record of Decision Amendment
RSMo	Revised Statutes of Missouri
SMP	Site Management Plan
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	Spill Prevention, Control, and Countermeasures
SWMP	Site Wide Monitoring Plan
TBC	To be considered
TSCA	Toxic Substances Control Act
UMTRCA	Uranium Mill Tailings Radiation Control Act
USEPA	United State Environmental Protection Agency
UU/UE	Unlimited Use/Unrestricted Exposure
WHMP	Wildlife Hazard Mitigation Plan

EXECUTIVE SUMMARY

The United State Environmental Protection Agency (USEPA) signed a Record of Decision Amendment (RODA) for Operable Unit (OU) 1 of the West Lake Landfill Site (Superfund Site ID # MOD079900932) in September 2018. The selected amended remedy in the RODA primarily includes partial excavation and offsite disposal of the radiologically impacted material (RIM) followed by installation of a final cover system with the objectives of preventing direct contact or radiation exposure from the contaminated media at West Lake Landfill Site (the Site) including protection of groundwater by limiting infiltration and thus leaching of contaminants.

USEPA and the Respondents have agreed to the conditions under which the Respondents will design the selected amended remedy in the RODA, as set forth in the Third Amendment to the Administrative Settlement Agreement and Order of Consent (ASAOC) and associated Statement of Work (USEPA Docket No. VII-93-F-0005). The selected amended remedy in the RODA includes:

- Partial excavation of RIM from the Radiological Areas 1 and 2 of OU-1 and disposal at an off-site facility;
- Excavation of radiologically impacted soil from the Buffer Zone and/or Lot 2A2 sufficient to reduce concentrations of radionuclides to allow for unrestricted use of the property;
- Installation of a landfill cover over Radiological Areas 1 and 2;
- Design, installation, and management of maintenance/monitoring systems for surface water, groundwater and gas;
- Long-term operation, maintenance and monitoring; and
- Implementation of institutional controls.

This Remedial Design Work Plan (RDWP) presents the activities and submittals that will be completed during the remedial design (RD) of the selected amended remedy in the RODA. The Respondents are committed to the timely design of the selected amended remedy. The selected amended remedy must achieve the remedial action objectives (RAOs) set forth in the RODA. RAOs are identifiable goals to protect human health and the environment.

Several remedial investigations have been completed in OU-1 areas. Additional investigations will be conducted to support the design of the selected amended remedy. The additional investigations that are anticipated during the RD process are discussed in the RDWP.

The Respondents will design the OU-1 remedy on an accelerated basis, to the extent possible. The remedial design for OU-1 will include the preparation of the following principal design submittals:

- Design Criteria Report (which is being submitted concurrently with this RDWP);
- Preliminary Excavation Plan;
- Preliminary (30%) Remedial Design;
- Design Investigation Work Plan;
- Design Investigation Evaluation Report;
- Revised Excavation Plan;
- Pre-Final (90%) Remedial Design; and
- Final (100%) Remedial Design.

In addition to these submittals, other design submittals will also be prepared to support the proposed investigation, remedial action, and post-implementation operation and maintenance activities as discussed in this RDWP. The remedial design and the submittals will be completed in accordance with the applicable or relevant and appropriate requirements (ARARs) included in the RODA.

Several organizations will be directly involved in the performance and review of the RD. The Respondents have retained professional consultants and subject matter experts to perform the technical, engineering, and analytical aspects of the RD, including preparation of the design submittals. USEPA will review and approve plans, drawings, reports, and schedules submitted for the investigations, remedial design, and remedial action. Missouri Department of Natural Resources (MDNR) will consult with USEPA as a supporting agency. The communication during the remedial design process, and the distribution and management of documents are discussed in the RDWP.

SECTION 1 - INTRODUCTION

This RDWP has been prepared on behalf of West Lake Landfill OU-1 Respondents Bridgeton Landfill, LLC, Cotter Corporation (N.S.L), and the U.S. Department of Energy (Respondents). The RDWP presents the design process for the selected Amended Remedy for OU-1 of the Site in Bridgeton, Missouri. The Site is USEPA Superfund Site (ID # MOD079900932). A RODA for OU-1 of the Site was issued on 27 September 2018 (USEPA 2018). The Respondents entered into a Third Amendment to the ASAOC with USEPA (Docket No. VII-93-F-0005) to perform the design of the Amended Remedy selected in the RODA for OU-1 on 6 May 2019 (USEPA 2019). USEPA is the lead agency for the Site and MDNR is the support agency.

The Site is located within the western portion of the St. Louis metropolitan area, east of the Missouri River in northwestern St. Louis County, with a physical address of 13570 St. Charles Rock Road, Bridgeton, Missouri as indicated on **Figures 1 and 2**. The Site consists of an approximately 200-acre parcel of land that includes six inactive waste disposal areas or units as indicated in **Figure 3**. The six units include Radiological Area 1 (Area 1), Radiological Area 2 (Area 2), a closed demolition landfill, an inactive sanitary landfill, the North Quarry, and the South Quarry. The North Quarry and the South Quarry are part of the permitted Bridgeton Landfill, former active sanitary landfills. These six identified units were used for solid and industrial waste disposal at the Site from approximately the 1950s through 2004.

The Site is composed of three OUs. OU-1 contains the radiologically contaminated areas and comprises Area 1, Area 2, the Buffer Zone (a 1.78-acre parcel of land adjacent to Area 2), and Lot 2A2 of the Crossroads Industrial Park. OU-2 contains areas not identified as containing radiological contamination and comprises the closed demolition landfill, the inactive sanitary landfill, the North Quarry and the South Quarry. OU-3 covers the sitewide groundwater. This RDWP addresses OU-1 only.

The primary objective of this work plan is to layout the process for the RD activities for OU-1 at the Site in accordance with the RODA (USEPA 2018) and the RD Statement of Work (SOW) attached to the ASAOC. This RDWP has been developed consistent with applicable federal and state guidance documents for remedial design for hazardous waste sites (USEPA 1995a, USEPA 1995b, USEPA 2005).

1.1 SITE HISTORY

The Site previously received radiologically contaminated materials from the processing of uranium ore for the Manhattan Engineering District and the U.S. Atomic Energy Commission (AEC), in addition to receiving municipal, demolition, and other waste. Parts of the Site were radiologically contaminated when soil mixed with leached barium sulfate residues (LBSR) was brought to the landfill and reportedly used as cover for landfilling operations at the Site in 1973. The U.S. Nuclear Regulatory Commission (NRC), as successor to the AEC, commissioned a radiological study that ultimately confirmed the presence of two distinct radiological areas at the Site. The USEPA added the Site to the National Priorities List (NPL) in 1990.

On March 3, 1993, the USEPA and the Respondents (at that time Laidlaw Waste Systems (Bridgeton), Inc.; Rock Road Industries, Inc.; Cotter Corporation (N.S.L.); and the U.S. Department of Energy (DOE) entered into an Administrative Order on Consent (AOC) for performance of an Remedial Investigation/Feasibility Study (RI/FS) for OU-1. Between 1994 and 2006, the Respondents performed multiple investigations at the Site, including the collection and analysis of waste and soil samples and the monitoring of surface water, sediments, groundwater, and air quality. The results of these evaluations were summarized in the Remedial Investigation (EMSI 2000 and Herst 2006), Baseline Risk Assessment (Auxier 2000), and Feasibility Study (EMSI 2006 and Herst 2006) reports. Based on these reports, the USEPA issued a proposed plan for OU-1 (and OU-2) in June 2006, and in May 2008 selected a remedial action (RA) for OU-1 in a ROD (USEPA 2008).

In the 2008 Record of Decision (ROD), the USEPA selected a capping remedy for OU-1, but was asked to reconsider its decision, which was granted in 2010. Other actions have been taken at the Site since 2008, which include preparation of a Supplemental Feasibility Study (EMSI et al. 2011), installation of a non-combustible cover (NCC) over portions of Area 1 and Area 2; development and implementation of an Incident Management Plan (IMP); installation of engineering controls and other active measures in the North Quarry of the Bridgeton Landfill (OU-2) due to the presence of a subsurface reaction; and air monitoring on-site and around the perimeter of the Site, an investigation of the extent of RIM in Area 1 (Feezor Engineering, 2014 and EMSI et al. 2016), an Isolation Barrier Alternatives Analysis (EMSI et al. 2014), additional characterization of Area 1 and Area 2 and preparation of a Remedial Investigation Addendum (EMSI 2018), an updated Baseline Risk Assessment (Auxier 2018), and a Final Feasibility Study (EMSI et al. 2018) for OU-1. In September 2018, USEPA amended the remedy for OU-1 in the RODA (USEPA 2018).

1.2 REMEDY OF RECORD - 2018 SELECTED AMENDED REMEDY

The Amended Remedy selected in the RODA (USEPA 2018) addresses the portions of the West Lake Landfill that are contaminated with radiologically impacted soils and landfilled waste through a combination of excavation and placement of an engineered cover. The selected Amended Remedy includes:

- Excavation and stockpiling of overburden in OU-1 Radiological Areas 1 and 2 to access the RIM;
- Excavation of RIM from the Areas 1 and 2 of OU-1 that contains combined radium or combined thorium activities greater than 52.9 pCi/g that is located generally within 12 feet of the 2005 topographic surface. Optimization of RIM removal above and below the 12-foot target depth (excavation as deep as 20 feet or as shallow as 8 feet) will be performed during the RD based on criteria set forth in Section 12.0 of the RODA (USEPA 2018);
- Excavation of radiologically impacted soil from the Buffer Zone and/or Lot 2A2 sufficient to reduce concentrations of radionuclides to background in order to allow for unlimited use and unrestricted exposure (UU/UE);
- Loading and transport of the RIM and radiologically impacted soil for disposal at an off-site permitted disposal facility;
- Regrading of the remaining solid waste materials within Areas 1 and 2 to meet the minimum (5%) and maximum (25%) slope criteria;
- Installation of a landfill cover over Areas 1 and 2 designed to meet the Resource Conservation and Recovery Act (RCRA) hazardous waste design criteria, municipal waste landfill regulations, and Uranium Mill Tailings Radiation Control Act (UMTRCA) performance and longevity standards;
- Design, installation, and maintenance of surface water runoff controls;
- Groundwater monitoring;
- Landfill gas and radon monitoring and control, in accordance with ARARs;
- Institutional controls (ICs) to prevent land uses that are inconsistent with a closed landfill containing radiological materials; and
- Long-term surveillance and maintenance of the landfill cover in Areas 1 and 2 and other remedial components.

1.3 REMEDIATION OBJECTIVES

RAOs are specific goals that the Amended Remedy selected in the RODA (USEPA 2018) must accomplish to protect human health and the environment from risks posed by the Site. The RAOs also serve as the design basis for the Amended Remedy selected for OU-1.

1.3.1 Updated RAOs for Areas 1 and 2 of OU-1

In the RODA, USEPA modified the RAOs for Areas 1 and 2 as follows:

- Prevent direct contact to contaminated media (including waste material, fill, stormwater, sediments, leachate and groundwater) located on or emanating from OU-1.
- Limit inhalation and external radiation exposure from contaminated media (including waste material, fill, leachate, and gas emissions) located on or emanating from OU-1 to within the acceptable risk range (10^{-4} to 10^{-6} cancer risk or a hazard index (HI) of less than 1 for non-carcinogenic risk).
- Minimize water infiltration to prevent contaminants from leaching to groundwater above levels protective for the reasonably anticipated use of the groundwater and surface water.
- Control and manage leachate that emanates from OU-1 in accordance with standards identified in the ARARs.
- Control and treat landfill gas from OU-1 including radon in accordance with standards identified in the ARARs.
- Control surface water runoff, and minimize erosion associated with OU-1 in accordance with standards identified in the ARARs.

Based on USEPA's site-specific evaluation of risk, the Amended Remedy selected in the RODA (USEPA 2018) requires partial excavation of some RIM greater than 52.9 pCi/g. Partial excavation of some RIM in combination with the installation of the engineered cover will meet the above RAOs.

1.3.2 Updated RAOs for Buffer Zone and Lot 2A2 of OU-1

Historic erosion of the landfill berm along the north side of Area 2 resulted in deposition of radiologically impacted soil on the surface of the Buffer Zone and Lot 2A2 of the Crossroads Industrial Park (also known as the former Ford Property). In the RODA, the updated RAO for this property is to remediate soils to the extent necessary to allow for unrestricted land use. The EPA determined the radiologically impacted soils on Lot 2A2 and parts of the Buffer Zone should be remediated to background levels. Additional background characterization will be performed as a post-RODA activity to determine statistically valid background concentrations for the Buffer Zone and Lot 2A2.

1.4 OVERVIEW OF RDWP

The primary objective of the RD is to develop plans and specifications for implementing the selected Amended Remedy in the RODA (USEPA 2018). Per the requirements listed in Section 3.1 of the SOW, this RDWP includes the following information to meet this objective:

- Identification and description of all plans necessary for implementing all RD activities identified in the SOW, in the RDWP, or required by EPA to be conducted to develop the RD (presented in Section 3 of this report);
- A description of the overall management strategy for performing the RD, including a proposal for phasing of design and outline considerations for phasing of construction, if applicable (to be included in the design submittal discussed in Section 3.1.1 of this report);
- A description of the potential considerations for guiding the general approach(es) to contracting, construction, operation, maintenance, and monitoring of the RA as necessary to implement the Work (to be included in the design submittal discussed in Section 3.1.1 of this report);
- Preliminary RD Schedule (included in Section 5.4 of this report);
- A description of the qualifications, responsibility and authority of all organizations and key personnel involved with the development of the RD (included in Section 5 of this report);

- Descriptions of any areas of the remedy requiring clarification and/or anticipated problems (e.g., areas where additional information is necessary) (to be included in the design submittal discussed in Section 3.1.1 of this report);
- Preliminary description of additional data needed to complete the RD, any evaluation of alternative models for estimating the extent of RIM, any proposed design investigation (DI) and recommended timing for the performance of the investigation activities (to be included in the plan discussed in Section 3.1.1.4 of this report);
- Descriptions of any applicable permitting requirements and other regulatory requirements (to be included in the design submittal discussed in Section 3.1.1 of this report);
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- Preliminary RD Schedule (included in Section 5.4 of this report);
- Description of plans for obtaining access in connection with the Work, such as property acquisition, property leases, and/or easements (to be included in the design submittal discussed in Section 3.1.1 of this report); and
- List of all supporting deliverables, and a schedule for submittal of each draft deliverable. This includes any plans necessary for planning, designing, implementing, and monitoring the remedy in the RODA, including those described in ¶ 5.7 of the RODA (USEPA 2018). (This requirement is address throughout this RDWP.)

1.4.1 RDWP Organization

Following this introduction, the RDWP is organized as follows:

- Section 2: Investigations – summarizes the investigations completed at the Site and outlines the design investigations that will be performed as part of RD. It also describes the quality assurance and health and safety plans that will be developed for the RD activities.
- Section 3: Remedial Design – presents the principal design elements of the RA; the reports, plans and specifications that will be developed to implement the selected Amended Remedy; monitoring that will be performed during RA to protect the community; and the RA contracting strategy.
- Section 4: ARARs and Permits – includes the ARARs and permitting requirements that will be followed during the RD.
- Section 5: Remedial Design Management – presents the RD team organization, project communication procedures, document management procedures, and the RD schedule.
- Section 6: Post-Construction Plans – discusses the final certification report and other plans that will be developed for post-RA activities.
- Section 7: References – Provides references for documents cited in this RDWP.

SECTION 2- INVESTIGATIONS

This section provides a summary of the investigations completed to date and investigations that are planned to support the design of the selected Amended Remedy for OU-1 at the Site.

2.1 REMEDIAL INVESTIGATIONS

The remedial investigations completed in OU-1 areas as of the date of the RDWP submittal are summarized in **Table 1**. The details of these investigations were included in the noted referenced documents, which were previously submitted to USEPA and MDNR.

2.2 PROPOSED DESIGN INVESTIGATIONS

Additional investigations will be performed to collect necessary information to design the Amended Remedy selected in the RODA (USEPA 2018). The following investigations will be performed as part of the RD process.

2.2.1 RIM Investigations

The results of the previous investigations completed in OU-1 and the geostatistical model previously developed to support the FFS will be evaluated to identify any data gaps that could affect the remedial design or remedy implementation. Based on the results of the data gap evaluation, RIM investigation(s) will be planned as needed in Areas 1 and 2 of OU-1.

The objectives of the RIM investigations include: to delineate the limits of RIM that is the subject of the RA, (including boundary confirmation of Areas 1 and 2); evaluate potential historical impacts to drainage areas and the northwest surface water body; collect additional data to support the optimization efforts required in the RODA; and collect sufficient samples to define the limits of RIM to be excavated. Subject to further discussions and approvals by USEPA, the RIM investigations may also inform whether confirmation sampling will be required during excavation as stated in the RODA or can be conducted prior to excavation reducing the time that excavations must be left open and the resultant impacts in terms of attraction of wildlife, odors, and windblown material. An analysis of pre-excavation confirmation sampling, including examples of where it has been used on other sites, discussion of criteria to use for proposing lateral and vertical distribution of confirmation samples, rationales for how this approach would achieve the objectives in the RODA, and an evaluation of various methods for confirmation sampling and the pros and cons will be provided in the 30% RD Report.

Locations of further RIM sampling will take into consideration the uncertainty analysis that will be developed during the geostatistical model (to be presented within the Preliminary Excavation Plan) and recommendations from USEPA including Figures 17 and 18 from the RODA (USEPA 2018). Sampling focused on possible removal areas is expected to be completed to a depth of 20 feet below the 2005 topographic survey surface. For this shallow sampling in Areas 1 and 2, several investigation techniques will be considered to select a method that will provide a high recovery ratio. Proposed sampling locations, investigation techniques and procedures will be presented in the DIWP.

The margins of Area 2 will be evaluated for the presence of RIM to define the edge of final cover, especially along the boundaries of the inactive sanitary and C&D landfills. It is currently expected that deeper borings for final cover boundary delineation will be conducted using a sonic drill rig, consistent with previous investigations. Proposed sampling locations, investigation techniques and procedures will be presented in the DIWP.

