29 AOC and Excess Spoil Disposal

CONTENTS

(Revised 08/01/2011)

SUBJECT:	**Durable Rock Fills**
DATE:	**November 13, 1992**

The West Virginia Surface Mining Reclamation Regulations at 38-2-14.14(g)(7), for durable rock fills, state in part that "the underdrain system may be constructed simultaneously with excess spoil placement by the natural segregation of dumped materials". This construction method results in the larger dumped rocks settling on the bottom of the valley floor to form an adequate underdrain.

It has been observed during recent field visits, that a few durable rock fills were being constructed using multiple side dumping points, which were located well ahead of the developing toe. However, this construction method, also known as "wing dumping, can create several types of problems.

Excessive side dumping of spoil creates increased disturbed area within the limits of the fill that results in an increased sediment load upon the sediment control structure. Additionally, when conditions arise which dictate that a durable rock fill cannot be constructed to meet its original design capacity, any spoil which had been previously side dumped ahead of the developing toe would than have to be rehandled and placed within the confines of the fill. Thus, this practice can result in environmental problems and unnecessary additional disturbance.

Therefore, for durable rock fills, it shall be the policy of this agency to limit side dumping or "wing dumping" of spoil to a distance not to exceed 300 feet downstream from the developing toe, as measured horizontally. The developing toe shall be defined as that area which is clearly being formed by the dumping of materials from points located near the center of the hollow.

NOTE: This is also in the I & E Handbook, Series 14

SUBJECT:	**Determination of form of Mining**
DATE:	**April 24, 2009**

This document is intended to clarify the agency position of the requirements that apply to determining the form of mining for applying the correct AOC Policy.

Whether or not the site is determined to be contour or area mining for a steep slope surface mine also determines whether the AOC Final Guidance Document (AOC+) or the AOC 199 (AOC Castle) policy applies. In making this determination, the form of mining will be decided based on which form of mining constitutes greater than 50% of the area mined.

If a permit application proposes both contour and area mining, the type of mining that constitutes 51% or greater of the surface area of mineral removal shall determine the type of mining used for determining which AOC Policy apples to the permit.

SUBJECT:	**AOC/Excess Spoil Guidelines**
DATE:	**June 24, 1999**

In order to establish a common beginning point for the AOC analysis, the applicant is to be requested to supply calculations, maps and cross-sections which are based upon the AOC/Excess Spoil Guidance of March 18, 1999. This will be in addition to the demonstration of AOC calculations contained in the mine designs and proposal maps submitted as part of the application. Other justification may be used; however, they must yield same or similar results as this agency will use this document for comparison as to whether AOC is achieved.

The foregoing information, together with information contained in the No Practical Alternatives document, will be used to evaluate valley fill size, location, and whether the backfilled area has been returned to AOC.

As always, the regulatory requirements of slope stability, drainage, etc., will apply to the review of the application. This applies to all applications which have not been approved.

MOUNTAINTOP RECLAMATION: AOC AND EXCESS SPOIL DETERMINATIONS

To: Michael Miano, Director

From: AOC/Excess Spoil Guidance Team (WVDEP-David Dancy, Jim Pierce, Joe Ross, Ken Stollings, Ed Wojtowicz; OSM-Michael Superfesky, Michael Castle)

Subject: AOC/Excess Spoil Guidance

Date: March 18, 1999

Executive Summary

This guidance document, through the implementing regulations of the West Virginia Surface Coal Mining and Reclamation Act (WVSCMRA), provides an objective and systematic process for achieving approximate original contour (AOC) on steep-slope surface mine operations while providing a means for determining excess spoil quantities. Using this process maximizes the amount of mine spoil returned to the mined area while minimizing the amount of mine spoil placed in excess spoil disposal sites, i.e., valley fills. This, in turn, minimizes impacts to aquatic and terrestrial habitats through ensuring compliance with environmental performance standards imposed by WVSCMRA.

The definition of approximate original contour, as found in the Surface Mining and Coal Reclamation Act of 1977 (SMCRA) and WVSCMRA, requires that the final surface configuration, after backfilling and grading, closely resemble the general surface configuration of the land prior to mining while maintaining the necessary flexibility to accommodate site-specific conditions. A detailed analysis of the terms in the definition of AOC, along with additional reclamation requirements in the environmental performance standards of WVSCMRA and the promulgated rules serve to constrain what post-mining configuration is feasible. That is, a surface coal mining operation must meet not only AOC standards, but satisfy numerous other requirements including stability, access, and environmental provisions such as drainage, erosion and sediment control that influence the determination of AOC. Other factors that affect configuration are the diversity of the terrain, climate, biological, chemical and other physical conditions in the area and their impacts on fish, wildlife, and related environmental values.

The key variables found in the AOC definition, influencing AOC determination are: *configuration, backfilling and grading, disturbed area (mined area in SMCRA), terracing or access roads, closely resembles, and drainage patterns.* These variables, for analysis purposes, can be logically grouped into three focus areas: (A) configuration, (B) stability, and (C) drainage.

These focus areas are addressed through a formula-like model that portrays these variables in an

objective yet flexible process for determining what post-mining surface configuration meets the AOC definition. Applying this process during mine planning will determine the amount of total spoil material that must be retained in the mined-out area. The resultant post mining configuration should closely resemble the premining topography, thus satisfying not only the access, drainage control, sediment, and stability performance standards of WVSCMRA, but achieving approximate original contour as well. These same performance standards, applied in a similar formula-like model, determine the quantity of excess spoil that must be placed in excess spoil disposal site(s).

Using the AOC model in conjunction with the excess spoil model not only ensures compliance with the environmental performance standards of WVSCMRA, but provides an objective and feasible means for determining what constitutes compliance with the approximate original contour definition.

I. Applicable Provisions of State Law

Surface Mining Control and Reclamation Act of 1977 (SMCRA)

30 USC 1291 Section 701(2)

West Virginia Surface Coal Mining and Reclamation Act (WVSCMRA)

22-3-3(e)
22-3-13(d)(3)
22-3-13(b)(4)
22-3-13(b)(10)(B), (C), (F), (G)

West Virginia Surface Mining Reclamation Regulations (WVSMRR)

38 CSR 2-2.47
38 CSR 2-2.63
38 CSR 2-5.2, 5.3, 5.4
38 CSR 2-8, 8.a
38 CSR 2-14.5
38 CSR 2-14.8.a
38 CSR 2-14.14
38 CSR 2-14.15.a

II Objectives

This guidance document has been developed to accomplish the following objectives:

- Provide an objective process for achieving AOC while ensuring stability of backfill material and minimization of sedimentation to streams.

- Provide an objective process for minimizing the quantity of excess spoil that can be placed in excess spoil disposal sites such as valley fills.

- Minimize watershed impacts by ensuring compliance with environmental performance standards imposed by WVSCMRA.

- Minimize impacts to aquatic and terrestrial habitats.

- Provide an objective process for use in permit reviews as well as field inspections during mining and reclamation phases.

- Maintain the flexibility necessary for addressing site-specific mining and reclamation conditions that require discretion by the regulatory authority as intended by WVSCMRA and Congress.

The West Virginia Division of Environmental Protection's (WVDEP) Office of Mining and Reclamation (OMR) recognizes the need for guidance on how the various performance standards of the West Virginia Surface Mining Control and Reclamation Act (WVSCMRA) and implementing regulations, West Virginia Surface Mining Reclamation Regulations (WVSMRR), Title 38, Series 2, influence the final land configuration following coal mining and reclamation. The following guidance document delineates the amount of excavated broken rock (also called mine spoil or overburden) that WVSCMRA considers "backfill," i.e., spoil placed in the mine area to restore the approximate original contour. Further, this document determines the amount of overburden or "excess" spoil that may be placed in excess spoil disposal sites outside the mining area or "pit." In so doing, this document provides guidance, as needed for WVSCMRA program administration in steep slope terrain, for determining whether the WVSCMRA provision of "approximate original contour," or AOC, has been attained.

Chapter 22, Article 3-13(b)(3) of WVSCMRA, as well as State and Federal regulations, requires all mining operations to return the mined areas to AOC, unless an appropriate variance is granted by the appropriate regulatory authority. Chapter 22, Article 3-3(e) of WVSCMRA defines AOC to mean,

> *"that surface configuration achieved by the backfilling and grading of the disturbed areas so that the reclaimed area, including any terracing or access roads, closely resembles the general surface configuration of the land prior to mining and blends into and complements the drainage pattern of the surrounding terrain, with all highwalls and spoil piles eliminated: Provided, That water impoundments may be permitted pursuant to subdivision (8), subsection (b), section thirteen of this article: Provided, however, That minor deviations may be permitted in order to minimize erosion and sedimentation, retain moisture to assist revegetation, or to direct surface runoff."*

Section 701(2) of the Surface Mining Control and Reclamation Act of 1977 (SMCRA) uses the term *mined area* instead of *disturbed area.* SMCRA requires that the mined area be reclaimed so that the area closely resembles the general surface mining configuration of the land prior to mining. Section 14.15 of WVSMRR requires, "Spoil returned to the mined-out area shall be backfilled and graded to the approximate original contour with all highwalls eliminated." Section 2.89 of WVSMRR defines "pit" to mean "that part of the surface mining operation from which the mineral is being actively removed or where the mineral has been removed and the area has not been backfilled." Section 2.47 of the WVSMRR regulations defines excess spoil as "overburden material disposed of in a location other than the pit."

III. Elements of AOC Definition

In order to determine whether approximate original contour has been attained, processes must be developed to objectively assess what surface configuration *closely resembles the general surface configuration of the land prior to mining,* while maintaining the flexibility required to accommodate the *diversity in terrain, climate, biologic, chemical and other physical conditions in areas subject to mining operations,* as intended by Congress in Public Law 95-87 (SMCRA). To accomplish this, it is necessary to determine, and address, the variables that influence the postmining surface configuration. A detailed analysis of the terms in the definition of AOC, and additional reclamation requirements in the performance standards of WVSCMRA and the promulgated rules serve to constrain what post-mining configuration is feasible. That is, a surface coal mining operation must meet not only the AOC standards, but satisfy numerous other requirements, including stability, access, and environmental provisions such as drainage, erosion, and sediment control that influence the determination of AOC. Focusing on the collective requirements of WVSCMRA leads to an objective process for obtaining AOC.

The key variables found in the AOC definition, influencing AOC determination are: *configuration, backfilling and grading, disturbed area (mined area in SMCRA), terracing or access roads, closely resembles, and drainage patterns.* These variables logically group into the following three focus areas: (A) configuration, (B) stability, and (C) drainage.

A. Configuration: Configuration relates to the shape of regraded or reclaimed area after the reclamation phase. This shape should *closely resemble* the general pre-mining shape or surface configuration. However, final configuration, including elevation, is restricted or affected by the requirement to comply with performance standards found in WVSCMRA, such as ensuring stability, controlling drainage, and preventing stream sedimentation.

B. Stability: The second focus area, stability, concentrates on ensuring that the reclaimed configuration is stable. Section 22-3-13(b)(4) of WVSCMRA requires the mining operation, at a minimum, to "Stabilize and protect all surface areas, including spoil piles, affected by the surface mining operation to effectively control erosion and attendant air and water pollution." The WVSMRR also requires that spoil returned to the mined-out area to be backfilled and graded to achieve AOC (see 38 CSR-2-14.15.a.). The backfilling process places the spoil material in the mined-out area, while the grading process shapes and helps compact the material in a manner that ensures that the material is stable.

State regulations, *(see* 38 CSR-2-14.8.a. and 14.15.a) require the backfilled material to be placed in a manner that achieves a postmining slope necessary to achieve a minimum long-term static safety factor of 1.3, prevent slides, and minimize erosion. This is often obtained by using a combination of slopes and terraces (benches) as needed. Generally acceptable prudent engineering configurations are slopes of 2 horizontal to 1 vertical and terraces not to exceed 20 feet in width. The 2:1 slope is measured between the terraces. Compliance with these stability requirements, such as adding terraces and designed slopes, renders it virtually impossible to replicate the configuration of the land prior to mining. However, if backfilling and grading utilizes 2:1 slopes with terraces, the mine site will be reclaimed to a shape that closely resembles the pre-mining configuration.

C. Drainage: The third focus area, drainage, as referred to in the AOC definition, requires the postmining surface configuration to complement the drainage pattern of the surrounding terrain. WVSCMRA, *see* Section 22-3-13(b)(10)(B), (C), (F), and (G). WVSCMRA also requires the proposed operation "minimize the disturbances to the prevailing hydrologic balance at the mine-site and in associated offsite areas and to the quality and quantity of water in surface and groundwater systems both during and after surface mining operations and during reclamation..." Among these requirements are the prevention of stream sedimentation, construction of certified sediment structures prior to disturbance, restoration of recharge capacity of the mined area to approximate pre-mining conditions, and any other actions that the regulatory authority may require.

The State regulations, (*see* 38 CSR 2-2.63), define hydrologic balance to mean:

> *"the relationship between the quality and quantity of water inflow to, water outflow from a hydrologic unit including water stored in the unit. It encompasses the dynamic relationships among precipitation, runoff, evaporation, and changes in ground and surface water levels and storage capacity."*

Specific requirements for the protection of the hydrologic balance are found in 38 CSR 2-14.5; 38 CSR 2-5.2, 5.3 and 5.4. These performance measures require the minimization of disturbance to the hydrologic balance within the permit and adjacent areas as well as preventing material damage outside the permit area. The regulations provide appropriate measures for complying with these requirements through the use of designed diversions channels and appurtenant drainage conveyance structures, designed sediment control structures, and measures, such as minimizing erosion, disturbing the smallest practical area at any one time, stabilizing the backfill, and retaining sediment within the disturbed area. As with stability, compliance with these drainage control requirements makes it virtually impossible to replicate the configuration of the land prior to mining.

Other performance standards that affect the reclamation configuration of the mine site must also be taken into account. If access to the reclaimed area is necessary, the placement of a road will obviously factor into the possible post-mining landform. The more flat areas cut into backfill slopes or placed on the mined bench at the toe of backfill, the more difficult it becomes to create a reclamation "template" that parallels the land configuration prior to mining. It is an absolute necessity to provide some combinations of these flat areas in a reclaimed mine backfill for access, as well as drainage and erosion control (sediment ditches, terraces, diversion channels), to conform with the environmental performance standards.

