PROPOSED AMENDMENT

10 CSR 80-11.010-Design and Operation--Utility Waste and Coal Combustion Residuals Landfills. The Department is amending the rule title, purpose, sections (1), (2), (4), (5), (6), (7), (8), (11), (12), (13), (14), (16), and (17), deleting sections (3) and (10) and adding sections (3), (5), (15), (18), (19), and (20).

PURPOSE: The purpose of this amendment is to modify the provisions for Utility Waste Landfills and make those provisions applicable to Coal Combustion Landfills as specified in 40 CFR 257 and section 260.242, RSMo.

PURPOSE: This rule pertains to the design and operation of a utility waste landfill.

(1) General Provisions. This rule is intended to provide for utility waste landfill operations that will have minimal impact on the environment. The rule sets forth requirements and the method of satisfactory compliance to ensure that the design, construction and operation of utility waste landfills will protect the public health, prevent nuisances and meet applicable environmental standards. The requirement subsections contained in this rule delineate minimum levels of performance required of any utility waste landfill operation. The satisfactory compliance subsections are presented as the authorized methods by which the objectives of the requirements can be realized. The satisfactory compliance subsections are based on the practice of landfilling utility waste. If techniques other than those listed as satisfactory compliance in design or operation are used, it is the obligation of the utility waste landfill owner/operator to demonstrate to the department in advance that the techniques to be employed will satisfy the requirements. Procedures for the techniques shall be submitted to the department in writing and approved by the department in writing prior to being employed. Notwithstanding any other provision of these rules, when it is found necessary to meet objectives of the requirement subsections, the department may require changes in design or operation as the condition warrants. This rule applies to new utility waste landfill construction and operating permits issued on or after the effective date of this rule.

(2) Solid Waste Accepted.
   (A) Requirement. Fly ash, bottom ash, boiler slag or other slag waste and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels may be accepted at a utility waste landfill. Clean fill may also be accepted.
   (B) Satisfactory Compliance--Design. The plans shall specify the types of waste to be accepted for disposal at a utility waste landfill.
   (C) Satisfactory Compliance--Operations.
      1. The first layer of waste placed above the liner shall be monitored to ensure that the liner's integrity has been maintained.
2. The disposal of waste approved in the construction permit shall be conducted in accordance with approved design and operating plans plus any additional procedures determined by the department as necessary to protect the water, air and land resources and to provide for safety of the operators and waste haulers.

(3) Solid Waste Excluded.

(A) Requirement. In consultation with the department, the applicant shall determine what wastes are to be accepted and shall identify them in the plan and the application for construction permit form.

(B) Satisfactory Compliance--Design.

1. The criteria used to determine whether the waste can be accepted shall include the design of the landfill, the physical and chemical characteristics of the wastes, the quantity of the wastes, the proposed operating procedures.

2. The plans shall specify the operating procedures for screening and removal of wastes which are excluded from disposal.

(C) Satisfactory Compliance--Operations.

1. The operating procedures for screening of wastes and for removal of wastes which are excluded from disposal shall be implemented.

2. Bulk liquid waste shall not be placed in a utility waste landfill unless the waste is leachate derived from the utility waste landfill, and the utility waste landfill is designed with a liner and leachate collection system as described in sections (9) and (10) of this rule.

3. Sluicing of waste for transport to proposed utility waste landfills shall be allowed only so long as the hydraulic head on top of the landfill liner can be maintained at less than one foot (1') of head, and the collected leachate and runoff meet all Water Pollution Control Program permit requirements.

(4) Site Selection.

(A) Requirement. Site selection and utilization shall include a study and evaluation of geologic and hydrologic conditions and soils at the proposed utility waste landfill and an evaluation of the environmental effect upon the projected use of the completed utility waste landfill. Applications for utility waste landfill construction permits received on or after the effective date of this rule shall document compliance with all applicable siting restriction requirements contained in paragraphs (4)(B)1. through 5. of this rule.

(B) Satisfactory Compliance--Design.

1. Owners/operators of proposed utility waste landfills, located in one hundred (100)-year floodplains shall demonstrate to the department that the utility waste landfill will not restrict the flow of the one hundred (100)-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of waste so as to pose a hazard to public health or the environment.

2. Wetlands.

   A. Proposed utility waste landfills shall not be located in wetlands, unless the owner/operator can make the following demonstrations to the department:

      (I) The presumption that a practicable alternative to the proposed landfill is available which does not involve wetlands is clearly rebutted;

      (II) The construction and operation of the utility waste landfill will not--
(a) Cause or contribute to violations of any applicable state water quality standard;
(b) Violate any applicable toxic effluent standard or prohibition under section 307 of the federal Clean Water Act;
(c) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and
(d) Violate any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary;

(III) The utility waste landfill will not cause or contribute to significant degradation of wetlands. The owner/operator shall demonstrate the integrity of the utility waste landfill and its ability to protect ecological resources by addressing the following factors:

(a) Erosion, stability and migration potential of native wetland soils, muds and deposits used to support the landfill;
(b) Erosion, stability and migration potential of dredged and fill materials used to support the landfill;
(c) The volume and chemical nature of the waste disposed of in the landfill;
(d) Impacts on fish, wildlife and other aquatic resources and their habitat from potential release of waste from the landfill;
(e) The potential effects of contamination of the wetland and the resulting impacts on the environment; and
(f) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected;

(IV) Steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent practicable as required by subparagraph (4)(B)2.A. of this rule, then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions (for example, restoration of existing degraded wetlands or creation of man-made wetlands); and

(V) The requirements of paragraph (4)(B)3. may be satisfied by the owner/operator obtaining a United States Army Corps of Engineers permit for construction in a wetland or by demonstrating that the wetland is not regulated by the United States Army Corps of Engineers or other appropriate agency.

3. Proposed utility waste landfills located in the seismic impact zone shall not be located within two hundred feet (200') of a fault that has had displacement in Holocene time unless that owner/operator demonstrates to the department that an alternative setback distance of less than two hundred feet (200') will prevent damage to the structural integrity of the landfill and will be protective of public health and the environment.

4. Owners/operators of proposed utility waste landfills located in an unstable area shall demonstrate to the department that the utility waste landfill’s design ensures that the integrity of the structural components of the utility waste landfill will not be disrupted. The owner/operator shall consider the following factors, at a minimum, when determining whether an area is unstable:
A. On-site or local rock or soil conditions that may result in failure or significant differential settling;
B. On-site or local geologic or geomorphologic features; and
C. On-site or local human-made features or events (both surface and subsurface).

5. Plans shall include:
A. A map showing initial and proposed topographies at contour intervals of five feet (5') or less. This map shall have a scale of not less than one inch (1") equal to one hundred feet (100'). If the entire site cannot be illustrated on one (1) plan sheet, an additional map with appropriate horizontal and vertical scales that allows the site to be shown on one (1) plan sheet is required;
B. A map showing the land use and zoning within one-fourth (1/4) mile of the utility waste landfill including location of all residences, buildings, wells, water courses, springs, lakes, rock outcroppings, caves, sinkholes and soil or rock borings. All electric, gas, water, sewer and other utility easements or lines that are located on, under or over the utility waste landfill shall be shown on the map. This map shall have a scale of not less than one inch (1") equals four hundred feet (400');
C. A description of the projected use of the closed utility waste landfill if the landfill is not located on the power plant site. In addition to maintenance programs and provisions, where necessary for monitoring and controlling leachate, the plans shall specify appropriate design, construction and operating provisions for the utility waste landfill to complement the projected future use;
D. An evaluation of the characterististics and quantity of available on-site soil with respect to its suitability for utility waste landflling operations. The engineering properties and quantity estimates of the on-site soil shall be discussed and shall include:
   (I) Texture. Sieve and hydrometer analyses shall be performed to determine grain size distribution of representative soil samples. Texture may be determined by using the procedures described in ASTM method D422-63 or the procedures described in Appendix D of Engineer Manual 1110-2-1906 prepared by the United States Army Corps of Engineers;
   (II) Plasticity. The liquid limit, plastic limit and plasticity index of representative soil samples shall be determined. Plasticity may be determined by using the procedures described in ASTM method D4318-84 or the procedures described in Appendix III of Engineer Manual 1110-2-1906, prepared by the United States Army Corps of Engineers;
   (III) Hydraulic conductivity. Laboratory hydraulic conductivity tests shall be performed upon undisturbed representative soil samples using a flexible wall permeameter (ASTM D-5084). If an aquifer is found to be laterally continuous across the anticipated limit of the proposed landfill, the hydraulic conductivity of each significant continuous geologic unit must be determined. Examples of accepted field tests are in situ slug or pump tests which isolate the geologic unit of interest.
   (IV) Areal extent and depth. The areal extent and depth of soil suitable for landfill construction shall be determined. Variations in soil depth shall be clearly described.
6. If the base of the landfill liner will be in contact with groundwater, the applicant shall demonstrate to the department’s satisfaction that the groundwater will not adversely impact the liner.

7. Owners/operators of proposed utility waste landfills shall demonstrate how adverse geologic and hydrologic conditions may be altered or compensated for via surface water drainage diversion, underdrains, sumps, and other structural components. All alterations of the site shall be detailed in the plans. Precipitation, evapotranspiration and climatological conditions shall be considered in site selection and design.

8. The results of the detailed site investigation report will be the basis to determine if a secondary liner, such as a geomembrane, or a leachate collection system is mandatory to ensure that there is no environmental impact from the landfill. Owner/operators of proposed utility waste landfills shall make a demonstration based on the following:
   A. An evaluation of the physical and/or chemical characteristics of the waste; and
   B. Documentation through modeling, testing, or other research data proving that the quality of groundwater underlying the proposed site will not be affected and that there is no potential for migration of fluids from the utility waste landfill.

(C) Satisfactory Compliance—Operations.

1. The utility waste landfill shall be accessible to vehicles which the utility waste landfill is designed to serve.

2. Temporary storage of waste for more than sixty (60) days is not permitted. Temporarily stored wastes shall be managed so as to prevent uncontrolled surface water runoff and erosion. All Water Pollution Control Program permits and approvals necessary to comply with the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(5) Design.

(A) Requirement. Plans, addendums, as-built drawings, or other documents which describe the design, construction, operation, or closure of a utility waste landfill or which request an operating permit modification for the utility waste landfill shall be prepared or approved by a professional engineer. These documents shall be stamped or sealed by the professional engineer and submitted to the department for review and approval.

1. Plans submitted as part of an application for a construction permit after the effective date of this rule shall provide for the maintenance of a one hundred foot (100')-buffer zone between utility waste landfill operations and any property line(s) or any right of way(s) of adjoining road(s) when the property line(s) is inside the right of way(s) to provide for assessment and/or remedial actions.

2. The plan shall include an operating manual describing the various tasks that shall be performed during a typical shift.

3. Owners/operators of utility waste landfills shall demonstrate how adverse geologic and hydrologic conditions may be altered or compensated for via surface water drainage diversion, underdrains, sumps, and other structural components. All alterations of the site shall be detailed in the plans.
   A. Precipitation, evapotranspiration and climatological conditions shall be considered in site selection and design.
   B. Engineering plans and specifications that have computer model attached to them shall list the limitations and assumptions of each model used in the application.
4. Plans for stability analyses for all stages of construction shall include:
   A. Settlement and bearing capacity analyses shall be performed on the in-place foundation material beneath the disposal area. The effect of foundation material settlement on the liner and leachate collection shall be evaluated;
   B. Stability analyses shall be performed on all liner and leachate system components;
   C. Leachate collection pipe material and drainage media shall be analyzed to demonstrate that these components possess structural strength to support maximum loads imposed by overlying waste materials and equipment;
   D. Waste mass stability analyses shall be performed on the disposal area at final waste grade conditions and at intermediate slope conditions; and
   E. Stability analyses shall be performed on all final cover system components, including an evaluation of the effect of waste settlement on the final cover system components, side slope liner system components, surface water management system components and gas migration system components.

(B) Satisfactory Compliance--Operations.
   1. Construction and operation of the utility waste landfill shall be conducted in accordance with the engineering plans and specifications approved by the department.
   2. The operating manual describing the various tasks that shall be performed during a typical shift shall be available to employees for reference and to the department upon request.
   3. Phase development drawings shall be included with the application.

(6) Quality Assurance/Quality Control (qa/qc).
   (A) Requirement. The construction, operation and closure of the utility waste landfill shall include quality assurance and quality control measures to ensure compliance with approved plans and all applicable federal, state and local requirements. The permittee shall be responsible for ensuring that the qa/qc supervision is conducted by a qualified professional.
   (B) Satisfactory Compliance--Design.
      1. Plans shall include:
         A. A detailed description of the qa/qc testing procedures that will be used for every major phase of construction. The description must include at a minimum, the frequency of inspections, field testing, laboratory testing, equipment to be utilized, the limits for test failure, and a description of the procedures to be used upon test failure; and
         B. A detailed procedure for the reporting and recording of qa/qc activities and testing results.
      2. All qa/qc reports shall be reviewed and approved by a professional engineer.
   (C) Satisfactory Compliance--Operations.
      1. At a minimum qa/qc testing shall include:
         A. Testing of each lift of the soil component of the final cover and landfill liner for field density and field moisture once per every ten thousand (10,000) square feet and providing relatively uniform coverage over the landfill surface;
         B. Laboratory hydraulic conductivity testing of the soil used for liner construction once for every five thousand (5,000) cubic yards of liner constructed;
         C. Continuous visual classification of borrow soil during landfill construction by qualified qa/qc inspector(s) or certifying professional engineer;
D. Measuring the elevations of the final cover and the landfill liner on a maximum spacing of one hundred-foot (100') centers and at one hundred-foot (100') intervals along each line where a break in slope occurs.
   (I) Landfill liner. Measuring the elevations of the top and bottom of the landfill liner;
   (II) Final cover. Measuring the elevations of the top and bottom of--
      (a) The compacted clay layer; and
      (b) The soil layer supporting vegetative growth; and
E. Verification of the thickness of the leachate collection media shall be made by the qualified qa/qc inspector(s) or certifying professional engineer on one hundred-foot (100') centers.

2. If a geomembrane is proposed--
   A. Nondestructive testing of all seams of the geomembrane in the landfill liner; and
   B. Random destructive testing of the seams of the geomembrane liner in the landfill liner on an average frequency of at least one (1) every five hundred (500) linear feet of seams.

3. All testing shall be performed under the direction of qualified qa/qc inspectors for every major phase of construction.

4. The qa/qc plan shall include the following components:
   A. Leachate collection system. Reports prepared or approved by the professional engineer transmitting the results of the qa/qc procedures and stating that the leachate collection system was constructed according to the approved design or describing any deviations from the approved design; and
   B. Liner. The liner specified by section (10) of this rule shall be constructed in accordance with the approved design specifications. The qa/qc procedures shall include:
      (I) Evidence that the liner material(s) utilized meet the minimum design specifications;
      (II) Evidence that field construction techniques are resulting in the minimum design specifications (for example, soil density tests);
      (III) Evidence that the liner construction is proceeding as designed through regular verification using a predetermined system of horizontal and vertical survey controls; and
      (IV) Oversight of the liner construction and qa/qc procedures by a professional engineer. This shall include reports prepared, or approved, by the professional engineer transmitting the results of the qa/qc procedures and stating that the liner was constructed according to design or describing any deviations from the design.

(7) Survey Control.
   (A) Requirement. Benchmarks, horizontal controls and boundary markers shall be established by a land surveyor to check and mark the location and elevations of the utility waste landfill. Construction stakes marking an individual section(s) or phase(s) shall be established as necessary to ensure the construction and operation(s) proceed in accordance with approved plans.
   (B) Satisfactory Compliance--Design.
1. **Boundary survey.** A survey of the entire permitted acreage shall be conducted in accordance with the current Minimum Standards for Property Boundary Surveys, 10 CSR 30-2.010.