The scope of the investigation(s) for the Buffer Zone and Lot 2A2 will include characterization of the background radioactivity and then delineating the limits of the radiologically impacted soil that will be removed from these areas. Background measurements generally comprise a range of values, particularly for mineral elements that are naturally occurring as well as a result of anthropogenic activities. The general approach to developing statistically valid background values will be provided in the DCR. The proposed locations and sampling requirements for characterizing the background radioactivity will be presented in the DIWP.

The RIM investigations will likely require negotiated access agreements for both the Lot 2A2 and background investigations. The Respondents will negotiate these agreements. If difficulties are encountered, the Respondents will contact USEPA for assistance. As these locations for sampling are developed, access agreement discussion will be initiated. It is anticipated these agreement discussions will start in the latter part of 2019 and early in the year 2020.

A DIWP outlining the scope and details of these investigations will be submitted to USEPA for review and approval as discussed in Section 3.1.1.4 below.

2.2.2 Geotechnical Investigation

Information on the soil stratification and pertinent geotechnical characteristics of soils underlying the Site will be needed to design RA and post-closure elements such as the landfill side slopes, starter berm or toe protection against flooding, temporary structures that may be required during RA, proposed permanent structures post-RA, site access by road/rail, proposed utilities, etc. The objective of the geotechnical investigation(s) will be to collect the information needed to design the RA and post-closure elements under static and seismic conditions. The results of previous investigations completed at the Site will be evaluated to define the scope of additional geotechnical investigation(s) needed. If geotechnical investigation data is required, this information would be presented in the Design Investigation Report. Types of geotechnical data that may be required could include material strength properties, gradation, plasticity, and moisture content.

The regrading and cover construction are expected to require substantial amounts of imported fill. The technical specifications for these materials will be developed during the RD to determine selection criteria to meet the ARARs. Geotechnical testing of these materials will be required during the RA and will be defined in the Construction Quality Assurance/Construction Quality Control Plan (CQA)/CQCP) as discussed in Section 3.1.2.8.

2.2.3 Utilities

During the RD process, the existing above and below ground utilities on Site (which may need to be protected or relocated to facilitate implementation of the selected Amended Remedy) and offsite utilities (which may need to be relocated or connected to during RA or post-closure) will be identified. Existing information (survey, dimension, depth, etc.) available for these utilities will be evaluated, this initial assessment will be presented in a Design Drawing(s) in the 30% RD Report. Additional investigation may be performed to collect the information necessary to complete design for protecting, relocating, and/or connecting to these utilities. This would be conducted between the 30% and 100% RD and presented in the 90% RD Report in the form of an updated utility design drawing(s).

2.2.4 Surveys

Aerial photography and topographic survey of the Site will be performed to define the existing conditions at the Site that will be used in the RD. Topographic and land surveying will be conducted to meet the technical requirements outlined in Missouri Department of Transportation Engineering Policy Guides 238.1 and 238.2.

These will provide site location data in NAD83 in compliance with the requirement in section 5.5(b) of the SOW. Elevation data will be reference to NAVD 88.

It is anticipated that a detailed site survey will be collected during the DI. The survey plan and details will be presented in the DIWP. Results of this survey will be incorporated in subsequent design submittals.

The 2005 site survey already exist in an electronic AutoCAD file and this survey will be used in development of the geostatistical model and development of the excavation plan. The new surface is important for efficiently developing site grading plans. We note that past survey data at the site has been located in the NAD 1927 State Plane Coordinate System for Missouri East and will be converted as needed to match the new site survey and the requirements of SOW 5.5(b).

2.2.5 Investigation of Potential Saturated Conditions

The seep previously observed in OU-1 Area 2 and any other areas where saturated waste may be encountered during implementation of the remedy will be investigated and evaluated as a part of the OU-1 DI. Further details will be provided in the DIWP.

2.2.6 Putrescible Waste Investigation

The need and timing of a putrescible waste investigation is being in evaluated in consultation with the City of St. Louis/St. Louis Lambert International Airport (Airport) and the USDA. The need for and details of the investigation program will be presented in the DIWP.

2.3 DATA QUALITY ASSURANCE

Standard quality assurance and quality control procedures will be applied during the RD process. Laboratory analyses conducted as part of design investigations will follow procedures outlined in the Field Sampling Plan (FSP) (Section 3.1.2.4), Quality Assurance Project Plan (QAPP) (Section 3.1.2.5), and the Data Management Plan (DMP) (Section 3.1.2.7). The QAPP will be focused on the collection, shipping, laboratory analysis, data validation, and reporting of laboratory data. The FSP will contain Standard Operating Procedures (SOPs) for field activities and will also incorporate industry standards for these activities, such as American Society for Testing and Materials (ASTM) standards, by reference. If additional investigation work plans are required, the quality assurance and quality control procedures will be incorporated in those plans as they are developed.

The plans provide a standard for quality control for obtaining and managing data that is scientifically sound, comparable, defensible, and of known quality. These plans define procedures required to meet the data quality objectives including, but not limited to, procedures for field sampling, laboratory analysis, data validation, and data management.

2.4 HEALTH AND SAFETY

The health and safety of site personnel, visitors and members of the public are considered paramount. A health and safety plan (HASP) will be developed as discussed in Section 3.1.2.3 and will describe the anticipated hazards and control measures that be applied during the RD activities. The HASP will be updated as needed to reflect changes in activities or site conditions during design investigations, RA, and post-RA activities.

SECTION 3 – REMEDIAL DESIGN PROCESS

This section describes the RD submittals, primary design elements, and a preliminary RA contracting strategy.

3.1 REMEDIAL DESIGN SUBMITTALS

3.1.1 Principal Design Submittals

The principal design deliverables that will be submitted to USEPA (other than this RDWP) are listed below. It is noted that these design submittals and their scope are as agreed in the RD SOW (USEPA 2019). These deliverables will be submitted to the USEPA in accordance with the RD schedule included in Section 5.4.

3.1.1.1 DESIGN CRITERIA REPORT

The Design Criteria Report (DCR) is being submitted to USEPA for approval concurrently with this RDWP. It defines the technical parameters upon which the RD will be based in accordance with the USEPA's *Remedial Design/Remedial Action Handbook* (USEPA 1995b).

The DCR presents the design and performance criteria for the principal elements of the RD. The DCR also addresses how the ARARs included in the RODA (USEPA 2018) will be addressed.

3.1.1.2 PRELIMINARY EXCAVATION PLAN

The Preliminary Excavation Plan and drawings will be based on a geostatistical model based on and functionally equivalent to the model used for the December 22, 2017, 3D Extent of RIM Report. The proposed geometry of the excavation design (Section 3.3.1) will be presented in the preliminary excavation plan and the excavation design will be clarified in subsequent design submittals. The excavation plan will be prepared in AutoCAD Civil3D. Themost recent available site topographic survey will be used to define the current ground surface for use in the Preliminary Excavation Plan. It will be submitted to USEPA for approval and will include:

- The updated geostatistical model based on the data presented in the RIA and its calibration to the previous established geostatistical model used in the December 22, 2017 3D Extent of RIM Report will be described in a technical memorandum that will be included with the Preliminary Excavation Plan and subsequently incorporated into the 30% RD Report. This technical memorandum will be developed to demonstrate the requirements of Section 12.2.1 of the RODA are satisfied;
- An evaluation of location of RIM greater than 52.9 pCi/g requiring removal as part of the remedy, subject to optimization as discussed below;
- Identification of and evaluation of the optimized excavation locations using the criteria provided in Section 12.2 in the RODA including:
  - Isolated pockets between 8 and 12 feet below the 2005 topographic surface that, if excavated, would require excavation of large volumes of non-RIM waste as overburden and setback; and
  - Higher concentrations of RIM greater than 12 feet and less than 20 feet below the 2005 topographic surface to be excavated in order to remove the activity represented by RIM greater than 52.9 pCi/g between the surface and 16 feet.
- Preliminary estimates of the radioactivity and volume of RIM to be excavated demonstrating the requirements of Section 12.2.1 of the RODA are satisfied. The computation of the excavated activity required in Section 12.2.1 of the RODA will be developed on a volumetric basis by calculating the average radioactivity in each computational cell, multiplying it by the volume of that cell, and summing the total

radioactivity computer for each cell across all the cells in the excavation limits for both the FFS Alternative 4 and the optimized Selected Remedy excavation.

- A preliminary estimate of the volume of all other waste (non-RIM) that must be excavated to access the RIM.
- An evaluation of data gaps and proposed additional boring locations for the investigation based on variances identified by the geostatistical model and other observations.

The initial geostatistical evaluation to support the Preliminary Excavation Plan and development of the design investigation will be performed using indicator kriging following the previously developed and accepted logic workflow in the December 22, 2017 3D Extent of RIM Report on the same data set. Parsons has reviewed the available data set. It is clear that there is substantial benefit and increased accuracy and precision in the modeling from incorporating the "soft" gamma data from downhole logging and other screening in addition to the "hard" laboratory data of thorium and radium measurements. Indicator kriging was developed to make full use of these various data types in characterizing underground environments. We note that the soft gamma data is most useful in identifying the relatively high radioactivity of combined thorium and radium above 100 piC/g, which is useful in identifying the 52.9 piC/g removal boundaries, identifying hot spots greater 1,000 piC/g in the 12 foot to 20 foot zone for targeted removal, and calculating the total radioactivity of the materials to be removed since that calculation will be greatly influenced by high radioactivity values identifiable using the gamma data. The indicator kriging will allow the design investigation to focus on accurately depicting the 52.9 piC/g boundary using hard laboratory data while still collecting additional gamma data to improve the accuracy of depicting the high radioactivity areas.

It is intended to use the C Tech Earth Volumetric Studio and EnterVol suite of integrated programs in addition to IK3D to perform the indicator kriging and provide 3D visualization. The use of these programs will be compared to the data presentation in the December 22, 2017 3D Extent of RIM Report for accuracy and precision using the same data set. The excavation described in the RODA is a subset of the entire data available for the landfill, so thinning and or truncation of data outside the areas of interest will be performed when necessary. This will be performed using the C Tech program suite to optimize the run times of the analyses for efficient use in design while still maintaining the accuracy required to accomplish the RODA requirements. We note that the programs may have different numerical techniques available for computing volumes and associated activities and these will be evaluated as the analysis progresses. While the C Tech suite of programs have 3D visualization and computational techniques available for preliminary evaluations, the geostatistical model will be used interactively with AutoCAD 3D to develop the proposed preliminary excavation plan in a design drawing format. Constructability and safety of the excavation as well as minimizing open area at any one time will be used for determining the proposed excavation geometry.

3.1.1.3 PRELIMINARY (30%) RD

Preliminary (30%) RD will include:

- The Design Criteria Report (Section 3.1.1.1) and the Preliminary Excavation Plan (Section 3.1.1.2) approved by USEPA;
- A Basis of Design Report, as described in the *Remedial Design/Remedial Action Handbook* (USEPA 1995b), including evaluation of field screening procedures;
- Preliminary drawings and specifications (**Tables 2** and **3**);
- Engineering calculations (**Table 4**)
- Identification and descriptions of applicable permits and requirements;
- Descriptions of how the design will meet ARARs identified in the RODA (USEPA 2018);
- A description of how the RA will be implemented in a manner that minimizes environmental impacts in accordance with USEPA's *Principles for Greener Cleanups* (USEPA 2009);

- A description of monitoring and control measures to be used to protect human health and the environment, such as storm water management, air monitoring and dust suppression, during the RA;
- Preliminary construction schedule; and
- Updates of the supporting deliverables submitted prior to the Preliminary (30%) RD along with the Loading, Transportation and Off-Site Disposal Plan (Section 3.1.2.9) below.

Basic elements of the backfilling of excavation (Section 3.3.2), final cover design (Section 3.3.3), stormwater management design (Section 3.3.4), material handling, transportation, and disposal (Section 3.4), post-RA flood protection (Section 3.5), environmental and community protection and monitoring during RA (Section 3.6) and remedial contracting strategy (Section 3.7) will be presented in the Preliminary (30%) design. These basic elements will be advanced in subsequent design submittals.

3.1.1.4 DESIGN INVESTIGATION WORK PLAN

The purpose of the DI is to collect additional information necessary to design implementation of the Amended Remedy selected in the RODA (USEPA 2018) by conducting additional field investigations. After receipt of USEPA approval of the Preliminary Excavation Plan (Section 3.1.1.2), a DIWP will be submitted to USEPA for approval and will include:

- An evaluation and summary of existing data and description of additional data needed including:
  - Additional characterization to support the proposed preliminary excavation, including the proposed optimized excavation locations, presented in the Preliminary Excavation Plan (Section 3.1.1.2);
  - Additional background characterization to determine statistically valid background levels for the radiological COC's that may be present in the Buffer Zone and Lot 2A2;
  - Extent of radiologically-impacted soil on the Buffer Zone and Lot 2A2;
  - Extent of RIM and the boundaries of Area 1 and Area 2; and
  - Extent of historical impacts, if any, in drainage areas and northwest surface water body.
- A FSP (Section 3.1.2.4) including media to be sampled, contaminants or parameters for which sampling will be conducted, sample locations (including boring locations and sample depths), and number of samples (includes the samples proposed to address confirmation sampling discussed in Section 2.2.1);
- Geotechnical investigations discussed in Section 2.2.2;
- Seep investigation discussed in Section 2.2.5;
- Putrescible waste investigation discussed in Section 2.2.6;
- Groundwater baseline monitoring requirements to be executed during RD as discussed in Section 3.6;
- Cross references to quality assurance/quality control (QA/QC) requirements set forth in the QAPP as described in Section 3.1.2.5;
- A Data Management Plan (Section 3.1.2.7); and
- A Health and Safety Plan (Section 3.1.2.3).

It is anticipated that only the field activities (e.g., soil borings) discussed in this Work Plan and to be described in more detail in the DIWP may disturb waste material during the RD process. The waste material that will be disturbed during the field activities is over 45 years old and thus is not expected to be putrescible; however, this will be evaluated further as part of the DIWP. The nature of the anticipated disturbances during the RD activities (e.g., soil borings) are the same as those previously conducted during the RIA which did not result in attraction of birds or other wildlife. Should additional activities potentially result in disturbance to putrescible waste, the Respondents will notify USEPA and the Airport for acceptance prior to implementing that work.

3.1.1.5 DI EVALUATION REPORT

After completion of the DI, a DI Evaluation Report will be submitted to USEPA for approval and will include:

- Summary of the investigations performed;
- Summary of investigation results;
- Summary of validated data (i.e., tables and graphics);
- Data validation reports and laboratory data reports;
- Narrative interpretation of data and results;
- Results of statistical analyses and comparison with the geostatistical modeling;
- Photographs documenting the work conducted; and
- Conclusions and recommendations for the RD, including revised excavation and final cover limits.

3.1.1.6 REVISED EXCAVATION PLAN

A Revised Excavation Plan and drawings (based on the investigation results presented in the DI Evaluation Report) will be submitted to USEPA for approval and will include:

- Further evaluation and the location of RIM greater than 52.9 pCi/g based upon:
  - further field testing, sampling and analysis;
  - Updating the geostatistical database to include additional field and laboratory data presented in the DI Report;
  - revising the geostatistical evaluation using the geostatistical tools calibrated and used during the Preliminary Excavation Plan development; and
  - optimization of the excavation plan.
- Final design-level delineation and supporting evaluation of the optimized excavation locations considering such factors as:
  - Isolated pockets between 8 and 12 feet below the 2005 topographic surface that, if excavated, would require excavation of large volumes of non-RIM waste as overburden and setback; and
  - Higher concentrations of RIM greater than 12 feet and less than 20 feet below the 2005 topographic surface to be excavated in order to remove the equivalent total activity represented by RIM greater than 52.9 pCi/g between the surface and 16 feet.
- Final calculations of the radioactivity and volume of RIM to be excavated; and
- Final estimated volume of all other waste (overburden) to be excavated and replaced as part of the RIM removal.

3.1.1.7 PRE-FINAL (90%) RD

The Pre-Final (90%) RD will be a continuation and expansion of the Preliminary (30%) RD (Section 3.1.1.3) and will address USEPA's comments regarding the Preliminary (30%) RD. The Pre-Final (90%) RD will include:

- An approved excavation plan based on completed DI as discussed in Section 3.1.1.6;
- Pre-final, updated versions that address USEPA comments of the design elements included in the Preliminary (30%) RD, including the supporting documents listed in Section 3.1.2, including:
  - Construction Quality Assurance/Quality Control Plan (CQAP/CQCP);
  - Institutional Controls Implementation and Assurance Plan (ICIAP);
  - Operation & Maintenance (O&M) Plan; and
  - O&M Manual.
- A complete draft set of construction drawings and specifications that are intended to be: (1) ready for certification by a registered professional engineer; (2) suitable for procurement; and (3) follow the

most recent Construction Specifications Institute's Master Format (**Tables 2** and **3**);
- A survey and engineering drawings showing existing Site features, such as property boundaries, easements, and Site conditions; and
- A specification for photographic documentation of the RA.

3.1.1.8 FINAL (100%) RD

A draft Final (100%) RD will be submitted to USEPA for review. It will address USEPA's comments on the Pre-final (90%) RD and will include draft final versions of all RD deliverables. Once all the modifications and revisions to the draft Final (100%) RD have been accepted by USEPA, the Final (100%) Design will be submitted. The Final (100%) Design will include certification of the design, including all drawings and specifications, by a Missouri registered professional engineer for formal acceptance by USEPA.

3.1.2 Supporting Design Submittals

In addition to the design submittal discussed above, other deliverables that support the RD activities will be submitted to USEPA. The supporting deliverables are listed below. It is noted that these supporting deliverables and their scope are as included in the RD SOW (USEPA 2019). These deliverables will be submitted to the USEPA in accordance with the RD schedule included in Section 5.4.

3.1.2.1 EMERGENCY RESPONSE PLAN

The ERP for OU-1 was submitted to USEPA for approval on September 26, 2019.

