

# **erosion&sedimentcontrol**

Guidelines for Land Disturbing Activities in the Auckland Region



Auckland **Regional** Council

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Guidelines for Land Disturbing Activities in the Auckland Region

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Special thanks also goes to Shelley Trueman and Clare Feeney for providing valuable advice and guidance.

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Guidelines for Land Disturbing Activities in the Auckland Region

These Guidelines replace Auckland Regional Council Technical Publication Number 2 and are to be known as Technical Publication Number 90 *Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region*.

The intent of these Guidelines is as follows:

- To provide a comprehensive guideline for erosion and sediment control.
- To detail the rules of the *Proposed Regional Plan: Sediment Control*.
- To minimise adverse environmental effects of sediment discharge through appropriate use and design of specific measures.

These Guidelines outline the principles of erosion and sediment control including detailing the *Ten Commandments of Erosion and Sediment Control* in the Auckland Region.

The practices detailed in these Guidelines are divided into erosion control, sediment control, works within a watercourse, quarries and vegetation removal. For each practice these Guidelines outline the following:

- Definition
- Purpose
- Application
- Design/construction specifications
- Comments
- Maintenance

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We will be regularly reviewing these Guidelines. Please help us keep them accurate and practical - let us know about any changes we need to make by using this form.

Please photocopy this form before you fill it out, to keep this original for future use.

## 1. Errors

Are there any errors in the text or diagrams? If so, please tell us:

- o which page and/or figure number it is on
- o what the error is and how you would correct it

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## 2. Omissions

Have we left out any measures/practices commonly used or which you find useful? If so, please list them below and if possible, any design guidelines for us to include:

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## 3. Effectiveness

Are these Guidelines helpful for complying with erosion and sediment control requirements. If not, please tell us how we can improve these Guidelines:

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## 4. Other Comments

Do you have any other comments or questions? If so, please note them below:

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## 5. Your contact details

*(Optional)* Please note your name and phone number below in case we need to discuss your suggestions in more detail:

Name: \_\_\_\_\_ Phone: \_\_\_\_\_

**Thank you for taking the time to improve our Guidelines.**

Feel free to phone us about your views on (09) 379 4420 (ask for the Sediment Management Team), or *Freepost* a copy of this response form to:

*The Sediment Management Team, Auckland Regional Council, Private Bag 92012, Auckland. Freepost No. 4103.*

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## 1.1 Intent of These Guidelines

These Guidelines have three main objectives:

1. To provide users, ranging from those directly associated with various Land Disturbing Activities (Land Disturbing Activities) to interest groups, with a series of comprehensive guidelines for erosion and sediment control for land disturbing activities by:
  - o outlining the principles of erosion and sediment control and the sediment transfer process; and
  - o providing a range of erosion and sediment control practices that can be implemented on various Land Disturbing Activities.
2. To detail the rules in the Auckland Regional Council's *Proposed Regional Plan: Sediment Control* (September 1995) which define when a Land Use Consent is required.
3. To minimise adverse environmental effects of Land Disturbing Activities through appropriate use and design of erosion and sediment control techniques.

## 1.2 How These Guidelines Work

These Guidelines replace Technical Publication No. 2 *Erosion and Sediment Control Guidelines for Earthworks*, updated March 1995. They overview the erosion and sediment controls that can be used when undertaking various Land Disturbing Activities and are known as Technical Publication No. 90 *Erosion and Sediment Control Guidelines for Land Disturbing Activities in the Auckland Region*.

These Guidelines focus on the principles and practices of erosion and sediment control recommended for various Land Disturbing Activities. While not providing the full details of the Land Use Consent application process, they refer to the process and it is anticipated that they will form an integral part of the consent process. The Guidelines should be used during the development of an Erosion and Sediment Control Plan for a project, and must also be used as part of operating under the conditions of an approved consent.

These Guidelines are split into two main sections, Principles and Practices. The Principles section outlines ten critical elements that need to be considered when developing an Erosion and Sediment Control Plan for

any Land Disturbing Activity. These ten elements are referred to as the *Ten Commandments of Erosion and Sediment Control*.

The Practices section covers on-site practices to be used when implementing the *Ten Commandments*. In most circumstances, a range of practices will need to be used on any Land Disturbing Activity within the Auckland Region.

