



Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director

## DEPARTMENT OF NATURAL RESOURCES

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JAN - 2 2015

CERTIFIED MAIL # 7009 3410 0001 9190 2422  
RETURN RECEIPT REQUESTED

Mr. Ajay Arora  
Vice President, Environmental Services  
Ameren Missouri  
P.O. Box 66149, MC 602  
1901 Chouteau Avenue  
St. Louis, MO 63166-6149

RE: Ameren Missouri, Ameren Missouri Labadie Utility Waste Landfill, Construction Permit  
Number 0907101, Franklin County

Dear Mr. Arora:

An application for a construction permit to construct the above-referenced solid waste disposal area was filed with the Missouri Department of Natural Resources' Solid Waste Management Program (SWMP) on December 11, 2013. The application was submitted to the department by Thomas R. Gredell, P.E., GREDELL Engineering Resources, Inc. and Paul Reitz, P.E., Reitz and Jens, for review and approval. The application includes engineering plans, specifications, operating procedures, and subsequent correspondence or amendments for the subject disposal area. The application was reviewed for compliance with the Missouri Solid Waste Management Law (Sections 260.200 to 260.345, RSMo), and the Missouri Solid Waste Management Regulations.

On December 19, 2014, the EPA Administrator Gina McCarthy signed the Disposal of Coal Combustion Residuals from Electric Utilities final rule and it was submitted for publication in the *Federal Register*. The rule establishes technical requirements for CCR landfills and surface impoundments under Subtitle D of the Resource Conservation and Recovery Act. Ameren's proposed project met or exceeded all of the requirements in EPA's proposed rule. However, with the final rule, EPA made a significant change to the requirements for the placement of CCR units with respect to groundwater. The proposed rule called for any new landfill or lateral expansion to have a base located a minimum of two feet above the upper limit of the natural water table. In the final rule, EPA amended this provision to require new CCR landfills and all lateral expansions to be constructed with a base no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer or demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the

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seasonal high water table). The effective dates of the new federal rule are not yet known because the dates will be triggered by the rule's publication in the *Federal Register*. An argument can be made that Ameren's initial cell would be considered an "existing" landfill under the new rule, and thus not subject to this requirement. Nonetheless, as we have discussed with you, the department will be requiring Ameren to comply with the requirement for the initial cell and future expansions. Consequently, the department has included a condition in the permit to reflect this requirement.

In accordance with Section 260.205.5(7), RSMo, the SWMP hereby approves the application as provided in the enclosed "Solid Waste Disposal Area Construction Permit Number 0907101" issued to Ameren Missouri as owner/operator to construct a solid waste disposal area as of the date of this letter. This facility is a utility waste landfill located at 226 Labadie Power Plant Road, about 2.5 miles northeast of the town of Labadie and immediately southeast of the Missouri River in northeast Franklin County, Missouri. The general legal description is as follows: Part of Sections 8 and 17 and part of U.S. Survey 98, Township 44 North, Range 2 East, Missouri Quadrangle Map in Franklin County, Missouri. The Latitude is 38 degrees, 33 minutes, 47 seconds North, and the Longitude is 90 degrees, 48 minutes, 08 seconds West. This permit applies only to that tract of land consisting of approximately 813 acres as described by the engineering plans, specifications, and operating procedures submitted to the SWMP. The disposal area contains approximately 166.5 acres divided into four (4) cells to be used for waste disposal. The remaining approximately 646.5 acres are to be utilized for utility waste landfill-related design features such as borrow area, all-weather access roads, buffer zone, leachate collection and removal system, gas monitoring system, and storm water diversion structures.

The department may review this permit after the date of issuance and notify the permit holder as necessary to assure the utility waste landfill continues to comply with the currently applicable requirements and provisions of the Missouri Solid Waste Management Law and rules adopted thereunder. This permit is not to be construed as compliance with any existing federal or state environmental laws other than the Missouri Solid Waste Management Law; nor should this be construed as a waiver for any other regulatory requirements. This permit is not to be construed as compliance with any existing local ordinances or zoning requirements.

As the holder of this permit, you are required to comply with all applicable federal and state environmental laws and regulations enforced by the department. These environmental requirements are administered by the department's Air Pollution Control Program, Water Protection Program, Land Reclamation Program, Hazardous Waste Program and the SWMP. In addition, you are required to comply with all applicable environmental laws administered by the government of Franklin County, Missouri. Noncompliance with these environmental laws and

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regulations may, in certain circumstances, result in the suspension or revocation of this permit and may subject the permit holder to civil and criminal liability.

If you are aggrieved by this decision, you may be entitled to seek further administrative review within 30 days of this notice pursuant to Section 260.235 and Chapter 536 of the Missouri Revised Statutes.

