DEPARTMENT OF ENVIRONMENTAL QUALITY
LAND QUALITY DIVISION

GUIDELINE NO. 15

ALTERNATIVE SEDIMENT CONTROL MEASURES

COAL

DEQ Exhibit 24

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I. INTRODUCTION

This document is a guideline only. Its contents are not to be interpreted by applicants, operators, or LQD staff as mandatory. If an operator wishes to pursue other alternatives, he or she is encouraged to discuss these alternatives with the LQD staff.

This guideline identifies specific Alternative Sediment Control Measures(ASCM) that may be used in addition to and/or in place of conventional sedimentation ponds. Permitting and implementation requirements for drainage areas 30 acres or fewer are minimal. Monitoring requirements are also minimal for small ephemeral receiving streams.

These recommendations do not constitute the only acceptable alternative sediment control techniques. LQD intends to maintain flexibility so that they can evaluate sediment control systems not envisioned in this guideline.

II. OBJECTIVE OF ALTERNATIVE SEDIMENT CONTROL MEASURES

Alternative Sediment Control Measures are presented as an option other than the use of sedimentation ponds when it can be demonstrated that they "will not degrade receiving waters" (LQD Coal R&R; Chapter 4, Section 2.(f)(i)). Receiving waters are defined by the LQD as:

- Any undisturbed or permanently reclaimed stream outside of the permit area that is within three (3) channel miles downstream of an area controlled by an ASCM; or

- Any undisturbed or permanently reclaimed stream within the permit area downstream of an ASCM.

As stated in LQD Coal R&R; Chapter 4, Section 2.(f)(vii), "Appropriate sediment control measures shall be designed, constructed, and maintained using the best technology currently available to prevent additional contributions of sediment to streamflow or to runoff outside the affected land". Also, a surface water monitoring program "...will be used to demonstrate that the quality and quantity of runoff from affected lands...will minimize disturbance to the hydrologic balance". (LQD Coal R&R; Chapter 4, Section 2.(i)(ii)).

These regulations suggest there is a design/maintenance standard of **best technology currently available (BTCA),** a performance standard of **non-degradation of receiving waters,** and a verification standard of a **demonstrable monitoring program.** ASCM should be designed so that it can be demonstrated that sediment yields downstream of the ASCM are not greater than background levels. Sediment ponds may be necessary if malfunctioning ASCMs are a chronic problem. Traditional treatment methods must be used for drainage from facilities areas, coal stockpiles, mine pits, and other sources of process water as defined in Water Quality Division(WQD) R&R; Chapter 10, Section 2.

A distinction should be made between ASCM and methods used to keep soil from reaching sediment control structures. Methods used to keep soil in place are not necessarily alternative sediment control measures but may serve to keep sediment on slopes or in a channel upstream of a sediment pond and reduce the load on the pond. Many of alternative sediment control measures may be used in this way and are then not viewed as ASCM. Several measures in combination may be used as sediment control for a single drainage area.

III. BEST TECHNOLOGY CURRENTLY AVAILABLE (BTCA)

A. Elements of BTCA.

The design methods, construction techniques, maintenance practices and monitoring system all contribute to a BTCA system.

B. Determination of BTCA.

1. BTCA will be determined on a case by case basis. BTCA determinations will be based on the type of disturbance, the size of the disturbance, slope conditions, and the length of time the ASCM will be in place. For example, the LQD will not require the same ASCM sophistication for a small, temporary topsoil stockpile or topsoil stripping areas as for a permanently reclaimed watershed. The determination of BTCA will be based on how effective the ASCM is at:

   a. Preventing soil detachment and erosion, using slope erosion control practices.

   b. Retaining sediment as close as possible to its point of origin, using on-slope and in-channel sediment trapping structures.

   It is preferable to use effective slope erosion control practices where possible. Sediment trapping structures should constitute a second line of defense. A combination of the two might be used to control sediment for one drainage area.

2. The LQD realizes that many technologies currently exist that can be considered the "best" technology including: silt fence, rock check dams, sediment traps(less than 0.5 acre-feet), contour ditches, mulch, vegetation filters, established vegetation, and surface pitting to name a few. New technologies may be developed in the near future that provide a higher degree of erosion protection than is "currently" available. Appendix 2 provides a list of references.

IV. PERMITTING OF ASCM

A. An “Alternative Sediment Control Measures” section should be incorporated into the permit via a Chapter 13 revision. Usually this section would be added to the Mine Plan which can be referenced if there is separate sediment control plan for the Reclamation Plan. Contents should include:

1. Descriptions and drawings of typical ASCM to be employed on the mine site. This should include generic design information such as rock size for check dams, installation specifications, etc. The description should also include the usual conditions under which each measure will be used.

