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# DESIGN CRITERIA REPORT

## WEST LAKE LANDFILL SUPERFUND SITE OPERABLE UNIT-1

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The United States Environmental Protection Agency Region VII



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Table 1 – Remedial Design ARARs

## LIST OF ACRONYMS

ACRONYM	Definition	ACRONYM	Definition
ARAR	Applicable or Relevant and Appropriate Requirements	NRC	Nuclear Regulatory Agency
ASAOC	Administrative Settlement Agreement and Order of Consent	OSHA	Occupational Safety and Health Administration
BMP	Best Management Practices	OU	Operable Unit
C&D	Construction and Demolition	pCi/g	picoCurie/gram
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limits
CFR	Code of Federal Regulations	PGA	Peak Ground Acceleration
DIWP	Design Investigation Work Plan	POTW	Publicly Owned Treatment Work
DOT	U.S. Department of Transportation	QAPP	Quality Assurance Project Plan
DQO	Data Quality Objective	RA	Remedial Action
FAA	Federal Aviation Administration	RAO	Remedial Action Objective
FFS	Final Feasibility Study	RCRA	Resource Conservation and Recovery Act
FSP	Field Sampling Plan	REL	Recommended Exposure Limits
HASP	Health and Safety Plan	RD	Remedial Design
IBC	International Building Code	RDWP	Remedial Design Work Plan
IC	International Control	RIM	Radiologically Impacted Material
LTODP	Loading, Transportation and Disposal Plan	RODA	Record of Decision Amendment
MDNR	Missouri Department of Natural Resources	RSMo	Revised Statutes of Missouri
MQO	Measurement Quality Objective	SMP	Site Management Plan
MSW	Municipal Solid Waste	SOW	Statement of Work
NCC	Non-Combustible Cover	SWMP	Site Wide Monitoring Plan
NCP	National Oil and Hazardous Substance Pollution Contingency Plan	SWPPP	Stormwater Pollution Prevention Plan
NOAA	National Oceanic and Atmospheric Administration	TBC	To Be Considered
NPDES	National Pollutant Discharge Elimination System	UMTRCA	Uranium Mill Tailings Radiation Act
		USDA	U.S. Department of Agriculture
		USEPA	U.S. Environmental Protection Agency
		UU/UE	Unlimited Use/Unrestricted Exposure
		VOC	volatile organic compound
		WAC	Waste Acceptance Criteria
		WHMP	Wildlife Hazard Mitigation Plan

## 1.0 INTRODUCTION

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### 1.1 PROJECT DESCRIPTION

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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 off-site 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 the Site including protection of groundwater by limiting infiltration and thus leaching of contaminants.

USEPA and the Respondents have entered into the Third Amendment to the Administrative Settlement Agreement and Order on Consent (ASAOC) (USEPA Docket No. VII-93-F-0005) dated May 6, 2018. The attached Remedial Design Statement of Work, or Remedial Design (RD) Statement of Work (SOW), contains the requirements for developing the Remedial Design to implement the selected Remedy presented in the September 27, 2018 RODA. The scope of the remedy selected in the RODA 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 picoCurie/gram (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 ROD and summarized below:
  - If RIM greater than 52.9 pCi/g occurs between 12 and 20 feet below the surface, then evaluate and excavate where necessary to achieve long-term effectiveness and permanence objective;
  - The USEPA places a priority on focusing the excavation on the higher activity occurrences of RIM. Therefore, the USEPA expects the areas between 12 and 16 feet will be excavated if they are greater than 1,000 pCi/g;
  - The USEPA also expects to focus the excavation in the areas between 16 to 20 feet on the higher activity occurrences of RIM (greater than 1,000 pCi/g) if it doesn't add significant excavation of non-RIM waste;
  - Data show that isolated pockets of RIM between 8 and 12 feet only occur in a limited number of areas; and
  - Not excavating isolated pockets of RIM between 8 and 12 feet will minimize the short-term impacts by reducing the volume of overburden and setback.
- 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 applicable or relevant and appropriate requirements (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.

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.

The RD and the submittals will be completed in accordance with the ARARs and To Be Considered (TBC) requirements included in the RODA.

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 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:

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

## 1.2 ARARS

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The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 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 1**. The ARARs will be integrated into the remedial design in the 30%, 90%, and Final RD reports. ARARs related to monitoring during and after remedial action will be integrated into the Site Management Plan (SMP) and Site Wide Monitoring Plan (SWMP). ARARs related to post-closure care will also be incorporated into the Operations and Maintenance Plan and Manual as well as being considered in the remedial design reports.

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 the 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 Remedial Action (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. 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. The facilities and operating systems are required to meet the Occupational Safety and Health Administration (OSHA) regulations for industrial and construction worker protection, including protecting against physical, atmospheric, chemical, radiologic, and electrical hazards. 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.

### **1.3 ENGINEERING CODES AND STANDARDS**

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Various engineering and testing societies and organizations have published codes, standards, and guidelines over the years. American Society of Civil Engineers, Institute of Electrical and Electronics Engineers, American Society of Testing and Materials, and the Geosynthetic Institute are examples of organizations that maintain codes, standards, and guidelines that may be relevant to the RD and RA for this project. They will be considered on a case-by-case basis during the RD and used as a reference where appropriate and relevant.

### **1.4 REPORT ORGANIZATION**

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This Design Criteria Report is being prepared concurrently with the Remedial Design Work Plan (RDWP).

This report lists specific project elements that are required to be addressed in the RD and provides basic requirements or concepts that are expected to govern the design of that element. The technical evaluations and decisions regarding these requirements will be supplemented in future RD deliverables.

## 2.0 SITE PREPARATION

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### 2.1 SITE SECURITY

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The larger West Lake site – except for the borrow area – is enclosed by fencing, and access to the site is controlled by Bridgeton Landfill. Within the landfill, access to OU-1 Area 1, Area 2, and the Buffer Zone is also further controlled. OU-1 areas with shallow RIM are enclosed by chain-link fences that are approximately six feet in height and topped with three strands of barbed wire. Aluminum placards are posted on the fence approximately every 40 feet. These placards depict the standard radiation warning trefoil in magenta on a yellow background, with magenta lettering stating: “CAUTION. CONTROLLED AREA. AUTHORIZED ENTRY ONLY.” Areas outside the OU-1 fence line with deeper RIM (such as the North Quarry Overlay) are inaccessible due to the presence of a thick overburden layer and site facilities.

The RA may require fencing and gates in different locations due to the physical activities that will be required, but it is anticipated that similar levels of security will be provided so that the OU-1 areas are secured. Site security during the RA will be addressed in an update/addendum to the Site Management Plan (SMP) that will be prepared in conjunction with the various RA submittals prior to construction.

### 2.2 SITE ACCESS AND INTERNAL ROADS

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The primary foot and vehicle entrance to Area 1 is a 20-foot gate on the southern side of the area’s fence line. Signage on the primary entrance gate indicates that there is no entry without proper authorization. There are also three secondary entrances at various locations: a 6-foot gate at the northwest corner; and two 20-foot gates on the north side, accessible from the larger West Lake site’s main entrance and parking area. The primary and secondary gates are kept closed and padlocked when not in use.

The primary foot and vehicle entrance to Area 2 is a 20-foot gate on the southwestern side of the area’s fence line. Signage on the primary entrance gate indicates that there is no entry without proper authorization. There are also five secondary entrances at various locations: a 12.5-foot gate near the southwestern corner, accessible from Boenker Lane / Old St. Charles Rock Road; a 20-foot gate at the southwest end of the Buffer Zone, accessible from Boenker Lane / Old St. Charles Rock Road; a 3-foot gate near the northern corner; a 3-foot gate on the northern side, accessible from St. Charles Rock Road; and a 6-foot gate near the northeastern corner. The primary and secondary gates are kept closed and padlocked when not in use.

The entrances may be modified to permit larger and more frequent heavy equipment and truck access during the RA. Additional potential entrance or exit locations to the site will be evaluated if they would enhance the ability to execute the RA, particularly if it would reduce traffic or left turns on major public roads. Additional access points could be temporary or permanent.

Internal construction roads will be required to execute the RA. One-way vehicle traffic without requiring backing up to turn around is the preferred construction road configuration where practicable. Separation of heavy equipment and material hauling truck routes from other on-site traffic is also preferred. Internal roadways for hauling RIM-containing waste prior to final loading into on-road transportation trucks will be maintained separately from other roadways in the Bridgeton Landfill site to reduce the potential for tracking RIM off-site and to assist in managing on-site traffic flow.

Internal roads are anticipated to change during different phases of RA. The 90% and Final RD reports are anticipated to provide phasing of the proposed excavation, backfilling, and capping sequencing but modifications may occur during RA and road layouts may shift. In general, internal access roads developed for extended use are anticipated to be constructed with geotextile and aggregate sub-base to reduce dust and mud generation as well as to control rutting. The 90% and Final RD will provide typical details of the proposed access road construction.

