

Coal Combustion Residual Storage and Disposal Sites in Missouri

Division of Environmental Quality

I. Introduction

The programs within Missouri's Division of Environmental Quality act in complementary fashion to manage the risks associated with coal combustion residual (CCR) handling and disposal. Although CCR has been classified as solid waste, the Water Protection Program (WPP) plays a central role in regulating existing CCR impoundments because discharges to groundwater are the primary concern at these sites. The Hazardous Waste Program oversees risk-based corrective action (RBCA) demonstrations as well as any remediation at sites enrolled in the Voluntary Cleanup Program, while the Solid Waste Management Program (SWMP) is involved in utility waste landfill permitting and beneficial use determinations. These and other programs may develop or have in place separate requirements that must also be fulfilled in order to protect public health and the environment.

Coal-fired power generating facilities supply roughly half of the electricity used in the United States, and produce approximately 110 million tons of CCR annually. CCR contains various minerals and metals depending on the chemical composition of the source coal. Many of these constituents pose human health and environmental risks when CCR is not properly disposed of and contained. In response to nationwide concern after a major CCR impoundment site failure, the U.S. Environmental Protection Agency (EPA) was prompted to further assess the safety issues surrounding CCR.

On April 17, 2015, the EPA published its final rule governing disposal of CCR produced by electric utilities. The rule became effective on October 19, 2015. The rule regulates CCR from electric utilities as a non-hazardous solid waste under Subtitle D of the Resource Conservation and Recovery Act (RCRA). Although the final regulation does not call for federal permits or enforcement, the facility will be considered an "open dump" subject to civil law suits if the federal requirements for location, design, operation, closure, and post-closure care are not met.

This white paper discusses the role of several departmental programs in administering and enforcing Missouri Revised Statutes as they pertain to CCR management and disposal. Because the federal CCR rule includes many requirements that are similar in nature to requirements that would be established in state construction or operating permits, this white paper is intended to provide clarity regarding permit requirements for CCR. **This is a preliminary document for discussion purposes only.**

The department's SWMP administers Missouri's Solid Waste Management Law and regulations, which involves, among other things, the permitting and inspection of CCR landfills (which are called utility waste landfills in the current state regulations) and the approval of beneficial uses of CCR. The applicable utility waste regulations are cited below:

- 10 CSR 80-2.020 General landfill permitting process
- 10 CSR 80-11.010 Design and operation of utility waste landfills
- 10 CSR 80-2.030 General landfill closure and post-closure care
- 10 CSR 80-2.020(9). Beneficial use of solid waste

In the state of Missouri, the permanent placement of utility waste on the land in a manner constituting disposal must conform to these regulations.

The WPP oversees efforts to minimize the potential for lined and unlined CCR impoundments to discharge water to the subsurface. The Missouri Clean Water Law establishes subsurface waters as waters of the state (RSMo 644.016(26)) and, therefore, discharges to subsurface waters are subject to Missouri State Operating

Permit (MSOP) requirements established under the authority of the Missouri Clean Water Law. While the federal rule may not apply to all facilities handling CCR, the WPP has deemed it necessary to require groundwater monitoring and other requirements for all lined and unlined CCR impoundments via MSOPs per RSMo 644. This white paper is not intended to explain, regulate or implement the recently published CCR RCRA regulations found at 40 CFR 257.50 – 257.107.

Definitions and Acronyms

Aquifer – a subsurface water-bearing bed or stratum that stores or transmits water in recoverable quantities that is presently being utilized or could be utilized as a water source for private or public use. It does not include water in the vadose zone. For purpose of the effluent regulation (10 CSR 20-7.015), sandy or gravelly alluvial soils in or on the floodplains of intermittent streams are not an aquifer.

Coal Combustion Residuals (CCR) – includes fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for power generation by electric utilities and independent power producers.

CCR Impoundment – a natural topographic depression, man-made excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and treats, stores, or disposes of CCR; impoundments no longer receiving CCR after Oct. 19, 2015, which still contain both CCR and liquids are considered to be inactive, while those that continue to receive CCR past this date are considered to be existing impoundments.

Unencapsulated Use – use of CCR that does not involve binding the CCR to a solid matrix, thus leaving it prone to mobilization into the surrounding environment.

II. Solid Waste Management Program

A. Current State Solid Waste Regulations relevant to CCR

Missouri's current utility waste regulations do not fully align with the federal CCR regulations, though there are many similarities. For example, Missouri has no solid waste regulations governing the design and operation of CCR surface impoundments; the regulations only address the closure of CCR surface impoundments on a very elementary level. The federal regulations pertaining to CCR landfills are more stringent than Missouri's regulations with respect to groundwater separation, construction in seismic impact zones, liner and final cover requirements, groundwater corrective action, the length of the post-closure period, and inspections. However, Missouri's regulations are more stringent than the federal regulations with regard to financial assurance, construction quality assurance, survey control, soil characterization, and closure documentation.

Missouri's definition of utility waste:

Fly ash waste, bottom ash waste, slag waste and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels

While the *material* itself is essentially the same as CCR as they are defined in the federal regulations, we should point out some important aspects of the state definition. One is that the disposal of utility waste generated by non-utility power plants (such as power plants dedicated to manufacturing facilities or universities) is regulated under Missouri's landfill chapter, and is not subject to the federal regulations at all. Also, the disposal of utility waste generated by the combustion of other fossil fuels is regulated under Missouri's landfill chapter, while the federal regulations only apply to the disposal of material generated by the combustion of coal. In fact, if Missouri's definition is literally interpreted, it not only includes waste

generated by power plant boilers, but it also includes waste generated by any combustion device that burns fossil fuels. Thus, Missouri's regulations address a larger universe of facilities.

At the 2015 Missouri Waste Control Coalition Conference, the department announced that we would be pursuing changes to our solid waste regulations to ensure that they meet the minimum standards of the federal CCR regulations. Regulatory development and promulgation is a long process. In the interim, the department will strive to work with affected facilities to manage parallel state and federal regulatory requirements in a way that facilitates compliance with both state and federal regulations simultaneously where possible. During this period, it is important for affected facility owners to understand two aspects of this parallel state and federal regulation of CCR:

- The federal regulations are self-implementing, which means that, among other things, owners are required to comply with the regulations without federal or state oversight, regardless of other regulations that may be in place; and
- The more stringent of the two regulations will always govern

B. Future Rulemaking Efforts

The department cannot say with absolute certainty what final state CCR regulations will look like because we will have to engage in a robust stakeholder process. The purpose of this section is to provide stakeholders some insight into the department's current thinking with respect to prospective rule changes.

Prior to EPA's promulgation of the final CCR rule, SWMP staff had already begun an internal evaluation of all current solid waste regulations in anticipation of future revisions. The potential changes to Chapter 3, which governs sanitary landfill design and operation, were to serve as a template for potential changes to Chapter 11. In other words, because of the similarities that already exist between Chapter 3 and Chapter 11, many of the changes the SWMP is contemplating making in Chapter 3 may apply to Chapter 11 as well.

The department will propose to adopt the term 'coal combustion residuals (CCR)' as opposed to continuing to use the term 'utility waste'. We also intend to propose to change Missouri's current definition to exclude waste from fossil fuels other than coal (such as crude oil or natural gas), and waste from combustion devices other than those associated with the generation of electric power (such as coal-fired plants which produce steam heat). We still intend to regulate the disposal and beneficial use of CCR from non-utilities who generate electric power (such as industries or universities who own and operate coal-fired power plants to produce electricity for institutional use) under Chapter 11. However, excluding waste from other fossil fuels from regulation under Chapter 11 will align state rules with federal rules more closely. In addition, the department believes that waste from the combustion of other fossil fuels, and waste from other types of plants, is a very small waste stream. This is evidenced by the fact that, since Chapter 11 became effective in 1997, we have never permitted a facility for the disposal of any waste other than coal combustion waste from electric power plants. Thus, throughout the remainder of this white paper, for ease of discussion we will use the term 'CCR', with the understanding that a final decision must be made with input from our stakeholders.

This does not mean that Missouri will no longer regulate the disposal of waste from the combustion of other fossil fuels or waste from other types of plants. This material will still be considered a special waste under Missouri regulations, and will need to be disposed of in a permitted sanitary landfill. There are also provisions for the permitting of special waste landfills in the current Missouri solid waste regulations if someone desires to do so.