Another consideration in designing the post-mining configuration is minimizing the adverse impacts on fish, wildlife, and related environmental values (*see* 38 CSR 2-8). While seemingly general, when put into context with the requirements of the Fish and Wildlife Coordination Act and Clean Water Act, the provisions combine to limit mine site spoil disposal disturbances to stream channels and terrestrial habitats. This results in the requirement that excess spoil disposal should be confined to the smallest practicable site. Minimizing spoil disposal fill sizes means maximizing the amount of spoil backfill on the mining bench. Maximizing backfilling on the mine bench does not circumvent the need for stable backfill slopes, adequate drainage control, access roads (where necessary), and erosion/sediment control. However, it is feasible to configure a reclaimed area to satisfy configuration, stability, drainage control and also closely resemble the land surface that existed before mining. The planning process utilized in developing a surface coal mining permit application, while complex, can and must simultaneously satisfy all of these competing performance standards.

IV AOC and Excess Spoil Determination

This guidance document applies to steep-slope surface mining operations (*see* 38 CSR 2-14.8.a), including area mines and contour mines, that remove all or a large portion of the coal seam or seams running through the upper fractions of a mountain and propose to return the site to AOC. As described in the previous sections, many variables, such as stability requirements, drainage requirements, and sediment control requirements, affect or determine what the post-mining surface configuration, or shape, of the land will be at a steep slope surface coal mining operation proposing to return the site to AOC. Incorporating compliance with these performance standards into the proposed permit application requires the applicant to carefully plan the mining and reclamation phases of the proposed surface coal mining operation. This process requires, among other requirements, plans showing: post-mining contour maps, cross-sections, and profiles; spoil volume calculations; drainage structure designs; sediment control structure designs; access road designs (if justified); spoil placement sequences; and excess spoil determinations and calculations. When these findings are integrated, the resulting surface configuration of the land should satisfy the Congressional intent, as presented in SMCRA, the Legislative intent as presented in WVSCMRA, and related regulations, of returning the land to AOC.

A. AOC Model: Portraying these performance standards as variables in a model or formula provides an objective, yet flexible, process for determining what post-mining surface configuration meets the AOC definition, while complying with the other performance standards in WVSCMRA. The following terms were developed and defined for use in the formula:

OC Pre-mining configuration, or volume of backfill material required to replicate the original contours of the undisturbed area proposed to be mined.

SR Backfill volume displaced due to compliance with stability requirements.

DR Backfill volume displaced due to compliance with drainage control requirements.

SCR Backfill volume displaced due to compliance with sediment control requirements.

AR Backfill volume displaced due to compliance with access/maintenance requirements.

AOC Volume of backfilled spoil required to satisfy the Congressional intent of SMCRA for approximate original contour.

This document uses the above acronyms for illustrative purposes only and are not intended to represent standard engineering terminology. Instead, they illustrate the AOC model process, rather than quantifying each term in the formula. While the terms can be quantified individually, this is not required by the AOC model process. Use of the model results in a reclamation configuration that can be quantified into a cumulative volume, accounting for the overall effect of the individual reclamation components which are performance standards in WVSCMRA. Volume calculations, however, are an integral requirement in order to satisfy the model.

The term “backfill volume displaced” refers not to specific volumes, but to the concept that, if not for complying with these performance standards, additional spoil or backfill material volumes could theoretically be placed in the location where these structures or slopes are proposed. (See Figure 1). In practice, however, placing additional spoil in these location will violate other performance standards.

Details of Backfill Volume Displaced When Complying with Performance Standards

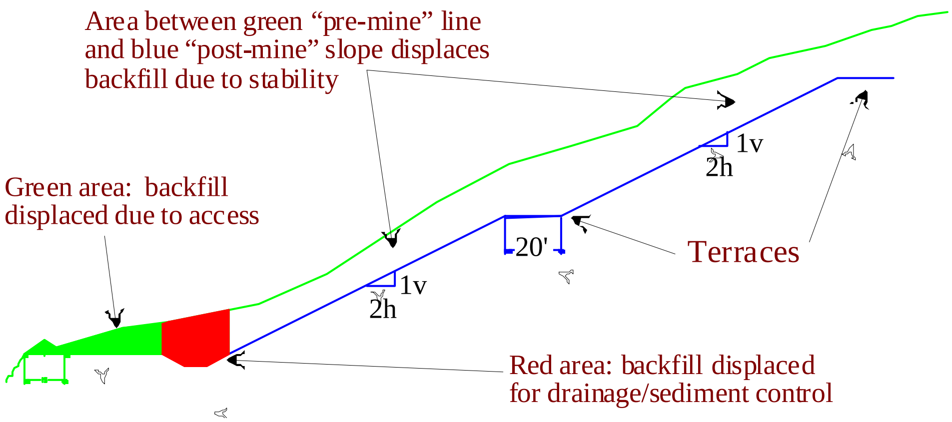

Figure 1

Based on the terms and illustrations used above, the following formula determines the amount of backfill which must be returned to the mined area to satisfy AOC.

OC - SR - DR - SCR - AR = AOC

Several of the terms must be further quantified to be used consistently in the AOC model:

Total Spoil Material **(TSM)** - Total spoil material is all of the overburden that must be handled as a result of the proposed mining operation. **TSM** will either be placed in the mined area or in excess spoil disposal sites (valley fill or pre-existing benches). This value is determined by combining the overburden (**OB**) volume over the uppermost coal seam to be excavated with the interburden (**IB**) volumes between the remaining lower coal seams. These values are typically expressed as bank cubic yards (bcy).

TSM volumes are determined by using standard engineering practice, such as average-end area, stage-volume calculations, or 3-dimensional (3-D) grid subtraction methods. The regulatory authority must have adequate information submitted by the applicant to **TSM** properly evaluate **TSM** calculations. If the applicant utilizes an average-end area method, cross-sections must be supplied for a base line or lines, at an interval no less than every 500 feet–or more frequently, if the shape of the pre-mined area is highly variable between the 500-foot intervals. If the applicant utilizes a stage-storage method, planimetered areas should also be determined on a contour interval (CI) that is representative and reflects any significant changes in slope (20' CI or less recommended). If a 3-D model is used, the pre-mining contour map and, if possible, a 3-D model graphic should be provided. The grid node spacings used in generating volumetrics should be identified. If digital data is utilized by the applicant, it should be in a format and on a media acceptable to the regulatory authority.

TSM is determined by calculating the in-situ overburden and interburden volume, multiplied by a "bulking" factor **(BF)**. Bulking factors are calculated by a two-step process: 1) "swell" volume is determined from the amount of expected expansion of in-situ material through the incorporation of air-filled void spaces; 2) "shrink" volume can be calculated from the amount the swelled material compacts during placement (reducing the void spaces and, consequently, the volume). Thus, the bulking factor is the swell factor minus the shrink factor, which varies based on the overburden lithology (e.g., sandstone swells more and shrinks less than shales). **TSM** is reported in cubic yards (cy). Permit applications should contain a justification of the weighted bulking factor utilized-based not only on the weighting of individual swell factors calculated for each major rock type to be excavated that will be placed in the backfill, but on the shrinkage or compaction factor due to spoil placement methods as well. In equation form:

(OB + IB) x BF = TSM

<u>Spoil Placement Areas</u> - There are only two areas that **TSM** can be placed: 1) disturbed area (mined area in SMCRA) or backfill (**BFA**); and, 2) excess spoil disposal areas (**ESD**), i.e. valley fills.

BFA the backfill area, referred to as the mine area, is generally thought of as the area between, if viewed from a cross-section, the outcrop boundaries of the lowest coal seam being mined. (See Figure 2)

ESD excess spoil disposal sites are areas **outside of the mined area** used for placement of excess spoil. (See Figure 2)

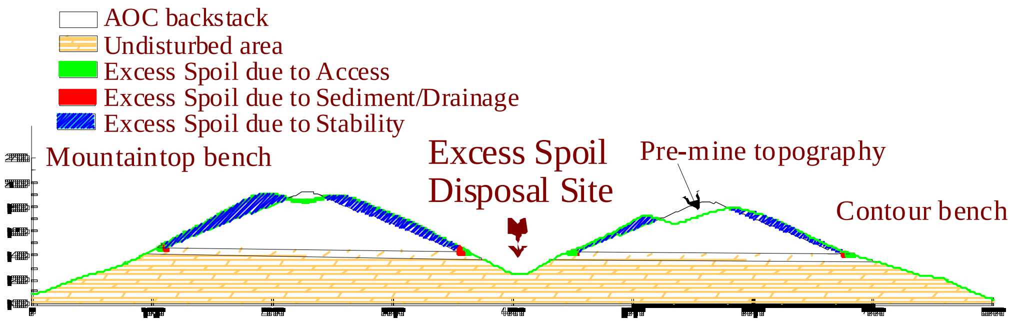

Figure 2

Original Contour (**OC**) - The original configuration of the mine area is determined from topographic maps of the proposed permit area. This configuration is developed through the use of appropriate cross-sections, slope measurements, and standard engineering procedures. Sufficiently detailed topographic maps, adequate numbers of cross-sections, or labeled 3-D model grids/graphics should be submitted that illustrate the representative pre-mine topography and slopes. Digital data should be submitted with the application in a format and on a media acceptable to the regulatory authority.

Stability Requirements (**SR**) - The concept of stability, in this model, focuses on the stability of the slopes of the spoil material placed in the backfill areas or excess spoil disposal sites. The spoil material must be placed in such a manner as to prevent slides or sudden failures of the slopes. State regulations require that slopes be designed to prevent slides and achieve a minimum, long-term static safety factor of 1.3. This safety factor should be the result of a worst-case stability analysis. There are standard engineering analytical procedures, that use unique shear strength and pore water pressure factors of the spoil material, for performing slope stability analyses. Therefore, it is the spoil strength characteristics and the water level anticipated within the backfill that determine the slope to which material can be placed and satisfy the safety factor requirement of the Federal and state counterpart regulations.

A generally acceptable practice, unless it results in a safety factor of less than 1.3, includes grading the backfill slopes (between the terraces) on a 2 horizontal to a 1 vertical ratio (2H:1V, or a 50 feet rise in 100 foot of slope length) and placing terraces where appropriate or required to control erosion or surface water runoff diversion (See Figure 3). It may be theoretically possible to place spoil on slopes steeper than 2:1, but other performance requirements may not recommend exceeding 2:1 slopes. For example, the Mine Safety and Health Administration recommends that slopes not be greater (steeper) than 2:1, because that is the maximum safe slope for operation of trackedequipment.

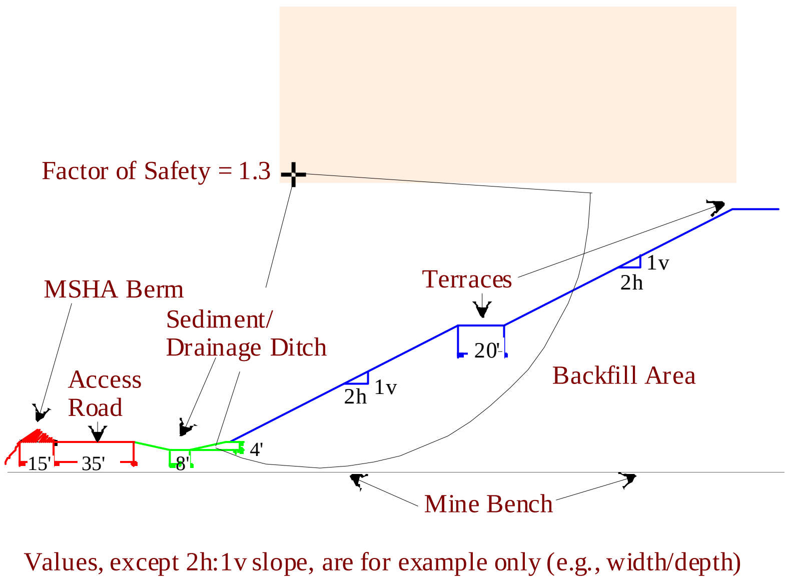

Figure 3

Slopes shallower or less than 2:1, with appropriate terraces, would result in more excess spoil material and would not closely resemble pre-mining configuration. Thus, the basis for these slopes would have to be documented based on engineering practices and approved by the regulatory authority. For example, if overburden and interburden were predominantly weak shales that cannot attain a 1.3 factor of safety at 2:1 slopes, more gentle slopes could be justified. The 2:1 backfill slope, and associated terraces or drainage conveyances will determine the ultimate backfill height for the mined area. This final elevation may be lower than the pre-mining elevation, approximate the pre-mining elevation, or exceed the pre-mining elevation.

However, as can be seen in Figure 4, this reclamation technique results in a configuration or shape that closely resembles the premining configuration, when defining the “approximate original contour.”

<u>Drainage Control Requirements (**DR**)</u> - Drainage structures are used to divert or convey surface runoff away from the disturbed area, after complying with effluent standards. These structures must be properly designed to adequately pass the designed flow. These structures are designed using standard engineering practices and theory. The purpose of these structures is to minimize the adverse impacts to the hydrologic balance (e.g., erosion, sedimentation, infiltration and contact with acid/toxic materials, etc.) within the

permit area and adjacent areas, as well as prevent material damage outside the permit area while ensuring the safety of the public. The size and location of these structures vary throughout the permit area depending on factors, such as travel time, time of concentration, degree of slope, design peak runoff curve, and depth, length, and width of drainage structures. The size and location of these structures necessarily reduce backfill spoil volume because of the flat area required to properly construct effective structures and meet drainage requirements.

Sediment Control Requirements (**SCR**) - Sediment control structures, like drainage control structures, are used to minimize the adverse impacts to the hydrologic balance within the permit area and adjacent areas, as well as prevent material damage to areas outside the permit area while ensuring the safety of the public. Their primary purpose is to prevent, to the extent possible, additional contributions of sediment to stream flow or to runoff outside the permit area. Oftentimes, drainage control structures and sediment control structures are combined into a single dual-purpose structure, i.e., the sediment control structure discharges from the disturbed area. These structures must be properly designed to accommodate the required sedimentation storage capacity and are designed using standard engineering practices and theory. As with drainage structures, the size and location of these structures dictate the amount of flat area that will, consequently, displace backfill spoil storage. When reviewing the size and placement of these structures for adequacy in meeting effluent and drainage control requirements, the regulatory authority will also assess the design plans to assure the structures are no larger/wider than needed for proper design.