### 2.3 SITE CLEARING

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Most areas in OU-1 will require clearing of vegetation and surficial debris. The timing of vegetation clearing will be shown on phasing drawings in the 90% and Final RD reports.

### 2.4 LAYDOWN AND SUPPORT AREAS

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The proposed remediation is complex and will require laydown and support areas during the RA. Where practicable, these areas will be located within the limits of the OU-1 areas. However, it is likely that office trailer, other similar facilities, and clean material stockpiles will be located elsewhere on the Bridgeton Landfill portions of the Site. The identification of potential laydown and support areas will be identified during the RD and negotiated with Bridgeton Landfill, LLC after considering the various usage requirements in addition to the OU-1 requirements.

Laydown areas will be required for staging equipment, storing imported materials and managing excavated materials. Support areas will be required for office trailers, worker parking, RIM handling building (if necessary), and a temporary water treatment plant. The general laydown and support area is expected to be identified during the 30% RD. A proposed laydown and support area plan will be shown in the 90% and Final RD. We note that these areas are subject to change during the RA based on contractor preferences and proposed means and methods.

### 2.5 UTILITY PROTECTION AND RELOCATION

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Buried and overhead utilities will be identified and protected or relocated as necessary to execute the RA. Utility research and identification will be ongoing through RD and identified utilities will be shown on drawings in the 30%, 90%, and Final RD reports. Proposed utility relocations (if any) will be shown in the 90% and Final RD reports.

Specific known utilities that will likely require protection or relocation include:

- Septic system in Area 1;
- Electric service along the perimeter of Area 1 and Area 2;
- Overhead Ameren power lines along St. Charles Rock Road; and
- Landfill gas piping, leachate conveyance piping, and electric service over the North Quarry Overlay.

## **3.0 ENVIRONMENTAL AND COMMUNITY PROTECTION AND MONITORING DURING REMEDIAL ACTION**

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### **3.1 DUST CONTROL**

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Currently, the only significant potential source of air impacts from routine OU-1 inspection and maintenance activities is vegetation removal performed in those areas with Non-Combustible Cover (NCC). As described in the NCC Inspection and Maintenance Plan originally presented in the NCC Installation Work Plan (EMSI et al. 2016), removal of vegetation from the NCC area is performed semi-annually, if deemed necessary during quarterly NCC inspections. Per the NCC Inspection and Maintenance Plan, dust generation is to be minimized during vegetation removal. Dust control methods described in the plan include wetting of vegetation prior to mower advancement and wetting of removed woody vegetation prior to grinding and chipping.

It is anticipated that RD activities may potentially include vegetation clearing within the boundaries OU-1. In such an event, dust generation from clearing will be minimized using methods that will be presented in the DIWP (Deliverable 8 on the RD Schedule presented in SOW Paragraph 6.2). It is anticipated that these dust control methods will be similar to those described in the NCC Installation Work Plan (EMSI, et al. 2016).

The air monitoring program for OU-1 provides continual monitoring of potential radionuclides associated with OU-1. The program will continue during the performance of RD activities in part to demonstrate the effectiveness of air impact control and mitigation procedures. The approved air monitoring program will be incorporated as an appendix to the SMP and the SWMP and conducted under the May 6, 2019 amendment to the ASAOC.

Depending on the nature and scope of the OU-1 Design Investigation, additional air impact control and mitigation procedures may be necessary during the investigation field activities. It is anticipated that any such procedures, if needed, will be further defined in the DIWP and executed and reported in the subsequent RD deliverables.

The potential for dust generation during the RA will be evaluated for the RA activities. Specific activities with the potential for dust generation include: clearing of vegetation; initial site grading; construction of access roads; operation of vehicles on access roads; delivery and placement of backfill and capping materials; use of construction additives (e.g., lime, cement, if used); and stockpiles of dried materials. The 90% and Final RD reports will provide specifications for dust control. Particulates in Ambient Air (MO 10 CSR § 10-6.170) and NESHAP 40 CFR § 61.90 to 61.97 are the ARARs applicable to setting standards for managing and monitoring particulates in air generated in dust. The primary standard for particulates in ambient air leaving the site will be preventing visible dust crossing the site boundary. OSHA Permissible Exposure Limits (PELs) and National Institute for Occupational Safety and Health Recommended Exposure Limits (RELs) for particulate in ambient air will also be considered for on-site worker protection.

### **3.2 AIR MONITORING**

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Perimeter air monitoring during the RD is being conducted in accordance with the SMP for community protection. Perimeter air monitoring stations are monitoring for total alpha and beta activity, isotopic uranium, thorium, and radium, radon-222 and daughter products, and gamma radiation. The results are compared against limits based on 10 CFR § 20, Appendix B, Tables 1 and 2 and 40 CFR § 61.92, 61.97, and 61.222(a).

It is expected that the perimeter air monitoring program will be adjusted during RA to include active particulate and volatile organic compound (VOC) monitoring that provides alarms if criteria are exceeded and provides daily downloads of data for more detailed evaluation. The National Primary and Secondary Ambient Air Quality Standards (40CFR § 50.3-50.19) and the Missouri Air Quality Standards and Air Pollution Control Regulations (10 CSR §10-6.165, 6.170, and 6.241) are additional ARAR criteria for this monitoring. The RA air monitoring program will be specified in the SWMP.

The fundamental air monitoring program is simple observation of visible dust generation with counter-measures available for immediate deployment if visible dust is observed. Personal worker monitoring or atmospheric monitoring of confined spaces will be conducted on an as-needed basis determined by the Health and Safety Plan (HASP) requirements. OSHA PELs and National Institute for Occupational Safety and Health RELs will be considered for on-site worker protection. Worker protection criteria and monitoring will be specified in the RA HASP.

### 3.3 STORMWATER MONITORING

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Stormwater monitoring during the RD and RA will be conducted in accordance with the SMP. Where quantitative data is available, 40CFR § 122 (National Pollutant Discharge Elimination System (NPDES) and Missouri Water Quality Standards 10 CSR §20-7.031 (5)) will be applicable to off-site discharge of stormwater. The RA stormwater monitoring will be developed and specified in the SWMP.

During the RA, daily inspections (on days with active site activities) will be conducted on Best Management Practices (BMPs) installed in active work areas. Weekly inspections will be conducted on BMPs installed in inactive areas and perimeter locations. Inspections of BMPs will occur within 24 hours of rainfall or snow melt events of 0.25 inches or more of precipitation. The inspections will review the integrity of the BMPs as well as look for erosion and/or sedimentation downgradient of the BMPs. The Missouri stormwater regulations 10 CSR § 20-6.200 (2)(B)3.B, (6)(A)1 and (6)(B) are applicable to these monitoring activities. The required monitoring of BMPs will be specified in the Stormwater Pollution Prevention Plan (SWPPP).

### 3.4 GROUNDWATER MONITORING

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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 in the DIWP with baseline monitoring occurring during RD for monitoring during the RA and continuing post-RA. Sampling, analysis, and data management requirements will be identified and included in the associated Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Data Management Plan. 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. The groundwater monitoring requirements will be provided in the SWMP and included in the SMP.

## 4.0 TEMPORARY STORMWATER AND EROSION CONTROL

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### 4.1 DESIGN STORM EVENT

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Temporary stormwater conveyance features on the portions of the OU-1 Site that contain waste and will be disturbed or on areas that will be used to manage waste materials, including RIM, will be designed for a 25-year, 24-hour storm per Missouri solid waste regulations 10 CSR § 80-3.010(8)(B)1.F. St. Louis-Lambert International Airport is assumed to be the relevant weather reporting station for assessing the magnitude of these weather events. Per National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 8, Version 2, the estimated precipitation with a 90% confidence interval for the 25-year, 24-hours storm is 5.62 inches.

### 4.2 DISCHARGE AND DETENTION REQUIREMENTS

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The Bridgeton Landfill site has multiple existing stormwater discharge locations regulated under a NPDES permit. OU-1 also has several existing stormwater discharge locations monitored under the authority of USEPA. Where practicable, stormwater during the OU-1 RA will be directed to the existing stormwater locations. These discharge locations will be upgraded to manage increased flows if necessary. If temporary sediment basins or similar features are required prior to discharge during periods of active ground disturbance, they will be designed for a 2-year, 24-hour storm per the Missouri General Permit for Construction or Land Disturbance substantive requirements. The primary purpose of a sedimentation basin is to reduce particulate solids leaving the Site. Per NOAA Atlas 14, Volume 8, Version 2, the estimated precipitation with a 90% confidence interval for the 2-year, 24-hours storm is 3.16 inches.

The utility of general construction requirements for temporary basins or features along with the need for any other BMPs will be further evaluated to ensure they can attain ARARs and meet the required stormwater quality criteria requirements of the RODA. If additional temporary stormwater discharge points are required, they will be designed, installed, and monitored similarly to the existing stormwater discharge points at the Site. Preliminary assessments of temporary and permanent stormwater conveyance and discharge requirements will be developed during the 30% RD and completed in the 90% and Final design once the construction phasing and final grading plan have been established.

