POLICY No 5
EROSION AND SEDIMENT CONTROL

DOUGLAS SHIRE COUNCIL PLANNING SCHEME POLICY NO 5

Erosion and Sediment Control

Intent

This Policy is intended to support the local dimension of the Planning Scheme by ensuring that development controls erosion and sedimentation.

Objectives

The objectives of this Policy are:

- to ensure that development is undertaken to minimise erosion and to control sedimentation; and
- to ensure that any potential risks associated with erosion and sedimentation are adequately addressed through the implementation of Erosion and Sediment Control Plans.

Principles of Erosion and Sediment Control

A number of general principles can be applied to the planning and development of all areas to cater for sound development, while minimising the impact of erosion and sedimentation on the local environment.

An overview of these principles is set out below:-

Investigate Site Features to Ensure that the Land Capability and the Proposed Development are Compatible

The physical resources of any proposed development area should be investigated at the initial planning stage, with geological, soil, landform and hydrological limitations critically evaluated. A development plan should then be selected which is compatible with the natural characteristics of the site.

Natural features, such as drainage lines, water bodies, and existing vegetation which can be used in the development, should be identified. The development plan should:

- avoid hazard areas such as flood plains and steep or unstable slopes
- aim to minimise the impact of site limitations
- provide for erosion and sediment control integrated with stormwater management.

Making the development fit the terrain minimises the risk of erosion and sedimentation. For example, the alignment of roads and the layout of subdivision lot boundaries can greatly influence the area of a site which needs to be disturbed - and hence the extent of the erosion hazard.

Prepare an Erosion and Sediment Control Plan

A strategy to manage erosion and sedimentation should be considered at an early stage in the development assessment process. It is an essential first step.

The preparation of the Plan must recognise that erosion control is of primary importance. It can be achieved by managing runoff at a non-erosive velocity; by minimising the length of slope during land shaping; and by providing protection to the soil surface.

Sediment control, on the other hand, involves trapping and containing soil particles that have already been eroded. This is necessary because some erosion is unavoidable. Erosion control, therefore, is potentially more effective and preferable than sediment control and will often be the only alternative for fine grained and dispersible soils.

Before an effective Erosion and Sediment Control Plan can be prepared, it is essential to understand the erosion processes likely to occur.

Expose the Smallest Possible Area of Land for the Shortest Possible Time

Limit site regrading and retain as much of the natural vegetation as possible. Vegetation is the most effective form of erosion control because it both absorbs and uses water. On the other hand, revegetating areas once they are disturbed can be difficult, costly and time consuming.

Development should be staged so that land disturbance is confined to minimum areas of manageable size. This will limit the time disturbed areas are exposed to erosion. Stabilising measures should be applied progressively as each section is opened up.

Seasonal variations in temperature and rainfall can result in periods of varying erosion potential during the year. Where possible, land disturbing operations should be scheduled for the least erosive times of the year.

Save Topsoil for Reuse

The stripping and stockpiling of topsoil must be the first step in the land development operation. The topsoil will later be respread on areas to be revegetated.

The stockpiles should be stored outside hazard areas such as drainage lines and heavily trafficked areas, and protected by temporary control measures to prevent them becoming a source of sediment.

Control Runoff Onto, Through and From the Site

Permanent drainage works, particularly trunk drainage arteries, must be installed early in the development program to protect disturbed areas from runoff and to convey stormwater safely through and from the site. All runoff water must be managed at a non-erosive velocity.

The impact of urban development on flow regimes, channel erosion, sedimentation and flooding can be substantially reduced by adopting stormwater management techniques which concentrate on maintaining the natural drainage system as far as possible. A variety of measures for detaining stormwater flow can be used to offset unavoidable increases in flow volume or reductions in flow time. Where natural channels must be modified to increase their capacity, shaped and vegetated waterways can be used.

