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LAND RESTORATION AFTER STRIP MINING FOR COAL

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DISCLAIMER

LAND RESTORATION AFTER STRIP MINING FOR COAL

Recent legislation [1] requires that lands surface mined for coal be returned to approximate original topography and that vegetative cover be restored.

The impetus towards the newly enacted legislation in restoring surface mined lands has been the poor esthetics and harmful environmental aspects of doing nothing to mine spoils. The harmful effects to land are centered around a markedly decreased biological productivity and also a less rich species composition which implies that raw spoils are inherently difficult substrates for plants to colonize. Spoils provide poor rooting habitat because of extreme stoniness or excessively slope steepness which provide few niches for seeds to become lodged and also spoil may provide poor mineral nutrition, poor water retention and sometimes the spoil may even have chemical properties detrimental to plant growth (acidity, alkalinity or even unusually large amounts of toxic mineral elements i.e., copper, sodium).

To provide a substrate better suited for plant growth, recommendations for restoration call for deep burial of unfavorable substrate components i.e., rocks and materials of unusual chemistry and the dressing of reshaped spoil with topsoil i.e., material with the most favorable properties for plant growth.

Even though all the substrate requirements for healthy plant growth may be met, such as adding a form of available nitrogen as fertilizer, plants will not grow if weather conditions are extreme. For example, in very dry (desert) climates precipitation may be too scanty or too erratic to permit the successful establishment of many kinds of plants. Even under the most favorable conditions

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[1] Public Law 95-87 - 95th Congress
An act to provide for the cooperation between the Secretary of the Interior and the States with respect to the regulation of surface coal mining operations, and the acquisition and reclamation of abandoned mines and for other purposes.

plant productivity as averaged over a period of years is low. Also in very cold climates the growing season may be limited to only a few weeks in summer e.g., arctic and alpine tundra regions. This shortens the time available for photosynthesis and keeps plant productivity low.

A number of years ago I did a small scale field study of plant productivity that compared the performance of an Alaskan Arctic Tundra plant community at Cape Thompson with that of plant community in the dry steppe region of South Central Washington. Total productivity was about 100 gm^{-2} in both regions but the growing season was 7 months long in Washington and only 2 months long in Alaska. Clearly lack of soil water was a limiting factor in Washington where annual precipitation amounted to only 6.7 inches per year. The Alaskan communities did not suffer from moisture stress since water was standing at the soil surface in Eriophorum tussock and water sedge (Carex) communities. The point is, however, that climate is an important determinant of plant growth and that over a long period of years different plant species have become adapted to growth and reproduction in contrasting environments. Many ecologists believe that the best source of genetic material for land restoration purposes lies in native plants. Nevertheless there are other gene sources i.e., alien plants and artifically induced mutations.

General observations of terrestrial landscapes show that land plants are able to grow on the vast majority of the earths surface not permanently covered by ice and snow, deep water. Very steep slopes and very rocky places are almost devoid of plants as are mobile sand dunes and the gravel bars associated with swift flowing rivers and streams. Although plants can grow on most parts of a landscape, different parts are more productive than others.

Man has been able to increase crop plant productivity by genetic selection of strains for food, fiber, pharmaceuticals, etc., by irrigation and by copious application of fertilizer. Net crop production is also often increased by applications of herbicides to kill competitive weedy plants and the use of pesticides to kill insects which otherwise would consume a large part of primary production.

In temperature climates with abundant rain and deep topsoil it is reasonable to expect good productivity of shaped spoils within a few years. However in dry climates < 9 inches revegetation is not so readily accomplished and as far as I know there is no 20 year experience to show how effective revegetation really is in such regions. However, it is unlikely that shaping and topsoiling will enhance primary productivity which will be low and is likely to be dominated by plants whose major use will be limited to forage use by livestock and wildlife.

