PIT AND QUARRY REHABILITATION STANDARDS IN MANITOBA

Background:

The responsibility of rehabilitation of lands used for project sites and aggregate quarry has always been with the landholder. In 1992 the Mines and Minerals Act proclaimed the ability of the Minister to enter into agreements to rehabilitate areas of disturbance.

In 2020, a revised program introduced a grant funding process for private landowners to rehabilitate the land based on submission of an application of proposed rehabilitation with minimum quarry standards. These updated Quarry Standards provide further potential rehabilitation opportunities for private and municipal lands.

Within the Mines and Minerals Act rehabilitation of aggregate quarries and pits is defined as the actions to be taken for the purpose of

- protecting the environment against adverse effects resulting from operations,
- minimizing the detrimental impact on adjoining lands of operations,
- minimizing hazards to public safety resulting from operations, and
- leaving the site or quarry in a state that is compatible with adjoining land uses and that conforms, where applicable, to a zoning by-law or development plan under The Planning Act and to the specifications, limits, terms and conditions of a licence issued under The Environment Act in respect of the project.

There are several sources that try and define both quarry rehabilitation, as well as progressive rehabilitation, and a couple of examples are provided below:

> Quarry Rehabilitation: All planned activities that aim to turn mined/exploited land into a stable, safe state area, compatible with its natural environment and suitable for the proposed future use of the land.
>
> Quarry Rehabilitation: All activities needed to ensure that quarry operations are closed in an environmentally and socially responsible manner with the objective of ensuring a sustainable post-quarrying land use. It is the overall term for restoration, reclamation, re-cultivation and includes progressive rehabilitation.
>
> Progressive rehabilitation: progressive rehabilitation should be undertaken wherever possible. This has the advantage of reducing open areas within the quarry, reducing potential soil erosion.

While the Mines and Minerals Act does not specifically define progressive rehabilitation for aggregate operations, it should be applied where possible as good practice and with the advantage of reducing open areas within the quarry, reducing potential soil erosion while boosting biodiversity benefits at an early stage.

Ultimately, the goal of site rehabilitation is to create safe and stable area for future land use, manage impacts, and reduce risks with potential to identify opportunities to achieve viable positive change.

Before developing a pit or quarry

Prior to starting development, collect information on the existing site conditions to include surface and subsurface and plan the post development land use – crop production, pasture, industrial, wetland, or forested (agri-forestry). Rehabilitation plans may resemble pre-quarry land use i.e. cultivation, pasture, grassland, brush, or forest, Please note that natural rehabilitation will be preferred under this funding program

The Quarry Mineral Regulation (MR65/92) provides the requirements for clearing a site, stockpiling, setbacks, landscape screens, erosion and weed problems, waste water drainage, blasting, noise, ground water protection and open burning. Section 38(1) prescribes that topsoil must be retained on site for the purpose of rehabilitation.

Considerations for reclamation:

- Adjacent land use and Land use zoning
- Slopes and grading
- Site drainage

Potential Rehabilitated Land Use:

- Agriculture
- Forestry
- Natural Environments
- Wildlife Habitat
- Recreation[1]
- Residential and Industrial Use[1]

1. If you as the landowner wish to initiate further site development, to establish a housing subdivision, wetlands, or a golf course, you must do so at own expense.

Pit Rehabilitation

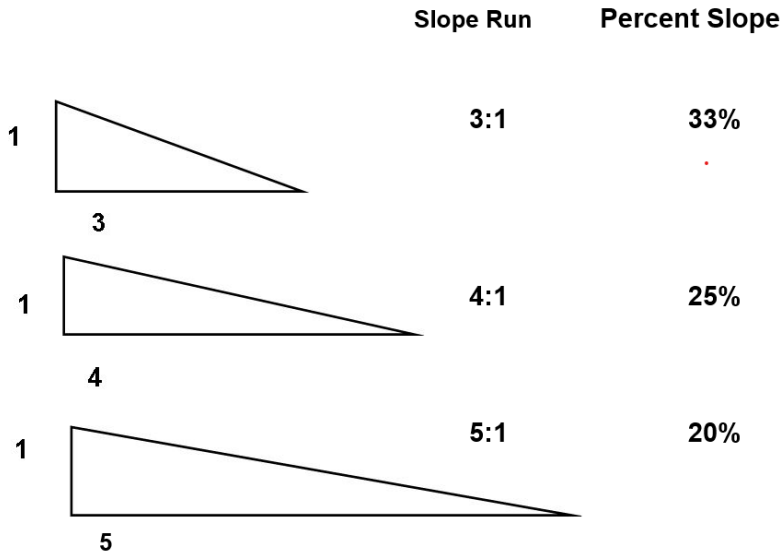
Embankment Sloping (Slope and Safety)