If stormwater calculations indicate that temporary construction conditions will increase peak stormwater flow discharges from the Site, then the need for providing detention basin(s) in addition to sedimentation basin(s) will be evaluated and designed. Since there is little existing impermeable surface and only short periods where there would be significant impermeable surface during construction (e.g., placing geomembranes on the final cover before covering with soils), the need for additional detention time or capacity is not expected.

### 4.3 EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES

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Missouri Department of Natural Resources (MDNR) provides detailed information and requirements for selecting and using appropriate erosion and sediment control BMPs in the guidelines for preparing SWPPPs under 10 CSR § 20-6.200, as does USEPA for the Construction General Permit under 40 CFR § 122.26(b). The substantive requirements of these BMPs will be used during RD and RA.

#### **4.4 EXCAVATION AND MATERIAL HANDLING STORMWATER MANAGEMENT**

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A design goal will be to reduce potential stormwater contact with waste per 10 CSR § 80-3.010(8)(C) which will likely require controlling the number and size of open areas of excavation as well as diversion of to direct stormwater to unimpacted locations where it can be conveyed and discharged as stormwater under Sections 4.2 and 4.3 above.

Stormwater that contacts waste materials, excavated materials containing wastes, and materials containing waste will be managed as described in Sections 5 and 6.

## 5.0 EXCAVATION

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### 5.1 DEFINITION OF AREA 1 AND AREA 2 EXCAVATION BOUNDARIES

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The RODA requires removal of RIM with radioactivity greater than 52.9 pCi/g from the upper 12 feet of the landfill below the 2005 topographic surface. USEPA has defined RIM at the Site as any material containing combined Ra-226 plus Ra-228 or combined Th-230 plus Th-232 at levels greater than 7.9 pCi/g, or U-238 plus U-235 plus uranium-234 (U-234) at levels greater than 54.5 pCi/g except as stated in the RODA and approved by USEPA.

The RODA defines a requirement for total radioactivity to be removed to be equivalent to the total radioactivity defined in the geostatistical model provided in the Final Feasibility Study (FFS) (EMSI 2018) for Alternative 4 (Proposed Plan version). This definition described excavation of RIM equivalent to the total radioactivity represented by the combined radium and thorium for RIM greater than 52.9 pCi/g down to 16 feet below the 2005 topographic surface. In order to identify the total radioactivity for removal, the total radioactivity will be computed for the Alternative 4 (Proposed Plan version) excavation description (down to 16 feet below the 2005 topographic surface) by multiplying the average radioactivity of each survey unit within the removal zone by the volume and estimated mass density of the survey unit and then summing the total radioactivity calculated by each survey unit for the survey units within the removal volume defined in the RD geostatistical model. The RODA selected remedy generally requires removal of RIM greater than 52.9 pCi/g to a depth of 12 feet below the 2005 surface but will include removal of some RIM between 12 and 20 feet below the 2005 surface and allow for isolated pockets of RIM greater 52.9 pCi/g between 8 feet and 12 feet below the 2005 surface to remain in place. The approach to selecting the locations that will deviate from the general depth of 12 feet below the 2005 surface are discussed in the next paragraph.

Removal of RIM greater than 52.9 pCi/g to 12-feet below the 2005 topographic surface which is generally required for the RODA selected remedy would result in the removal of less radioactivity than a similar excavation to 16-foot below the 2005 topographic surface described in Alternative 4 of the Proposed Plan. Therefore, the RD excavation design must include additional removal below the 12-foot depth in order to achieve a total radioactivity removal equivalent to Alternative 4 in the Proposed Plan. The RODA proposes that this additional radioactivity will be removed by targeting localized deposits of higher radioactivity materials in the 12- to 20-foot deep zone, particularly materials with radioactivity greater than 1,000 pCi/g. The RD will consider practical aspects to define the excavation boundaries, including performing deeper excavation in areas where overlying materials are already planned for removal and leaving local isolated RIM in place where extensive overburden excavation would be required.

The RODA requires that each total radioactivity calculation be computed using the same RD geostatistical model. This will require developing a common RD geostatistical model with common survey unit geometries for each of these two excavation descriptions using the same data set. This model will be presented in a technical memo supporting the Preliminary Excavation Plan. The Preliminary Excavation Plan will be developed prior to preparation of the DIWP which will include identification of data gaps related to the extent of RIM to be excavated as well as the extent of the RIM to be included under the final cover. Therefore, inclusion of the geostatistics technical memorandum as part of the Preliminary Excavation plan will allow for preparation of the DIWP. The geostatistical model will be updated based on the results of the DI and the updated model will be used to develop the Final Excavation Plan.

Additional radioactivity data will be collected in a design investigation to fill in data gaps identified in an analysis of the geostatistical model. This data will include both field screening (e.g., downhole gamma logging, core scans) and laboratory analysis of core samples. In order to use both types of data (e.g., “soft” downhole



gamma logs and “hard” analytical laboratory results), it is expected that indicator kriging will be used for the RD geostatistical model. The data gaps will be identified in the geostatistical technical memorandum accompanying the Preliminary Excavation Plan. The investigation to fill these data gaps will be proposed in the DIWP. Field screening procedures and the development of the resulting “soft” data during the design investigation will be based on Data Quality Objectives and Measurement Quality Objectives defined in the DIWP, QAPP, and/or FSP.

## 5.2 DEFINITION OF BUFFER ZONE/LOT 2A2 EXCAVATION BOUNDARIES

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Per the RODA, the impacted soils on Lot 2A2 and portions of the Buffer Zone will be remediated to levels that allow for unlimited exposure and unrestricted use. Since the radiological contaminants of concern are naturally occurring elements that are ubiquitous in soils and rock (both undisturbed and fills), the RODA requires evaluating background levels to define the vertical and horizontal remediation boundaries in these areas. Background sampling will be conducted in areas that appear to have the same general characteristics of the Buffer Zone and Lot 2A2. The background samples will provide a range of results that will be assumed to represent naturally occurring activities. The averages of the results of various samples obtained from individual survey units of 2,000 square meters or less will be compared to the range of background values to define materials that are distinctly elevated above the background range that will require removal. The 99% upper confidence limit is proposed to define the upper limit of the background range as it would be expected that contamination from the site should have a distinctly different signature and magnitude than the naturally occurring conditions in the area. The specific methodology and proposed background sample locations will be provided in the DIWP and associated plans. The proposed methodology for sampling the Buffer Zone and Lot 2A2 and the specific statistical test(s) that will be used to compare the data sets from samples collected within the survey units to the background data set will be presented in the DIWP. Due to the difficulties of accessing many of the likely removal locations because of the numerous trailers parked on the site, it is anticipated that the excavation delineation will occur during the excavation process.

## 5.3 CONFIRMATION SAMPLING

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The final boundaries of excavation will be confirmed through a combination of field screening and soil sample collection within survey units no larger than 2,000 square meters. Soil samples will be collected and shipped to the analytical laboratory as described in the RDWP. Confirmation sampling will be performed to:

- Confirm that material above 52.9 pCi/g within 12 feet of the 2005 topographic surface that is required to be excavated has been identified; and
- Confirm the proposed additional excavation will contain sufficient total radioactivity (as defined above) to meet the total radioactivity equivalence requirements of the RODA.

The confirmation sampling will be input into the RD geostatistical model to confirm the model accuracy of the excavation boundary depiction and estimation of the total radioactivity and RIM volumes to be removed from the site by observing if the new data cause significant modifications in the geostatistics-derived geometry of the proposed excavation.

Sampling methodologies and strategies will be evaluated to identify techniques and locations most likely to prevent false positives and false negatives that could lead to inaccurate results during confirmation sampling. The confirmation sampling strategy will also be evaluated to identify an approach that is most likely to minimize open excavations and delays. We anticipate that the confirmation sampling will be best executed during the RD and additional confirmation sampling would not be required in the RA. This will be further addressed in the 30% RD report with follow up in the Final Excavation Plan, 90% and Final RD reports for discussion with USEPA.

## 5.4 EXCAVATION SAFETY

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OSHA defines an excavation as any man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal. The RODA requires excavations for RIM removal generally to be 12 feet below the 2005 topographic surface. In some locations the RIM excavations may extend down to 20 feet below the 2005 topographic surface. Typically, additional overburden removal will be required as other materials have been placed over the RIM during construction of the NCC and other Site activities.

OSHA 1926.651(g) requires atmospheric testing in excavations where oxygen deficiency or hazardous atmosphere can be reasonably expected. Precautions to prevent worker exposure to oxygen deficient or hazardous atmospheres is required as well as providing attended emergency rescue equipment. This will be addressed in the specifications provided in the 30%, 90%, and Final RD reports.

OSHA 1926.651(h) requires precautions to protect workers from accumulated water or accumulating water. At the OU-1 excavations, this could include both precipitation and leachate. This will be addressed in the specifications provided in the 30%, 90%, and Final RD reports.