2. **Vertical control.** The land surveyor shall establish a permanent monument as a benchmark or confirm the prior establishment of a benchmark on or adjacent to the property. The elevation shall be on the North American Vertical Datum, 1929 or similar well-documented datum. If no such established datum exists within one (1) mile of the property, a project datum may be assigned to the benchmark. The benchmark shall be clearly shown on the survey plat.

3. **Horizontal control.** The land surveyor shall establish three (3) permanent monuments as horizontal control stations. These stations shall form a triangle whose sides shall not be less than one thousand feet (1,000'). The location of the horizontal control will be shown on the survey plat.

4. The land surveyor shall establish boundary markers designating the entire permitted acreage which shall be composed of material which will last throughout the life of the utility waste landfill.

5. **Construction stakes.** Stakes marking the individual section(s) or phase(s) specifically designated for the placement of waste are to be placed in locations and composed of material that is consistent with the operating life of the section or phase.

(C) **Satisfactory Compliance--Operations.**

1. All boundary markers, benchmarks, horizontal control stations and construction stakes shall be clearly marked and identified.

2. Missing or displaced benchmarks or horizontal control stations shall be replaced or reestablished by or under the supervision of a land surveyor. The registered surveyor shall prepare a plat showing the replacement or reestablishment and furnish a copy to the department.

3. Missing or displaced construction stakes shall be replaced or reestablished as necessary to ensure the operations proceed in accordance with approved plans.

4. The permanent monuments designating vertical and horizontal control stations and boundary markers designating the entire permitted acreage shall be placed prior to receiving an operating permit as required by 10 CSR 80-2.020(2)(B).

5. Construction stakes marking the active area shall be placed prior to deposition of waste in individual areas, sections or phases of the utility waste landfill as designated by the approved engineering plans.

(8) **Water Quality.**

(A) **Requirement.** The location, design, construction and operation of the utility waste landfill shall minimize environmental hazards and shall conform to applicable ground and surface water quality standards and requirements. Applicable standards are federal, state or local standards and requirements that are legally enforceable.

(B) **Satisfactory Compliance--Design.**

1. Plans shall include:

   A. A report on the detailed geologic and hydrologic investigation of the site as required by 10 CSR 80-2.015;

   B. Current and projected use of water resources in the potential zone of influence of the utility waste landfill;
C. Groundwater elevation and proposed separation between the lowest point of the lowest cell and the predicted maximum water table elevation;
D. Potential interrelationship of the utility waste landfill, local aquifers and surface waters based on historical records or other sources of information;
E. Proposed location and design of observation wells, sampling stations and testing program planned; and
F. Provisions for surface water runoff control to minimize infiltration and erosion of cover. All Water Pollution Control Program permits and approvals necessary to comply with requirements of the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(I) The area of the watershed which will be affected by the utility waste landfill shall be specified.

(II) On-site drainage structures and channels shall be designed to prevent flow onto the active portion of the utility waste landfill during peak discharge from at least a twenty-five (25)-year storm. The engineering calculations and assumptions shall be included and explained in the engineering report.

(III) On-site drainage structures and channels shall be designed to collect and control at least the water volume resulting from a twenty-four (24)-hour, twenty-five (25)-year storm.

(IV) On-site drainage and channels shall be designed to empty expeditiously after storms to maintain the design capacity of the system.

(V) Contingency plans for on-site management of surface water which comes in contact with solid waste shall be specified.

(C) Satisfactory Compliance--Operations.

1. Surface water courses and runoff shall be diverted from the utility waste landfill (especially from the working face) by devices such as ditches, berms, and proper grading. The utility waste landfill shall be constructed and graded so as to promote rapid surface water runoff without excessive erosion. Regrading shall be done as required during construction and after completion to avoid ponding of precipitation and to maintain cover integrity.

2. The quantity of water coming in contact with solid waste shall be minimized by the daily operational practices. Water which comes in contact with the waste shall be managed as leachate in accordance with the approved plans.

(9) Leachate Collection Systems.

(A) Requirement. A leachate collection system shall be designed, constructed, maintained and operated to collect, and remove leachate from the utility waste landfill, unless the applicant provides adequate demonstrations specified in paragraph (4)(B)8. of this rule, and as determined by the department on a site-by-site basis.

(B) Satisfactory Compliance--Design. The potential for leachate generation shall be evaluated in determining the design of the system. Leachate flow quantities shall be estimated and the method(s) of leachate management shall be outlined. Leachate storage facilities shall comply with all currently applicable requirements of the Missouri Clean Water Law and corresponding rules. Construction qa/qc procedures shall be included. Where a leachate treatment system is designed to have a discharge to the waters of the state, any required
discharge permit(s) shall be obtained from the department in accordance with requirements of the Missouri Clean Water Law and corresponding rules.

1. Minimum design criteria for leachate collection systems shall include the following:
   A. Ponds and/or tanks of sufficient capacity to store, equalize flow to disposal systems, and allow system/operating flexibility;
   B. Construction material chemically resistant to the waste managed in the utility waste landfill and the leachate expected to be generated;
   C. Construction materials of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying utility wastes, cover, leachate, and by any equipment used at the utility waste landfill;
   D. Design and operate systems to function without clogging through the scheduled operating life, closure and post-closure of the utility waste landfill;
   E. Design and operate to maintain less than one foot (1') depth of leachate over the disposal area liner; and
   F. Design and operate collection systems so that any leachate formed will flow by gravity into collection areas from which the leachate can be removed, treated, and disposed.

2. Leachate management by recirculation within the permitted fill area shall be conducted in accordance with an approved engineering method.

3. Any leachate collection system open to the atmosphere must be designed to prevent discharge during a twenty-five (25)-year, twenty-four (24)-hour storm event. Plans shall include the calculations detailing the design.

4. The applicant shall provide a method of leachate management in the application. A secondary or "backup" method of leachate disposal will be required unless the applicant can demonstrate that a secondary method will not be necessary.

(C) Satisfactory Compliance--Operations.

1. The leachate collection system specified by subsection (9)(B) shall be properly installed and operated in accordance with the permit and the approved design and plans and maintained for the twenty (20)-year post-closure care period, or as long as the department determines necessary.

2. Leachate generated by the utility waste landfill shall be controlled on-site and not be allowed to discharge off the utility waste landfill property or discharge into the waters of the state, except in accordance with the approved plans and the Missouri Clean Water Law and corresponding rules.

(10) Liner System.

(A) Requirement. A liner shall be placed on all surfaces to minimize the migration of leachate from the utility waste landfill.

(B) Satisfactory Compliance--Design. A composite or a clay liner shall be required at all utility waste landfills applying for a construction permit after the effective date of this rule that includes--

1. For a composite liner a lower component that consists of at least a two-foot (2') layer of compacted soil with a hydraulic conductivity of no more than $1 \times 10^{-5}$ cm/sec. A compacted soil liner at a minimum shall be constructed of six to eight-inch (6 8") lifts, compacted to ninety-five percent (95%) of standard Proctor density with the moisture content between optimum moisture content and four percent (4%) above the optimum
moisture content, or within other ranges of density and moisture such that are shown to provide for the liner to have a hydraulic conductivity no more than $1 \times 10^{-5}$ cm/sec. For a single compacted clay liner a component that consists of at least a two-foot (2') layer of compacted soil with a hydraulic conductivity of no more than $1 \times 10^{-7}$ cm/sec. A compacted soil liner at a minimum shall be constructed of six to eight-inch (6 8") lifts, compacted to ninety-five percent (95%) of standard Proctor density with the moisture content between optimum moisture content and four percent (4%) above the optimum moisture content, or within other ranges of density and moisture such that are shown to provide for the liner to have a hydraulic conductivity no more than $1 \times 10^{-7}$ cm/sec. The design shall include a detailed explanation of the construction techniques and equipment necessary to achieve ninety-five percent (95%) of the standard Proctor density under field conditions. The design also shall include qa/qc procedures to be followed during construction of the liner. The composite liner and the compacted clay liner shall be protected from the adverse effects of desiccation or freeze/thaw cycles after construction, but prior to placement of waste. Traffic shall be routed so as to minimize the detrimental impact on the constructed liner prior to placement of waste. The soils used for this purpose shall meet the following minimum specifications:

A. Be classified under the Unified Soil Classification Systems as CL, CH, or SC (ASTM Test D2487-85);
B. Allow more than thirty percent (30%) passage through a No. 200 sieve (ASTM Test D1140);
C. Have a liquid limit equal to or greater than twenty (20) (ASTM Test D4318-84);
D. Have a plasticity index equal to or greater than ten (10) (ASTM Test D4318-84); and
E. Have a coefficient of permeability equal to or less than $1 \times 10^{-7}$ cm/sec for the compacted clay liner and $1 \times 10^{-5}$ cm/sec for the composite liner when compacted to ninety-five percent (95%) of standard Proctor density with the moisture content between optimum moisture content and four percent (4%) above the optimum moisture content, when tested by using a flexible wall permeameter (ASTM D-5084) or other procedures approved by the department.

2. For the composite liner an upper component consisting of a minimum thirty (30) mil thick geomembrane shall be installed if the applicant for a proposed utility waste landfill does not provide adequate demonstrations specified in paragraph (4)(B)8. of this rule, and as determined by the department on a site-by-site basis. Geomembrane components consisting of high density polyethylene (HDPE) shall be at least sixty (60) mil thick;
3. The geomembrane component shall be installed in direct and uniform contact with the compacted soil component so as to minimize the migration of leachate through the geomembrane should a break occur; and
4. All utility waste landfills shall have a minimum bottom slope in any direction of flow of at least one percent (1%).

(C) Satisfactory Compliance--Operations.

1. A test pad shall be constructed at the site and tested to verify that the proposed construction and quality control (qc) procedures are adequate to ensure that the soil component of the composite liner system will meet the requirements of paragraph (10)(B)1. of this rule.
DISCUSSION DRAFT, NOT INTENDED FOR FORMAL PUBLIC COMMENT. COMMENTS SHOULD BE BASED ON VERSION PUBLISHED BY SECRETARY OF STATE.

A. Construction and qc procedures to be used during test pad construction shall be described in detail in the approved engineering report, and shall be identical to those proposed for liner construction with the following additions:
   (I) At least two (2) laboratory hydraulic conductivity tests shall be performed on undisturbed samples of the completed test pad;
   (II) At least one (1) in situ hydraulic conductivity test shall be performed on the completed test pad; and
   (III) At least two (2) test pits shall be excavated into the completed test pad to observe interlift bonding.

B. If test pad construction and testing shows that the proposed methods are not sufficient to meet the requirements of paragraph (10)(B)1. of this rule, a new test pad shall be constructed using revised procedures approved by the department.

2. For phased construction, only one (1) test pad will be required.

3. A final report shall be submitted to the department which describes in detail the construction and qc procedures which were used to achieve satisfactory test pad performance.
   A. The report must be approved by the department prior to beginning construction of any portion of the composite liner system in the disposal area.
   B. The report shall serve as guidance for construction of the soil component of the composite liner system.

4. The requirement for a test pad may be waived provided:
   A. The applicant can demonstrate to the department's satisfaction the construction and qc procedures are identical to those described in the approved engineering report and will result in construction of a liner which meets the requirements of paragraph (10)(B)1. of this rule; and
   B. The soils proposed for liner construction meet the following minimum specifications:
      (I) Have a plasticity index greater than fifteen (15) and less than thirty (30) (ASTM test D4318-84);
      (II) Allow more than fifty percent (50%) passage through a number 200 seive (ASTM D11400); and
      (III) Have less than ten percent (10%) by weight particle sizes greater than two (2) mm.

5. The liner specified in subsection (10)(B) of this rule shall be constructed in accordance with the approved design specifications.

(11) Groundwater Monitoring.
   (A) Requirements. The owner/operator of a utility waste landfill shall implement a groundwater monitoring program capable of determining the utility waste landfill's impact on the quality of groundwater underlying the utility waste landfill.
   (B) Satisfactory Compliance--Design.
      1. All utility waste landfills permitted after the effective date of this rule, must be in compliance with all groundwater monitoring requirements of section (11).
      2. The department may require utility waste landfills permitted prior to the effective date of this rule, to comply with part or all of section (11) if it is determined necessary by the department.
3. The owner/operator of a utility waste landfill shall establish the potential for migration of fluid generated by the utility waste landfill into the groundwater by an evaluation of--
   A. A water balance of precipitation, evapotranspiration, runoff and infiltration;
   B. At a minimum, the following characteristics:
      (I) Geologic materials;
      (II) Description of soil and bedrock to a depth adequate to allow evaluation of water quality protection provided by the soil and bedrock;
      (III) Groundwater elevation;
      (IV) Proposed separation between the lowest point of the lowest cell and the maximum water table elevation;
      (V) Proximity of the utility waste landfill to water supply wells or surface water;
      (VI) Rate and direction of groundwater flow; and
      (VII) Current and projected use of water resources in the potential zone of influence of the utility waste landfill.

4. A groundwater monitoring system shall be capable of yielding groundwater samples for analysis and shall consist of--
   A. Monitoring wells (at least one (1)) installed hydraulically upgradient; that is, in the direction of increasing static head from the utility waste landfill. The numbers, locations and depths shall be sufficient to yield groundwater samples that are--
      (I) Representative of background water quality in the groundwater near the utility waste landfill; and
      (II) Not affected by the utility waste landfill; and
   B. Monitoring wells (at least three (3)) installed hydraulically down gradient; that is, in the direction of decreasing hydraulic head from the utility waste landfill. The number, locations and depths shall ensure that they detect any significant amounts of fluids generated by the utility waste landfill that migrate from the utility waste landfill to the groundwater. Monitoring wells, or clusters of monitoring wells, shall be capable at a minimum, of monitoring all saturated zones down to and including the uppermost aquifer.

5. All monitoring wells shall be constructed as per 10 CSR 23-4.
(C) Satisfactory Compliance--Operations.
1. Groundwater monitoring wells.
   A. Groundwater monitoring wells shall be installed so that the number, spacing and depths of monitoring systems shall be determined based upon site-specific technical information that shall include thorough characterization of:
      (I) Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and
      (II) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer; including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities and porosities.
   B. The design and installation of groundwater monitoring well systems shall be observed, supervised, and certified by a qualified groundwater scientist and approved by the department.
C. All groundwater monitoring wells shall be operational prior to the acceptance of wastes, unless other arrangements are approved by the department.

D. The design, installation, development, and decommissioning of monitoring wells and piezometers must be performed in accordance with 10 CSR 23-4.

2. Sampling and reporting.
   A. Each groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of groundwater quality at the background and down gradient wells installed in compliance with subsection (11)(B). The owner/operator must submit the sampling and analysis program to the department for approval. The program must include procedures and techniques for--
      (I) Monitoring well maintenance;
      (II) Monitoring well redevelopment;
      (III) Monitoring well depth measurement and hydraulic levels;
      (IV) Monitoring well purging and sampling utilizing dedicated equipment;
      (V) Equipment calibration;
      (VI) Decontamination and field blanks;
      (VII) Sample and duplicate sample collection;
      (VIII) Sample preservation;
      (IX) Sample labeling;
      (X) Sample handling;
      (XI) Field measurements;
      (XII) Field documentation;
      (XIII) Chain of custody control;
      (XIV) Sample shipment;
      (XV) Analytical procedures;
      (XVI) Qa/qc control--field and laboratory; and
      (XVII) Statistical testing strategy per paragraph (11)(C)5. for each parameter's concentrations.
   B. Each groundwater monitoring program shall include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. Analysis shall be performed on unfiltered samples.
   C. The sampling procedures and frequency shall be protective of human health and the environment.
   D. Groundwater elevations shall be measured in each well immediately prior to purging, each time groundwater is sampled. The owner/operator shall determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells which monitor the same utility waste landfill shall be measured within a period of time short enough to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction.

   A. The owner/operator shall establish background groundwater quality for each of the monitoring parameters or constituents required under paragraph (11)(C)4. To establish background, a minimum of four (4) quarterly samples of statistically
independent sample data shall be obtained and analyzed from all monitoring wells during a minimum of one (1) year following well installation.