Minimum gradients for embankments of unconsolidated material (loose aggregate) shall be sloped:

Final slopes for **Stability and Safety** should be at least 3 horizontal to 1 vertical or 33%, preferably 4 horizontal to 1 vertical or 25% where achievable.

Final slopes for **Agricultural Cropping** should be at 5 horizontal to 1 vertical or 20% on Canada Land Inventory Class 1 – 5.

Final slopes for **safe exit of water filled quarries** should be at 5 horizontal to 1 vertical or 20% and extending 4 metres from the water edge.



Notes: Previously cultivated land with relatively good capability for agriculture (Canada Land Inventory Soil Capability for Agriculture Classes 1 to 4) should be reclaimed for crop production. Previously cultivated land with poorer soil capability should be reclaimed to pastureland or native vegetation.

Landowners should consider surface drainage requirements and establish slopes to a level that restore natural drainage to the area. Where post-mining land use is cropland, drainage should minimize ponding and designed in a manner to minimize erosion during spring runoff and major rainfall events on both your property and adjoining land holders. Water drainage should not impact neighbouring properties on other landowners.

Stockpiles:

Stockpiles considered surplus may be re-graded to establish safe slope angles. Alternatively, surplus material may be moved to alternate site locations for future use during operation and maintenance phases or spread evenly over disturbed areas prior to closure. Excess material shall be left in a manner that does not impede drainage.

Oversize Boulders and Other Material:

Boulders (minimum 25 cm or 10 inches in diameter) and stockpiles of waste sand or other materials that may be left at a site can be used as backfill in sloping, or otherwise disposed of in the grading of the landscape. Where boulders are not buried, they shall be piled neatly.

This also provides for the removal and/or remediation due to trees or water constraints on the property.

Rehabilitation and Reclamation for Various Rehabilitated Land Uses

Spreading of Overburden & Topsoil for Seeding and Natural Regeneration

Closure of pit and quarry areas typically consist of redistributing topsoil and other organic materials to encourage both natural vegetation and regeneration, planting or preparing ground for seeding.

Available topsoil and overburden material suitable as a soil material should be graded over the surface of the disturbed lands after sloping is completed. If such material does not exist on site, improvements to the sub-soil will need to be made by the landowner to facilitate establishment of a vegetation cover.

Topsoil will not be purchased and hauled onto a site as a cost of rehabilitation under this program. If topsoil was not retained as required by regulation and is not available on site, the costs of having it brought it will be the responsibility of the landowner.

Stripping piles on the subject site that are comprised predominately of biologically inert overburden (sub-soil) material can be used as backfill, to slope embankments, or otherwise leveled off in accordance with sloping standards. Bringing in additional top soil will be the financial responsibility of the landowner.

Special handling of soil will only be considered in relation to any biologically productive topsoil /overburden located on the site. Experience since the program started has clearly demonstrates the value of such soil in terms of restoring agricultural productivity to the rehabilitated landscape. This is usually a consequence of the soil texture, nutrient

availability, organic matter composition or dormant seed content. Where even a thin mantle of topsoil can be spread over the disturbed lands, a cover crop can be more easily and quickly established. Special measures are therefore warranted to optimize the use of any residual topsoil for this purpose, provided it is present in sufficient quantity. These measures may include:

i. stripping topsoil away from the edge of an embankment, so that only subsoil material is used to achieve the prescribed slope
ii. using scrapers, loaders or rock trucks, as opposed to dozers, to carry topsoil greater distances over the site

Seeding operations should be completed following grading operations. If conditions do not permit re-seeding immediately, then re-seed the next growing season. Seeding operations should not be carried out during high wind events, snow cover, ice conditions or in standing water.

