COAL SLURRY IMPOUNDMENTS

NEW VIRGINIA GUIDELINES

MARCH 28, 2019
HISTORY

• The Martin County event in October 2000, along with several other breakthrough events of lesser magnitude (Lone Mountain and Buchanan 1 in 1996), provided the motivation for OSMRE to launch an oversight study in 2012 to evaluate how well each state SMCRA program is ensuring that similar releases will not occur in the future.
OSMRE OVERSIGHT STUDY

• OSMRE Appalachian Region Oversight Study on prevention of breakthrough into underground mines
  o WV, OH, VA, KY, PA, MD, TN (minimum of 10% or 10 impoundments reviewed in each state)
  o OSMRE review team was charged with determining whether the following investigative and engineering design measures had been taken:
    ▪ Identification of mineable coal seams
    ▪ Identification of all underground coal mines
    ▪ Assessment of the barrier stability to adjacent mines and roof and pillar stability of subjacent mines
    ▪ Construction or enhancement of mine barrier when necessary
    ▪ Assessment of slurry flowability when the location of nearby mines or barrier stability is uncertain
    ▪ PE certification that the required and approved breakthrough prevention methods had been performed
OSMRE Report

• Virginia report was completed in late 2016 with assessment of 10 impoundments

• OSMRE found three areas in Virginia DMLR’s program for which “improvement is needed”:
  o Availability of permit documents
  o Breakthrough Analysis using IC-8741 and PIL I99-V-3
  o Mineable Coal Seams identified subjacent / adjacent to impoundment. All underground mines noted and accurately located.
This Guidance Memorandum addresses the requirements for construction of coal waste impoundments as required by §4VAC25-130-784.16 and §4VAC25-130-816.81 of the Virginia Coal Surface Mining Reclamation Regulations (VCSMRR). Specifically, this memorandum addresses the submittal of additional information necessary to determine the potential for breakthrough of coal waste slurry into underlying or adjacent underground mine workings located in proximity to a coal waste impoundment.

To all permittees holding a DMLR permit containing a coal waste impoundment:

You are hereby directed to provide to DMLR the following information, no later than the next mid-term or renewal submittal date of your permit or 7-1-20, whichever comes first. If the next mid-term or renewal submittal date is in less than twelve months from the date of this directive, the information shall be provided by 7-1-20. The information shall be prepared and certified by a Registered Professional Engineer licensed in the State of Virginia (the “certifying engineer”) and submitted in a Permit Revision under E-Forms.

1. A geologic cross-section that identifies all coal seams adjacent to or subjacent to the coal waste impoundment and identification of any that are equal to or greater than 24-inches in seam thickness.

2. Of those coal seams equal to or greater than 24-inches, identify those that have previously been underground mined or surface mined by auger or highwall miner. Provide mapping of the mine works for each seam mined. This investigation shall not rely on the presence or absence of mine mapping alone but should be reinforced through other sources such as interviews with local residents or miners, research of historical documents, surface reconnaissance, outcrop exploration, drilling, or geophysical surveys as deemed appropriate by the certifying engineer.

This Memorandum is to be considered a guideline issued under the authority of § 45.1-230.A1 of the Code of Virginia which reads:

In addition to the adoption of regulations under this chapter, the Director may at his discretion issue or distribute to the public interpretative, advisory or procedural bulletins or guidelines pertaining to permit applications or to matters reasonably related thereto without following any of the procedures set forth in the Administrative Process Act (§ 2.2-4000 et seq.). The materials shall be clearly designated as to their nature, shall be solely for purposes of public information and education, and shall not have the force of regulations under this chapter or under any other provision of this Code.
3. Provide a narrative and supporting documentation that meets one of the following requirements:

a. A written statement from the certifying engineer that the impoundment has been reviewed and meets the explicit requirements of “Bureau of Mines Information Circular IC-8741” as it relates to safety zones for no extraction or limited extraction beneath the embankment and the impoundment.

b. A written statement from the certifying engineer (along with supporting data and calculations) that the impoundment does not meet the explicit requirements of IC-8741, but meets similar criteria which provide equivalent protection to the impoundment as would be afforded under IC-8741 and/or its underlying assumptions.

c. A written statement from the certifying engineer that the impoundment does not meet the explicit requirements of IC-8741 or similar criteria, but plans are currently approved by MSHA which specifically address minimizing the potential for a breakthrough from the impoundment into underground mine workings. If the approved MSHA plans were previously provided to DMLR in an approved revision, the approved revision should be referenced and digital copies of the plans and specifications attached (if not previously provided to DMLR in digital format). If the approved MSHA plans were not previously provided to DMLR, digital copies of these approved MSHA plans should be attached to the revision via E-Forms.

d. A written statement from the certifying engineer that the impoundment does not meet the explicit requirements of IC-8741 or similar criteria and plans are not currently approved by MSHA which specifically address minimizing the potential for a breakthrough from the impoundment into underground mine workings, but plans to minimize breakthrough potential have been submitted to MSHA for review. In this case, digital copies of the plans submitted to MSHA should be attached to the revision and replaced with final plans upon approval by MSHA along with documentation of final MSHA approval.