The total catchment area of any development site must be recognised as the logical unit for stormwater management planning. During the construction stage, all external water, and clean runoff from undisturbed areas within the site, should be diverted to alternative stable outlets, to protect those areas being developed. This strategy is vital if the cost of erosion and sediment control measures is to be minimised and their efficiency maximised.

Use Erosion Control Measures to Prevent On Site Damage

Erosion control measures must be incorporated during all stages of development to minimise sediment generation. The control of erosion as close to the source as possible can reduce the subsequent demand on sediment trapping structures.

The integration of a range of erosion control techniques, to function by managing stormwater runoff at a non-erosive velocity and by protecting disturbed soil surfaces, can maintain stability and prevent erosion.

Use Sediment Control Measures to Prevent Off Site Damage

Stormwater runoff from all disturbed areas must be filtered through sediment trapping structures to minimise or prevent sediment leaving the site.

These measures function by slowing the velocity of runoff and letting sediment settle by gravity or by filtration. Some soil erosion is inevitable and the eroded soil must be trapped before it leaves the site and pollutes adjacent property and watercourses.

Rehabilitate Disturbed Areas Quickly

Vegetation is the most effective form of erosion control.

All disturbed areas must be progressively stabilised and revegetated so that no areas remain exposed to erosion damage for more than 14 days after earthworks cease. If permanent rehabilitation is

delayed by construction activities or unsuitable site conditions, temporary protection will be needed. The establishment of permanent vegetation should proceed as soon as construction activity is completed.

All roads and parking areas should be stabilised with appropriate sub-grade as soon as possible after their formation.

All erosion and sediment control earth structures should be seeded and, if necessary, mulched immediately they are built.

Maintain Erosion and Sediment Control Measures

All erosion and sediment control measures must be regularly inspected and adequately maintained to ensure they function efficiently until the development is completed and the site rehabilitated.

Temporary control measures not required after rehabilitation should be removed and the area stabilised and revegetated.

Permanent control measures will require a long term maintenance strategy to ensure their on-going efficiency.

Erosion and Sediment Control Plans

Introduction

To be fully effective throughout the site development process, the planning and implementation of an Erosion and Sediment Control Strategy must be an integral part of the initial site development plan.

The effective integration of erosion and sediment control measures in the development sequence can only be effectively achieved if construction and control practices are jointly planned and implemented.

Erosion and Sediment Control Plans should therefore be prepared for all developments where:-

- there is a high risk of sediment pollution to downslope lands or receiving waters.

The major goals of any Erosion and Sediment Control Plan must include:

- site investigations to determine areas most, and least suited, to development;
- minimal disturbance of the area;
- control of water from the top of the site, through to and beyond, the bottom of the site;
- maintenance of a protective groundcover where ever possible;
- prevention/minimising of sediment leaving the site.

Plans may range from a brief, simple sketch with accompanying notes for a small site, to a detailed, comprehensive plan for a complex development on a large site. The scale of plans should generally be of the order of 1:500 to 1:1000.

Regardless of the size of the development, an Erosion and Sediment Control Plan is essential.

Preparation of Plan

The following steps should be taken in the preparation of an effective Erosion and Sediment Control Plan:

- investigate site characteristics;
- integrate clearing and grading with site layout design;
- determine existing and proposed drainage patterns;
- select erosion control practices;
- select sediment control practices;
- outline site rehabilitation program.

Investigate Site Characteristics

A full investigation and analysis of the physical features and limitations of the site is essential if any development is to proceed with minimal environmental degradation.

Data collected on the natural environment of the site should include:-

Topography

Prepare a plan of the site showing existing contours at a suitable interval consistent with the scale of the plan. Aspects such as slope gradient, slope length and drainage patterns can be determined from this plan.

Soils

Soils data should identify the major soil types present on the site, including their limitations, and show their location on the site plan. Areas of problem soils, including soils with high erosion hazards, can be determined from this plan. Data on the distribution of soil particle sizes will also assist in sizing sediment trapping structures.

Soils data for some areas is available from soil landscape maps. For other areas, a specific soil survey may need to be undertaken by a qualified soil surveyor.