Standard symbols for erosion and sediment controls are used in Part B.

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Auckland Regional Council staff are available for further advice and can be contacted at Auckland Regional Council, Private Bag 92 012, Auckland or by telephoning (09) 379 4420.

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## 1.3 Erosion and Sediment Control in the Auckland Region

Hundreds of hectares of land are stripped of vegetation or laid bare each year around Auckland for the construction of subdivisions, roads, landfills and other developments. Without protection measures, the transformation of this land can result in accelerated on-site erosion and greatly increased sedimentation of waterways, estuaries and harbours.

Significant quantities of sediment are discharged from bare earth surfaces where appropriate erosion and sediment control measures are not implemented.

Various studies in Auckland indicate there is a 10 to 100 times increase in sediment yield from construction sites compared with pastoral land, while data from the United States suggests that there may be up to 1000 times the sediment yield from disturbed sites during construction compared with permanent forest cover.

In the 1996 – 97 earthworks season, 1000 ha of bare land was worked around the Auckland region. If left unprotected this could have resulted in a discharge of up to 66,000 tonnes of sediment/year to aquatic receiving environments.

The adverse ecological effects caused by sediment in waterways include:

- o Modified or destroyed instream values.
- o Modified estuarine and coastal habitats.
- o Smothering and abrading of fauna and flora.

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- o Changes in food sources and interruption of life cycles.

There is often a total change to instream communities. Recovery times from the impacts of sediment deposition are more likely to be measured in years rather than months.

In addition to ecological changes, there may be damage to water pumps and other structures; the quality of water supplies usually diminishes; localised flooding can occur and there is a loss of aesthetic appeal.

The Resource Management Act 1991 (RMA) establishes the Auckland Regional Council's statutory responsibilities for resource management. The purpose of the RMA is to promote the sustainable management of natural and physical resources. 'Sustainable management' is defined in Section 5 of the Act as:

*'managing the use, development and protection of natural and physical resources in a way or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while:*

- '(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- '(b) safeguarding the life supporting capacity of air, water, soil and ecosystems; and
- '(c) avoiding, remedying or mitigating any adverse effects of activities on the environment.'

Historically, earthworks controls were based on voluntary controls initiated in the 1970s by the former Auckland Regional Water Board, which implemented guidelines and a complaints response role. The 1980s saw the introduction of Section 34 notices under the Soil Conservation and River Control Amendment Act 1959, requiring consents be obtained from the Regional Water Board prior to undertaking earthworks. This remained in effect until 30 September 1993 as part of Auckland Regional Council's Transitional Regional Plan. A Soil Conservation Consent for earthworks was then required under the Auckland Regional Council's *Erosion and*

*Sediment Control Proposed Regional Plan*. As a result of further submissions and subsequent hearings this has been replaced by the current *Proposed Regional Plan: Sediment Control* (September 1995), developed under the RMA, requiring a Land Use Consent: Sediment Control to be obtained prior to undertaking a range of Land Disturbing Activities.

## 1.4 Current Legislation: When is a Resource Consent Required?

The legal basis for requiring a Land Use Consent for Land Disturbing Activities is the *Proposed Regional Plan: Sediment Control* (September 1995). The Plan's rules apply to Land Disturbing Activities including earthworks, vegetation removal, roading, tracking, trenching and quarries. A copy of these rules can be found in Appendix A of these Guidelines. Consent application forms are provided in Appendix B.

It is important to note that the rules are valid at the time of publishing these Guidelines but are subject to change. Contact the Auckland Regional Council to confirm the status of the rules contained within these Guidelines before making a decision based upon them.

## 1.5 When is Erosion and Sediment Control Required?

All projects involving Land Disturbing Activities in the Auckland Region must incorporate erosion and sediment controls as an integral part of development. Projects which do not require a Land use Consent under the *Proposed Regional Plan: Sediment Control*, and are classified as permitted activities, MUST still implement appropriate erosion and sediment controls as detailed in these Guidelines.

On all projects, erosion and sediment controls should be in place before earthworks commence and should be removed only after the site has been fully stabilised to protect it from erosion. The principles and practices within these Guidelines should be referred to, and the Erosion and Sediment Control staff at the Auckland Regional Council contacted for further advice if required.