Access/Maintenance Roads (**AR**) - these structures are often necessary to gain access to sediment control structures for cleaning and maintenance. They may also serve to provide principal access to the mining operation and reclamation areas. The size and location of these roads or benches will vary throughout the minesite and should be based on documented need. This distinction is important, because the larger the road, the more backfill material displaced which will increase the size of the excess spoil disposal sites. The regulatory authority permit review should evaluate the necessity for roads in the final reclamation configuration and approve only those widths suited for the road purpose and equipment size.

The top of the backfill should be no wider/flatter than is necessary for safely negotiating the largest reclamation equipment utilized for the mine site (see Figure 4). Areas larger than necessary to work this equipment would need to be documented and approved by the regulatory authority. The final configuration of the top of the backfill should be graded in a manner to facilitate drainage and prevent saturation.

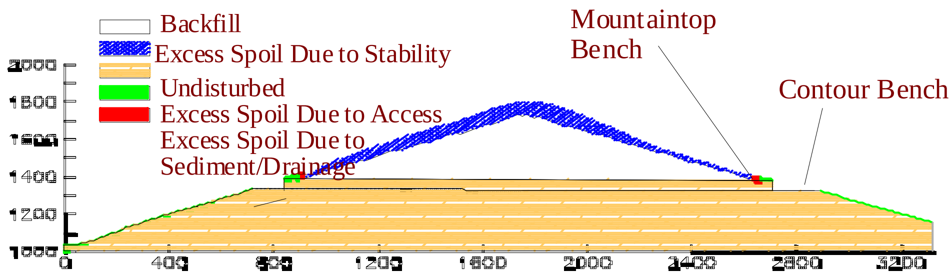

Figure 4a-results in lower elevation than pre-mining

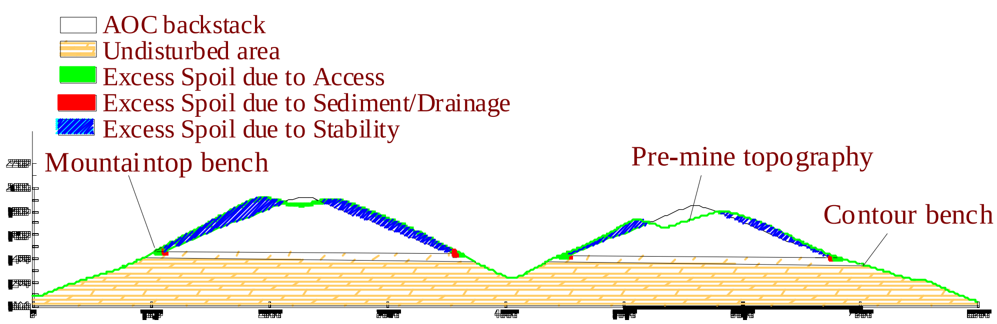

Figure 4b- results in approximately pre-mining elevation

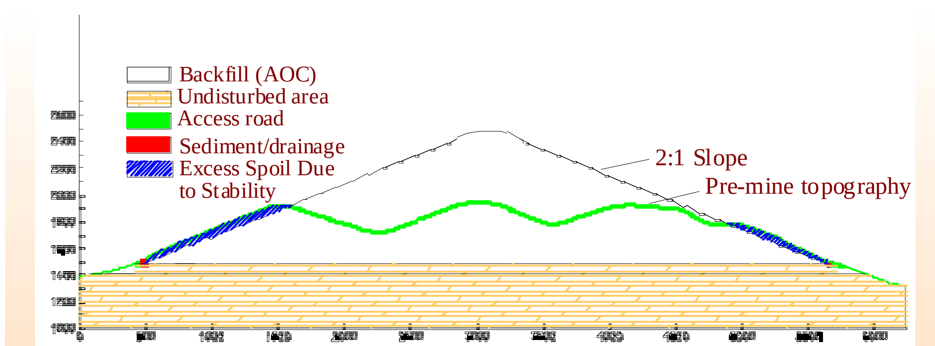

Figure 4c-results in higher elevation than pre-mining

Figure 4. Restoring contours and meeting performance standards

B. AOC Process Determination

Applying these performance requirements in the mine planning process will determine the amount of total spoil material which must be retained in the mined-out area. The backfill material that will be placed within the mined-out area can be backfilled in a flexible configuration, in accordance with a practical mine sequencing and haulback operation. Consequently, the resultant post-mining configuration should closely resemble the pre-mining topography, thus satisfying not only the access, drainage, sediment, and stability performance standards of WVSCMRA, but AOC in addition (See Figure 4).

Summarizing the formula or process:

Formula: **OC - SR - DR - SCR - AR = AOC**

Step 1: Determine original or pre-mining configuration (Original Contour (**OC)**)

Step 2: Subtract from Original Contour:

Volume displaced due to Stability Requirements (**SR**) (based on documented plans)

Volume displaced due to Drainage Requirements (**DR**) (based on documented plans)

Volume displaced due to Sediment Control Requirements (**SCR**) (based on documented plans)

Volume displaced due to Access Requirements **(AR**) (based on documented plans)

Step 3: Evaluate results. The remaining volume is what has been termed backfill (**BKF**) or spoil material placed in mined-out area. The configuration of this backfill material will be (point where 2:1 outslopes begin) dependent on the placement of roads, sediment, and drainage control structures (see Figures 1, 3 and 4)

Step 4: This is an iterative process that is linked to the placement of excess spoil in excess spoil disposal sites.

C. Excess Spoil Determination Model: The parameters used in the formula developed for determining the quantity of backfill material also are used to develop a model or formula for determining the quantity of excess spoil. As with the backfill quantity formula, converting these variables into a model or formula provides an objective, yet flexible, process for determining what is truly excess spoil–while complying with the performance standards in WVSCMRA.

Applicable terms and concepts used in the development of the model:

TSM Total spoil material to be handled or available. This material will be classified as either backfill material (**BKF**) or excess spoil material (**ES**)

OC Pre-mining configuration, or volume of backfill material required to replicate the original contours of the undisturbed area proposed to be mined.

SR Backfill volume displaced due to compliance with stability requirements.

DR Backfill volume displaced due to compliance with drainage control requirements.

SCR Backfill volume displaced due to compliance with sediment control requirements.

AR Backfill volume displaced due to compliance with access/maintenance requirements.

AOC Volume of backfilled spoil required to satisfy the intent of WVSCMRA for approximate original contour.

BKF Volume of backfill or spoil material placed in the mined area

ES Volume of excess spoil remaining after satisfying **AOC** by backfilling and grading to meet **SR**, **DR**, **SCR**, **AR.**

The term “backfill volume displaced” refers not to specific volumes, but to the concept that, if not for complying with these performance standards, additional spoil or backfill material volumes could theoretically be placed in the location where these structures or slopes are proposed (See Figure 1). Spoil material unable to be placed in backfill area (in order to comply with all other performance standards), by default, must be excess spoil (**ES**), and placed in an approved excess spoil disposal site(s). The process for quantifying these terms is in Section IV A, above.

The **ES** quantity, as determined by the following formula, is obtained by complying with the stability (slopes) standards as well as incorporating the other performance standards such as drainage controls, sediment control, and access/maintenance requirements.

The excess spoil relationships.

ES = TSM - BKF

Since **BKF = OC - (SR + DR + SCR + AR),**

Therefore:

ES = TSM - (OC - (SR + DR + SCR + AR))

The regulatory authority should carefully evaluate the spoil balance information provided in the permit application to assure that excess spoil volumes are not inflated merely for achieving cost savings from material handling costs. Inflated excess spoil volumes would most likely occur because of wider or more numerous flat areas than required for drainage, sediment, or erosion control; access roads; or top of backfill areas. Use of backfill slopes less that 2:1 would also increase the excess spoil disposal. Permits that propose to conduct steep-slope surface mining operations, but change plans due to unanticipated field conditions (e.g., mining reduced to contour strip from area mining), should submit permit revisions containing revised volumetric calculations and excess spoil designs.

Solving this formula establishes the quantity of excess spoil material (**ES**) that must be placed in an excess spoil disposal site(s) (See Figure 2). Generally this **ES** volume, and/or mining logistics, requires more than one site. Typically, in steep-slope regions of Appalachia, excess spoil is placed in adjacent valleys. In areas where extensive "pre-law" mining (prior to passage of SMCRA, or August 3, 1977) has occurred, pre-existing benches are commonplace. Sometimes, operations utilize adjacent pre-existing benches (without coal removal occurring) as part of the permitted area for excess spoil disposal–if in close proximity to the operation. More often, pre-existing benches are part of the mined area, and provide for storage of additional backfill material–ultimately reducing the volume of excess spoil. Performance standards for excess spoil disposal areas are found in 38 CSR 2-14.14.

The most common site selected to place excess spoil is in the adjacent valleys. Site selection is typically made by calculating a stage-storage-volume curve for each valley adjacent to the mining operation. This stage-storage relationship changes, dependent on the point in the valley from which the downstream limits of fill is established. The permit application should contain the alternative stage-storage-volume data illustrating the various valley capacities for excess spoil storage dependent on toe location and crest elevation.

If pre-existing benches are to be used as excess spoil disposal sites, the capacity of each pre-existing bench area must be calculated. Typically these calculations utilize the average-end area method based on cross-sections representing the site configuration. After determining the capacity of these sites, the total value determined for excess spoil will be reduced by this value. The remaining quantity of excess spoil will then be placed in an adjacent valley(s), as described above.

Other factors, besides the quantity of material, that go into this **ES** site selection may include: 1) if a valley, the steepness of the valley profile (so as not to exceed 20 percent for durable rock fills or other value designated by regulatory authority relative to design changes for additional stability); 2) location in relation to mining phase; and, 3) other statutory requirements, such as the size of watershed that can be disturbed without additional permitting requirements.

Regardless of which factor(s) determine the location of the toe of the fill, the process is an iterative procedure that requires the available backfill and excess spoil material to balance, consistent with the formula developed above. After this material balance is achieved, the excess spoil disposal areas are designed to accommodate this quantity of excess spoil. If the excess spoil disposal site is a valley fill, this design will determine the height or elevation of the crest (top) of the excess spoil disposal site or fill. Once this design is complete, and top of fill elevation is determined, the next step would be to repeat or perform another iteration using the AOC model or process (See Figure 5).

If the excess spoil disposal sites are pre-existing bench areas, the sites are designed to accommodate the calculated quantity of excess spoil, while complying with the performance standards imposed by the regulatory authority's regulations.

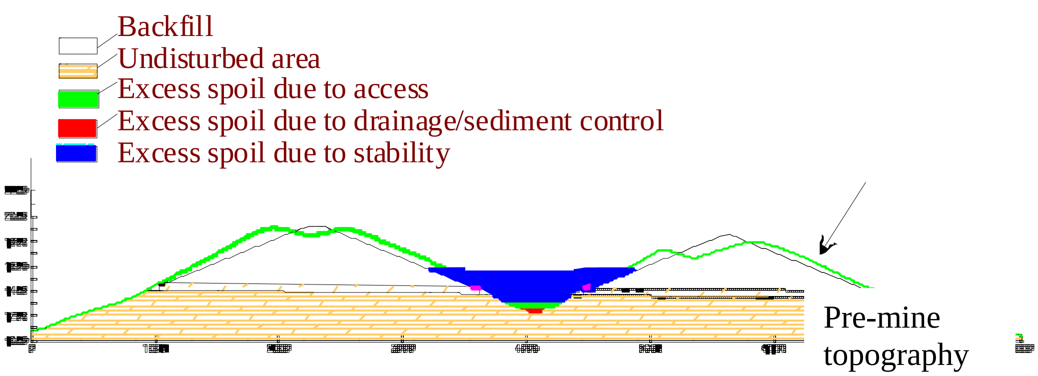

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Figure 5

D. Combining AOC Model with Excess Spoil Determination Model: The excess spoil model in Section IV B establishes the quantity of material that must be placed in an excess spoil disposal site(s). Performing a material balance, comparing the excess spoil volumes with the valley storage possibilities established the height or elevation of the fills. At least a second iteration of the AOC model must be performed to establish the final reclamation configuration. Before performing a new iteration of the AOC model (as in Section IV A), another term or concept must be introduced. The new concept determines the interface between the backfill area and the excess spoil disposal area. (See Figure 2). This demarcation can be used consistently in any steep slope mining situation, and is determined using the following process:

> Locate the outcrop of the lowest seam being mined, whether contour cut only or removal of the entire seam. (See Figure 6)
>
> Project a vertical line upward beyond the crest of the fill and backfill elevations (See Figure 2).
>
> The area where coal removal occurs, to one side of this line, is backfill area

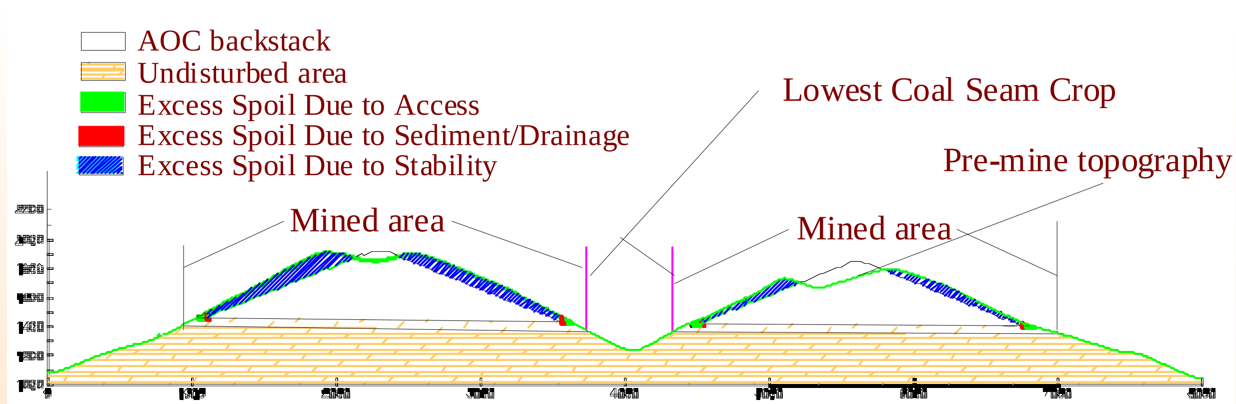


Figure 6. Lowest coal seam outcrop and mined area

> (BFA); and, the area on the other side of the line, including the valley bottom, is excess spoil disposal area (see Figure 2).