B. The number of samples collected to establish background values for groundwater quality data shall satisfy the requirements of subsection (11)(C) and shall be consistent with the appropriate statistical procedures determined pursuant to paragraph (11)(C)5. The sampling procedures shall be those specified under paragraph (11)(C)4. for detection monitoring and paragraph (11)(C)6. for assessment monitoring.

4. Detection monitoring.
A. The owner/operator shall obtain and analyze water samples from the groundwater monitoring wells during the months of May and November of each calendar year.
B. The following parameters shall be analyzed each time a sample is obtained:
   - Chemical Oxygen Demand (COD in milligrams per liter (mg/l));
   - Chlorides (Cl, mg/l);
   - Iron (Fe, (mg/l));
   - pH (units);
   - Specific Conductance (Conductivity at twenty-five degrees Celsius (25°C) (µmho/cm));
   - Total Dissolved Solids (TDS, in mg/l);
   - All parameters listed in Appendix I of this rule; and
   - Additionally, the water level in each well shall be measured at the time the sample is taken.
C. The sample results, and any results of statistical analysis determining statistically significant increases for any parameter per paragraph (11)(C)5., shall be submitted to the department in one (1) report within ninety (90) days of when samples are collected.
D. In the case of all detection monitoring requirements previously listed, the department may specify an appropriate alternative frequency for repeated sampling and analysis during the active life of the utility waste landfill (including closure) and the post-closure period. The department may add additional parameters or delete parameters on a site-by-site basis through an evaluation of waste and leachate characteristics of the utility waste landfill.
E. The electronic submission of groundwater data is required. This submission shall be in the format and method as prescribed by the department.

5. The owner/operator shall specify in the operating record one (1) or more of the following statistical methods to be used in evaluating groundwater monitoring data for each monitoring constituent. The statistical test chosen shall be conducted separately for each constituent--
A. A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The procedure shall include estimation and testing of the contrasts between each down gradient well’s mean and the upgradient means for each parameter;
B. An ANOVA based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The procedure shall include estimation and testing of the contrasts between each down gradient well’s median and the background medians for each parameter;
C. A confidence interval procedure in which an interval for each parameter in each down gradient well is constructed around the mean/median of the particular well's data or data residuals and compared to the mean/median of pooled background well data;

D. A prediction interval procedure in which an upper prediction limit for an interval for each parameter in each well is compared to subsequently obtained values from the same well;

E. A prediction interval procedure in which an upper prediction limit for an interval for each parameter constructed on the pooled background well data or data residuals is compared to subsequently obtained values from each down gradient well;

F. A tolerance interval procedure in which an upper tolerance limit for an interval for each parameter's pooled background well data is compared to each down gradient well's concentration values;

G. A multicomparison procedure utilizing any recommended U.S. Environmental Protection Agency combinations of intra-well and inter-well procedures for each parameter;

H. A control chart approach meeting the performance standards of part (11)(C)5.J.(III), that gives control limits for each parameter;

I. A different statistical test method that meets the performance standards of subparagraph (11)(C)5.J. of the rule. The owner/operator must submit the statistical test method to the department for approval before the use of the alternative test; and

J. Any statistical method chosen under paragraph (11)(C)5. of this rule shall comply with the following performance standards, as appropriate:

(I) The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of the concentration data for the chemical parameters or hazardous constituents. If the distribution of the concentration data for the chemical parameters or hazardous constituents is shown by the owner/operator to be inappropriate for a normal data distribution theory test, then the data should be transformed or a distribution-free (nonparametric) theory test should be used. If the concentration data distributions for the constituents of each well differ, more than one (1) statistical method will be needed;

(II) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentration or a groundwater protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experiment-wide error rate for each testing period shall be no less than 0.05, however, the Type I error of no less than 0.01 for individual well comparisons shall be maintained. This performance standard does not apply to tolerance intervals, prediction intervals or control charts;

(III) If a control chart approach is used to evaluate groundwater monitoring data, the specific type of control chart and its associated parameter values shall be protective of human health and the environment. The selection of this method shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern;
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(IV) If a confidence interval, tolerance interval or a prediction interval is used to evaluate groundwater monitoring data, then the level of confidence for each interval, and the percentage of the population that each interval contains, shall be protective of human health and the environment. Selection of one (1) or more of these methods shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern;

(V) The statistical method shall account for data below the limit of detection with one (1) or more statistical procedures that are protective of human health and the environment. Any practical quantization limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility; and

(VI) If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

6. Response to statistical analysis.

A. If the comparison for the upgradient wells shows a statistically significant increase (or pH change) over background, the owner/operator shall submit this information to the department.

B. If the comparisons for down gradient wells show a statistically significant increase (or pH change), resulting from the landfill, over background, the owner/operator shall within ninety (90) days of the last sampling event obtain additional groundwater samples from those down gradient wells where a statistically significant difference was detected, split the samples in two (2), and obtain analyses of all additional samples to determine whether the significant statistical difference was a result of laboratory error.

C. If the additional samples show a statistically significant increase (or pH change) over background, the owner/operator must demonstrate to the department within ninety (90) days that a source other than the utility waste landfill caused the contamination or that the statistically significant increase resulted from an error in sampling, analysis, statistical evaluation or natural variation. If the owner/operator cannot make this demonstration to the department, the owner/operator shall submit a plan to the department for a groundwater assessment monitoring program and implement the program as described in subparagraphs (11)(C)6.D. through H. of this rule. The plan shall specify the following:

   (I) The number, location and depth of wells;
   (II) Sampling and analytical methods for the monitoring parameters listed in Appendix I of this rule on a quarterly basis;
   (III) Evaluation procedures, including any use of previously gathered groundwater quality information;
   (IV) The rate and extent of migration of the contaminant plume in the groundwater;
   and
   (V) The concentrations of the contaminant plume in the groundwater.

D. After obtaining the results from the initial or subsequent sampling events required in subparagraph (9)(C)6.D. the owner/operator shall--
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(I) Within fourteen (14) days, notify the department and place a notice in the operating record identifying the constituents that have been detected;

(II) Within ninety (90) days, and on a quarterly basis after that, resample all wells and conduct analysis for all constituents listed in Appendix I to this rule and notify the department of the constituent concentrations. A minimum of one (1) sample from each well sampled (background and down gradient) shall be collected and analyzed during these sampling events;

(III) Establish background concentrations for any new constituents detected during subsequent monitoring events; and

(IV) Establish groundwater protection standards for all new constituents detected during subsequent monitoring events.

E. If the concentrations of all constituents listed in Appendix I to this rule are shown to be at or below background levels as established in paragraph (11)(C)3. of this rule for two (2) consecutive sampling periods, the owner/operator may reinstate detection monitoring at the utility waste landfill as specified under subparagraph (11)(C)3.C. of this rule.

F. If the concentrations of any constituents listed in Appendix I of this rule are above background values, but all concentrations are below the groundwater protection standard established under subparagraph (11)(C)6.D. of this rule using the statistical procedures in paragraph (11)(C)5. of this rule, the owner/operator shall notify the department and the department may require the owner/operator to--

(I) Continue assessment monitoring; or

(II) Develop a corrective measures assessment, or both.

G. If one (1) or more constituents listed in Appendix I of this rule are detected at levels above the groundwater protection standard as established under subparagraph (11)(C)6.D., the owner/operator shall--

(I) Provide the department with a report assessing potential corrective measures;

(II) Characterize the nature and extent of the release by installing additional monitoring wells as necessary; install at least one (1) additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with paragraph (11)(C)6. of this rule and, if required by the department, notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site if indicated by sampling of wells; and

(III) Continue assessment monitoring as per the groundwater quality assessment plan, and implement the approved corrective action program specified in part (11)(C)6.G.(I) of this rule.

H. The results of implementation of the assessment monitoring program shall be submitted to the department at the end of each year or an alternate time period approved by the department.

(12) Air Quality.

(A) Requirement. The design, construction and operation of the utility waste landfill shall minimize environmental hazards and shall conform to applicable ambient air quality and source control regulations.

(B) Satisfactory Compliance--Design. Plans shall include an effective dust control program.
(C) Satisfactory Compliance--Operations. A burning permit or exemption may be obtained from the department permitting the burning of tree trunks, tree limbs, and vegetation during clearing and grubbing. In areas operating under exemption certificates authorized by Chapter 643, RSMo approval shall be obtained from the local pollution control agency. The operating procedures and location for burning practices shall be submitted to the department for review and written approval. Burning at the utility waste landfill shall be conducted in accordance with Chapter 643, RSMo, the corresponding rules, the terms, conditions, or both, of the plans, permit, or both, and all local requirements.

(13) Aesthetics.
(A) Requirement. The utility waste landfill shall be designed and operated at all times in an aesthetically acceptable manner.
(B) Satisfactory Compliance--Design. Plans shall include an effective vegetative growth program.
(C) Satisfactory Compliance--Operations.
   1. Wastes that are easily moved by wind shall be covered, as necessary, to prevent becoming airborne and scattered.
   2. On-site vegetation should be cleared only as necessary. Natural windbreaks, such as green belts, should be maintained where they will improve the appearance and operation of the utility waste landfill.
   3. Mining operations for the purpose of removing waste for beneficial reuse shall be conducted in such a manner as to not detract from the appearance of the utility waste landfill. Materials removed from the utility waste landfill shall be stored for not more than sixty (60) days prior to beneficial reuse. Materials removed from the utility waste landfill shall be stored so as to prevent infiltration, surface water runoff and erosion from these removed materials. All Water Pollution Control Program permits and approvals necessary to comply with the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(14) Cover.
(A) Requirement. Cover shall be applied to minimize infiltration of precipitation, airborne waste; and provide a pleasing appearance.
(B) Satisfactory Compliance--Design. The owner/operator shall prepare a written closure plan that describes the steps necessary to close all utility waste landfill phases at any point during the active life of the utility waste landfill in accordance with the requirements of 10 CSR 80-2.030(4)(A). In addition, the final cover requirements specified in the closure and post-closure plans shall specify--
   1. Cover sources, quantities and soil classification (Unified Soil Classification System or United States Department of Agriculture classification system);
   2. The capability of the cover to perform the functions listed in subsection (14)(A) of this rule;
   3. Surface grades and side slopes needed to promote maximum runoff, without excessive erosion, and to minimize infiltration. Final side slopes shall not exceed twenty-five percent (25%) unless it has been demonstrated in a detailed slope stability analysis approved by the department that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill;
4. Procedures to establish and maintain vegetative growth to combat erosion and improve appearance of idle and completed areas. Procedures shall include seeding rate, fertilizer rate, soil conditioning rate and provisions for mulching;
5. Procedures to maintain a cover integrity, for example, regrading and recovering;
6. Methods for borrow areas to be reclaimed so as to restore aesthetic qualities and prevent excessive erosion;
7. The final slope of the top of the utility waste landfill shall have a minimum slope of one percent (1%); and
8. Shear failure analyses shall be included where intermediate or final slopes exceed twenty-five percent (25%). However, the department will waive the analyses for the slopes of twenty-five percent (25%) or less except in seismic impact zones.

(C) Satisfactory Compliance--Operations.
1. Cover shall be applied at a total thickness of at least one foot (1') of compacted soil on filled areas of the utility waste landfill which are idle for more than sixty (60) days, and on all final side slopes at the end of each filling sequence.
2. No active, intermediate or final slope shall exceed thirty-three and one-third percent (33 1/3%).
3. As each phase of the utility waste landfill is completed, a final cover system shall be installed consisting of one foot (1') of compacted clay with a coefficient of permeability of $1 \times 10^{-5}$ cm/sec or less and overlaid with one foot (1') of soil capable of sustaining vegetative growth.
4. The installation of the final cover systems shall include provisions for slope stability.
5. The department may approve the use of an alternative final cover system provided that the owner/operator can demonstrate to the department that the alternative design will be at least equivalent to the final cover system described in paragraph (14)(C)3. of this rule.
6. Surface grades and side slopes shall be maintained to promote runoff without excessive erosion.
7. Vegetation shall be established within one hundred eighty (180) days of application of the cover required by paragraphs (14)(C)3. and 4. of this rule. Vegetation shall be established and maintained to minimize erosion and surface water infiltration.
8. Regrading and recovering shall be performed as necessary to maintain cover slope and integrity.
9. Borrow areas shall be reclaimed in accordance with the approved plans.
10. The compacted clay portion of the final cover shall consist of soils classified under the Unified Soil Classification System as CH, CL, ML, SC or MH.

(15) Compaction.
(A) Requirement. In order to conserve utility waste landfill site capacity, thereby preserving land resources and to minimize moisture infiltration and settlement, waste and cover shall be compacted to the smallest practicable volume.
(B) Satisfactory Compliance--Design.
1. Arrangements shall be made and indicated in the plans where substitute equipment will be available to provide uninterrupted service during routine maintenance periods or equipment breakdowns.
2. The plans shall specify the equipment that should be available to conduct the utility waste landfill operation.
(C) Satisfactory Compliance--Operations.
1. Waste handling equipment, during filling operations, shall be capable of performing and shall perform the following functions:
   A. Spread the wastes to be compacted in layers no more than two feet (2’) thick, while confining it to the smallest practicable area;
   B. Compact the spread wastes to the smallest practicable volume; and
   C. Place, spread and compact the final cover as much as practicable.
2. A preventive maintenance program should be employed to maintain equipment in operating order.
3. No waste shall be disposed of in water where the presence of the water will prohibit the proper spreading and compaction of the waste or where a mosquito breeding problem would be created.

(16) Safety.
(A) Requirement. The utility waste landfill shall be designed, constructed and operated in a manner so as to protect the health and safety of personnel and others associated with and affected by the operation.
(B) Satisfactory Compliance--Design.
1. Provisions shall be included in the plans to control and limit access to the utility waste landfill in a manner that is compatible with the surrounding land use.
2. Provisions shall be included in the plans to control dust for safety purposes and to prevent a nuisance to the surrounding area.
(C) Satisfactory Compliance--Operation.
1. Adequate communications equipment shall be available at the utility waste landfill for emergency situations.
2. Access to the utility waste landfill shall be controlled and shall be by established roadways only. The utility waste landfill shall be accessible only when operating personnel are on duty.
3. Traffic signs or markers should be provided to promote an orderly traffic pattern to and from the discharge area and, if necessary, to maintain efficient operating conditions.
4. Dust control provisions shall be utilized as necessary for safety purposes and to prevent a nuisance to the surrounding area.

(17) Records.
(A) Requirement. The owner/operator of a utility waste landfill shall maintain records and monitoring data as specified by the department and file appropriate documents with the county recorder(s) of deeds.
(B) Satisfactory Compliance--Design. Plans shall prescribe methods to be used in maintaining records and monitoring the environmental impact of the utility waste landfill. Information on recording and monitoring requirements may be obtained from the department.
(C) Satisfactory Compliance--Operations.
1. Records shall be maintained at the facility site. Records five (5) years old or older may be stored at an alternate site if approved by the department; such stored records must be made available at the landfill upon request of department personnel. Records must cover at least the following:
   A. Major operational problems, complaints or difficulties;
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B. Any demonstration, certification, finding, monitoring, testing or analytical data required under sections (4) and (9) of this rule;
C. Dust and litter control efforts;
D. Quantitative measurements of the waste handled and an estimate of the air space left at the facility. Every two (2) years after the date of the permit issuance and within sixty (60) days of the anniversary date of the permit issuance, the owner/operator shall submit to the department two (2) copies of a topographic map, prepared under the direction of a land surveyor or by aerial photography, showing the current horizontal and vertical boundaries of waste in the utility waste landfill and the boundaries of the utility waste landfill. Maps prepared by aerial photography shall meet the current National Map Accuracy Standards for Photogrammetry as indicated in United States Bureau of the Budget "Circular A-16 Exhibit C," dated October 10, 1958;
E. Closure and post-closure care plans and any monitoring, testing or analytical data as required under 10 CSR 80-2.030(4)(A);
F. Any cost estimates and financial assurance documentation required under 10 CSR 80-2.030(4);
G. Inspection records and training procedures as required under subsection (3)(B) of this rule;
H. Records associated with corrective measures as required under section (10) of this rule; and
I. The landfill operator shall keep a detailed report of the origin of all waste received. Effective January 1, 1998, on or before January 31 of each calendar year and annually thereafter each utility waste landfill shall submit a report to the department specifying the amount of utility waste received for disposal from states other than Missouri.