In addition, all future impoundment plans, revisions, response to review comments, and certifications that are submitted to MSHA for review and approval shall at the same time be sent to the DMLR Chief Engineer. These should be in electronic format rather than paper copies. File formats in pdf and dwg are required.
This Guidance Memorandum addresses the requirements for construction of coal waste impoundments as required by §4VAC25-130-784.16 and §4VAC25-130-816.81 of the Virginia Coal Surface Mining Reclamation Regulations (VCSMRR). Specifically, this memorandum addresses the submittal of additional information necessary to determine the potential for breakthrough of coal waste slurry into underlying or adjacent underground mine workings located in proximity to a coal waste impoundment.
Virginia Slurry Impoundments

• Presently 21 permitted slurry impoundments
• Eight of these are currently active (Guidance Memo applies to all 21)
To all permittees holding a DMLR permit containing a coal waste impoundment:

You are hereby directed to provide to DMLR the following information, no later than the next mid-term or renewal submittal date of your permit or 7-1-20, whichever comes first. If the next mid-term or renewal submittal date is in less than twelve months from the date of this directive, the information shall be provided by 7-1-20.
Submittal Date

- 7/1/2020 for 20 impoundments
- 5/14/2020 for one impoundment
To all permittees holding a DMLR permit containing a coal waste impoundment:

The information shall be prepared and certified by a Registered Professional Engineer licensed in the State of Virginia (the “certifying engineer”) and submitted in a Permit Revision under E-Forms.
1. A geologic cross-section that identifies all coal seams adjacent to or subjacent to the coal waste impoundment and identification of any that are equal to or greater than 24-inches in seam thickness.
Coal Seam Cross-Section

- Coal Seam A
- Coal Seam B (48"
- Impoundment Pool
- Valley Floor
- Coal Seam C (23"
- Coal Seam D (30"
2. Of those coal seams equal to or greater than 24-inches, identify those that have previously been underground mined or surface mined by auger or highwall miner. Provide mapping of the mine works for each seam mined. This investigation shall not rely on the presence or absence of mine mapping alone but should be reinforced through other sources such as interviews with local residents or miners, research of historical documents, surface reconnaissance, outcrop exploration, drilling, or geophysical surveys as deemed appropriate by the certifying engineer.
Coal Slurry Impoundment Schematic

- Hillside
- Level of slurry
- Impoundment basin
- Subjacent underground mine
- Preexisting stream drainage
- Hillside
- Underground mine
- Outcrop barriers
- Adjacent underground mine
3. Provide a narrative and supporting documentation that meets one of the following requirements:

a. A written statement from the certifying engineer that the impoundment has been reviewed and meets the explicit requirements of “Bureau of Mines Information Circular IC-8741” as it relates to safety zones for no extraction or limited extraction beneath the embankment and the impoundment.
Results of Research To Develop Guidelines for Mining Near Surface and Underground Bodies of Water

By Clarence O. Babcock and Verne E. Hooker
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FIGURE 1. Safety zone beneath body of surface water.

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<th>Method</th>
<th>Distance</th>
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<tr>
<td>Room and pillar</td>
<td>5s or 10ft</td>
</tr>
<tr>
<td>Panel</td>
<td>3p or 270ft</td>
</tr>
<tr>
<td>Total extraction</td>
<td>.60ft</td>
</tr>
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</table>

-X- Whichever is larger
3. Provide a narrative and supporting documentation that meets one of the following requirements: (continued)

b. A written statement from the certifying engineer (along with supporting data and calculations) that the impoundment does not meet the explicit requirements of IC-8741, but meets similar criteria which provide equivalent protection to the impoundment as would be afforded under IC-8741 and/or its underlying assumptions.
Other Evaluation Methods

• Computer software is often used.
• One such tool is the Surface Deformation Prediction System (SDPS) used to calculate and predict ground deformations above undermined areas. SDPS was developed by Virginia Tech and distributed by Carlson Software.
• Other software apps are available to model localized pillars.
c. A written statement from the certifying engineer that the impoundment does not meet the explicit requirements of IC-8741 or similar criteria, but plans are currently approved by MSHA which specifically address minimizing the potential for a breakthrough from the impoundment into underground mine workings. If the approved MSHA plans were previously provided to DMLR in an approved revision, the approved revision should be referenced and digital copies of the plans and specifications attached (if not previously provided to DMLR in digital format). If the approved MSHA plans were not previously provided to DMLR, digital copies of these approved MSHA plans should be attached to the revision via E-Forms.
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- Issued by MSHA 12/01/97
- Purpose – Evaluate breakthrough potential and impact of an unintentional release of water or slurry from an impoundment
- Evaluation priority system based on:
  - Breakthrough potential
  - Impact that a breakthrough might have
Breakthrough Potential