An innovative way to reshape land to enhance primary productivity in dry regions is sponsored by the U.S. Energy Research and Development Administration at the Pacific Northwest Laboratory, Richland, Washington. Here mounds and valleys are engineered to provide for judicious placement of the best soil in the valleys to serve as rooting substrate and mineral nutrient medium while the functions of mounds is to intercept and direct the flow of precipitation to the valley floor where it can be stored and used by growing plants. The area of mound interception is four times that of the valley floor. Assuming 100% efficiency, six inches of annual rainfall can be increased to 24 inches which is enough to raise certain kinds of crop plants. In this way land with extremely low primary productivity and with no potential for crop plant production (without irrigation) can be converted to crop land. The key to such landscape modification is in the waterproofing of the slopes to discourage the growth of

water-wasting weeds and the efficient direction of water to the valley floor.

In cold, wet naturally forested regions, land restoration engineering can be aimed at providing a rooting substrate with good internal moisture drainage or the engineering can be aimed at converting terrestrial habitats to freshwater ponds or wetlands.

Public Law 95-87 provides for environmental performance standards and Sec. 515 is reproduced in the following pages.

(1) conduct surface coal mining operations so as to maximize the utilization and conservation of the solid fuel resource being recovered so that reaffecting the land in the future through surface coal mining can be minimized;

(2) restore the land affected to a condition capable of supporting the uses which it was capable of supporting prior to any mining, or higher or better uses of which there is reasonable likelihood, so long as such use or uses do not present any actual or probable hazard to public health or safety or pose any actual or probable threat of water diminution or pollution, and the permit applicants' declared proposed land use following reclamation is not deemed to be impractical or unreasonable, inconsistent with applicable land use policies and plans, involves unreasonable delay in implementation, or is violative of Federal, State, or local law;

(3) except as provided in subsection (c) with respect to all surface coal mining operations backfill, compact (where advisable to insure stability or to prevent leaching of toxic materials), and grade in order to restore the approximate original contour of the land with all highwalls, spoil piles, and depressions eliminated (unless small depressions are needed in order to retain moisture to assist revegetation or as otherwise authorized pursuant to this Act): *Provided, however*, That in surface coal mining which is carried out at the same location over a substantial period of time where the operation transects the coal deposit, and the thickness of the coal deposits relative to the volume of the overburden is large and where the operator demonstrates that the overburden and other spoil and waste materials at a particular point in the permit area or otherwise available from the entire permit area is insufficient, giving due consideration to volumetric expansion, to restore the approximate original contour, the operator, at a minimum, shall backfill, grade, and compact (where advisable) using all available overburden and other spoil and waste materials to attain the lowest practicable grade but not more than the angle of repose, to provide adequate drainage and to cover all acid-forming and other toxic materials, in order to achieve an ecologically sound land use compatible with the surrounding region: *And provided further*, That in surface coal mining where the volume of overburden is large relative to the thickness of the coal deposit and where the operator demonstrates that due to volumetric expansion the amount of overburden and other spoil and waste materials removed in the course of the mining operation is more than sufficient to restore the approximate original contour, the operator shall after restoring the approximate contour, backfill, grade, and compact (where advisable) the excess overburden and other spoil and waste materials to attain the lowest grade but not more than the angle of repose, and to cover all acid-forming and other toxic materials, in order to achieve an ecologically sound land use compatible with the surrounding region and that such overburden or spoil shall be shaped and graded in such a way as to prevent slides, erosion, and water pollution and is revegetated in accordance with the requirements of this Act;

(4) stabilize and protect all surface areas including spoil piles affected by the surface coal mining and reclamation operation to effectively control erosion and attendant air and water pollution;

(5) remove the topsoil from the land in a separate layer, replace it on the backfill area, or if not utilized immediately, segregate it in a separate pile from other spoil and when the topsoil is not replaced on a backfill area within a time short enough to avoid deterioration of the topsoil, maintain a successful cover by quick growing plant or other means thereafter so that the topsoil is preserved from wind and water erosion, remains free of any contamination by other acid or toxic material, and is in a usable condition for sustaining vegetation when restored during reclamation, except if topsoil is of insufficient quantity or of poor quality for sustaining vegetation, or if other strata can be shown to be more suitable for vegetation requirements, then the operator shall remove, segregate, and preserve in a like manner such other strata which is best able to support vegetation;