Components of the ERP include:

- Description and contact information for personnel responsible (primary and alternate) for notifications and response elements of the plan, as well as individuals with the authority to commit resources;
- Plan and date(s) for meeting(s) with the local community, including local, State, and federal agencies involved in the cleanup, as well as local emergency squads and hospitals;
- SPCC Plan, consistent with the regulations under 40 C.F.R. § 112, describing measures to prevent, and contingency plans for, spills and discharges;
- Notification activities in accordance with Section 3.10(b) of the RD SOW (USEPA 2019) (Release Reporting) in the event of a release of hazardous substances requiring reporting under Section 103 of CERCLA, 42 U.S.C. § 9603, or Section 304 of the EPCRA, 42 U.S.C. § 11004;
- Identification of when and how notifications will be made to local emergency responders and regulatory agencies, such as EPA, MDNR, and the MDHSS, including a notification checklist to be used in the event of an emergency;
- Description of appropriate training for emergency responders on the ERP, and
- A description of all necessary actions to ensure compliance with Section 3.10 of the RD SOW (USEPA 2019) (Emergency Response and Reporting) in the event of an occurrence during the performance of the Work that causes or threatens a release of waste material from the Site that constitutes an emergency or may present an immediate threat to public health or welfare or the environment.

3.1.2.2 SITE MANAGEMENT PLAN

The SMP for OU-1 was submitted to USEPA for approval on September 26, 2019.

Components of the SMP include:

- Methods for controlling access to the Site;
- Methods for monitoring Site conditions during RD/RA;
- Description of environmental monitoring to be performed during the RD activities, including items 1 through 6 in Section 5.7 (f) of the RD SOW (USEPA 2019);
- Pollution Control and Mitigation Plan, including demonstration of effectiveness of existing controls for storm water and air media;
- Secure waste management, staging or disposal practices; and
- Site management responsibilities.

3.1.2.3 HEALTH AND SAFETY PLAN

The HASP will include all activities that will be performed to protect on-site personnel and area residents from physical, chemical, and other hazards posed by the RD Work. Respondents shall develop the HASP in accordance with USEPA's Emergency Responder Health and Safety and OSHA requirements under 29 C.F.R. §§ 1910 and 1926. The HASP will cover RD investigation activities and will be updated, as needed, to cover the DI, RA, and the post-RA activities. The HASP will be submitted for USEPA review to ensure that all necessary elements are included and that the plan provides for the protection of human health. The HASP will be submitted concurrently with the DIWP. We note that HASPs are intended to be dynamic documents addressing worker health and safety, revised as necessary as specific activities are added or modified. Revisions of the HASP at major project milestones such as beginning of RD, RA and Post-RA activities shall be submitted to USEPA.

It is anticipated that final adjustments to this plan may be made in consultation with the RA contractor after they have been selected. Final adjustments will require approval from USEPA, the Respondents and the engineer,

3.1.2.4 FIELD SAMPLING PLAN

The FSP will address all sample collection activities during the RD investigations. The FSP will be written so that a field sampling team unfamiliar with the project would be able to gather the samples and field information required. The FSP will be developed in accordance with USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies* (USEPA 1988). The FSP will be submitted concurrently with the DIWP. The FSP will have the following sections per the EPA guidance:

- Site background;
- Sampling objectives;
- Sample location and frequency;
- Sample designation;
- Sampling equipment and procedures; and
- Sample handling and analysis.

3.1.2.5 QUALITY ASSURANCE PROJECT PLAN

The QAPP will augment the FSP and will addresses sample analysis and data handling related to the RD Work. The QAPP will include a detailed explanation of quality assurance, quality control, and chain of custody procedures for all treatability, design, compliance, and monitoring samples. The QAPP will define the Electronic Data Deliverable (EDD) format for provision of the laboratory data. The QAPP will be developed in accordance with USEPA's *Requirements for Quality Assurance Project Plans* (USEPA 2006a); *Guidance for Quality Assurance Project Plans* (USEPA 2002); and *Uniform Federal Policy for Quality Assurance Project Plans* (USEPA 2005). The QAPP will also include procedures:

- To ensure that USEPA and their authorized representatives have reasonable access to laboratories used by the Respondents in implementing the ASAOC (Respondents' Labs);
- To ensure that Respondents' Labs analyze all samples submitted by USEPA pursuant to the QAPP for quality assurance monitoring;
- To ensure that Respondents' Labs perform all analyses using USEPA-accepted methods (i.e., the methods documented in USEPA's *Contract Laboratory Program Statement of Work for Inorganic Analysis* (USEPA 2006b); *Contract Laboratory Program Statement of Work for Organic Analysis* (USEPA 2007); and *Contract Laboratory Program Statement of Work for Inorganic Superfund Methods (Multi-Media, Multi-Concentration)* (USEPA 2010)) or other methods acceptable to USEPA;
- To ensure that Respondents' Labs participate in an USEPA-accepted QA/QC program or other program QA/QC acceptable to USEPA;
- For Respondents to provide USEPA with notice at least 28 days prior to any sample collection activity;
- For Respondents to provide split samples and/or duplicate samples to USEPA upon request;
- For USEPA to take any additional samples that it deems necessary;
- For USEPA to provide the Respondents, upon request, split samples and/or duplicate samples in connection with USEPA's oversight sampling
- For Respondents to submit to USEPA all sampling and tests results and other data in connection with the implementation of the ASAOC; and
- For field investigations other than analytical sampling, including surveying and geotechnical investigations.

The QAPP will be submitted concurrently with the DIWP.

3.1.2.6 SITE-WIDE MONITORING PLAN

The purpose of the Site-Wide Monitoring Plan (SWMP) is to describe the environmental monitoring that will be required during the performance of the RA for air, stormwater, and groundwater as discussed in Section 3.6; to obtain baseline information regarding the extent of contamination in affected media at the Site; to obtain information, through short- and long-term monitoring, about the movement of and changes in contamination throughout the Site, before, during, and after implementation of the RA; to obtain information regarding contamination levels to determine whether the RA objectives are achieved; and to obtain information to determine whether to perform additional actions, including further Site monitoring. The SWMP will include:

- Description of each of the environmental media (air, groundwater, stormwater) to be monitored and the objectives of that monitoring;
- Description of the data collection parameters, including existing and proposed monitoring devices and locations, schedule and frequency of all monitoring, analytical parameters to be collected, and analytical methods employed;
- Description of how performance data will be analyzed, interpreted, and reported, and/or other Site-related requirements;

- Description of verification sampling procedures;
- Description of deliverables that will be generated in connection with monitoring, including sampling schedules, laboratory records, monitoring reports, statistical analyses, and monthly and annual reports to USEPA and State agencies; and
- Description of proposed additional monitoring and data collection actions (such as increases or decreases in frequency of monitoring, and/or installation of additional monitoring devices in the affected areas) if results from monitoring devices indicate changed conditions (such as higher or lower than expected concentrations or movement of the contaminants of concern).

3.1.2.7 DATA MANAGEMENT PLAN

The DMP will describe the site-wide approach to collect and manage data during the RD, including:

- The types of data being collected;
- The tools being used to collect, store, manage, and display the data;
- The requirements for data documentation, deliverables and presentation;
- Descriptions of how the data will be used (i.e., standardized reports, GIS viewers, models);
- Description of Roles and Responsibilities for individuals and organizations responsible for reporting and managing the data;
- A flowchart of data transmission and data functions;
- Description of the technical resource requirements; and
- Site specific procedures/checklists/SOP.

3.1.2.8 CONSTRUCTION QUALITY ASSURANCE/QUALITY CONTROL PLAN (CQAP/CQCP)

The CQAP will describe planned and systemic activities that provide confidence that the RA activities meet the design, drawings, specifications, and related requirements, including data and construction quality objectives. The CQCP will describe the activities and data used to verify that the RA activities meet the design, drawings, specifications, and related requirements, including quality objectives. The CQAP/CQCP will:

- Identify, and describe the responsibilities of, the organizations and personnel implementing the CQAP/CQCP;
- Describe the performance standards required to be met to achieve completion of the RA;
- Describe the activities to be performed: to (i) provide confidence that performance standards will be met; and (ii) determine whether performance standards have been met;
- Describe verification activities, such as inspections, sampling, testing, monitoring, and production controls, under the CQAP/CQCP;
- Describe industry standards and technical specifications used in implementing the CQAP/CQCP;
- Describe procedures for tracking construction deficiencies from identification through corrective action;
- Describe procedures for documenting all CQAP/CQCP activities; and
- Describe procedures for retention of documents and for final storage of documents.

It is anticipated that final adjustments to this plan may be made in consultation with the RA contractor after they have been selected. Final adjustments will require approval from USEPA, the Respondents and the engineer,

3.1.2.9 LOADING, TRANSPORTATION AND OFF-SITE DISPOSAL PLAN

The Loading, Transportation and Off-Site Disposal Plan (LTODP) will include plans to ensure compliance with Off-Site Shipment requirements (Section 3.4). The initial draft of the LTODP will be submitted with the 30% RD. Revisions to the LTODP and final requirements will be provided in the Pre-Final (90%) and Final (100%) Design. Proof that requirements were met will be provided during the RA as part of the selection of a transportation and disposal subcontractor, subject to USEPA acceptance. The LTODP will include procedures for identifying the following items:

- Name and location of disposal facility or facilities;
- If radioactive waste from the Site is anticipated to be disposed in a non-NRC licensed disposal facility, the LTODP shall define the process and requirements to:
  - ensure the facility is designed and operated to accept the waste while protecting human health and the environment; and
  - ensure that the community surrounding the disposal facility is informed and provided the opportunity to comment.
- Description of RIM or other waste loading and transfer techniques for shipping;
- Description of shipping method(s) and containers;
- Location and description of loading facility;
- Anticipated routes for off-site shipment of waste materials;
- Identification of communities that may be affected, if any, by shipment of waste materials; and
- Description of preliminary plans to minimize impacts, if any, on the affected communities.

It is anticipated that final adjustments to this plan may be made in consultation with the RA contractor after they have been selected. Final adjustments will require approval from USEPA, the Respondents and the engineer,

3.1.2.10 WILDLIFE HAZARD MITIGATION PLAN

The Wildlife Hazard Mitigation Plan (WHMP) shall describe the actions that will be taken to satisfy the Federal Aviation Administration (FAA), U.S. Department of Agriculture (USDA), and the Airport's requirements regarding wildlife hazard management prior to and during the investigation and RA excavation of the waste materials.

A City of St. Louis-approved WHMP exists for the Bridgeton Landfill portion of the Site. Discussions are ongoing between the Respondents and the city of St. Louis (specifically Airport staff) to confirm that the existing WHMP is sufficient for RD investigation activities.

An OU-1 plan will be prepared for the RA in consultation with the City of St. Louis, FAA, and USDA. It will involve a one-year wildlife hazard assessment that will be taken into account in the RD timeline. As RA activities are designed significant coordination will be required between the Respondents, FAA, USDA and the City of St. Louis. USEPA will not approve the WHMP. The DCR outlines the rules and regulations that may apply to the OU-1 RA WHMP. The OU-1 RA WHMP will include, at a minimum the following:

- Description of preliminary wildlife studies conducted previously, including ongoing bird monitoring at the Bridgeton Landfill;
- Identification of data gaps in existing wildlife monitoring studies, if any;
- A one-year wildlife hazard assessment with a five-mile radius from the Site per FAA rules and regulations;
- A putrescible waste evaluation (to be defined in conjunction with FAA and USDA);
- Description of coordination activities with other entities, such as Airport, the FAA, the USDA, and USEPA;
- Description of actions and techniques used to mitigate wildlife hazards, including control measures, if necessary, to address potential increase in wildlife populations;

- Identification of resources necessary to implement the plan;
- Designation of personnel responsible for implementing, coordinating, and overseeing the procedures;
- Description of required training or certifications for designated personnel;
- Description of weekly and monthly reports of wildlife populations when putrescible waste is exposed;
- Description of contingency plans; and
- Any other requirements identified by the FAA or the Airport.

3.1.2.11 OPERATION & MAINTENANCE PLAN

The Operation & Maintenance (O&M) Plan will describe the post-RA requirements for inspecting, operating, maintaining and monitoring the remedy post-construction. The O&M Plan will be developed in accordance with USEPA's *Guidance for Management of Superfund Remedies in Post Construction* (USEPA 2017). The O&M Plan will include the following additional requirements:

- Description of performance standards required to be met to implement the RODA-selected remedy;
- Description of activities to be performed to (i) provide confidence that performance standards will be met; and (ii) determine whether performance standards have been met;
- Description of records and reports that will be generated during O&M, such as daily operating logs, laboratory records, records of operating costs, reports regarding emergencies, personnel and maintenance records, monitoring reports, and monthly and annual reports to USEPA and State agencies;
- Description of corrective action in case of systems failure, including: (i) alternative procedures to prevent the release or threatened release of waste material which may endanger public health and the environment or may cause a failure to achieve performance standards; (ii) analysis of vulnerability and additional resource requirements should a failure occur; (iii) notification and reporting requirements should O&M systems fail or be in danger of imminent failure; and (iv) community notification requirements; and
- Description of corrective action to be implemented in the event that performance standards are not achieved, and a schedule for implementing these corrective actions.

3.1.2.12 O&M MANUAL

The O&M Manual will serve as a guide to the purpose and function of the equipment and systems that make up the remedy. The O&M Manual will be developed in accordance with USEPA's *Guidance for Management of Superfund Remedies in Post Construction* (USEPA 2017).

3.1.2.13 INSTITUTIONAL CONTROLS IMPLEMENTATION AND ASSURANCE PLAN

The Institutional Controls Implementation and Assurance Plan (ICIAP) will describe plans to implement, maintain, and enforce the Institutional Controls (ICs) related to OU-1 at the Site. Section 2.1.4 of the FFS (ESMI 2018b) discusses existing site zoning, use restrictions, and easements with copies of the land covenants included in Appendix A of the FFS (ESMI 2018). Revisions or amendments to the existing ICs will be developed as part of this plan.

The ICIAP will be developed in accordance with USEPA's *Institutional Controls: A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites* (USEPA 2012a), and *Institutional Controls: A Guide to Preparing Institutional Controls Implementation and Assurance Plans at Contaminated Sites* (USEPA 2012b). The ICIAP will include the following additional requirements:

- Locations of recorded real property interests (e.g., easements, liens) and resource interests in the property that may affect ICs (e.g., surface, mineral, and water rights), including accurate mapping and geographic information system (GIS) coordinates of such interests; and

- Legal descriptions and survey maps that are prepared according to current American Land Title Association (ALTA).

3.1.2.14 OTHER PLANS

We expect that a Stormwater Pollution Prevention Plan based on the state and federal regulations governing construction sites will be developed during the 90% RD for use as guidance by the RA Contractor. A Stormwater Management Plan will also be developed to demonstrate that stormwater is being managed in substantive compliance with state and federal regulations.

3.2 SITE PREPARATION AND CONTROLS

Site preparation and controls addresses the activities and control measures that will be implemented in preparation for the RA. The RD for site preparation and controls is anticipated to include the following:

- Defining measures that will be implemented to secure the Site and the work areas during remedy implementation (to be included in the 90% RD report);
- Designing site access and egress for construction equipment and construction-related traffic as well as the on-site roads and traffic patterns that will be used during RA. This will include evaluating the available options for Site access (existing or alternate site access, entrances, or exits) and on-site traffic patterns (existing or alternate on-site roads) (to be included in the 90% RD report);
- Defining the scope of clearing, grubbing, and stripping that will be performed in OU-1 areas including mechanisms for disposal of the vegetation and other deleterious materials (e.g. tires) that may be encountered during the site clearing activities (to be included in the 90% RD report);
- Details of the laydown areas that will be used for storing construction equipment and materials and the support areas that will be used for temporary staging of excavated materials during RA (to be included in the 90% RD report);
- Identifying on-site and offsite (if any) utilities or structures that will be protected, relocated, and/or removed to facilitate the proposed RA in OU-1 at the Site (to be included in the 90% RD report);
- Designing temporary stormwater and erosion control measures that will be implemented during RA. These measures will be designed in accordance with federal, state, and local storm, detention, and erosion control requirements as described in the DCR. Temporary stormwater and erosion control will include (i) construction water management; (ii) measures to prevent run-on into the excavations and runoff from the excavations or the excavated materials; and (iii) erosion and sediment control best management practices (BMPs) (to be included in the 90% RD report);
- Designing the construction water (contact water and leachate) management system which will include: (i) defining criteria for construction contact water and leachate requiring treatment; (ii) measures to minimize construction water that requires treatment; (iii) approach for construction water testing and characterization to define the treatment system; (iv) designing pumping, transmission, and detention system to manage the construction water; (v) identifying federal, state and local permitting and testing requirements to allow discharge; (vi) discharge mechanism including discharge locations, discharge rate, structures, and method (batch versus continuous discharge); and (vii) disposal requirements for sludge and treatment media (to be included in the 90% RD report);
- Describing the decontamination processes, including decontamination procedures and the locations of decontamination stations; and
- Describing land access requirements.

3.3 PRIMARY DESIGN ELEMENTS

The primary design elements of the RA including excavation, backfill and grading, final cover system, and permanent stormwater management system are discussed below.