Vegetation

A plan of the site showing existing vegetation should be prepared. The preservation of existing vegetation should be maximised due to its highly effective function in controlling erosion.

The different classes of vegetation (eg. grasses, ground covers, shrubs, trees, etc.) should be identified as they differ in their effectiveness in filtering surface runoff and in their management requirements.

Adjacent to Environmentally Sensitive Areas

Off site or down stream features such as watercourses, foreshores, tidal areas, critical vegetation types, developments and roads which may be particularly susceptible to erosion and sediment damage, should be identified.

Analysis and interpretation of the above data allows the identification of critical natural areas such as:

- drainage lines;
- water bodies
- steep or unstable slopes;
- floodplains;
- rocky outcrops;
- seasonally wet areas;
- critical stabilising vegetation;
- sensitive downstream features,

which represent the areas within the site with the greatest potential for erosion.

Following the investigation of site characteristics, the Erosion and Sediment Control Plan should show:

- locality plan identifying development site;
- locality plan identifying catchment area boundaries;
- site plan identifying existing contours;
- site plan identifying location and limitations of major soil types;
- site plan identifying location, nature and condition of existing vegetation;
- site plan identifying location of critical natural area, on site and immediately adjacent.

Integrate Clearing and Grading with Layout Design

The proposed development should be assessed in light of the physical characteristics and limitations identified, particularly their impact on the level of site disturbance.

Excessive disturbance of these environmentally sensitive areas can be avoided by planning the development to fit the site. The erosion potential of the entire site can also be reduced together with the subsequent requirement for, and cost of, structural control measures.

The Erosion and Sediment Control Plan should therefore identify:

- the nature and extent of vegetation to be cleared;
- the nature and extent of proposed earthworks, including areas of cut and fill;
- the final site contours.

Provision should be made for the on-site marking of physical limits to clearing or site disturbance by using distinctive fencing, markers, signs, etc.

The staging of clearing and land shaping should be considered as an alternative to total site clearing and disturbance, to reduce the area and time of exposure to erosive forces.

Roads and development sites should be located so as to minimise disturbance, by utilising the existing topography.

Determine Existing and Proposed Drainage Patterns

The understanding of drainage patterns within a development site is critical to the preparation of an effective Erosion and Sediment Control Plan.

The existing drainage pattern can be determined by interpretation of the site characteristics – refer above. It must be stressed, however, that any drainage pattern has two major components: overland (sheet) flow and channel (concentrated) flow. Both components must be addressed to achieve effective erosion control. This will involve determination of the following:

- the point at which existing concentrated and sheet flows enter the site;
- how runoff, both concentrated and sheet flow, travels across the site;
- where runoff leaves the site, and whether it is concentrated or sheet flow;
- how much water flows through the site.

The impact of the proposed development plan on the above components of the existing drainage pattern of the site should then be assessed.

Stormwater drainage design should allow for stormwater run off to be safely diverted or conveyed through the site at non-erosive velocities.

The diversion and/or separate management of all stormwater runoff from undisturbed areas of the catchment is to be encouraged, as it can reduce the load on other drainage measures, particularly sediment trapping structures.

The natural drainage system should be used to convey run off from the site wherever possible, rather than constructing stormwater drains or concrete channels. If impervious surfaces are kept to a minimum and runoff from these surfaces is percolated into the soils on-site, it may be possible, without installing channel protection measures, to use the natural drainage system to drain a development.

The cost of using the natural drainage system can be substantially lower than the cost of constructing a conventional stormwater drainage system. Preserving the natural drainage system can also retain visual amenity that will enhance the value of a development.

If runoff flows will be increased by development, the additional flows can be directed into a stormwater drainage system, thereby preserving the natural drainage system in its original condition. If the stability of the natural system is upset, it may be very difficult to prevent a long term erosion process from beginning.