(6) restore the topsoil or the best available subsoil which is best able to support vegetation;

(7) for all prime farm lands as identified in section 507(b)(16) to be mined and reclaimed, specifications for soil removal, storage, replacement, and reconstruction shall be established by the Secretary of Agriculture, and the operator shall, as a minimum, be required to—

(A) segregate the A horizon of the natural soil, except where it can be shown that other available soil materials will create a final soil having a greater productive capacity; and if not utilized immediately, stockpile this material separately from other spoil, and provide needed protection from wind and water erosion or contamination by other acid or toxic material;

(B) segregate the B horizon of the natural soil, or underlying C horizons or other strata, or a combination of such horizons or other strata that are shown to be both texturally and chemically suitable for plant growth and that can be shown to be equally or more favorable for plant growth than the B horizon, in sufficient quantities to create in the regraded final soil a root zone of comparable depth and quality to that which existed in the natural soil; and if not utilized immediately, stockpile this material separately from other spoil, and provide needed protection from wind and water erosion or contamination by other acid or toxic material;

(C) replace and regrade the root zone material described in (B) above with proper compaction and uniform depth over the regraded spoil material; and

(D) redistribute and grade in a uniform manner the surface soil horizon described in subparagraph (A);

(8) create, if authorized in the approved mining and reclamation plan and permit, permanent impoundments of water on mining sites as part of reclamation activities only when it is adequately demonstrated that—

(A) the size of the impoundment is adequate for its intended purposes;

(B) the impoundment dam construction will be so designed as to achieve necessary stability with an adequate margin of safety compatible with that of structures constructed under Public Law 83–566 (16 U.S.C. 1006);

(C) the quality of impounded water will be suitable on a permanent basis for its intended use and that discharges from the impoundment will not degrade the water quality below water quality standards established pursuant to applicable Federal and State law in the receiving stream;

(D) the level of water will be reasonably stable;

(E) final grading will provide adequate safety and access for proposed water users; and

(F) such water impoundments will not result in the diminution of the quality or quantity of water utilized by adjacent or surrounding landowners for agricultural, industrial recreational, or domestic uses;

(9) conducting any augering operation associated with surface mining in a manner to maximize recoverability of mineral reserves remaining after the operation and reclamation are complete; and seal all auger holes with an impervious and noncombustible material in order to prevent drainage except where the regulatory authority determines that the resulting impoundment of water in such auger holes may create a hazard to the environment or the public health or safety: *Provided*, That the permitting authority may prohibit augering if necessary to maximize the utilization, recoverability or conservation of the solid fuel resources or to protect against adverse water quality impacts;

(10) 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 ground water systems both during and after surface coal mining operations and during reclamation by—

(A) avoiding acid or other toxic mine drainage by such measures as, but not limited to—

(i) preventing or removing water from contact with toxic producing deposits;

(ii) treating drainage to reduce toxic content which adversely affects downstream water upon being released to water courses;

(iii) casing, sealing, or otherwise managing boreholes, shafts, and wells and keep acid or other toxic drainage from entering ground and surface waters;

(B) (i) conducting surface coal mining operations so as to prevent, to the extent possible using the best technology currently available, additional contributions of suspended solids to streamflow, or runoff outside the permit area, but in no event shall contributions be in excess of requirements set by applicable State or Federal law;

(ii) constructing any siltation structures pursuant to subparagraph (B) (i) of this subsection prior to commencement of surface coal mining operations, such structures to be certified by a qualified registered engineer to be constructed as designed and as approved in the reclamation plan;

(C) cleaning out and removing temporary or large settling ponds or other siltation structures from drainways after disturbed areas are revegetated and stabilized; and depositing the silt and debris at a site and in a manner approved by the regulatory authority;