Lands that are not intended for agricultural production due to their location, soil type or slope may also benefit from a topsoil cover and seeding to establish grasses so their root systems will ensure bank stability and the prevention of erosion.

Agriculture - Whether rehabilitated lands are intended be returned to annual crop production, if they were used for that purpose prior to aggregate having been extracted, or the land will be used for grazing, rehabilitated properties benefit from even a thin mantle of topsoil being spread over the disturbed lands.

Top soil used and top soil depth should be similar to what occurred before aggregate extraction or similar to the surrounding area that has not been disturbed. Depth of topsoil and sub-soil should also not restrict plant / crop growth.

Consult the resources listed in **Appendix A** for more information. Depending upon the soil texture, nutrient availability, organic matter composition or dormant seed content, spreading topsoil ensures a cover crop can be more easily and quickly established.

Forestry – Remote sites in forested areas may be reasonably expected to re-vegetate naturally. However, seeding of the graded areas will be carried out where:

a) embankments would be otherwise subject to surface erosion that would deteriorate
b) invasion by noxious weeds would detrimentally affect adjoining agricultural lands.

Wetlands – Restoration activities could include removing barriers to hydrological connectivity, which will allow the boreal wetland to return to its pre-impacted state over time.

Quarry Rehabilitation

Embankment safety in bedrock quarry sites is not a concern. However, sloping of the embankment by blasting down the mine face to create a gradient of no less than 3:1 should be carried out where conditions constitute a significant hazard to public safety.

Sloping of quarry embankments is relatively expensive, since it involves blasting as well as grading work. While sloping permanently resolves the safety concern and associated liability, other measures may be considered where:

a) sites are located in remote areas, where there is little potential for human encounter.

b) site conditions restrict access to the top of a quarry embankment.

The objective, where the vertical embankment has not been sloped, is to prevent inadvertent access to the top edge. Anyone approaching the top edge, on foot or by vehicle (snowmobile, quad, truck, etc.), should be sufficiently warned of the condition so that they can exercise due caution. The following measures, in order of relative effectiveness, can be implemented:

a) Construction of a berm, set back a safe distance from the quarry edge and built up to a sufficient height to pose as an obvious barrier during winter or periods of low visibility/darkness.

b) Construction of a fence, set back suitably from the quarry edge, using chain link or page wire material. (not barbed wire strands, which can represent a hazard.)

c) Erection of signs at prominent locations warning of the quarry embankment.

d) Strip vegetation and soil off the upper edge of the quarry embankment for a distance of 8 metres, to ensure that this approach zone is clear and visible, and that vegetation will not grow back to mask the edge condition.

NOTE: The above are the minimum standards that are funded under the program. Landowners are ultimately liable if further measures are necessary.

APPENDIX A

Resources	Description	Links
Digital elevation models	Area collection of three dimensional coordinates representing an X and Y horizontal location on the ground along with its associated elevation (one metre resolution).	**DataMB https://geoportal.gov.mb.ca/**
LiDAR	Laser-derived elevation models with a resolution of 25 cm, limited to southern Manitoba.	DataMB **https://geoportal.gov.mb.ca/**
Soil Mapping	Municipal maps of soil properties, primarily within Manitoba's agriculture zone.	DataMB **https://geoportal.gov.mb.ca/**
Manitoba Land Use / Land Cover Classification	Land cover maps available for southern and central Manitoba.	DataMB https://geoportal.gov.mb.ca/
Canadian Land Cover Classification and Earth Observation Data	Remote sensing products available for government and commercial use.	Canada Centre for Remote Sensing (CCRS): **www.nrcan.gc.ca/maps-tools-publications/satellite-imagery-and-air-photos/10782**
Provincial database on rare elements, including rare species and species at risk	Conservation status ranks for rare species and communities in GIS database.	Manitoba Conservation Data Centre (MBCDC): **https://www.gov.mb.ca/sd/environment_and_biodiversity/cdc/index.html**