Establishing this boundary between excess spoil areas and backfill areas is not arbitrary. It is the same procedure used by some regulatory authorities in determining where permanent diversion ditches must be located. Also, this boundary establishes where permanent sediment control structures may be placed without being considered a violation of the prohibition of locating a permanent impoundment on an excess spoil disposal site.

This point becomes a reference line to perform the second or additional iterations of the AOC model used in Section IV A. That is, the road access, stability, drainage, sediment control analysis is applied to establish where backfilling at a 2:1 slope begins. The additional material placed on the mined area as a result of the iteration process creates the need to perform another material balance exercise, as describe above in Section IV B. This readjustment of the material balance may result in a reduction of excess spoil volume. In either case, the elevation of the fills would not be lowered, but instead the material balance would result in a reduction of length of the fills or possibly the elimination of some proposed fills (See Figures 7 and 8).

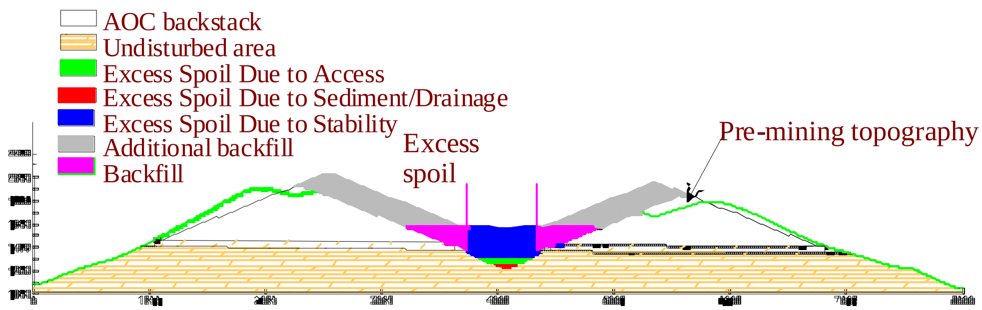


Figure 7

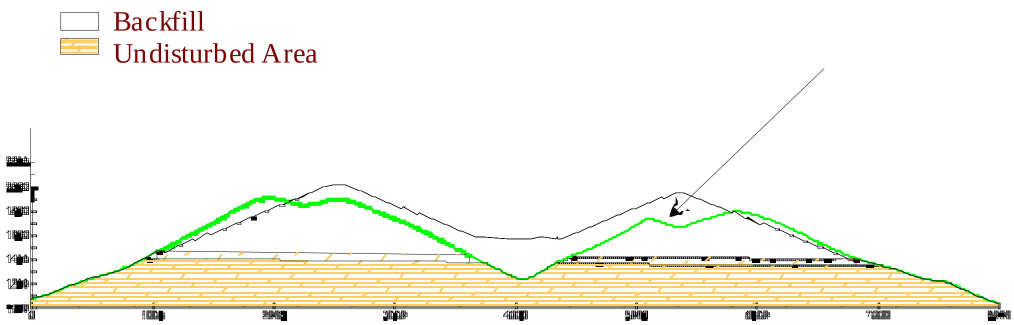
Final topography

Pre-mine topography

Figure 8

Reevaluation of fill designs using this second iteration becomes an important component of the permit design. Reduction in fill lengths could result in the toe of the fill being placed upon too steep of a slope–requiring additional material excavation for a keyway cut, or additional material placement for a stabilizing toe buttress.

However, this process may still result in large flat areas at the fill crest that could be used to store additional backfill. This provides the further option of storing additional excess spoil in the crest area–reducing excess spoil fill length. This option would further



minimize terrestrial and aquatic impacts in the excess spoil disposal area because the toe of the fill would move upstream (See Figure 9).

E. Contour Mining Operations: Contour mining excavates only part of the mountainside, leaving undisturbed areas above and below the excavation (see Figure 10). The mining phase of a contour mine creates a cliff-like highwall and shelf-like bench on

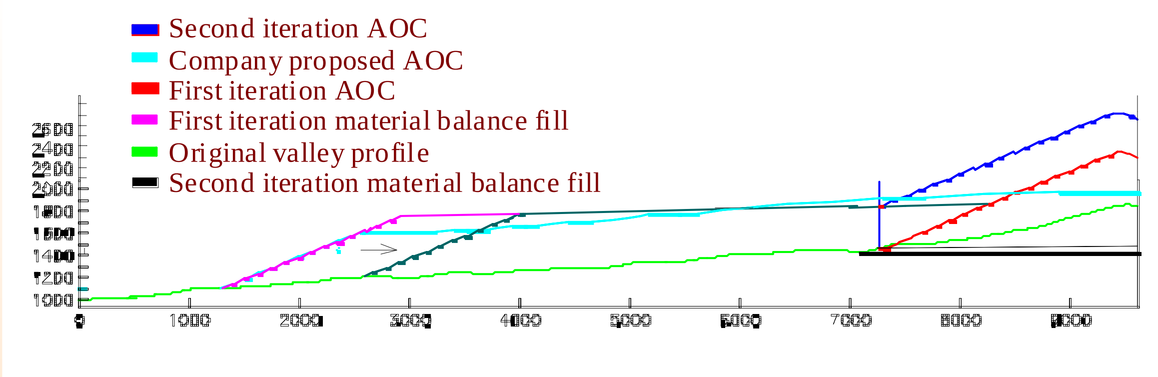


Figure 9. How the AOC process affects fill length

the hillside that must be restored to approximate original contour, with the highwall completely eliminated, in the reclamation phase. The AOC/excess spoil determination models, described in IV A-C, are used to achieve AOC and determine excess spoil volumes for this type of surface mining operation as well.

For example, a contour mine typically takes one (1) contour "cut" (see Figure 10) and progresses around the coal outcrop, leaving a highwall and bench after the coal is removed. Reclaiming the site, utilizing the AOC process, would require documentation showing drainage structure designs, access road requirements, and properly designed sediment structures. The application would also require documentation demonstrating the stability of the outslope of the material placed in the backfill area. Regulations require that slopes be designed to prevent slides and achieve a minimum long-term static safety factor of 1.3. A generally acceptable practice, unless it results in a static safety factor of less than 1.3, includes grading the backfill slopes (between terraces where required) on a 2 horizontal to a 1 vertical ratio (2H:1V) (See Section IV A for details). If compliance with the other performance standards, i.e., drainage, access, and sediment control, result in backfill out-slopes being steeper than 2:1, the application should contain adequate documentation that the backfill configuration meets a 1.3 static safety factor (see Figure 10). Documentation described in Section IV A would be required if slopes flatter than 2:1 are proposed.

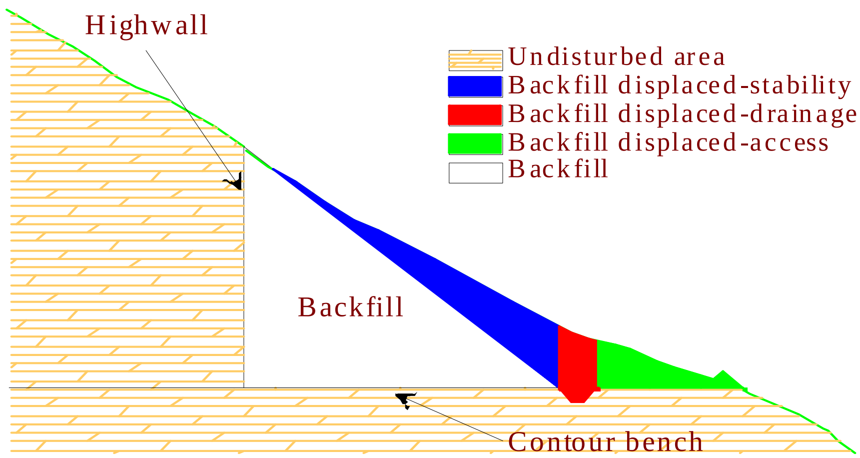


Figure 10

Oftentimes, contour mining operations encounter long, narrow ridges or points that require more than one cut to recover the coal seam(s). Although the mining phase utilizes both the contour and area mining methods when this occurs, the AOC/excess spoil determination models are used in the same way for determining AOC and excess spoil volumes. The same principles and performance standards apply–drainage, sediment control, and access requirements must be designed and documented. Also, compliance with the stability requirements for the outslopes of the backfill must be achieved and documented.

However, in order to comply with these requirements and achieve AOC, the reclamation phase of these sites must integrate two perspectives when utilizing the AOC model:
1) elimination of the highwall (perpendicular to the ridge line); and, 2) returning all spoil material that is not excess spoil to the mined area(s) (the area between the highwall and

the end of the ridge line). Combining the two perspectives results in a postmining configuration that closely resembles the general configuration of the ridge or point prior to mining, while still complying with the performance standards discussed earlier in Section IV A- D.

SUBJECT:	**Final AOC Guidance Document Policy**
DATE:	**February 19, 2004**
Approval:	**F. Joe Parker, Acting Director**

All surface mine applications submitted after March 24, 2000, must have the Final AOC Guidance Document Policy used to determine the adequacy of the AOC design and fill placement.

This Policy updates the June 5, 2000 Director Michael C. Castle, Final AOC Guidance Document Policy without substantive change to its contents. As mutually agreed by the Coal Permitting Quality Assurance/Quality Control (QA/QC) Advisory Panel at its February 19, 2004 Session; acknowledged errata have been corrected, minor editing was performed and illustrative figures have been inserted.

It is important to note that the Final AOC Guidance Document Policy does not apply to contour mines. Contour mining applications (regardless of date of receipt) will be reviewed using the existing AOC/Excess Spoil Guidelines document (1999), which does apply to contour operations.

FINAL AOC GUIDANCE DOCUMENT

WITH

ERRATA CORRECTIONS THROUGH FEBRUARY 19, 2004

ORIGINAL DOCUMENT DRAFTED JANUARY 27, 2000
ORIGINAL DOCUMENT EFFECTIVE MARCH 24, 2000

1. INTRODUCTION AND BACKGROUND

1.1 Applicable Provisions of State Law

Surface Mining Control and Reclamation Act of 1977 (SMCRA)

30 USC 1291 Section 701(2)

West Virginia Surface Coal Mining and Reclamation Act (WVSCMRA)

22-3-3(e)
22-3-13(d)(3)
22-3-13(b)(4)
22-3-13(b)(10)(B), (C), (F), (G)

West Virginia Surface Mining Reclamation Regulations (WVSMRR)

38 CSR 2-2.47
38 CSR 2-2.63
38 CSR 2-5.2, 5.3, 5.4
38 CSR 2-8, 8.a
38 CSR 2-14.5
38 CSR 2-14.8.a
38 CSR 2-14.14
38 CSR 2-14.15.a

1.2 Purpose, Objectives and Applicability

An objective and well-defined method for determining post-mining land configuration is necessary to assure compliance with applicable laws, provide an opportunity for early coordinated regulatory review, and allow for meaningful and timely public input and transparent decision-making.

This method is referred to as the "AOC Process" throughout this document.

The AOC Process outlined in this document shall be undertaken for all proposed steep slope surface coal mining applications. Steep slope operations are all operations where the natural slope of the land within the permit area exceeds an average of twenty (20) degrees, as measured from the horizontal. The AOC Process shall be completed before the issuance of a Surface Mining Application (SMA) number by WVDEP.

Nothing in this AOC Process shall be construed to regulate the surface activity solely associated with underground mining or coal refuse facilities.

This guidance document has been developed to accomplish the following objectives:

- Provide an objective process for achieving AOC while ensuring stability of backfill material and minimization of sedimentation to streams.
- Provide an objective process for determining the quantity of excess spoil that may be placed in excess spoil disposal sites such as valley fills.
- Optimize the placement of spoil to reduce watershed impacts.

- Provide an objective process for use in permit reviews as well as field inspections during mining and reclamation phases.
  - Maintain the flexibility necessary for the operator to address site-specific mining and reclamation conditions.
  -

1.3 Acronym Definitions

The following acronyms are used throughout the AOC Process:

- **OC –** Volume of material required to replicate the **O**riginal **C**ontours of the undisturbed area.
- **TSM – T**otal **S**poil **M**aterial to be handled or available.
- **SR –** Backfill volume displaced due to compliance with **S**tability **R**equirements.
- **DR –** Backfill volume displaced due to compliance with **D**rainage control **R**equirements.
- **SCR –** Backfill volume displaced due to compliance with **S**ediment **C**ontrol **R**equirements.
- **AR –** Backfill volume displaced due to compliance with **A**ccess/maintenance **R**equirements.
- **MBR –** Backfill volume displaced due to compliance with the reduction of peak backfill elevation to meet **M**aximum **B**ackfill **R**equirements.
- **AOC –** Volume of backfilled spoil and configuration required to satisfy the definition of **A**pproximate **O**riginal **C**ontour.
- **OB –** Volume of material in the **O**ver**B**urden.
- **IB –** Volume of material in the **I**nter**B**urden.
- **BF – B**ulking **F**actor. The result of the swell factor minus the shrinking factor associated with a certain material.
- **BFA – B**ack**F**ill **A**rea. The area inside the outcrop of the lowest isolated coal seam mined.
- **ESDA – E**xcess **S**poil **D**isposal **A**rea. The area outside of the mined area used for placement of excess spoil.
- **OSDA – O**ff-**S**ite **D**isposal **A**rea.
- **IBKF – I**nitial **B**ac**KF**ill volume. The spoil material placed in the mined area prior to the placement of any excess spoil areas.
- **ES –** The volume of **E**xcess **S**poil remaining after satisfying AOC by backfilling and grading to meet SR, DR, SCR, AR, and MBR.
- **OSDV –** The quantity of material in **O**ff-**S**ite **D**isposal **V**olume.
- **ABKF –** The volume of **A**dditional **B**ac**KF**ill created by revising the location of the toe of the backfill slope as required by the AOC process.

