

**DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF MINING AND RECLAMATION**

DOCUMENT NUMBER: 563-2112-225

TITLE: Technical Guidance Document for Beneficial Uses of Coal Ash

EFFECTIVE DATE: April 30, 1998

AUTHORITY: Pennsylvania's Solid Waste Management Act
(35 P.S. §§6018.101 et seq.) and 25 Pa. Code Chapter 287.

POLICY:

It is the Department's policy to provide guidance for the different beneficial uses of coal ash at active coal mine sites, abandoned coal mine sites, and abandoned noncoal (industrial mineral) mine sites.

PURPOSE:

This document describes the four beneficial uses of coal ash that can be approved in active coal mine permits or that can be approved as part of the Department's mine reclamation contracts or other Department approved mine reclamation projects.

APPLICABILITY:

This guidance applies to generators of coal ash, mine operators, consultants, reclamation contractors, and Department staff who are involved in the beneficial use of coal ash at active coal mine sites or abandoned coal and noncoal (industrial mineral) mine sites.

DISCLAIMER:

The policies and procedures outlined in this guidance document are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of the Department to give these rules that weight or deference. This document establishes the framework, within which the Department will exercise its administrative discretion in the future. The Department reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 8

LOCATION: Vol. 12, Tab 59B (BMR/PGM Section II, Part 2, Subpart 25)

DEFINITIONS: See 25 Pa. Code Chapter 287

TECHNICAL GUIDANCE:

BACKGROUND

The Pennsylvania Solid Waste Management Act of 1980 was amended in December 1986 to allow the beneficial use of coal ash. In July 1992, provisions describing standards for the beneficial use of coal ash were placed in the residual waste management regulations. Although beneficial use of coal ash occurred under these regulations, the regulations were generally considered to be too restrictive and prescriptive and therefore hindered the beneficial use potential at active coal mine sites. As a result, changes were proposed to the regulations governing the beneficial use of coal ash. The revised regulations were adopted by the EQB on October 15, 1996, and became effective on January 25, 1997. The revised coal ash regulations required the development of this Technical Guidance Document for Beneficial Uses of Coal Ash (hereinafter “Technical Guidance Document”) and Certification Guidelines for Beneficial Uses of Coal Ash (hereinafter referred to as “Certification Guidelines”). These two documents will be used in the review of proposals for the beneficial uses of coal ash at active coal mine sites, abandoned coal mine sites and abandoned noncoal (industrial mineral) mine sites (hereinafter collectively referred to as “mine sites”). This Technical Guidance Document and the Certification Guidelines are to be used in conjunction with the beneficial use of coal ash regulations.

INTRODUCTION

This Technical Guidance Document provides the technical information that is needed to approve the different beneficial uses of coal ash at mine sites.

Four beneficial uses of coal ash are discussed in this guidance document. These are the uses at mine sites that the mining program has delegated authority to approve as provided for in §§287.663 and 287.664. A variety of other uses are provided for in §§287.661, 287.662 and 287.665; approval for these is generally the responsibility of the Bureau of Land Recycling and Waste Management. As additional beneficial uses of coal ash are identified, the Department will include them in this document. These four beneficial uses are: coal ash placement, coal ash alkaline addition, coal ash as soil additive or soil substitute, and coal ash as low-permeability material. Before it can be used, coal ash must be certified for a beneficial use by the Department or it must be demonstrated to the Department that the coal ash meets the chemical and physical characteristics in the Certification Guidelines. The Certification Guidelines have been developed as a separate document.

The Certification Guidelines, this Technical Guidance Document, a technical guidance entitled “Beneficial Uses of Coal Ash at Active Coal Mine Sites” 563-2112-206 (BMR/PGM Section II, Part 2, Subpart 6), and Modules 25 and/or 27 of the coal surface mine applications must be followed to obtain approval for the beneficial use of coal ash at active coal mine sites. To obtain approval for the beneficial use of coal ash at abandoned mine sites, the Certification Guidelines, this Technical Guidance Document, and specific contracts or approvals with the Department must be followed.