The department reserves the right to revoke, suspend, or modify Permit Number 0907101 if the permit holder fails to maintain the facility in compliance with the state's Solid Waste Management Law and regulations, the terms and conditions of the permit, and the approved engineering plans and specifications.

I appreciate your cooperation. If you have any questions, please contact Mr. Darrell G. Hartley, P.E., Permits Unit Chief of the SWMP at (573) 526-3940 or P.O. Box 176, Jefferson City, MO 65102-0176.

Thank you.

Sincerely,

DIVISION OF ENVIRONMENTAL QUALITY



Leanne Tippett Mosby  
Director

LTM:dpl

Enclosure

c: Senator Nieves, Missouri Senate  
Representative Curtman, Missouri House of Representatives  
The Honorable John Griesheimer, Presiding Commissioner, Franklin County  
Thomas R. Gredell, P.E., GREDELL Engineering Resources, Inc.  
Mr. Chuck Eichmeyer, Planner, East Central SWMD, Region I  
St. Louis Regional Office via Electronic Shared File



**MISSOURI DEPARTMENT OF NATURAL RESOURCES  
SOLID WASTE PERMIT**

Ameren Missouri Labadie Utility Waste Landfill  
Solid Waste Disposal Area Construction Permit Number 0907101  
Franklin County, Missouri

Issue Date: January 2, 2015

**FACILITY DESCRIPTION**

This facility is a utility waste landfill located at 226 Labadie Power Plant Road, about 2.5 miles northeast of the town of Labadie and immediately southeast of the Missouri River in northeast Franklin County, Missouri. The general legal description is as follows: Part of Sections 8 and 17 and part of U.S. Survey 98, Township 44 North, Range 2 East, Missouri Quadrangle Map in Franklin County, Missouri. The Latitude is 38 degrees, 33 minutes, 47 seconds North, and the Longitude is 90 degrees, 48 minutes, 08 seconds West. This permit applies only to that tract of land consisting of approximately 813 acres as described by the engineering plans, specifications, and operating procedures submitted to the Missouri Department of Natural Resources' Solid Waste Management Program (SWMP). The disposal area contains approximately 166.5 acres divided into four (4) cells to be used for waste disposal. The remaining approximately 646.5 acres are to be utilized for utility waste landfill-related design features such as borrow area, all-weather access roads, buffer zone, leachate collection and removal system, groundwater monitoring system, and storm water diversion structures.

**PERMIT DOCUMENTS**

These documents are incorporated by this reference into Permit Number 0907101:

1. "Ameren Missouri Labadie Energy Center Construction Permit Application for a Proposed Utility Waste Landfill, Franklin County, Missouri", including Appendices A through Z, prepared by Reitz & Jens, Inc., and GREDELL Engineering Resources, Inc., first received December 11, 2013, last revised January 31, 2014. The construction permit application designates Ameren Missouri as the Owner and Operator of the landfill, with Reitz & Jens, Inc. and GREDELL Engineering Resources, Inc., as the project engineering team. Paul H. Reitz, P.E. and Thomas R. Gredell, P.E. are the certifying professional engineers registered in Missouri.
2. Engineering drawings numbered Sheet 1 through 23 titled, "Labadie Energy Center Proposed Utility Waste Landfill, Franklin County, Missouri", prepared by GREDELL Engineering Resources, Inc., dated January 2013 and signed and sealed on December 11, 2013. Thomas R. Gredell, P.E. is the certifying professional engineer registered in Missouri.

## **GENERAL CONDITIONS**

The following general conditions are an integral part of Permit Number 0907101. Compliance with these general conditions shall, in part, determine compliance with the permit. All reports, plans, and data required to satisfy these general conditions shall be prepared or approved by a professional engineer registered in the state of Missouri.

1. Operation and Design

Any change in the operation and/or design of this facility other than that which has been described in the application and approved in this permit is a modification of the permit, and prior written approval shall be obtained in advance of the permittee making that change.

2. Easement, Notice and Covenant

The owner and the department shall execute:

- A. An easement to allow the department, its agents or its contractors, to enter the premises to complete work specified in the closure plan, monitor or maintain the site, or take remedial action during the post-closure period; and
- B. A notice and covenant indicating that the property has been permitted as a solid waste disposal area and prohibiting use of the land in any manner which interferes with the closure filed with the department.

To satisfy these requirements, the department's SWMP has prepared a standard document titled Agreement for Easement, Notice and Covenant Running with the Land. A copy of the document is enclosed for your use. At least two (2) copies of the original document shall be submitted to the department's SWMP for approval and signature within thirty (30) days of the date of this permit.