3.3.1 Excavation Design

Based on the results of the investigations and the geostatistical modeling, the limits of RIM that will be excavated and disposed offsite will be defined during the RD. The design for excavation of the RIM from the defined areas is anticipated to include the following:

- Defining total activity criteria per 12.2.1 of the RODA for Areas 1 and 2 which will be used to develop the targeted excavation locations for optimization that deviate from the general excavation depth of 12 feet below the 2005 surface. The results of this total activity definition and associated optimization will be presented in the preliminary excavation plan;
- The total radioactivity for a total removal geometry will be calculated by summing the total radioactivity for all of the survey units within the removal geometry. The total radioactivity for each survey unit will be computed by multiplying the average radioactivity (combined radium plus combined thorium) for the survey unit by the estimated mass of the survey unit (computed by multiplying the volume of the survey unit by the estimated mass density of the materials in the survey unit).
- Identifying criteria that will be used in geostatistical modeling to define the limits of RIM to be excavated and disposed offsite. The geostatistical modeling criteria will include unit and sub-unit sizes used in modeling, probability percentage or degree of certainty used in defining RIM, horizontal and vertical boundary conditions used in modeling and multiple indicator Kriging (as discussed in 3.1.1.2).
- Since the geostatistical model referenced in the RODA was developed for decision-making purposes during the FFS process, it will be updated during the design process to meet the objectives provided in 12.2.1 and 12.2.2 of the RODA, including evaluating field survey units of up to 2,000 square meters. We anticipate that indicator Kriging will still be used in order to use both field and laboratory data. It is likely that the geostatistical excavation design model will be focused on data from the upper portions within the proposed zone that may be excavated (shallower than 20 feet below the 2005 topographic survey) since it is expected that the deep RIM (deeper than 20 feet below the 2005 topographic survey) materials have little bearing on the location of RIM in the excavation zone. Various numerical modeling approaches will be evaluated to focus the model so that accuracy and precision of the design model are not impacted.
- Delineating the horizontal and vertical limits of excavations in Areas 1 and 2 of OU-1. For every excavation, limits will be defined for RIM (which will be excavated and disposed offsite) and for non-RIM and RIM below the 52.9 pCi/g threshold (which will be excavated to access the RIM but will be reused to backfill the excavation or to perform grading in Area 1 or Area 2);
- Identifying requirements for, and timing of, confirmation sampling to meet the requirements of the RODA;
- Defining statistically valid background levels for radiological Constituents of Concern (COCs) in the Buffer Zone and Lot 2A2 for use in identifying the presence and extent of radiological-impacted soil in these areas;
- Delineating the horizontal and vertical limits of materials to be removed from the Buffer Zone and Lot 2A2;
- Designing sloping and shoring requirements to maintain stability of excavation side slopes and to perform excavation and sampling activities safely;
- Determining temporary stormwater management measures to manage storm run-on and run-off and erosion;

- Evaluating confined space considerations for the excavations including monitoring of the atmosphere within the excavations, mechanisms to enter and egress the excavations safely, and the requirements for rescuing workers, if needed;
- Excavation dewatering and management of water from dewatering activities (treatment, disposal, and/or infiltration/injection into excavation/landfill);
- Requirements for daily and intermediate cover for materials in open excavations;
- Air quality monitoring, dust control, and odor control measures that will be implemented during the excavation activities including the thresholds and the mitigation measures;
- Birds and vector control measures during excavation including the thresholds and the mitigation measures;
- Contingency measures in the event intact drums containing hazardous waste or other hazardous waste are encountered during the excavation activities; and
- Evaluation, f removal and stockpiling of overburden and/or setback materials.

3.3.2 Backfilling of Excavations

After RIM is excavated from the defined areas, the excavations will be backfilled and graded in accordance with the design. The design for backfilling the excavations is anticipated to include the following:

- Reuse of excavated materials or excess materials from grading of side slopes for backfilling the excavations including placement of RIM with activity below 52.9 pCi/g . To the extent practicable, materials containing RIM with activity below 52.9 pCi/g that will not be disposed offsite will be placed at greater depths during backfilling of excavations;
- Conceptual plan for backfilling operations including timing and sequencing of backfill; processing/screening of excavated materials that will be placed during backfilling, draining of excavated materials to be placed during backfilling, laydown area(s) for stockpiling backfill materials, etc.;
- Placement and compaction requirements for backfill materials including maximum lift thicknesses and minimum compaction requirements;
- Requirements for imported backfill materials and the potential borrow area(s) for all excavation areas including the landfill and the Buffer Zone/Lot 2A2 areas;
- Temporary stormwater management measures to manage storm run-on and run-off and erosion; and
- Requirements for cover for excavated materials that will be temporarily stockpiled on-site for re-use as backfill material. This will include birds and vector control measures for excavated materials that will be temporarily stockpiled on-site.

3.3.3 Final Cover Design

After excavation and backfilling, the areas will be graded and a final cover system will be installed. The design of final cover system is anticipated to include the following:

- Definition of the boundary of the RIM and boundary of the final cover system within Areas 1 and 2 of OU-1. RIM materials left in place will be used in defining the final cover boundary in Areas 1 and 2. It is anticipated that the entire surface area of Area 1 and Area 2, including any additional areas of RIM greater than 7.9 pCi/g combined radium or combined thorium that may be identified during the DI, will be covered by the final cover system. Therefore, this portion of the design (identification of the extent of RIM greater than 7.9 pCi/g) does not require a geostatistical analysis;
- Components of the final cover system and the expected design life. The final cover system will be designed in accordance with Subtitle D landfills requirements, RCRA/CERCLA guidance, and UMTRCA requirements. The final cover system will be designed to be stable under static and seismic conditions;

- Grading plan for the areas where the final cover system will be installed to meet the slope requirements as discussed in Section 4.3 of this RDWP. The grading plan will include regrading of the existing side slope (cut or fill as needed) to meet the design slope requirements;
- A starter berm at the toe of the waste in Areas 1 and 2. The design of the starter berm will include configuration of the berm (berm height, side slopes, and crest width), materials that will be used to construct the berm, and the surface finish of the berm for an extended design life and protection against flooding;
- Gas management system to manage methane and/or radon gas that may be generated after installation of the final cover system and to maintain the integrity of the cover system over its design life;
- Access roads to facilitate regular inspection and routine maintenance of the final cover system post-RA;
- Security system to prevent access to the area post-closure by unauthorized personnel;
- Vegetated final cover surface; and
- Evaluation of cover integration for contiguous boundaries between OU-1 and OU-2 that also includes stormwater management elements (Section 3.3.4).

3.3.4 Stormwater Management Design

As part of the RD, a permanent stormwater and erosion control system will be designed to manage runoff from the remediated areas. Preliminary details and concepts for permanent stormwater design, discussed below, will be included in the 30% RD report and advanced in subsequent design submittals. The permanent stormwater and erosion control system is anticipated to include the following:

- Identification of the design storm event(s) for which the stormwater management system is designed for. The design storm event(s) will be selected based on consideration of requirements from RCRA Subtitle D, UMTRCA, and the Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments requirements and the design life of the final cover system;
- Design of the stormwater management system to contain and convey the runoff from the design storms such that the integrity of the final cover system is maintained. It will include the BMPs for erosion and sediment control;
- Design of detention system (location(s), layouts, and capacity) in accordance with the applicable requirements to allow time for sediments to settle and controlled discharge from detention ponds;
- Discharge locations and discharge mechanism (discharge rate and structures) such that discharge from the site does not cause erosion or flooding of the areas downstream; and
- Design elements for conveyance and storage that consider contribution or shared volume from adjacent properties and operable units.

3.4 MATERIALS HANDLING, TRANSPORTATION, AND DISPOSAL

After excavation of the materials from the defined areas, the excavated materials will be processed for reuse as backfill or for transportation to offsite location(s) for disposal. The RD for material handling, segregation, transportation, and disposal is anticipated to include the following:

- Mechanism for segregating excavated materials for reuse as backfill or as RIM for transportation to offsite location(s) for disposal. RIM to be disposed offsite may be segregated further based on the requirements of the disposal facilities;
- Evaluating the rate at which excavated materials can be managed based on processing time, on-site stockpiling limitations, and transportation/disposal facilities requirements or restrictions. The material management rate limitations will be used in developing the operations and sequencing of excavation and backfilling activities;

- Requirements for containment of excavated materials and loading/unloading of trucks. This will include evaluating types of containers, use of off-road and/or on-road trucks, and loading/unloading areas;
- Design of laydown areas (locations, size, etc.) to temporarily stockpile the excavated materials on-site before processing and post-processing. This will include the requirements for (i) daily/intermediate cover for stockpiled materials; (ii) management of contact water or leachate from the stockpiled materials; (iii) birds and vector threshold and control measures; (iv) air quality monitoring and odor control;
- Evaluating factors to consider whether the management of excavated materials in an enclosed structure is necessary to comply with ARARs during the excavation and how a structure could affect the efficiency of the excavation. This will include evaluating the criteria and the respective thresholds that may warrant an enclosed structure, use of temporary or permanent structure, and the applicable design/regulatory requirements for the structure. While it was assumed in the FFS and the RODA that a building would be erected to contain RIM staging, temporary storage, and loading activities, due to the focused nature of the RIM excavation included in the RODA, staging and temporary storage of RIM prior to loading for offsite may not be necessary, especially in Area 1. We also note that construction of a building is likely to be a time-consuming mobilization activity and the building size and operating requirements could be a significant rate limiter for the excavation process which could extend the duration of excavation and backfilling;
- Identifying applicable DOT transportation requirements for transporting RIM to offsite disposal facilities. This include (i) evaluating available options for transportation (use of rail or trucks and use of existing or alternate roads, entrance, and exit to access Site); (ii) container types in which RIM can be transported; and (iii) shipping routes including use of potential offsite rail loading areas;
- Identifying offsite disposal facilities criteria and requirements for RIM and non-RIM (e.g., RCRA characteristically hazardous materials), and facilities' ability to accept RIM mixed with other waste. This will include evaluating material testing requirements prior to shipment of waste to the disposal facilities; and
- Working with disposal facility communities (as needed). This may include performing analysis for non-NRC permitted facilities to demonstrate that disposal of the waste would meet the protectiveness criteria established by CERCLA.

3.5 POST-RA FLOOD PROTECTION

The closure design of OU-1 will take into consideration theoretical flooding of the Site due to an extreme storm event plus failure of the levee. The design storm event for local flooding during a storm will be selected based on consideration of guidelines in RCRA Subtitle D, UMTRCA, and the Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments requirements and the design life of the final cover system. Available public records and studies regarding the consequences of a levee failure will be evaluated to assess potential theoretical water surface elevations. The primary focus of the design will be stability of the closed slopes and the starter berm at the toe of waste slope. Stability analysis will include rapid drawdown analyses. It is assumed that erosion protection will also be designed and will include armoring of the toe of the OU-1 cover. Preliminary details and concepts for the flood protection design will be included in the 30% RD report and advanced in subsequent design submittals and finalized with USEPA approval of the 100% RD report.

3.6 ENVIRONMENTAL & COMMUNITY PROTECTION & MONITORING DURING RA

During the RA, monitoring programs will be implemented to protect the health and safety of the on-site workers and the surrounding community. The RD will develop the following protection and monitoring programs for implementation during RA:

- Dust control measures will be designed to mitigate/prevent RIM or other waste materials from getting airborne and being transmitted through air. The RD will layout the monitoring and mitigation plan including monitoring locations, methodology (visual and instruments), monitoring frequency, and the criteria that will be used to mitigate/prevent dust during remedial activities.
- Perimeter air monitoring will be performed during RA. The RD will identify the perimeter air monitoring network that will be used during RA, monitoring frequency, parameters that will be monitored, threshold for the parameters being monitored, and the actions that will be implemented if thresholds are exceeded.
- Odor control measures that may be used during RA will be identified. The RD will outline the implementation criteria and the odor control measures that will be implemented if those criteria are met.
- Temporary stormwater and erosion control measures that will be implemented during RA. These measures will be designed as discussed in Section 3.2 above.
- Construction water (contact water and leachate) will be effectively managed during RA. The construction water management system will be designed as discussed in Section 3.2 above. As noted, it will include discharge mechanism (discharge locations, rate, structures, and method) and testing requirements prior to discharge (monitoring frequency, parameters, thresholds, and the actions when the thresholds are exceeded).
- Groundwater monitoring will be performed during and after RA. Sentinel wells will be identified during the initial phase of the RD and presented in the DIWP. Baseline groundwater monitoring data will be collected from those wells during the DI for comparison to groundwater monitoring data collected during and after RA.

Details related to the Environmental and Community Protection and Monitoring during RA will be presented in the Site-wide Monitoring Plan discussed in Section 3.1.2.6 of this Work Plan.

3.7 REMEDIAL ACTION CONTRACTING STRATEGY

In light of the size and complexity of the RA , the selected RA contractor will need to have demonstrated the ability to manage large complex projects in urban settings, landfill excavation and cover experience, and radioactive material excavation and handling. It is expected that contractor qualifications would be requested and reviewed during the Final RD process with a technical and price Request for Proposal issued to a select group of contractors deemed qualified.

SECTION 4 – ARARS AND PERMITS

The Comprehensive Environmental Response, Compensation, and Liability Act (CERLCA) Section 121(d) and National Oil and Hazardous Substances Pollution Contingency Plan (NCP) Section 300.430(f)(1)(ii)(B) require that RAs at CERCLA sites should attain a level or standard of control at least equivalent to a legally applicable or relevant and appropriate federal and state requirements, standards, criteria, or limitations that are collectively referred to as ARARs, unless such ARARs are waived under CERCLA Section 121(d)(4). The ARARs for the Amended Remedy selected by the USEPA in the RODA (as included in Appendix D of the RODA) are presented in **Table 5**.

Many of the ARARs relate to landfill design and closure. These are "relevant and appropriate" where professional judgement is used in their application considering site-specific environmental and technical factors. Multiple federal and state regulations and guidance documents related to landfill design and closure are cited in the ARARs listed in the RODA. While there are overlapping aspects of these regulations and guidance, they were formulated for substantially different materials, challenges, and time frames. Consequently, the final cover design will be a hybrid that will meet or exceed ARARs

ARARs have not been identified in the RODA or SOW for buildings, structures, or electrical/mechanical systems that may be required during the RD or RA phases. The State of Missouri does not have statewide building codes. Instead, St. Louis County or City of Bridgeton codes are expected to be relevant and appropriate for specific elements that may be required and will be addressed in the Design Criteria and 30% Remedial Design Reports. No permanent structures or systems are expected to be installed, so the portions of the codes that are relevant to temporary facilities are expected to be appropriate for use in the RD and RA phases. Formal permit applications are not anticipated for facilities that may be constructed on site.

ARARs have not been identified in the RODA or SOW for activities that are completely off-site, such as trucking materials to and from the Site on public roads or disposal of materials at off-site landfills. These activities are governed by applicable laws, regulations, and permit requirements in the jurisdictions where those activities occur.

Water discharges to a local publicly owned treatment work (POTW) will be required to follow the rules and requirements of that specific entity.

Permitting requirements are waived under Section 121 of CERCLA for on-site activities; however, activities and discharges taking place off-site may require a permit.

The key ARARs are discussed below.

4.1 ENVIRONMENTAL PROTECTION STANDARDS FOR URANIUM AND THORIUM MILL TAILINGS

The UMTRCA standards set forth in Title 40 of the Code of Federal Regulations (CFR) § 192.02(b)(1) state that control of residual radioactive materials and their listed constituents shall be designed to provide reasonable assurance that release of Rn-222 from residual radioactive material to the atmosphere will not exceed an average release rate of 20 pCi/m^2s. The Amended Remedy will meet the radon emission standard promulgated under UMTRCA through excavation of RIM greater than 52.9 pCi/g to a target depth of 12 feet and construction of the engineered landfill cover. The landfill cover system will be designed to provide sufficient radon attenuation to limit future maximum surface emissions from Areas 1 and 2 of OU-1 to meet the UMTRCA performance standard.

The remedy will also meet the longevity standard presented in 40 CFR § 192.02(a) in that it will be designed to be effective for up to 1,000 years, as far as reasonably achievable, but at a minimum, 200 years.

The Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings in 40 CFR 192 Subparts A and B include standards which establish concentration limits for groundwater protection. Based on the presence of radioactive materials in OU-1 and the potential for leaching to groundwater, the groundwater protections standards (40 CFR § 192.02(c)(3) and (4)) and monitoring requirements (40 CFR § 192.03) of the UMTRCA regulations are relevant and appropriate requirements.

RCRA cover systems have design lives much greater than the minimum 30-year post-closure care period required in regulations. The design lives for properly designed cover systems extend to at least several hundred years, but it is unclear how much further beyond that they extend (April 2004 *(Draft) Technical Guidance for Resource Conservation and Recovery Act (RCRA) / CERCLA Final Covers*). RD will include evaluation of materials and cover system component combinations in the 30% and Pre-Final (90%) RD that will act in addition to the RCRA (including MDNR solid waste regulations) cover requirements or provide technically equivalent performance during the timeframes considered under RCRA while providing increased longevity suitable for the UMTRCA time frames.

4.2 RCRA FINAL COVER GUIDANCE

In addition to the UMTRCA standards, the design of the engineered cover component of the Amended Remedy will evaluate design criteria discussed in the guidance that has been identified as To Be Considered (TBC). Specifically, these include the USEPA's July 1989 *Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments* and the April 2004 *(Draft) Technical Guidance for Resource Conservation and Recovery Act (RCRA) / CERCLA Final Covers*. The 1989 Technical Guidance Document provides design guidance on final cover systems for hazardous waste landfills and surface impoundments. This guidance addresses multilayer cover design to provide long-term protection from infiltration of precipitation. The 2004 Draft Technical Guidance provides design information regarding cover systems for municipal solid waste and hazardous waste landfills being remediated under CERCLA, RCRA Corrective Action, and sites regulated under RCRA. This guidance includes updated information related to development of design criteria and provides a wide array of traditional and alternative approaches that may be used to accomplish the short- and long-term objectives of the Missouri Solid Waste Rules and UMTRCA to create a hybrid cover system.

4.3 RCRA SUBTITLE C HAZARDOUS WASTE REQUIREMENTS AND OTHER REGULATED MATERIALS

If RCRA hazardous waste is generated during the RA, it will be managed and disposed of off-site in accordance with RCRA Subtitle C requirements regarding identification of hazardous wastes (40 CFR § 261), packaging, temporary storage, off-site transportation of hazardous wastes (40 CFR§ 262 and 263), and treatment and disposal of hazardous wastes (40 CFR § 268). These are applicable requirements for generators in the event that hazardous waste is generated during remedy implementation. Similarly, the requirements of the Missouri Hazardous Waste Management Law (260.350 – 260.430 Revised Statutes of Missouri (RSMo)) and associated regulations (10 CSR § 25-7) would apply in the event that hazardous wastes are generated during the RA. In addition, any regulated asbestos-containing material excavated during the remediation will be managed and disposed of in compliance with 40 CFR § 61.154(j), 10 CSR § 10-6.241, and St. Louis County Ordinance 612.530, all of which pertain to excavating/disturbing asbestos.