2. Upon closing of the utility waste landfill, the existence of the utility waste landfill shall be recorded with the recorder(s) of deeds in the county(ies) where the utility waste landfill is located. The owner/operator may request permission from the department to remove the notation from the deed if all wastes are removed from the facility.
A. A survey and plat meeting the requirements of the current Minimum Standards of Property Boundary Survey 10 CSR 30-2.010 and detailed description of the utility waste landfill shall be prepared by a land surveyor. The survey plat and detailed description, at a minimum, shall contain the following information:
(I) The name of the property owner as it appears on the property deed;
(II) The detailed description of the property;
(III) The general types and location of the wastes and the depth(s) of fill within the property; and
(IV) The location of any leachate control or water monitoring systems which shall be maintained after closure and the length of time that these systems are to be maintained.
B. The owner/operator shall obtain approval from the department of the survey plat and detailed description prior to filing with the county recorder of deeds. Filing the plat and detailed description shall be accomplished within thirty (30) days of departmental approval. Two (2) copies of the properly recorded plat and detailed description showing the recorder of deeds' seal or stamp, the book and page numbers

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and the date of filing shall be submitted to the department within thirty (30) days of filing.

C. Owners of all proposed utility waste landfills as a part of closure of the solid waste disposal area shall--

(I) Execute an easement with the department, which allows the department, its agents or its contractors to enter the premises to complete work specified in the closure plan; and

(II) Submit evidence to the department that a notice and covenant running with the land has been recorded with the recorder of deeds in the county where the utility waste landfill is located. The notice and covenant shall specify the following:

(a) That the property has been permitted as a utility waste landfill; and

(b) That use of the land in any manner which interferes with closure plans, and post-closure plans filed with the department, is prohibited.


Appendix I--Constituents for Detection Monitoring

Arsenic (As, µg/l)
Aluminum (Al, µg/l)
Antimony (Sb, µg/l)
Barium (Ba, µg/l)
Beryllium (Be, mg/l)
Boron (B, µg/l)
Cadmium (Cd, µg/l)
Calcium (Ca, mg/l)
Chemical Oxygen Demand (COD, mg/l)
Chloride (Cl, mg/l)
Chromium (Cr, µg/l)
Cobalt (Co, µg/l)
Copper (Cu, µg/l)
Fluoride (Fl, µmg/l)
Hardness (calculated, mg/l)
Iron (Fe, µg/l)
Lead (Pb, µg/l)
Magnesium (Mg, mg/l)
Manganese (Mn, µg/l)
Mercury (Hg, µg/l)
Nickel (Ni, mg/l)
PH (units)
Selenium (Se, µg/l)
Silver (Ag, µg/l)
Sodium (Na, mg/l)
Specific Conductance (Conductivity at 25°C)
PURPOSE: This rule pertains to the design, construction, and operation of utility waste and coal combustion residuals (CCR) landfills. The requirements of this rule ensure the operation of utility waste and CCR landfills have no adverse effects on human health or the environment.

PUBLISHER’S NOTE: The secretary of state has determined that the publication of the entire text of the material which is incorporated by reference as a portion of this rule would be unduly cumbersome or expensive. This material as incorporated by reference in this rule shall be maintained by the agency at its headquarters and shall be made available to the public for inspection and copying at no more than the actual cost of reproduction. This note applies only to the reference material. The entire text of the rule is printed here.

(1) General Provisions. This rule applies to new utility waste and CCR landfills and those existing landfills that did not certify and receive department approval of final closure prior to the effective date of this rule. Applicable provisions contained in 10 CSR 80-2 also apply. In the event of a conflict between 10 CSR 80-2 and this rule, this rule shall prevail.

(A) If standards or techniques other than those listed in this rule are used, it is the obligation of the utility waste or CCR landfill owner/operator to demonstrate to the department in advance that the standards or techniques to be employed will be at least as protective as the criteria in this rule. Procedures for the standards or techniques shall be submitted to the department in writing and approved by the department in writing prior to being employed. Notwithstanding any other provision of these rules, when it is found necessary, the department may require changes in design and/or operation as the condition warrants.

(B) Existing utility waste and CCR landfills that do not meet the performance standards of paragraph (4)(B)6., must cease placing CCR and submit closure plans per regulation 10 CSR 80-2.030 and sections (19) and (20) of this rule and initiate closure within six (6) months of the effective date of this rule. Closure schedules shall be approved by the department and shall include as part of the closure plan, site-specific information, factors, and considerations that would support any time extension requested. Until closure is achieved, these utility waste and CCR landfills shall continue to operate in compliance with this rule.

are incorporated by reference. This rule does not incorporate any subsequent amendments or additions.

(2) Solid Waste Accepted. Fly ash, bottom ash, boiler slag or other slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels; coal residuals; clean fill; and department approved solidification additives used during closure of a utility waste or CCR landfill may be accepted.

(3) Sluicing. Sluicing of waste for transport to utility waste or CCR landfills shall be allowed only so long as the hydraulic head on top of the landfill liner can be maintained at less than one foot (1') of head, and the collected leachate and runoff meet the Missouri Clean Water Law and corresponding rules.

(4) Site Selection.
   (A) Site selection and utilization shall include a study and evaluation of geologic and hydrologic conditions and soils at the proposed utility waste or CCR landfill and an evaluation of the environmental effect upon the projected use of the completed utility waste or CCR landfill. Applications for utility waste or CCR landfill construction permits received on or after the effective date of this rule shall document compliance with all applicable siting restriction requirements contained in paragraphs (4)(B)1. through 6.

   (B) Location Restrictions.
   1. The owner/operator of a proposed utility waste or CCR landfill, located in one hundred (100)-year floodplains shall demonstrate to the department that the utility waste or CCR landfill will not restrict the flow of the one hundred (100)-year flood, reduce the temporary water storage capacity of the floodplain, or result in release of waste or leachate so as to pose a hazard to public health or the environment.
   2. Placement above the uppermost aquifer. Landfills permitted after October 19, 2015, including lateral expansions, must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the utility waste or CCR landfill and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table).
   3. Wetlands. Utility waste or CCR landfills shall not be located in wetlands, unless the owner/operator can make the following demonstrations to the department:
      A. The presumption that a practicable alternative to the proposed landfill is available which does not involve wetlands is clearly rebutted;
      B. The construction and operation of the utility waste or CCR landfill will not:
         (I) Cause or contribute to violations of any applicable state water quality standard;
         (II) Violate any applicable toxic effluent standard or prohibition under section 307 of the federal Clean Water Act by the U.S. Environmental Protection Agency;
         (III) Violate any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary;
C. The utility waste or CCR landfill will not cause or contribute to significant degradation of wetlands. The owner/operator shall demonstrate the integrity of the utility waste or CCR landfill and its ability to protect ecological resources by addressing the following factors:
   (I) Erosion, stability and migration potential of native wetland soils, muds and deposits used to support the landfill;
   (II) Erosion, stability and migration potential of dredged and fill materials used to support the landfill;
   (III) The volume and chemical nature of the waste disposed of in the landfill;
   (IV) Impacts on fish, wildlife and other aquatic resources and their habitat from potential release of waste from the landfill;
   (V) The potential effects of contamination of the wetland and the resulting impacts on the environment; and
   (VI) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.

D. Steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent practicable as required by subparagraph (4)(B)3.A., then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions (for example, restoration of existing degraded wetlands or creation of man-made wetlands); and

E. The requirements of paragraph (4)(B)3. may be satisfied by the owner/operator obtaining a United States Army Corps of Engineers permit for construction in a wetland or by demonstrating that the wetland is not regulated by the United States Army Corps of Engineers or other appropriate agency.

4. Fault areas. Utility waste or CCR landfills located in the seismic impact zone shall not be located within two hundred feet (200') of a fault that has had displacement in Holocene time unless that owner/operator demonstrates to the department that an alternative setback distance of less than two hundred feet (200') will prevent damage to the structural integrity of the landfill and will be protective of human health and the environment.

5. Seismic impact zones. Utility waste and CCR landfills must not be located in seismic impact zones unless the owner/operator demonstrates that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

6. Unstable areas. The owner/operator of a utility waste or CCR landfills located in an unstable area shall demonstrate to the department that the utility waste or CCR landfill's design ensures that the integrity of the structural components of the utility waste or CCR landfill will not be disrupted. The owner/operator shall consider the following factors, at a minimum, when determining whether an area is unstable:
   A. On-site or local rock or soil conditions that may result in failure or significant differential settling;
   B. On-site or local geologic or geomorphologic features; and
   C. On-site or local man-made features or events (both surface and subsurface).
7. Endangered species. Utility waste or CCR landfills shall not:
   A. Cause or contribute to the taking of any endangered or threatened species of
      plants, fish, or wildlife listed in section 4 of the Endangered Species Act; or
   B. Result in the direct or indirect alteration of critical habitat which appreciably
      diminishes the likelihood of the survival and recovery of threatened or endangered
      species using that habitat of endangered or threatened species as identified in 50
      CFR part 17.

8. Surface water. CCR landfills shall operate in accordance with the Missouri Clean
   Water Law, corresponding rules, and permits and shall not:
   A. Cause a discharge of pollutants into waters of the United States that is in violation
      of the requirements of the National Pollutant Discharge Elimination System
      (NPDES) under section 402 by the U.S. Environmental Protection Agency;
   B. Cause a discharge of dredged material or fill material to waters of the United
      States that is in violation of the requirements under section 404; and
   C. Cause non-point source pollution of waters of the United States that violates
      applicable legal requirements implementing an area-wide or statewide water
      quality management plan that has been approved by the Administrator under
      section 208.

9. An owner/operator of a CCR landfill may submit to the department for review and
   approval alternative location restrictions or requirements other than those listed in
   (4)(B)4., 5., and 6. if the owner/operator establishes through technical analysis and an
   engineering demonstration that adverse effects are not reasonably probable given the
   design, construction and/or operation of the utility waste or CCR landfill in such
   location.

(5) Plans for new utility waste or CCR landfills shall include:
   (A) A map showing initial and proposed topographies at contour intervals of five feet (5')
      or less having a scale of not less than one inch (1") equal to one hundred feet (100'). If
      the entire site cannot be illustrated on one (1) plan sheet, additional plan sheets should
      be included with appropriate horizontal and vertical scales in addition to the full site
      map;
   (B) A map having a scale of not less than one inch (1") equals four hundred feet (400')
      identifying the land use and zoning within one-fourth (1/4) mile of the utility waste or
      CCR landfill including location of all residences, buildings, wells, water courses, springs,
      lakes, rock outcroppings, caves, sinkholes, and soil or rock borings. All electric, gas,
      water, sewer, and other utility easements or lines that are located on, under, or over the
      utility waste or CCR landfill shall be shown on the map;
   (C) A description of the projected use of the closed utility waste or CCR landfill. In
      addition to maintenance programs and provisions, where necessary for monitoring and
      controlling leachate, the plans shall specify appropriate design, construction, and
      operating provisions for the utility waste or CCR landfill to complement the projected
      future use;
   (D) An evaluation of the characteristics and quantity of available on-site soil with respect
      to its suitability for utility waste or CCR landfilling operations. The engineering
      properties and quantity estimates of the on-site soil shall be discussed and shall include:
1. Texture. Sieve and hydrometer analyses shall be performed to determine grain size distribution of representative soil samples. Texture may be determined by using the procedures described in ASTM method D422-63 (2007) ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428 Publication date 2007;

2. Plasticity. The liquid limit, plastic limit and plasticity index of representative soil samples shall be determined. Plasticity may be determined by using the procedures described in ASTM method D4318-17 (ASTM International 100 Barr Harbor, West Conshohocken, PA 19428, Publication date 2017);

3. Hydraulic conductivity. Laboratory hydraulic conductivity tests shall be performed upon undisturbed representative soil samples using a flexible wall permeameter (ASTM D-5084-16 ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428 Publication date 2016). If an aquifer is found to be laterally continuous across the anticipated limit of the proposed landfill, the hydraulic conductivity of each significant continuous geologic unit must be determined. Examples of accepted field tests are in situ slug or pump tests, which isolate the geologic unit of interest; and

4. Areal extent and depth. The areal extent and depth of soil suitable for landfill construction shall be determined, clearly describing variations in soil depth; and

(E) A demonstration by the owner/operator of a proposed utility waste or CCR landfill of how adverse geologic and hydrologic conditions may be altered or compensated for via surface water drainage diversion, underdrains, sumps, and other structural components. All alterations of the site shall be detailed in the plans. Precipitation, evapotranspiration and climatological conditions shall be considered in site selection and design.

(6) Design.

(A) Plans, addendums, as-built drawings, or other documents which describe the design, construction, operation, or closure of a utility waste or CCR landfill or which request a design modification for the utility waste or CCR landfill shall:

1. Be prepared, sealed, and signed by the professional engineer and submitted to the department for review and approval;

2. Contain a minimum of a one hundred foot (100')-buffer zone between the utility waste or CCR landfill operations and any property line(s) or any right(s) of way of adjoining road(s) when the property line(s) is inside the right(s) of way to provide for assessment and/or remedial actions;

3. Consider precipitation, evapotranspiration, and climatological conditions in site selection and design;

4. Include all computer models used in the design and list the limitations and assumptions of each model;

5. Include stability analyses for all stages of construction, as well as all liner and leachate system components, and on all final cover system components, include an evaluation of the effect of waste settlement on the final cover system components, side slope liner system components, and surface water management system components;

6. Perform settlement and bearing capacity analyses on the in-place foundation material beneath the disposal area;

7. Analyze the effect of foundation material settlement on the liner and leachate collection systems;
8. Analyze leachate collection pipe material and drainage media to demonstrate that these components possess structural strength to support maximum loads imposed by overlying waste materials and equipment; and
9. Include phase development drawings.
(B) Liner system requirement. A composite liner shall be required at all utility waste or CCR landfills applying for a construction permit after the effective date of this rule that includes:
1. A composite liner must consist of two (2) components: the upper component consisting of, at a minimum, a 30-mil geomembrane liner (GM), and the lower component consisting of at least a two-foot (2’) layer of compacted soil with a hydraulic conductivity of no more than $1 \times 10^{-7}$ centimeters per second (cm/sec). GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. The GM or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component. The compacted soil liner component at a minimum shall be:
   A. Constructed of six to eight inch (6 - 8”) lifts;
   B. Compacted to ninety-five percent (95%) of standard Proctor density with the moisture content between optimum moisture content and four percent (4%) above the optimum moisture content, or within other ranges of density and moisture such that are shown to provide for the liner to have a hydraulic conductivity no more than $1 \times 10^{-7}$ cm/sec.;
   C. Protected from the adverse effects of desiccation or freeze/thaw cycles after construction, but prior to placement of waste;
   D. Soils used for this purpose shall meet the following minimum specifications:
      (I) Be classified under the Unified Soil Classification Systems as CL, CH, or SC (ASTM Test D2487-11 ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428 Publication date 2011);
      (II) Allow more than thirty percent (30%) passage through a No. 200 sieve (ASTM Test D1140-17 ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428, Publication date 2017);
      (III) Have a liquid limit equal to or greater than twenty (20) (ASTM Test D4318-17 ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428 Publication date 2017);
      (IV) Have a plasticity index equal to or greater than ten (10) (ASTM Test D4318-17 ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428 Publication date 2017); and
      (V) Have a minimum bottom slope in any direction of flow of at least one percent (1%); and
   E. Constructed of materials that:
      (I) Have appropriate chemical properties and sufficient strength and thickness to prevent failure due to: pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;
      (II) Provide appropriate shear resistance of the upper and lower component interface to prevent sliding of the upper component including on slopes;
Are placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and (IV) Are installed to cover all surrounding earth likely to be in contact with the CCR or leachate.