3. Borehole Abandonment

All exploratory boreholes, abandoned monitoring wells and abandoned piezometers shall be plugged in accordance with 10 CSR 23-3.110 "Permanent Abandonment of Wells" and 10 CSR 23-4.080 "Plugging of Monitoring Wells", or an alternate method approved by the department. Proof of proper abandonment of boreholes and piezometers within each cell boundary shall be submitted to the department's SWMP for approval prior to requesting an operating permit for each subsequent cell.

4. Groundwater Monitoring

- A. Groundwater monitoring shall be required as per the following documents, of which are hereby incorporated by reference into Solid Waste Permit Number 0907101:
1. Engineering Appendix Q, Groundwater Sampling and Analysis Plan found in "Ameren Missouri Labadie Energy Center Construction Permit Application", prepared by Reitz & Jens, Inc. and GREDELL Engineering Resources, Inc.
  2. The enclosed document titled, "Groundwater Monitoring Program Ameren Missouri Labadie Utility Waste Landfill Permit Number 0907101" dated January 2, 2015, which is hereby incorporated by reference into Solid Waste Permit Number 0907101.
- B. Before an operating permit will be granted, the construction of all groundwater monitoring wells shall be approved by the department. Two (2) copies of the geologist's boring logs and as-built drawings showing the well construction for any new monitoring wells, as well as two (2) copies of plan sheets that show the as-built locations of these wells, shall be submitted to the department's SWMP.

5. Liner and Final Cover

- A. All borrow material used for liner and cover construction shall be from a previously sampled and approved borrow area.
- B. The top surface of each lift of the compacted clay soil liner and final cover shall be scarified prior to placement of an over-lying lift of liner soil.
- C. The top surface of the final lift of the compacted clay soil liner shall be smooth drum rolled prior to flexible membrane liner placement to ensure intimate contact between the compacted clay liner and the flexible membrane liner.
- D. The soils to be used for liner and cover construction shall be periodically tested and analyzed to ensure they meet the requirements as described in the engineering report. The compaction of the soil liner and final cover shall be confirmed via the following Quality Assurance/Quality Control (QA/QC) procedures. All QA/QC data results shall be submitted to the department's SWMP:
1. Whenever soil conditions change, perform laboratory tests of grain size, soil classification, Atterberg limits, permeability, and density/moisture testing

- (Standard or Modified Proctor) to determine new specifications for placing liner and cover material.
2. All laboratory analysis on soil shall be performed prior to initial placement of soil.
  3. Nuclear gauge field density and moisture tests (ASTM D 2922) shall be performed on each lift of the soil liner and final cover. Testing shall be performed at a maximum horizontal spacing of one hundred (100) foot centers, offset fifty (50) feet, for each lift of the liner. Any portion of the liner and final cover which fails to meet the minimum compaction shall be remediated before placing additional liner in the same area.
  4. A moisture/density calibration adjustment shall be performed at the start of each construction phase, when the soil used for liner/cover construction changes, when you change instruments, or every 12 months; whichever occurs first. Calibration adjustment procedures are covered in Annex A1 paragraph A1.3 of ASTM D 3017.
  5. Conduct laboratory hydraulic conductivity testing on undisturbed (e.g., Shelby tube) samples collected from the in-place compacted soil liner and final cover for every 5,000 cubic yards of soil placed and compacted, unless a zone of acceptability for soil placement was approved by the department.
  6. Elevations of the bottom and top of the landfill compacted soil liner and final cover shall be checked at a maximum horizontal spacing of one hundred (100) foot centers.
- E. Installation of the flexible membrane liner and cover shall be performed in accordance with the QA/QC measures specified in the approved engineering report, and with the manufacturer's recommendations.
- F. Supply the department's SWMP with QA/QC data and results on the composite liner's geosynthetic components for each phase and conduct both nondestructive and destructive testing on the geomembrane.
- G. The permittee shall provide seven (7) days advance notice of the following activities to the department's SWMP:
1. Subgrade excavation;



2. Test pad construction;
3. Placement of the soil component of the liner system, including final surface preparation;
4. Placement of the geosynthetic components of the liner system; and
5. Placement of the leachate collection system and its protective layer.

The department's SWMP reserves the right to inspect, and approve or disapprove any of the above-mentioned activities during the construction of the landfill.

6. Test Pad

- A. Test pad construction and testing shall be required as per the following document, which is hereby incorporated by reference into Solid Waste Permit Number 0907101:

“Construction Quality Assurance Plan for a Utility Waste Landfill” Appendix P, Section 3.2, “Test Pad,” of the Construction Permit Application.