4.4 MISSOURI SOLID WASTE RULES FOR SANITARY LANDFILLS

The Amended Remedy will meet various provisions of the state of Missouri's Solid Waste Rules establishing closure and post-closure requirements for sanitary landfills as listed in Table 5. Although not applicable to the closure of Areas 1 and 2, these rules are relevant and appropriate.

In addition to the requirements in the ARARs discussed above, the final cover will consist of at least 2 feet of compacted soil and overlaid by at least 1 foot of soil capable of sustaining vegetative growth (10 CSR § 80-3.010(17)(C)4. Placement of soils cover addresses the requirements for minimization of fire hazards, odors, vectors, blowing litter, control of gas venting, and scavenging. The final cover system will address the requirement for minimizing precipitation infiltration. Placement of soil and establishment of a vegetative cover meet the requirement of providing a pleasing appearance. The final cover will prevent direct contact with the waste material. The final cover will provide a hydraulic transmissivity equivalent to or less than a 2-foot thick compacted clay layer with a hydraulic conductivity of 1x10-7 cm/sec as required by the RODA..

The Missouri Solid Waste Rules also contain minimum and maximum side and top slope requirements. The object of these slope requirements is to promote maximum runoff without excessive erosion and to account for potential differential settlement of the waste and engineered cover. Because landfilling of Areas 1 and 2 was completed many years ago, much of the compaction of the refuse has already taken place and differential settlement may no longer be a significant concern. Specifications will be developed for backfilling and compacting the excavation backfill to manage the potential for differential settlement from these disturbed materials. Therefore, the 5% minimum sloping requirement may be greater than necessary and may not be optimal for the Amended Remedy. Sloping specifications will be designed to promote drainage and reduce infiltration of precipitation while minimizing the potential for erosion. It is anticipated that a 2% to 3% slope may be sufficient to meet drainage requirements while resulting in a lower potential for erosion. This approach could increase the life of the cover and overall longevity of the remedy compared to a steeper slope, which would be subject to increased erosion potential. The optimal minimal slope for the remedy will be further evaluated during the RD. The maximum sloping requirements will be met at elevations within the limits of waste and/or for slopes containing geosynthetics parallel to the slope surface, such as geomembranes. Perimeter or starter toe berms are built out of soil or rock outside of the limit of waste and are not part of the final cover system. Their maximum exterior slopes will be based on geotechnical analyses to be presented in the 30% and Pre-Final (90%) RD Reports.

The substantive requirements for decomposition gas monitoring and control in 10 C§ 80-3.010(14) SR § 80-3.010(14) are relevant and appropriate and will be met. The number and locations of gas monitoring points and the frequency of measurement will be established in the RD submittals. Since the waste has been in place for several decades, it is anticipated that is well past peak methane gas production and is not expected to require the same level of gas venting and controls as a recently closed landfill. The landfill gas management will need to be addressed in a manner that also meets the radon gas protection requirements in the USEPA National Emission Standards for Hazardous Air Pollutants, which will likely result in a hybrid cover system design. In the event that landfill gas is detected at the site boundaries above the regulatory thresholds, appropriate gas controls will be implemented.

Potential and previously identified leachate seeps from the slopes of Areas 1 and 2 will be evaluated during the design investigation and counter-measures developed in the 90% RD.

The requirements for a groundwater monitoring program in 10 CSR § 80-3.010(11) are relevant and appropriate to OU-1. A sentinel monitoring well network will be identified during RD with baseline monitoring occurring during DI and monitoring continuing during RA and post-RA. The monitoring program will be capable of monitoring potential impacts to underlying groundwater. The substantive MDNR landfill requirements for post-closure care and corrective action in 10 CSR § 80-2.030 will be used in addition to the USEPA CERCLA policy and guidance to develop robust monitoring meeting these requirements.

4.5 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

The Amended Remedy will meet the USEPA's National Emission Standards for Hazardous Air Pollutants (NESHAPs) at 40 CFR § 61, which include standards for Rn-222 emissions to ambient air from designated uranium mill tailings piles that are no longer operational. While not applicable, the Rn-222 NESHAP is relevant and appropriate. The Amended Remedy will meet the radon emission standard through excavation and off-site disposal of RIM greater than 52.9 pCi/g to a target depth of 12 feet (with a potential range of 8 – 20 feet), and construction of the engineered landfill cover. The landfill cover system will be designed to provide sufficient radon attenuation so that the radon NESHAP standard is met under both current conditions and in the future, accounting for future radon generation resulting from increased radium levels owing to the decay of thorium over time. Performance of radon flux measurement tests, in accordance with the procedures set forth in 40 CFR § 61 Appendix B Method 115, or other procedures with prior USEPA approval, will be conducted upon completion of construction of the engineered cover to demonstrate that the landfill cover achieves the radon emission standard.

The Amended Remedy will also meet the USEPA's National Emissions Standard for Radionuclides Other Than Radon from Department of Energy Facilities (40 CFR § 61.90-97). It sets a limit on the emission of radionuclides other than radon from DOE facilities, so no member of the public receives an effective dose equivalent of more than 10 mrem/year. While not applicable, these standards are relevant and appropriate because the COCs at OU-1 of the West Lake Landfill Site include radionuclides other than Rn-222. The "Dose Compliance Concentrations for Radionuclides at Superfund Sites" (DCC) Calculator website is also included as a TBC for the site to demonstrate compliance with any dose-based ARARs.

4.6 CLEAN WATER ACT, MISSOURI STORMWATER MANAGEMENT REGULATIONS, AND DRINKING WATER STANDARDS

The Federal Clean Water Act sets standards for ambient water quality and incorporates chemical-specific standards including federal water quality criteria and state water quality standards. The Amended Remedy will be designed so that the management of contaminated water that would potentially be discharged from the site or sent to a treatment plant will be protective. Discharge to surface water will meet National Pollutant Discharge Elimination System (NPDES) standards specific to the contaminants as appropriate.

The RD will develop approaches to stormwater management by minimizing stormwater flow into the working areas (also referred to as run-on), by minimizing the surface area of disturbed ground that is exposed to direct precipitation, and by properly detaining and treating, if necessary, runoff that has contacted the working areas. Following remedial excavation activities, Site work will include the installation and maintenance of an engineered landfill cover to prevent stormwater from contacting any remaining waste materials, and construction and maintenance of stormwater diversion and controls structures as part of the final engineered landfill cover system.

The Missouri regulations governing stormwater management are set forth in 10 CSR § 20-6.200 for construction sites and are applicable during remedial construction. The Missouri Clean Water Law – Chapter 6 – Storm Water Regulations at 10 CSR § 20-6.200(2)(B)3.B (the corresponding federal regulation is 40 CFR § 122.26(b)(14)(v)) defines discharges from landfills, land application sites, and open dumps that have received industrial waste as being subject to the requirements set forth for industrial discharges through the state of Missouri. The substantive requirements of stormwater permitting are required for all industrial discharges per 10 CSR § 20-6.200(6)(A)(1). The substantive requirements of stormwater permitting are established in 10 CSR § 20-6.200(6)(B). The effluent limitations protective of the waters of the state at 10 CSR § 20-6.200(6)(B) are substantive.

A Stormwater Management Plan will be developed that clarifies how the substantive requirements of 10 CSR § 20-6.200(6)(A)(1), 10 CSR § 20-6.200(6)(B) and 10 CSR § 20-6.200(2)(B)3.B will be met. BMPs will be used both during and following remedial construction activities to achieve the substantive requirements and protectiveness.

Discharges of water will comply with applicable Missouri water quality standards. Missouri Water Quality Standards, at 10 CSR § 20-7.031(4), provide general water quality requirements that are applicable to all waters of the state, regardless of use designations. The requirements provided in this section will be met so that proposed or existing discharges are protective. Furthermore, standards specific to the contaminants will be met and the levels will be protective for the designated use of the receiving stream. All waters of the state are subject to the acute toxicity requirements listed in Tables A and B of 10 CSR § 20-7.031(5), the requirements of subsection 5(B), and other requirements of (4). The regulations at 10 CSR § 20-7.031(5) establish specific water quality standards necessary to ensure protectiveness in waters with designated uses, based on those respective uses. Specifically, water contaminants will not cause or contribute to an exceedance of standards for radiological contaminants or other primary standards and will be protective for the designated used of the receiving waters.

4.7 MISSOURI REGULATIONS FOR PROTECTION AGAINST IONIZING RADIATION

The Missouri Radiation Regulations for Protection Against Ionizing Radiation (19 CSR § 20-10.070 and 19 CSR § 20-10.090) contain standards that address storage and releases of radioactive materials. These requirements are considered relevant and appropriate during implementation of the Amended Remedy. Specifically, these regulations establish ventilation standards for rooms storing radioactive materials and limits for releases of radionuclides to the air. Other standards related to health and safety and protection of remediation workers are not ARARs but will be complied with as appropriate.

4.8 MISSOURI WELL CONSTRUCTION CODE

The Missouri Water Well Construction Code (10 CSR § 23-3.010) prohibits the placement of a water supply well within 300 feet of a landfill. These rules are applicable and should provide protection against the placement of wells on or near the Site. The regulations on monitoring well construction (10 CSR § 23-4) will apply to the construction of new or replacement monitoring wells. Preparation of the Site Wide Monitoring Plan will consider these requirements. The Amended Remedy will meet this ARAR through enforcement of the existing ICs, imposition of new ICs, and by adhering to the Monitoring Well Construction Code requirements for the installation of new monitoring wells or abandonment of existing monitoring wells.

4.9 TRANSPORTATION REGULATIONS

Although off-site transportation requirements are not considered ARARs, these requirements will be complied with. These requirements include the U.S. Department of Transportation (DOT) regulations for transport of hazardous materials (49 CFR § 100 – 178), and specific regulations related to transport of radioactive materials (49 CFR § 171 – 180). The NRC, through a Memorandum of Understanding with DOT, also has promulgated regulations regarding transport of radioactive materials (10 CFR § 71). The State of Missouri also has transportation related requirements at Missouri Revised Statute 260-.392 and 2060.380.1(5) that will be met. Requirements established by common carriers (including rail carriers) for transport of waste materials or radioactive wastes, while not ARARs (because they are not a state or federal requirement), may also be applicable to the Amended Remedy. Identification and evaluation of the carrier-specific requirements will be performed during the RD.

SECTION 5 – REMEDIAL DESIGN MANAGEMENT

This section describes the management approach, including project organization, project communication, and document management for West Lake RD.

5.1 REMEDIAL DESIGN ORGANIZATION

Several organizations will be directly involved in the performance and review of the RD. The objective of this section is to describe the overall project organization and responsibility of various parties to aid in the exchange of information and to provide for efficient project operation. An organization chart is included in **Figure 4**.

5.1.1 United States Environmental Protection Agency

The USEPA is the lead agency for the Site. This federal agency will review and approve plans, drawings, reports, and schedules submitted for the pre-design, RD, and RA as documented in the Statement of Work for the Third Amendment to the ASAOC and the Consent Decree. Ms. Christine Jump is USEPA's Project Manager for the West Lake Landfill Site.

5.1.2 Missouri Department of Natural Resources

The MDNR is the supporting state regulatory agency. MDNR will coordinate and consult with USEPA on review of submittals. Mr. Ryan Seabaugh is MDNR's Project Manager for the West Lake Landfill Site.

5.1.3 West Lake Landfill OU-1 Respondents

The current West Lake Landfill OU-1 Respondents include Cotter Corporation (N.S.L.), Bridgeton Landfill, LLC, and the Department of Energy (DOE). Together this group is responsible for the RD of OU-1 of the West Lake Landfill Site. Cotter Corporation (N.S.L.) and Bridgeton Landfill, LLC, are performing parties for the RD while DOE is a settling federal agency. Ms. Victoria Warren is the Project Manager representing Bridgeton Landfill, LLC and Mr. Scott Sklenar is the Project Manager acting for Cotter Corporation (N.S.L.).

5.1.4 Project Coordinator

Mr. Paul Rosasco of EMSI will serve as the Project Coordinator. Paul has supported the West Lake Landfill Site investigations for 25 years. He will provide direction and leadership to the remedial consultants.

5.1.5 Primary Consultant

Parsons will serve as the primary consultant for the RD. The design organization for the project team is further described below.

5.1.5.1 PROJECT MANAGER AND ENGINEER OF RECORD

Mr. Raymond (Ray) D'Hollander, PE is Parsons Project Manager for the West Lake Landfill Project. Ray will be directly responsible to Respondents and Parsons' management for meeting the project objectives and project schedules. Mr. D'Hollander is licensed as a Professional Engineer in the State of Missouri.

Ray D'Hollander, PE has been project manager, design manager, and engineer-of-record for design and construction on numerous CERCLA, RCRA, Toxic Substances Control Act (TSCA), and other inactive hazardous waste sites in the United States and Canada since 1985. Ray has managed remedial investigations, RD, remedial construction, and site operations and maintenance for a wide variety of projects including excavations, landfills, and building demolition.

Ray has worked on Subtitle D, Subtitle C, and TSCA landfills for RCRA and CERCLA sites since 1993. He understands the theory and practice of the geosynthetic and soil components of the landfill systems and has provided technical equivalency evaluations for regulatory approval when using new materials that were not available at the time the original regulations were written. Ray has been involved with slope stability evaluations throughout North America since 1981 and has applied this experience to both the design of new landfills and forensic evaluations of landfill failures. He has expertise in the static and dynamic liquefaction of soils and has provided expert testimony on static and seismic stability of landfills in regulatory hearings.

Ray has also been the engineer-of-record on numerous RDs and RA reports over the past 30 years. Ray has provided expert strategy advice on high visibility projects such as the remedy selection for the Sydney Tar Ponds in Canada, including public presentations and media interviews. Ray's geotechnical engineering background has prepared him to manage complex excavations in various types of waste which is often below the water table and adjacent to critical structures. Subsurface containment systems for these sites included sheet piles and slurry walls. Cover systems included geosynthetic landfill covers, soil covers, and pavements.

The Project Manager will perform the functions listed below:

- Provide overall direction and management for RD activities;
- Perform administrative and decision-making activities, as well as provide necessary authorizations within Parsons related to the project;
- Facilitate RD coordination between Parsons and external organizations;
- Review all reports in the draft version prior to their final edition;
- Communicate with USEPA and other agencies on an ongoing basis regarding technical issues and project status;
- Engineer-in-Responsible-Charge for the design; and
- Seal the Final RD Report, Drawing, and Specifications cover sheets after coordinating the sealing of individual components by the discipline leads.

5.1.5.2 DEPUTY PROJECT MANAGER

Mr. Paul Roth will serve as Deputy Project Manager for the RD. Paul has 14 years of project management and environmental engineering experience involving construction oversight, site investigations, feasibility studies, RD, and construction estimating. His experience includes serving as project manager, design engineer, and project engineer for contaminated soil, landfill design and sediment projects throughout the United States. Paul has experience providing services from initial site investigations through post-construction project closeouts. He is proficient with project execution understanding how all the pieces fit together and understand the bigger picture. He manages teams so that efficient solutions are delivered within project schedule requirements.

The Deputy Project Manager will assist the Project Manager in managing the project and coordinating with the different parties associated with the RD, permitting, review and approval process.

5.1.5.3 DESIGN MANAGER

Mr. Ayushman Gupta, P.E. will serve as Design Manager for the RD. Ayushman has 24 years of experience in the landfill and solid waste industries. Ayushman is a geo-environmental engineer with experience in landfill design, permitting, construction, expansion, operation support, and closure. He has worked on several landfill projects for private and public waste management clients including Waste Management, Waste Services, and several Florida counties (Sarasota, Indian River, Pensacola, and Polk). Some of his pertinent landfill projects include Oak Hammock Disposal Facility (a Class I MSW landfill), Sun Country Disposal Facility (a Class III and C&D landfill), and Sarasota County Landfill (a Class I, Class III, and C&D facility). For 7 years, he served as the site engineer at the Oak Hammock landfill, which involved phased development of a greenfield site into a 264-acre Class I landfill with a capacity of over 55 million tons and a 30-year life.

The Design Manager will perform the functions listed below:

- Direct and coordinate the technical components of the project;
- Integrate the individual project components into a functional system;
- Manage RD coordination between the technical discipline leads; and
- Supervise preparation of calculations, design drawings, and specifications.

5.1.5.4 ANALYTICAL QUALITY ASSURANCE MANAGER

Ms. Maryanne Kosciewicz is the Analytical Quality Assurance Manager. Maryanne has 29 years' experience as a quality assurance officer and project chemist with experience in hydrogeologic and remedial investigations. She oversees analytical data reviews and evaluations for projects, prepares data usability and data validation reports and site-specific quality assurance project plans, and provides technical support for data quality assessment and interpretation. Maryanne is familiar with environmental analytical methods employed by the USEPA. She is experienced in data validation using USEPA Contract Laboratory Program guidelines, revisions. Maryanne is experienced in field sampling and on-site laboratory analysis screening of volatile organic compounds, semi-volatile organic compounds, and pesticides, using gas chromatography and mass spectrophotometer instrumentation.

Maryanne will perform the functions listed below:

- Provide quality assurance technical assistance to the project staff;
- Direct the preparation and review of quality assurance plans for analytical work, as required;
- Review and validate analytical data in accordance with approved quality assurance plans; and
- Assess compliance with Region VII data validation protocols.

5.1.5.5 PROJECT CONTROL SPECIALIST

Mr. Sudipta Ghorai is the Project Control Specialist for the RD. Sudipta will develop and maintain a working project schedule, including assessing project status against target milestones. He will coordinate with the Project Manager so that relevant project control issues are managed effectively.