2. A test pad shall be constructed at the site and tested to verify that the proposed soils, construction, and quality assurance/quality control (QA/QC) procedures are adequate to ensure that the soil component of the composite liner system will meet the requirements listed above.

A. Construction and QA/QC procedures to be used during test pad construction shall be described in detail in the approved engineering report, and shall be identical to those proposed for liner construction with the following additions:

(I) At least two (2) laboratory hydraulic conductivity tests shall be performed on undisturbed samples of the completed test pad;

(II) At least one (1) in-situ hydraulic conductivity test (i.e. Boutwell) shall be performed on the completed test pad; and

(III) At least two (2) test pits shall be excavated into the completed test pad to observe inter-lift bonding.

B. If test pad construction and testing shows that the proposed methods are not sufficient to meet the requirements of this rule, a new test pad shall be constructed using revised procedures approved by the department.

C. For phased construction, only one (1) test pad will be required for a particular soil source and type and equipment type.

D. A final report shall be submitted to the department, which describes in detail the construction and QA/QC procedures, which were used to achieve satisfactory test pad performance.

(I) The report must be approved by the department prior to beginning construction of any portion of the composite liner system in the disposal area.

(II) The report shall serve as guidance for construction of the soil component of the composite liner system.

E. The requirement for a test pad may be waived provided the applicant can demonstrate to the department’s satisfaction the construction and QA/QC procedures are identical to those described in the approved engineering report and will result in construction of a liner which meets the requirements of this rule, and the soils proposed for liner construction meet the following minimum specifications:

(I) Have a plasticity index greater than fifteen (15) and less than thirty (30) (ASTM test D4318-17 ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428 Publication date 2017);

(II) Allow more than fifty percent (50%) passage through a number two-hundred (200) sieve (ASTM D1140-17 ASTM International, 100 Barr Harbor, West Conshohocken, PA 19428, Publication date 2017); and

(III) Have less than ten percent (10%) by weight particle sizes greater than two (2) millimeters.

(C) Alternative composite liners. If the owner/operator elects to install an alternative composite liner, all of the following requirements must be met:
1. An alternative composite liner must consist of two (2) components: the upper component consisting of, at a minimum, a 30-mil GM, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet (2') of compacted soil with a hydraulic conductivity of no more than \(1 \times 10^{-7}\) cm/sec. GM components consisting of HDPE must be at least 60-mil thick. If the lower component of the alternative liner is compacted soil, the GM must be installed in direct and uniform contact with the compacted soil.

2. The owner/operator must obtain certification from a professional engineer that the liquid flow rate through the lower component of the alternative composite liner is no greater than the liquid flow rate through two feet (2') of compacted soil with a hydraulic conductivity of \(1 \times 10^{-7}\) cm/sec. The hydraulic conductivity for the two feet (2') of compacted soil used in the comparison shall be no greater than \(1 \times 10^{-7}\) cm/sec. The hydraulic conductivity of any alternative to the two feet (2') of compacted soil must be determined using recognized and generally accepted methods. The liquid flow rate comparison must be made using Equation 1 of this section, which is derived from Darcy's Law for gravity flow through porous media.

\[
\frac{Q}{A} = q = k \left( \frac{h}{t} + 1 \right)
\]

Where,
- \(Q\) = flow rate (cubic centimeters/second);
- \(A\) = surface area of the liner (squared centimeters);
- \(q\) = flow rate per unit area (cubic centimeters/second/squared centimeter);
- \(k\) = hydraulic conductivity of the liner (centimeters/second);
- \(h\) = hydraulic head above the liner (centimeters); and
- \(t\) = thickness of the liner (centimeters); and

3. The alternative composite liner must meet the performance requirements specified in parts (6)(B)1.E.(I) through (IV).

(D) The leachate collection and removal system must be designed, constructed, operated, and maintained to collect and remove leachate from the utility waste or CCR landfill during the active life and post-closure care period. The leachate collection and removal system must be:

1. Designed and operated to maintain less than a thirty (30)-centimeter (one foot) depth of leachate over the composite liner or alternative composite liner;
2. Constructed of materials that are chemically resistant to the CCR and any non-CCR waste managed in the utility waste or CCR landfill and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste, waste cover materials, and equipment used at the utility waste or CCR landfill; and
3. Designed and operated to minimize clogging during the active life and post-closure care period.
4. Leachate flow quantities shall be estimated and the method(s) of leachate management shall be outlined in the application submittal.
5. Leachate storage facilities shall comply with all currently applicable requirements of the Missouri Clean Water Law and corresponding rules. Where a leachate treatment system is designed to have a discharge to the waters of the state, any required discharge permit(s) shall be obtained from the department in accordance with requirements of the Missouri Clean Water Law and corresponding rules.
6. Minimum design criteria for leachate collection systems shall include the following:
   A. Ponds and/or tanks of sufficient capacity to store, equalize flow to disposal systems, and allow system/operating flexibility;
   B. Collection systems designed and operated so that any leachate formed will flow by gravity into collection areas from which the leachate can be removed, treated, and disposed;
   C. Leachate management by recirculation within the permitted fill area shall be conducted in accordance with an approved engineering method;
   D. Any leachate collection system open to the atmosphere must be designed to prevent discharge during a twenty-four (24)-hour, twenty-five (25)-year storm event. Plans shall include the calculations detailing the design; and
   E. A method of leachate management in the application. A secondary or “backup” method of leachate disposal will be required unless the applicant can demonstrate that a secondary method will not be necessary.

(7) Quality Assurance/Quality Control. The construction, operation, and closure of the utility waste or CCR landfill shall include QA/QC measures to ensure compliance with approved plans and all applicable federal, state, and local requirements. The permittee shall be responsible for ensuring that the QA/QC supervision is conducted by a qualified professional.
   (A) Plans shall include a detailed description of the QA/QC testing procedures that will be used for every major phase of construction. The description must include at a minimum, the frequency of inspections, field testing, laboratory testing, equipment to be utilized, the limits for test failure, a description of the procedures to be used upon test failure, and a detailed procedure for the reporting and recording of QA/QC activities and testing results.
   (B) For the following components:
      1. Leachate collection system. Reports shall be prepared or approved by the professional engineer transmitting the results of the QA/QC procedures and stating that the leachate collection system was constructed according to the approved design or describing any deviations from the approved design; and
      2. Liner. The liner specified by section (6) shall be constructed in accordance with the approved design specifications. The QA/QC procedures shall include:
         A. Evidence that the liner material(s) utilized meet the minimum design specifications;
         B. Evidence that field construction techniques are resulting in the minimum design specifications (for example, soil density tests);
         C. Evidence that the liner construction is proceeding as designed through regular verification using a predetermined system of horizontal and vertical survey controls; and
         D. Oversight of the liner construction and QA/QC procedures by a professional engineer. This shall include reports prepared, or approved, by the professional engineer transmitting the results of the QA/QC procedures and stating that the liner was constructed according to design or describing any deviations from the design.
      3. All QA/QC reports shall be reviewed and approved by a professional engineer.
(C) At a minimum QA/QC testing shall include:

1. Testing of each lift of the soil component of the final cover and landfill liner for field density and field moisture once per every ten thousand square feet (10,000 ft$^2$) and providing relatively uniform coverage over the landfill surface;
2. Laboratory hydraulic conductivity testing of the soil used for liner construction once for every five thousand cubic yards (5,000 yd$^3$) of liner constructed;
3. Continuous visual classification of borrow soil during landfill construction by qualified QA/QC inspector(s) or certifying professional engineer; and
4. Measuring the elevations of the final cover and the landfill liner on a maximum spacing of one hundred foot (100’) centers and at one hundred foot (100’) intervals along each line where a break in slope occurs.
   - (a) Landfill liner. Measuring the elevations of the top and bottom of the landfill liner and leachate collection system;
   - (b) Final cover. Measuring the elevations of the top and bottom of the landfill cover:
     I. The compacted clay layer; and
     II. The soil layer supporting vegetative growth.
5. For a geomembrane:
   - A. Nondestructive testing of all seams of the geomembrane in the landfill liner; and
   - B. Random destructive testing of the seams of the geomembrane liner in the landfill liner on an average frequency of at least one (1) every five hundred (500) linear feet of seams.
6. All testing shall be performed under the direction of qualified QA/QC inspectors for every major phase of construction.

(8) Survey Control. Benchmarks, horizontal controls, and boundary markers shall be established and maintained by a registered land surveyor to check and mark the location and elevations of the utility waste or CCR landfill ensuring compliance with design plans, phasing plans, and applicable conditions within the approved construction permit. At a minimum, a survey of the entire permitted acreage shall be conducted in accordance with the current Missouri Standards for Property Boundary Surveys, 2 CSR 90-60, and identify the permanent monument used as a benchmark. All site information must be reported in the State Plane Coordinate System.

(9) Run-on and Run-off Controls. All Water Protection Program permits and approvals necessary to comply with requirements of the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(A) The owner/operator of an existing or new utility waste or CCR landfill or any lateral expansion must design, construct, operate, and maintain:

1. A run-on control system to prevent flow onto the active portion of the landfill during the peak discharge from a twenty-four (24)-hour, twenty-five (25)-year storm; and
2. On-site drainage, collection, and control structures and channels shall be designed for all stages of development to accommodate at a minimum the stormwater volume from a twenty-four (24)-hour, twenty-five (25)-year storm. The engineering calculations and assumptions shall be included and explained in the engineering report submitted to the department.
(B) The quantity of water coming in contact with solid waste shall be minimized by the daily operational practices. Water which comes in contact with the waste shall be managed as leachate in accordance with the approved plans. Stormwater runoff from the utility waste or CCR landfill shall be controlled on site and not be allowed to discharge off the utility waste or CCR landfill property or discharge into the waters of the state, except in accordance with the approved plans and the Missouri Clean Water Law and corresponding rules.

(10) Groundwater Monitoring.

(A) The owner/operator of a utility waste or CCR landfill shall implement a groundwater monitoring program capable of determining the impact on the quality of groundwater underlying the utility waste or CCR landfill. The downgradient monitoring system must be installed at the relevant point of compliance specified by the department. When physical obstacles preclude installation of groundwater monitoring wells at the relevant point of compliance, the downgradient monitoring system may be installed at the closest practicable distance hydraulically downgradient specified by the department that ensures detection of groundwater contamination in the uppermost aquifer.

1. All utility waste or CCR landfills permitted after the effective date of this rule must be in compliance with all groundwater monitoring requirements of this section.

2. All utility waste or CCR landfills permitted prior to the effective date of this rule, but not officially closed by the department as of October 19, 2015, must comply with this section.

3. The owner/operator of a utility waste or CCR landfill shall establish the potential for migration of fluid generated by the utility waste or CCR landfill into the groundwater by an evaluation of:
   A. A water balance of precipitation, evapotranspiration, runoff, and infiltration; and
   B. At a minimum, the following characteristics:
      (I) Geologic materials;
      (II) Description of soil and bedrock to a depth adequate to allow evaluation of water quality protection provided by the soil and bedrock;
      (III) Groundwater elevation;
      (IV) Proposed separation between the lowest point of the lowest cell and the maximum water table elevation;
      (V) Proximity of the utility waste or CCR landfill to water supply wells or surface water;
      (VI) Rate and direction of groundwater flow; and
      (VII) Current and projected use of water resources in the potential zone of influence of the utility waste or CCR landfill.

4. Groundwater monitoring wells shall be installed based upon site-specific technical information that considers the following when determining the number, spacing, and depths of monitoring systems:
   A. Aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and
   B. Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost...
aquifer; including, but not limited to, thicknesses, stratigraphy, lithology, hydraulic conductivities and porosities.

5. Groundwater monitoring well locations shall be based on site-specific technical information and be capable of yielding groundwater samples for analysis, effectively monitor the site, and shall consist of at least one (1) well installed hydraulically upgradient; that is, in the direction of increasing static head from the utility waste or CCR landfill and at least three (3) wells installed hydraulically downgradient; that is, in the direction of decreasing hydraulic head. The numbers, locations, and depths shall be based on site-specific technical information and be sufficient to yield groundwater samples that:
   A. Represents background water quality in the groundwater upgradient of the utility waste or CCR landfill;
   B. Detect any significant amounts of fluids generated by the utility waste or CCR landfill that migrate from the utility waste or CCR landfill to the groundwater; and
   C. Monitor all saturated zones down to and including the uppermost aquifer.

6. All monitoring wells shall be:
   A. Designed, constructed, developed, and decommissioned in accordance with 10 CSR 23-4;
   B. Designed and installed under the observation and supervision of a qualified groundwater scientist, who certifies installation, and then approved by the department; and
   C. Operational prior to the acceptance of wastes, unless other arrangements are approved by the department.

(B) Sampling and reporting.
1. Each groundwater monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of groundwater quality at monitoring wells installed in compliance with this section. The owner/operator must submit the sampling and analysis program to the department for approval. The program must include procedures and techniques for:
   A. Monitoring well maintenance;
   B. Monitoring well redevelopment;
   C. Monitoring well depth measurement and hydraulic levels;
   D. Monitoring well purging and sampling utilizing dedicated equipment;
   E. Equipment calibration;
   F. Decontamination and field blanks;
   G. Sample collection;
   H. Sample preservation;
   I. Sample labeling;
   J. Sample handling;
   K. Field measurements;
   L. Field documentation;
   M. Chain of custody control;
   N. Sample shipment;
   O. Analytical procedures;
   P. QA/QC control--field and laboratory; and
Q. Statistical testing strategy for each parameter's concentrations.
2. Each groundwater monitoring program shall include sampling and analytical methods that are appropriate for groundwater sampling and that accurately measure hazardous constituents and other monitoring parameters in groundwater samples. Analysis shall be performed on unfiltered samples.
3. The owner/operator shall determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells that monitor the same utility waste or CCR landfill shall be measured within a period of time short enough to avoid temporal variations in groundwater flow, which could preclude an accurate determination of groundwater flow rate and direction.
4. Each groundwater monitoring program shall include: a map, aerial image, or diagram showing the utility waste or CCR landfill and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers that are part of the groundwater monitoring program for the utility waste or CCR landfill.
5. Suspension of groundwater monitoring requirements.
   A. The department may suspend or modify in whole or in part for up to ten (10) years the groundwater monitoring requirements for a utility waste or CCR landfill if the owner/operator provides written documentation that there is no potential for risk to human health or the environment or migration of the constituents listed in Appendices I and II to this section during the active life of the utility waste or CCR landfill and the post-closure care period. In making this decision to suspend groundwater monitoring requirements in whole or in part and in making remedy decisions, the department may consider the impact of activity and use limitations that have been placed on the property and any affected off-site area. This demonstration must be certified by a qualified professional engineer and approved by the department, and must be based upon:
      (I) Site-specific field collected measurements, sampling, and analysis of physical, chemical, and biological processes affecting contaminant fate and transport; and
      (II) Contaminant fate and transport predictions that maximize contaminant migration and consider impacts on potential receptors.
      
(C) Background monitoring. The owner/operator shall establish background groundwater quality for each of the monitoring parameters or constituents required in Appendix I and Appendix II. To establish background, a minimum of eight (8) samples of statistically independent sample data shall be obtained and analyzed from all monitoring wells. Additional background samples may be required based upon the statistical methodology used.
(D) Detection monitoring.
   1. The owner/operator shall obtain and analyze water samples from the groundwater monitoring wells during the months of May and November of each calendar year for Appendix I constituents unless an alternative schedule is approved by the department.
   2. The water level in each well shall be measured at the time the sample is taken.
3. The sample results must be submitted electronically in a format specified by the department, and any results of statistical analysis determining statistically significant increases (SSI) for any parameter shall be submitted to the department in one (1) report within ninety (90) days of when samples are collected, unless the department approves an alternative schedule.