With respect to other regulatory requirements, the department can make the following general statements regarding future proposed CCR landfill regulations:

- A revised Chapter 11 will resemble the current Chapter 3;
- The detailed site investigation process described in 10 CSR 80-2.015 is not likely to change substantively;
- Revised state rules are likely to require post-closure financial assurance in addition to the current requirement for closure financial assurance;
- Chapter 11 will likely be revised to adopt the list of groundwater monitoring parameters in Appendices III and IV of the federal CCR regulations;
- Regulatory requirements in Chapter 11 that are more stringent than the federal CCR rule are likely to remain in effect. These include requirements for:
 - Construction Quality Assurance
 - Survey Control
 - Operating Manuals
 - Closure Survey Plats
 - Easement, Notice, and Covenant

As far as the regulatory requirements for CCR surface impoundments are concerned, the department can make the following statements:

- The detailed site investigation process described in 10 CSR 80-2.015 will apply to surface impoundments;
- The regulatory requirements for the following aspects of CCR surface impoundment design and operation will be identical to those for CCR landfills:
 - Site location restrictions
 - Air quality
 - Liners
 - Final cover systems
 - Groundwater monitoring
 - Financial assurance
 - CQA
 - Survey Control
 - Operating Manuals
 - Closure Survey Plats
 - Easement, Notice, and Covenant

Developing regulatory requirements to address the remaining aspects of the design and operation of CCR surface impoundments will be more difficult. These include the structural integrity and hydrologic/hydraulic capacity requirements. The department's Dam and Reservoir Safety Program currently regulates surface impoundments with dams thirty-five feet or more in height from the crest to the downstream toe. The current Dam and Reservoir Safety regulations are found at 10 CSR 22. The dam safety program has also developed a companion document titled *Engineering Analysis of Dams*, dated August 1989, which provides guidance for many aspects of impoundment design.

The SWMP intends to incorporate the federal standards for design and operation of existing and new CCR surface impoundments into revised state regulations. It is likely that the state CCR regulations developed to address the new federal CCR regulations will be similar in many respects to the current structural integrity and hydrologic/hydraulic capacity requirements found in the dam safety regulations. The detailed regulatory requirements will be developed with stakeholder involvement.

C. New Permit Applications

Any affected facility owner who desires to submit a construction permit application for a new CCR landfill or an expansion must, at a minimum, meet the permitting requirements outlined in the current Missouri regulations, regardless of how those requirements align with the new federal CCR regulations. The department also asks that applicants address the minimum requirements of the federal regulations in their applications for a state permit as well. Where there are similar regulatory requirements, but one regulation is more stringent than the other, the application should address the more stringent requirement (e.g. the liner should be designed to meet the federal criteria rather than the state criteria, but the owner must provide a closure financial assurance instrument (FAI) in accordance with state regulations; though a FAI is not required under the federal regulations). This will avoid any potentially conflicting permit terms and conditions, and should be the shortest path to compliance with overlapping state and federal requirements. It should also result in the lowest cost to all parties. Affected facility owners who desire to submit an application for a new landfill permit should make this a major point of discussion during the pre-application meeting with the department.

D. Modifications to Existing CCR Landfill Permits

Owners of affected facilities must work with the SWMP when producing new permit documents, or revising or modifying any existing permit document pertaining to a permitted CCR landfill, even if the changes are made to comply with the federal regulations. The degree to which CCR landfill owners are required to modify current state permit documents depends largely on when their landfills were permitted. Chapter 11 first became effective on July 30, 1997. In November 1997, the department sent letters to owners of all CCR landfills (which were originally permitted as 'special waste' landfills), explaining how the regulatory changes applied to existing landfills. The letter stated that the following new regulations did not apply to existing landfills:

- The requirement for a 100-foot buffer zone
- Site selection criteria (wetlands, fault areas, etc.)
- The requirement for a leachate collection system
- The requirement for a liner system
- The requirement to demonstrate that liners placed in contact with groundwater would not be adversely impacted
- The quality assurance/quality control requirements for liners and final cover systems
- The requirement to implement groundwater monitoring
- The requirement to limit final slopes to twenty-five (25) percent unless stability analyses were provided

Because owners of CCR landfills permitted after July 30, 1997, were required to comply with these requirements, many of which are similar to those in the new federal CCR regulations, owners of these facilities are much closer to complying with the new federal regulations than owners whose landfills were permitted prior to July 30, 1997. For example, the 1997 Missouri regulations include most of the site location restrictions in the new federal regulations; only the groundwater separation and seismic impact zone restrictions of the federal regulations are not currently in Chapter 11. In addition, many of the groundwater monitoring requirements in the current Missouri regulations are the same as those in the federal regulations. The requirements for surface water control in the 1997 Missouri regulations are essentially the same as those in the new federal regulations. However, even for CCR landfills permitted after July 30, 1997, the new federal regulations change things considerably.

Below is a series of discussions addressing the more important aspects of the new federal CCR regulations governing CCR landfills, how the requirements of each section of the federal regulations differ from the

requirements of the Missouri Solid Waste Management regulations, and what the SWMP requires in the way of modifications to current CCR landfill permits to address changes mandated by the new federal regulations.

1) Other Federal, State, or Local Laws and Regulations

§257.52(b) Applicability of other regulations

This regulation simply points out that §§257.3-1, 257.3-2, and 257.3-3 concerning impacts to floodplains, endangered species, and surface water, respectively, were applicable to waste disposal practices prior to promulgation of the federal CCR rule.

Owners of Missouri CCR landfills permitted after July 30, 1997, were required to address the floodplain and endangered species restrictions in their permit application. Any modification of a previously submitted demonstration, or additional information or evaluations prepared in support of a previously submitted demonstration, must be submitted to the SWMP for review and approval.

Any CCR landfill owner who has not yet demonstrated compliance with the floodplains and endangered species requirements must submit the documentation to the SWMP as soon as possible.

There is no need to demonstrate compliance with §257.3-3 as long as landfill operations are taken into account in the facility's WPP's MSOP.

2) Site Location Restrictions

§257.60 Placement above the uppermost aquifer

This location restriction applies to CCR landfills for which construction commenced after October 19, 2015. As such, it applies to any undeveloped phase of a permitted landfill. An owner who is unable to make this demonstration is prohibited from placing waste in the landfill, or in the phase, whichever is applicable.

This demonstration requires a geologic interpretation affecting public health, safety, and welfare which pertains directly to a site permitted by the state of Missouri. Thus, the installation of any investigative test pit, piezometer, or monitoring well, as well as the collection and interpretation of any data pertaining to this demonstration must be overseen by the department's Missouri Geological Survey (MGS). The final demonstration must be submitted to the MGS for review and approval. While the MGS will not be in a position to determine compliance with the federal regulations, we will be able to state whether we agree with the interpretation of the data and any conclusions drawn.

Owners of landfills permitted after July 30, 1997, were required to perform a Detailed Site Investigation (DSI). The data from the DSI, combined with groundwater elevation data collected during subsequent sampling events, should provide enough information to make this demonstration. If any additional site investigation or data collection is planned, the MGS must provide oversight. The MGS must also approve any new interpretation or evaluation of previously submitted data or information.

Owners of landfills permitted prior to July 30, 1997, will need to perform a DSI and install a groundwater monitoring system to satisfy the requirements of §§257.91 through 257.98. If the landfill has undeveloped phases, the owner will also need to use the information and data collected during the DSI to demonstrate that there is adequate groundwater separation in the undeveloped phases. See the discussion under §257.91 for additional information concerning the site characterization requirements.

It is important to discuss the SWMP's interpretation of this requirement. The federal regulations state that CCR landfills and surface impoundment must be constructed with a base that is located no less than five (5)

feet above the upper limit of the uppermost aquifer, or the owner must demonstrate that there will not be intermittent, recurring, or sustained hydraulic connection between any portion of the base of the landfill and the uppermost aquifer due to normal groundwater fluctuations. Note that the ultimate standard for this location restriction is that there is no contact allowed between the base of the liner and the uppermost aquifer. The owner may design the landfill with any groundwater separation she/he chooses. The department's understanding is that a design featuring a smaller groundwater separation is more appropriate for a site with a small fluctuation in groundwater elevation, while a site with a large fluctuation in groundwater elevation should be designed with a larger groundwater separation.

There are several aspects of the groundwater separation standard that are worth noting. First, the standard is treated as a *design* standard. Regardless of the design groundwater separation, owners are not prohibited from placing waste in a landfill or phase if future data reveals that groundwater elevations have risen since the landfill or phase was originally designed, as long as there is no contact between the uppermost aquifer and the base of the liner. Nor is the owner required to close the landfill or phase if, after it is placed in operation, groundwater data indicates that there is contact between the base of the liner and the uppermost aquifer.

However, because undeveloped phases are considered to be lateral expansions under the federal regulations, prior to constructing each new phase in the future, owners are required to verify that there will be no contact between the uppermost aquifer and the base of the landfill liner as designed. If groundwater data indicates there will be contact, the owner is required to redesign the base grades of the phase to raise the base-of-liner elevations above the upper limit of the uppermost aquifer. This, of course, requires a permit modification, which must be submitted to the SWMP for review and approval.

We want to emphasize that this is the SWMP's current interpretation of the rule. While it is based on a telephone conversation held between SWMP staff and the EPA, we intend to discuss this matter further with EPA to ensure our interpretation is correct.

§257.61 Wetlands

Because this site location restriction is in the current Missouri regulations, owners of landfills permitted after July 30, 1997, were required to address the wetlands in their construction permit applications. A demonstration submitted in support of the permit application should be sufficient to satisfy the requirements of the federal regulations. However, if any additional evaluation or information is prepared in support of this demonstration, it must be submitted to the SWMP for review and approval.