(D) restoring recharge capacity of the mined area to approximate premining conditions;

(E) avoiding channel deepening or enlargement in operations requiring the discharge of water from mines;

(F) preserving throughout the mining and reclamation process the essential hydrologic functions of alluvial valley floors in the arid and semiarid areas of the country; and

(G) such other actions as the regulatory authority may prescribe;

(11) with respect to surface disposal of mine wastes, tailings, coal processing wastes, and other wastes in areas other than the mine working or excavations, stabilize all waste piles in designated areas through construction in compacted layers including the use of incombustible and impervious materials if necessary and assure the final contour of the waste pile will be compatible with natural surroundings and that the site can and will be stabilized and revegetated according to the provisions of this Act;

(12) refrain from surface coal mining within five hundred feet from active and abandoned underground mines in order to prevent breakthroughs and to protect health or safety of miners: *Provided*, That the regulatory authority shall permit an operator to mine near, through or partially through an abandoned underground mine or closer to an active underground mine if (A) the nature, timing, and sequencing of the approximate coincidence of specific surface mine activities with specific underground mine activities are jointly approved by the regulatory authorities concerned with surface mine regulation and the health and safety of underground miners, and (B) such operations will result in improved resource recovery, abatement of water pollution, or elimination of hazards to the health and safety of the public;

(13) design, locate, construct, operate, maintain, enlarge, modify, and remove or abandon, in accordance with the standards

and criteria developed pursuant to subsection (f) of this section, all existing and new coal mine waste piles consisting of mine wastes, tailings, coal processing wastes, or other liquid and solid wastes, and used either temporarily or permanently as dams or embankments;

(14) insure that all debris, acid-forming materials, toxic materials, or materials constituting a fire hazard are treated or buried and compacted or otherwise disposed of in a manner designed to prevent contamination of ground or surface waters and that contingency plans are developed to prevent sustained combustion;

(15) insure that explosives are used only in accordance with existing State and Federal law and the regulations promulgated by the regulatory authority, which shall include provisions to—

(A) provide adequate advance written notice to local governments and residents who might be affected by the use of such explosives by publication of the planned blasting schedule in a newspaper of general circulation in the locality and by mailing a copy of the proposed blasting schedule to every resident living within one-half mile of the proposed blasting site and by providing daily notice to resident/occupiers in such areas prior to any blasting;

(B) maintain for a period of at least three years and make available for public inspection upon request a log detailing the location of the blasts, the pattern and depth of the drill holes, the amount of explosives used per hole, and the order and length of delay in the blasts;

(C) limit the type of explosives and detonating equipment, the size, the timing and frequency of blasts based upon the physical conditions of the site so as to prevent (i) injury to persons; (ii) damage to public and private property outside the permit area, (iii) adverse impacts on any underground mine, and (iv) change in the course, channel, or availability of ground or surface water outside the permit area;

(D) require that all blasting operations be conducted by trained and competent persons as certified by the regulatory authority;

(E) provide that upon the request of a resident or owner of a man-made dwelling or structure within one-half mile of any portion of the permitted area the applicant or permittee shall conduct a pre-blasting survey of such structures and submit the survey to the regulatory authority and a copy to the resident or owner making the request. The area of the survey shall be decided by the regulatory authority and shall include such provisions as the Secretary shall promulgate.

(16) insure that all reclamation efforts proceed in an environmentally sound manner and as contemporaneously as practicable with the surface coal mining operations: *Provided, however*. That where the applicant proposes to combine surface mining operations with underground mining operations to assure maximum practical recovery of the mineral resources. the regulatory authority may grant a variance for specific areas within the reclamation plan from the requirement that reclamation efforts proceed as contemporaneously as practicable to permit underground mining operations prior to reclamation:

(A) if the regulatory authority finds in writing that:

(i) the applicant has presented, as part of the permit application, specific, feasible plans for the proposed underground mining operations;

(ii) the proposed underground mining operations are necessary or desirable to assure maximum practical recovery of the mineral resource and will avoid multiple disturbance of the surface;