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## Works Within a Watercourse

Any works within a watercourse must be carefully planned because controlling sediment generation from these activities is difficult. These Guidelines include a number of erosion and sediment control measures that can be used for realignment, piping, culverting and stabilisation works.

The two most critical factors in minimising the impact of works of this nature are timing and duration of works.

Techniques for minimising sediment generation and discharge when undertaking works within a watercourse are outlined in Part B, Section 3 of these Guidelines.

It should be noted that further consents may be required when undertaking such works, and contact should be made with Auckland Regional Council staff to discuss the specific details of the proposed activity.

## Cleanfills

Cleanfills are another Land Disturbing Activity that, while not directly referenced within the *Proposed Regional Plan: Sediment Control*, do generate sediment. These Guidelines do not include a specific section on cleanfill operations, but standard earthworks erosion and sediment control practices are appropriate for cleanfill operations. The ARC's definition of cleanfill (below) should be noted whenever cleanfill operations are to be undertaken:

- That cleanfill material is defined as a filling operation disposing of soil (other than contaminated soil) rock, asphalt, fibrolite, plaster/clay products, and glass, and concrete with a maximum of 5% by volume per 10 truckloads of attached structural building materials (wood and structural steel excluding corrugated iron).
- Cleanfilling operations are permitted to accept only those materials outlined above. These operations are not for the disposal of organic material, vegetation, contaminated soils or other waste materials. Additionally cleanfilling operations are not for the disposal of unattached structural building materials.

- Should non-cleanfill material be disposed to a cleanfill site the site may be required to obtain authorisation for any discharge of contaminants (other than sediment) under section 15 of the Resource Management Act 1991, or remove non-cleanfill material from the site, whether or not this material is part of the existing fill matrix.

## 1.6 Auckland's Clays: The Prime Importance of Erosion Control

The small size of soil particles typical of Auckland's geology reduces the effectiveness of erosion and sediment controls. The fine clays, once mobilised, take a much longer time to settle than the coarser sand and silt material.

Bigger, better or more numerous sediment control measures may therefore not be very effective in limiting off-site transfer of sediments.

Most effort should be put into preventing sediment generation in the first instance. That is, into erosion control rather than sediment control. Erosion control techniques include the following:

- Revegetation
- Minimisation of earthworks
- Timing
- Staging of earthworks operations

Other measures such as the use of chemical treatment of runoff may also be necessary in some circumstances.

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## 2.1 Types of Erosion

Erosion is the process whereby the land surface is worn away by the action of water, wind, ice or other geological processes. The resultant displaced material is known as sediment. Sedimentation is the deposition of this eroded material. Accelerated erosion, caused primarily by human development activities, is generally much more rapid than natural erosion.

The basic erosion process is detachment, transport and deposition (sedimentation). In Auckland, water is the usual eroding agent and transport medium, through raindrop impact and overland flow energy. Water dislodges exposed soil particles and transports them downslope. Runoff and streamflow transport the eroded soil particles to the final receiving environment where sedimentation occurs.

There are seven main types of erosion associated with land disturbing activities.

- Splash erosion
- Sheet erosion
- Rill erosion
- Gully erosion
- Tunnel erosion
- Channel erosion
- Mass movement

These are outlined below.

### Splash Erosion

- Soil erosion is a mechanical process that requires energy. Much of this energy is supplied by falling rain drops.
- The impact of a single raindrop on a soil surface or on a thin film of water may break up the soil aggregates and cause individual particles to be thrown into the air. If this occurs on a slope then some particles will move up-slope, but the net effect due to gravity will cause splashed particles to move downslope. Splash erosion is directly related to the size, distribution, shape, velocity and direction of the raindrop.
- In Auckland, the erosive ability of splash erosion is enhanced by the typically intense cyclonic storms that can occur during the earthworks season.

### Sheet Erosion

- When rainfall intensity exceeds the infiltration rate of a soil and the capacity of the available surface detention, excess water moves downslope, transporting soil particles detached by splash erosion.
- Sheet erosion or wash erosion is the uniform removal of soil in thin layers by the forces of raindrops and overland flow. It can be a very significant erosive process because it can cover large areas of sloping land and may go unnoticed for some time. Sheet erosion can be recognised by soil deposition at the bottom of a slope, or by the appearance of light coloured subsoil material on the surface. If left unattended, sheet erosion of topsoils will gradually remove the nutrients and organic matter important to revegetation, and will eventually result in loss of soil productivity on contributing slopes and elevated sediment concentrations in receiving waters.