Owners of landfills permitted prior to July 30, 1997, will need to perform a site reconnaissance and perhaps a wetlands delineation to satisfy these requirements for any undeveloped phases. The final demonstration and supporting information must be submitted to the department for review and approval. An owner who is unable to make this demonstration is prohibited from placing waste in the undeveloped phase.

§257.62 Fault areas

This site location restriction is also in the current Missouri regulations. As such, owners of landfills permitted after July 30, 1997, were required to address it in their construction permit application. The demonstration that was submitted in support of the permit application should be sufficient to satisfy the requirements of the federal regulations. However, if any additional evaluation or information is prepared to demonstrate compliance with the federal regulations, it must be submitted to the SWMP for review and approval.

Our interpretation of the federal CCR regulations is that owners of landfills permitted prior to July 30, 1997, will need to perform a site reconnaissance and a literature review, to determine whether there are any Holocene era faults within two hundred feet of any undeveloped phase. If there are, the owner must also perform a damage projection. The final demonstration and supporting information must be submitted to the department for review and approval. An owner who is unable to make this demonstration is prohibited from placing waste in the undeveloped phase.

§257.63 Seismic impact zones

The current Missouri Solid Waste Management regulations do not include this location restriction. To satisfy the federal regulations, all owners of permitted CCR landfills which have undeveloped phases located in the seismic impact zone will need to have seismic analyses performed on the undeveloped phases. The final analyses along with supporting data and information must be submitted to the department for review and approval. An owner who is unable to make this demonstration is prohibited from placing waste in the undeveloped phase.

§257.64 Unstable areas

Because this site location restriction is included in the current Missouri regulations, owners of landfills permitted after July 30, 1997, were required to address it in their construction permit application. The demonstration that was submitted in support of the permit application should be sufficient to satisfy the requirements of the federal regulations. However, if any additional evaluation or information is prepared to demonstrate compliance with the federal regulations, it must be submitted to the SWMP for review and approval.

Owners of landfills permitted prior to July 30, 1997, will need to perform a site reconnaissance and an evaluation to satisfy these requirements for the entire permitted landfill footprint. The final demonstration and supporting information must be submitted to the department for review and approval. Any owner of an existing CCR landfill, who is unable to make this demonstration for an operating phase, must close the landfill. Any owner who is unable to make this demonstration for an undeveloped phase is prohibited from placing waste in the phase.

3) Design Criteria

§257.70 Design criteria for new CCR landfills and any lateral expansion of a CCR landfill

The liner requirements in the current Missouri regulations do not meet the minimum standards of the federal regulations. However, some CCR landfills permitted after July 30, 1997, were designed with composite liner systems that meet the new minimum federal standards. If this is the case, undeveloped phases of the landfill may be constructed without any additional approval from the department. However, for any undeveloped phase of a landfill permitted with a liner design that does not meet the minimum federal standards, regardless of when the permit was issued, the owner must submit a permit modification request to the department to redesign the phase to include a composite liner system meeting the new federal standards. The liner redesign must be approved by the department before the owner may begin construction of the phase. Alternate liner designs will be considered by the department on a case by case basis if the owner can demonstrate that the design meets the minimum standards for alternate liners in the federal regulations. An extensive program of laboratory testing, including testing for chemical compatibility, may be required.

Much of the same can be said regarding leachate collection systems. Though the current Missouri regulations do not require leachate collection systems for a CCR landfill if the owner can demonstrate that there is no potential for migration of fluids from the landfill, there have been no CCR landfills permitted after

July 30, 1997, without a leachate collection system. Any redesign of an undeveloped phase of a permitted CCR landfill that incorporates a leachate collection system, or any modification to or evaluation of a component of an existing leachate collection, conveyance, or storage system, must be submitted to the department for review and approval.

Owners of CCR landfills permitted after July 30, 1997, are reminded that changes to the design of the liner system and/or leachate collection system may necessitate revising the facility's quality assurance/quality control plan as well.

4) Operating Criteria

§257.80 Air criteria

The current Missouri solid waste regulations include requirements for maintaining air quality at CCR landfills, including a requirement that the owner develop an effective dust control program. Unfortunately, the November 1997 letter the department sent to owners of CCR landfills did not mention how these requirements were to be applied to new versus existing CCR landfills, so it is difficult to say how the new federal CCR regulations will impact owners of existing landfills.

However, the Missouri regulations do not explicitly require the owner to develop a site-wide CCR Fugitive Dust Control Plan, as required by the new federal regulations. Under the present state regulatory structure, most site-wide air quality requirements associated with coal-fired power plants are administered by the department's Air Pollution Control Program (APCP) under the facility's Part 70 permit. The SWMP and the APCP are currently in discussions regarding the administration of these somewhat overlapping responsibilities. It is likely that the SWMP will enforce the air quality requirements of the solid waste regulations within the landfill footprint, while the APCP will enforce the air quality requirements within the plant property but outside the landfill footprint, and within beneficial use storage areas.

Owners of CCR landfills and surface impoundments were required to prepare CCR Fugitive Dust Control Plans by October 19, 2015, and place the plans in their operating record and on their publicly accessible website. As time permits, the SWMP will review those plans and determine whether any aspect of the plan warrants a solid waste permit modification. Implementing many of the control measures discussed in the federal regulations, such as utilizing enclosed structures for handling CCR, reducing fall distances, reducing vehicle speed limits, and covering trucks during transport will not require a solid waste permit modification. Other measures, such as utilizing water sprays or wind barriers, and moisture conditioning the CCR may require a solid waste permit modification depending on where the activity occurs within the plant property. The SWMP encourages owners to implement these procedures as quickly as possible; the program will work with owners to incorporate them into the landfill's operating manual as staff time allows.

§257.81 Run-on and run-off controls for CCR landfills

The current Missouri regulations include requirements for run-on and run-off controls that largely reflect the requirements of the new federal regulations. While the federal regulations explicitly require the owner to develop a Run-on and Run-off Control System Plan, the state requirement to prepare a surface water control system design essentially serves the same purpose. However, the November 1997 letter the department sent to owners of CCR landfills did not mention how the run-on/run-off requirements were to be applied to new and existing CCR landfills. Added to the difficulty this creates is the fact that some older CCR landfills may not have well-defined final grades. Therefore, the extent of any redesign necessary is difficult to assess.

The federal requirement that owners update the run-on/run-off control plan every five (5) years has led some to believe that the plan is a 'living' document, meaning that the design of run-off control systems must

continuously change as phase development progresses, and that new calculations are required every five (5) years. Based on the department's discussions with EPA, this is not the case. The high points of those discussions are that stormwater run-off from the active area (any area that has not been completely closed) must be captured to prevent the release of contaminants to the environment and that the purposes of the 5-year update are to ensure that the design storm event has not changed and no development on adjacent property has affected stormwater run-on. However, discussions with EPA are ongoing; as the department develops a better understanding of this requirement, we will assist owners with the development of these plans.

Owners of CCR landfills permitted after July 30, 1997, should have addressed this requirement in their construction permit applications by including a design for a surface water control system to be constructed at final build out of the landfill. General methods for controlling stormwater in and around the working face and on intermediate slopes should also have been addressed in the landfill operating manual by describing the use of temporary diversion berms and other best management practices. If an owner of an existing landfill makes any changes to the design of the surface water control system, or performs a new evaluation of the performance of an existing component or system, this information must be submitted to the SWMP for review and approval.

Owners of CCR landfills permitted prior to July 30, 1997, must prepare designs for surface water control systems and develop operating manuals incorporating best management practices if they have not already done so. As mentioned above, this may necessitate redesigning the final contours of the landfill to provide adequate surface drainage. Owners of these facilities are cautioned to limit these redesigns to the minimum necessary for adequate drainage. All requests must be submitted to the SWMP for review and approval.

§257.84 Inspection requirements for CCR landfills

The new federal regulations require owners of CCR landfills to perform two types of regularly scheduled inspections. The first is a weekly inspection performed by staff trained to recognize specific appearances of structural weakness and other potentially disrupting conditions. The second is an annual inspection performed by a qualified professional engineer, and involves not only a visual inspection to look for appearances of structural weakness, but also a records review to determine the approximate volume of waste in place as well as whether any changes were made in the geometry of the landfill.

The current Missouri regulations do not include any requirements for inspections other than screening for incoming loads of waste. Therefore, owners of CCR landfills permitted after July 30, 1997, must revise their operating manuals to include these federal inspection requirements. Owners of CCR landfills permitted prior to July 30, 1997, must develop operating manuals which include these requirements. Any revisions to an existing operating manual, as well as any new operating manual, must be submitted to the SWMP for review and approval.