(iii) the applicant has satisfactorily demonstrated that the plan for the underground mining operations conforms to requirements for underground mining in the jurisdiction and that permits necessary for the underground mining operations have been issued by the appropriate authority;

(iv) the areas proposed for the variance have been shown by the applicant to be necessary for the implementing of the proposed underground mining operations;

(v) no substantial adverse environmental damage, either on-site or off-site, will result from the delay in completion of reclamation as required by this Act;

(vi) provisions for the off-site storage of spoil will comply with section 515(b)(22);

(B) if the Secretary has promulgated specific regulations to govern the granting of such variances in accordance with the provisions of this subsection and section 501, and has imposed such additional requirements as he deems necessary;

(C) if variances granted under the provisions of this subsection are to be reviewed by the regulatory authority not more than three years from the date of issuance of the permit; and

(D) if liability under the bond filed by the applicant with the regulatory authority pursuant to section 509(b) shall be for the duration of the underground mining operations and until the requirements of sections 515(b) and 519 have been fully complied with.

(17) insure that the construction, maintenance, and postmining conditions of access roads into and across the site of operations will control or prevent erosion and siltation, pollution of water, damage to fish or wildlife or their habitat, or public or private property;

(18) refrain from the construction of roads or other access ways up a stream bed or drainage channel or in such proximity to such channel so as to seriously alter the normal flow of water;

(19) establish on the regraded areas, and all other lands affected, a diverse, effective, and permanent vegetative cover of the same seasonal variety native to the area of land to be affected and capable of self-regeneration and plant succession at least equal in extent of cover to the natural vegetation of the area; except, that introduced species may be used in the revegetation process where desirable and necessary to achieve the approved postmining land use plan;

(20) assume the responsibility for successful revegetation, as required by paragraph (19) above, for a period of five full years after the last year of augmented seeding, fertilizing, irrigation, or other work in order to assure compliance with paragraph (19) above, except in those areas or regions of the country where the annual average precipitation is twenty-six inches or less, then the operator's assumption of responsibility and liability will extend for a period of ten full years after the last year of augmented seeding, fertilizing, irrigation, or other work: *Provided*, That when the regulatory authority approves a long-term intensive agricultural postmining land use, the applicable five- or ten-year

period of responsibility for revegetation shall commence at the date of initial planting for such long-term intensive agricultural postmining land use: *Provided further*, That when the regulatory authority issues a written finding approving a long-term, intensive, agricultural postmining land use as part of the mining and reclamation plan, the authority may grant exception to the provisions of paragraph (19) above;

(21) protect offsite areas from slides or damage occurring during the surface coal mining and reclamation operations, and not deposit spoil material or locate any part of the operations or waste accumulations outside the permit area;

(22) place all excess spoil material resulting from coal surface mining and reclamation activities in such a manner that—

(A) spoil is transported and placed in a controlled manner in position for concurrent compaction and in such a way to assure mass stability and to prevent mass movement;

(B) the areas of disposal are within the bonded permit areas and all organic matter shall be removed immediately prior to spoil placement;

(C) appropriate surface and internal drainage systems and diversion ditches are used so as to prevent spoil erosion and movement;

(D) the disposal area does not contain springs, natural water courses or wet weather seeps unless lateral drains are constructed from the wet areas to the main underdrains in such a manner that filtration of the water into the spoil pile will be prevented;

(E) if placed on a slope, the spoil is placed upon the most moderate slope among those upon which, in the judgment of the regulatory authority, the spoil could be placed in compliance with all the requirements of this Act, and shall be placed, where possible, upon, or above, a natural terrace, bench, or berm, if such placement provides additional stability and prevents mass movement;

(F) where the toe of the spoil rests on a downslope, a rock toe buttress, of sufficient size to prevent mass movement, is constructed;

(G) the final configuration is compatible with the natural drainage pattern and surroundings and suitable for intended uses;

(H) design of the spoil disposal area is certified by a qualified registered professional engineer in conformance with professional standards; and

(I) all other provisions of this Act are met.