Sudipta Ghorai has 9 years' experience in design and construction project controls, with primary responsibilities that include supporting programs and projects with schedule and cost management, maintaining detailed schedules for multiple industrial and infrastructure projects; updating schedules at regular intervals in accordance with program and project requirements, implementing earned value management to analyze cost and schedule indicators, and presenting budget and schedule reviews to stakeholders. His experience also includes identifying potential change orders, preparing schedule updates, estimating detailed costs for procurement contracting officers, and conducting time impact analyses.

5.1.6 Teaming Partners

Parsons has partnered with Feezor Engineering, Inc. and Ameriphysics as experts to provide technical direction and support for the RD.

5.1.6.1 FEEZOR ENGINEERING

Feezor will lead the implementation of the site investigation under the direction of Parsons with support from Ameriphysics. Feezor has the local resources and on-site knowledge to efficiently and safely implement the field investigation, as they have been doing for the past decade. This site experience and expertise will provide efficient design investigation. Feezor's investigation team will be supplemented by Parsons as-needed drawing on the experience in their local St. Louis office. Feezor will also support Parsons with various aspects of the RD. Specifically, Feezor will be involved in the excavation grading plans, stockpile plans, stormwater designs, and final cover designs.

Daniel (Dan) Feezor, PE is the president and owner of Feezor Engineering, Inc. Dan has 29 years of experience designing liners and final cover systems in the US Midwest and is licensed as a Professional Engineer in the State of Missouri. He has extensive solid waste management experience, including designing waste management facilities and hydraulic structures; securing NPDES permits; and permitting new landfill units in accordance with Illinois regulations. He has also designed three material recovery facilities and provided construction observation for landfills in Missouri and Illinois, including serving as a construction quality assurance officer for several landfill facilities in accordance with the Title 35 of the Illinois Administrative Code, Part 811. Recently, Daniel has been involved with the Bridgeton Landfill and West Lake Landfill Superfund site, providing unique consulting services such as gamma cone penetration testing, sonic drilling and sampling in waste, in waste thermocouple installation, and installation of one of the first in-situ heat removal systems in the county.

5.1.6.2 AMERIPHYSICS

Ameriphysics will support this project drawing on their radiation expertise and health and safety experience for working with radioactive materials. Ameriphysics will advise on all phases of the projects. They will be responsible for health and safety plans related to radiological material, radiation work permits, field screening procedures, radiological waste disposal methods, and radiological laboratory testing. Ameriphysics currently has the required licensures to complete this scope of work.

Thomas Hansen PhD, CHP, PMP, is a widely-recognized expert in the design and execution of radiological cleanup activities. Evidence supporting this statement includes Dr. Hansen's nominations by US Department of Agency and the International Atomic Energy Agency to lead dozens of national and international workshops and symposia on topics related to nuclear decommissioning. He is an American Board of Health Physics Certified Health Physicist (CHP), and his education includes a doctorate degree in health physics and bachelor's degree in radiation protection. He has more than 30 years of nuclear field experience and has personally planned and managed more than 60 cleanup projects across the US and Canada.

5.2 PROJECT COMMUNICATION

Respondents or their agents will communicate with the USEPA and other agencies in order to complete the RD effectively and efficiently. Respondents will submit monthly progress reports that describe actions from the prior month, provide raw and/or validated data not previously submitted, identify completed deliverables, describe actions anticipated for the next month, provide overall status of ongoing obligations, and identify modifications to work plans, as required by the Third Amendment to the Administrative Order on Consent and the associated SOW. Each monthly progress report, data submittal, or other design deliverable will be

submitted to the agencies and persons on the distribution list identified in the Consent Order for review and comment. Regular conference calls and meetings will be scheduled between the Respondents and USEPA and other agencies.

5.3 DOCUMENTS MANAGEMENT

Respondents will prepare and submit RD documents for review and/or approval in accordance with the Third Amendment to the Administrative Order on Consent and associated SOW.

5.4 REMEDIAL DESIGN SCHEDULE

The RD schedule is presented in **Table 6**.

SECTION 6 – POST-CONSTRUCTION PLANS

6.1 REMEDIAL CONSTRUCTION COMPLETION REPORT

A Remedial Action Report (RAR) will be submitted to USEPA after USEPA determines in writing that the remedial construction for OU-1 at the Site is complete. The RAR will be completed pursuant to the requirements for RARs described in USEPA's *Closeout Procedures for National Priority List Sites* (USEPA 2011).

The RAR will include a description of the completed RA including RIM removed and disposed offsite; quantities and placement of materials (RIM below 52.9 pCi/g and imported) used to backfill the excavations; grading and/or construction completed in OU-1 areas; areas closed with a final cover system; deviations from the RD approved by USEPA, if any; various systems constructed for long-term operation and maintenance; and the institutional controls implemented for OU-1. The RAR will also include tables, figures, quality control and quality assurance documents, and "as-built" drawings signed and sealed by a Missouri professional engineer. A certification signed by a Missouri professional engineer stating that the RA was completed in accordance with the USEPA-approved RD will be included in the RAR.

6.2 SITE MANAGEMENT PLAN POST RA

A Post-RA SMP will be prepared for OU-1 following completion of the remedial construction activities and acceptance of the RAR. The schedule for submission of the SMP will be identified in the 90% RD for. The Post-RA SMP will include an O&M Plan, an O&M Manual, and an ICIAP as described below and will be subject to USEPA review and approval. Drafts of the O&M Plan, O&M Manual, and ICIAP will be provided in the 90% and Final RD but are expected to require updates after the RA is complete during the preparation of the Post-RA SMP.

6.2.1 Operations and Maintenance Plan and Manual

An O&M Plan and an O&M Manual will be prepared as discussed in Sections 3.1.2.11 and 3.1.2.12, respectively. The O&M program will include inspection of various components of the remedy, and performance of any repairs that might be necessary to maintain effectiveness of the remediation. The O&M program will evaluate if the remedial technologies are performing as specified in the RD to meet RAOs and RGs. The description of the O&M requirements will include contingency planning in case any element of the RD fails to achieve RAOs or RGs. The description of O&M requirements prepared during the design will be updated, as needed, to reflect the "as-built" conditions and incorporated into the O&M Plan and the O&M Manual.

6.2.2 Institutional Controls Implementation and Assurance Plan

The ICIAP will be developed as discussed in Section 3.1.2.13. The specific institutional controls (environmental easements and deed restrictions) that will be implemented will be identified in the plan based on the RODA (USEPA 2018), RD, and the RAR.

SECTION 7 - REFERENCES

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TABLES

Table 1
Summary of Investigations in OU-1

Type of Work	Year	Conducted By	Scope of Work	Reference Doc
Site Reconnaissance	1994	McLaren/Hart	Identify changed features since 1994 RI/FS Work Plan & conditions that may affect remedial investigations & development of alternatives	RI Addendum (EMSI 2018)
Gamma Surveys	1977	EG&G, DOE	Aerial survey identified 2 areas with external radiation levels up to 100 microR/hour	RI Addendum (EMSI 2018)
	1980 - 1981	RMC, NRC	Walkover surveys using grid system in Areas 1 & 2 - Levels in both areas had decreased significantly due to added waste & construction fill	
	1994	McLaren/Hart, SEG	Overland survey along transects to identify & delineate (i) areal extents of Areas 1 & 2 and (ii) areas with elevated rad needing additional investigation work	
	2013	EPA-OEM, ASPECT	Rad survey to identify areas with elevated gamma (gamma above background) - 10 of 800 measurements (all in Area 2) indicated elevated level of rad	
	2013 - 2015	EMSI, et al.	Overland surveys of areas with potential for site worker rad exposures during RI investigations which included vegetation clearing, drill pad/road construction, etc.	
	2016 - 2018	EMSI, et al.	Overland surveys to delineate areal extent of non-combustible cover (NCC) over Areas 1 & 2 surface RIM	
	2013 - 2015	EPA, MDNR	Three off-site radiation surveys including the Bridgeton Municipal Athletic Complex (BMAC)	
Drilling & Sampling	1981	RMC, NRC	43 auger borings in Area 1 & 2, downhole gamma logging, field analyses (61 samples) for U, Ra, and Pb, lab analyses (10 samples) for Th & U isotopes	RI Addendum (EMSI 2018)
	1995	McLaren/Hart, Geotechnology	66 drilled/hand-augered borings, downhole gamma logging, lab analyses of surface/subsurface samples for Priority Pollutants, VOCs, & radioisotopes	
	1997 - 2000	EMSI, CoLog, Quanterra	12 drilled/hand-augered borings from Area 1 & Ford Property, downhole logging, analyses for radioisotopes, sampling/analyses of Lot 2A2/Buffer Zone	
	2013	EMSI, et al.	Phase 1A – 68 GCPT soundings in Area 1, no sampling	
	2014	EMSI, et al.	Phase 1B – 26 GCPT soundings in Area 1, no sampling	
	2014	EMSI, et al.	Phase 1C – 16 rotosonic & 14 direct-push borings in Area 1, downhole gamma logging, gamma core scans, lab analyses (82 samples) for radioisotopes	

Table 1
Summary of Investigations in OU-1

Type of Work	Year	Conducted By	Scope of Work	Reference Doc
	2015	EMSI, et al.	Phase 1D – 18 GCPT + 20 rotosonic borings in Area 1, downhole gamma logging, alpha & gamma core scans, lab analyses (46 samples) for radioisotopes & non-rads	
	2015	EMSI, et al.	Additional characterization of Areas 1 & 2 – 27 rotosonic borings, downhole gamma logging, alpha & gamma core scans, lab analyses (64 samples) for radioisotopes & non-rads	
	2015	SSP&A, et al.	Fate & Transport study – 10 rotosonic borings in Areas 1 & 2, gamma core scans, lab analyses (22 samples) for radioisotopes, major cations/anions, pH & redox, TOC, XRD, SEM/EDS, CEC, SBLT, & SPLP	
Drilling & Sampling (Cont'd)	2015 - 2016	Cotter Corp, et al.	Additional characterization of Areas 1 & 2 – 5 rotosonic borings, downhole gamma logging, alpha & gamma core scans, lab analyses (39 samples including archived core samples) for radioisotopes, TCLP, XRD, & non-rads, and independent analyses on behalf of EPA	
Surface Soil Sampling	2016 - 2018	EMSI, et al.	Perimeter & step-out surface soil grab sampling/analyses in conjunction with 2016 NCC installation in Areas 1 & 2 and Area 2 steep slope work in 2018 & lab analyses (130+ samples) for Th-230 (quick-turn) and other radioisotopes	Final Report Installation of NCC over RIM (EMSI et al 2019)
Sediment Sampling	1995 - 1997	McLaren/Hart, EMSI	Assessment of chemical transport potential via sediments & lab analyses of sediment samples (collected from weirs and stormwater drainage) for radioisotopes and non-rads	RI Addendum (EMSI 2018)
	2016 - 2017	EMSI, et al.	10 sediment samples collected from stormwater drainage along west side of St. Charles Rock Road and 3 samples collected Mar 2016 with EPA splits, all analyzed for radioisotopes	

Table 2
Anticipated Drawings

Title Sheet and Drawing List
General Legend
General Notes
Existing Condition Site Plan
2005 Topographic Survey
Existing Utility Plan
Existing Grading
Temporary Facilities Site Layout
Site Construction Roadway and Traffic Plan
Waste Relocation and Removal Plan
Top of Existing Material Grading Plan and Top of Geomembrane
Top of Geomembrane Protection Layer
Proposed Finished Grade (Top of Topsoil)
Proposed Restoration Surfacing
Site Stormwater Management and Access Roads Plan
Landfill Gas Collection, Control and Monitoring
Finished Grade Cross-Sections
Temporary Facilities Detail
Water Treatment Plant Process Flow Diagram
Waste Relocation and Removal
Proposed Waste Relocation and Backfill Phasing Plan
Proposed Waste Relocation and Backfill Phasing Cross-Sections
Final Site Grading Details
Cover System Details
Connections Between Adjacent Cover Systems
Temporary Stormwater and Erosion Control Details
Permanent Stormwater and Roadway Details
Monitoring Well and Piezometer Plan and Schedule
Proposed Excavations Outside Landfill Footprint Plan
Restoration of Excavation Outside Landfill Footprint Plan
Restoration of Excavations Outside Landfill Footprint Details

Notes:
- Only the Italicized drawings are anticipated to be submitted with 30% design.
- Details provided in 30% design are anticipated to be typical details. Detailed drawings will be submitted with 90% design.

Table 3
Anticipated Specifications

00 73 19	*Health and Safety Requirements*
00 73 53	*Anti-Pollution Measures*
00 73 63	*Security Requirements*
00 73 73	*Statutory Requirements*
01 11 00	Summary of Work
01 18 00	Project Utility Sources
01 30 00	Administrative Requirements (various)
01 40 00	Quality Requirements (various)
01 50 00	Temporary Facilities and Controls (various)
01 57 00	Temporary Environmental Protection Controls (various)
01 70 00	Execution and Closeout Requirements (various)
01 71 23.16	*Construction Surveying*
01 80 00	*Performance Requirements (various)*
02 01 00	*Maintenance of Existing Conditions*
02 24 23	Chemical Sampling and Analysis of Soils
02 26 36	*Hazardous Waste Drum Assessment*
02 41 00	Demolition (if needed)
02 55 00	Remediation Soil Stabilization
02 56 13	*Waste Containment*
02 56 13.13	*Geomembrane Waste Containment*
02 61 00	*Removal and Disposal of Contaminated Soils*
02 61 13	*Excavation and Handling of Contaminated Material*
02 71 00	*Groundwater Treatment*
02 81 00	*Transportation and Disposal of Waste*
02 86 00	*Hazardous Waste Drum Handling*
31 01 00	*Maintenance of Earthwork*
31 05 13	*Soils for Earthwork*
31 05 16	*Aggregates for Earthwork*
31 05 19	*Geosynthetics for Earthwork*
03 05 19.13	*Geotextiles for Earthwork*
03 05 19.16	*Geomembranes for Earthwork*
03 05 19.26	*Geocomposites*
31 21 00	*Gas Collection and Control System*

Table 3 (Continued)
Anticipated Specifications

33 01 50.81	Groundwater Monitoring Well Abandonment
31 11 00	*Clearing & Grubbing*
31 14 00	*Soil Stripping and Stockpiling*
31 23 19	*Dewatering and Construction Water Management*
33 11 53	*Groundwater Monitoring Wells*
31 23 16	*Excavation*
31 37 00	*Riprap*
31 25 00	Erosion and Sediment Controls
31 25 14	Stabilization Measures for Erosion and Sedimentation Control
31 25 24.13	Rock Barriers
31 25 14.13	Hydraulically-Applies Erosion Control
31 25 14.16	Rolled Erosion Control MATS™ and Blankets
31 05 19.26	*Geocomposites*
31 05 19.29	*Geonets*
33 05 33.33	*Corrugated Perforated HDPE Drainage Pipe*
33 05 33.36	*Corrugated Non-Perforated HDPE Drainage Pipe*
31 05 19.23	*Geosynthetic Clay Liner*
32 91 19.13	*Topsoil Placement and Grading*
32 92 19	*Seeding*

Notes:

- Only the italicized specifications are anticipated to be submitted with 30% design.
- Details provided in 30% design are anticipated to be typical details. Complete detailed specifications will be submitted with 90% design.

Table 4
Anticipated Calculations

Geostatistical Model
Removal Design / Excavation Plan
Volumes Calculations
Evaluation of Hydraulic Performance (HELP)
Max Allowable Gas Pressure
Veneer Stability Analysis
Slope Stability Analysis
Gas Management System Design
Temporary Stormwater Management During RA
Final Cover System Stormwater Management System
Uranium Mill Tailings Radiation Control Act (UMTRCA) Cover Analysis
Applicable Permits
Remedial Action Schedule

Notes:

- All listed calculations will be provided in the 30% and 90% design. Calculations and estimates provided in 30% design are anticipated to be conceptual and ballpark estimates in nature for decision-making. Complete detailed calculation packages for detailed design will be submitted with 90% design.