- **ESDV – E**xcess **S**poil **D**isposal **V**olume. The volume of excess spoil remaining after deducting the total backfill volume that shall be placed in an excess volume disposal facility.
- **IES – I**nitial **E**xcess **S**poil. The volume of total spoil produced from mining less the volume that can be backfilled in the mined area.
- **ESH – E**quivalent **S**well **H**eight. The height calculated by dividing the sum of OB and IB by BFA, and multiplying this ratio by the bulking factor, BF.
- **TFE – T**arget **F**ill **E**levation. The sum of the average elevation of the outcrop of the primary mountaintop seam with each valley selected for fill placement, plus ESH.
- **BKF – B**ac**KF**ill volume. The volume of spoil material to be returned to the mined area.

2. AOC AND EXCESS SPOIL QUANTITY RELATIONSHIP

Elements of AOC Definition

The following terms are necessary for development of the AOC Process:

A. Configuration: **-** Configuration relates to the shape of the regraded or reclaimed area. In addition to complying with the definition of AOC the reclaimed configuration must comply with performance standards found in WVSCMRA, such as ensuring stability, controlling drainage, and preventing stream sedimentation.

B. Stability: **-** Stability relates to the placement of material in the regraded or reclaimed area. State regulations (see 38 CSR-2-14.8.a. and 14.15.a) require material to be placed in a manner that achieves a minimum long-term static safety factor, prevents slides, and minimizes erosion.

C. Drainage: **-** Drainage relates to moving water from and within the regraded or reclaimed area. Reclaimed drainage configurations must comply with performance standards found in WVSCMRA, such as minimizing sedimentation, and restoring water quality and quantity.

2.2 INTRODUCTION OF AOC MODEL CONCEPT

The AOC Process includes the development a volumetric model referred to as the AOC Model. This volumetric model provides a definitive and reproducible means to calculate the volumes of material that can be backfilled or placed in excess spoil disposal areas. The volumes obtained from the AOC Model are used as a volumetric basis for the actual mine configuration. The proposed final regrade configuration of the Mine Plan may vary from the AOC Model except as described below.

Portraying these performance standards as variables in a model or formula provides an objective process for determining what post-mining surface configuration meets the AOC definition, while complying with the other performance standards in WVSCMRA. The following terms were developed and defined for use in the AOC Model:

Configuration

OC Volume of material required to replicate the original contours of the undisturbed area proposed to be mined. **OC** includes overburden (**OB**), interburden (**IB**), and coal in their undisturbed pre-mining state.

TSM Total spoil material to be handled or available. This material will be classified as either backfill material (**BKF**), excess spoil material (**ES**), or off site disposal material (**OSDV**)

Performance Standards

SR Backfill volume displaced due to compliance with **S**tability **R**equirements.

DR Backfill volume displaced due to compliance with **D**rainage control **R**equirements.

SCR Backfill volume displaced due to compliance with **S**ediment **C**ontrol **R**equirements.

AR Backfill volume displaced due to compliance with **A**ccess / maintenance **R**equirements.

MBR Backfill volume displaced due to compliance with the reduction of peak backfill elevation to meet **M**aximum **B**ackfill **R**equirements.

AOC Volume of backfilled spoil and configuration required to satisfy the definition of **A**pproximate **O**riginal **C**ontour.

This document uses the above acronyms for illustrative purposes only and they are not intended to represent standard engineering terminology. Instead, they illustrate the AOC Model process, rather than quantifying each term in the formula. While the terms can be quantified individually, this is not required by the AOC Model process. Use of the AOC Model results in a theoretical reclamation configuration that can be quantified.

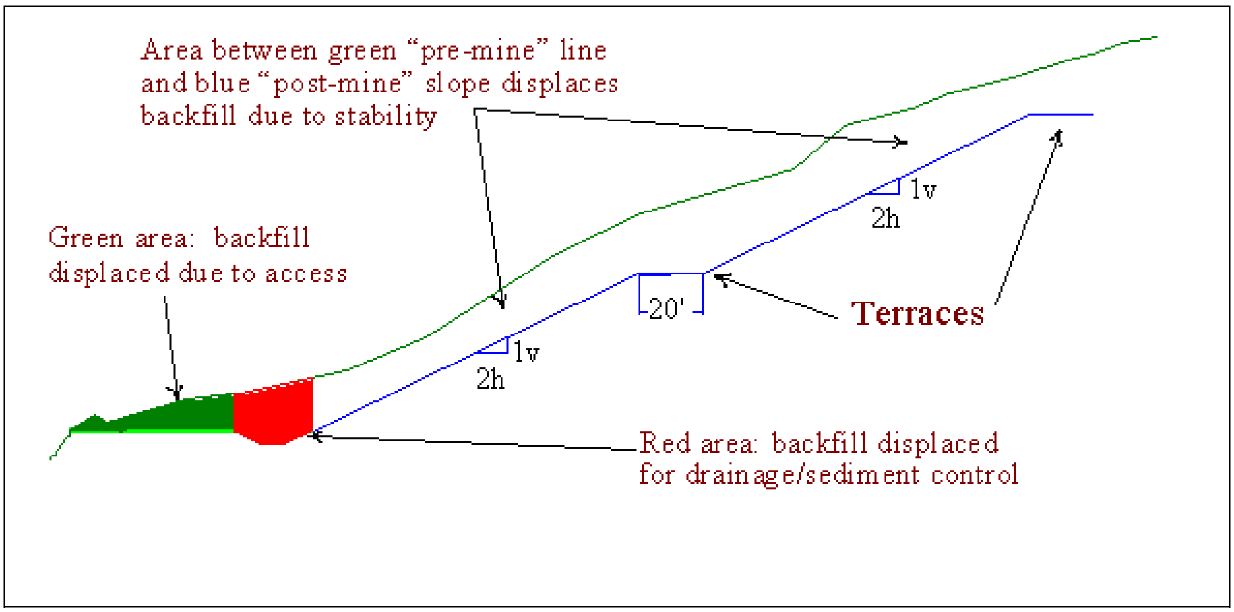


Figure 1. Typical Backfill Volume Displaced When Complying With Performance Standards

The following formula determines the amount of backfill that must be returned to the mined area to satisfy AOC.

$$\mathbf{OC - (SR + DR + SCR + AR + MBR) = AOC}$$

2.3 DEFINITION OF CONFIGURATION

2.3.1 Introduction

The following terms are used consistently in the AOC Model to define the condition of the mined area:

2.3.2 Total Spoil Material (**TSM**)

Total spoil material is all of the overburden and interburden that must be handled as a result of the proposed mining operation. **TSM** will either be placed in the mined area, in excess spoil disposal sites (valley fills), on pre-existing benches or in off-site disposal areas.

TSM volumes are determined by using standard engineering practice, such as average-end area, stage-volume calculations, or 3-dimensional (3-D) grid subtraction methods. The Director must have adequate information submitted by the applicant to properly evaluate **TSM** calculations. If the applicant uses an average-end area method, cross-sections must be supplied for a base line or lines at an interval no less than every 500 feet or more frequently if the shape of the pre-mined area is highly variable between the 500-foot intervals. If the applicant uses a stage-storage method, planimetered areas should also be determined on a contour interval (CI) that is representative and reflects any significant changes in slope (20' CI or less recommended). If a 3-D model is used, the pre-mining contour map and, if possible, a 3-D model graphic should be provided. The grid node spacings used in generating volumetrics should be identified. If digital data is used by the applicant, it should be in a format and on a media acceptable to the Director.

TSM is determined by combining the overburden (**OB**) volume over the uppermost coal seam to be excavated with the interburden (**IB**) volumes between the remaining lower coal seams, and then multiplying this sum by a “bulking” factor (**BF**). Bulking factors are calculated by a two-step process: 1) “swell” volume is determined from the amount of expected expansion of previously undisturbed natural material through the incorporation of air-filled void spaces; 2) “shrink” volume can be calculated from the amount the swelled material compacts during placement (reducing the void spaces and, consequently, the volume). Thus, the bulking factor is the swell factor minus the shrink factor, which varies based on the overburden lithology (e.g., sandstone swells more and shrinks less than shale). The applicant shall clearly identify the value of **BF** used. Permit applications that propose a **BF** greater than 30% shall contain a justification of the weighted bulking factor utilized-based not only on the weighting of individual swell factors calculated for each major rock type to be excavated that will be placed in the backfill, but also on the shrinkage or compaction factor due to spoil placement methods. In equation form:

$$\mathbf{(OB + IB) \times (1 + BF) = TSM}$$

Spoil Placement Areas **-** There are only three areas that **TSM** may be placed:

- backfill (**BFA**)
- excess spoil disposal areas (**ESDA**), i.e. valley fills.
- off-site disposal areas (**OSDA**)

BFA Backfill Area (mined area) is the area inside the outcrop of the lowest coal seam mined. (See Figure 2)

ESDA Excess Spoil Disposal Area. The area outside of the mined area used for placement of excess spoil. (See Figure 2)

OSDA Off-Site Disposal Areas include but are not limited to:

- unreclaimed mine sites not subject to SMCRA and State mining reclamation laws that are permitted and bonded by the applicant for spoil disposal
- approved AML or bond forfeiture projects that require such additional spoil to achieve final reclamation
- existing benches in accordance with 38 CSR-2.14.14.

- previously mined post SMCRA mined areas and excess spoil disposal areas that can accommodate additional spoil disposal that do not change the toe location. These areas shall be permitted and bonded by the applicant for spoil disposal.
-

The volume of spoil placed off-site shall be deducted from the spoil volumes in accordance with Section 3.4.

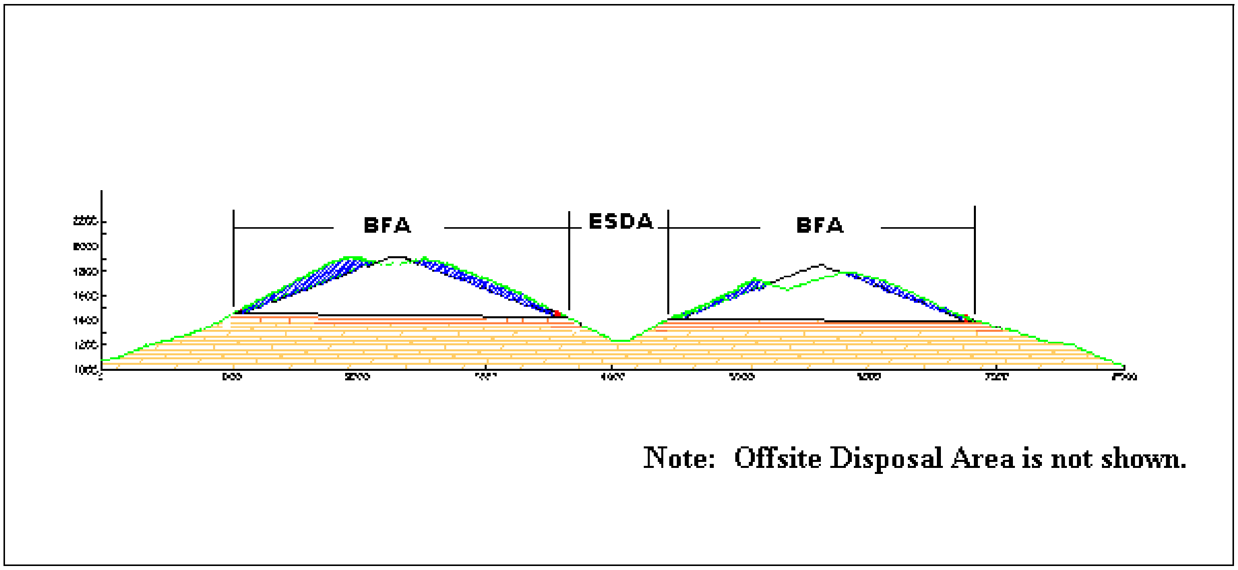


Figure 2. Typical excess spoil site selection

2.3.3 <u>Original Contour (**OC**)</u>

The original configuration of the mine area is determined from topographic maps of the proposed permit area. This configuration is developed through the use of appropriate cross-sections, slope measurements, and standard engineering procedures. Sufficiently detailed topographic maps, adequate numbers of cross-sections, or labeled 3-D model grids/graphics should be submitted that illustrate the representative pre-mine topography and slopes. Digital data should be submitted with the application in a format and on a media acceptable to the regulatory authority.

2.4 Effect of Performance Standards on Backfill Volume

2.4.1 <u>Introduction</u>

The spoil material displaced due to the performance standards is deducted from configuration volumes. Each component occupies space in the mined area that could otherwise contain spoil material. The Director shall assure that the AOC Model design includes only necessary and justifiable deductions based on the following criteria, as depicted by Figure 3. This shall constitute the standard template for defining the backfill volume. The template only applies to the determination of backfill volumes for the AOC Process. The backfill configuration proposed in the Mine Plan need not conform to the template or the "AOC Model".

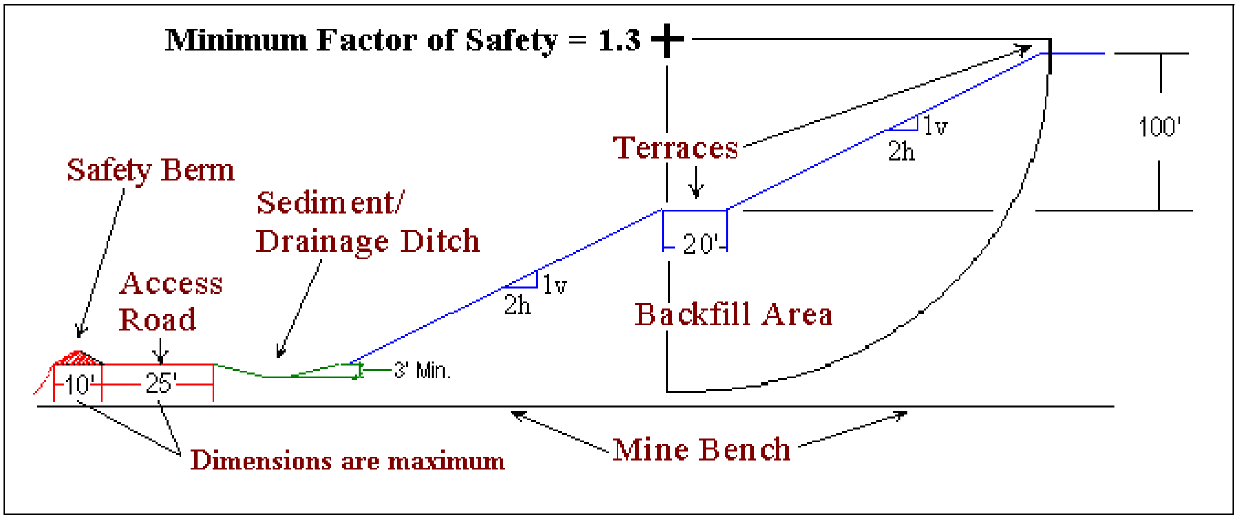


Figure 3. **Template for stability, drainage, sediment control, and access control requirement.**

2.4.2 Stability Requirements (**SR**)

The slopes of the spoil material placed in the backfill areas or excess spoil disposal sites must be stable. Accordingly, the spoil material shall be placed in such a manner as to prevent slides or slope failures and achieve a minimum, long-term static safety factor of 1.3 for the backfill.