(23) meet such other criteria as are necessary to achieve reclamation in accordance with the purposes of this Act, taking into consideration the physical, climatological, and other characteristics of the site; and

(24) to the extent possible using the best technology currently available, minimize disturbances and adverse impacts of the operation on fish, wildlife, and related environmental values, and achieve enhancement of such resources where practicable;

(25) provide for an undisturbed natural barrier beginning at the elevation of the lowest coal seam to be mined and extending from the outslope for such distance as the regulatory authority shall determine shall be retained in place as a barrier to slides and erosion.

(c)(1) Each State program may and each Federal program shall include procedures pursuant to which the regulatory authority may permit surface mining operations for the purposes set forth in paragraph (3) of this subsection.

(2) Where an applicant meets the requirements of paragraphs (3) and (4) of this subsection a permit without regard to the requirement to restore to approximate original contour set forth in subsection 515(b)(3) or 515(d) (2) and (3) of this section may be granted for the surface mining of coal where the mining operation will remove an entire coal seam or seams running through the upper fraction of a mountain, ridge, or hill (except as provided in subsection (c)(4)(A) hereof) by removing all of the overburden and creating a level plateau or a gently rolling contour with no highwalls remaining, and capable of supporting postmining uses in accord with the requirements of this subsection.

(3) In cases where an industrial, commercial, agricultural, residential or public facility (including recreational facilities) use is proposed or the postmining use of the affected land, the regulatory authority may grant a permit for a surface mining operation of the nature described in subsection (c)(2) where—

(A) after consultation with the appropriate land use planning agencies, if any, the proposed postmining land use is deemed to constitute an equal or better economic or public use of the affected land, as compared with premining use;

(B) the applicant presents specific plans for the proposed postmining land use and appropriate assurances that such use will be—

(i) compatible with adjacent land uses;

(ii) obtainable according to data regarding expected need and market;

(iii) assured of investment in necessary public facilities;

(iv) supported by commitments from public agencies where appropriate;

(v) practicable with respect to private financial capability for completion of the proposed use;

(vi) planned pursuant to a schedule attached to the reclamation plan so as to integrate the mining operation and reclamation with the postmining land use; and

(vii) designed by a registered engineer in conformance with professional standards established to assure the stability, drainage, and configuration necessary for the intended use of the site;

(C) the proposed use would be consistent with adjacent land uses, and existing State and local land use plans and programs;

(D) the regulatory authority provides the governing body of the unit of general-purpose government in which the land is located and any State or Federal agency which the regulatory agency, in its discretion, determines to have an interest in the proposed use, an opportunity of not more than sixty days to review and comment on the proposed use;

(E) all other requirements of this Act will be met.

(4) In granting any permit pursuant to this subsection the regulatory authority shall require that—

(A) the toe of the lowest coal seam and the overburden associated with it are retained in place as a barrier to slides and erosion;

(B) the reclaimed area is stable;

(C) the resulting plateau or rolling contour drains inward from the outslopes except at specified points;

(D) no damage will be done to natural watercourses;

(E) spoil will be placed on the mountaintop bench as is necessary to achieve the planned postmining land use: *Provided*, That all excess spoil material not retained on the mountaintop shall be placed in accordance with the provisions of subsection (b) (22) of this section;

(F) insure stability of the spoil retained on the mountaintop and meet the other requirements of this Act;

(5) The regulatory authority shall promulgate specific regulations to govern the granting of permits in accord with the provisions of this subsection, and may impose such additional requirements as he deems to be necessary.

(6) All permits granted under the provisions of this subsection shall be reviewed not more than three years from the date of issuance of the permit, unless the applicant affirmatively demonstrates that the proposed development is proceeding in accordance with the terms of the approved schedule and reclamation plan.

