MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
INDUSTRIAL AND ENERGY MINERALS BUREAU
COAL PROGRAM
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GUIDELINES ON EROSIONAL FEATURES

INTRODUCTION:

The following guidelines are offered as a means of addressing whether or not maintenance work is required or may be imminent for erosional features encountered by field inspectors. In formulating these guidelines, it was first necessary to define some terms so that it would be clear as to what kind of erosional feature was being addressed. Erosional problems commonly found in the field have been placed in one of two categories: 1) those that will require immediate maintenance, placed under the heading of 'Required Maintenance' and, 2) those that may eventually require maintenance, placed under the heading of 'Possible Maintenance.' Since many erosional features that develop in reclaimed fields are the result of poor planning and/or reclamation procedures, a number of preventative measures have been listed under the heading of 'Preventative Measures.'

DEFINITIONS:

The following features occur throughout the native and reclaimed landscapes of eastern Montana. Swales and dry washes can be included as part of normal reclamation. Rills and gullies that form after soil laydown may be acceptable as part of reclamation on a case-by-case basis if the features do not conflict with approved post-mine goals.

Swale:
-In cross section, a generally broad, shallow feature where runoff may become concentrated. A thalweg and a floodplain are generally not discernable.

Rill:
-An erosional feature usually less than 12 inches in depth which forms on newly reclaimed or cultivated fields. Rilling is an intermediate stage between sheet erosion and gully erosion. Rills can be removed from agricultural fields using normal tillage operations. In certain areas, as fields become vegetated with the approved permanent seed mix, and the features become less distinct, the rills can form valuable micro-topographic features.

Gully**:**
-An erosional feature caused by concentrated but intermittent flow of water usually during and immediately following large runoff events. Gullies are deep enough to interfere with, and not be obliterated by, normal tillage operations. Gullies may contribute to significant redistribution or loss of soil resources and may interfere with the post-mine land use. Gullies are characterized by steep walls and steep head cuts. Gullies usually range from 2 to 30 feet in depth and are unstable.

Dry Wash:

-A steep-sided feature having a relatively flat bottom (usually greater than 3 feet in width) that is in dynamic equilibrium (there is minimal headcut progression, and usually a mature growth of shrubs and/or trees are present, except in newly constructed dry washes). Readily observed erosion and runoff is usually only due to large precipitation events. A thalweg and a floodplain are generally not discernable. (If a dry wash is to be left in place or constructed, it should have a functional use such as providing a corridor for wildlife or microsites for specific, and desirable, trees and/or shrubs. It should also exhibit geomorphic characteristics of representative native drainage channels.)

REQUIRED MAINTENANCE:

Location is critical in determining whether or not maintenance work for rills and gullies is necessary. Maintenance will be required if such conditions as the following exist:

- Roads and road embankments are or are becoming impaired to the point that continued safe operations are in question.

- Adverse impacts outside the permit boundary appear imminent or have occurred.

- Post-mine land use has been, is being, or is likely to be adversely affected.

- Soil loss from a soil stockpile is imminent or has occurred.

- A gully or other undesirable erosion feature forms as a result of improper blending.

- Deposition of spoil onto soil, or soil erosion and redeposition onto spoil, is occurring due to excessive and/or widespread gullying.

Many rills and gullies will not fall under the categories listed above, and yet they may still require maintenance work. The determination of whether or not maintenance work is required under conditions other than noted above will need to be made on a case by case basis, and as outlined below under the heading of 'Possible Maintenance.'

POSSIBLE MAINTENANCE:

To determine whether or not maintenance will likely be required for erosional features not listed under 'Required Maintenance,' the following examples should be considered:

- Whenever a soil substitution field is approved, rills and gullies are likely to develop. These rills and gullies may be left in place as long as a situation such as those listed under 'Required Maintenance' does not exist.

- A dry wash that has been inappropriately located or constructed and that results in an unacceptable rate of erosion that conflicts with approved postmine goals.

- Erosion and sediment deposition is occurring and is likely to accelerate in constructed drainage channels. Drainage channels cannot be allowed to degenerate into gullies that interfere with post-mine land use.

- Deposition of spoil onto soil, or soil erosion and redeposition onto spoil, is occurring due to excessive and/or widespread rilling. This should only be viewed as a maintenance item if coverage by spoil, or loss of soil, is severe enough to prevent establishment and/or growth of vegetation, or to interfere with achievement of post-mine land use goals and standards. Severity will be judged on such criteria as the extent of soil loss, contamination, degradation or deterioration, as well as loss of seed through overland flow. Soil is considered to be permanently lost if it cannot be retrieved (e.g., the soil material is deposited in a sediment pond, in a mine pit, or outside the disturbance boundary). Soil is unacceptably degraded, contaminated or deteriorated if establishment and/or growth of vegetation is adversely affected or if the ability of the soil to meet post-mine land use goals and standards is significantly altered.

An entire field may need to be considered when making a decision on whether or not maintenance work is required. For example, the number and density of the rills and/or gullies, as well as the depth to which individual features have eroded, will need to be considered.

Finally, before requiring maintenance, enough time should be allowed for the natural geomorphic process to reach a state of relative equilibrium consistent with the post-mining topography, approved post-mine land use, and with respect to comparable but more mature native or reclaimed sites. Many shallow erosional features will fill with sediment and/or become acceptably stabilized by vegetation given sufficient time. Once a permanent vegetative cover has become established, which often takes one to two years after initial seeding, the level of erosion can be expected to dramatically decline. Field inspectors will decide whether or not to require maintenance work by balancing such things as the location and severity of an erosional feature with the knowledge that a limited amount of erosion is expected and acceptable as newly formed landscapes mature.

PREVENTATIVE MEASURES:

The following concepts are provided in an effort to reduce the formation of unacceptable rills and gullies:

- The reclamation sequence must be properly planned in terms of blending reclaimed fields with all surrounding fields and include the rough regrading and contouring phases of reclamation. Proper blending of one field to another is a critical factor in preventing the development of rills and gullies.

- The location and type (soil substitution fields, special shrub planting fields, etc.,) of fields is a critical factor in whether or not a gully can, and should, be left in place or requires maintenance. Therefore, proper consideration must be given to placement of such fields far in advance of when resoiling and seeding is to occur.

- The newly created feature must complement the vegetation and land use goals.

- It is recommended that swales be constructed (e.g. approximately 300 to 500 feet apart) along ridge lines during the rough regrade phase of reclamation. This should inhibit the formation of excessively large gullies or a high density of rills and/or gullies.

- Reclamation activities (rough regrading, revegetation, etc.,) would be best performed in a continuous panel extending from drainage channel to drainage divide. This would help prevent improper blending and encourage the creation of micro-topographic features such as swales.

- Where trees or shrubs are planted on steep slopes, care must be taken to prevent the furrow from exacerbating erosion by concentrating runoff. The furrow should follow the contour of the land. Planting by hand is encouraged and will minimize the concentration of overland flow.