- B. The test pad shall only need to be constructed once for phased construction, as long as the same soil type and clay liner construction equipment are used.
- C. The compacted soil liner shall be constructed from the same soil type, design specifications, equipment, and procedures as are used for the test pad.

7. Construction Quality Assurance Plan

- A. The department may require you to revise the Construction Quality Assurance (CQA) plan included in Appendix P of the approved engineering report following completion of the test pad. All construction and testing methods determined to be necessary during test pad construction shall be incorporated into the CQA plan at that time. The department must review and approve the revised CQA plan prior to construction of the liner system for the first landfill phase or cell.
- B. Determination of soil placement criteria and construction of a test pad are required for each soil type proposed for use in liner construction. The department reserves the right to require test pads for future phases.

- C. In addition to the testing outlined in the approved engineering report, a minimum of five (5) uniformly spaced nuclear moisture/density tests, per ASTM D 3017 and ASTM D 2922, shall be performed on each lift of the test pad.
1. A detailed discussion explaining how each soil type was identified and characterized to determine the acceptable placement range. The discussion shall also take into account the soil testing performed during the detailed site investigation. This discussion shall include, at a minimum, a comparison of the following soil properties:
    - a) Grain Size
    - b) Atterbergs
    - c) USCS soil classification
    - d) Optimum moisture content
    - e) Maximum dry density
    - f) Color
    - g) Texture
  2. For each soil type, one plot showing the Proctor curves using symbology indicating which Proctor points passed the hydraulic conductivity criteria and which failed.
  3. For each soil type, one plot showing the field moisture/density test results compared with the Proctor curves and the moisture and density pass/fail criteria.
  4. A map showing soil sample locations and depths. All laboratory test reports shall be clearly correlated to sample locations.
  5. A detailed discussion of the successful and unsuccessful construction techniques used, including:
    - a) Methods of moisture conditioning
    - b) Methods of surface preparation for each lift
    - c) Depth of penetration of the compactor feet
  6. A discussion of the amount of compactive effort applied to each lift of compacted soil based on the type and weight of equipment used, the number of passes, and the lift thicknesses.

7. A detailed discussion of how each soil type was identified in the field in order to correlate it to the proper soil placement range.
8. Documentation that all required calibration procedures specified by ASTM D 2922 and ASTM D 3017 (nuclear density and moisture testing) were performed before/during test pad construction.
9. A description of the methods used for subgrade preparation.
10. Copies of all field notes taken during test pad construction.

8. Operating Permit

When requesting the Operating Permit for the initial cell, three (3) copies of a written report shall be submitted containing all QA/QC data/results, as-built drawings, drawing(s) showing details of inter-phase berms, and a certification by a professional engineer who is registered in the state of Missouri stating that the landfill cell was constructed as per the department-approved engineering design plans and specifications. The certification shall be signed, or sealed, and dated by both the permittee and a professional engineer registered in the state of Missouri. The closure Financial Assurance Instrument (FAI) shall be submitted along with the request for the Operating Permit. The report, certification, and FAI shall be approved by the department's SWMP before the Operating Permit for the initial cell will be granted.

If an application for the Operating Permit for the initial cell of the solid waste disposal area is not received by the department within sixty (60) months of issuance of a Construction Permit, the applicant, prior to submittal of an Operating Permit Application, shall hold a public awareness and community involvement session, solicit comments, and respond to the comments; submit to the department for approval any necessary changes to the design and operating of the facility so as to be in compliance with currently applicable law and rules, and submit to the department an updated violation history disclosure statement.

9. Authorization to Operate

When requesting Authorization to Operate (ATO) for all subsequent cells, two (2) copies of a written report shall be submitted containing all QA/QC data/results, as-built drawings, drawing(s) showing the details of inter-phase berms and the tie-in of liner elements to previously constructed phases, and a Missouri registered professional engineer's certification that each was constructed as per the department-approved engineering design plans and specifications. The certification shall be signed, or sealed,

and dated by both the permittee and the Missouri registered professional engineer. The report and certification must be approved by the department's SWMP before an ATO for that cell will be issued. Additionally, the closure FAIs for the subsequent cells must be submitted and approved.

10. Surface Water Control

Before an Operating Permit will be issued, the permittee shall provide correspondence to the department showing that all applicable permits and design approvals have been acquired from the Missouri Department of Natural Resources' Water Protection Program, including the Antidegradation Review and Operating Permit Modification.

11. Air Pollution Control

Before an Operating Permit will be issued, the permittee shall provide correspondence to the department showing that all applicable permits and design approvals have been acquired from the Missouri Department of Natural Resources' Air Pollution Control Program.