2. A maintenance and inspection plan including inspection frequencies for each type of ASCM.

3. An outline of the implementation procedure for an ASCM structure. Implementation procedures should include:

a. A notification package submitted to the LQD referencing the typical design(s) from the permit. See IV.A.1 above.

b. A plan view showing the specific drainage area and location for the measure(s) chosen.

c. Justification for the selected design(s). This should include the size of the drainage area, surface condition, slope gradient, and estimated runoff accruing to the structure if applicable.

d. A map updated with each submittal which shows all active ASCM locations.

e. A letter will be issued by the LQD acknowledging receipt, review, and approval of the package or comments if not acceptable.

f. ASCM submittals will be housed in a separate ASCM volume along side of the permit.

V. DESIGN OF ASCM

ASCM can be considered for disturbed or reclaimed areas that drain directly into a Class 3 or Class 4 stream. ASCM may not be used for drainage areas that are within one-half mile (channel distance) of any Class 1 or Class 2 stream. These classes are defined in the WQD R&R, Chapter 1, Section 4. Traditional treatment methods must be used for drainage from facilities areas, coal stockpiles, mine pits, and other sources of process water as defined in WQD R&R, Chapter 10, Section 2.

A. Designing ASCM For Small Areas (maximum of 30 acres).

ASCM design requirements for a small area are:

1. Sediment trapping structures (e.g., toe ditches, rock check dams, sediment traps) should be designed to pass or detain runoff from storms of recurrence intervals determined by their expected lifetimes (see Appendix 1).

2. The operator must report the ASCM design based on the typical approved designs presented in the permit along with its justification and a plan view of the location.(See IV.A.3. above)

3. Multiple structures, each with a drainage area of 30 acres or less may be placed in a single watershed. Stacking structures along a single channel is possible as long as the lower structure can handle the cumulative runoff from the upstream structure(s).

B. Designing ASCM For Large Areas(greater than 30 acres)

1. Designs should be based on predicted sediment yields from the particular area of disturbance. The operator should compare background sediment yields with those predicted for the disturbed area after treatment by ASCM. A state-of-the-art watershed model should be used as a design tool. Suggestions are SedCad and SEDIMOT as well as others. The

LQD will work with the operator to determine which models may be appropriate for the particular application.

C. Implementation Priorities For Various ASCM

Some areas are more suited to ASCM use than others. Some examples are areas in the pit advance that initially grade away from the pit but will drain to the pit as overburden is removed, isolated disturbances such as power stations or material stock piles that are away from main sediment control structures, reclaimed areas that produce less sediment each year and will be eligible for sediment control release as vegetation becomes established. Following are some basic suggestions for ASCM and drainage control implementation.

1. General drainage control practices which may not be considered ASCM but are prudent measures to control sediment delivery to a sediment control structure.

   a. Divert undisturbed runoff around the disturbed area into an approved diversion channel to lessen loads on sediment control systems.
   b. Divert disturbed area runoff into the pit.
   c. Establish vegetation as soon as possible on all appropriate disturbed areas.
   d. Any measure installed upstream of a sediment pond that provides final sediment control for the area.

2. Drainage from topsoil stripping areas that do not drain to the pit may be diverted through an ASCM.

   a. Place vegetation buffer strips or filter cloth between the affected area and the channel.
   b. Place sediment trapping structures in channel (porous rock check dams, staked straw bales, sediment fence).
   c. Place sediment trapping structures below the channel grade.
   d. Place sediment traps at low areas in the stripped zone but do not impound water along the topsoil edge.

3. Runoff from topsoil and overburden stockpiles may be controlled with an ASCM.

   a. Utilize a flat construction profile.
   b. Locate stockpiles away from drainage ways.
   c. Use contour plowing, seeding, and mulch on stockpiles.
   d. Establish an approved vegetative cover as soon as possible.
   e. Grade contour ditch outlets to stabilized outlets and drainage ways.
   f. Grade toe ditches to zero grade with less than 0.5 acre-foot capacity.

4. Reclaimed Surfaces

   For reclaimed areas additional prudent practices may be employed that are usually not considered ASCM, but may be included as part of a proactive runoff and sediment control program.

a. Stable landform design

Geomorphic approaches to stable landform design are highly recommended to minimize sediment yield. For example, drainage density and channel and hillslope profile shapes can be varied and slope lengths reduced to minimize sediment yield to a down gradient sediment control structure.

b. Slope erosion controls

(1) Reclaimed topsoil surfaces should be scarified with a chisel plow or ripper working along the contour to increase infiltration and detain runoff.