OSHA 1926.652(b) requires that excavations in fill materials be sloped at 1.5H:1V or flatter unless structural shoring is provided or alternative configurations of sloping and benching are approved by a registered professional engineer. This will be considered in the preparation of the Preliminary and Final Excavation Plans and carried through the design drawings developed in the 30% and 90% Final RD reports.

For this project, excavation safety will be a continuous process until the completion of the RA and will be considered during RD. The final responsibility for excavation safety will be that of the RA contractor. An RD goal is to design the excavation boundaries to be efficient for the RA contractor to execute the excavation without substantive changes for excavation safety.

A general project goal will be to minimize or eliminate the need for people to enter the excavation areas. This would include surveying, water management, drilling, and sampling/testing activities.

## 5.5 CONTACT WATER AND LEACHATE MANAGEMENT

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Contact water and leachate will be removed from the excavation as needed per 10 CSR § 80-3.010(8)(C) to provide a safe working environment and reduce dewatering of excavated materials outside the excavation areas. It is expected that pumping equipment would be lowered into the excavation area using equipment rather than having people enter the excavation. Excavation dewatering requirements will be considered during development of excavation phasing in the 90% and Final RD drawings, potentially incorporating low points in excavation phases where leachate and contact water can be efficiently removed.

Contact water and leachate removed from the excavation will be conveyed to the on-site temporary water treatment plant for treatment prior to approved discharge.

The RD will seek to reduce contact water and leachate quantities by limiting the open excavation area during each excavation phase and reducing the number of multiple excavation phases open simultaneously.

Preventing run-on into an excavation from surrounding terrain will be a design objective during phasing development. Similarly, preventing run-off from exposed waste in an excavation area onto surrounding clean ground or into unimpacted stormwater will be a design objective while developing phasing per 10 CSR § 80-3.010(8)(C).

## 5.6 AIR QUALITY AND ODOR

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A significant portion of the excavations will be conducted in aged municipal solid waste. These materials have the potential to generate odors. A putrescible waste investigation will be included in the DIWP. It is anticipated that this investigation will provide additional information on the odor potential from the excavated waste.

RD will include development of tiered response actions to address management of odors and other air quality issues in accordance with 10 CSR § 10-6.165 and 10 CSR § 10-6.170 if they arise. These measures are anticipated to be quickly implemented as flexible responses and may include a variety of techniques including misting, odor suppressant foams, masking agents, and temporary covers as discussed in Section 5.8. The 30% RD report will discuss the general approach to odor control. More precise specifications will be developed in the 90% and Final RD reports.

## 5.7 WILDLIFE MANAGEMENT

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A portion of OU-1 fall within 10,000 feet of a runway for turbojet aircraft which triggers a requirement for sanitary landfills to demonstrate that they are designed and operated so that the landfill does not pose a bird hazard to aircraft per 10 CSR § 80-3.010 (4)(B)(1). This runway opened in 2006 long after OU-1 had ceased accepting waste. The RODA requires re-opening the landfill surface and exposing aged municipal solid waste (MSW). The proposed remediation will not bring new putrescible waste on site but will require exposing the aged MSW which creates a potential for birds and other vectors to visit the Site. Past activities at the North and South Quarry areas of the Bridgeton Landfill (such as drilling and smaller scope disturbances) have not been observed to present a significant attraction to birds, notwithstanding the associated exhumation of aged MSW.

The Bridgeton Landfill has an active Bird Hazard Monitoring and Mitigation Plan (CEC 2016) for its current site maintenance operations. Bridgeton Landfill performs bird monitoring and deterrence on a regular basis under this plan. U.S. Department of Agriculture (USDA) has performed independent wildlife monitoring from 2015 through the present for the Bridgeton Landfill Site. The Respondents are in active discussions with the City of St. Louis/St. Louis-Lambert International Airport regarding how the current Bird Hazard Monitoring and Mitigation Plan can be used during RD investigations.

The OU-1 design team will also work closely with USDA, the City of St. Louis/St. Louis Lambert International Airport and the Federal Aviation Administration (FAA) to research and develop a wildlife hazard monitoring and mitigation plan for RA. It is anticipated that a one-year wildlife hazard survey will be conducted to assist in developing the WHMP for RA.

Active excavation areas during RA will be phased to reduce the areas of MSW exposed at any time. Specifications for using temporary (daily or intermediate) covers of the (e.g., soil, foam, or geosynthetics) will be developed in the event that exposed waste demonstrates attraction to birds or other vectors. Temporary and permanent stormwater retention basins will be designed to hold water for less than 48 hours for typical storms per the recommendations in FAA Circular 150/5200-33B "Hazardous Wildlife Attractants On or Near Airports). Detention basins that hold water for long periods will be avoided due to the potential for increased attraction for birds and other wildlife.

Provisions to deter or cull persistent birds will be developed in conjunction with the USDA, Lambert-St. Louis International Airport, and FAA.

Vectors other than birds will be managed per Missouri Solid Waste Regulation 10 CSR § 80-3.010(15).

## 5.8 DAILY AND INTERMEDIATE COVERS

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Daily and intermediate covers may be required during the RA to minimize fire hazards (oxygen infiltration), infiltration of precipitation, odors and blowing litter, control gas venting and vectors, discourage scavenging, and provide a pleasing appearance per 10 CSR § 80-3.010(17)(A). Daily cover is expected to include a minimum of 6-inches of soil material and intermediate cover a minimum of 12-inches of soil material in accordance with 10 CSR § 80-3.010(17)(C)1 and 2. Alternatively, daily and intermediate cover may consist of tarps, foam, or other methods to meet the above listed objectives. Use of alternative methods of daily and intermediate cover may be appropriate to reduce the volume of material that may need to be excavated and shipped off-site or import materials brought to the site. Use of alternative cover methods will be developed as part of the 30% RD and their use will be subject to USEPA approval. The excavation will be into a combination of cover soils and aged MSW with no new putrescible waste being added. Therefore, the need for daily and intermediate covers will be defined by sequencing and actual conditions encountered during the work. The 90% and Final RD reports will develop criteria based on these categories to define the requirement for and types of cover that are appropriate.

The purpose of the cover will dictate which type of cover(s) is selected (e.g., odor reducing foams versus temporary geomembrane to shed water). The RD will describe alternative daily covers and their intended uses with criteria for selection of appropriate daily and intermediate covers if necessary.

## 5.9 CONTINGENCY FOR “ATYPICAL ITEMS” ENCOUNTERED DURING EXCAVATION

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It is expected that atypical MSW will be encountered during the RA. The RD will address procedures for handling and disposal of these materials, if encountered. Below is a list of materials that could be encountered and a preliminary outline of how each will be addressed in the RD. These will be included in the specifications developed in the 90%, and Final RD reports.

### 5.9.1 Intact Drums

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A procedure will be developed in the RD to address discovery of an intact drum during RA.

### 5.9.2 Tires

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Based on previous work conducted at the site it is expected that vehicle tires will be encountered during the remedial actions. The tires will be disposed back into the landfill in an intact state as part of the backfill. The RD will address procedures for removing RIM above threshold levels from tires prior to placement, specifically considering whether they were found in a RIM impacted zone or not. Efforts will be made to minimize tire-to-tire contact and void space during placement and to preferentially place tires in the base of the excavations.

### 5.9.3 White Goods

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White goods are defined as large appliances (e.g., refrigerators). White goods will be disposed intact back into the landfill as part of the backfill. The RD will address procedures for removing RIM above threshold levels from white goods prior to placement, specifically considering whether they were found in a RIM impacted zone or not. Efforts will be made to minimize void space during placement and to place white goods separate from each other in deeper backfill materials.

#### **5.9.4 Other Over-Size Materials**

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Over size material could include things like vehicles and old construction equipment. The intent is to keep these materials on-site and either leave them unexcavated or place them back in deeper backfill materials. The RD will outline an approach to address these materials in a case by case basis.

#### **5.9.5 Construction Demolition Debris Materials**

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Construction and demolition (C&D) debris is noted on the surface of many areas of Area 1 and Area 2 and is expected to be encountered at subsurface during the RA. C&D debris will be disposed back into the landfill. The RD will address procedures for removing RIM above threshold levels from C&D debris prior to placement, specifically considering whether they were found in a RIM impacted zone or not. Efforts will be made to minimize void space during placement, which could include a reduction in size of the debris and to place C&D debris with deeper backfill materials.

#### **5.9.6 Regulated Asbestos Containing Materials**

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Regulated asbestos containing materials will be managed per 40 CFR 61.150 and 154(j) if encountered and disturbed during excavation.

#### **5.9.7 Hazardous Waste or PCBS**

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If suspected hazardous waste is encountered during excavation, it will be evaluated for RCRA hazardous characteristics per 40 CFR 261.21 through 262.24. If the waste is determined to be a characteristic hazardous waste, then it will be disposed of off-site at a RCRA Subtitle C landfill if the waste is not above that facility's permit limits for radioactivity. If the radioactivity is in excess of the Subtitle C facility permit limits, then it will be disposed at a landfill permitted to receive both radioactive and hazardous waste materials.