The Erosion and Sediment Control Plan should therefore show:

- the catchment boundaries and area of each existing watercourse within, or flowing through, the site;
- the location and extent of proposed roads and other areas with impervious surfaces;
- the location and capacity of proposed permanent stormwater drainage facilities, and methods of discharging stormwater from the site;
- any critical areas where the development plan will result in major changes to the site's drainage pattern.

Select Erosion Control Practices

Erosion control measures reduce the duration of soil exposure and protect the soil by shielding it, and/or holding the soil in place. These functions may improve the soil's capacity to absorb stormwater runoff, thereby reducing the amount of overland runoff and its power to erode soil materials.

In general, the amount of soil material eroded and transported to streams will be proportional to runoff flow velocity and the duration of flow, with erosion rates increasing with increasing runoff flow quantity and velocity. Flow quantity and flow velocity therefore, must be managed if erosion is to be controlled.

Soils data can be used to identify highly erodible areas within the site, and to show the particle size distribution of the various soils.

For many soils with a high content of clay and/or fine silt, the control of erosion at the source is the only feasible strategy to prevent downstream sedimentation. It would be extremely difficult and expensive to try and trap these fine soil particles once they have been eroded and are in suspension.

An effective Erosion Control Strategy should therefore encompass the following principles:

- integrate clearing and grading with layout design;
- keep clearing to a minimum and preserve as much of the existing vegetation as possible;
- limit grading to those areas involved in current construction activities;
- minimise the length and steepness of slopes;
- limit the time during which unprotected graded areas are exposed to wind and rain;

- intercept, divert and safely dispose of clean runoff flowing onto all disturbed or critical areas, including soil stockpiles;
- install permanent stormwater drainage works as the first stage in land development;
- reduce runoff velocities by minimising the length of flow paths, constructing channels with gentle gradients, and by providing rough linings to the steeper channels;
- apply temporary vegetation or mulch to all disturbed areas, including soil stockpiles, where construction is only partially completed but which will remain exposed for a period of 14 days or more;
- stabilise all disturbed areas with permanent vegetation as each stage of the development is completed.

The Erosion and Sediment Control Plan should therefore show:

- location and design criteria of structural and vegetative erosion control measures needed to control the volume, direction and velocity of runoff;
- details regarding the scheduling of proposed erosion control measures;
- details regarding the maintenance of proposed erosion control measures.

Select Sediment Control Practices

Once erosion occurs, the resultant sediment is removed in stormwater runoff and deposited downstream. The rate at which sediment particles are removed from runoff depends on the size and specific gravity of the particles, the temperature of the water in which they are suspended, and the motion of the water flow.

The objective of applying sediment control measures is to ensure that conditions most conducive to deposition, and least likely to hold particles in suspension, occur at locations where deposition is desirable. If the flow of water is slowed, reduced in volume, or its flow turbulence reduced, less sediment will be transported.

Sediment deposition can therefore be stimulated by reducing runoff flow volume and velocity, as occurs with sediment traps or basins. Sediment removal can also be achieved by filtering sediment laden runoff through a filtering medium (straw bale, geotextile filter fabric, grass, etc) which traps or absorbs the sediment particles, but allows clean water to pass through.

Sediment control should aim to:

- implement an effective erosion control program;
- trap sediment as close to its source as possible;
- locate sediment traps or filters below all disturbed areas, to detain sediment laden runoff;
- locate sediment filters above environmentally sensitive areas such as watercourses, foreshores, steep slopes etc;
- subdivide drainage catchments into smaller units, at a size appropriate to the type of sediment control measure to be used;

- use sediment traps or basins as the most effective structures to control concentrated runoff flows;
- use sediment filters as the most appropriate means of controlling sheet runoff flows;
- identify areas of existing vegetation which may have the potential to filter sediment laden sheet runoff flows;
- locate multiple sediment basins or major sediment traps so that they drain in parallel, not in series, to reduce the risk of total failure;
- ideally, install sediment traps and basins at the lowest point in the watershed, in swales or small drainage lines.