12. Statistical Evaluation of Groundwater Data

- A. The department's SWMP shall be notified and allowed to review any changes in the statistical evaluation as they occur.
- B. The permittee shall notify the department's SWMP of any statistical deviations in the groundwater data as they occur.
- C. A minimum of eight (8) rounds of groundwater monitoring data must be collected prior to filling.

**SITE SPECIFIC CONDITIONS**

1. Subsequent Operating Permit & Local Approval

Permittee shall not dispose of coal combustion residuals unless and until so authorized by a subsequent operating permit issued under Section 260.205, RSMo. The Department will again seek local verification pursuant to Section 260.003, RSMo prior to issuance of an operating permit.

2. Pending Litigation

There are currently pending legal challenges to Franklin County's landfill ordinance and issuance of a local permit thereunder. Permittee shall suspend construction activities to the extent so ordered by a court of competent jurisdiction, subject to Permittee's appeal and bonding rights.

3. New federal rule regarding disposal of CCR from electric utilities

Permittee's authorization to commence construction is contingent upon the initial cell and all subsequent lateral expansions being constructed with a landfill base no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer. With respect to the site, such distance shall be measured from the ground surface as determined by the most recent land survey performed by the Permittee. As required by section 260.205.6 RSMo, prior to construction of the landfill base, Permittee shall submit to the Department by a registered professional engineer licensed by the State of Missouri, updated plans, designs, and relevant data in order to demonstrate compliance with this condition and to demonstrate the suitability of the fill material to be used to increase the elevation of the landfill base, and obtain Department approval prior to such construction.

## **DISPOSAL AREA DESCRIPTION**

The types of waste accepted shall consist of coal combustion by-products including, but not limited to, fly ash, bottom ash, boiler slag and flue gas desulfurization waste. The area fill method of utility waste landfill operation shall be utilized.

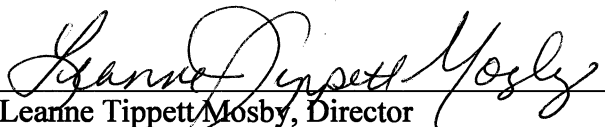
The excavation depths and solid waste fill locations shall be completed as shown on the approved engineering plans and specifications. Upon completion of the disposal area, the final cover shall be graded, limed, fertilized as necessary, and seeded with grasses to control erosion. Continued maintenance of the area shall be provided in accordance with the approved closure plan.

All fencing, gates, equipment maintenance buildings, all-weather access roads, signs, surface water control devices, leachate treatment facilities, operating equipment, standby equipment, and other necessary appurtenances shall be provided as per the approved plans, specifications, and operating procedures. The plans, specifications, and operating procedures described above have been examined as to engineering features of design which might affect the operation of the solid waste disposal area as a utility waste landfill.

**MODIFICATION AND TERMINATION OF PERMIT**

The department reserves the right to revoke, suspend, or modify Permit Number 0907101 if the permit holder fails to maintain the facility in compliance with the Missouri Solid Waste Management Law and regulations, the terms and conditions of the permit, and the approved engineering plans and specifications.

January 2, 2015  
Date of Permit

  
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Leanne Tippet Mosby, Director  
DIVISION OF ENVIRONMENTAL QUALITY

**GROUNDWATER MONITORING PROGRAM**  
Ameren Missouri Labadie Utility Waste Landfill  
Solid Waste Disposal Area Construction Permit Number 0907101  
Franklin County, Missouri

DATE: January 2, 2015

**A. INCORPORATED DOCUMENTS**

The following documents are incorporated by reference into the Groundwater Monitoring Program of Permit Number 0907101:

1. Engineering Appendix Q, Groundwater Sampling and Analysis Plan found in "Ameren Missouri Labadie Energy Center Construction Permit Application", prepared by Reitz & Jens, Inc. and GREDELL Engineering Resources, Inc., first received December 11, 2013, revised January 31, 2014, and
2. Engineering drawing number 3, "Project Overview" of the December 11, 2013, set of revised drawings for "Ameren Missouri Labadie Energy Center Construction Permit Application", prepared by GREDELL Engineering Resources, Inc. and signed by Thomas R. Gredell, P.E., certifying professional engineer registered in Missouri.
3. This document, prepared by the Solid Waste Management Program titled "GROUNDWATER MONITORING PROGRAM Ameren Missouri Labadie Utility Waste Landfill," dated January 2, 2015 is hereby incorporated by reference into solid waste Permit Number 0907101.