Table 5
Remedial Design ARARs

Chemical Specific ARARs						
Citation		**Chemical/Medium**	**Requirement**	**Determination**	**RDWP**	**DCR**
40 CFR § 192.02(a), (b)	Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites (UMTRCA)	Radon-222 in air	Standards for Radon-222 release rate and average concentration in air; plus duration of control effectiveness.	Relevant and appropriate.	3.3.1; 3.3.3; 4.1	11.3.2
40 CFR § 61.90-97; 40 CFR § 61.90-92	National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities (NESHAP)	Radionuclides other than Radon-222 and Radon-220 in air	Standard for radionuclide emissions expressed as effective dose equivalent to a member of the public.	Relevant and appropriate for buildings, structures, and operations on OU-1.	3.3.1; 3.3.3; 4.5	3.1; 11.3.2
40 CFR § 61.222(a)	National Emission Standards for Radon Emissions From the Disposal of Uranium Mill Tailings (NESHAP)	Radon-222 in air	Standard for Radon-222 release rate.	Relevant and appropriate.	3.3.1; 3.3.5; 4.5	11.3.2
10 CSR § 20-7.031(5)	Missouri Water Quality Standards	Water	Specific criteria for water quality, including limits for radionuclides.	Applicable to discharges to waters of the state.	3.1.2.6; 3.3; 3.3.4; 3.6; 4.6	3.3; 9.2
RSMo 260.500-550; 10 CSR § 24-2.010; 10 CSR § 24-3.010	Emergency Notification of Releases of Hazardous Substances and Extremely Hazardous Substances	All chemical compounds or substances listed under CERCLA	Notification requirements for hazardous substance releases.	Notification requirement is not an ARAR, but compliance is anticipated.	3.1.2.1	5.9.1; 8.1
		Petroleum	Notification requirements for petroleum releases.	Notification requirement is not an ARAR, but compliance is anticipated.	3.1.2.1	5.9.1; 8.1
10 CSR § 20-7.031(5)(B)(1)	Missouri Water Quality Standards - Toxic Substances	Water	Criteria for toxicity; including benthic organism harm mitigation and maximum fish tissue levels.	Applicable to discharges to waters of the state.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 9.2

Table 5 (Continued)
Remedial Design ARARs

Chemical Specific ARARs						
Citation		**Chemical/Medium**	**Requirement**	**Determination**	**RDWP**	**DCR**
10 CSR § 20-7.031(5)(B)(2)	Missouri Water Quality Standards - Toxic Substances	Water	Metal analysis methods.	Applicable to discharges to waters of the state.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(B)(3)	Missouri Water Quality Standards - Toxic Substances	Water	Standard for toxic substances for which sufficient toxicity data are not available.	Applicable to free liquids generated from contaminated media, if discharged to a surface water body.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(E) .	Missouri Water Quality Standards - pH	Water	Criteria for pH.	Applicable to free liquids generated from contaminated media, if discharged to a surface water body.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(F)	Missouri Water Quality Standards - Taste- and Odor-Producing Substances	Water	Criteria for taste- and odor-producing substances.	Applicable to discharges to waters of the state.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(H)	Missouri Water Quality Standards - Solids	Water	Criteria for solids.	Applicable if elevated TSS is present in potential discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(I)	Missouri Water Quality Standards - Radioactive Materials	Water	Criteria for radioactive materials.	Applicable.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(J)	Missouri Water Quality Standards - Dissolved Oxygen	Water	Criteria for dissolved oxygen.	Applicable if DO is not within acceptable range in potential discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(K)	Missouri Water Quality Standards - Total Dissolved Gases	Water	Criteria for total dissolved gases.	Applicable if dissolved gases are present in potential discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2

Table 5 (Continued)
Remedial Design ARARs

Chemical Specific ARARs						
Citation		**Chemical/Medium**	**Requirement**	**Determination**	**RDWP**	**DCR**
10 CSR § 20-7.031(5)(L); 10 CSR § 20-7.031 Table	Missouri Water Quality Standards - Sulfate and Chloride	Water	Criteria for sulfate and chloride for protection of aquatic life.	Applicable if elevated sulfides and chlorides are present in potential discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(M)	Missouri Water Quality Standards - Carcinogenic Substances	Water	Criteria for carcinogenic substances expressed as cancer risk rate.	Applicable if elevated carcinogenic substances are present in potential discharge.	3.1.2.6; 3.3; 3.4.4; 3.7; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(Q)	Missouri Water Quality Standards - Whole Effluent Toxicity (WET) Chronic Tests	Water	Criteria for chronic WET tests results.	Applicable if elevated WET is present in potential discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(R)	Missouri Water Quality Standards - Biocriteria	Water	Criteria comparing reference waters to receiving waters	Applicable if discharges are significant enough to reach a classified water body and biological impacts occur.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 80-3.010(11)B.4; 10 CSR § 80-3.010 Appendix 1; 10 CSR § 80-3.010 Appendix 2	Missouri Water Quality Standards - Groundwater Monitoring Requirements	Water	Criteria for defining groundwater monitoring requirements and satisfactory compliance	Relevant and appropriate	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.4; 14.4
10 CSR § 20-7.031 Table A	Missouri Water Quality Standards - Total Maximum Daily Load (TMDL)	Water	TMDLs	Relevant and appropriate	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 10-6.165	Missouri Air Quality Standards - Odors	Air	Criteria for odors.	Relevant and appropriate	3.1.2.6; 3.3.1; 3.4; 3.6	5.6

Table 5 (Continued)
Remedial Design ARARs

Chemical Specific ARARs						
Citation		**Chemical/Medium**	**Requirement**	**Determination**	**RDWP**	**DCR**
10 CSR § 10-6.170	Missouri Air Quality Standards - Particulates in Ambient Air	Air	Particulates matter (dust) in air leaving the property	Relevant and appropriate if PM/dust is generated	3.1.2.6; 3.3.1; 3.4; 3.6	3.1; 5.6; 6.1; 6.5
10 CSR § 10-6.241	Missouri Air Quality Standards - Registration, Notification, and Performance Requirements	Air	Friable asbestos encountered	Relevant and appropriate if friable asbestos encountered	4.3	5.9.6
RSMO 640.100-640.140; 10 CSR § 60-4.010	Missouri Water Quality Standards - Safe Drinking Water Law	Water	Criteria for contaminants in drinking water source	ARAR if water is discharged to surface water that may be a present or future drinking water source or in contact with aquifer that my be a present or future drinking water source.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2

Table 5 (Continued)
Remedial Design ARARs

Location-Specific ARARs						
Citation		**Location**	**Requirement**	**Determination**	**RDWP**	**DCR**
10 CSR § 20-6.200 [specifically 20-6.200(2)(B)3.B, 200(6)(A)1, and 200(6)(B)]	Missouri Storm Water Regulations	Landfills, land application sites, open dps that have received hazardous or industrial wastes.	Regulatory basis and substantive requirements for storm water discharges.	Substantive requirements applicable for control of stormwater runoff during and after remedy construction.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 4.3; 12.3
10 CSR § 20.7.015(5)(A)	Missouri Effluent Regulations - No-Discharge Streams	Fee Free Creek watershed	Prohibition of discharge to metropolitan no-discharge streams (except as permit under 10 CSR § 20-7.031(7)).	Applicable if water pollutants are present in any water discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(2)(A) - (C)	Missouri Water Quality Standards - Designated Uses	Waters of the State of Missouri	Designated uses of state waters, including specified rivers, streams, lakes, and reservoirs.	Applicable if water pollutants are present in any water discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(3)	Missouri Water Quality Standards - Anti-Degradation Standards	Waters of the State of Missouri	Standards for Tier I and II anti-degradation protection.	Applicable if water pollutants are present in any water discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(4)	Missouri Water Quality Standards - General Criteria	Waters of the State of Missouri	General water quality criteria applicable to all waters of the state at all times, including mixing zones.	Applicable if water pollutants are present in any water discharge.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2
10 CSR § 20-7.031(5)(A)	Missouri Water Quality Standards - Chronic Toxicity Criteria	Mixing zones	Criteria for chronic toxicity; where mixing zones are applicable, they will be based on 7Q10 low flow.	Applicable if water pollutants are present in any water discharge. (Mixing zone applicable only if receiving stream is not classified.)	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	3.3; 4.2; 9.2

Table 5 (Continued)
Remedial Design ARARs

Location-Specific ARARs						
Citation		**Location**	**Requirement**	**Determination**	**RDWP**	**DCR**
10 CSR § 80-3.010(8)(B)1.F and (8)(C)	Missouri Landfill Regulations - Design and Operation - Water Quality	Surface of landfills	Design and operation requirements for surface water runoff control.	Not applicable, but substantive portions are relevant and appropriate. Operational requirements in (8)(C) should be performed.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	4.1; 12.1
10 CSR § 80-3.010(15)(A)	Missouri Landfill Regulations - Design and Operation - Vectors	Landfill	Requirements for control of vectors	Relevant and appropriate to Areas 1 and 2 after removal of RIM.	3.1.2.10	5.7
10 CSR § 80-3.010(4)(B)1.A and 1.B; 10 CSR § 80-3.010(19)	Missouri Landfill Regulations - Design and Operation - Site Selection and Safety	All work areas	Requirements for protection of safety of landfill personnel and other affected parties; includes requirements related to airports and bird hazards.	Not relevant and appropriate to Areas 1 and 2 after removal of RIM, but still TBC.	3.1.2.10	5.7
10 CSR § 80-3.010(13)	Missouri Landfill Regulations - Design and Operation - Air Quality	Landfill	Requirements for minimization of air quality impacts at landfills.	Relevant and appropriate to excavation and grading activities in Areas 1 and 2.	3.1.2.6; 3.3.1; 3.3.2; 3.3.3; 3.4; 3.6	5.6

Table 5 (Continued)
Remedial Design ARARs

Location-Specific ARARs						
Citation		**Location**	**Requirement**	**Determination**	**RDWP**	**DCR**
10 CSR § 80-3.010(6)(A) - (B)	Missouri Landfill Regulations - Design and Operation - Quality Assurance / Quality Control	Side slope of landfill and disturbed areas	Requirements for QA/QC measures for landfill construction, operation, corrective action, and closure.	Not applicable, but substantive portions related to closure / final cover are relevant and appropriate; addressed under Action-Specific ARARs. QA/QC design requirements will be detailed in CERCLA documents and subject to approval under CERCLA process.	3.1.2.8; 3.3.3; 4.4	11.3.1
10 CSR § 80-3.010(17)(A) - (B)	Missouri Landfill Regulations - Design and Operation - Cover	Landfill	Requirements related to daily, intermediate, and final landfill covers, including application and design.	Substantive elements are relevant and appropriate.	3.3.1; 3.3.2; 3.3.3	5.5; 5.6
10 CSR § 80-3.010(18)(A) - (C)	Missouri Landfill Regulations - Design and Operation - Compaction	Landfill	Requirements related to solid waste and cover compaction at landfills.	Substantive elements are relevant and appropriate.	3.3.2; 3.3.3	10.2; 11.2; 11.3.1
10 CSR § 80-3.010(4)(A)	Missouri Landfill Regulations - Design and Operation - Site Selection	Landfill	Requirements related to landfill site selection, including geologic,	Substantive elements are relevant and appropriate.	3.1.2.6; 3.3.3	11.4

Table 5 (Continued)
Remedial Design ARARs

Location-Specific ARARs						
Citation		**Location**	**Requirement**	**Determination**	**RDWP**	**DCR**
54 USC 312508; PL 113-287; 128 Stat. 3256	Archaeological and Historic Preservation Act	Land	Requirements for data recovery and preservation activities if federal actions endanger prehistoric, historical, and archaeological data.	Applicable only if such data are affected (*e.g.,* a potential off-site borrow area). Site has been considerably disturbed by past human activities and is not expected to contain such data.		
16 USC 1531-15444; 50 CFR § Part 17	Endangered Species Act	Any	Requirements for federal agencies to ensure federal actions do not adversely affect endangered or threatened species or critical habitat.	Applicable only if such species were affected. No federal listed or proposed threated and endangered species or their habitats identified by assessment performed during RI.	3.1.2.10	5.7
RSMo 252.240; 3 CSR § 10-4.111	Missouri Wildlife Code - Endangered Species	Any	Prohibition against pursuing, taking, possessing or killing endangered or threatened species designated by U.S. DoE or MDoC.	Applicable only if such species were affected.	3.1.2.10	5.7
7 USC 4201 et seq; 7 CFR § 658; 40 CFR § 6.302(c)	Farmland Protection Policy Act	Farmland (prime, unique, or of state and local importance)	Requirements for federal agencies to ensure federal actions to not adversely affect farmlands.	Applicable to any potential off-site soil borrow area.		

Table 5 (Continued)
Remedial Design ARARs

Action-Specific ARARs						
Citation		**Action**	**Requirement**	**Determination**	**RDWP**	**DCR**
40 CFR § 192.02	Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites (UMTRCA)	Radioactive waste disposal	Standards for Radon-222 release rate and average concentration in air and duration of control effectiveness.	Not applicable, as site is not a designated Title I uranium mill tailings site and current and future uses of Areas 1 and 2 are restricted. However, longevity standard is relevant and appropriate.	3.3.1; 3.3.3; 4.1	11.3.2; 11.6
40 CFR § 192.32, specifically 192.32(b)(1)	Standards for Management of Uranium Byproduct materials Pursuant to Section 84 of the Atomic Energy Act of 1954, As Amended	Radioactive waste disposal	Standards for management of uranium byproduct materials; includes standards for Radon-220 and Radon-222 release rates and duration of design effectiveness.	Not applicable, as site is not a designated Title I uranium mill tailings site and current and future uses of Areas 1 and 2 are restricted. However, longevity standard is relevant and appropriate.	3.3.1; 3.3.3; 4.1	11.3.2; 11.6
40 CFR § 260 et seq	Resource Conservation and Recovery Act Subtitle C	Hazardous waste management	Standards for identification of and treatment, storage, and disposal of hazardous wastes; includes methods for determining whether a waste is hazardous and storage container markings.	May be applicable. RIM in Areas 1 and 2 do not meet criteria for classification as hazardous wastes, but other waster materials in Areas 1 or 2 may meet criteria.	3.3.1; 4.3	5.9.1; 8.1
19 CSR § 20-10.090	Missouri Radiation Regulations - Disposal of Radioactive Wastes	Radioactive waste disposal	Requirements for the disposal of radioactive materials.	Substantive portions of requirements are applicable.	4.7	8.2; 8.3

Table 5 (Continued)
Remedial Design ARARs

Action-Specific ARARs						
Citation		**Action**	**Requirement**	**Determination**	**RDWP**	**DCR**
19 CSR § 20-10.070	Missouri Radiation Regulations - Storage of Radioactive Materials	Radioactive waste storage and control of radioactive contamination	Requirements for the storage of radioactive materials.	Substantive portions of requirements are applicable to temporary on-site storage of RIM.	4.7	8.2; 8.3
10 CSR § 80-4.010(17)	Missouri Landfill Regulations - Demolition Landfill Design and Operation	Solid waste disposal	Cover placement and design requirements for demolition landfills.	Relevant and appropriate to regrading of Areas 1 and 2 after removal of RIM, and to final slopes and cover design for Areas 1 and 2.	3.3.3	11.2; 11.3
42 USC 4901 et seq	Noise Control Act	Construction activities	Requirements for protection of the public from noises that jeopardize human health or welfare.	Applicable to any remedial action.	2.4; 3.1.2.3; 3.1.2.6	
40 CFR § 61.150 and 154(j)	National Emission Standards for Hazardous Air Pollutants (NESHAP) - Asbestos	Asbestos management	Requirements for management of regulated asbestos containing materials (RACM).	Demolition and renovation standards are applicable if RACMis encountered during implementation. Notice requirements may be applicable if RACM is disturbed during excavation.	4.3	5.9.6
40 CFR 50.3-50.19	National Primary and Secondary Ambient Air Quality Standards	Radionuclides and radon particulates	Standards for ambient air quality for numerous pollutants.	Standards do not directly address radioactive materials, but may be relevant during remedy implementation.	3.1.2.6; 3.3.1; 3.4; 3.6	3.1; 3.2; 5.6; 6.1; 6.5

Table 5 (Continued)
Remedial Design ARARs

Action-Specific ARARs						
Citation		**Action**	**Requirement**	**Determination**	**RDWP**	**DCR**
40 CFR § 761 Subparts D, G, N, O, P, R, and S	PCB Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (Toxic Substances Control Act)	PCB cleanup and management	Requirements for cleanup of PCB wastes; including performance standards for disposal technologies.	Applicable if PCBs are encountered during remedy implementation.	3.3.1; 3.4	5.9
10 CSR § 20-6.200	Missouri Storm Water Regulations	Runoff-generating activities.	Requirements, terms, and conditions for stormwater discharge permits.	Substantive requirements applicable for control of stormwater runoff during and after remedy construction.	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	4.0; 12.0
10 CSR § 10-6.020(3)(A)	Missouri Air Quality Standards and Air Pollution Control Regulations	PM_{10} non-methane organic compounds (NMOC)	Specifies *de minimis* emission levels.	Applicable during remedy implementation.	3.1.2.6; 3.3.1; 3.4; 3.6	3.1; 3.2; 5.6; 6.1; 6.5
10 CSR § 10-6.130	Missouri Air Quality Standards and Air Pollution Control Regulations	Emissions-generating activities.	Requirements for controlling emissions during air pollution events.	Applicable. Could require shut-down of remedy construction activities during purple or maroon air quality event.		3.1; 3.2; 5.6; 6.1; 6.5
10 CSR § 10-6.170	Missouri Air Quality Standards and Air Pollution Control Regulations	Particulate matter	Requirements for control of particular matter emissions.	Applicable to control of fugitive dust emissions during remedy	3.1.2.6; 3.4.1; 3.5; 3.7	3.1; 3.2; 5.6; 6.1; 6.5

Table 5 (Continued)
Remedial Design ARARs

Action-Specific ARARs						
Citation		**Action**	**Requirement**	**Determination**	**RDWP**	**DCR**
40 CFR Part 122; incl. 40 CFR § 122.26(b)(14)(v)	National Pollutant Discharge Elimination System (NPDES)	Various pollutants	Requirements of the NPDES program; defines "storm water discharged associated with industrial activity" to include landfills, land application sites, and open dumps that receive or have received industrial wastes.	Applicable if stormwater draining from site impact Waters of the United States. Missouri has an approved state program under 40 CFR Part 123.	3.1.2.6; 3.3; 3.4.4; 3.7; 4.6	3.3; 4.2; 4.3
40 CFR Part 131; incl. 40 CFR § 131.36	Water Quality Standards	Development, review, revision, and approval of water quality standards by states, as authorized by Clean Water Act	Standards for water quality; including toxics criteria for states not complying with Clean Water Act Section 303(c)(2)(B).	Not applicable to Missouri, but are relevant. Missouri has adopted its own water quality standards under 10 CSR 20-7.031(5).	3.1.2.6; 3.2; 3.3.4; 3.6; 4.6	9.2
L. 1981 H.B. 1192	Missouri Cave Protection Law	Pollution and vandalism	Classifies vandalism and pollution of Missouri caves as a Class A misdemeanor.	May be applicable if site is determined to contain solution-enlarged fractures during excavation.		
RSMo 260.350-260.1039; 10 CSR § 25-1 through 19; 10 § CSR 25-19.010	Hazardous Waste Management Law; Missouri Hazardous Waste Management Regulations	Hazardous waste generation, storage, treatment, transportation, and disposal	Requirements for management of hazardous waste (including electronic scrap).	Substantive portions of 10 CSR 25 may be relevant and appropriate if hazardous waste management is required under Amended Remedy.	4.3	5.9.1; 8.1