If materials suspected of containing PCBs are encountered and observed, then they will be tested for total PCB concentration and managed per 40 CFR § 761 Subparts D, G, N, O, P, R, and S, as well as 10 CSR § 25-13.010.

## 6.0 MATERIAL HANDLING AND SEGREGATION

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### 6.1 SEGREGATE MATERIAL FOR REUSE AS BACKFILL

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Section 12.2.2 of the RODA specifies that excavated RIM-impacted waste with radioactivity less than 52.9 pCi/g will be preferentially placed in the base of the excavations after waste with radioactivity greater than 52.9 pCi/g is removed to depth. An RD goal is that these materials will be segregated during excavation and returned to the excavation for backfilling as soon as practicable. It is expected that the RD geostatistical model will be used to identify the zones of materials between 7.9 and 52.9 pCi/g as well as the zones greater than 52.9 pCi/g so they can be segregated during excavation.

RIM-containing materials from the Buffer Zone and Lot2A2 excavation areas that are less than 52.9 pCi/g can be placed as backfill within the footprint of the engineered cover in Areas 1 and 2.

Non-RIM impacted overburden and waste will be segregated from RIM-containing waste. These materials may be stockpiled for use in backfilling the excavations above backfilled RIM-containing waste as discussed above. These (non-MSW) materials may also be used as daily or intermediate cover. The procedures and decision-making criteria will be presented in the 30% RD report.

The segregation of these materials will occur during the excavation process where specific three-dimensional zones will be designated using the final geostatistical model developed during RD. The RD will be developed so the coordinates will be programmed into survey equipment used to control the excavation process and each zone will be excavated and placed in a segregated stockpile or haul truck directly by the excavator for management for reuse. Where possible, these materials will be returned immediately into excavation backfill to avoid *ex-situ* double-handling and stockpiling.

Segregated stockpiles will be protected from the elements to prevent dust or contact water generation. Stockpiles with aged MSW will also be covered if they exhibit attractiveness to birds or vectors.

### 6.2 SEGREGATE RIM BY DISPOSAL SITE

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RIM materials with radioactivity above 52.9 pCi/g will be transported and disposed of off-site at approved regulated facilities. Each facility will likely have different requirements defining which wastes they can receive. This may require specific testing of stockpiled RIM-containing waste. The segregation of these materials will occur during the excavation process and each zone will be excavated and placed in a segregated stockpile. Disposal site specific testing would then occur prior to loading the shipping containers if the disposal sites require pre-disposal testing beyond the prior in situ testing. The procedures for segregating RIM by disposal site will be developed in the 90% and Final RD reports based on the phasing drawings.

### 6.3 CONTAINMENT REQUIREMENTS

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RIM-containing waste removed from the excavation area for processing, stockpiling, and/or loading will be stored on lined containment pads designed to contain dewatering fluids, including leachate and contact water from precipitation. The lining system will be designed to withstand construction and operating loads for the duration of the work. The containment areas will be designed with sumps for pumping of the contact water for conveyance to the temporary water treatment plant. Typical details will be developed in the 30% RD report.

The use of an enclosed structure will be evaluated for containing waste stockpiles with RIM. The FFS and the RODA contemplate that a building would be erected to contain RIM staging, temporary storage, and loading

activities. However, 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. The purpose of the RIM staging and loading building included in the FFS was to provide a location for blending of the RIM if necessary to ensure that the material shipped offsite meets the disposal facilities' waste acceptance criteria (WAC). Alternatives to this approach will be evaluated as part of the 30% design and may include planning of the excavation sequencing based on the geostatistical model characterization of RIM in order to allow for direct loading of the RIM in a manner that meets the WAC and/or blending of RIM as needed to meet the WAC at or near the excavation locations (i.e. excavation and simultaneous loading of RIM from two areas, one with higher activity and one with lower activity in order to meet the WAC). This would allow for immediate direct loading of the RIM into the containers for offsite transport without double-handling or uncontained storage on-site. This will be evaluated in the 30% RD report and procedures included in the Loading, Transportation, and Off-Site Disposal Plan (LTODP).

If the use of additives (e.g., cement) are likely to be necessary to reduce water content of RIM-containing materials prior to off-site disposal and need to be performed outside the excavation area, then an enclosed structure may be considered for that processing. The preliminary evaluation regarding the necessity of a building will be provided in the 30% RD report. If a building is required, the design will be provided in the 90% and Final RD reports.

#### **6.4 CONTACT WATER AND LEACHATE MANAGEMENT**

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Contact water and leachate from MSW and RIM materials handled outside of the excavation areas will be contained and conveyed per 10 CSR § 80-3.010(8)(C) to the on-site temporary water treatment plant for treatment prior to approved discharge.

The RD will seek to reduce contact water and leachate quantities by limiting the area and quantity of RIM-containing waste and other materials located outside of the excavations. This will be a major factor in development of the phasing drawings to be included in the 90% and Final RD reports.

Preventing run-on into materials handling areas from surrounding terrain will be a design objective during pre-excavation site development. Similarly, preventing run-off from exposed waste in waste handling locations outside of the excavations onto adjacent clean ground or into unimpacted stormwater will be a design objective during pre-excavation site development and phasing during the RA. This will be considered during the temporary stormwater analyses performed in 30%, 90%, and Final RD. Lined containment areas will be designed as discussed in Section 6.3.

#### **6.5 AIR QUALITY AND ODOR**

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A significant portion of the materials that will be handled outside of the excavations will contain aged MSW. These materials have the potential to generate odors. The RD will develop tiered response actions to address management of odors and other air quality issues if they arise. These measures are anticipated to be quickly implemented as flexible responses and may include a variety of techniques including misting, odor suppressant foams, masking agents, and temporary covers. Materials stockpiled for several days may dry, which could create a dust generation potential. Prevention of dust generation may include the use of covers or spraying with water. These management techniques will be presented in the 30%, 90%, and Final RD reports.

#### **6.6 WILDLIFE MANAGEMENT**

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Wildlife will be managed during material handling and segregation as part of the wildlife management procedures discussed in Section 5.7.

## 6.7 TRUCK LOADING

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Trucks will be loaded for off-site transport of RIM-containing waste. The loading may take various forms depending on the containers that the waste will be transported in. Truck loading procedures may include loading a filled container onto the truck or a flatbed truck receiving landfill containers (e.g., Super Sack®). These container/sacks may be filled near the excavation site and brought to the truck loading area to be put on the highway truck and taken directly to a disposal facility or to a rail transfer yard. Truck loading and transportation procedures will be presented in the LTODP.

RIM may also be loaded directly into a truck without prior containerization. This truck loading area would be designed to maintain on-road highway trucks on an unimpacted surface that does not receive traffic from vehicles travelling in the excavation or material handling and segregation areas. The RIM to be loaded would likely be placed onto a lined and contained pad and then scooped and placed in the on-road truck. The truck would be inspected and cleaned as necessary prior to departure to prevent RIM from being tracked off-site.

This truck loading area may be outside or in a building. The need for a building to load trucks and generally process materials will be evaluated during the design.

## 6.8 STRUCTURES AND MECHANICAL/ELECTRICAL SYSTEMS

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Temporary structures and systems are expected to be designed and constructed for use during the RA excavation, material handling, and backfilling phases. These include a potential building for handling RIM and a water treatment system for fluids encountered during the excavation, material handling, and backfilling processes. These facilities are anticipated to be temporary and will be deconstructed and demobilized at the end of the RA. If these structures are required, they will be designed in the 90% and Final RD.

Design of the structures and other facilities will follow the substantive requirements of the technical building codes for the locality that are appropriate and relevant for temporary facilities. Design board permitting, review, and approval ordinances are not applicable or appropriate and relevant to these temporary facilities.

Operating and monitoring systems within these facilities are required to meet the OSHA regulations 29 CFR 1910 Occupational Safety and Health Standards and 29 CFR 1926 Safety and Health Regulations for Construction. These standards include subparts for physical, chemical, and radiation hazards. These regulations set the protection and operating standards. Building codes cited below address the detailing of the constructed structures and systems. Explosive gas monitoring will be provided in confined spaces and along preferential pathways, such as utility lines in the work areas on the site.

The State of Missouri does not have a state building code or related codes. The City of Bridgeton administers the Building Code for structures within the City limits, including the vicinity of the site. Ordinance No. 06-35 adopted specific chapters of the International Building Code (IBC) 2003 with amendments in Article 2 Sections 500.120 through 500.230. The technical requirements in Article 2 are generally appropriate and relevant and will be considered during RD.

St. Louis County has adopted the following codes with technical requirements that are relevant and appropriate:

- Electrical Code (Ch. 1102 – 2014 NEC);
- Energy Conservation Code (Ch. 1115.13-2009 IBC/IMC);
- Fuel Gas Code (Ch. 1108.21-2009 IMC);
- Mechanical Code (Ch. 1108-2009 IMC); and
- Plumbing Code (Ch. 1103-2015 UPC).