5) Groundwater Monitoring and Corrective Action

Groundwater monitoring is addressed in the following sections of the new federal CCR regulations:

- §257.90 Applicability
- §257.91 Groundwater monitoring systems
- §257.93 Groundwater sampling and analysis requirements
- §257.94 Detection monitoring program
- §257.95 Assessment monitoring program

- §257.96 Assessment of corrective measures
- §257.97 Selection of remedy
- §257.98 Implementation of the corrective action program

The current Missouri regulations governing groundwater monitoring systems, sampling and analysis, detection monitoring and assessment monitoring largely mirror the requirements of the new federal regulations, with the exception of the contaminants of concern. Importantly, the requirement to base the number and locations of groundwater monitoring wells on a thorough subsurface site characterization (called a Detailed Site Investigation in the Missouri regulations) is the same in both the state and federal regulations.

There the similarity between the federal and state groundwater monitoring requirements ends. The new federal regulations clearly require owners to make an assessment of corrective measures, select a remedy, and take corrective action when concentrations of Appendix IV contaminants exceed groundwater protection standards. The current Missouri regulations only *imply* that these three steps are required.

Additionally, the November 1997 letter to CCR landfill owners stated that the requirements for semi-annual groundwater monitoring and reporting, the list of monitoring parameters, the requirement that groundwater monitoring wells be purged and sampled using dedicated equipment, and the requirement for electronic submission of groundwater monitoring data applied to owners of new landfills as well as any owners of existing landfills who had implemented a groundwater monitoring program. However, owners of landfills permitted prior to July 30, 1997, were not required to implement a groundwater monitoring program if they had not already done so.

The new federal regulations require owners of all CCR landfills who continued to receive waste after October 19, 2015, to implement a groundwater monitoring program. As of the date of this guidance, there are nine (9) operating CCR landfills permitted by the state of Missouri. All have implemented groundwater monitoring programs, though only those permitted or horizontally expanded after July 30, 1997, have monitoring programs in place that the department believes meet the minimum standards of the new federal regulations.

There are several important things to understand about the groundwater monitoring aspects of the new federal regulations. Perhaps the most important thing to understand is that the number and locations of groundwater monitoring wells must be based on a thorough subsurface site characterization, i.e., a DSI as described in 10 CSR 80-2.015, and Appendix I to that rule. The state of Missouri's current DSI process was developed to comply with the site characterization requirements of the federal Subtitle D regulations for municipal solid waste landfills, which are very similar to the new federal CCR regulations. The process has been refined during the past twenty years to the point where the department feels that we have one of the more robust processes in the country. As such, we feel confident that an owner who follows the process will fulfill the requirement with regard to the federal CCR regulations. Therefore, we recommend that owners who have not yet completed a subsurface site characterization follow the current state DSI process. The process is not likely to be revised during state rulemaking efforts, thus any completed DSI would be valid for compliance with Missouri's future CCR regulations as well, eliminating the need to do additional work when those regulations are promulgated.

Also, the federal regulations require owners to install the monitoring wells and collect eight (8) statistically independent background samples from each well prior to October 17, 2017, which means that the DSI should be well underway at this point. The department's MGS will provide the necessary oversight during the DSI process, and work with the owners of these landfills as closely as possible to provide assistance.

Another important aspect of the federal groundwater monitoring requirements is the location of the monitoring wells. In Missouri, the entire monitoring well network is typically installed around the perimeter of the landfill footprint, some distance from the edge of the footprint but within the plant property boundary. All of the wells are installed prior to issuance of the operating permit, and wells are seldom relocated except when it is necessary to replace damaged or deteriorated wells. One major difference between the state and federal requirements is that the new federal regulations require the down gradient monitoring wells to be located as close to the down gradient waste boundary as is practical, whereas under state regulations, they may be located a greater distance from the landfill footprint. Owners of landfills whose down gradient monitoring wells are not located as close to the landfill footprint as is practical are required to install new monitoring wells near the down gradient edge of waste. This requires prior approval from the department's SWMP and MGS. For landfills permitted after July 30, 1997, the DSI most likely yielded enough information to allow new well locations to be selected without further site characterization. However, owners are urged to discuss this issue with MGS prior to installing any new monitoring wells.

For landfills designed and constructed in phases, the issue of groundwater monitoring well location can have a more profound effect. Undeveloped phases (for which construction commences after October 19, 2015) are considered to be lateral expansions under the new federal CCR regulations. Therefore, if the phase development sequence permitted by the state, relative to the direction of groundwater flow, is from the up gradient to the down gradient direction, then under the federal regulations, owners must install monitoring wells near the down gradient edge of each successive phase as it is constructed. The wells will need to be installed in sufficient time to allow the owner to collect eight (8) statistically independent background samples prior to placing waste in the new phase. If those newly installed downgradient monitoring wells are within the footprint of future phases, they will need to be properly abandoned prior to beginning construction of the future phases. Thus, the landfill development process will usually include the installation of new monitoring wells and the abandonment of previously installed wells on a phase-by-phase basis.

This is not the case for a landfill permitted with a phase development sequence that proceeds from downgradient to up gradient relative to groundwater flow. Since the new federal regulations do not require the up gradient monitoring wells to be installed as closely as possible to the waste boundary, in this landfill development scenario the entire monitoring well network can be installed from the beginning of operation as is currently done under the state process.

It is also important to note that the owners of all CCR landfills currently permitted in Missouri will be required to update their sampling and analysis plans to meet the minimum requirements of the new federal regulations, including the list of monitoring parameters. Some may be required to update their statistical analysis plans as well. All revised plans must be submitted to the department for review and approval. The department's SWMP will assist owners in making any necessary changes.

Another aspect of groundwater monitoring which warrants mentioning is the federal requirement that most documents associated with groundwater monitoring be sealed by a professional engineer (P.E.). In Missouri, by statute, any geologic interpretation affecting public health, safety, and welfare must be sealed by a registered geologist (R.G.). This includes any document associated with groundwater monitoring that is placed into the facility's operating record to satisfy the new federal CCR regulations. This may require documents to be sealed by both a P.E. and an R.G.

6) Closure and Post-Closure Care

Closure and post-closure are addressed in the following sections of the new federal CCR regulations:

§257.101 Closure or retrofit of CCR units

§257.102 Criteria for conducting the closure or retrofit of CCR units

§257.103 Alternative closure requirements

§257.104 Post-closure care requirements

Under §257.101 of the new federal CCR regulations, owners of CCR landfills who continued to accept waste on October 19, 2015, must close if they are unable to make the demonstration required to comply with the unstable area location restriction. Under the current Missouri regulations, none of the location restrictions apply to CCR landfills permitted prior to July 30, 1997. However, the federal regulations govern in this situation.

Both the new federal regulations and the current Missouri regulations require CCR landfill owners to prepare written closure plans. In Missouri, however, the closure plans should focus mostly on the closure sequence rather than the detailed design of the final cover system, or the construction procedures. The design and construction of the final cover system are considered to be part of the engineering design of the facility. The federal regulations, on the other hand, require the closure plan to describe the steps necessary to close the landfill and to demonstrate how the final cover system will meet the specified performance standards: minimize infiltration, preclude future impoundment of water, provide measures for stability, minimize future maintenance, and be completed in a relatively short period of time. The department prefers the closure plan to simply incorporate the approved final cover system design by reference rather than reiterate it in detail. We believe this will suffice to satisfy the federal regulations. However, we intend to work with EPA to ensure that this is sufficient. Prior to making any change to an existing closure plan, the landfill owner must submit the plan to the SWMP for review and approval.

Owners of landfills permitted after July 30, 1997, should have developed closure and post-closure plans during the construction permitting process. However, the November 1997 letter the department sent to owners of CCR landfills did not mention whether closure plans were required for owners of existing CCR landfills. Therefore, owners of landfills permitted prior to July 30, 1997, may need to develop a closure plan if they have not done so, and submit it to the department for review and approval.

As far as design of the final cover system is concerned, there is a vast difference between the requirements of the current Missouri regulations and the new federal regulations. The current Missouri regulations require a final cover system consisting of a soil infiltration layer with a thickness of one (1) foot and a permeability equal to or less than 1×10^{-5} cm/s, overlain by a vegetative layer consisting of one (1) foot of soil capable of sustaining vegetation. The new federal CCR regulations require a final cover system consisting of an infiltration layer with a thickness of at least eighteen (18) inches, overlain by a vegetative layer with a thickness of at least six (6) inches. The permeability of the cover system must be less than or equal to that of any bottom liner system or natural subsoils beneath the landfill footprint, but no greater than 1×10^{-5} cm/s in any case.

Note that the federal regulations do not explicitly require the final cover system to be designed with a geomembrane in any situation, even if the landfill was constructed with a geomembrane in the liner system. However, if the liner includes a geomembrane and the owner wishes to close the landfill by installing a cover system consisting only of soil, the soil infiltration layer must be compacted to achieve permeability equal to or less than that of the geomembrane in the bottom liner. Given that the permeability of most geomembranes is on the order of 1×10^{-13} cm/s, the department does not consider this to be a viable option, thus it is not included in the following discussion. Any owner desiring to incorporate a final cover system design of this nature is urged to discuss the issue in detail with the department prior to submitting a request for a permit modification.

Consider the following three scenarios as illustrations of how the department interprets the final cover requirements of the new federal CCR regulations:

Scenario 1 An existing landfill was constructed with a soil liner having a thickness of two (2) feet and a permeability of 1×10^{-7} cm/s.