### Rill Erosion

- Rill erosion is the removal of soil by runoff moving in concentrated flows. As the flow changes from sheet flow to deeper flow in these channels, or rills, the velocity and turbulence of the flow increases, and the energy of this flow is able to both detach and transport soil particles.
- Rill erosion has been estimated to be the dominant contributor to erosion on hill slopes.

### Gully Erosion

Gully erosion is the removal of soil by running water resulting in the formation of channels greater than 300 mm deep. Gullies can be distinguished from rills when normal agricultural tillage operations cannot obliterate them.

The following are the processes which act in the formation of gullies in Auckland.

- Waterfall erosion at the head of the gully
- Channel erosion
- Raindrop splash
- Diffuse flow from the side of the gully or from seepage
- Slides or mass movement of soil within the gully.

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A gully may develop and grow rapidly and their formation may generate a considerable amount of erosion. Therefore, their prevention and remediation is vital for erosion control.

## Tunnel Erosion

Tunnel erosion, or piping, is the removal of subsurface soil by subsurface water while the surface soil remains relatively intact. This produces long cavities beneath the ground surface, which may enlarge until the soil surface is no longer supported, at which point the surface may collapse forming a circular hole, sometimes referred to as a 'tomo'. Such erosion tunnels may range in size from a few centimetres to several metres in diameter and typically form a series along the surface above a tunnel.

## Channel Erosion

The erosion of ephemeral or perennial channels results from direct action of concentrated flow when the velocity or volume of flow in a stream increases. Natural channels adjust over time to the volume and velocity of runoff that normally occurs in the catchment. Channel erosion occurs by scouring or undercutting of the stream bank below the water surface and generally happens during medium to high flows.

Channel erosion is a major contributor to sedimentation in the Auckland metropolitan area. High flows in stream channels occur more frequently once a catchment has been urbanised, eroding stream banks and enlarging the channel. For example, an Auckland study showed a three-fold channel widening after 85% of the catchment had been urbanised (Herald, 1989).

## Mass Movement

Mass movement is the erosion of soil or rock by gravity-induced collapse. It is usually triggered by groundwater pressure after heavy rain, but can also have other causes, notably streams undercutting the base of a slope or earthworks. Movement can be either rapid and near instantaneous (landslides, avalanches, debris flows), or slow and intermittent (earthflows and slumps). Earth and soil slip movement are also often noted after the removal of vegetation from critical slopes associated with Land Disturbing Activities. These slopes need to be identified before development starts and should be avoided wherever practicable.

Mass movement can cause major problems on earthworks sites and geotechnical investigations should be undertaken where possible to avoid critical slopes or allow for the prevention of such erosion.