GENERAL INFORMATION

The following general information is the same for beneficial uses. This information is referenced in the beneficial uses in the following two sections: Water Quality Monitoring and Depth to Regional Groundwater Table.

Water Quality Monitoring

The following discussion applies to monitoring for COAL ASH PLACEMENT, COAL ASH AS ALKALINE ADDITION, AND COAL ASH AS LOW-PERMEABILITY MATERIAL. No water quality monitoring is required for COAL ASH AS SOIL SUBSTITUTE OR SOIL ADDITIVE.

Monitoring points typically associated with active coal mine sites are, in most instances, capable of providing information on the effect of coal ash placement. However, groundwater monitoring points should be discussed and approved by the Department prior to placement of coal ash. Monitoring points normally include monitoring wells, springs, seeps, mine discharges, and abandoned mine shafts. Upgradient groundwater monitoring points are not required unless there is a need to characterize the groundwater coming onto the placement sites because of concerns unrelated to the mine sites being monitored. For example, there may be other activities that could impact groundwater quality which are located close to the mine site.

There must be at least one downgradient groundwater monitoring point from the active coal mine site. The actual number of downgradient monitoring points and their locations will depend upon the configuration of the coal ash placement area, the volume of coal ash placed, and the groundwater conditions at the mine site. Sufficient groundwater monitoring must be performed in order to provide an assessment of the impact of coal ash on the groundwater. The assessment must address its areal extent as well as any changes to water quality.

At active coal mine sites, six background samples from each monitoring point taken monthly or at six-week periods are normally necessary to adequately characterize groundwater quality prior to coal ash placement. Any proposal for using less than six background samples must be justified by the applicant and be approved by the Department. Background sampling may be necessary to characterize groundwater quality prior to coal ash placement for abandoned mine reclamation projects.

All sample collections and analyses will be in accordance with EPA's Test Methods for Evaluating Solid Waste, SW-846. This information must be submitted to the Department. The required data from monitoring points shall be obtained monthly or at six-week periods prior to coal ash placement and shall include the following parameters: static water elevation (for monitoring wells), flow (for springs, seeps or mine discharges), pH (field and laboratory), specific conductance, alkalinity, acidity, iron, manganese, sulfate, total dissolved solids, total suspended solids, aluminum, arsenic, cadmium, calcium, chloride, chromium, copper, lead, magnesium, mercury, nickel, potassium, selenium, sodium, and zinc.

Once this beneficial use begins at active coal mine sites, groundwater monitoring must be performed quarterly for the following parameters: static water elevation (for monitoring wells), flow (for springs, seeps or mine discharges), pH (field and laboratory), specific conductance, alkalinity, acidity, iron, manganese, sulfate, total dissolved solids, and total suspended solids. Groundwater monitoring must be performed annually for the following parameters: aluminum, arsenic, cadmium, calcium, chloride, chromium, copper, lead, magnesium, mercury, nickel, potassium, selenium, sodium, and zinc.

The Department may require groundwater monitoring to be performed for abandoned mine sites once coal ash placement begins, at a sampling frequency determined by the Department, to include the following parameters: static water elevation (for monitoring wells), flow (for springs, seeps or mine discharges), pH (field laboratory), specific conductance, alkalinity, acidity, iron, manganese, sulfate, total dissolved solids, total suspended solids, aluminum, arsenic, cadmium, chloride, calcium, chromium, copper, lead, magnesium, mercury, nickel, potassium, selenium, sodium, and zinc.

Depth to Regional Groundwater Table

The following information applies to all four beneficial uses.

The regulations addressing the beneficial use of coal ash, §§287.663 and 287.664, require the isolation distance between the bottom of coal ash and the top of the regional groundwater table elevation (defined in §287.1) to be at least eight feet (2.44 meters) unless otherwise approved by the Department. If the ash is to be placed within eight feet (2.44 meters) of regional groundwater table, a study shall be submitted to the Department which demonstrates that there will be an improvement to water quality or at least there will be no groundwater pollution. At a minimum, this demonstration should address the proposed distance between the coal ash elevation and the regional groundwater table elevation, the volume of coal ash to be placed, the location of the downgradient wells or springs, fluctuations in the seasonal groundwater levels, and the modeling or research that justify the design. It is suggested that the elements of the demonstration be discussed with the Departmental staff before proceeding with the demonstration.