4. In the case of all detection monitoring requirements previously listed, the department may specify an appropriate alternative frequency for repeated sampling and analysis during the active life of the utility waste or CCR landfill including during the closure and post-closure periods. The alternative frequency during the active life including closure shall be no less than annual. The alternative frequency shall be based on consideration of the following factors:
   A. Lithology of the aquifer and unsaturated zone;
   B. Hydraulic conductivity of the aquifer and unsaturated zone;
   C. Groundwater flow rates;
   D. Minimum distance between the upgradient edge of the CCR surface impoundment and the downgradient monitoring well screen (minimum distance of travel); and
   E. Resource value of the aquifer.

5. If the owner/operator determines, pursuant to subsection (10)(E), that there is a SSI over background for one or more of the constituents listed in Appendix I, the owner/operator:
   A. Must, within fourteen (14) days of this finding, notify the department indicating which constituents have shown statistically significant changes from background levels; and
   B. Must establish an assessment monitoring program meeting the requirements of subsection (10)(F) within ninety (90) days except as provided for in subparagraph (10)(D).

6. The owner/operator may demonstrate that a source other than the CCR surface impoundment caused the contamination or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. A report documenting this demonstration must be certified by a qualified groundwater scientist and submitted to the department for review and approval. If a successful demonstration is made and documented, the owner/operator may continue detection monitoring as specified in this subsection. If, after ninety (90) days, a successful demonstration is not made, the owner/operator must initiate an assessment monitoring program as specified in subsection (10)(F).

(E) Statistical method. The owner/operator shall specify one (1) or more statistical method(s) to be used in evaluating groundwater monitoring data for each monitoring constituent.

1. The statistical method used to evaluate groundwater monitoring data shall be appropriate for the distribution of the concentration data for the chemical parameters or hazardous constituents and approved by the department. If the distribution of the concentration data for the chemical parameters or hazardous constituents is shown by the owner/operator to be inappropriate for a normal data distribution theory test, then the data should be transformed or a distribution-free (nonparametric) theory test should be used. If the concentration data distributions for
the constituents of each well differ, more than one (1) statistical method will be needed;

2. If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentration or a groundwater protection standard, as defined below in paragraph (10)(F)7., the test shall be done at a Type I error rate no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experiment-wide error rate for each testing period shall be no less than 0.05, however, the Type I error rate of no less than 0.01 for individual well comparisons shall be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts;

3. If a control chart approach is used to evaluate groundwater monitoring data, the specific type of control chart and its associated parameter values shall be protective of human health and the environment. The selection of this method shall be determined after considering the number of samples in the background database, the data distribution, and the range of the concentration values for each constituent of concern;

4. If a confidence interval, tolerance interval, or a prediction interval is used to evaluate groundwater monitoring data, then the level of confidence for each interval, and the percentage of the population that each interval contains, shall be protective of human health and the environment. Selection of one (1) or more of these methods shall be determined after considering the number of samples in the background database, the data distribution, and the range of the concentration values for each constituent of concern;

5. The statistical method shall account for data below the limit of detection with one (1) or more statistical procedures that are protective of human health and the environment. Any practical quantization limit that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility; and

6. If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.

(F) Response to statistical analysis/assessment monitoring.

1. Assessment monitoring is required whenever a SSI over background levels has been detected for one (1) or more of the constituents listed in Appendix I.

2. Within ninety (90) days of triggering an assessment monitoring program, and annually thereafter, the owner/operator of the utility waste or CCR landfill must sample and analyze the groundwater for all constituents listed in Appendix II of this rule. The number of samples collected and analyzed for each well during each sampling event must be consistent with subsection (10)(B), and must account for any unique characteristics of the site, but must include at least one (1) sample from each well.

3. The owner/operator of a utility waste or CCR landfill may submit to the department for review and approval a demonstration for an alternative monitoring frequency for repeated sampling and analysis for constituents listed in Appendix II during the active life and the post-closure care period based on the availability of groundwater. If there is not adequate groundwater flow to sample wells semiannually, the
alternative frequency shall be no less than annual. The need to vary monitoring frequency must be evaluated on a site-specific basis. The demonstration must be supported by, at a minimum, the following information:

A. Information documenting the need for less frequent sampling. The alternative frequency must be based on consideration of the following factors:
   (I) Lithology of the aquifer and unsaturated zone;
   (II) Hydraulic conductivity of the aquifer and unsaturated zone; and
   (III) Groundwater flow rates.

B. Information documenting that the alternative frequency will be no less effective in ensuring that any leakage from the utility waste or CCR landfill will be discovered within a timeframe that will not materially delay the initiation of any necessary remediation measures.

C. The owner/operator must obtain a certification from a professional engineer and submit it to the department for review and approval, stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner/operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a professional engineer in the annual groundwater monitoring and corrective action report required by section (10).

4. After obtaining the results from the initial and subsequent sampling events required in paragraph (10)(F)2., the owner/operator must:
   A. Within ninety (90) days of obtaining the results, and on at least a semiannual basis thereafter, resample all wells that were installed pursuant to the requirements of section (10), conduct analyses for all constituents in Appendix I and for those constituents in Appendix II that are detected in response to subparagraph (10)(F)4.B., submit the sampling and analysis to the department for review and approval and record their concentrations in the facility operating record. The number of samples collected and analyzed for each background well and downgradient well during subsequent semiannual sampling events must be consistent with subsection (10)(D), and must account for any unique characteristics of the site, but must be at least one (1) sample from each background and downgradient well;
   B. Establish groundwater protection standards for all constituents detected pursuant to paragraph (10)(F)2. or subparagraph (10)(F)4.A. The groundwater protection standards must be established in accordance with paragraph (10)(F)8; and
   C. Include the recorded concentrations required by subparagraph (10)(F)8., identify the background concentrations established under subsection (10)(C), and identify the groundwater protection standards established under subparagraph (10)(F)4.B. in the annual groundwater monitoring and corrective action report. The owner/operator must submit the annual groundwater monitoring and corrective action report to the department for review and approval.

5. If the concentrations of all constituents listed in Appendices I and II are shown to be at or below background values, using the statistical procedures in subsection (10)(E), for two (2) consecutive sampling events, the owner/operator may return to detection monitoring of the utility waste or CCR landfill. The owner/operator must prepare and submit a notification to the department for review and approval requesting that
detection monitoring resume for the utility waste or CCR landfill. The owner/operator has completed the notification when the approved notification is placed in the facility's operating record.

6. If the concentrations of any constituent in Appendices I and II are above background values, but all concentrations are below the groundwater protection standard established under paragraph (10)(F)8., using the statistical procedures in subsection (10)(E), the owner/operator must continue assessment monitoring in accordance with this section.

7. If one or more constituents in Appendix II of this rule are detected at statistically significant levels above the groundwater protection standard established under paragraphs (10)(F)4. and 8. in any sampling event, the owner/operator must prepare a notification identifying the constituents in Appendix II to this rule that have exceeded the groundwater protection standard. The owner/operator has completed the notification when the notification is submitted to the department for approval and the approved notification is placed in the facility's operating record. The owner/operator of the utility waste or CCR landfill also must:

A. Characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected. The characterization must be sufficient to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the utility waste or CCR landfill pursuant to section (11). Characterization of the release includes the following minimum measures:

   (I) Install additional monitoring wells necessary to define the contaminant plume(s);
   (II) Collect data on the nature and estimated quantity of material released including specific information on the constituents listed in Appendix II of this rule and the levels at which they are present in the material released;
   (III) Install at least one (1) additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with subparagraph (10)(F)4.A.; and
   (IV) Sample all wells in accordance with subparagraph (10)(F)4.A. to characterize the nature and extent of the release;

B. Notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off site if indicated by sampling of wells in accordance with subparagraph (10)(F)7.A. The owner/operator has completed the notifications when they are submitted to the department for approval and the approved notification is placed in the facility's operating record;

C. Within ninety (90) days of finding that any of the constituents listed in Appendix II to this rule have been detected at a statistically significant level exceeding the groundwater protection standards must either:

   (I) Initiate an assessment of corrective measures as required by subsection (11)(A); or
   (II) Demonstrate that a source other than the utility waste or CCR landfill caused the contamination, or that the SSI resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such
demonstration must be supported by a report that includes the factual or
evidentiary basis for any conclusions and must be certified to be accurate by a
professional engineer. If a successful demonstration is made to the department,
the owner/operator must continue monitoring in accordance with the
Assessment Monitoring program pursuant to this section, and may return to
detection monitoring if the constituents in Appendices I and II of this rule are at
or below background as specified in paragraph (10)(F)5. The owner/operator
must also include the demonstration in the annual groundwater monitoring and
corrective action report submitted to the department for review and approval in
addition to the certification by a professional engineer; and

D. If a successful demonstration has not been made at the end of the ninety (90) day
period provided by paragraphs (10)(F)7.C.(II), initiate the assessment of corrective
measures requirements under subsection (11)(A).

8. The owner/operator of the utility waste or CCR landfill must establish a groundwater
protection standard for each constituent in Appendix II of this rule detected in the
groundwater. The groundwater protection standard shall be:
A. For constituents for which a maximum contaminant level (MCL) has been
established pursuant to the National Primary Drinking Water Regulations 40 CFR
141.62 (June 29, 2004) and 40 CFR 141.66 (December 7, 2000), the MCL for that
constituent;
B. For the following constituents:
   (I) Cobalt 6 micrograms per liter (µg/l)
   (II) Lead 15 µg/l
   (III) Lithium 40 µg/l
   (IV) Molybdenum 100 µg/l; or
C. For constituents for which the background level is higher than the levels identified
under subparagraphs (10)(F)8.A and B, use the background concentration.

(11) Corrective Action. The owner/operator of a utility waste or CCR landfill that shows one
(1) or more constituents listed in Appendix II of this rule being detected at levels above the
groundwater protection standard as established under paragraph (10)(F)8. shall proceed
with corrective action measures outlined in subsections (11)(A) through (C) below.

(A) Assessment of corrective measures.
1. Within ninety (90) days of finding that any of the constituents listed in Appendix II of
this rule have been detected at a statistically significant level exceeding the
groundwater protection standards listed under paragraphs (10)(F)4. and 8., or
immediately upon detection of a release from a utility waste or CCR landfill, the
owner/operator shall initiate an assessment of corrective measures to prevent further
releases, to remediate any releases and to restore the affected area(s) to original
conditions. This assessment of corrective measures shall be completed within ninety
(90) days, unless the owner/operator demonstrates the need for additional time to
complete the assessment of corrective measures due to site-specific conditions or
circumstances. The owner/operator must obtain a certification from a professional
engineer attesting that the demonstration is accurate. The ninety (90)-day deadline to
complete the assessment of corrective measures may be extended by the department
for no longer than sixty (60) days. The owner/operator must also include the
2. The owner/operator shall continue to monitor in accordance with the assessment monitoring program as specified in paragraph (10)(F)2.
3. The assessment shall include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described in this rule, addressing at least the following:
   A. The performance, reliability, ease of implementation and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts and control of exposure to any residual contamination;
   B. The time required to begin and complete the remedy; and
   C. The institutional requirements such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(ies).
4. The owner/operator must place the completed assessment of corrective measures in the facility's operating record and submit it to the department for review and approval. The assessment has been completed when it is approved by the department.
5. The owner/operator shall discuss the results of the corrective measures assessment at least thirty (30) days prior to the selection of remedy, in a public meeting with interested and affected parties.

(B) Selection of remedy.
1. The department may determine that remediation of a release of a constituent listed in Appendix II from a utility waste or CCR landfill is not necessary if the owner/operator demonstrates to the satisfaction of the department that—
   A. The groundwater is additionally contaminated by substances that have originated from a source other than a utility waste or CCR landfill and those substances are present in concentrations such that cleanup of the release from the utility waste or CCR landfill would provide no significant reduction in risk to actual or potential receptors;
   B. The constituent(s) is present in groundwater that:
      (I) Is not currently or reasonably expected to be a source of drinking water; and
      (II) Is not hydraulically connected with a potential drinking water source to which the constituent(s) is migrating or likely to migrate in a concentration(s) that would exceed the groundwater protection standards established under paragraph (10)(F)8.;
   C. Remediation of the release(s) is technically impracticable; or
   D. Remediation results in unacceptable cross-media impacts.
2. Notwithstanding a determination by the department pursuant to paragraph (11)(A)1., the department may require the owner/operator to undertake source control measures or other measures (including closure if triggered) that may be necessary to eliminate or minimize further releases to the groundwater, to prevent exposure to the groundwater, or to remediate the groundwater to concentrations that are technically feasible and significantly reduce threats to human health or the environment.
3. Based on the results of the corrective measures assessment conducted in accordance with section (11)(A), the owner/operator must, as soon as feasible, select a remedy that, at a minimum, meets the standards listed in paragraph (11)(B)4. This requirement applies to, not in place of, any applicable standards under the Occupational Safety and Health Act. The owner/operator must prepare a semiannual report describing the progress in selecting and designing the remedy. Upon selection of a remedy, the owner/operator must prepare a final report describing the selected remedy and how it meets the standards specified in paragraph (11)(B)4. and submit this report to the department for review and approval. The owner/operator must obtain a certification from a professional engineer that the remedy selected meets the requirements of this section. The owner/operator shall submit the final report to the department within fourteen (14) days of selecting a proposed remedy. The report is complete once the report is approved by the department and the owner/operator has placed it in the operating record.

4. Remedies shall:
   A. Be protective of the public health and the environment;
   B. Attain the groundwater protection standard specified in paragraph (10)(F)8.;
   C. Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents listed in Appendix II of this rule into the environment that may pose a threat to human health or the environment;
   D. Remove from the environment as much of the contaminated material that was released from the utility waste or CCR landfill as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; and
   E. Comply with standards for management of wastes as specified in paragraph (11)(C)3.

5. In selecting a remedy that meets the standards of paragraph (11)(B)4. the owner/operator, and in approving a remedy, the department, shall consider the following evaluation factors:
   A. The long- and short-term effectiveness and protectiveness of the potential remedy, along with the degree of certainty that the remedy will prove successful based on consideration of the following:
      (I) Magnitude of reduction of existing risks;
      (II) Magnitude of residual risks in terms of likelihood of further releases due to waste remaining following implementation of the proposed remedy;
      (III) The type and degree of long-term management required, including monitoring, operation, and maintenance;
      (IV) Short-term risks that might be posed to the community, workers, or the environment during implementation of the remedy, including potential threats to human health and the environment associated with excavation, transportation, redisposal, or containment;
      (V) Time until full protection is achieved;
      (VI) Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, redisposal, or containment;
      (VII) Long-term reliability of the engineering and institutional controls; and
      (VIII) Potential need for replacement of the remedy;
B. The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:
   (I) The extent to which containment practices will reduce further releases; and
   (II) The extent to which treatment technologies may be used;

C. The ease or difficulty of implementing the potential remedy(ies) based on consideration of the following types of factors:
   (I) Degree of difficulty associated with constructing the remedy technology;
   (II) Expected operational reliability of the proposed technologies;
   (III) Need to coordinate with and obtain necessary approvals and permits from other agencies;
   (IV) Availability of necessary equipment and specialists; and
   (V) Available capacity and location of needed treatment, storage, and disposal services; and

D. The degree to which community concerns are addressed by the proposed remedy(ies).

6. The owner/operator shall specify as part of the proposed remedy a schedule(s) for initiating, implementing, and completing remedial activities. This schedule must require the completion of remedial activities within a reasonable period of time taking into consideration the factors set forth in subparagraphs (11)(B)6.A. through H. The owner/operator shall consider the following factors in determining, and the department will consider the following factors in approving, the schedule of remedial activities:
   A. Extent and nature of contamination as determined by the characterization required pursuant to subsection (10)(F);
   B. Reasonable probabilities of remedial technologies in achieving compliance with groundwater protection standards established in paragraph (10)(F)8. and other objectives of the remedy;
   C. Availability of treatment or disposal capacity for CCR managed during implementation of the remedy;
   D. Desirability of utilizing technologies that are not currently available, but which may offer significant advantages over already available technologies in terms of effectiveness, reliability, safety, or ability to achieve remedial objectives;
   E. Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy;
   F. Resource value of any affected aquifer including:
      (I) Current and future uses;
      (II) Proximity and withdrawal rate of users;
      (III) Groundwater quantity and quality;
      (IV) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to the waste constituent;
      (V) The hydrogeologic characteristic of the facility and surrounding land; and
      (VI) The availability of alternative water supplies;
   G. Practicable capability of the owner/operator; and
   H. Other relevant factors.