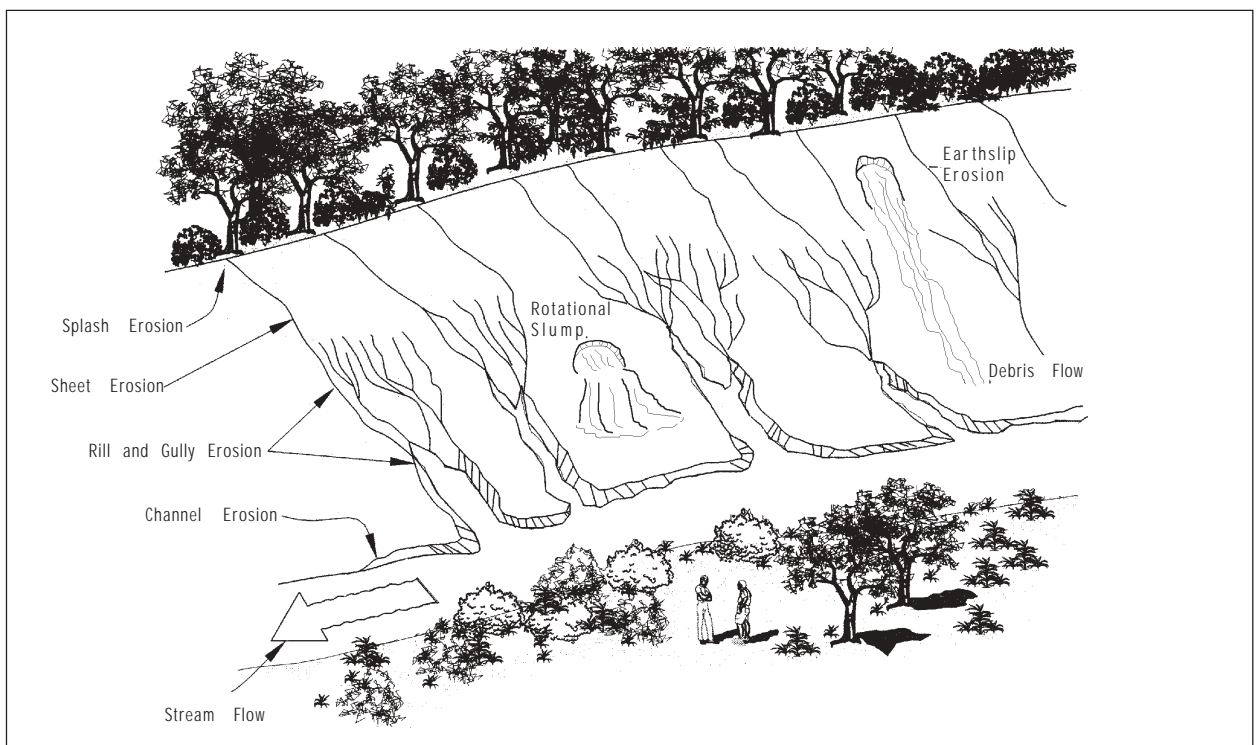


Figure 2.1 Types of Erosion Common in the Auckland Region

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## 2.2 Factors Influencing the Erosion Process

The main factors influencing soil erosion are climate, soil characteristics, topography, ground cover and evapotranspiration.

### Climate

Climate affects erosion potential both directly and indirectly. The direct relationship arises from the action of rain - a driving force of erosion - where raindrops dislodge soil particles and runoff carries them away. The annual pattern of rainfall and temperature change, by and large, determines the extent and growth rate of vegetation. This is critical, because vegetation is currently the most important form of erosion control used on Land Disturbing Activities in Auckland.

The Auckland Region receives about 1200 mm of rainfall annually, with average monthly rainfalls being greatest throughout the winter period. Summer has the greatest rainfall variability, some summers being very dry, others wet.

Intense cyclonic storms during summer also create many erosion problems, with a large amount of rain falling within a short time period. Erosion and sediment control for all Land Disturbing Activities must be planned accordingly.

### Soil Characteristics

Four soil characteristics are important in determining soil erodibility:

- *Soil texture* refers to the particle sizes making up a particular soil and their relative proportions. Sand, silt and clay are the three major soil particle classes. Auckland soils tend to have a high content of fine sands and silts, which are the more erodible fractions of the soil. The clay content also creates difficulty as once mobilised, it is very difficult to settle out. This is due to the small nature of individual particles and the tendency for clay particles to repel each other, thus keeping them in suspension.
- *Organic matter* improves soil structure and increases permeability, water holding capacity and soil fertility.
- *Soil permeability* refers to the ability of the soil to allow air and water to move through the soil. Soils with a higher permeability produce less runoff at a

lower rate than soils with low permeability. Engineered fills have a very low permeability, resulting in increased levels of potentially erosive runoff.

- *Soil structure* is the degree that soil particles are arranged into aggregates. A granular structure is the most desirable in both agricultural and erosion control terms. When the soil surface is compacted or crusted, water tends to run off rather than infiltrate. Erosion potential increases with increased runoff.

### Topography

Slope length and slope angle are critical factors in erosion potential because they play a large part in determining the velocity of runoff. Long continuous slopes allow runoff to build up velocity and to concentrate flow. This produces rill and gully erosion.

The shape of a slope also has a major bearing on erosion potential. The base of a slope is more susceptible to erosion than the top because runoff arriving there is moving faster and is more concentrated. However, deposition may occur at the base of concave slopes where slope angle diminishes.

### Ground Cover

Ground cover includes vegetation and surface treatment such as mulches and geotextiles. Vegetation is without question the most effective long term form of erosion control for protecting surfaces that have been disturbed. Vegetation shields the soil surface from the impact of falling rain, slows the velocity of runoff, holds soil particles in place and maintains the soil's capacity to absorb water.