For the purpose of determining the backfill volume for the AOC Model the backfill slopes shall consist of a 2 horizontal to a 1 vertical (2H:1V) slope between the terraces plus a terrace of twenty feet (20') width constructed at each one hundred feet (100') vertical rise above the toe of the backfill.

If the applicant demonstrates that the overburden and interburden cannot attain a 1.3 factor of safety at 2:1 slopes, more gentle slopes may only be justified by the submission of geotechnical test data and stability analyses to the Director.

2.4.3 Drainage Control Requirements (**DR**)

Drainage structures are used to divert or convey surface runoff. For the determination of backfill volumes for the AOC model, it is assumed that all drainage structures, except for clean water diversion ditches, are integrated with the sediment control structures.
The integration of the drainage structure with the sediment control structures only apply for the determination of backfill volumes for the AOC Model and the final design and configuration need not conform to the AOC Model.

If the applicant proposes a diversion ditch to transport discharge from undisturbed areas, or from drainage control structures, these structures must be properly designed to provide the required capacity and designed using standard engineering practices and theory. When reviewing the size and placement of these structures, the Director shall assess the design plans to assure the structures are no larger/wider than necessary for proper design and comply with standard engineering practices.

The design of the drainage structures only apply for the determination of backfill volumes for the AOC Model and the final design and configuration need not conform to the AOC Model.

2.4.4 Sediment Control Requirements (**SCR**)

For the determination of backfill volumes for the AOC Model, the design of the sediment control structures shall include the drainage structures (except for diversion ditches). It is also assumed that the sediment control structures are located at the toe of the backfill slopes on the pavement of the primary mountaintop seam and on the seam mined for contour mining.

For the purpose of the AOC Model the design of the sediment control shall consist of continuous ditches around the perimeter of both the primary mountaintop seam and on the lowest seam mined for contour mining. These structures must have a total design depth (including freeboard) of no less than 3 feet. These structures must be properly designed to provide the required sediment storage capacity and designed using standard engineering practices and theory.

When reviewing the size and placement of these structures used in the AOC Model, the Director shall assess the design plans to assure the structures are no larger/wider than necessary for proper design and comply with standard engineering practices.

The design of the sediment control structures only applies to the determination of backfill volumes for the AOC Model. The final design and configuration need not conform to the AOC Model.

2.4.4 Access/Maintenance Roads (**AR**)

For purposes of this AOC Model, the applicant must justify, based on operation specific details, all access and maintenance road and safety berm widths. Under no circumstances may the road width exceed 25 feet plus a maximum allowance of 10 feet (horizontal) for a safety berm. An allowance for roads shall be provided for roads located on the primary mountaintop seam outcrop and along the outcrop of the lowest seam mined for contour mining, or each outcrop for Multiple Contour Operations.

The Director shall also assess the road configuration to assure the roads and safety berms are no larger/wider than necessary.

The design of the roads only applies to the determination of backfill volumes for the AOC Model. The final design and configuration need not conform to the AOC Model.

2.4.5 Maximum Backfill Requirements (**MBR**)

The crest of the backfill ridge must accommodate the mining equipment that transports and places the spoil but the crest must not be unnecessarily wide. For purposes of this AOC Model, the backfill crest width shall not exceed 100 feet. The applicant must justify, based on operation specific details, any backfill crest width in excess of 30 feet.

The AOC Model can create an anomaly when the extent of the mined area is significantly increased due to contour mining within the perimeter of valley fills. As the total mined area expands, the potential backfill height increases. In certain instances, the AOC Model generates a peak backfill elevation that is substantially higher than the surrounding terrain. To avoid this anomaly, an applicant shall not be required to design backfill higher than the peak pre-mining elevation within the mined area for purposes of calculating backfill volume and excess spoil volume using this model.

The MBR applies only for the determination of backfill volumes for the AOC Model. The final design and configuration need not conform to the AOC Model as it does not establish a ceiling elevation above which no backfill material can or must be placed in the actual Mine Plan. Incorporating the other components of the AOC definition in the proposed final regrade configuration will prevent the development of a flat plateau in the Mine Plan.

3. AOC Determination (Mountaintop Mining)

3.1 Introduction

Applying these performance requirements in the mine planning process will determine the amount of total spoil material that must be retained in the mined area to satisfy the objective criteria for AOC. The calculations and drawings developed through application of this plan are used to determine the volumetric components of AOC.

3.2 Backfill Spoil Determination Model

The backfill material that will be placed within the mined area can be backfilled so that the resulting post-mining configuration closely resembles the pre-mining topography, thus satisfying not only the access, drainage, sediment, and stability performance standards of SMCRA and WVSCMRA, but also providing flexibility and meeting the AOC requirements.
Restating the AOC Model from the previous section:

OC – (SR + DR + SCR + AR + MBR)= AOC

Step 1: Determine original or pre-mining configuration Original Contour (**OC**)

Step 2: Subtract from Original Contour:

Volume displaced due to Stability Requirements (**SR**)

Volume displaced due to Sediment Control Requirements (**SCR**) which include Drainage Requirements (**DR**) except for clean water diversion ditches, as defined above

Volume displaced due to Access Requirements (**AR**)

Volume displaced due to Maximum Backfill Elevation Requirements (**MBR**)

Step 3: The remaining volume is the initial backfill (**IBKF**) which is the spoil material placed in the mined area prior to the placement of any excess spoil areas.
Therefore, the relationship becomes:

IBKF = **OC** – (**SR** + **DR** + **SCR** + **AR** + **MBR**)

3.3 Excess Spoil Determination

The parameters used in the AOC Model for determining the **TSM** also are used to determine the quantity of excess spoil. This approach provides an objective process for determining what is excess spoil (**ES**).

The additional terms and concepts used are:

IBKF Volume of backfill or spoil material placed in the mined area prior to the placement of any excess spoil areas

ES Volume of excess spoil remaining after satisfying AOC by backfilling and grading to meet **SR, DR, SCR, AR, MBR**.

OSDV Volume of spoil material placed in an approved off-site location

The **ES** quantity, as determined by the following formula, is obtained by complying with the stability standards and other performance standards.

The excess spoil relationships:

ES = TSM - IBKF

Therefore:

ES = TSM - (OC - (SR + DR + SCR + AR + MBR)

3.4 Adjustment to ES and BKF to reflect Off Site Disposal

Operations may use adjacent pre-existing benches (without coal removal occurring) as part of the permitted area for excess spoil disposal. If pre-existing benches are to be used as excess spoil disposal sites, the capacity of each pre-existing bench area must be calculated.

Additional off-site material disposal locations include Abandoned Mine Land (AML) sites, Bond Forfeiture sites and civil works projects approved by the Director.

Excess spoil may be placed on adjacent, post SMCRA, mine sites that have suitable locations for spoil disposal. Any such areas used for spoil disposal must be appropriately permitted and bonded.

The total quantity of off-site disposal volume (**OSDV**) shall be calculated and details shall be provided to the Director. The information submitted shall be sufficient to allow the Director to review the adequacy of calculation.

As an incentive to use previously disturbed areas, the quantity of off-site disposal **OSDV** shall be deducted from the Total Spoil Material (**TSM**), resulting in a reduction in both the Excess Spoil (**ES**) and the Initial Backfill (**IBKF**). The allocation of this volume shall be based on the ratio of Excess Spoil (**ES**) to Total Spoil (**TSM**).

The deduction decreases the volume of Total Spoil Material; therefore, the new value for Total Spoil Material ($\mathbf{TSM_N}$) is defined as:

$$\mathbf{TSM_N = TSM - OSDV}$$

The new value for the Excess Spoil volume ($\mathbf{ES_N}$) shall be defined as:

$$\mathbf{ES_N} = \mathbf{ES} - (\mathbf{OSDV} \times (\mathbf{ES/TSM})$$

The new value for the Backfill volume ($\mathbf{IBKF_N}$) shall be defined as:

$$\mathbf{IBKF_N} = \mathbf{IBKF} - (\mathbf{OSDV} \times (1 - (\mathbf{ES/TSM})$$

If the applicant intends to use off-site disposal areas, all subsequent references in this document to **ES** and **IBKF** shall be replaced with $\mathbf{ES_N}$ and $\mathbf{IBKF_N}$.

3.5 Additional Backfill Capacity Required by AOC Model

The AOC Model requires that the excess spoil disposal fill is raised to an elevation above the lowest seam to be mined. The backfill slope must start at the vertical projection of the outcrop of the lowest seam being mined. The toe of the slope may be set back from the vertical projection of the lowest seam by a distance equal to the width of the sediment requirements (**SR**) plus the drainage requirements (**DR**). For the purpose of the AOC Model the access roads shall be located on the excess spoil disposal area.

This concept determines the demarcation between the backfill area **(BFA**) and the excess spoil disposal area (**ESDA**). (See Figure 2) This demarcation can be used consistently in any steep slope mining situation, and is determined using the following process:

- Locate the outcrop of the lowest seam being mined within each excess spoil disposal area, whether contour cut only or removal of the entire seam.
- Project a vertical line upward beyond the crest of the fill and backfill elevations. This is the demarcation line, or purple corner. (See Figure 4)
- The area where coal removal occurs, to one side of this line, is backfill area (**BFA**); and, the area on the other side of the line, including the valley bottom, is excess spoil disposal area (**ESDA**) (see Figure 5)

The initial volume of material placed on the mined area with no influence of any valley fills shall be referred to as the Initial Backfill (**IBKF**).

The revised location of the toe of the backfill slope to the demarcation line between **ESDA** and **BFA**, as a result of the construction of an excess spoil disposal facility, results in additional backfill volume. This is referred to as Additional Backfill (**ABKF.**)

The total volume of backfill material (**BKF**) placed in the backfill area (**BFA)** consists of the initial backfill (**IBKF**) plus the additional backfill (**ABKF)**. Therefore:

$$\mathbf{BKF = IBKF + ABKF}$$

The volume of excess spoil remaining after deducting the total backfill volume shall be placed in an excess spoil disposal facility. This volume of material is the Excess Spoil Disposal Volume (**ESDV**). Establishing this boundary between excess spoil areas and backfill areas is the same procedure used in determining where permanent valley fill diversion ditches must be located.

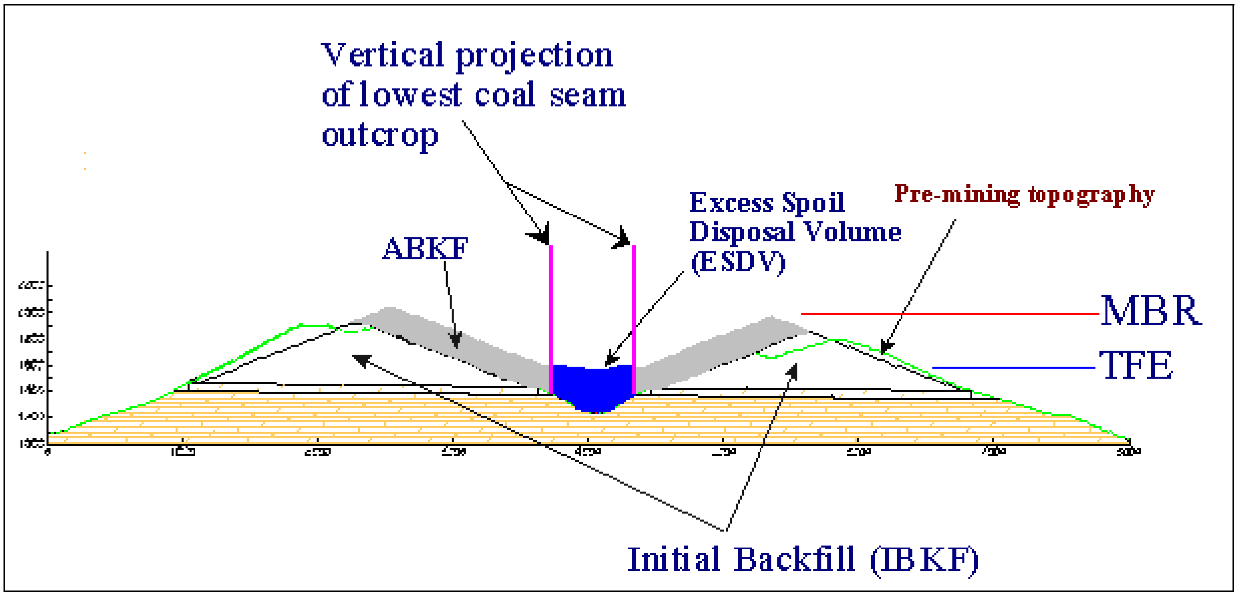


FIGURE 4. **Delineate mined and excess spoil areas.**

Section 5 of this guidance document contains an optimization procedure for mountaintop mining excess spoil disposal plans. Successful optimization is attained through elevating excess spoil fills to a target height above the mined area, thus converting a portion of Initial Excess Spoil **(IES)** to additional backfill volume (**ABKF**) and thereby reducing the size and impact of valley fills.

3.6 Summary of Volume Allocations

Summarizing the previous terms and relationships, excess spoil is the total spoil produced from mining the property less the amount that can be backfilled in the mined area:

IES = TSM – IBKF

Through the use of previously mined benches, AML projects, and other off-site disposal sites, the volume of both Excess Spoil and Backfill may be reduced. As a result of these reductions:

$$ES_N = TSM_N - BKF_N$$

If spoil is placed in the mined area, this volume is converted from **IES** to Additional Backfill volume (**ABKF**). The Excess Spoil Disposal Volume (**ESDV**) is the Initial Excess Spoil (**IES**) less that volume converted to backfill as **ABKF**.