**B. MONITORING WELLS**

The groundwater monitoring network of the Ameren Missouri Labadie Utility Waste Landfill shall consist of thirty-five (35) permanent monitoring wells and one (1) temporary monitoring well. This monitoring system will be used to monitor groundwater flowing beneath the landfill. Eight (8) monitoring wells are designated as generally upgradient and twenty-seven (27) monitoring wells are designated as generally downgradient. TMW-1 is to serve as a sentry well during Cell 1 development and will be removed from the network at a later date.

The Missouri Department of Natural Resources' Solid Waste Management Program (SWMP) and the Missouri Geological Survey (MGS) shall review any changes in direction of groundwater flow from potentiometric surface maps and as waste filling progresses in the landfill. The department's SWMP shall review all groundwater monitoring data to evaluate statistical determinations.

The proposed monitoring wells listed in Table I below are those for which Ameren Missouri Labadie Utility Waste Landfill is responsible for monitoring, including purging, field observations, sampling, chemical analysis and reporting of representative samples from the Ameren Missouri Labadie Utility Waste Landfill. For consistency in designations, the department's SWMP will use the monitoring point designations as shown in Table I.

These designations shall appear on subsequent electronic submissions of groundwater data and groundwater monitoring reports. These monitoring designations shall be referenced in future correspondence associated with this permit.

**Table I**

COMPLIANCE STATUS (SUBJECT TO CHANGE BY THE SWMP AND MGS)	APPROVED GROUNDWATER MONITORING SYSTEM WELLS & LOCATIONS	MONITORING WELL DESIGNATIONS FOR SAMPLING & REPORTING
Compliance	<b>Monitoring well 1</b> located at: N 995572 / E 727213	MW-1
Compliance	<b>Monitoring well 2</b> located at: N 995657 / E 727664	MW-2
Compliance	<b>Monitoring well 3</b> located at: N 995740 / E 728101	MW-3
Compliance	<b>Monitoring well 4</b> located at: N 995818 / E 728546	MW-4
Compliance	<b>Monitoring well 5</b> located at: N 995546 / E 728819	MW-5
Compliance	<b>Monitoring well 6</b> located at: N 995177 / E 729227	MW-6
Compliance	<b>Monitoring well 7</b> located at: N 994621 / E 729411	MW-7
Compliance	<b>Monitoring well 8</b> located at: N 994383 / E 729643	MW-8
Compliance	<b>Monitoring well 9</b> located at: N 994168 / E 729893	MW-9
Compliance	<b>Monitoring well 10</b> located at: N 993950 / E 730149	MW-10



COMPLIANCE STATUS (SUBJECT TO CHANGE BY THE SWMP AND MGS)	APPROVED GROUNDWATER MONITORING SYSTEM WELLS & LOCATIONS	MONITORING WELL DESIGNATIONS FOR SAMPLING & REPORTING
Compliance	<b>Monitoring well 11</b> located at: N 993725 / E 730398	MW-11
Compliance	<b>Monitoring well 12</b> located at: N 993470 / E 730662	MW-12
Compliance	<b>Monitoring well 13</b> located at: N 993256 / E 730913	MW-13
Compliance	<b>Monitoring well 14</b> located at: N 993052 / E 731166	MW-14
Compliance	<b>Monitoring well 15</b> located at: N 992807 / E 731406	MW-15
Compliance	<b>Monitoring well 16</b> located at: N 992618 / E 731651	MW-16
Compliance	<b>Monitoring well 17</b> located at: N 992302 / E 731675	MW-17
Compliance	<b>Monitoring well 18</b> located at: N 991678 / E 730928	MW-18
Compliance	<b>Monitoring well 19</b> located at: N 992089 / E 730178	MW-19
Compliance	<b>Monitoring well 20</b> located at: N 991669 / E 729952	MW-20
Compliance	<b>Monitoring well 21</b> located at: N 991334 / E 729950	MW-21
Compliance	<b>Monitoring well 29</b> located at: N 995679 / E 726962	MW-29

COMPLIANCE STATUS (SUBJECT TO CHANGE BY THE SWMP AND MGS)	APPROVED GROUNDWATER MONITORING SYSTEM WELLS & LOCATIONS	MONITORING WELL DESIGNATIONS FOR SAMPLING & REPORTING
Compliance	<b>Monitoring well 30</b> located at: N 995760 / E 727409	MW-30
Compliance	<b>Monitoring well 31</b> located at N 995836 / E 727854	MW-31
Compliance	<b>Monitoring well 32</b> located at: N 995914 / E 728306	MW-32
Compliance	<b>Monitoring well 33(D)</b> located at: N 995750 / E 727359	MW-33(D)
Compliance	<b>Monitoring well 34(D)</b> located at: N 995544 / E 728880	MW-34(D)
Background	<b>Monitoring well 22</b> located at: N 990929 / E 729355	MW-22
Background	<b>Monitoring well 23</b> located at: N 991099 / E 728511	MW-23
Background	<b>Monitoring well 24</b> located at: N 991819 / E 727992	MW-24
Background	<b>Monitoring well 25</b> located at: N 992707 / E 727529	MW-25
Background	<b>Monitoring well 26</b> located at: N 993976 / E 726911	MW-26
Background	<b>Monitoring well 27</b> located at: N 994664 / E 726608	MW-27