## 7.0 TRANSPORTATION

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### 7.1 USDOT AND MISSOURI DOT REQUIREMENTS

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Transportation of materials related to the RA will be conducted under the requirements of 49 CFR Transportation and will be discussed in the LTODP.

Transportation of waste materials from the Site will be conducted in accordance with the requirements of 49 CFR Subchapter C – Hazardous Materials Regulations. These include regulations on hazardous materials communications, emergency response information, training requirements and security plans (49 CFR § 172) which address special provisions, preparation and retention of shipping papers, packaging and conveyance marking, labelling, placarding, emergency response, and security planning. The regulations contain specific requirements associated with shipment of radioactive materials (e.g., 49 CFR § 172.310, 172.403, 172.436, 172.438, 172.440, and 172.556). Other regulations (49 CFR § 173) describe requirements for shipment and packaging that are applicable to shippers, including specific requirements for shipment of radioactive materials. Regulations set forth in 49 CFR § 174 address shipment by rail and include special handling requirements for radioactive materials (49 CFR § 174.700). Required emergency response information is described in 49 CFR Subpart G (49 CFR § 173.602). The NRC, through a Memorandum of Understanding with DOT, also has promulgated regulations related to transport of radioactive materials (10 CFR § 71 and § 177).

Missouri Section 260.392 Revised Statutes of Missouri (RSMo) will be evaluated during RD to assess if it is applicable to the transport of RIM-containing waste from the site.

### 7.2 SITE ACCESS

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Site access for all construction deliveries and contractors will be evaluated during the RD. Access evaluations will assess impacts to local and Site traffic patterns, safety and feasibility of implementation. Preliminary analyses will be provided in the 30% RD report with final analyses and design in the 90% and Final RD reports.

In addition to the general U.S. Department of Transportation (DOT) transportation requirements, Parsons will consider state and local requirements; specifically, these requirements will be applied to our assessment of site entrances and exits. These requirements include the following:

- AASHTO - A Policy on Geometric Design of Highways and Streets, 2018;
- Missouri Department of Transportation – Engineering Policy Guide (MoDOT Maintained Roads);
- St. Louis County – Design Criteria Manual (St. Louis County / Local Maintained Roads);
- Missouri Department of Transportation – Engineering Policy Guide (Design Criteria, Traffic Analysis and Access Permit Information for MoDOT Maintained Roads); and
- St. Louis County – Access Management Guidelines, June 2008 (Design Criteria, Traffic Analysis and Access Permit Information for St. Louis County / Local Maintained Roads).

### 7.3 TRUCK ROUTES

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Trucking of earthen materials to and from the Site will be required to implement the selected remedy. This will include trucking of import material to the Site for backfill, landfill grading and cover materials. This may include trucking of RIM off-site.

Development of truck routes will be for the entire truck route. A primary objective will be to route the trucks on interstate and major state highways designed for heavy truck traffic for as much of the route as possible. As part of this objective, the truck routes will be developed to direct the trucks onto these major roads as early as practicable. These local truck routes will also consider reducing left turns which can cause traffic delays and have higher accident potential. These will be provided in the LTODP.

#### 7.4 RAILROAD TRANSPORTATION

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The RD will assess railway transportation of waste. This will include two aspects: (1) installing a new rail spur directly at the Site; and (2) identifying and assessing the feasibility of using an existing off-site truck-to-rail transfer facility for transportation of RIM to a disposal facility.

To assess the feasibility of developing a rail spur directly to the Site, the guidance provided in the documents below will be evaluated. Based on an initial review the feasibility of this option is unlikely, but it will still be evaluated in the 30% RD report.

<b>Regulating Organization</b>	<b>Document Title</b>
AREMA	Manual for Railway Engineering
AREMA	Portfolio of Trackwork Plans
FHWA	Railroad-Highway Grade Crossing Handbook
FRA	49 CFR 213 - Track Safety Standard
FRA	49 CFR 214 Subpart C - Roadway Worker Protection
MoDOT	State Railroad Regulations
NS	Public Projects Manual for Projects that May Impact Norfolk Southern Railway Company
NS	Norfolk Southern Railway Company Specifications for Design and Construction of Privately Owned Industry Tracks

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## 8.0 WASTE DISPOSAL

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### 8.1 WASTE CLASSIFICATION

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Waste that requires removal from the Site has been defined in the RODA, as discussed in Section 5.1 of this Design Criteria Report. Classification of this waste will be based on the specific permit requirements of the off-site disposal sites that will be receiving these materials. In general, the presence of mixed waste, including MSW, soil, and RIM may be a specific classification category for one or more disposal sites. Each disposal site has specific permit limits on the nature and level of radioactivity that it is permitted to receive. These limits may be different from the internal excavation segregation RODA definitions used in the RD the geostatistical analysis. Therefore, once the disposal sites have been defined (possibly at the beginning of RA instead of in the RD), the excavation internal segregation boundaries defined by the geostatistical analysis may be sub-divided by additional analysis using disposal site criteria in addition to the RODA criteria as discussed in Section 6.

If suspected hazardous waste is encountered during excavation, it will be evaluated for RCRA hazardous characteristics per 40 CFR 261.21 through 262.24. If the waste is determined to be a characteristic hazardous waste, then it will be disposed of off-site at a RCRA Subtitle C landfill if the waste is not above that facility's permit limits for radioactivity. If the radioactivity is in excess of the Subtitle C facility permit limits, then it will be disposed at a landfill permitted to receive both radioactive and hazardous waste materials.

### 8.2 DISPOSAL SITE REQUIREMENTS AND COMMUNITY ACCEPTANCE

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The disposal of regulated materials above a certain threshold at a non-Nuclear Regulatory Agency (NRC) licensed facility will require analysis of potential disposal facilities. This analysis would evaluate the design of the disposal facility, safeguards and controls, and community involvement. The analysis would need to demonstrate that disposal of the waste at a non-NRC-licensed facility would meet the protectiveness criteria established by CERCLA (i.e., constraining excess cancer risk to  $10^{-4}$  to  $10^{-6}$  and a hazard index of less than 1). This analysis would also look at the measures used to protect the health and safety of workers at the off-site disposal facility and the surrounding community. It would also examine the facility's ability to protect groundwater. This analysis, if necessary, will be conducted as part of the 90% and Final RD and provided to the State of Missouri and the receiving state that the non-NRC licensed disposal facility is located in for comment. Ultimately, only after USEPA approval of the analysis can the facility be accepted for disposal of RIM-containing waste from this site. The analysis may be updated as necessary during RA.

### 8.3 WASTE ACCEPTANCE CRITERIA

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WACs are established for each disposal site based on their federal and state permit or license requirements. These permit and license requirements can change over time and may change during the RD and RA processes. Current requirements for each potential facility will be obtained during the RD and evaluated against the existing data set. A preliminary evaluation of WAC will be made during the 30% RD based on available data. Additional data may be obtained during the DI to aid in screening materials for evaluation by potential disposal facilities and will be proposed in the DIWP based on this preliminary evaluation. These data are expected to be included in the DI Report with the evaluation of the waste acceptance criteria provided in the 90% and Final RD reports. Additional testing may be required on excavated materials during the RA prior to shipping for disposal. The evaluations will be provided in the 30%, 90%, and Final RD reports. The final recommendations will be provided in the LTODP.

## 9.0 CONTACT WATER TREATMENT

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### 9.1 DEFINITIONS

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Contact water is defined as water that has been in direct contact with materials characterized as waste on the Site. Collected contact water will be treated prior to discharge from the Site. It is anticipated that a temporary water treatment system will be used for pre-treatment prior to discharge.

Contact water includes leachate from the MSW materials in Areas 1 and 2, and stormwater that falls on or flows on or through MSW or RIM-containing waste.

Water that falls on and flows on non-waste materials, such as clean soils used for daily cover, temporary geomembranes, or spray-on foams and coating, is not considered contact water if it is diverted or collected prior to contacting waste materials. This water can be discharged as surface water through the stormwater discharge system or allowed to percolate into the ground in non-waste areas. This will be addressed in the SWPPP and specifications that will be provided in the 90% and Final RD reports.

### 9.2 TREATED WATER DISCHARGE REQUIREMENTS

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Treated water discharge will meet the requirements of Missouri Water Quality Standards per 10 CSR § 20-7.031 if discharged directly to waters of the state.

Discharge to a POTW or a private industrial wastewater treatment facility will be treated to the pre-treatment limits set by that facility in their permit requirements in accordance with 40 CFR § 403.

The process requirements for the water treatment plant will be defined in the 30%, 90%, and Final RD.

### 9.3 SLUDGE AND TREATMENT MEDIA DISPOSAL

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Sludge and treatment media from the water treatment process will be placed in Areas 1 and 2 excavation backfill and regrading fills below the cover system during the RA. Sludge and treatment disposed off-site will be tested to demonstrate that it meets the receiving facility's waste acceptance criteria prior to shipping off-site. This will be included in the specifications developed in the 30%, 90%, and Final RD reports.