IES = ABKF + ESDV

or

ESDV = IES – ABKF

Resolving the two relations defined above:

TSM – IBKF = ABKF +ESDV

or

TSM = ESDV + (IBKF + ABKF)

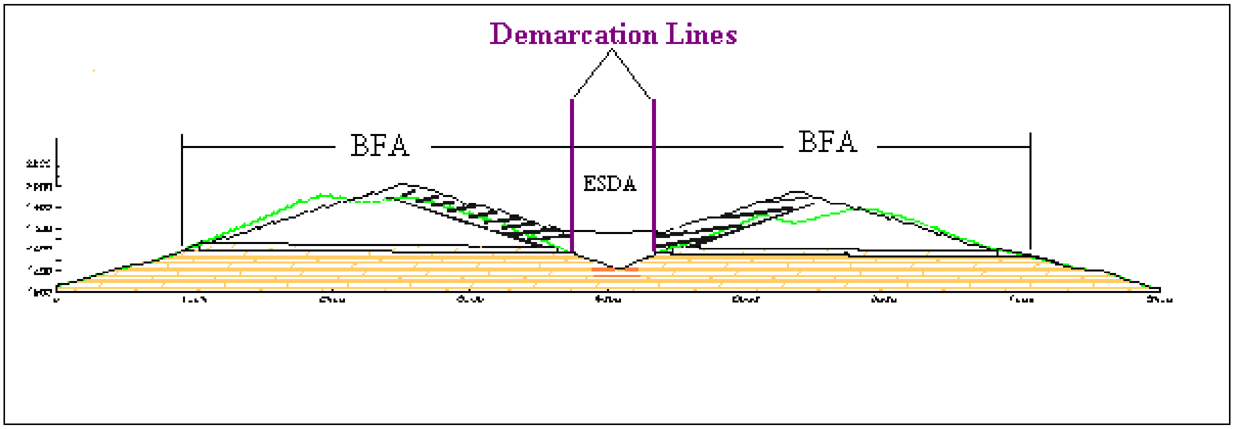


Figure 5. Demarcation between ESDA and BFA.

3.7 Isolated Coal Seams

After designing the optimized mine plan and spoil disposal plan, excess spoil disposal areas may cover coal seams that will be rendered unminable once the fill is placed. Therefore, treatment of contour mining in such seams as ordinary "mined area" under this model may create a disincentive to the recovery of that coal.

In order to allow the extraction of coal that would otherwise be lost, the applicant may submit a request to designate a contour-mined seam as "isolated". The Director may designate a contour-mined seam as an "isolated coal seam" only if:

- the "isolated coal seam" is mined only within the excess spoil disposal areas
- that this "isolated coal seam" may not be added to the permit by revision or amendment or be included in an adjacent permit
- no additional excess spoil disposal area may be permitted to accommodate spoil from future mining of the "isolated coal seam"
- the mineral removal area associated with the "isolated coal seam" contouring is not contiguous to the primary mountaintop seam mineral removal area or to mineral removal areas related to other contiguous contouring
- the "isolated coal seam" area could not reasonably be extended to become contiguous to the mountaintop mined mineral removal area

In no event shall a contour mined area where the top of the highwall extends to within 50 feet vertically of the elevation of the primary mountaintop seam be designated as an "isolated coal seam".

The Director may determine that the above criteria is satisfied and that, based on documentation provided by the applicant only if this "isolated coal seam" could not be feasibly mined as an independent or "stand-alone" operation. The mined areas of the "isolated" coal seam shall not be used to define the lowest seam mined for demarcation between the **ESDA** and **BFA**.

4. EXCESS SOIL DISPOSAL AREA DEFINITION

4.1 Introduction

A standardized approaches for characterizing excess spoil disposal sites allows consistent and reproducible analysis and calculation of both the Excess Spoil Disposal Volume (**ESDV**) and the Additional Backfill (**ABKF**) volume resultant from the construction of excess spoil disposal site(s). The calculations defined in this section are used for the excess spoil disposal optimization process discussed in of this document.

4.2 Equivalent Swell Height

The Equivalent Swell Height (**ESH**), in feet, is calculated by dividing the sum of overburden volume (**OB**) and the interburden volume (**IB**), in bank cubic feet, by the mineral extraction area, in square feet, (also termed Backfill Area **BFA**), and then multiplying that value by the determined bulking factor (**BF**) as utilized by the applicant in the AOC Model.

ESH = [(**OB**+**IB**)/**BFA**] x **BF**

For example, a bulking factor of 25% shall be expressed as 0.25 in this relationship.

4.3 Target Fill Elevation

The Target Fill Elevation (**TFE**) for each valley fill is defined as the sum of the average elevation of the outcrop of the primary mountaintop seam within each valley selected for fill placement, plus the **ESH**. To simplify volume calculations and solely for calculation, each excess spoil disposal area shall be assumed to have a horizontal top surface. (See Figure 4)

5. EXCESS SPOIL DISPOSAL OPTIMIZATION (MOUNTAINTOP MINING)

5.1 Introduction

The procedure described in this section applies only to those watersheds in which mountaintop mining is proposed. If mountaintop mining is not proposed in a specific watershed but other mining types (e.g. contouring) are to be used, the excess spoil optimization procedure specific to those mining types shall be employed for any fill within that watershed.

5.2 Spoil Disposal Plan Approval

An application for a mountaintop surface mine permit shall be deemed to have an optimized spoil disposal plan only if the:

- plan satisfies the Presumed Criteria Test, or
- total non-mineral removal area affected by valley fills does not exceed the "Excess Spoil Disposal Area Bank" (**ESDA Bank**) plus the Acreage Tolerance

Under unusual circumstances the AOC / Fill Optimization Panel may approve exceptions to fill optimization as described in Section 8 of this guidance document. Mining operations receiving such approved exceptions do not have optimized spoil placement plans. If an applicant is seeking an AOC variance, the applicant must follow the appropriate procedures described in Section 9.2 of this guidance document.

5.3 Presumed Criteria Test

The proposed excess spoil disposal plan in the AOC Model shall be presumed to be optimized if it meets the Presumed Criteria Test. The excess spoil disposal plan is optimized with regard to spoil disposal and the disturbed area associated with valley fills when **every** proposed valley fill in the AOC Model achieves the "target fill elevation." This design approach establishes the toe of each valley fill.
Calculation of the "presumed criteria" valley fill toes shall comply with the following steps:

Step 1 Select the valleys to be considered or qualified for excess spoil disposal.

Step 2 Determine the maximum downstream toe location to be considered for each valley fill. Environmental factors, statute, rules, property rights, operational issues, and other factors will influence this location.

Step 3 Define the value for Excess Spoil (**ES**) based on backfilling with no valley fills. The initial backfill volume (**IBKF**) will be determined using the AOC Model.

Step 4 Define the "equivalent swell height" (**ESH**).

Step 5 Define the average elevation of the primary mountaintop seam, upstream of the maximum downstream toe (as defined in Step 2) in each valley selected for the placement of excess spoil.

Step 6 Determine the Target Fill Elevation (**TFE**) for the top of each excess spoil disposal structure. The **TFE** is the average elevation of the primary mountaintop seam plus the equivalent swell height as defined in Step 4.

Step 7 Determine the volume of **ES** to be allocated to each fill. For the combination of the **ESDV** and **ABKF** required to contain the **ES** volume, establish the toe location for each fill.

Step 8 Document compliance with the above criteria by preparing and submitting as part of the surface mine application details of each valley fill model developed in Step 7. Each model shall include a plan view and profile view at a scale of 1"=200' (or as otherwise approved) and appropriate engineering calculations.

Step 9 Design the final regrade configuration and excess disposal areas of the Mine Plan in any sequence or configuration as long as the toe located in Step 7 does not move downstream and the design complies with Section 9.1 of this document.

Positive Determination — If the proposed toe location for each valley fill is maintained at or upstream of the toe location established for each valley fill in accordance with the above AOC Model procedure, the Director shall find that the Excess Spoil Disposal Area ("**ESDA**") has been optimized.

Negative Determination - If any of the proposed valley fills have a toe location that does not permit the fill to meet the Presumed Criteria Test as described, the Director shall notify the applicant that it must submit calculations to define the **ESDA Bank**.

5.4 "ESDA Bank" Analysis

If the proposed excess spoil disposal plan does not achieve a positive determination under the Presumed Criteria Test, the excess spoil disposal plan will be evaluated using the **ESDA Bank** analysis. This analysis employs the procedures defined in the preceding sections of the AOC Model except that the crest elevation of each fill is fixed to calculate the **ESDA Bank**.

This procedure provides a standardized means of comparing and rating available excess spoil disposal sites to achieve the most efficient placement of the excess spoil. Each fill is evaluated to determine its spoil disposal capacity per specified length of valley. The total volume of excess spoil is then assigned to the fills in descending order based on each fill's relative "efficiency." The result will be the optimum placement of spoil in terms of cubic yards per acre of **ESDA**.

Calculation of the **ESDA Bank** shall comply with the following steps:

Step 1 Define the primary mountaintop mining seam. This is the lowest seam within each proposed valley fill site that is being mountaintop mined

Step 2 Select the valleys to be considered or qualified for excess spoil disposal

Step 3 Determine the maximum downstream toe location to be considered for each valley fill. Environmental factors, statutes, rules, property rights, operational issues, and other factors will influence this location

Step 4 Define the value for Excess Spoil (**ES**) based on backfilling with no valley fills. The backfill volume (**IBKF**) will be determined using the AOC Model

Step 5 Define the "equivalent swell height."(**ESH**)

Step 6 Determine the Target Fill Elevation (**TFE**) for each excess spoil disposal structure. The TFE is the average elevation of the primary mountaintop seam plus the equivalent swell height as defined in Step 5

Step 7 Construct a straight baseline from the logical toe to the top of backfill (**IBKF**) generally along the centerline of each valley to be filled. The baselines should be oriented perpendicular to the face of the anticipated valley fills at their logical toe. Draw a profile along the baseline for each valley to be filled from the top of the initial backfill.

Step 8 Locate the toe for the Initial Increment for each fill. The toe location for the Initial Increment shall be the lowest stratigraphically of either:

- the most upstream toe that complies with the geotechnical stability requirements defined by the regulations, or
- 50 horizontal feet downstream of the outcrop of the lowest seam to be mined

Step 9 Calculate the excess spoil disposal volume (**ESDV**) and the additional backfill volumes (**ABKF)** associated with the Initial Increment. For this optimization model only, assume a constant valley fill front face slope for all valley fills and all "slices" of 2.4h:1v.

Step 10 Separate the remaining portions of all of the selected fills into equal length increments referred to as "slices" (these slices are perpendicular to the baseline constructed in Step 7). These "slices" shall extend from the Initial Increment all the way along the profile to the toe selected in Step 2. The slice length along the profile shall be selected by the applicant but may be no greater than 500 feet. The slice length shall be consistent for all fills and all slices, except for the last slice which shall be adjusted pro-rata to the ES volume required.

Step 11 Calculate the excess spoil disposal volume (**ESDV**) and the additional backfill volume (**ABKF)** associated with each "slice". As in Step 9, these volumes include the additional backfill volumes defined by the AOC Process.

Step 12 Develop a matrix indicating the volume of excess spoil disposal volume (**ESDV**) and additional backfill volume (**ABKF**) for each Initial Increment plus each of the "slices" for each valley fill under consideration.

Step 13 Calculate the optimum configuration of fill "slices." This optimization shall be based on the sequential inclusion of each Initial Increment for the valley fills under consideration. The selection process shall continue until the excess spoil volume (including additional backfill volume) equals the Excess Spoil (**ES**). If the sum of all the initial increments equals or exceeds the ES volume proceed to Step 16.

Step 14 If the volume of all of the Initial Increments does not meet the ES volume, sequentially include the increment with the greatest volume (excess spoil disposal volume (**ESDV**) plus additional backfill volume (**ABKF**)). Continue to select the "slice" with the next highest volume (naturally each fill must be selected in logical order). The selection process shall continue until the excess spoil volume (including additional backfill volume) equals the Excess Spoil (**ES**).

Step 15 If sufficient disposal volume is not available within the defined logical toes, the elevation of the valley fill surface shall be increased, and the iterations run again, thus creating further **ESDV** and A**BKF**.

Step 16 For the combination of the "Initial Increments" and "slices" required to contain the **ES** volume, determine the total area used for excess spoil. This area is referred to as the **ESDA Bank**. The **ESDA Bank** shall be the planimetric area of the excess spoil disposal area portion of the valley fill. (i.e. the area outside the mined area but contained by the fill between the toe and the outcrop of the lowest seam mined.)

Step 17 Develop the final regrade configuration and excess disposal areas of the Mine Plan in any sequence or configuration as long as the area used for excess spoil disposal does not exceed the **ESDA Bank** plus the specified acreage tolerance. The only limitation on the design is that it must comply with Section 9.1.

Step 18 After the applicant has defined the excess spoil disposal areas for the Mine Plan, the total area utilized for excess spoil under this configuration (Proposed Excess Spoil Disposal Area) shall be compared to the optimum excess spoil disposal area (**ESDA Bank.**)

<u>Acreage Tolerance</u>: An acreage tolerance factor shall be applied to the **ESDA Bank**. The Acreage Tolerance shall be ten percent (10%) of the area below the outcrop of the primary mountaintop seam but contained within the valley fill footprints.

Positive Determination - The Director shall find that the Proposed Excess Spoil Disposal Area has been optimized and permit review may proceed if the proposed excess spoil disposal area for the entire permit area does not exceed the **ESDA Bank** plus the Acreage Tolerance.

Negative Determination - If the application does not meet the above criteria, the Director shall issue a written "notice of negative excess spoil optimization" to the applicant and the permit application shall be submitted to an independent AOC / Fill Optimization Panel for consideration. Mining operations that receive a negative determination do not have an optimized spoil disposal plan.

6. AOC DETERMINATION (COUNTOUR MINING)

This document does not apply to contour mining.

7. EXCESS SPOIL DISPOSAL OPTIMIZATION (CONTOUR MINING)

This document does not apply to contour mining.