COMPLIANCE STATUS (SUBJECT TO CHANGE BY THE SWMP AND MGS)	APPROVED GROUNDWATER MONITORING SYSTEM WELLS & LOCATIONS	MONITORING WELL DESIGNATIONS FOR SAMPLING & REPORTING
Background	<b>Monitoring well 28</b> located at: N 995276 / E 726640	MW-28
Background	<b>Monitoring well 35(D)</b> located at: N 992613 / E 727529	MW-35(D)
Compliance	<b>Temporary monitoring well 1</b> located at: N 993783 / E 728657	TMW-1

For each monitoring event, prepurging water level elevations from all monitoring wells shall be recorded and the data electronically submitted to the department's SWMP in a separate file concurrent with the results of Appendix I groundwater sampling analytical testing. The department's MGS shall be notified 72 hours prior to mobilization of any drilling so that on-site technical assistance can be provided to the driller and site manager.

Any field investigations shall include a descriptive log as noted in the department's guidance document entitled, APPENDIX 1, GUIDANCE FOR CONDUCTING AND REPORTING DETAILED GEOLOGIC AND HYDROLOGIC INVESTIGATIONS AT A PROPOSED SOLID WASTE DISPOSAL AREA. At the time of construction of any new monitoring well, full details concerning the drilling procedures and development shall be reported to the department's SWMP and the department's MGS before the department will grant approval for each well. The information and data submitted to the department's SWMP and the department's MGS shall include, but not be limited to, the following:

1. Depth and lithologic description of all water bearing or saturated zones encountered during drilling;
2. Descriptions of all geologic materials encountered and sampled during drilling, including: lithology, mineralogy, texture, grain size, color, fossil occurrence, percent sample recovery, and primary/secondary porosity features;
3. Changes in porosity and degrees of saturation of all geologic materials encountered, (e.g., dry, damp, moist, wet, and/or saturated) including their associated depths from the ground surface;

4. Water level depths measured from the ground surface immediately following daily final drilling activity and measured preceding any subsequent drilling activity;
5. Complete records of drilling fluid volumes, including any lost fluid volumes and depths at which they are lost;
6. Complete records of recovered (lost) fluids prior to installation and development of well;
7. A description of all sources and chemical analyses of potable water used in drilling or boring, analyzing for the same chemical parameters as specified in the enclosed groundwater parameters to establish baseline groundwater quality;
8. Complete details or methods(s) of drilling, including starting and ending times, depth and location of any drilling equipment refusals;
9. Measurements of drilling rate, including pressure gauges or weights on bit read during drilling and coring;
10. Measurements of soil sampling advance (e.g., loads on the sampling device as specified by the weight or number of blow counts to sample and/or refusal);
11. Complete details of well development, including starting and ending times;
12. Appearance of well fluids before, during, and after development;
13. Records of indicator parameters monitored throughout development;
14. Initial and final water levels immediately prior and immediately after development;
15. Initial well bore fluid volume (gallons);
16. Initial depth of well prior to development in feet from a specified point;
17. Total depth of well immediately after development from a specified point;
18. Total volume (gallons) evacuated during development;
19. Completed copies of all field notes;
20. Complete copies of monitoring well construction summaries having north and east location survey coordinates;

21. Complete copies of monitoring well boring logs having detailed soil and lithologic graphics/descriptions; and
22. Complete copies of the Monitoring Well Certification Record.

Existing or new wells improperly constructed, or screened to monitor improper or inadequate zones shall be abandoned as per 10 CSR 23-4.

All wells shall be constructed in accordance with Missouri Department of Natural Resources' Well Construction Codes, 10 CSR 23-1 through 6.

As per monitoring well construction standards cited above, each well borehole shall be at least four (4) inches larger than the outside diameter of the casing used.

Well construction (including locking cap security casing) shall be completed the same day the well casing is installed.

No wells shall be located in swales, drainage ditches, or any place where water can accumulate around the well. Proposed monitoring well locations are based on hydrogeologic and topographic information, and do not take into account the location of any man-made alterations to the site. Alternate locations, upon prior approval, may be accepted if conflicts arise with the proposed locations.