Under the federal regulations the infiltration layer in the final cover must be at least eighteen (18) inches thick with a permeability less than or equal to 1×10^{-7} cm/s, and the infiltration layer must be overlain with at least six (6) inches of vegetative soil.

Scenario 2 An existing landfill was constructed with a soil liner having a thickness of two (2) feet and a permeability of 1×10^{-5} cm/s, overlain by a 60-mil HDPE geomembrane.

Under the federal regulations, the infiltration layer in the final cover must be at least eighteen (18) inches thick with a permeability of less than or equal to 1×10^{-5} cm/s. The infiltration must be overlain with a geomembrane equal to or superior to 60-mil HDPE (other types of geomembranes, such as linear low-density polyethylene, could be as thin as 30 mils). The geomembrane must be overlain with at least six (6) inches of vegetative soil.

Scenario 3 An existing landfill was constructed with the prescriptive composite liner system in the federal regulations: two (2) feet of soil with a permeability of 1×10^{-7} cm/s overlain by a 60-mil HDPE geomembrane.

Under the federal regulations, the infiltration layer in the final cover would need to have a permeability equal to or less than 1×10^{-7} cm/s, but the thickness only has to be eighteen (18) inches. The infiltration layer must be overlain with a geomembrane equal to or superior to 60-mil HDPE. The geomembrane must be overlain with at least six (6) inches of vegetative soil.

In each of the above scenarios, under the current Missouri regulations, the final cover system would only have to consist of a soil infiltration layer with a thickness of one (1) foot and a permeability equal to or less than 1×10^{-5} cm/s, overlain by a vegetative layer consisting of one (1) foot of soil capable of sustaining vegetation. Therefore, many CCR landfill owners will be required to modify the design of their final cover systems and submit them to the SWMP for review and approval. Owners of CCR landfills permitted after July 30, 1997, are reminded that this may necessitate revising the facility's quality assurance/quality control plan as well.

Alternate final cover designs will be considered by the department on a case-by-case basis if the owner can demonstrate that the design meets the minimum standards for alternate final covers in the federal regulations. An extensive program of laboratory testing may be required.

One aspect of landfill closure that is addressed in the new federal regulations but not in the current Missouri regulations is closure by removal of the CCR. Should a CCR landfill owner desire to close a permitted landfill by removal of waste, it will be considered to be a permit modification, which requires prior approval from the SWMP. The specific closure requirements will have to be worked out on a case-by-case basis. The department advises any such owner to contact the SWMP to discuss the closure requirements prior to preparing the request for a permit modification.

The post-closure monitoring and maintenance requirements in the current Missouri regulations are essentially the same as those in the new federal CCR regulations, with the exception that in the Missouri regulations the post-closure period for CCR landfills is only twenty (20) years while in the federal regulations it is thirty (30) years. In addition, the twenty (20)-year post-closure period in the Missouri regulations does not apply to CCR landfills permitted prior to July 30, 1997, per the department's November 1997 letter to CCR landfill owners. Therefore, owners of CCR landfills permitted after July 30, 1997, are

only required to make minor modifications to their post-closure plans in order to comply with the new federal regulations, while owners of CCR landfills permitted prior to July 30, 1997, are required to develop complete post-closure plans. Any revisions to an existing post-closure plan, as well as any new post-closure plan, must be submitted to the SWMP for review and approval.

E. Regulation of CCR Surface Impoundments

1) Closure of CCR Surface Impoundments

The Missouri Solid Waste Management regulations include one regulatory requirement pertaining to CCR surface impoundments, and that is found at 10 CSR 80-2.020(9)(A)7. Essentially, this regulation allows owners of CCR surface impoundments and other types of industrial storage lagoons to operate and close the lagoons without having to obtain a landfill permit. Where the owner received a permit or approval from the Missouri Clean Water Commission after the effective date of the regulations (July 30, 1997), a landfill permit is required for the permanent disposal of CCR in a lagoon. The WPP will consider any closure conducted in accordance with the federal CCR as being “Approved” for the purposes of 10 CSR 80-2.020(9)(A)7. Any closure conducted outside the authority of the federal CCR regulation will need to seek formal approval of closure from the WPP prior to closure to ensure compliance with 10 CSR 80-2.020(9)(A)7. This provision applies to both cap-in-place and clean closure methods. WPP’s MSOP will require groundwater requirements in accordance with the Missouri Groundwater Quality Standards during any future permitting actions regardless of closure activities. The department is not aware of any existing CCR surface impoundments that received a permit or approval from the Missouri Clean Water Commission after July 30, 1997.

Given the likelihood that most impoundments will be closed with the CCR in place, the department has elected to become involved in the oversight of CCR surface impoundments at this juncture in order to protect state water resources. Therefore, when closing CCR surface impoundments with the CCR in place, owners must contact the SWMP prior to beginning closure activities. Though the aforementioned state regulation does not provide final cover requirements for closure, the SWMP will work with utility owners and the EPA to develop closure criteria that satisfy the federal CCR regulations and can be applied to CCR impoundments on a statewide basis. These criteria can then be adopted into a formal state rulemaking process in the near future. Final cover systems are not foreign to the SWMP, as we have been working with very similar closure requirements regarding sanitary landfills for more than twenty years. The dewatering requirements, on the other hand, will require us to work closely with industry.

If an owner dewatered an existing CCR surface impoundment prior to October 19, 2015, so the impoundment contained CCR but not water on the effective date of the new federal CCR regulation, the impoundment still needs to be closed in a timely manner even though the impoundment is not subject to the new federal CCR regulations. The current state solid waste regulations [10 CSR 80-2.020(9)(A)7] require an owner closing a CCR surface impoundment that was constructed prior to July 30, 1997, to cover the impoundment with soil and file a survey plat or detailed description of the disposal area in accordance with 10 CSR 80-2.030(2)(B). Any owner of a CCR surface impoundment who desires to close the impoundment with the waste in place must contact the SWMP prior to commencing closure activities. In addition, any owner of a CCR surface impoundment who desires to close the impoundment with the waste in place or conduct clean closure must contact the WPP regarding groundwater monitoring requirements.

2) The SWMP’s Role in Other Aspects of the Regulation of CCR Surface Impoundments

At this point in time, owners of CCR surface impoundments that contained CCR and water on October 19, 2015, should be actively working on a DSI for the impoundments. Since the subsurface characterization of a site for the purposes of establishing a groundwater monitoring well network involves multiple geologic interpretations affecting public health, safety, and welfare, the department’s MGS will be actively involved

in the investigation. All work plans, data, information, and reports associated with the DSI must be submitted to the MGS for review and approval. Owners should contact the department's MGS to begin this process.

The department must also be involved in the development of the various plans, demonstrations, designs etc., that CCR surface impoundment owners must prepare in order to comply with the new federal CCR regulations. From a technical standpoint, the SWMP has extensive experience reviewing permit documents that are essentially the same as those associated with CCR surface impoundments, with the exception of the structural integrity and the hydrologic/hydraulic capacity design and assessment. The SWMP is actively working with the department's Dam Safety Program to develop these design criteria for CCR surface impoundments.

F. The Department's Review Process

The department encourages utility owners to submit permit documents to the SWMP and MGS for review as soon as possible. The SWMP recommends that owners finalize all documents, place them into the facility's operating record and on the website in order to satisfy the federal rule, and submit them to the SWMP for review. The SWMP will attempt to complete all reviews in accordance with the review timelines in the current Missouri regulations. If the SWMP completes its review and has comments on a document, the owner may simply revise the document and place the revision into the record and on the website to replace the original.

It seems reasonable to begin working through this process in order of due dates. Attached is a table showing the federal deadlines applicable to owners of CCR landfills and surface impoundments for compliance with the various aspects of the CCR regulations. Several documents, such as closure/post-closure plans, initial structural stability and safety factor assessments, run-on/run-off control plans, and inflow design flood control system plans, to name a few, are due on October 17, 2016. Documentation of the closure of inactive CCR surface is due on April 17, 2018, and the site location demonstrations are due on October 17, 2018.

Groundwater monitoring must be fully implemented by October 17, 2017, which means that the DSI field work report must be completed, the sampling and analysis and statistical analysis plans must be completed, monitoring wells must be installed, and eight (8) statistically independent background samples must be collected by that date. All certified documents must be placed into the operating record and on the website by this date as well.

From the state perspective, the SWMP's approval is not required to put an already approved plan or demonstration that was developed to comply with the state regulations into the federal record to demonstrate compliance with the federal regulations. However, if any changes are made to the plan or demonstration, it must be resubmitted to SWMP for review and approval.

It is important to stress that the department's approval of a document will not ensure compliance with the new federal CCR regulations. It will simply mean that the document is acceptable from a state perspective. In all situations, owners should provide the data and information they feel is required to comply with the federal regulations.