(C) Implementation of the corrective action program.
1. If required to select a remedy pursuant to subsection (11)(B), the owner/operator must initiate remedial activities within ninety (90) days. Based on the schedule established pursuant to subsection (11)(B) for initiation, implementation and completion of remedial activities the owner/operator shall:
   A. Establish and implement a corrective action groundwater monitoring program that:
      (I) At a minimum, meets the requirements of an assessment monitoring program of subsection(10)(F);
      (II) Indicates the effectiveness of the corrective action remedy; and
      (III) Demonstrates compliance with groundwater protection standards pursuant to paragraph (10)(F)8.;
   B. Implement the corrective action remedy selected under subsection (11)(B); and
   C. Take any interim measures necessary, any measures determined to be necessary by the department, or both, to reduce the contaminants from leaching from the utility waste or CCR landfill, and/or potential exposures to human or ecological receptors. Interim measures shall, to the greatest extent feasible, be consistent with the objectives of and contribute to the performance of any remedy that may be required pursuant to subsection (11)(B). The following factors shall be considered by an owner/operator, and will be considered by the department, in determining whether interim measures are necessary:
      (I) Time required to develop and implement a final remedy;
      (II) Actual or potential exposure of nearby populations or environmental receptors to hazardous constituents listed in Appendix II;
      (III) Actual or potential contamination of drinking water supplies or sensitive ecosystems;
      (IV) Further degradation of the groundwater that may occur if remedial action is not initiated expeditiously;
      (V) Weather conditions that may cause hazardous constituents to migrate or be released;
      (VI) Potential for exposure to any of the constituents listed in Appendix II to this rule as a result of an accident or failure of a container or handling system;
      (VII) Risks of fire or explosion, or potential for exposure to hazardous constituents as a result of an accident or failure of a container or handling system; and
      (VIII) Other situations that may pose threats to human health and the environment.

2. The department may determine, based on information developed after implementation of the remedy has begun or other information, that compliance with the requirements of subsection (11)(B). are not being achieved through the remedy selected. In those cases, the owner/operator shall implement other methods or techniques that could feasibly achieve compliance with the requirements. Remedies selected pursuant to subsection (11)(B) shall be considered complete when:
   A. The owner/operator complies for three (3) consecutive years with the groundwater protection standards established pursuant to paragraph (10)(F)8. at all points within the plume of contamination that lie beyond the groundwater monitoring well system established pursuant to section (10);
B. Compliance with the groundwater protection standards established pursuant to paragraph (10)(F), has been achieved within the plume of contamination that lies beyond the groundwater monitoring well system following risk assessment, or at a compliance point otherwise established by the department; and
C. All actions required to complete the remedy have been completed.

3. All CCR that are managed pursuant to a remedy required under subsection (11)(B), or an interim measure required under subparagraph (11)(C)1.C. shall be managed in a manner that complies with all applicable Resource Conservation Recovery Act requirements.

4. Upon completion of the remedy, the owner/operator shall submit a certification to the department within fourteen (14) days after the remedy has been completed in compliance with the requirements of subsection (11)(C). The certification shall be signed by the owner/operator and by a professional engineer prior to review and approval by the department. The report has been completed when it is placed in the operating record after department approval.

5. When, upon completion of the certification, the owner/operator and the department determine that the corrective action remedy has been completed in accordance with the requirements under subsection (11)(C), the owner/operator shall be released from the requirements for financial assurance for corrective action.

(12) Air Quality.

(A) The design, construction, and operation of the utility waste or CCR landfill shall minimize environmental hazards and shall conform to applicable ambient air quality and source control regulations.

(B) Fugitive dust control plan. The owner/operator must prepare and operate in accordance with a fugitive dust control plan as specified below:

1. The fugitive dust control plan must identify and describe measures the owner/operator will use to minimize CCR from becoming airborne at the facility. The owner/operator must select, and include in the fugitive dust control plan, measures that are most appropriate for site conditions, along with an explanation of how the measures selected are applicable and appropriate for site conditions and periodically assess the effectiveness of the control plan.

2. The fugitive dust control plan must include procedures to emplace CCR as conditioned CCR. Conditioned CCR means wetting CCR with water to a moisture content that will prevent wind dispersal, but will not result in free liquids. In lieu of water, CCR conditioning may be accomplished with an appropriate chemical dust suppression agent approved by the department.

3. Amendment of the plan. The owner/operator must amend the written plan whenever there is a change in conditions that would substantially affect the written plan in effect and submit the revised plan to the department for review and approval.

(13) Aesthetics. The utility waste or CCR landfill shall be designed and operated at all times in an aesthetically acceptable manner. Wastes that are easily moved by wind shall be covered, as necessary, to prevent becoming airborne and scattered. On-site vegetation should be cleared only as necessary. Natural windbreaks, such as green belts, should be maintained where they will improve the appearance and operation of the utility waste or
CCR landfill. Mining operations for the purpose of removing waste for beneficial reuse shall be conducted in such a manner as to not detract from the appearance of the utility waste or CCR landfill and receive prior approval from the department. All Water Protection Program permits and approvals necessary to comply with the Missouri Clean Water Law and corresponding rules shall be obtained from the department.

(14) Cover.

(A) Cover shall be applied to: minimize infiltration of precipitation, prevent fugitive dust, and provide final cover as outlined below:

1. The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than $1 \times 10^{-5}$ cm/sec, whichever is less.

2. This final cover consists of component layers, in order from top to bottom, as follows:
   A. Six inches (6”) of soil capable of sustaining vegetative growth;
   B. An infiltration layer that contains a minimum of eighteen inches (18”) of earthen material, with a coefficient of permeability of $1 \times 10^{-5}$ cm/sec or less; and
   C. Vegetation shall be established within one (1) year of initial seeding or within an alternative schedule approved by the department.

3. The cover system integrity must be maintained throughout the operational and post closure periods;

4. Surface grades and side slopes need to promote maximum runoff, without excessive erosion, and to minimize infiltration. Final side slopes shall not exceed twenty-five percent (25%) unless it has been demonstrated in a detailed slope stability analysis approved by the department that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill. No active or final slope shall exceed thirty-three and one-third percent (33 1/3%);

5. Procedures to establish and maintain vegetative growth to combat erosion and improve appearance of idle and completed areas. Procedures shall include: seeding rate, fertilizer rate, soil conditioning rate, and provisions for mulching;

6. Procedures to maintain cover integrity, for example, regrading, and recovering;

7. Methods for borrow areas to be reclaimed so as to restore aesthetic qualities and prevent excessive erosion;

8. The final slope of the top of the utility waste or CCR landfill shall have a minimum slope of one percent (1%); and

9. The department may approve the use of an alternative final cover system provided that the owner/operator can demonstrate to the department that the alternative design will be at least equivalent to the final cover system described in this section.

(15) Post-Closure Care Requirements.

(A) Post-closure care maintenance requirements. Following closure of the utility waste or CCR landfill, the owner/operator must conduct post-closure care for the utility waste or CCR landfill, which must consist of at least the following:

1. Maintain the integrity and effectiveness of the final cover system, including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover;
2. Maintain the integrity and effectiveness of the leachate collection and removal system and operate the leachate collection and removal system in accordance with the approved plans; and
3. Maintain the groundwater monitoring system and monitor the groundwater in accordance with the approved plans.

(B) Post-closure care period.

1. The owner/operator of the utility waste or CCR landfill must conduct post-closure care for thirty (30) years. However, the post-closure care period may be:
   A. Decreased by the department if the owner/operator demonstrates that the reduced period is sufficient to protect human health and the environment and this demonstration is approved by the department; or
   B. Increased by the department if determined that the lengthened period is necessary to protect human health and the environment.

2. If at the end of the post-closure care period the owner/operator of the utility waste or CCR landfill is operating under assessment monitoring then post-closure care shall continue until the owner/operator returns to detection monitoring.

3. Written post-closure plan.

   A. Contents of the plan. The owner/operator of a utility waste or CCR landfill must prepare a written post-closure plan that includes, at a minimum, the information specified below:
      (I) A description of the monitoring and maintenance activities required and the frequency at which these activities will be performed;
      (II) The name, address, telephone number, and email address of the person or office to contact about the facility during the post-closure care period;
      (III) A description of the planned uses of the property during the post-closure period. Post-closure use of the property shall not disturb the integrity of the final cover, liner(s), or any other component of the containment system, or the function of the monitoring systems unless corrective action is necessary as approved by the department; and
      (IV) No other disturbance is allowed, unless the owner/operator of the utility waste or CCR landfill demonstrates that disturbance of the final cover, liner, or other component of the containment system, including any removal of CCR, will not increase the potential threat to human health or the environment. The demonstration must be certified by a professional engineer, and submitted to the department for approval.

   B. Amendment of a written post-closure plan. The owner/operator may amend the initial or any subsequent written post-closure plan developed pursuant to approval by the department.

(C) Completion of post closure.

1. No later than sixty (60) days following completion of the post closure care period, the owner/operator of a utility waste or CCR landfill must submit a notification to the department verifying the post closure care has been completed. The notification must include a certification by a professional engineer verifying that post closure care has been completed in compliance with the post-closure plan specified in this section and 10 CSR 80-2.030.
(16) Safety. The utility waste or CCR landfill shall be designed, constructed, and operated in a manner so as to protect the health and safety of personnel and others associated with and affected by the operation. Access to the facility must be controlled and appropriate safety equipment required.

(17) Records.
A. The owner/operator of a utility waste or CCR landfill shall maintain records and monitoring data as specified by the department in their operating record and file appropriate documents with the county recorder(s) of deeds.
1. Records shall be maintained at the facility site. Records five (5) years old or older may be stored at an alternate site, if approved by the department; such stored records must be made available at the landfill upon request of department personnel.
2. An owner/operator with more than one (1) utility waste or CCR landfill that is subject to the provisions of this rule may comply with the requirements of this section by using a single recordkeeping system provided the system identifies each file by the name of each utility waste or CCR landfill. The files may be maintained on electronic media accessible by a computer using common software. Records must cover at least the following:
   A. Copies of the approved permit documents and plans, and the current permit;
   B. Major operational problems, complaints, and difficulties;
   C. Any demonstration, certification, finding, monitoring, testing, or analytical data required under this rule;
   D. The current fugitive dust control plan and annual report, as well as dust and litter control efforts;
   E. Closure and post-closure care plans and any monitoring, testing, or analytical data;
   F. Most recently approved cost estimates and financial assurance documentation; and
   G. Records associated with corrective measures.
3. Upon closing of the utility waste or CCR landfill, the existence of the utility waste or CCR landfill shall be recorded with the recorder(s) of deeds in the county(ies) where the utility waste or CCR landfill is located. The owner/operator may request permission from the department to remove the notation from the deed if all wastes are removed from the facility.
   A. A survey and plat meeting the requirements of the current Missouri Standards for Property Boundary Surveys, 2 CSR 90-60, and detailed description of the utility waste or CCR landfill shall be prepared by a land surveyor. The survey plat and detailed description, at a minimum, shall contain the following information:
      (I) The name of the property owner as it appears on the property deed;
      (II) The detailed description of the property;
      (III) The general types and location of the wastes and the depth(s) of fill within the property; and
      (IV) The location of any leachate control or water monitoring systems, which shall be maintained after closure, and the length of time that these systems are to be maintained.
   B. The owner/operator shall:
(I) Obtain approval from the department of the survey plat and detailed description;
(II) Have the plat sealed by a lawful notary public;
(III) File the survey plat and description with the county recorder of deeds within thirty (30) days of department approval; and
(IV) Submit to the department within thirty (30) days of filing, two (2) copies of the sealed and properly recorded survey plat and detailed description showing the recorder of deeds’ seal or stamp, the book and page numbers, and the date of filing.

(18) Self-Certification.
(A) Existing CCR landfills must within thirty (30) days of the effective date of this rule or thirty (30) days of request by the department, provide to the department for review and approval a self-certification report verifying compliance with the requirements of subsection (18)(B) and additionally include the following:
1. The name and address of the owner/operator or permittee of the CCR landfill; the name associated with the CCR landfill; and the permit number of the CCR landfill if one has been assigned;
2. The location of the CCR landfill identified on the most recent United States Geological Survey (USGS) seven and one half (7 1/2) minute or fifteen (15) minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available;
3. A statement of the purpose for which the CCR landfill is being used;
4. The name and size in acres of the watershed within which the CCR landfill is located;
5. Describe the groundwater monitoring network and plan, and summarize the data obtained;
6. Upon request, provide all groundwater monitoring data in a digital format specified by the department;
7. Provide any initial or interim closure plan and post closure plan prepared prior to the effective date of this rule;
8. Identify the groundwater statistical procedure chosen and background values;
9. Identify whether a SSI exists over background values;
10. Identify any planned additional groundwater investigations, including a schedule; and
11. Provide a schedule for future detection or assessment monitoring. The department may consider all relevant data whether or not it was collected from a groundwater monitoring network installed as a requirement of Title 40 CFR 257 subtitle D.
(B) Certifications. Certifications from a professional engineer, professional or registered geologist, or toxicologist as appropriate shall be submitted to the department certifying for the following technical assessments that:
1. The location restrictions meet the requirements of this rule;
2. The design of the composite liner or alternative composite liner meets the requirements of this rule, and the cover system meets the requirements of this rule;
3. The design and construction of the groundwater monitoring system and statistical analysis plan meets the requirements of this rule; and
4. The design and construction of the closure and post-closure plan meets the requirements of this rule; and
5. A compiled history of construction for the CCR landfill that, to the extent feasible, contains:
   A. A description of the physical and engineering properties of the foundation and abutment materials on which the CCR landfill is constructed;
   B. A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each phase or stage of the CCR landfill; the method of site preparation and construction of each zone of the CCR landfill; and the approximate dates of construction of each successive stage of the CCR landfill;
   C. At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR landfill, detailed dimensional drawings of the CCR landfill, including a plan view and cross sections of the length and width of the CCR landfill, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, and any identifiable natural or manmade features that could adversely affect operation of the CCR landfill due to malfunction or misoperation;
   D. A description of the type, purpose, and location of existing instrumentation;
   E. A description of each diversion design feature and capacities and calculations used in their determination;
   F. The construction specifications and provisions for surveillance, maintenance, and repair of the CCR landfill; and
   G. Any record or knowledge of structural instability of the CCR landfill.

(C) Application for department approval and assessment of fees.
1. By October 1, 2019, all owner/operator of existing CCR landfills must submit to the department an application for review and approval of completeness of the reports, data, and assessments required in subsections (18)(A) and (B).
2. The application for review and approval will include the following:
   A. A request to the department to review the documents that the owner/operator has certified;
   B. Agreement to pay fees as provided by section 260.242, RSMo;
3. Within sixty (60) days of receipt of the application, the department shall issue a letter approving or approving with conditions receipt of a complete application and accepting the CCR landfill into the state review process; and
4. The owner/operator of CCR landfills shall submit engineering drawings or plans to the department detailing the manner and timing of closure. Such engineering drawings and plans shall be submitted ninety (90) days prior to commencement of closure.