### C. SAMPLING FREQUENCY/PARAMETERS

#### 1. Baseline and Background Sampling

Prior to filling in a phase/cell, baseline groundwater sampling shall be conducted. The appropriate number of background samples being the greater of four (4) quarters of independent samples as described in 10 CSR 80-11.010(11)(C)3 or required pursuant to the statistical method approved for the site as per 10 CSR 80-11.010(11)(C)5 for all monitoring wells designated in this document. A minimum of eight (8) independent samples shall be taken over the first eight (8) quarters after the date of development of any new monitoring well. Each of these baseline samples shall be analyzed for the groundwater monitoring parameters contained in the enclosed list titled Groundwater Monitoring Parameters. During baseline sampling, compliance monitoring wells shall be sampled during the first, second, third, and fourth quarters of a year for the parameters contained in the enclosed list.

Subsequent to the first eight (8) quarters of baseline monitoring, the background database for each monitoring well will continuously be updated with detection monitoring data as described in "Groundwater Monitoring Plan" Appendix Q of the approved permit application. A report detailing the graphical and mathematical evaluation of historic and background groundwater data, including recommendations

for intrawell or interwell statistical analysis shall be provided to the SWMP prior to issuance of any authorization to operate within the disposal area.

2. Detection Monitoring

After the previously described eight (8) quarters of baseline sampling have been completed, all monitoring wells shall be sampled semi-annually in November and May for the parameters contained in the enclosed table entitled Groundwater Monitoring Parameters. Historic detection monitoring sampling results from existing monitoring wells must be compiled in electronic format and submitted to the SWMP prior to issuance of any authorization to operate within the disposal area.

All sampling results shall be submitted electronically to the department's SWMP within ninety (90) days from the date the sample is obtained. Data must be submitted in the precise format as prescribed at <http://www.dnr.mo.gov/env/swmp/gdwtrsub.htm>. Written reports detailing sampling activities and statistical analysis must be submitted to the SWMP within ninety (90) days from the date the sample is obtained. Reports must be bound and in duplex format.

3. Assessment Monitoring

The Permittee shall follow the procedures outlined in 10 CSR 80-11.010(11)(C)6 as a response to statistical analysis of significant difference in groundwater sampling results.

**D. GROUNDWATER MONITORING PROGRAM**

Statistical analyses of groundwater data or additional hydrogeologic characterization through subsurface sampling and testing could alter the interpretation of previous hydrogeologic investigations. Approval of this Groundwater Monitoring Program does not preclude it from any future revision.

**E. INQUIRIES**

All inquiries concerning these reporting procedures and/or any discussion of possible deviations from these reporting procedures shall first be directed to the department's SWMP at 573-751-5401 for consideration by the department.

**List of 10 CSR 80-11- Appendix I  
 GROUNDWATER MONITORING PARAMETERS\***

Constituent Name (Appendix I) ***	Constituent Abbreviation	Reporting Unit	Constituent Name (Appendix I)	Constituent Abbreviation	Reporting Unit
Aluminum	Al	ug/l	Magnesium	Mg	mg/l
Antimony	Sb	ug/l	Manganese	Mn	ug/l
Arsenic	As	ug/l	Mercury	Hg	ug/l
Barium	Ba	ug/l	Molybdenum	Mo	mg/l
Beryllium	Be	mg/l	Nickel	Ni	mg/l
Boron	B	ug/l	pH **	----	S.U.
Cadmium	Cd	ug/l	Selenium	Se	ug/l
Calcium	Ca	mg/l	Silver	Ag	ug/l
Chemical Oxygen Demand	COD	mg/l	Sodium Specific	----	umhos/c m
Chloride	Cl	mg/l	Conductance **		
Chromium	Cr	ug/l	Sulfate	SO4	mg/l
Cobalt	Co	ug/l	Thallium	TI	ug/l
Copper	Cu	ug/l	Total Dissolved Solids	TDS	mg/l
Fluoride	Fl	mg/l	Total Organic Carbon	TOC	mg/l
Hardness	Calculated	mg/l	Total Organic Halogens	TOX	mg/l
Iron	Fe	ug/l	Zinc	Zn	ug/l
Lead	Pb	ug/l			

\* Groundwater Elevations are a required parameter and must be collected prior to purging

\*\* ALL FIELD OBSERVATIONS SHOULD BE REPORTED ON THE CHAIN-OF-CUSTODY FORM AND SUBMITTED FROM THE LABORATORY IN THE ELECTRONIC FORMAT DESCRIBED BY THE DEPARTMENT.

\*\*\* ALL METALS ARE TOTAL ANALYSIS - DO NOT FIELD FILTER SAMPLES