G. Beneficial Use of CCR

The Missouri Solid Waste Management regulations include provisions allowing the beneficial use of solid waste. Beneficial use activities do not require a solid waste disposal area or processing facility permit provided that pollution, a public nuisance or a health hazard is not created. The current regulations include several beneficial use exemptions specific to CCR, which were developed with industry input.

Paragraphs 2.020(9)(A)11 and 12 allow the use of bottom ash or boiler slag for traction control on snow and ice, and the use of fly ash as a concrete or flowable fill additive, respectively. These exemptions, commonly referred to as general exemptions, do not require the prior approval of the department.

Site-specific exemptions, on the other hand, require prior approval from the department. One such exemption, addressed in subsection 2.020(9)(F), allows the beneficial use of type C fly ash, bottom ash, and boiler slag for road base construction and structural fill. For road base applications, the total depth of the mixture of soil and ash must not exceed two (2) feet. For structural fill applications, the depth of ash must not exceed two (2) feet and the disturbed area must be less than five (5) acres. Subsection 2.020(9)(G) allows the use of type C fly ash as a soil amendment, and for soil stabilization. For soil amendment applications the depth of the total mixture of soil and ash must not exceed six (6) inches. For soil stabilization applications, the depth of ash must not exceed two (2) feet and the disturbed area must be less than five (5) acres.

Subsection 2.020(9)(A)(H) allows the department to grant exemptions in quantities greater than those specified in these regulations. Subsection 2.020(9)(A)(I) allows the use of bottom ash and boiler slag as alternate daily cover in a landfill. Again, though these activities are exempt from the solid waste permitting requirements, a written submittal to the department and a written approval from the department is required.

We should point out that in the interest of promoting waste reduction, the department has issued general beneficial use exemptions for the use of CCR to several utilities and material management companies, as well as MoDOT, because these entities tend to conduct a large enough number of beneficial use projects that case-by-case approval is impractical. The beneficial use exemptions allow the department to establish statewide procedures for beneficial use without reviewing each individual request.

Other solid waste permit exemptions are generic in nature, but can be applied to the beneficial use of CCR. These include paragraph 2.020(9)(A) 5, the use of solid waste in the processing or manufacturing of products. This exemption applies to the use of CCR in the manufacture of asphalt shingles, the use of flue gas desulfurization material in the manufacture of gypsum wallboard, and the use of boiler slag as sandblast media.

While all of these exemptions apply under current state regulations, the new federal CCR regulations change the situation somewhat. It is important to mention that the following discussion hinges in large part on the *department's interpretation* of the federal regulations. Under the federal regulations, in order to be considered a legitimate beneficial use, the activity must meet the definition of beneficial use.

From §257.52:

Beneficial use of CCR means *the CCR meet all of the following conditions:*

- (1) The CCR must provide a functional benefit;*
- (2) The CCR must substitute for the use of a virgin material, conserving natural resources that would otherwise need to be obtained through practices, such as extraction;*
- (3) The use of the CCR must meet relevant product specifications, regulatory standards or design standards when available, and when such standards are not available, the CCR is not used in excess quantities; and*
- (4) When unencapsulated use of CCR involving placement on the land of 12,400 tons or more in non-roadway applications, the user must demonstrate and keep records, and provide such*

documentation upon request, that environmental releases to groundwater, surface water, soil and air are comparable to or lower than those from analogous products made without CCR, or that environmental releases to groundwater, surface water, soil and air will be at or below relevant regulatory and health-based benchmarks for human and ecological receptors during use.

In most beneficial use applications, it should not be that difficult to meet the first three criteria in the definition. It is the fourth criterion that presents the problem.

Also, though the term ‘unencapsulated’ is not defined in the federal regulations, §257.52 does include a definition of the term ‘encapsulated beneficial use’:

Encapsulated beneficial use means a beneficial use of CCR that binds the CCR into a solid matrix that minimizes its mobilization into the surrounding environment.

EPA discusses encapsulated beneficial uses in several sections of the preamble to the regulations. Based on that discussion, the two most common encapsulated beneficial uses of CCR are as a substitute for Portland cement in a concrete mixture, and as a substitute for natural gypsum in wallboard. For encapsulated beneficial uses, the end user is not required to keep records. EPA also discusses unencapsulated uses on page 21353 of the preamble to the regulations:

Unencapsulated uses of CCR are numerous and range, in total use, from hundreds of thousands of tons to millions of tons per year. These applications include, as examples, the following:

- (1) Flowable fill;*
- (2) Structural fills;*
- (3) Soil modification/stabilization;*
- (4) Waste stabilization/solidification;*
- (5) Use in agriculture as a soil amendment; and*
- (6) Aggregate.*

Also note that the fourth criterion in the definition of ‘beneficial use of CCR’ essentially ‘exempts’ those who beneficially use CCR in roadway applications from the requirement to keep records and make environmental impact demonstrations. Based on the discussion in the preamble, EPA considers the beneficial use of CCR in roadway applications to be an unencapsulated use. However, the discussion also indicates that because the fill methods used in these applications are significantly different from those used in land filling, the projects typically include technical specifications for engineering properties such as compaction and compressive strength, and oversight is provided during construction. EPA does not consider roadway applications problematic if done properly.

Based on the entirety of the discussion in the preamble, certain beneficial uses allowed under Missouri regulations should be acceptable under the federal regulations. These include the use of CCR in:

- concrete mixtures;
- the manufacture of gypsum wallboard; and
- construction of state and federal highways.

Other beneficial use applications allowed by the Missouri regulations, while considered to be unencapsulated uses, should also be acceptable, though end users should take a more cautious approach. These include the following uses of CCR:

- soil stabilization
- agricultural soil amendment

Beneficial use in these applications should rarely, if ever, approach the quantity threshold of 12,400 tons of CCR. However, the department recommends that end users maintain records of the quantities used. Though you are not explicitly required to do so, it would allow you to prove you did not exceed the threshold.

The department is not comfortable making the same statement regarding the beneficial use of CCR as friction control on snow and ice and in the manufacture of asphalt shingles. We will hopefully obtain clarification on these two beneficial uses from EPA in the near future.

Also, we should point out that, on page 21347 of the preamble, EPA explains that they consider the land application of CCR for agricultural uses not to be a legitimate beneficial use if constituent levels or loading rates exceed those specified in EPA's biosolids regulations, 40 CFR 503 Subpart B.

This leaves what the department feels are the two beneficial uses allowed under the current Missouri regulations that may cause difficulties for end users under the federal regulations. These are the use of CCR as:

- flowable fill; and
- structural fill

The quantity of CCR used in these types of fill projects can easily exceed the quantity threshold specified in the federal CCR regulations. If this in fact occurs (in any beneficial use application), the end user is required to maintain records and other documentation necessary to make at least one of the two environmental demonstrations described in the fourth criteria of the definition of the beneficial use of CCR. The department is currently developing guidance as to how to make those demonstrations, and plans to work with industry in the near future to refine the procedures.

One other thing we should point out is that the department does not consider groundwater monitoring alone to be sufficient to make either of these demonstrations. We believe that EPA intended the demonstrations to be *preventative* measures, i.e. the end user must show, prior to placing the material into the environment, there will be no environmental impact associated with the beneficial use. Groundwater monitoring is more of a *diagnostic* tool, to be used to evaluate whether a release has in fact occurred.

There are many issues to consider with regard to the beneficial use of CCR. Therefore, the department has decided to make beneficial use one of the first major topics of discussion with stakeholders. We expect to hold stakeholders discussions on the topic soon.

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III. Water Protection Program

A. Regulatory Background

Missouri Clean Water Law, found at RSMo 644.051, states that it is unlawful for any person to:

Cause pollution, including the placement of a water contaminant in a location where it is reasonably certain to cause pollution, of any waters of the state:

- Discharge any water contaminants to waters of the state which reduce the quality of that water below the established water quality standards;
- Violate any pretreatment or toxic materials regulations, or discharge any water contaminants to waters of the state which exceed effluent regulations or permit provisions; or
- Discharge any radiological, chemical, or biological warfare agent or high-level radioactive waste into waters of the state.

Waters of the state includes all waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common.

To implement this statute, the department's WPP has developed and codified water quality standards and effluent regulations, which can be found at 10 CSR 20-7.031 and 10 CSR 20-7.015, respectively. MSOPs will include site-specific monitoring requirements and effluent limitations along with any other protective measures necessary to ensure compliance with RSMo 644 and all relevant regulations.

Additionally, RSMo 644.143 requires the establishment of procedures for determining whether remediation of groundwater, based on risk to human health and the environment, is appropriate for any particular site. The department's regulation 10 CSR 20-7.015 allows for Missouri's RBCA process to be used for such determinations.

B. Development of Missouri State Operating Permits

Certain impoundments as required by the federal CCR regulation must have an appropriate groundwater monitoring network and perform semi-annual monitoring throughout the operation of the impoundment and the post-closure period. Regardless of the level of compliance with the federal rule, these facilities are also subject to relevant WPP regulations and will be permitted accordingly.