The Erosion and Sediment Control Plan should therefore show:

- the location and design criteria of structural and vegetative sediment control measures;
- details regarding the scheduling of proposed sediment control measures;
- details regarding the maintenance of proposed sediment control measures.

Outline Site Rehabilitation Program

Vegetation is the most effective erosion and sediment control measure, particularly in the medium to long term. The re-establishment of vegetation on all disturbed areas, as soon as is feasible, is therefore a critical requirement of any erosion and sediment control strategy.

As each stage is completed, permanent vegetation should be progressively established on all disturbed areas where no further subdivision or building activity will take place.

Temporary vegetation is appropriate where any disturbed areas of soil are to be left exposed for a period of fourteen days or more, but where further subdivision or building activity is planned.

The Erosion and Sediment Control Plan should therefore show:

- location of areas where temporary revegetation is to be undertaken;
- location of areas where permanent revegetation is to be undertaken;
- location and details of specialised revegetation or stabilising methods to be undertaken;
- details of types and rates of planting materials, fertilisers and/or mulches to be used in revegetation;
- details regarding the scheduling of proposed revegetation measures;
- details regarding the maintenance of proposed revegetation measures.

Information to be Provided

Presentation of Plan

The Erosion and Sediment Control Plan should contain all the relevant information which is pertinent to the development in question.

Erosion and Sediment Control Plans may be individual plans or they may be incorporated into site engineering drawings. The complexity of the plans will depend on the size and complexity of the proposed development, and/or on its potential environmental impact. For some sites, two plans may be more appropriate, detailing earthworks and control measures separately from rehabilitation proposals.

The use of standardised symbols to denote erosion and sediment control measures on the plan will improve the level of interpretation and effective use of the plan, and is strongly recommended.

The following components of an Erosion and Sediment Control Plan will be required for most development submissions:

- locality plan and site plan;
- supporting documentation;
- construction details and notes.

The Plan/s

This key component of the plan/s, generally prepared at a scale of 1:500 to 1:1000, should illustrate the following aspects of the site:

- locality of development site;
- existing contours of the site, including catchment area boundaries;
- location of existing vegetation;
- location of critical natural areas requiring special planning or management;
- nature and extent of earthworks, including cut and fill;
- location of all soil stockpiles;
- location of proposed roads and other impervious areas;
- existing and proposed drainage patterns;
- location and type of proposed erosion control measures;
- location and type of proposed sediment control measures;
- site rehabilitation proposals, including final contours.

Supporting documentation

The information provided on the plan/s should be supported by a brief description of the overall Erosion and Sediment Control Strategy for the proposed development. This summary document should include:-

- A brief description of existing site conditions. Relevant soils, the proposed development activities, the impact on the site, and any adjacent areas that might be affected by the proposal, should be included.

- A description of any areas within the site that have the potential for serious erosion or sedimentation, together with details of special planning or management requirements proposed for their protection.

- The construction sequence over the life of the development. This should schedule major land clearing, grading and stabilisation and indicate how long the disturbed areas will remain exposed. A chart or table outlining the sequence of works, including erosion and sediment control measures, can be helpful to relate construction activities to a week-by-week schedule and thereby identify critical activities and times and their inter-relationships. This can be particularly useful for site supervisors.

- A brief description of measures to be used to control sediment on-site, including the criteria used to select, locate and schedule such measures.

- A brief description of the overall site rehabilitation program.

- A maintenance strategy for all control measures, including the nomination of responsibility for follow-up maintenance required by any permanent control measures.

Construction Details, Calculations and Notes

All design criteria and calculations used to size stormwater drainage and disposal systems, and major structural control measures, should be shown.

While the plan/s will depict the location and type of control measures to be employed, construction drawings or written specifications should be provided on each different type of structural control measure proposed. These should include details of the type of materials to be used in their construction, installation procedures, and any specific maintenance requirements.

Specifications for all vegetative components of the plan, including seeding, fertilising and mulching materials and rates, and methods of application, should also be shown.

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