Table 5 (Continued)
Remedial Design ARARs

Action-Specific ARARs						
Citation		**Action**	**Requirement**	**Determination**	**RDWP**	**DCR**
10 CSR § 80-2.030	Missouri Solid Waste Management Regulations - Closure and Post-Closure	Closure and post-closure	Requirements for post-closure care and O&M.	Post-closure care and corrective action requirements for landfills are relevant and appropriate.	3.1.2.12; 4.4	14.1; 14.2; 14.4
10 CSR § 80-2.030(1)	Missouri Solid Waste Management Regulations - Closure and Post-Closure	Closing side of disturbed landfill	Requirement to obtain approval of closure method from MDNR	Post-closure care and corrective action requirements for landfills are relevant and appropriate.	3.1.2.12; 3.3.3; 4.4	11.2; 11.3; 14.1; 14.2
10 CSR § 80-3.010(17)(B)3 and 7, (C)3	Missouri Landfill Regulations - Design and Operation - Cover	Slope construction	Design standards for: surface grades; side slopes; active, immediate, and final slopes.	Substantive elements are relevant and appropriate.	3.3.1; 3.3.2; 3.3.3; 3.3.4; 4.4	11.2; 11.3; 14.1; 14.2
10 CSR § 80-3.010(8)(C)2	Missouri Landfill Regulations - Design and Operation - Water Quality	Precipitation on open side slopes	Standards for management of water which comes into contact with, passes through, or emerges from solids waste.	Relevant and appropriate during construction.	3.1.2.6; 3.2; 3.3.1; 3.3.2; 3.3.3; 4.6	4.4; 5.5; 6.4; 9.1
10 CSR § 80-3.010(6)	Missouri Landfill Regulations - Design and Operation - Quality Assurance / Quality Control	QA/QC of cover	Standards for thickness and testing of each lift of soil for final cover.	Relevant and appropriate during construction.	3.1.2.8; 3.3.3	11.3
10 CSR § 80-3.010(17)(C)4	Missouri Landfill Regulations - Design and Operation - Cover	Cover requirements	Design standards for final cover.	Substantive elements are relevant and appropriate.	3.3.3; 4.2; 4.3; 4.4	11.3

Table 5 (Continued)
Remedial Design ARARs

To Be Considered						
Citation		**Chemical/Medium**	**Requirement**	**Determination**	**RDWP**	**DCR**
EPA OSWER 530-SW-89-047 (July 1989)	Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments	Hazardous wastes	Guidance on final cover systems for hazardous waste landfills and surface impoundments; includes multilayer cover design guidance.	Not applicable or relevant, but presents information that may be useful for design of final cover system.	3.3.3; 3.3.4; 4.1; 4.2; 4.3; 4.4; 4.5	11.3.1
EPA 540-R-04-007 (April 2004)	(Draft) Technical Guidance for RCRA/CERCLA Final Covers	Hazardous wastes	Guidance on final cover systems for MSW and hazardous waste landfill being remediated under CERCLA and RCRA; includes design standards, monitoring, and maintenance.	Not applicable or relevant, but presents information that may be useful for design of final cover system.	3.3.3; 3.3.4; 4.1; 4.2; 4.3; 4.4; 4.5	11.3.1
FAA Record of Decision (1988); FAA Memorandum of Understanding (2003)	-	-	ROD presents requirements relative to the proximity of the proposed Lambert Airport runway to Bridgeston Sanitary Landfill. MOU between FAA, EPA, and other agencies addresses aircraft-wildlife strikes.	Not legally binding, but TBC.	3.1.2.10	5.7

Table 5 (Continued)
Remedial Design ARARs

To Be Considered						
Citation		**Chemical/Medium**	**Requirement**	**Determination**	**RDWP**	**DCR**
FAA Advisory Circular AC 150/5200-33B (2007)	Hazardous Wildlife Attractants On or Near Airports	-	Guidance on land uses that have the potential to attract hazardous wildlife on or near public-use airports; includes separation distances.	TBC for site excavation activities.	3.1.2.10	5.7
Executive Order 11988; 40 CFR § 6.302(b) and App. A	Floodplain Management - Procedures for Implementing the National Environmental Policy Act and Assessing the Environmental Affects Abroad of EPA Actions	-	Requirements for federal agencies to avoid adverse impacts associated with development of a floodplain. 40 CFR Part 6 specifies EPA policy on implementation of Executive Order 11988.	TBC for any remedial action for the Buffer Zone / Crossroads Property. Mitigative measures would be taken to minimize any adverse impacts.	3.3.1; 3.3.2	5.2
Governor's Executive Order 82-19	-	-	Specifies that the potential effects of actions taken in a floodplain should be evaluated to avoid adverse impacts.	TBC for any remedial action for the Buffer Zone / Crossroads Property. Mitigative measures would be taken to minimize any adverse impacts.	3.3.1; 3.3.2	5.2

Table 5 (Continued)
Remedial Design ARARs

To Be Considered						
Citation		**Chemical/Medium**	**Requirement**	**Determination**	**RDWP**	**DCR**
Closure and Post-Closure Plan for Bridgeton Sanitary Landfill (Revised April 2016)		-	Closure and post-closure procedures for any portion of OU-1 remedy that impacts Bridgeton Landfill permitted area, specifically final cover, grading, and vegetation plan.	TBC in design and construction of cover system or drainage improvements for Areas 1 and 2; if additional waste materials are placed in those areas as a part of remedial action impact the Bridgeton Landfill permitted area; or if regrading and/or cover improvements are implemented for Areas 1 and 2.	3.1.2.6; 3.1.2.11; 3.1.2.12; 3.3.3; 3.3.4; 4.1; 4.2; 4.3; 4.4; 4.5	11.3; 14.1; 14.2; 14.3; 14.4

Table 6
Remedial Design Schedule

	Description of Deliverable	Deadline Condition	Date Due or Submitted
1	Draft RDWP	Within 90 days of the effective date of the ASAOC	Submitted 7/16/19 Resubmitted 10/15/19
2	Draft Design Criteria Report	Within 90 days of the effective date of the ASAOC	Submitted 7/23/19 Resubmitted 10/15/19
3	Emergency Response Plan	Within 60 days of the effective date of the ASAOC	Submitted 7/3/19 Resubmitted 9/26/19
4	Site Management Plan	Within 60 days of the effective date of the ASAOC	Submitted 7/3/19 Resubmitted 9/26/19
5	Preliminary Excavation Plan	Within 45 days of EPA approval of the Final RDWP & DCR	TBD
6	Preliminary (30%) RD	Within 60 days of EPA approval on Preliminary Excavation Plan	TBD
7	LTODP	Within 60 days of EPA approval on Preliminary Excavation Plan	TBD
8	Design Investigation Workplan	Within 45 days of EPA approval on the Preliminary Excavation Plan	TBD
9	Field Sampling Plan	Within 45 days of EPA approval on the Preliminary Excavation Plan	TBD
10	Quality Assurance Project Plan	Within 45 days of EPA approval on the Preliminary Excavation Plan	TBD
11	Health and Safety Plan	Within 45 days of EPA approval on the Preliminary Excavation Plan	TBD
12	Data Management Plan	Within 45 days of EPA approval on the Preliminary Excavation Plan	TBD
13	Wildlife Hazard Mitigation Plan	Within 90 days of EPA approval of Design Investigation Workplan	TBD
14	Site Wide Monitoring Plan	Within 90 days of EPA approval of the Design Investigation Work Plan	TBD
15	Design Investigation Evaluation Report	Within 60 days of receipt of all validated data packages for the Design Investigation or within 120 days of completion of the Design Investigation fieldwork, whichever comes first.	TBD
16	Revised Excavation Plan	Within 30 days of approval of DI Evaluation Report	TBD
17	CQAP/CQCP	Within 75days of EPA approval of Design Investigation Evaluation Report	TBD
18	O&M Plan	Within 75 days of EPA approval of Design Investigation Evaluation Report	TBD
19	O&M Manual	Within 75 days of EPA approval of Design Investigation Evaluation Report	TBD

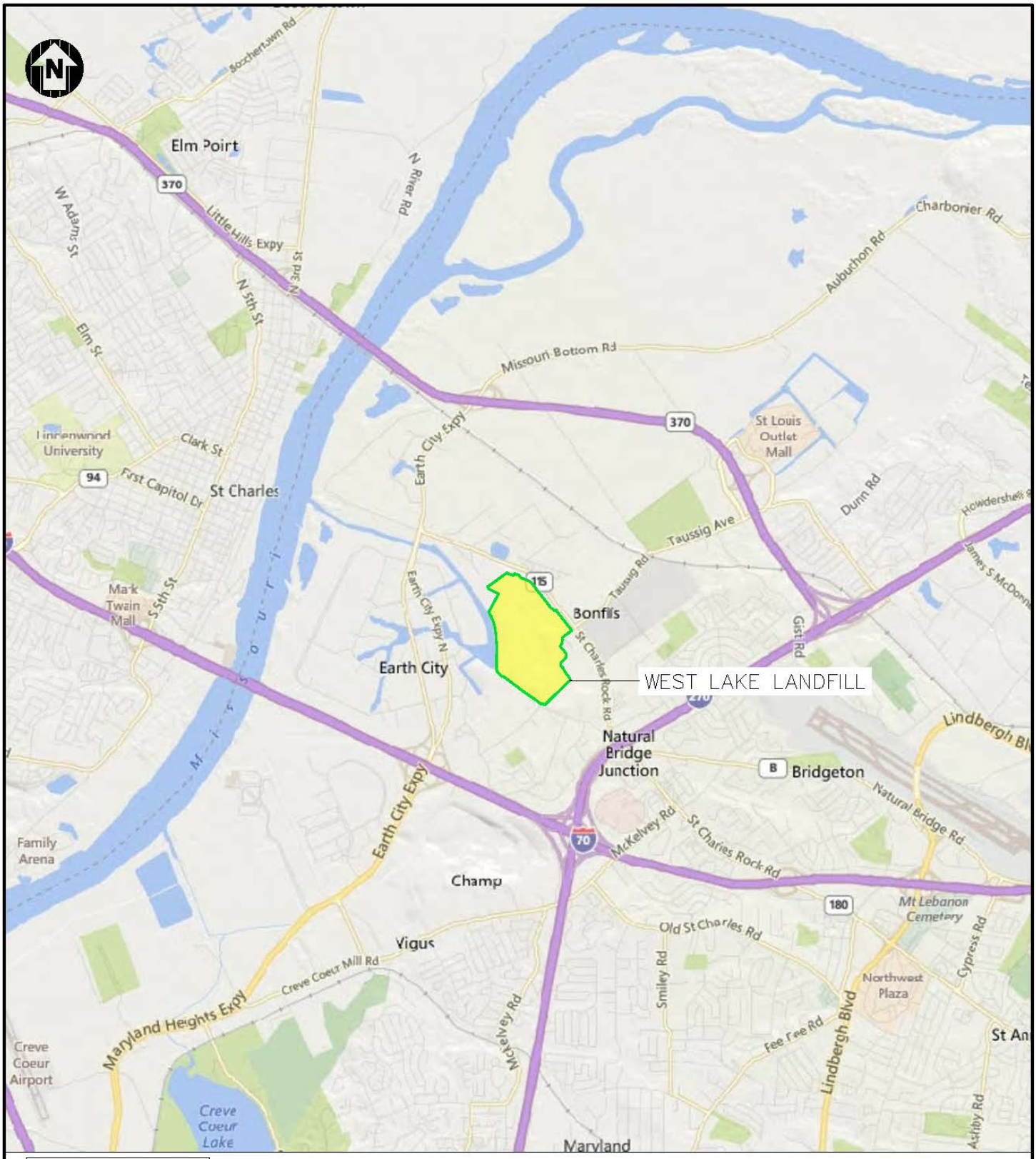
Table 6 (Continued)
Remedial Design Schedule

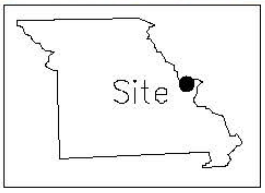
	Description of Deliverable	Deadline Condition	Date Due or Submitted
20	ICIAP	Within 75 days of EPA approval of Design Investigation Evaluation Report	TBD
21	Pre-final (90%) RD	Within 75 days of EPA approval of the revised excavation plan	TBD
22	Final (100%) RD	Within 75 days of EPA comments on the Pre-Final (90%) plan	TBD
23	PE Sealed Final (100%) RD	Within 30 days of EPA acceptance of Final (100%) RD	TBD

Notes:

1. The Respondent entered into a Third Amendment to the Administrative Settlement Agreement and Order of Consent (ASAOC) with USEPA on 6 May 2019.
2. TBD = To be determined based on the noted deadline condition.

FIGURES





Missouri Quadrangle

5000 2500 0

SCALE: 1"=5000'

SITE LOCATION MAP

West Lake Landfill OU-1 Respondents
RDWP
WEST LAKE LANDFILL OU-1

PARSONS
301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315-451-9560

PROJECT #	DATE:	DRWN:	CHKD:	FIGURE #
451662.02300	7/19/19	JR	AG	1

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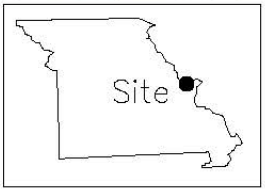


Missouri Quadrangle

5000 2500 0

SCALE: 1"=5000'

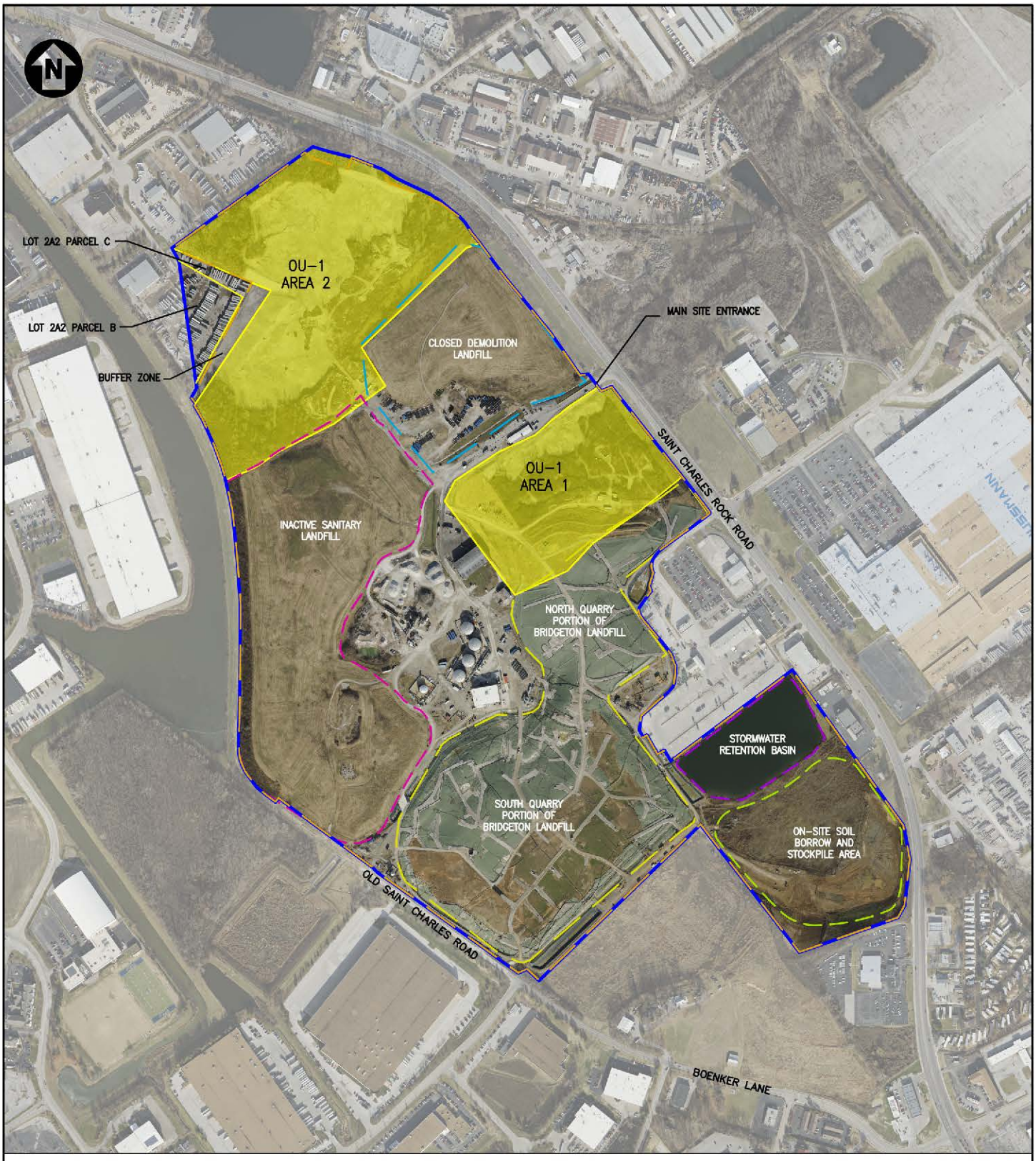
SITE LOCATION MAP ON AERIAL PHOTO

West Lake Landfill OU-1 Respondents
RDWP
WEST LAKE LANDFILL OU-1

PARSONS
301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315-451-9560

PROJECT #	DATE:	DRWN:	CHKD:	FIGURE #
451662.02300	7/19/19	JR	AG	2

FILE NAME: P:\WEST LAKE\10.0 TECHNICAL CATEGORIES\10.1 CAD\FIGURES\RDWP\RDWP-FIG-1-2.DWG
PLOT DATE: 7/29/2019 9:09 AM PLOTTED BY: RUSSO, JILL



LEGEND:

- SUPERFUND SITE
- LANDFILL BOUNDARY
- BRIDGETON LANDFILL
- INACTIVE SANITARY LANDFILL
- CLOSED DEMOLITION LANDFILL
- STORMWATER RETENTION POND
- SOIL BORROW/STOCKPILE AREA

800 400 0

SCALE: 1"=800'

SITE AREAS

West Lake Landfill OU-1 Respondents
RDWP
WEST LAKE LANDFILL OU-1

PARSONS
301 PLAINFIELD ROAD * SUITE 350 * SYRACUSE, NY 13212 * 315-451-9560

PROJECT #	DATE:	DRWN:	CHKD:	FIGURE #
451662.02300	7/19/19	JR	AG	3

FILE NAME: P:\WEST LAKE\10.0 TECHNICAL CATEGORIES\10.1 CAD\FIGURES\RDWP\RDWP-FIG-3.DWG

Figure 4 - Organization Chart