The WPP will establish permit requirements for facilities to conduct or submit the results of a previously conducted site investigation. For those CCR sites that lack a site investigation prior to the operating permit

being renewed, WPP will require a site investigation work plan be submit for department approval according to the [guidance](#) issued by the Missouri Geological Survey. Deviations from this guidance are allowed but must be approved by WPP during the investigation planning process. Because many facilities may have conducted site investigations to facilitate work under the self-implementing CCR regulation, the WPP will utilize results of those hydrologic and geologic investigations. The results of the investigation will need to have had identified the hydrology and geology of the site, as it pertains to potential discharges to groundwater from CCR impoundments, and whether groundwater can be effectively monitored. This information will be utilized to establish the number and location of groundwater monitoring wells as well as the site-specific conditions to be included in future permits. If site investigation deficiencies are noted during current or future WPP permit renewals, additional site characterization investigation may be required.

Facilities must also submit a groundwater monitoring and sampling plan to the department for approval, and once background water quality has been established, permittees will conduct all groundwater monitoring as established by the operating permit. In order to establish background water quality, the WPP will require, via a permit requirement, the submittal of a minimum of eight consecutive, preferably quarterly samples, to be analyzed for the constituents and parameters listed in the table below. Missouri's water regulations do not allow for statistical analysis to determine that a water of the state has a demonstrated exceedance. Data collected prior to the establishment of the permit requirement can be utilized to satisfy the minimum background water quality requirement; however, WPP reserves the right to request additional data collection via the permit as necessary to establish the current groundwater condition.

1) Water Quality Standards for Groundwater [10 CSR 20-7.031(6)]

The water in any part of an aquifer is subject to the most stringent applicable protection criteria listed in Table A of 10 CSR 20-7.031, as outlined in this paragraph. Aquifers that qualify as an underground source of drinking water are subject to drinking water supply standards. Where groundwater contributes an important part of base flow to surface waters, the lower of the appropriate criteria for protection of aquatic life or human health protection – fish consumption will be applied. Because the Missouri water quality standards for groundwater are drinking water criteria, and were developed for total recoverable substances, analysis will be performed on unfiltered samples except where appropriate, such as the measurement of total dissolved solids.

10 CSR 20-7.031(6) states that water contaminants shall not cause or contribute to exceedance of Table A, groundwater limits in aquifers and caves. Where contaminants are found to be naturally present in groundwater, releases will be limited or even prohibited entirely to prevent any such exceedances.

2) Effluent Limitations [10 CSR 20-7.015]

According to section (9)(A) of this rule, MSOPs will include the most protective effluent limits applicable. These site-specific limits must uphold section (7)(A) of this same rule, which prohibits the direct or indirect release into aquifers of any water which would result in the exceedance of the appropriate water quality standards. Facilities with CCR impoundments discharging or having the potential to discharge to subsurface waters are subject to section (7)(D), which requires the development of a site-specific monitoring plan to determine compliance. The groundwater sampling program must be approved by the department before it can be implemented.

3) Groundwater Monitoring Parameters

Pursuant to 10 CSR 20-7.015(7)(D), a site-specific monitoring plan will be used to demonstrate compliance with water quality criteria. As part of that plan, the below list of constituents and parameters for evaluating CCR releases has been developed based on Appendices III and IV of the federal CCR rule and Missouri

water quality standards. Facilities wishing to deviate from this list must provide justification for deviation to WPP as part of the monitoring plan development process.

Metals	Organics
Aluminum	Sulfate, as SO ₄
Antimony	Total Organic Carbon (TOC)
Arsenic	Total Organic Halogens (TOX)
Barium	Field Parameters
Beryllium	pH
Boron	Specific Conductance
Cadmium	Oxidation/Reduction Potential (ORP)
Chromium III	Radionuclides
Chromium VI	Radium 226 (²²⁶ Ra)
Cobalt	Radium 228 (²²⁸ Ra)
Copper	Other
Iron	Chemical Oxygen Demand (COD)
Lead	Chloride
Lithium	Fluoride
Magnesium	Hardness, as CaCO ₃
Manganese	Total Dissolved Solids (TDS)
Mercury	
Molybdenum	
Nickel	
Selenium	
Silver	
Sodium	
Thallium	
Zinc	

C. Corrective Measures

Groundwater monitoring via the MSOP will be conducted regardless of whether or not closure occurs, even when monitoring shows groundwater quality to be at or below established background levels. If the results of monitoring indicate discharge of particular constituents is not occurring or doesn't pose a threat to water quality, the department has the ability to remove parameters, specify an alternative sampling schedule, or even remove monitoring requirements entirely. If pollutant concentrations are detected in an up gradient well, whether naturally occurring or resulting from human activity, the permitted effluent limits may be altered accordingly though corrective action is not required. The WPP acknowledges that some ash impoundments are not subject to the closure requirements of the federal CCR rule. For these impoundments WPP is not dictating closure under MSOP as a standard practice; however, closure may be required via the MSOP in instances where closure is necessary to mitigate exceedances of groundwater standards associated with discharges.

If monitoring indicates that any constituent or parameter has the reasonable potential to exceed the appropriate water quality standard, subsequent permit decisions will be made to establish permit limits and applicable schedules of compliance for groundwater. Facilities not able to comply with permit limits will need to address these exceedances in one of the following ways, as chosen by the facility:

- Request the permit be modified to include alternative limits based upon a RBCA demonstration;
- Request the permit be modified to include alternative limits from the Clean Water Commission;

- Request the permit be modified to include alternative limits based upon RBCA demonstration via enrollment in the Brownfields Voluntary Cleanup Program (BVCP); or
- Complete groundwater restoration to comply with permit limits within the timeframe of the schedule of compliance.

These options are discussed in detail below.

1) Risk-Based Corrective Actions

10 CSR 20-7.015(7) allows for the use of Missouri’s RBCA process in establishing alternative limits for facilities able to demonstrate that any impacts on water quality due to contamination do not negatively affect uses of the water. This process is outlined at [10 CSR 25-18.010](#) and in guidance available at <http://dnr.mo.gov/env/hwp/mrbca/mrbca.htm>. The Hazardous Waste Program will determine which sites are eligible to use RBCA and any implications involved therein. RBCA requires the evaluation of both groundwater and soil within the site (“site” as defined at 10 CSR 25-18.010(1)(A)30), and may necessitate the application of an Environmental Covenant to the site to prevent future exposure to remaining contamination. The WPP will have the opportunity to concur, where appropriate, with the results of all demonstrations made using the RBCA rule that are overseen by the department’s Hazardous Waste Program.

According to 10 CSR 7.015(7), if such demonstrations show that impacts to groundwater don’t negatively impact human health or the environment, WPP will establish alternate effluent limitations in the facility’s Missouri State operating discharge permit. Per the RBCA rule, if cleanup is required, a certificate of completion will be issued by the department once cleanup has been performed according to the approved risk management plan. This certification may greatly reduce any liability associated with owning or operating on contaminated properties.

Although the remediating party chooses how to address unacceptable risk posed by contamination, ultimately the department must ensure the remediation is protective of human health and the environment.

2) Request for Alternative Limits

Permittees may request alternative permit limits upon demonstrating that impacts to groundwater quality will not result in unreasonable risks to human health, aquatic life, or the environment. This demonstration involves a process very similar to RBCA, including but not limited to evaluation of the following factors:

- Site geology;
- Site geohydrology;
- Existing and potential water uses;
- Existing surface and groundwater quality; and
- Characteristics of waste and wastewater at the facility.

The results of this demonstration will be reviewed by the WPP, which will propose alternate effluent limits and present these, along with all information included in the demonstration, to the Clean Water Commission for approval. The Clean Water Commission has the right to require monitoring, reporting, and other information as deemed appropriate, and can hold a public hearing before taking final action. If approved, the alternative limits will be incorporated into the appropriate operating permit and will remain in place until groundwater concentrations meet water quality standards.

3) Brownfield Voluntary Cleanup Program

When contamination does not warrant cleanup or enforcement action under existing regulations, facilities can voluntarily perform remediation with oversight of the department's BVCP in order to obtain a Certification of Completion letter that may greatly reduce liability for contamination. Though 10 CSR 25-15.010 states that neither permitted or interim status Resource Conservation & Recovery Act (RCRA) facilities, nor sites that warrant enforcement action for cleanup under RCRA, are eligible for participation in BVCP; impoundments may exist that are not subject to RCRA and therefore may enroll in BVCP. Upon acceptance into the program, the facility uses Missouri's RBCA process to assess and address the contamination. The entire site (as identified in the application submitted to the department) and all potentially contaminated media must be characterized and evaluated under RBCA. A Certification of Completion letter will be issued by the department upon completion of any necessary remedial actions. Because this program is voluntary, participation can be terminated at any time by providing written notification to the department.

4) Groundwater Restoration

In lieu of the above corrective actions, remediating parties may choose to conduct basic groundwater restoration. Where monitoring constituents are found in concentrations that exceed Missouri water quality standards, remedial actions are taken to reduce concentrations below these levels without analysis of water uses or exposure pathways. The remediating party must develop and submit for WPP approval a site-specific corrective action plan that describes the corrective action activities to be conducted, a listing of the constituents in groundwater for which corrective action will be conducted, the applicable target levels for each such constituent, and a schedule for implementation of all activities. The corrective action plan may be implemented upon WPP approval. A draft proposal of a statewide groundwater restoration plan can be found at:

<http://dnr.mo.gov/env/hwp/sfund/docs/4-24-15%20Groundwater%20Restoration.pdf>.