### Evapotranspiration

The Auckland Region has a fairly frequent rainfall during the winter, but due to high evapotranspiration and a minimum of rainfall in the summer period, soil moisture levels are often so low that irrigation or watering is needed to achieve the moisture levels needed for plant growth. Evapotranspiration rates and the number of days of soil moisture deficit vary across the region. Careful consideration needs to be given to evapotranspiration when attempting to establish a vegetative cover and prevent erosion.

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*These “Ten Commandments,” summarise the ten principles to follow when preparing an Erosion and Sediment Control Plan.*

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## 1. Minimise Disturbance

Fit land development to land sensitivity.

Some parts of a site should never be worked and others need very careful working. Watch out for and avoid areas that are wet (streams, wetlands, springs), have steep or fragile soils or are conservation sites or features.

Bear in mind the *minimum earthworks strategy (low impact design)* – ideally, only clear areas required for structures or access.

*Show* all Limits of Disturbance on the Erosion and Sediment Control Plan (E&SCP). On site, clearly show Limits of Disturbance using fences, signs and flags.

## 2. Stage Construction

Carrying out bulk earthworks over the whole site maximises the time and area that soil is exposed and prone to erosion. “Construction staging”, where the site has earthworks undertaken in small units over time with progressive revegetation, limits erosion.

Careful planning is needed. Temporary stockpiles, access and utility service installation all need to be planned. Construction staging differs from sequencing. Sequencing sets out the order of construction to contractors.

*Detail* both construction staging and sequencing in the E&SCP.

## 3. Protect Steep Slopes

Existing steep slopes should be avoided. If clearing is absolutely necessary, runoff from above the site can be diverted away from the exposed slope to minimise erosion. If steep slopes are worked and need stabilisation, traditional vegetative covers like topsoiling and seeding may not be enough – special protection is often needed.

*Highlight* steep areas on the E&SCP showing Limits of Disturbance and any works and areas for special protection.

## 4. Protect Watercourses

Existing streams, watercourses and proposed drainage patterns need to be mapped. Clearing is not permitted adjacent to a watercourse unless the works have been approved by the Auckland Regional Council. Where undertaken, work that crosses or disturbs the watercourse

*Map* all watercourses and show Limits of Disturbance and protection measures; show all practices to be used to protect new drainage channels; and indicate crossings or disturbances and associated construction methods in the E&SCP.

## 5. Stabilise Exposed Areas Rapidly

The ultimate objective is to fully stabilise disturbed soils with vegetation after each stage and at specific milestones within stages. Methods are site specific and can range from conventional sowing through to straw mulching. Mulching is the most effective instant protection.

*Clearly define* time limits for grass or mulch covers, outline grass rates and species and define conditions for temporary cover in the case of severe erosion or poor germination in the E&SCP.

## 6. Install Perimeter Controls

Perimeter controls above the site keep clean runoff out of the worked area – a critical factor for effective erosion control. Perimeter controls can also retain or direct sediment laden runoff within the site. Common perimeter controls are diversion drains, silt fences and earth bunds.

*Detail* the type and extent of perimeter controls in the E&SCP along with design parameters.

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## 7. Employ Detention Devices

Even with the best erosion and sediment practices, earthworks will discharge sediment laden runoff during storms. Along with erosion control measures, sediment retention structures are needed to capture runoff so sediment generated can settle out. The fine grained nature of Auckland soils means sediment retention ponds are often not highly effective. Ensure the other control measures used are appropriate for the project and adequately protect the receiving environment.

*Include* sediment retention structure design specifications; detailed inspection and maintenance schedules of structures and conversion plans for permanent structures, in the E&SCP.

## 8. Get Registered

A trained and experienced contractor is an important element of an E&SCP. These people are responsible for installing and maintaining erosion and sediment control practices. On-site staff certified through the Auckland Regional Council Industry Education Programme can save project time and money, by identifying threatened areas early on and putting into place correct practices.

*Contact* Auckland Regional Council about registration. Include arrangements for a pre-construction meeting, regular inspection visits (including a pre-wintering meeting), and final inspection.

## 9. Make Sure the Plan Evolves

An effective E&SCP is modified as the project progresses from bulk earthworks to developed individual lots. Factors such as weather, changes to grade and altered drainage can all mean changes to planned erosion and sediment control practices.