(2) Reclaimed surfaces should be seeded as soon as possible after re-topsoiling.

(3) Mulch should be anchored in the topsoil. Cover crops, if approved, provide a standing mulch that can be mowed prior to subsequent plantings.

(4) All tillage activities should be on the contour.

c. In-channel sediment retention measures

Reclaimed vegetated channels should be designed to be sufficiently stable such that they do not produce sediment in excess of premine levels. While appropriate rock check dams may be considered as permanent, riprap as stream stabilization is not acceptable as a permanent feature.

VI. CONSTRUCTION AND MAINTENANCE OF ASCM

A. Construction of ASCM

Each type of ASCM has construction and maintenance guidelines that are specified in most handbooks on sediment control (see Appendix 2). Construction methods and specifications should be described in the permit(see III.A.). Some basic guidelines include:

1. Mulch must be anchored to prevent it from being washed or blown off the slope.

2. Rocks used in porous rock check dams should be the appropriate size, angularity, and density to prevent flows from transporting them. Gabions may be used for higher flows.

3. Contour ditches should be constructed with a stabilized outlet and berms that are well compacted and vegetated.

4. Outlets of diversion ditches should be adequately constructed and stabilized to prevent erosion.

5. Baled hay check dams should be staked into the bed and banks of channels. Flow should pass over the low point of the channel. If hay

bales are placed level across the channel, they should be staggered so that water will not pond behind them to any extent.

B. Maintenance of ASCM

An inspection and maintenance program for ASCM similar to the following plan must be written into the permit.

At a minimum the operator should inspect all ASCM at the beginning of the runoff season(March 1 to November 1) and after each runoff event. Through the runoff season, hay bale and sediment fence structures should be inspected at least once a month. Other more durable structures must be inspected at least quarterly. An inspection and maintenance log should be kept to document the condition of each ASCM at the time of each inspection. The operator should log and repair any significant damage to an ASCM as soon as possible after it occurs.

VII. PERFORMANCE OF ASCM

A. Monitoring Streams

The water quality standard set by WQD R&R; Chapter 1, Section 15, is as follows:

"...substances attributable to or influenced by the activities of man that will settle to form sludge, bank or bottom deposits shall not be present in quantities which could result in significant aesthetic degradation, significant degradation of habitat for aquatic life or adversely affect public water supplies, agricultural or industrial water use, plant life or wildlife."

1. Small streams that are receiving waters for ASCM:

   a. During inspections the downstream side of an ASCM structure should be inspected for sediment deposits which may indicate poor function.

   b. Channels and hillslopes should be inspected for signs of rill and gully erosion as an indicator whether or not slope protection methods are effective.

   c. Repeat photographs should be taken at least annually and after large runoff events at several permanent locations along the receiving stream to supplement the written record of observations.

2. Large receiving streams

   In addition to the requirements for visually monitoring small receiving streams, monitoring of large receiving streams (drainage areas greater than 1.0 square mile) should include one, or both, of the following:

   a. Repeat surveys of representative permanently benchmarked stream channel cross sections located within the disturbed reach of the channel and continuing into the receiving stream channel.

   b. Upstream and downstream sediment yield monitoring stations.

APPENDIX 1

DESIGN EVENTS FOR TEMPORARY STRUCTURES

Storm events which exceed the design parameters will likely destroy in-channel ASCM and remobilize stored sediment. Therefore, temporary structures should be designed for an event with some reasonably small probability of occurrence over the structure's lifetime.

Example:

The highest acceptable risk of structure failure during that structure's lifetime is 20%.

Table 1 shows event return periods for which the risk of failure (at least once) over a given number of years will be no greater than 20%. The return periods in Table 1 were calculated from the following equation:

$$P = 1 - (1-1/t)^{n}$$

where P is the probability that an event of return period t will be equaled or exceeded at least once during the course of n years (Linsley, Kohler and Paulhus, 1982).

Table 1 - Design Event Return Periods

(n) Expected Lifetime of Structure (yrs)	2	5	7	10
(t) Design Event Return Period (yrs)	10	25	33	50

Over any two-year period, a 10-year event has a 20% chance of being equaled or exceeded at least once. Therefore, based on the criterion of 20% acceptable risk of failure, the appropriate design storm for a structure intended to function for two years is the 10-year peak runoff, or predicted peak runoff from the 10-year rainfall. For structure lifetimes outside the range of those in Table 1, appropriate design storm return periods should be calculated in the same manner from the equation given above.

APPENDIX 2

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