C. Beneficial Use

Because beneficial uses could potentially result in harmful releases to groundwater, the WPP must determine where groundwater monitoring requirements should be used to uphold the Missouri Clean Water Law. It may take the cooperation of several department programs to determine if a proposed beneficial use meets all of the necessary criteria found in the federal rule. Per §257.53, in order to qualify as beneficial use and thus be exempt from the subpart D requirements of the federal rule, placement of CCR must:

- Provide a functional benefit;
- Substitute for the use of a virgin material, thereby conserving natural resources;
- Meet relevant product specifications, regulatory or design standards when available, and in the absence of such standards, must not be used in amounts greater than necessary for the project; and
- When 12,400 tons or more of unencapsulated CCR is used in non-roadway applications, it must be demonstrated that environmental releases are equal to or lower than releases from either analogous products made without CCR or relevant regulatory and health-based benchmarks.

Roadway applications were excluded from the criterion regarding large-scale use because the manner in which these amounts of CCR are used are drastically different than fill operations. Roadways are subject to engineering specifications that generally only allow between six and twelve inches of CCR to be placed under the road surface, which has the added benefit of protecting the CCR from precipitation. Practices that have previously qualified as beneficial use are not required to meet the above criteria under the condition that the use is completed prior to October 19, 2015. Commonly proposed beneficial uses are discussed below.

1) Mine Reclamation (Non-Coal)

CCR has commonly been used as a fill material in the reclamation of surface and subsurface mines. It is the position of the WPP that this practice does not meet the federal definition of beneficial use in absence of a demonstration that environmental releases are going to be equal to or lower than releases from either analogous products made without CCR or relevant regulatory and health-based benchmarks. Absent a formal demonstration, placement should be regulated as solid waste disposal.

2) Land Application

Missouri Clean Water Law requires that land application of industrial wastes occur in a no-discharge manner. Because many land application practices don't meet the definition of a no-discharge facility found at 10 CSR 20-6.015, they must obtain an exemption in order to remain in compliance. The WPP will grant no-discharge exemptions to facilities that have been approved by the department's SWMP for a beneficial use exemption from solid waste disposal area permit, provided that the CCR isn't and will not be in contact with surface or subsurface waters of the state. Because this condition is designed to protect groundwater from land application of any harmful substances, groundwater monitoring is not necessary.

The SWMP may grant general exemptions for the beneficial use of CCR as a soil amendment under the condition that the mixture used cannot exceed six inches. Soil stabilization is also eligible for a general exemption so long as the area to be disturbed is less than five acres and CCR-stabilized soil is less than two feet thick. Though management scenarios differ for use of CCR as a soil amendment as compared to biosludge land application, the EPA requires that such CCR use must meet the appropriate standards developed for agricultural application of biosolids, found at 40 CFR 503 subpart B.

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IV. Resources

EPA summary of biosolids rule

http://water.epa.gov/scitech/wastetech/biosolids/503pe_index.cfm

Guidelines for Conducting a Detailed Geologic Site Investigation

<http://dnr.mo.gov/geology/geosrv/envgeo/swmpappl.htm>

Hazardous Waste Program fact sheet on Environmental Covenants

<http://dnr.mo.gov/pubs/pub2414.htm>

Solid Waste Management Program fact sheet on groundwater sampling procedures

[DNR publication 181](#)

Technical Guidance for Missouri RBCA

<http://dnr.mo.gov/env/hwp/mrbca/docs/mrbca-sections6-06.pdf>

The appendices can be found at:

<http://dnr.mo.gov/env/hwp/mrbca/docs/mrbca-append6-06.pdf>

Deadlines Applicable to Owners of Existing CCR Landfills¹ and Surface Impoundments

Regulatory/Statutory Requirement	Surface Impoundments		Landfills		Notes/Comments
	Deadline	Citation	Deadline	Citation	
Site location demonstration: floodplain	Current	40 CFR 257.3-1	Current	40 CFR 257.3-1	
Site location demonstration: endangered species	Current	40 CFR 257.3-2	Current	40 CFR 257.3-2	
Surface water criteria (general operating criteria)	Current	40 CFR 257.3-3	Current	40 CFR 257.3-3	
General recordkeeping requirements	October 19, 2015	40 CFR 257.105	October 19, 2015	40 CFR 257.105	
Recordkeeping: notification to implementing agency	October 19, 2015	40 CFR 257.106	October 19, 2015	40 CFR 257.106	
Recordkeeping: establish publicly assessable internet website	October 19, 2015	40 CFR 257.107	October 19, 2015	40 CFR 257.107	
Compliance with air criteria (general operating criteria)	October 19, 2015	40 CFR 257.80(a)	October 19, 2015	40 CFR 257.80(a)	
Fugitive dust control plan	October 19, 2015	40 CFR 257.80(b)(5)	October 19, 2015	40 CFR 257.80(b)(5)	
Inspections: commence weekly inspections by qualified person	October 19, 2015	40 CFR 257.83(a)(2)(i)	October 19, 2015	40 CFR 257.83(a)(2)(i)	
Inspections: commence monthly instrumentation checks	October 19, 2015	40 CFR 257.83(a)(2)(i)	N/A	N/A	See Note 2
Owners of existing <u>unlined</u> impoundments must cease accepting CCR and commence closure or retrofit if GW monitoring reveals an SSI above a GWPS after this date	October 19, 2015	40 CFR 257.101(a)(1)	N/A	N/A	
Notify EPA and the appropriate state agency of the intent to complete closure within 3 years of the DOE, or comply with the federal CCR requirements	December 17, 2015	40 CFR 257.100(c)(1)	N/A	N/A	
Installation of permanent identification marker	December 17, 2015	40 CFR 257.73(a)(1)	N/A	N/A	See Note 3
Inspections: commence annual inspections by professional engineer	January 19, 2016	40 CFR 257.83(b)(3)(i)	January 19, 2016	40 CFR 257.84(b)(3)(i)	
Documentation of type of liner system	October 17, 2016	40 CFR 257.71(a)(1)	N/A	N/A	
Written closure plan	October 17, 2016	40 CFR 257.104(d)(2)(i)	October 17, 2016	40 CFR 257.102(b)(2)(i)	
Written post-closure plan	October 17, 2016	40 CFR 257.102(b)(2)(i)	October 17, 2016	40 CFR 257.104(d)(2)(i)	
Initial hazard potential classification assessment	October 17, 2016	40 CFR 257.73(f)(1)	N/A	N/A	See Note 3
Initial inflow design flood control system plan	October 17, 2016	40 CFR 257.82(c)(3)	N/A	N/A	
Initial run-on/run-off control system plan	N/A	N/A	October 17, 2016	40 CFR 257.81(c)(3)(i)	
History of construction compiled	October 17, 2016	40 CFR 257.73(c)(1)	N/A	N/A	See Note 4
Initial structural stability assessment	October 17, 2016	40 CFR 257.73(f)(1)	N/A	N/A	See Note 4
Initial safety factor assessment	October 17, 2016	40 CFR 257.73(f)(1)	N/A	N/A	See Note 4
Emergency Action Plan	April 17, 2017	40 CFR 257.73(a)(3)	N/A	N/A	See Note 5
Groundwater monitoring fully implemented: background concentrations established, detection monitoring/statistical analyses initiated, first GW monitoring/corrective action report submitted	October 17, 2017	40 CFR 257.90(b)(1)	October 17, 2017	40 CFR 257.90(b)(1)	
Owners of inactive impoundments must complete closure by this date to remain exempt from the requirements of the rule	April 17, 2018	40 CFR 257.100(b)	N/A	N/A	See Note 6
Site location demonstration: groundwater separation	October 17, 2018	40 CFR 257.60(c)(1)	N/A	N/A	
Site location demonstration: wetlands	October 17, 2018	40 CFR 257.61(c)(1)	N/A	N/A	
Site location demonstration: fault areas	October 17, 2018	40 CFR 257.62(c)(1)	N/A	N/A	
Site location demonstration: seismic impact zones	October 17, 2018	40 CFR 257.63(c)(1)	N/A	N/A	
Site location demonstration: unstable areas	October 17, 2018	40 CFR 257.64(d)(1)	October 17, 2018	40 CFR 257.64(d)(1)	

Note 1 Landfill requirements also apply to sand or gravel pits, and quarries

Note 2 N/A = Not applicable

Note 3 Does not apply to incised impoundments

Note 4 Applies to 'large' impoundments: (Ht ≥ 20 ft) or (Ht ≥ 5 ft and Vol ≥ 20 ac-ft)

Note 5 Applies only to impoundments w/high or significant hazard potential

Note 6 An extension of up to 2 years is available; certain demonstrations are required for an extension