8. AOC / FILL OPTIMIZATION PANEL

In accordance with procedures described in Section 5 of this AOC Model, the Director shall promptly notify an applicant when an application does not comply with the spoil optimization guidelines. Upon receipt of a "notice of negative excess spoil optimization" the applicant may:

- Withdraw the permit application
- Revise the permit application to request an AOC variance
- Revise the permit configuration in order to meet the excess spoil optimization criteria, or
- Submit the excess spoil handling plan to the "AOC / Fill Optimization Practices Advisory Panel" (the "Panel") for evaluation.
-

If the applicant submits the excess spoil handling plan to the Panel for evaluation, the Director shall convene the Panel.

Following submittal of the excess spoil handling plan to the Panel, the applicant shall provide detailed plans and calculations clearly stating why it believes the proposed permit configuration cannot be optimized. Throughout the process, the burden of proof will remain on the applicant to justify its proposal.

The Panel shall be comprised of, an appointee of Mountain State Justice, Inc. or its assigns, an appointee jointly made by the West Virginia Coal Association and West Virginia Mining and Reclamation Association, or its assigns, and a neutral member jointly selected by those panel members. The State will pay reasonable hourly rates and expenses for panel members within the 60 calendar days of submission of invoice.

The appointees must have a degree in Mining Engineering or Civil Engineering. The members need not be registered professional engineers. The appointees may have no interest, financial or otherwise, in the surface mining permit under review. If a conflict of interest arises, the panel member with the conflict shall be replaced by an alternate appointed by the appropriate party.

A Panel meeting shall be scheduled and convened within twenty-one (21) days of the submittal of the required information to WVDEP, as determined by the Director. The Panel shall hear the applicant's argument in support of its plan. Following the meeting of the Panel, the Panel shall issue a written recommendation within fifteen (15) days of the completion of the hearing. An exception to optimization may be recommended only after the Panel makes specific and detailed findings that there is no reasonable alternative to the exception. A majority vote of the Panel shall constitute a decision.

The "ESDA Limit" is the sum of **ESDA Bank** and the Acreage Tolerance, as established in Section 5.4.

For Mountaintop Mining the Panel may recommend by majority vote an exception of up to 10% greater than the "ESDA Limit". When this occurs the fill placement is not optimized.

The Director shall not be bound by the recommendation of the Panel. However, if the Director does not follow the recommendation of the Panel, the Director shall make written findings justifying his decision. In no event however may The Director approve an AOC compliant plan for Mountaintop Mining that is more than 10% greater than the "ESDA Limit."

9. AOC COMPLIANCE / AOC VARIANCE REQUESTS

9.1 AOC Compliance Determination

This AOC Process provides an objective means of assessing compliance with AOC specifically for steep-slope mining applications.

The "AOC Model" determined by the application of design components generates a volumetric determination of AOC. The AOC Process does not require that the Mine Plan matches the configuration of the "volumetric AOC Model".

The applicant shall submit detailed plans, cross sections and calculations as part of the permit application to define the final regrade configuration proposed in the Mine Plan. This documentation shall provide a clear indication to the Director relating to compliance with the tests detailed below. In addition, the documentation shall include the final reclamation plan, which clearly indicates the proposed post mining configuration.

The Director has the authority to determine that the final reclamation plan is not compliant with the AOC, even if is compliant with the volumetric requirements of the AOC Process (e.g. that it does not satisfy the aesthetic components of AOC). In addition, the Director shall assure that the final reclamation plan conforms to the following tests.

- **Backfill Volume**: The quantity of spoil material to be returned to the mined area (**BKF**) (or $\mathbf{BKF_N}$ if applicable) is calculated in Section 3.5. The final spoil balance and regrade design must demonstrate that **<u>at a minimum</u>** this volume of spoil to be placed as backfill in the Mine Plan.
- **Valley Fill Design**: The spoil optimization procedures in this AOC Process establish the maximum downstream toe location for each valley fill. Those maximum downstream locations must not be exceeded in the final Mine Plan.
- **Backfill Configuration**: Strict adherence to the "volumetric AOC Model" will often result in a reclaimed site that appears rigidly uniform and artificial. Therefore, applicants shall develop and submit as part of the permit application regrade plans that address aesthetic values along with engineering issues. This can be accomplished through the incorporation of landforms and other creative types of landscaping. However, the applicant must comply with certain objective configuration criteria that are established by this AOC Process.
- **Watershed Pattern**: The final "volumetric AOC Model" will create a readily identifiable ridge system separating the regraded site into discrete watersheds. This general watershed pattern must be maintained in the final Mine Plan. In those areas where the **MBR** constraint affects the AOC Model, a series of subwatersheds that reflect the pre-mining watershed system are to be established in the Mine Plan
- **Backfill Inflection Points**: A boundary is established in the AOC Model between the backfill slopes and the generally level or moderately sloped areas used for access, drainage features, and sediment control. This boundary is the demarcation between the Backfill Area (**BFA**) and the Excess Spoil Disposal Area (**ESDA**). To maintain the general configuration generated by the "volumetric AOC Model", this boundary is to be preserved in its approximate location in the final mine plan. Approximate is defined as being within 100 feet of the location of the **BFA / ESDA** boundary as defined in this AOC Process. Variations in elevation are allowable to promote drainage and to provide flexibility in shaping the final regraded configuration as defined in the Mine Plan.

- **Final Pit**: It is recognized that it is not practical to fully restore the final pit area to the configuration developed by the AOC Model. The inability to meet the ideal configuration shall not require an AOC variance, if the applicant can demonstrate in the Mine Plan that it has adequately addressed the issue of final pit reclamation through measures such as downsizing the active pit as mining draws to a close. However, the final pit regrade shall conform to the watershed pattern requirement and shall not result in any change to the quantity of **BKF** placed in the mined area (**BFA**).

These criteria will provide the regulatory authority with an objective, quantifiable means of assessing the Mine Plan's compliance with the approximate original contour requirements. For purposes of incorporating environmental enhancements into the final reclaimed configuration, the Director may allow a adjustment to the Backfill Volume test so that up to ten percent (10%) of **BKF** may be converted to **ESDV**, provided that the toe of each optimized valley fill shall not be moved downstream.

This adjustment is granted to encourage stream restoration projects, wetlands development, and similar aquatic habitat projects. The applicant is encouraged to restore streams by configuring the fills so that there is a positive grade from one side of the fill to the other so that the lower side of the fill intercepts the down dip pavement of the primary mining seam.

9.2 AOC Variance Request Evaluation

When an applicant applies for an AOC variance for a mountaintop surface mine, the applicant shall include a complete excess spoil-handling plan that includes excess spoil optimization in compliance with the AOC Process. This plan shall be based on returning the mined area fully to AOC and shall include all calculations and other details needed to establish the **ESDA Bank (AOC)** without the AOC variance.

The **ESDA Bank** procedure shall be repeated using the proposed alternate post-mining configuration instead of the AOC configuration to determine the corresponding **Alternate ESDA Bank** acreage. The applicant shall present both analyses in a clear and organized manner, complete with all supporting documentation. All variance requests shall indicate the additional excess spoil disposal area in excess of that required to achieve AOC. This additional area is the difference between the **Alternate ESDA Bank** and the **ESDA Bank** (AOC).

This procedure will provide the Director a quantifiable means of evaluating the impact of the alternate post-mining configuration versus the projected impacts if the site were returned to AOC by providing a specific additional acreage resulting from that variance request.
Any spoil disposal plan for which the **Alternate ESDA Bank** is greater than the **ESDA Bank (AOC)** shall not be considered optimized.

10. REPORTING REQUIREMENTS, PERMIT REVISIONS AND AMENDMENTS

10.1 Reporting

The optimization of the excess spoil disposal area, as defined in Section 5, for a particular permit remains valid only if the operation is in compliance with its approved mine plan.

For all operations found AOC compliant as defined in section 9.1 of this guidance document, the operator shall submit to the Director a semi-annual report certified by a Professional Engineer registered in West Virginia, that the operation is in compliance with its spoil handling plan and that the operation can maintain the excess spoil optimization plan as included in the permit.

10.2 Requirements for Permit Revisions

For all operations found AOC compliant as defined in section 9.1 of this guidance document, the Director shall require a permit revision prior to the operator implementing any material changes in the mine operation and mine plan. The operator must justify in the semi-annual report why any changes are necessary. A material change is defined as any change that is greater than 5%. Changes include:

- the volume of overburden generated
- the areal extent of coal to be mined
- the spoil balance
- change the final regrade configuration so it does not comply with Section 9.1
- increase the **ESDV**
- move the toe of any valley fill downstream
- impact the approved excess spoil optimization plan
- An operator who places spoil under a non-compliant spoil handling plan shall be deemed to be in serious violation of its permit. The Director shall deem this as significant imminent environmental harm to land and water resources and a cessation order shall be issued pursuant to 38 C.S.R. 2-20.3.a.1.

The permit revision shall include the following:

- A description of the proposed change to the mine plan
- A revised and updated material balance
- The status of each valley fill, particularly those completed or in progress
- An updated AOC Process
- A revised excess spoil optimization evaluation

If using the **ESDA Bank** method, the volume of spoil already placed in any valley fill must be addressed prior to completing the optimization process for any permit revision. This shall be done by determining the minimum configuration of each fill that can accommodate the volume of material already placed, then deducting the corresponding existing excess spoil disposal area from the calculated optimum before the remaining area is reallocated.

10.3 PERMIT AMENDMENTS TO ADD MINERAL EXTRACTION

Mineral removal area added to an existing permit affects the material balance and consequently will impact the excess spoil optimization plan.

Should the Director determine that the change to the spoil balance may have a significant effect on the spoil optimization plan, the permittee shall be required to include an updated excess spoil optimization plan. For the purposes of this document only, significance is defined as increasing the **ESDV** by greater than 5%, or moving the toe of any valley fill downstream.

If significant, the permit amendment application shall include the following:

- A revised and updated material balance for the entire permit area
- The status of each valley fill, particularly those completed or in progress
- An updated AOC model that incorporates the amended permit area
- A revised excess spoil optimization evaluation for the total permit area
-

If using the **ESDA Bank** method, the volume of spoil already placed in any valley fill must be addressed prior to completing the optimization process for the amendment. This shall be done by determining the minimum configuration of each fill that can accommodate the volume of material already placed, then deducting the corresponding existing excess spoil disposal area from the calculated optimum before the remaining area is reallocated.

10.4 ADJACENT PERMITS OR PERMIT AMENDMENTS

The objective of this section is to ensure that segmented permitting actions such as a “string of pearls” are not used to evade the intent of spoil optimization.

If an application for a permit by an operator is adjacent to or contiguous with another active permit or permits controlled or operated by that operator, then the Director shall consider the operation as a “total operation” if:

- Excess spoil disposal areas on the permit under consideration receive spoil from more than one permit, or
- The post mining contours at the boundary between the permits are different from the pre-mining contours. This means that if the regrade at the permit boundary continues between the two permits and is continuous and different from the pre-mining elevation
- The operation does not have total independent utility, including sediment control structures and access roads

If a permit is part of a “total operation” then the application shall meet the requirements of the AOC Model for the “total operation” including the new permit under consideration. The AOC Model shall consider the total volumes in the operation and shall either:

- Ensure that all fills meet the presumed criteria test, or
- Use the **ESDA Bank** analysis. In using the **ESDA Bank** any existing fills on the “total operation” shall be deducted from the **ESDA Bank** before reallocation of any residual **ESDA**.

Nothing in this section shall be construed to limit Off Site Disposal Areas (**OSDA**).

SUBJECT:	**Clarification of the Applicability and Certification for Operations Designed Using Final AOC Guidance Document (Steep Slope Operations Only)**
DATE:	**August 1, 2011**

This procedure shall be utilized for the clarification of the applicability and certification for operations designed using the Final AOC Guidance Document.

Policy/Procedures:

The West Virginia Surface Mining Reclamation Regulations provide for objective and well-defined methods for determining Approximate Original Contour (AOC) and to assure compliance. The Final AOC Guidance Document applies to steep-slope surface mining applications submitted after March 24, 2000. This Guidance Document is commonly referred to as (AOC-Plus) and is located within Section 29 of the Permit Handbook. The Final AOC Guidance Document does not apply to underground, refuse, contour or non-steep slope surface mining facilities.

Section 10.1 and 10.2 of the Final AOC Guidance Document provides criteria and guidance for Semi-Annual Certifications of AOC by a Registered Professional Engineer (RPE). The purpose of the Semi-Annual AOC Certification is to determine if the operation is in compliance with its spoil handling plan which was developed as part of the AOC Final Guidance Document and if the operation can maintain the excess spoil optimization plan as included in the approved permit. To ensure compliance, at a minimum, the following information shall be included in the semi–annual submission:

- Certification of Compliance with Final AOC Guidance Document
- Volumetric Table
  - Comparison to Spoil Balance in approved Permit,
- Progress Map
- Cross-section information for any areas backfilled to final regrade
  - Current cross-sections of the backfill area shall be compared with regrade plan and cross-sections in the approved Permit

The Certification criteria are as follows:

1. The operation is in compliance with its spoil handling plan which was developed as part of the AOC Final Guidance Document;

2. The operation can maintain the excess spoil optimization plan as included in the approved permit; and

3. There have been no material changes in, or are any material changes anticipated (defined as greater than 5%), in the following:
    a. The volume of overburden generated
    b. The areal extent of coal to be mined
    c. The spoil balance
    d. The final regrade configuration, so it does not comply with section 9.1 of the Final AOC Guidance Document
    e. Increases in the Excess Spoil Disposal Volume (ESDV)
    f. Moving the toe of any valley fill downstream, or
    g. Other changes that impact the approved excess spoil optimization plan, such as changes in mining method or equipment.

4. If any changes have occurred or are anticipated in the above, the operator must justify in the semi-annual report why the changes have occurred.

5. Should the answer be “yes” to any part of Paragraph 3 above (Question 3 on the Certification Form), the permittee shall submit a permit revision implementing any material changes in the mine operation and mine plan.

6. The required certifications should be submitted by the 15th day of January and July for the preceding (July 1 and December 31) and (January 1 and June 30) periods, respectively.

7. The Certification requirement described herein applies to both AOC and AOC Variance permits, which are designed in accordance with the Final AOC Guidance Document.