29 AOC and Excess Spoil Disposal

C O N T E N T S

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:	**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.

SUBJECT:	**Final AOC Guidance Document Policy**
DATE:	**June 5, 2000**
Approval:	**Michael C. Castle, Director**

Effective immediately, 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.

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

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.

2. AOC and Excess Spoil Quantity Relationship

2.1 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 actual configuration of the final 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.

INSERT GRAPHIC 1

Figure 1: Details Of 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 Secretary 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 Secretary.

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 4.3.

INSERT GRAPHIC 2

Figure 2

2.3.3 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.

2.4 Effect of Performance Standards on Backfill Volume

2.4.1 Introduction

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 Secretary shall assure that the AOC Model design includes only necessary and justifiable deductions based on the following criteria.

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 width constructed at each one hundred feet vertical rise above the toe of the backfill.

This shall constitute the standard template for defining the backfill volume. 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 Secretary.

The template only applies to the determination of backfill volumes for the AOC Process. The actual configuration need not conform to the template or the "AOC Model".

INSERT GRAPHIC 3

Figure 3

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 Secretary 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 a continuous ditch 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 Secretary 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.

2.4.5 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 Secretary 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.

2.4.6 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.

INSERT GRAPHIC 4

Figure 4. Restoring contours and meeting performance standards

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 Secretary.

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 Secretary. The information submitted shall be sufficient to allow the Secretary 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 (**TSM_N**) is defined as:

$$TSM_N = TSM - OSDV$$

The new value for the Excess Spoil volume (**ES_N**) shall be defined as:

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

The new value for the Backfill volume (**$IBKF_N$**) shall be defined as:

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

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

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 6) 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. (See Figure 6)
- Project a vertical line upward beyond the crest of the fill and backfill elevations (See Figure 7).
- 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 7).

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 **BFA / ESDA** demarcation line, 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:

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 diversion ditches must be located.

INSERT GRAPHIC 5

Section 6 and Section 7 of this guidance document contains an optimization procedure for mountaintop mining and contour mining respectively, for 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:

$$\mathbf{ES_N = TSM_N - BKF_N}$$

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)

INSERT GRAPHIC 6

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 Secretary 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 Secretary 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 Spoil 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, in feet, (**ESH**) is calculated by dividing the total spoil material (**TSM**) (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 = (**TSM** / **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 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.

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 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 Draw a profile along each valley to be filled from the top of the backfill (from the first iteration of the AOC Model) to the logical toe. The baselines should be oriented perpendicular to the face of the anticipated valley fills at their logical toe

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
- 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.

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 Determine the volume of **ES** to be allocated to each fill and then select the applicable number of slices to accommodate those volumes. The **ES** per fill will occur as both **ESDV** and **ABKF**; i.e., the volume of additional backfill created by the fill must be considered along with the excess spoil disposal volume.

Step 14 For the combination of the **ESDV** and **ABKF** required to contain the **ES** volume, establish the toe location for each fill.

Step 15 Design the mine and spoil areas in any sequence or configuration as long as the toe located in Step 8 does not move downstream and the design complies with Section 9.1 of this document.

Step 16 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.

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 Secretary 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 Secretary 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.

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 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 Secretary 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 Secretary 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 (Contour Mining)

To be Completed

7. Excess Spoil Disposal Optimization (Contour Mining)

To be Completed

8. AOC / Fill Optimization Panel

In accordance with procedures described in Section 5 and Section 7 of this AOC Model, the Secretary 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 Secretary 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 Secretary. 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 Secretary shall not be bound by the recommendation of the Panel. However, if the Secretary does not follow the recommendation of the Panel, the Secretary shall make written findings justifying his decision. In no event however may The Secretary 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 Mine Plan. This documentation shall provide a clear indication to the Secretary 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 Secretary 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 Secretary 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 3.4. 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 due to the lack of available material. 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.

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 Secretary 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 Secretary 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. Permit Revisions and Amendments

10.1 Mine Plan Revisions

The optimization of the excess spoil disposal area, as defined in Section 5 and 7, for a particular permit remains valid only if the operation is in compliance with its approved mine plan.

The operator shall submit to the Secretary 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.

The Secretary 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 quantity 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 Secretary 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.

10.2 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 Secretary 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. 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.

10.3 Adjacent Permits or Permit Amendments

The objective of this section is to ensure that segmented permitting actions such as a “string of pearls” is 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 Secretary 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**).