A. COAL ASH PLACEMENT

Coal ash placement for beneficial use may be used at active coal mine sites and abandoned mine sites to improve water quality or prevent groundwater degradation. In addition, coal ash is capable of eliminating public health and safety hazards.

1. Placement Method

Coal ash placement at active coal mine sites can occur by mixing the coal ash with spoil material, placing it in layers, or placing it at desirable locations in the backfill. Coal ash placement at coal refuse disposal sites can occur by placing the coal ash in layers and compacting it, or by mixing the coal ash with coal refuse which is then compacted.

For active coal mine sites, coal ash placement must be described as part of the reclamation plan in the mine permit application. For abandoned mine sites, coal ash placement must be described in the reclamation plan as part of the mine reclamation project. The reclamation plan must consider coal ash quality, compaction of coal ash, volume and areal extent of coal ash placement, and surrounding site topography. The plan must ensure that on-site or off-site operational problems, such as fugitive dust, do not occur.

2. Water Quality Monitoring

In addition to the details described under Water Quality Monitoring in GENERAL INFORMATION, the following requirements apply for coal ash placement.

Groundwater monitoring is required in §287.663 for coal ash placement at active coal mine sites in accordance with the applicable provisions of Chapters 86-90. Water quality monitoring is required in §287.664 for coal ash placement at abandoned mine sites only where such information is needed to evaluate the success of the reclamation project. Groundwater monitoring can be helpful in determining the impacts of coal ash placement and in providing the basic information needed for improving coal ash placement techniques. Water quality monitoring, which includes groundwater monitoring, may be useful for determining optimum placement conditions or designs for the use of coal ash at abandoned mine sites.

B. COAL ASH AS SOIL SUBSTITUTE OR SOIL ADDITIVE

Coal ash may be used as a soil substitute or as a soil additive to replace soil that was previously available at the site, to enhance soil properties, or to enhance plant growth. The method of application should be addressed in the reclamation plan of the mine permit or in the contract or approval for the abandoned mine reclamation project.

1. Application Method

The final pH of the coal ash and soil/spoil mixture must be in the range 6.5 to 8.0 unless approved by the Department on a case-by-case basis. However, the applicant must demonstrate that coal ash constituents will not cause pollution. If coal ash is used as a lime substitute or other nutrient substitute, the calcium carbonate or other nutrient of the coal ash should be used in accordance with the amount based on chemical equivalence that would be needed to substitute for lime or other constituents.

If coal ash is used as a soil substitute, it must be mixed with other vegetative supporting material. The depth of this soil substitution should not exceed three feet (0.91 meters) unless otherwise approved by the Department on a case-by-case basis.

If coal ash is used as a soil additive, the depth of the coal ash and soil mixture should not exceed one foot (0.30 meters) unless otherwise approved by the Department on a case-by-case basis.

The soil or spoil top cover must be sampled and analyzed before any coal ash can be added as a soil substitute or soil additive. This background analysis is needed to determine that the soil or spoil top cover is not contaminated. The samples must be analyzed in accordance with EPA's Test Methods for Evaluating Solid Waste, SW-846. The following constituents must be analyzed: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc.

The coal ash to be used as a soil substitute or soil additive cannot exceed any of the following maximum contaminant loading rates.¹

<u>Contaminant</u>	<u>Cumulative Contaminant Loading Rate</u>	
arsenic	40 lbs/acre	(45 kg/hectare)
cadmium	5 lbs/acre	(6 kg/hectare)
chromium	500 lbs/acre	(561 kg/hectare)
copper	125 lbs/acre	(140 kg/hectare)
lead	264 lbs/acre	(296 kg/hectare)
mercury	1.5 lbs/acre	(1.7 kg/hectare)
nickel	50 lbs/acre	(56 kg/hectare)
selenium	10 lbs/acre	(11 kg/hectare)
zinc	250 lbs/acre	(280 kg/hectare)

2. Water Quality Monitoring

No water quality monitoring is required for coal ash as a soil substitute or soil additive.