The following criteria should be used to assign a breakthrough potential rating.

| I. Deep mining where the coal seam does not intersect the surface at the impoundment |
|---------------------------------|--------------------------------------------------------------------------------------------------|
| High Potential                  | Any site where mining is located vertically within 100 feet beneath any portion of the impoundment. |
| Moderate Potential              | Any site where the distances outlined in Bureau of Mines Information Circular 8741 are not met.  |
| Low Potential                   | Any site where the distances outlined in Bureau of Mines Information Circular 8741 are met or exceeded. |

The primary concern in this situation is sinkhole formation in the pool area. Although sinkhole formation is difficult to predict, it is more likely where the separation between mine and ground surface contains less than 100 feet of intact rock. A secondary concern is slurry and water flow through subsidence cracking. We do not believe a sudden inrush of slurry will occur through subsidence cracks; however, cracks may be enlarged by water flow.
## II. Deep mining where the coal seam intersects the surface at the impoundment

### High Potential
- Any site where a vertical column of intact rock between the mine and the original ground surface in the impoundment is less than or equal to 100 feet.
- OR
- Any site where the coal barrier thickness at the outcrop is less than 50 feet.
- OR
- Any site where no manmade barrier has been designed for the anticipated maximum hydraulic head (for example, where a site is only sealed for compliance with 30 CFR §75.1711).

### Moderate Potential
- Any site where a vertical column of intact rock between the mine and the original ground surface in the impoundment is less than the criteria specified in IC 8741, but exceeds 100 feet.
- OR
- Any site where the coal barrier thickness equals or exceeds 50 feet, but is less than 50 feet + hydraulic head.
- OR
- Any site where a manmade barrier has been designed, but actual hydraulic head on the barrier exceeds the design value.

### Low Potential
- Any site where the vertical distance between the mine and the original ground surface in the impoundment meets or exceeds the criteria specified in IC 8741.
- AND
- Where the coal barrier thickness at least equals 50 feet + hydraulic head.
- OR
- Any site where a manmade barrier has been designed for the maximum anticipated hydraulic head.

## III. Auger mining where the coal seam intersects the surface at the impoundment

### High Potential
- Any site where a manmade barrier has not been designed as a cover for the auger holes.
- AND
- Where the coal barrier thickness (between the end of the auger holes and any deep mine) is less than 50 feet.

### Moderate Potential
- Any site where a manmade barrier has not been designed or has not been designed for the maximum anticipated hydraulic head.
- AND
- Where the coal barrier thickness (between the end of the auger holes and any deep mine) equals or exceeds 50 feet but is less than 50 feet + hydraulic head.
- OR
- Any site where a manmade barrier has been designed for the maximum anticipated hydraulic head.
- AND
- Where the coal barrier thickness (between the end of the auger holes and any deep mine) is less than 50 feet + hydraulic head.

### Low Potential
- Any site where a manmade barrier has been designed for the maximum anticipated hydraulic head.
- AND
- Where the coal barrier thickness (between the end of the auger holes and any mine) equals or exceeds 50 feet + hydraulic head.
Impact Potential

In addition to a site's breakthrough potential, a breakthrough impact should be indicated. The following items should be considered when assessing a site's breakthrough impact:

1. Breakthrough impacts the safety of miners on mine property.
2. Breakthrough impacts the safety of the general public.
3. Breakthrough impacts property (major roads, utilities, structures).
4. Breakthrough impacts the environment.
5. Breakthrough floods and is safely retained within abandoned mine.
### Evaluation Priority

After a breakthrough potential and impact potential have been assigned to a site, an evaluation priority rating can be assigned. The following table provides the assignment criteria.

<table>
<thead>
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<th>Priority Level</th>
<th>Category</th>
<th>Potential</th>
<th>Impact</th>
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<td>J</td>
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Copies of MSHA Submittals

- Submit using VITA Large File Transfer
- Link at the bottom of the DMME internet page [https://dmme.virginia.gov](https://dmme.virginia.gov)
- File types must be .pdf and .zip
- Autocad drawing files will need to be zipped
- Once MSHA approval is obtained, resubmit the plan as a permit application using DMLR E-Forms.
THANK YOU!
QUESTIONS