*Update* the E&SCP to suit site adjustments in time for the pre-construction meeting and initial inspection of installed erosion and sediment controls, and make sure it is regularly referred to and available on site.

## 10. Assess and Adjust

Inspect, Monitor and Maintain Control Measures

Assessment of controls is especially important following a storm. A large or intense storm will leave erosion and sediment controls in need of repair, reinforcement or cleaning out. Repairing without delay reduces further soil loss and environmental damage.

Assessment and adjustment is an important erosion and sediment control practice – make sure it figures prominently in the E&SCP.

*Assign* responsibility for implementing the E&SCP and monitoring control measures as the project progresses.

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Guidelines for Land Disturbing Activities in the Auckland Region

The following are the main types of Land Disturbing Activities undertaken in the Auckland Region and these are discussed in these Guidelines.

- o Trenching
- o Watercourse works
- o Cleanfills
- o Small sites and permitted activities
- o Earthworks
- o Roothing
- o Quarries and vegetation removal

The following is a brief summary of key considerations for minimising adverse environmental effects of these activities that are not found in the detailed description of erosion and sediment control measures in Part B.

## Trenching

Trenching, usually for installing utility services, often happens towards the end of the bulk earthworks phase of a project. The following points need to be considered when trenching.

- o The project needs to be undertaken in appropriately sized stages such that the area exposed can be fully stabilised within an acceptable time frame.
- o If trenching impacts on existing erosion and sediment control measures that are part of the overall development, those measures should be reinstated as soon as possible. Contingency measures should be put in place until the original measures are reinstated or replaced.
- o All trenching operators working within a larger site must be familiar with the overall Erosion and Sediment Control Plan for the site and must comply with this approved plan.
- o Independent erosion and sediment control measures detailed in these Guidelines should be employed for the trenching operation.
- o Topsoil and subsoils should be stockpiled separately adjacent to the trench so that at the completion of the operation, these soils can be replaced in the appropriate order and vegetation established.
- o When trenching through overland flow paths, give special consideration to the diversion of any flows, which may occur during trenching, as well as

reinstating and stabilising the overland flow path.

## Works Within a Watercourse

Works within a watercourse should be avoided wherever possible, with all alternatives considered beforehand. Where watercourse works are unavoidable, they will create sedimentation downstream, so the following points should be carefully considered when undertaking these works.

- o Have all alternatives been considered?
- o Install a stabilised diversion so that works can be undertaken in the dry and reinstate the streamflow only after these areas have been appropriately stabilised. If a diversion is not a viable option, then ensure the alternative options are fully considered.
- o Carry out works during a dry time of the year when stream flows are low and the likelihood of a storm is low.
- o Keep the duration of works short.
- o Identify instream values so as to avoid critical periods such as fish spawning periods.
- o Consider the direct short and long term impacts of culverts or instream structures and install appropriately designed fish-pass provisions.
- o Be sure to inform all downstream users, for example water-users, of potential downstream sediment discharges.

## Cleanfills

Cleanfills dispose of unwanted fill material which may contain some other material as in the definition of cleanfill provided in Part A of these Guidelines.

Land Disturbing Activities associated with cleanfills range from haul roads and access areas to tip faces and dumping areas. Several controls are needed for adequate erosion and sediment control on such sites and the following points should be carefully considered when undertaking such operations:

- o The cleanfill operator needs to ensure that material being accepted for the cleanfill fits within the ARC's definition. In cases where it doesn't, the operator must reject such loads, which will then need to be transported to an approved landfill.
- o Erosion and sediment controls should be installed

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Guidelines for Land Disturbing Activities in the Auckland Region

in accordance with these Guidelines and appropriate maintenance undertaken.

- o As a cleanfill operation is considered to be a land disturbing activity, each operation should be assessed for any necessary consents within the *Proposed Regional Plan: Sediment Control*.
- o Staging of cleanfill operations is critical and a programme of progressive stabilisation of all cleanfill sites should be part of each operation.