(d) The following performance standards shall be applicable to steep-slope surface coal mining and shall be in addition to those general performance standards required by this section: *Provided, however*, That the provisions of this subsection (d) shall not apply to those situations in which an operator is mining on flat or gently rolling terrain, on which an occasional steep slope is encountered through which the mining operation is to proceed, leaving a plain or predominantly flat area or where an operator is in compliance with provisions of subsection (c) hereof:

(1) Insure that when performing surface coal mining on steep slopes, no debris, abandoned or disabled equipment, spoil material, or waste mineral matter be placed on the downslope below the bench or mining cut: *Provided*, That spoil material in excess of that required for the reconstruction of the approximate original contour under the provisions of paragraph 515(b) (3) or 515(d) (2) shall be permanently stored pursuant to section 515(b) (22).

(2) Complete backfilling with spoil material shall be required to cover completely the highwall and return the site to the appropriate original contour, which material will maintain stability following mining and reclamation.

(3) The operator may not disturb land above the top of the highwall unless the regulatory authority finds that such disturbance will facilitate compliance with the environmental protection standards of this section: *Provided, however*, That the land disturbed above the highwall shall be limited to that amount necessary to facilitate said compliance.

(4) For the purposes of this subsection (d), the term "steep slope" is any slope above twenty degrees or such lesser slope as may be defined by the regulatory authority after consideration of soil, climate, and other characteristics of a region or State.

(e) (1) Each State program may and each Federal program shall include procedures pursuant to which the regulatory authority may permit variances for the purposes set forth in paragraph (3) of this subsection, provided that the watershed control of the area is improved; and further provided complete backfilling with spoil material shall be required to cover completely the highwall which material will maintain stability following mining and reclamation.

(2) Where an applicant meets the requirements of paragraphs (3) and (4) of this subsection a variance from the requirement to restore to approximate original contour set forth in subsection 515(d)(2) of this section may be granted for the surface mining of coal where the owner of the surface knowingly requests in writing, as a part of the permit application that such a variance be granted so as to render the land, after reclamation, suitable for an industrial, commercial, residential, or public use (including recreational facilities) in accord with the further provisions of (3) and (4) of this subsection.

(3)(A) After consultation with the appropriate land use planning agencies, if any, the potential use of the affected land is deemed to constitute an equal or better economic or public use;

(B) is designed and certified by a qualified registered professional engineer in conformance with professional standards established to assure the stability, drainage, and configuration necessary for the intended use of the site; and

(C) after approval of the appropriate state environmental agencies, the watershed of the affected land is deemed to be improved.

(4) In granting a variance pursuant to this subsection the regulatory authority shall require that only such amount of spoil will be placed off the mine bench as is necessary to achieve the planned post-mining land use, insure stability of the spoil retained on the bench, meet all other requirements of this Act, and all spoil placement off the mine bench must comply with subsection 515(b)(22).

(5) The regulatory authority shall promulgate specific regulations to govern the granting of variances in accord with the provisions of this subsection, and may impose such additional requirements as he deems to be necessary.

(6) All exceptions granted under the provisions of this subsection shall be reviewed not more than three years from the date of issuance of the permit, unless the permittee affirmatively demonstrates that the proposed development is proceeding in accordance with the terms of the reclamation plan.

(f) The Secretary, with the written concurrence of the Chief of Engineers, shall establish within one hundred and thirty-five days from the date of enactment, standards and criteria regulating the design, location, construction, operation, maintenance, enlargement, modification, removal, and abandonment of new and existing coal mine waste piles referred to in section 515(b)(13) and section 516(b)(5). Such standards and criteria shall conform to the standards and criteria used by the Chief of Engineers to insure that flood control structures are safe and effectively perform their intended function. In addition to engineering and other technical specifications the standards and criteria developed pursuant to this subsection must include provisions for: review and approval of plans and specifications prior to construction, enlargement, modification, removal, or abandonment; performance of periodic inspections during construction; issuance of certificates of approval upon completion of construction; performance of periodic safety inspections; and issuance of notices for required remedial or maintenance work.