C. COAL ASH AS ALKALINE ADDITION

Coal ash may be used at active coal mine and abandoned mine sites as alkaline addition. Alkaline addition is the placement of coal ash at locations and in amounts required to achieve neutralization of acid-forming materials.

¹ With the exception of arsenic and selenium, these loading rates were established by the Bureau of Land Recycling and Waste Management for use in the programs they oversee. The loading rates are set at levels that will not adversely affect food chain crops or groundwater. Loading rates for arsenic and selenium are based on the critical soil total concentrations referenced in Kabata-Perdias, A. and Perdias, H., Trace Elements in Soils and Plants.

1. Application Method

The beneficial use of coal ash as alkaline addition must be approved by the Department as part of the reclamation plan or abatement plan of the mining permit or in the contract or approval for the abandoned mine reclamation project. The volume of ash will depend on the amount of neutralization needed at the mine site, but this volume of coal ash cannot exceed the quantity needed to achieve the reclamation plan (includes alkaline addition plan). The location and method of application of the coal ash will depend upon the location of the acid-forming materials. The pH of the coal ash must be in the range from 7.0 to 12.5 at the generator's site.

2. Water Quality Monitoring

In addition to the details described under Water Quality Monitoring in GENERAL INFORMATION, the following requirements apply for coal ash as alkaline addition.

Groundwater monitoring when coal ash is used for alkaline addition is necessary and should be described as part of the hydrologic monitoring plan of the mine permit. Basic water quality monitoring is described in section A.2, dealing with coal ash placement. In addition to the following groundwater monitoring requirements, the monitoring requirements within "Alkaline Addition for Surface Coal Mines," 563-2112-217 (BMR/PGM Section II, Part 2, Subpart 17) should be considered.

In some instances, the Department may require water quality monitoring at abandoned mine sites. Water quality monitoring should be considered if a large volume of coal ash is being used, if the location of coal ash within the backfill is critical, or as a means to evaluate the success of the alkalinity derived from the coal ash. The monitoring points should be discussed with Department staff and agreed upon prior to the use of coal ash.

D. COAL ASH AS LOW-PERMEABILITY MATERIAL

Coal ash can be used as low-permeability material to isolate acid and toxic-forming materials by sealing or preventing infiltration of surface water in order to improve water quality or prevent groundwater degradation.

1. Installation Method

Coal ash used beneficially as low-permeability material at active coal mine sites has to be approved in the reclamation plan of the mining permit. Coal ash that is used beneficially as low-permeability material at abandoned mine sites must be approved in the contract or other approval with the Department.

The coal ash used beneficially to provide a low-permeability layer must have a minimum thickness of 2 feet (0.61 meters) unless Department approves a lesser thickness on a case-by-case basis. The volume of coal ash and method of application have to be approved by the Department. The pH of the coal ash must be in the range of 7.0 to 12.5 at the generator's site. If an additive to coal ash is necessary to achieve low permeability, the mixture of ash and additive must also be in the pH range of 7.0 to 12.5. The mixture of coal ash and additive to achieve low permeability may be done at the mine site.

2. Water Quality Monitoring

In addition to the details described under Water Quality Monitoring in GENERAL INFORMATION, the following requirements apply for coal ash as low-permeability material.

Groundwater monitoring at active coal mine sites, where coal ash is used as low-permeability material, is necessary in order to evaluate the success of the project. The normal monitoring points associated with coal mine permits are, in most instances, capable of monitoring the effect of coal ash used as low-permeability material. These groundwater monitoring points should be discussed and approved prior to the use of coal ash. In some instances the Department may require water quality monitoring (which includes groundwater) at abandoned mine sites for coal ash used as low-permeability material. Water quality monitoring may be necessary to evaluate the success of the abandoned mine reclamation project. These monitoring points should be discussed with the Department and agreed upon prior to the use of coal ash.