### 9.4 PUMPING, TREATMENT, TRANSMISSION, AND STORAGE

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Contact water will be pumped directly from its collection points to either storage for later treatment or a temporary on-site temporary water treatment facility. Where the untreated contact water transmission lines cross unimpacted ground, it will be conveyed in a double-walled pipe. The water will be treated in a temporary on-site contact water treatment plant designed to achieve the required discharge limits. This will be included in the specifications developed in the 30%, 90%, and Final RD reports.

## **10.0 BACKFILLING**

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### **10.1 EXCAVATED MATERIAL RE-USE**

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Section 12.2.2 of the RODA specifies that excavated RIM-impacted waste with thorium or radium radioactivity less than 52.9 pCi/g will be preferentially placed in the base of the excavations. Other excavated overburden materials will be placed over these materials. This will be included in the specifications developed in the 30%, 90%, and Final RD reports.

### **10.2 PLACEMENT AND GRADING**

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The backfill materials will be placed in horizontal lifts and compacted with a landfill trash compactor. Such placement and compaction will be in compliance with MSW Rule 10 CSR § 80-3.010(18) and general industry standards. This will be included in the specifications developed in the 30%, 90%, and Final RD reports.

The final stages of backfilling will be integrated into the regrading fill required to achieve acceptable final grades for the site.

The 90% and Final RD will evaluate phasing of the backfilling and regrading for temporary stormwater management as discussed in Section 4 of this Design Criteria Report.

## 11.0 FINAL COVER

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### 11.1 FINAL COVER BOUNDARY DEFINITION

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The location of the landfill toe defining the boundary of Areas 1 and 2 that are not contiguous with other waste-containing areas will be defined in the RD. This will define the edge of the final cover in those areas.

Along the edges of Areas 1 and 2 contiguous with other waste-containing areas, additional borings will be drilled through the full depth of waste to identify the furthest extent of RIM-containing waste beyond the excavation which will define the edge of the engineered cover in those areas. Additional investigation will be necessary in the DI to define the boundaries of the final cover in Area 2 adjacent to the inactive sanitary landfill and the C&D landfill. The location and sampling methods proposed for the borings will be proposed in the DIWP for execution during the DI.

### 11.2 REGRADING AND FINISHED GRADE

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The MSW Rules 10 CSR § 80-03010(17)(B)(3) and (7) 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. As discussed in Section 10.2, 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 maintain positive drainage over the life of the cover system 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 slope for the remedy will be further evaluated during the RD after computing expected future total and differential settlements of the waste materials. 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. The regrading of the site will be developed in the 30%, 90%, and Final RD reports.

### 11.3 ENGINEERED COVER REQUIREMENTS

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#### 11.3.1 USEPA and MDNR

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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  $1 \times 10^{-7}$  cm/sec. The final cover will consist of at least two feet of compacted soil and overlaid by at least one foot of soil capable of sustaining vegetative growth as described in MSW Rule 10 CSR § 80-3.010(17) (C)4(A). Placement of soils cover addresses the requirements for minimization of fire hazards, odors, blowing litter, control of gas venting, and scavenging. Placement of soil and establishment of a vegetative cover will meet the requirement of providing a pleasing appearance. The final cover will prevent direct contact with the waste material.

The engineered cover component of the Amended Remedy will consider criteria set forth in the guidance that has been identified as 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 MSW Rules and the UMTRCA to create a hybrid cover system. The final cover evaluations will be provided in the 30% RD report and the detailing will be provided in the 90% and Final RD reports.

### 11.3.2 UMTRCA

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The UMTRCA standards at 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<sup>2</sup>s. The Amended Remedy will meet the radon emission standard promulgated under UMTRCA through partial 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. This will likely include the addition of a bio-intrusion barrier. Weathering and performance reduction over time of some components typically used in RCRA caps can occur due to oxidation, desiccation, and frost action. The likely impact of these mechanisms on performance of potential cover elements over time will be considered and presented in the 30% RD design. Alternative cover concepts, such as evapo-transpirative covers, are often used to provide protection for periods of indefinite length after the geosynthetics are likely to have declined in effectiveness. Incorporating alternative cover elements into the hybrid final cover will be considered. Part of the evaluation of alternative cover systems for long-term stability will be to differentiate performance requirements of steeper side-slopes versus the comparatively flatter top plateaus. Infiltration performance is more important in the flatter areas (e.g., less than 15% slope) while slope stability is more important on the steeper side slopes. Therefore, the hybrid design may consider different cover cross-sections on the steeper side slopes and flatter plateau areas.

### 11.3.3 North Quarry Overlay

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The hybrid final cover system used to accomplish the short- and long-term objectives of the ARARs will be installed within the defined boundaries of OU-1 Areas 1 and 2 except for the portion of Area 1 covered with the Bridgeton Landfill North Quarry Overlay. A different final cover system will be proposed for the portion of the North Quarry overlying RIM which will use the thick non-RIM refuse over the RIM as an UMTRCA radon attenuation barrier, and a solid waste final cover meeting the standards of 10 CSR § 80-3.010(17)(C)4 over the non-RIM waste. 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  $1 \times 10^{-7}$  cm/sec. We note that the Bridgeton Landfill may have specific requirements that it must meet in this area. For example, the exposed ethylene vinyl alcohol

(EVOH) geomembrane required over portions of the Bridgeton Landfill may extend over areas deemed to be part of the OU-1 final cover. These EVOH-covered areas also incorporate active gas extraction and piping systems which would require coordination if buried under final cover soils.

The design of the area where the two cover systems may intersect will be coordinated in the 30% RD with Bridgeton Landfill, USEPA, and MDNR. This will allow the unimpeded operation and maintenance of the North Quarry leachate and landfill gas infrastructure while providing long-term protectiveness. Coordination will include evaluation and design of stormwater management systems for the intersecting location. Design of the final cover will also consider the slopes in the North Quarry area as well as the potential for greater total and differential settlement due to the fresher waste. The concepts for the final cover in this area will be presented in the 30% RD report with detailing in the 90% and Final RD reports.

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## 11.4 SEISMIC

The peak ground acceleration (PGA) for the Site is 0.199g for a return period of 2,475 years (2% probability of occurrence in 50 years) according to the U.S. Geological Survey Unified Hazard Tool. Pseudo-static slope stability analyses will be performed for the side slopes and final cover system per the procedures outlined in EPA600-R-95-051 "RCRA Subtitle D (258) Seismic Guidance for MSW Landfill Facilities" (USEPA 1995). If the pseudo-static slope stability analyses have a factor of safety of 1.0 or greater, no additional analyses will be required per the guidance. If the factor of safety is less than 1.0, then additional analyses will be conducted per the guidance recommendations. These analyses will be provided in the 30% RD report.

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## 11.5 LANDFILL GAS

Decomposition gases generated within the MSW will be managed on-site per MSW Rule 10 CSR § 80-3.010 (14). Areas 1 and 2 contain aged MSW that is well beyond peak gas generation, and gas generation is expected to decline in the coming years. Over the time frame required by the UMTRCA regulations, landfill gas generation in Areas 1 and 2 is expected to be minimal.

The primary challenge posed by landfill gas at the Site is a gradual build-up of pressure below an impermeable cover material (e.g., geomembrane) which could cause the membrane to inflate upward locally pushing cover soils to the side (colloquially known as a "whale" or "hippo"). Landfill gas can also cause vapor pressure gradients that can accelerate radon's migration to the ground surface during the first years after closure until landfill gas production is minimal. It should be noted that radon gas is naturally occurring and is generally present in landfill gases. The RD will design a gas management system to meet the ARARs listed in Section 11.6 and will be developed in the 30% RD with detailing presented in the 90% and Final RD reports.

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## 11.6 RADON

Radon's most stable isotope, Rn-222, has a half-life of 3.8 days. The design goal for managing radon gas is to provide reasonable assurance that the release of Rn-222 from residual radioactive material to the atmosphere will not exceed an average release rate of 20pCi/m<sup>2</sup>-s or an increase in the annual average concentration of Rn-222 in air at or above any locations outside the disposal facility by more than 0.5 pCi/l per 40 CFR 192.02(b).



### **11.7 RESTORATION**

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The final cover surface will be vegetated as a native prairie grassland. Post-closure operations and maintenance requirements to maintain this as a native prairie grassland through the RCRA post-closure period will be provided in the 90% and Final RD reports in the Operations and Maintenance Plan and Manual. The measures may include mowing or controlled burns.

### **11.8 ACCESS**

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Site access is expected to be limited to the existing gates. Roads will be provided on the final cover surface as necessary to provide access for maintenance and monitoring activities.

### **11.9 SITE SECURITY**

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Site security will be provided in accordance with the SMP.