## Small Sites and Permitted Activities

After the bulk earthwork phase of an earthworks operation, individual developers start house construction. This is the phase of small site developments which is considered permitted activities under the *Proposed Regional Plan: Sediment Control*. The cumulative impact from small sites is considered to be considerable and in some areas may cumulatively discharge as much sediment as the initial development itself. Often at this stage of the proposal, stormwater systems are in place and there are no, or minimal, erosion and sediment controls on the site. This results in sediment discharging through an efficient conveyance system (the stormwater system) directly to the receiving environment.

The following points need to be considered when undertaking small site development:

- o The developer should be fully aware of the permitted activity thresholds within the *Proposed Regional Plan: Sediment Control* and the conditions it specifies.
- o Erosion and sediment controls should be installed either on an individual site-by-site basis or a combination of the sites, in accordance with these Guidelines or the *Small Site Guidelines for Earthworks in the Auckland Region*.
- o Stormwater runoff from small sites needs careful planning in terms of the location of roof downpipes so that runoff across bare sites does not scour soils.
- o Areas of exposed soils should be stabilised upon completion of earthworks, including topsoil and subsoil stockpiles, lawn areas and accessways.
- o The site should be isolated from the subdivision's road system using silt fences to intercept flow from

the site, with a Stabilised Construction Entrance (see Part B, Section 1.8) of to provide site entry and exit.

## Earthworks

Earthworks include a wide range of activities from cleanfilling operations (defined above) through to earthworks associated with industrial, commercial and residential developments. The *Proposed Regional Plan: Sediment Control* defines the thresholds for resource consent requirements for earthworking activities. Earthworks have a major potential to generate large amounts of sediment, and if not controlled appropriately, can lead to large sediment discharges. Planning of these developments is critical to ensure that the activity is undertaken appropriately, and in a controlled manner to avoid unnecessary impacts on receiving environments. The "Ten Commandments" outline the critical features of an earthworks operation. The following are further key points contractors need to be aware of when undertaking earthworks operations.

- o It is important to comply with the specific requirements of the resource consent when undertaking earthworks operations.
- o Emphasis should be placed on erosion control, rather than sediment control, because preventing sediment generation is the best means of preventing sediment discharge from earthworks sites.
- o Always produce an Erosion and Sediment Control Plan (E&SCP) for an earthworks operation. Be sure that all parties involved with the operation, including subcontractors, are familiar with and have access to a current copy of this Plan.
- o Always update the E&SCP with major variations on the site and be sure these variations have the appropriate approvals. Keep this up-to-date version in the site office at all times.
- o Plan ahead and undertake consultation with necessary parties as required. Get approvals and start the operation early to avoid last minute delays and the need to keep working into the undesirable wetter months.
- o Install appropriate controls in accordance with the approved E&SCP and be sure that the design specifications are appropriate for the operation.

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Guidelines for Land Disturbing Activities in the Auckland Region

- Install subsurface drainage as required (to an agreed methodology) to divert subsurface cleanwater past control structures and areas of disturbance as appropriate.

## Roading

Like trenching, the linear nature of roading poses challenges for erosion and sediment control. Measures need to be carefully planned to ensure controls are successful. Often the operation can be undertaken sequentially, stabilising worked areas as they are completed. This minimises the total sediment generating area of the proposal and helps prevent unnecessary road maintenance.

The following are some key points to consider when working through a roading proposal.

- Provide enough room for effective erosion and sediment control measures. Often the road corridor itself can involve the whole designation area and no room remains for such controls. Where space is a constraint, make sure that the erosion and sediment controls are approved and will give the necessary protection to downstream receiving environments.

- Incorporate stormwater design into the E&SCP. This removes the need to revisit the area to install stormwater systems and the unnecessary extra earthworks that their construction would require.
- Keep the areas of road corridor exposed at any one time to a limit that can be practically stabilised with hardfill or by vegetative means, to minimise the exposed area at risk.
- When crossing watercourses, look for alternative routes and alternative designs and implement the option which provides the best environmental alternative.
- Control all upslope catchment runoff, diverting clean water around or safely through the area of disturbance.

## Quarries and Vegetation Removal

Measures in these Guidelines are suitable for quarry and vegetation removal operations. However, the long term nature of many quarries and the clearfelling of whole catchments during vegetation removal operations mean that some special erosion and sediment control measures need to be implemented. Careful planning of such operations is thus critical. The key areas where attention is required are discussed in detail in Part B of these Guidelines and should be read in conjunction with the other erosion and sediment controls also detailed.