(19) Closure of CCR Landfills.
(A) Closure of a CCR landfill or any lateral expansion of a CCR landfill must be completed either by leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR landfill, as described in subsections (19)(B) through (J).
(B) Written closure plan.
1. Content of the plan. The owner/operator of a CCR landfill must prepare a written closure plan that describes the steps necessary to close the CCR landfill at any point during the active life of the CCR landfill consistent with recognized and generally accepted good engineering practices. The written closure plan must include the following information:
   A. A narrative description of how the CCR landfill will be closed in accordance with this section;
   B. If closure of the CCR landfill will be accomplished through removal of CCR, a description of the procedures to remove the CCR and decontaminate the CCR landfill in accordance with subsection (19)(C);
   C. If closure of the CCR landfill will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with subsection (19)(D), and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in subsection (19)(D);
   D. An estimate of the maximum inventory of CCR ever on site over the active life of the CCR landfill;
   E. An estimate of the largest area of the CCR landfill ever requiring a final cover as required by subsection (19)(D) at any time during the CCR landfill's active life; and
   F. A schedule for completing all activities necessary to satisfy the closure criteria in this section, including an estimate of the year in which all closure activities for the CCR landfill will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR landfill, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR landfill closure. When preparing the written closure plan, if the owner/operator of a CCR landfill estimates that the time required to complete closure will exceed the timeframes specified in paragraph (19)(F)1., the written closure plan must include the site-specific information, factors, and considerations that would support any time extension sought under paragraph (19)(F)2.

2. Timeframes for preparing the initial written closure plan.
   A. Existing utility waste or CCR landfills. The owner/operator of the CCR landfill must provide the initial written closure plan prepared pursuant to 40 CFR 257 and placed the plan in the facility’s operating record.
   B. After the effective date of this rule, new CCR landfills or lateral expansions of a CCR landfill must submit a written closure plan to the department for review and approval as part of the new construction permit application that is consistent with the requirements listed in paragraph (19)(B)1.

3. Amendment of a written closure plan.
   A. The owner/operator may amend the initial or any subsequent written closure plan developed pursuant to section (19) at any time.
   B. The owner/operator must amend the written closure plan whenever:
      (I) There is a change in the operation of the CCR landfill that would substantially affect the written closure plan in effect; or
(II) Before or after closure activities have commenced, unanticipated events necessitate a revision of the written closure plan.

C. The owner/operator must amend the closure plan and receive department approval prior to an operational change at the facility or CCR landfill. If a closure plan requires revision after closure activities have commenced for a CCR landfill, the owner/operator must submit the amendment to the department for review and approval no later than thirty (30) days following the triggering event.

4. The owner/operator of the CCR landfill must obtain a written approval from the department for any closure plan or amendment of a closure plan. Closure plans must meet the requirements of this section.

(C) Closure by removal of CCR. An owner/operator may elect to close a CCR landfill by removing and decontaminating all areas affected by releases from the CCR landfill. CCR removal and decontamination are complete when constituent concentrations throughout the CCR landfill and any areas affected by releases have been removed and groundwater monitoring concentrations do not exceed the groundwater protection standard established pursuant to paragraph (10)(F). CCR landfills closed by removing the CCR are not subject to the post-closure criteria contained in section (15).

(D) Closure performance standard when leaving CCR in place.

1. The owner/operator of a CCR landfill must ensure that, at a minimum, the CCR landfill is closed in a manner that will:
   A. Control, minimize, or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;
   B. Preclude the probability of future impoundment of water, sediment, or slurry;
   C. Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;
   D. Minimize the need for further maintenance of the CCR landfill; and
   E. Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.

2. Final cover system. If a CCR landfill is closed by leaving CCR in place, the owner/operator must install a final cover system, or an alternative final cover system, that is designed to minimize infiltration and erosion, and at a minimum, meets the following requirements:
   A. The design of the final cover system must be included in the written closure plan required by subsection (19)(B). The final cover system must be designed and constructed to meet the criteria provided in section (14).
   B. The owner/operator may select an alternative final cover system design, provided the alternative final cover system is designed and constructed to meet the performance criteria in section (14). The design of the final cover system must be included in the written closure plan required by subsection (19)(B).
      (I) The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in section (14).
(II) The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in section (14).

(III) The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

C. For final cover systems installed prior to the effective date of this rule, the owner/operator of the CCR landfill must obtain a written certification from a professional engineer that the design of the final cover system meets the requirements of 40 CFR 257.102. Final cover systems installed after the effective date must meet the criteria contained in this section. The department will receive documentation in accordance with section (18).

(E) Initiation of closure activities. Except as provided for in paragraph (19)(E)4. and section (20), the owner/operator of a CCR landfill must commence closure no later than the applicable timeframes specified in either paragraph (19)(E)1. or 2., the CCR landfill owner/operator must also notify the department one hundred and eighty (180) days prior to initiating closure.

1. The owner/operator must commence closure of the CCR landfill no later than thirty (30) days after the date on which the CCR landfill either:
   A. Receives the known final receipt of waste, either CCR or any non-CCR waste stream; or
   B. Removes the known final volume of CCR from the CCR landfill for the purpose of beneficial use of CCR.

2. Initiation of closure activities timeframes.
   A. Except as provided by subparagraph (19)(E)2.B., the owner/operator must commence closure of a CCR landfill that has not received CCR or any non-CCR waste stream or is no longer removing CCR for the purpose of beneficial use within two (2) years of the last receipt of waste or within two (2) years of the last removal of CCR material for the purpose of beneficial use.

   B. Notwithstanding subparagraph (19)(E)2.A. the owner/operator of the CCR landfill may petition the department for an additional two (2) years to initiate closure of the idle utility waste or CCR landfill provided the owner/operator provides written documentation that the CCR landfill will continue to accept wastes or will start removing CCR for the purpose of beneficial use. The documentation must be supported by, at a minimum, the information specified in parts (19)(E)2.B.(I) and (II). The owner/operator may obtain two (2) two (2)-year extensions provided the owner/operator continues to be able to demonstrate that there is reasonable likelihood that the CCR landfill will accept wastes in the foreseeable future or will remove CCR from the landfill for the purpose of beneficial use. The owner/operator must submit to the department for approval each completed demonstration, if more than one (1) time extension is sought prior to the end of any two (2)-year period.

   (I) Information documenting that the CCR landfill has remaining storage or disposal capacity or that the CCR landfill can have CCR removed for the purpose of beneficial use; and

   (II) Information demonstrating that there is a reasonable likelihood that the CCR landfill will resume receiving CCR or non-CCR waste streams in the
foreseeable future or that CCR can be removed for the purpose of beneficial use. The narrative must include a best estimate as to when the CCR landfill will resume receiving CCR or non-CCR waste streams. The situations listed in subparts (19)(E)2.B.(II)(a) through (d) are examples of situations that would support a determination that the CCR landfill will resume receiving CCR or non-CCR waste streams in the foreseeable future:

(a) Normal plant operations include periods during which the CCR landfill does not receive CCR or non-CCR waste streams, such as the alternating use of two (2) or more CCR landfills whereby at any point in time one (1) CCR landfill is receiving CCR while CCR is being removed from a second CCR landfill after its dewatering;

(b) The CCR landfill is dedicated to a coal-fired boiler unit that is temporarily idled (e.g., CCR is not being generated) and there is a reasonable likelihood that the coal-fired boiler will resume operations in the future;

(c) The CCR landfill is dedicated to an operating coal-fired boiler (i.e., CCR is being generated); however, no CCR are being placed in the CCR landfill because the CCR are being entirely diverted to beneficial uses, but there is a reasonable likelihood that the CCR landfill will again be used in the foreseeable future; and

(d) The CCR landfill currently receives only non-CCR waste streams and those non-CCR waste streams are not generated for an extended period of time, but there is a reasonable likelihood that the CCR landfill will again receive non-CCR waste streams in the future.

C. In order to obtain additional time extension(s) to initiate closure of a CCR landfill beyond the two (2) years provided by subparagraph (19)(E)2.A., the owner/operator of the CCR landfill must include with the demonstration required by subparagraph (19)(E)2.B. the following statement signed by the owner/operator or an authorized representative:

(I) I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

3. For purposes of this paragraph, closure of the CCR landfill has commenced if the owner/operator has ceased placing waste and completes any of the following actions or activities:

A. Taken any steps necessary to implement the written closure plan required by subsection (19)(B);

B. Submitted a completed application for any required state or agency permit or permit modification; or

C. Taken any steps necessary to comply with any state or other agency standards that are a prerequisite, or are otherwise applicable, to initiating or completing the closure of a CCR landfill.
4. The timeframes specified in paragraphs (19)(E)1. and 2. do not apply to an owner/operator of an existing CCR landfill closing the CCR landfill for failure to meet the criteria in subsection (1)(B).

(F) Completion of closure activities.

1. Except as provided for in paragraph (19)(F)2., for existing and new CCR landfills and any lateral expansion of a CCR landfill, the owner/operator must complete closure of the CCR landfill within six (6) months of commencing closure activities or another timeframe as approved by the department as part of the official closure plan.

2. Extensions of closure timeframes following approval of the official closure plan.

   A. The timeframes for completing closure of a CCR landfill specified under paragraph (19)(F)1. may be extended if the owner/operator can demonstrate that it was not feasible to complete closure of the CCR landfill within the required timeframes due to factors beyond the facility's control. If the owner/operator is seeking a time extension beyond the time specified in the written closure plan as required by paragraph (19)(B)1., the demonstration must include a narrative discussion providing the basis for additional time beyond that specified in the closure plan. Factors that may support such a demonstration include:

      (I) Complications stemming from the climate and weather, such as unusual amounts of precipitation or a significantly shortened construction season;

      (II) The geology and terrain surrounding the CCR landfill will affect the amount of material needed to close the CCR landfill; or

      (III) Time required or delays caused by the need to coordinate with and obtain necessary approvals and permits from state and local agencies.

   B. Maximum time extensions. CCR landfills may extend the timeframe to complete closure of the CCR landfill multiple times, in one (1)-year increments. For each one (1)-year extension sought, the owner/operator must substantiate the factual circumstances demonstrating the need for the extension. No more than a total of two (2) one (1)-year extensions may be obtained for any CCR landfill.

   C. In order to obtain additional time extension(s) to complete closure of a CCR landfill beyond the times provided by paragraph (19)(F)1., the owner/operator must submit to the department for review and approval, the demonstration required by subparagraph (19)(F)2.A. along with the following statement signed by the owner/operator or an authorized representative:

      (I) I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

3. Upon completion, the owner/operator of the CCR landfill must obtain a certification from a professional engineer verifying that closure has been completed in accordance with the closure plan specified in subsection (19)(B) and the requirements of this section and submit the certification to the department for review and approval.

(G) No later than the date the owner/operator initiates closure of a CCR landfill, the owner/operator must submit a closure notification to the department.
(H) Within thirty (30) days of completion of closure of the CCR landfill or within a timeframe agreed to by the department, the owner/operator must submit a closure notification to the department. The notification must include the certification by a professional engineer as required by paragraph (19)(F).3.

(I) Deed notations – See section (17) and 10 CSR 2.030. An owner/operator that closes a CCR landfill through closure by removal in accordance with subsection (19)(C) is not subject to the deed notation requirements of subsection (19)(I).

(J) The owner/operator of the CCR landfill must comply with the closure recordkeeping requirements specified in section (17).

(20) Alternative Closure Requirements.

(A) The owner/operator of a CCR landfill, or any lateral expansion of a CCR landfill that is subject to closure pursuant to subsection (1)(B) may continue to receive CCR in the landfill provided the owner/operator meets the requirements of either subsection (20)(A) or (B) and receives department approval.

1. No alternative CCR disposal capacity. Notwithstanding the provisions of (1)(B), a CCR landfill may continue to receive CCR if the owner/operator of the CCR landfill certifies that the CCR must continue to be managed in that CCR landfill due to the absence of alternative disposal capacity both on site and off site of the facility. To qualify under this paragraph, the owner/operator of the CCR landfill must document that all of the following conditions have been met:
   A. No alternative disposal capacity is available on site or off site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification under this section;
   B. The owner/operator has made, and continues to make, efforts to obtain additional capacity. Qualification under this subsection lasts only as long as no alternative capacity is available. Once alternative capacity is identified, the owner/operator must arrange to use such capacity as soon as feasible;
   C. The owner/operator must remain in compliance with all other requirements of this rule, including the requirement to conduct any necessary corrective action; and
   D. The owner/operator must prepare an annual progress report documenting the continued lack of alternative capacity and the progress towards the development of alternative CCR disposal capacity.

2. Once alternative capacity is available, the CCR landfill must cease receiving CCR and initiate closure following the timeframes in section (19).

3. If no alternative capacity is identified within five (5) years after the initial certification, the CCR landfill must cease receiving CCR and close in accordance with the timeframes in section (19).

(B) Permanent cessation of a coal-fired boiler(s) by a date certain. Notwithstanding the provisions of subsection (1)(B), a CCR landfill may continue to receive CCR if the owner/operator certifies that the facility will cease operation of the coal-fired boilers within the timeframes specified in paragraph (20)(B)4., but in the interim period (prior to closure of the coal-fired boiler), the facility must continue to use the CCR landfill due to the absence of alternative disposal capacity both on-site and off-site of the facility. To qualify under this subsection, the owner/operator of the CCR landfill must document
that all of the following conditions have been met and submit such documentation to the department for review and approval:

1. No alternative disposal capacity is available on site or off site. An increase in costs or the inconvenience of existing capacity is not sufficient to support qualification under this section;
2. The owner/operator must remain in compliance with all other requirements of this subsection, including the requirement to conduct any necessary corrective action;
3. The owner/operator must prepare an annual progress report documenting the continued lack of alternative capacity and the progress towards the closure of the coal-fired boiler; and
4. For a CCR landfill, the coal-fired boiler must cease operation, and the CCR landfill must complete closure no later than April 19, 2021.

(C) Required notices and progress reports. An owner/operator of a CCR landfill that closes in accordance with subsection (20)(A) or (B) must complete and submit the notices and progress reports to the department specified in paragraphs (2)(C)1. and 2.

1. Within six (6) months of becoming subject to closure pursuant to subsection (1)(B), the owner/operator must prepare and submit to the department a notification of intent to comply with the alternative closure requirements of this section. The notification must describe why the CCR landfill qualifies for the alternative closure provisions under either subsection (20)(A) or (B), in addition to providing the documentation and certifications required by subsection (20)(A) or (B).

2. The owner/operator must prepare the periodic progress reports required by subparagraph (20)(A)1.D. or paragraph (20)(B)3., in addition to describing any problems encountered and a description of the actions taken to resolve the problems. The annual progress reports must be completed according to the following schedule:
   A. The first annual progress report must be prepared and submitted to the department for approval no later than thirteen (13) months after receiving department approval of the alternative closure requirements.
   B. The second annual progress report must be prepared and submitted to the department for approval no later than twelve (12) months after completing the first annual progress report. Additional annual progress reports must be prepared and submitted to the department for approval within twelve (12) months of completing the previous annual progress report.
   C. The owner/operator has completed the progress reports specified in paragraph (20)(C)2. when the reports are submitted to the department for approval, determined complete by the department, and the reports have been placed in the facility’s operating record.
   D. An owner/operator of a CCR landfill must also prepare the notification of intent to close a CCR landfill as required by section (19).
   E. The owner/operator of the CCR landfill must comply with the recordkeeping requirements specified in section (17).

Appendix I--Constituents for Detection Monitoring
Boron
Calcium
Chloride
Fluoride
pH
Sulfate
Total Dissolved Solids (TDS)

Appendix II--Constituents for Assessment Monitoring
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Fluoride
Lead
Lithium
Mercury
Molybdenum
Selenium
Thallium
Radium 226 and 228 combined

PUBLIC COST: This proposed amendment will cost state agencies or political subdivisions seven hundred and four thousand six hundred and forty one dollars ($704,641) in aggregate.

PRIVATE COST: This proposed amendment will cost private entities more than five hundred dollars ($500) in the aggregate.

NOTICE OF PUBLIC HEARING AND NOTICE TO SUBMIT COMMENTS: Anyone may file a statement in support of or in opposition to this proposed amendment with the Missouri Department of Natural Resources, 1101 Riverside Drive, Jefferson City, Missouri. To be considered, comments will be received until March 28, 2019. A public hearing is scheduled for 1:00 p.m. March 21, 2019, at the LaCharrette Conference Room, 1101 Riverside Drive, Jefferson City, Missouri.