## **12.0 PERMANENT STORMWATER AND EROSION CONTROL**

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### **12.1 DESIGN STORM FOR FINAL COVER SYSTEM**

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The stormwater management elements that are on the final cover will be stormwater conveyance swales and discharge down chutes. These elements within the limits of the final cover and starter berms could cause damage to the final cover system if they fail during a storm event. Based on the UMTRCA longevity requirements, These elements will be designed for the 1000-year, 30-minute storm using the “Rational Method” as described in *(Draft) Technical Guidance for Resource Conservation and Recovery Act(RCRA)/CERCLA Final Covers* (USEPA 2004). The 30-minute storm is the design storm that is expected to be the typical time of concentration of the drainage area for a typical swale. St. Louis Lambert International Airport is assumed to be the relevant weather reporting station for assessing the magnitude of these weather events. Per NOAA Atlas 14, Volume 8, Version 2, the estimated precipitation with a 90% confidence interval for the 1000-year, 30-minute storm is 3.09 inches. These calculations and preliminary designs will be presented in the 30% RD report and completed in the 90% and Final RD reports.

### **12.2 DISCHARGE AND DETENTION REQUIREMENTS**

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The current landfill surface and the final design landfill surface are expected to have similar runoff characteristics. Additional ponded water surface on or near the landfill is undesirable as it is attractive to waterfowl that create a hazard to the airport operations, so post-closure detention or retention basins will be avoided or minimized. Additional discharge points that are currently not developed at the Site may be required and will be evaluated in the 30% RD report and the design will be completed in the 90% and Final RD reports.

Flows outside the landfill and perimeter toe berm limits are not anticipated to have the potential to cause erosion of the landfill. Instead, the elements will be sized based on urban flooding considerations that are not subject to UMTRCA longevity criteria. they will be designed for a 25-year, 24-hour storm per Missouri solid waste regulations 10 CSR § 80-3.010(8)(B)1F. St. Louis Lambert International Airport is assumed to be the relevant weather reporting station for assessing the magnitude of these weather events. Per NOAA Atlas 14, Volume 8, Version 2, the estimated precipitation with a 90% confidence interval for the 25-year, 24-hour storm is 5.62 inches.

### **12.3 EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES**

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MDNR provides detailed information and requirements for selecting and using appropriate erosion and sediment control BMPs in the guidelines for preparing a SWPPP under 10 CSR § 20-6.200. The substantive requirements of these BMPS will be used for developing the design of the permanent stormwater and erosion control for the proposed project.

The spacing of swales on the final cover will be based on the USDA Revised Universal Soil Loss Equation assuming a permissible annual average soil loss of 2.0 tons per acre per year. The permissible stress method will be used to evaluate the maximum flow rates the swales and down chutes will be designed to prevent erosion in the base of the swales and down chutes. These methods are deemed appropriate as the Site is anticipated to vegetate quickly in the temperate, moist climate with rapid deep rooting by the prairie grasses.

## **13.0 POST-REMEDIAL ACTION FLOOD PROTECTION**

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### **13.1 DESIGN EVENT**

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Flooding is unexpected at the site except in the theoretical event of a levee breach along the Missouri River. The site is located within the area that is protected from a 500-year flood by the Earth City levee system. This is an engineered levee and flood control system designed, maintained, and operated to protect the commercial/industrial facilities in the Earth City Industrial Park.

Flooding that might reach the toe during a major rain event would be unlikely to cause substantial erosion because the water from such a flood would not flow with significant velocity. This is unlike the potential flow velocities that could develop with a levee breach.

### **13.2 EROSION AND SLOPE STABILITY**

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In the event of a levee breach along the Missouri River, it is expected that water will be at the toe of the perimeter berms at the landfill boundary. The primary challenges that these berms will face will be erosion of the perimeter berm and potential slope instability due to wetting of the berm soils. These challenges will be evaluated in the design of the perimeter toe berms. The lower slopes of the perimeter toe berms are anticipated to be armored to above the elevation of potential flooding. These analyses will be provided in the 30% RD and detailing provided in the 90% and Final RD reports.

## **14.0 POST-REMEDIAL ACTION OPERATION, MONITORING, AND MAINTENANCE**

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### **14.1 OPERATION AND MAINTENANCE**

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Post-closure care of the landfill will include operation and maintenance of the following elements per 10 CSR § 80-2.030(4)(B):

- Maintenance of cover integrity (for example, recovering, regrading), vegetative growth to protect cover material and surface water drainage systems;
- Operation and maintenance of the leachate collection system(s) and methane gas control system(s);
- Maintenance, sampling and testing of groundwater monitoring wells and methane gas monitoring systems; and
- Necessary operation or maintenance, or both, of any other environmental control features which are included in the design and operation of the solid waste disposal area to protect the public health and environment.

The details of the required post-closure care will be provided in the Operations & Maintenance Manual and Plan.

### **14.2 COVER INSPECTION**

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Cover inspections will be conducted regularly to monitor for loss of integrity of the systems listed in Section 14.1. The details of the required inspection will be provided in the Operations & Maintenance Manual and Plan and included in the Post-RA SMP.

### **14.3 STORMWATER MONITORING**

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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. The stormwater monitoring requirements will be provided in the SWMP and included in the Post-RA SMP.

### **14.4 GROUNDWATER MONITORING**

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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 RD and then monitored during RA. The groundwater monitoring will continue 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. The groundwater monitoring requirements will be provided in the SWMP and included in the Post-RA SMP.

## 15.0 REFERENCES

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- Civil & Environmental Consultants, Inc. (CEC), 2016. *Bird Hazard Monitoring and Mitigation Plan, Bridgeton Landfill*
- EMSI, Feezor Engineering, Inc. and Auxier. 2016. *Work Plan for Installation of a Non-Combustible Cover over Radiologically-Impacted Material At or Near the Ground Surface in Radiological Areas 1 and 2, West Lake Landfill Operable Unit-1*, March 16, 2016
- International Association of Plumbing and Mechanical Officials. *Uniform Plumbing Code (UPC)*, current edition
- International Code Council. *International Building Code (IBC)*, current edition
- International Code Council. *International Mechanical Code (IMC)*, current edition
- National Fire Protection Association. *National Electrical Code (NEC)*, current edition
- USEPA. 1989. *Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments*, USEPA530-SW-89-047, July 1989
- USEPA. 1995. *RCRA Subtitle D (258) Seismic Guidance for Municipal Solid Waste Landfill Facilities*, USEPA600-R-95-051, April 1995
- USEPA. 2004. *(Draft) Technical Guidance for Resource Conservation and Recovery Act (RCRA)/CERCLA Final Covers*. USEPA540-R-004-007, April 2004

## **TABLES**

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**Table 1**  
**Remedial Design ARARs**

<b>Chemical Specific ARARs</b>						
<b>Citation</b>		<b>Chemical/Medium</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 1 (Continued)**  
**Remedial Design ARARs**

<b>Chemical Specific ARARs</b>						
<b>Citation</b>		<b>Chemical/Medium</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 1 (Continued)**  
**Remedial Design ARARs**

<b>Chemical Specific ARARs</b>						
<b>Citation</b>		<b>Chemical/Medium</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 1 (Continued)**  
**Remedial Design ARARs**

<b>Chemical Specific ARARs</b>						
<b>Citation</b>		<b>Chemical/Medium</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 may 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 1 (Continued)**  
**Remedial Design ARARs**

<i>Location-Specific ARARs</i>						
<b>Citation</b>		<b>Location</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 1 (Continued)**  
**Remedial Design ARARs**

<i>Location-Specific ARARs</i>						
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 1 (Continued)**  
**Remedial Design ARARs**

<i>Location-Specific ARARs</i>						
<b>Citation</b>		<b>Location</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 1 (Continued)**  
**Remedial Design ARARs**

<i>Location-Specific ARARs</i>						
<b>Citation</b>		<b>Location</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
54 USC 312508; PL 113-287; 128 Stat. 3256		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		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 threatened 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		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 (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 1 (Continued)**  
**Remedial Design ARARs**

<i>Action-Specific ARARs</i>						
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 1 (Continued)**  
**Remedial Design ARARs**

<i>Action-Specific ARARs</i>						
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 RACM is 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 1 (Continued)**  
**Remedial Design ARARs**

<i>Action-Specific ARARs</i>						
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 <sub>10</sub> non-methane organic compounds (NMOC)	Specifies <i>de minimis</i> 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 particulate 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 1 (Continued)**  
**Remedial Design ARARs**

<i>Action-Specific ARARs</i>						
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 1 (Continued)**  
**Remedial Design ARARs**

<i>Action-Specific ARARs</i>						
<b>Citation</b>		<b>Action</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 1 (Continued)**  
**Remedial Design ARARs**

<i>To Be Considered</i>						
<b>Citation</b>		<b>Chemical/Medium</b>	<b>Requirement</b>	<b>Determination</b>	<b>RDWP</b>	<b>DCR</b>
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 1 (Continued)**  
**Remedial Design ARARs**

<i>To Be Considered</i>						
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 Effects 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 1 (Continued)**  
**Remedial Design ARARs**

<i>To Be Considered</i>						
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