# EROSION AND SEDIMENT CONTROL MANAGEMENT PLAN

## CORNERSTONE CHURCH

## #999 GOULDS ROAD
## ROLLESTON

## MARCH 2023

CONTENTS




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## *1.0 Introduction*

This report describes the methods by which potentially sediment laden stormwater runoff is to be controlled during the construction of the Church development by Cornerstone Church at #999 Goulds Road, Rolleston.

The site is located off Goulds Road, Rolleston. The Siteworks plan (with aerial) is included in **Appendix A** and gives an idea of the site**.**

The legal description of the land is:

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| Street Address: | 999 Goulds Road |
| Legal Description: | Lots 19/20/21 DP7589 |
| Record of Title: | |
| Total Land Area: | 1.2138 |

The site is presently used as a rural lifestyle lot, with an existing dwelling and some associated ancillary buildings.

The topography of the site is generally flat and falls gently towards the southeast. The northern & west bdy is lower than adjacent land. Therefore property along the west and north bdy will not be at risk of overland flows.

All buildings and carparks are to be graded to onsite kerbs with a minimum of 1 in 500 fall to three onsite soakpits. Any storm above 50 year return period may enter the secondary flow path which is via access roads towards each entrance/exit and then down Goulds Road.

It is the intention to restrict as much construction stormwater onsite as possible. Once the earthworks is partially complete, temporary soakholes (see plan) whill be setup to restrict stormwater to the new roads which will then easily allow all sediment laden water to be directed to the stormwater facility and sediment control areas marked on the attached plan.

Soil on the site typically consists of approximately 250mm depth of topsoil overlying gravels and minor silts. The depth to water table is at least 5m below ground level.

## *2.0 Land Disturbing Activities*

During construction the proposed development will involve the following land disturbing activities:

- Stripping and stockpiling topsoil.
- Cutting and filling to finish levels over parts of the site.
- Earthworks for carparks and the building.
- Trenching for the installation of drainage and water supply pipelines and structures, as well as power and telecom buried services.
- Earthworks to construct stormwater facility
- Respreading of topsoil.

## *3.0 Erosion and Sediment Control Measures*

Erosion is to be controlled by sequencing operations to minimise the areas of bare earth exposed for the shortest possible time. Once areas are cut/ filled and shaped to their final levels they are to be sown in grass, paved or landscaped and mulched as applicable to minimise erosion potential. Ground slopes on site are low

so runoff flow velocities will be minimal, however track rolling of stockpiles & other means to restrict runoff flow velocities where areas of bare earth are at steeper slopes are to be employed.

Site access will be restricted to two locations and will be stabilised with ramped rock aprons (crushed 65mm ballast).

The key method of control for this site is to ensure there are no discharges of sediment laden water beyond the site. Any stormwater runoff generated during the construction phase will be generally contained within the access road excavations, or if in large quantities will be directed to the existing low point at the location of the proposed stormwater area, see attached plan. As most of the stormwater will be "to ground" via the existing gravels, all sediment laden water shall be monitored to ensure no contaminants or oil/diesel spills are present. If contaminants are detected the construction outfall (temporary soak pit) shall be immediately closed down and water shall be directed to a silt stablised area, to decant before entering the ground. Emergency methods (hay bales, filter areas) shall be installed, if necessary. The construction outfall from the stormwater area will be bunded to restrict the worst storms from exiting the soakage area and flowing down the secondary flow path for as long as possible. When the worst case occurs, efforts will be made to direct stormwater flows to existing roads (not sections or irrigation races).

Soil bunds (300 to 500mm high) will be placed along the south and the east boundaries (accesses to be ramped to create height similar to bund) to prevent any runoff entering the adjacent properties, if deemed necessary. This is to be discussed & agreed at the pre-construction site meeting.

Some parts of the land adjacent to the site at the north & west boundaries has a gentle fall towards the site. That runoff may infiltrate to the existing soils before entering the construction area. A clean water diversion channel which could be a simple as sand bags could be installed if deemed necessary. However this is unlikely to be necessary and will be determined at the pre-construction site meeting.

Once construction is finished including grass established on lots and berms, roads and footpaths paved and landscape areas mulched, erosion and sediment control measures will be decommissioned.

Further details of the erosion and sediment control measures described above are shown on **Appendix B** "Erosion and Sediment Control Plan" and **Appendix C** "Excerpts from Environment Canterbury Erosion and Sediment Control Guidelines."

## *4.0 Construction Sequence*

- Plan the methodology and timing of land disturbing activities to minimise erosion and sediment generation.
- Stabilise the site entrances with ramped rock aprons, where deemed necessary.
- Construct clean water diversion bund along the northern boundary if determined to be required
- Install soil bunds along south and east boundaries (where deemed necessary).
- Install soil bunds along other perimeter boundaries if required
- Construct the stormwater area, if deemed necessary.
- Dust control is to be with suitable irrigation materials (K-lines or similar) at all times. The contractor is expected to watch the weather forecasts and pre-determine when winds and dust are likely to become a problem. Watering shall be required to start in advance of bad winds, concentrating on trafficked areas and close to existing houses. Trafficked areas shall be kept dust free regardless of what winds are present.
- Site clear, strip and stockpile topsoil.
- Stabilise any stockpiles of soil by surface roughening and sowing in grass.

- Trench and install buried services.
- Excavate and construct kerb and channel.
- Cut and fill balance lot and berms to required levels, respread topsoil and sow in grass (earthworks may be running concurrently with previous 4 items above).
- Irrigate newly sown areas as necessary to encourage speedy establishment.
- Excavate and backfill pavement in roading areas.
- Construct footpaths, install streetlights, traffic devices, landscape features and other structures.
- Seal paved areas.
- Surplus excavated soil to be utilised in predetermined areas requiring fill on site or cut-to-waste off-site.
- Remove erosion and sediment control measures

*It has been found during similar construction works in the area that provided existing gravels in the road subgrade are exposed in a controlled manner that all construction phase stormwater can be controlled within the site. Local authorities are generally happy with this methodology provided regular thought and attention is paid to ESC.*

## *5.0 Monitoring*

These sediment control measures will be continually reviewed on a day to day basis and amendments and additions will be made where necessary. Site staff shall be encouraged to watch for issues and make suggestions (they are the ones always on site, best suited to see issues coming).

Sediment control facilities shall be inspected by the Site Superviser at least once a week and after each rainfall. A weekly on site record of each inspection will be kept. Any repairs required shall be effected urgently. In addition inspections of the facilities will be undertaken and recorded prior to forecasted rainfall events and regularly throughout rainfall events.

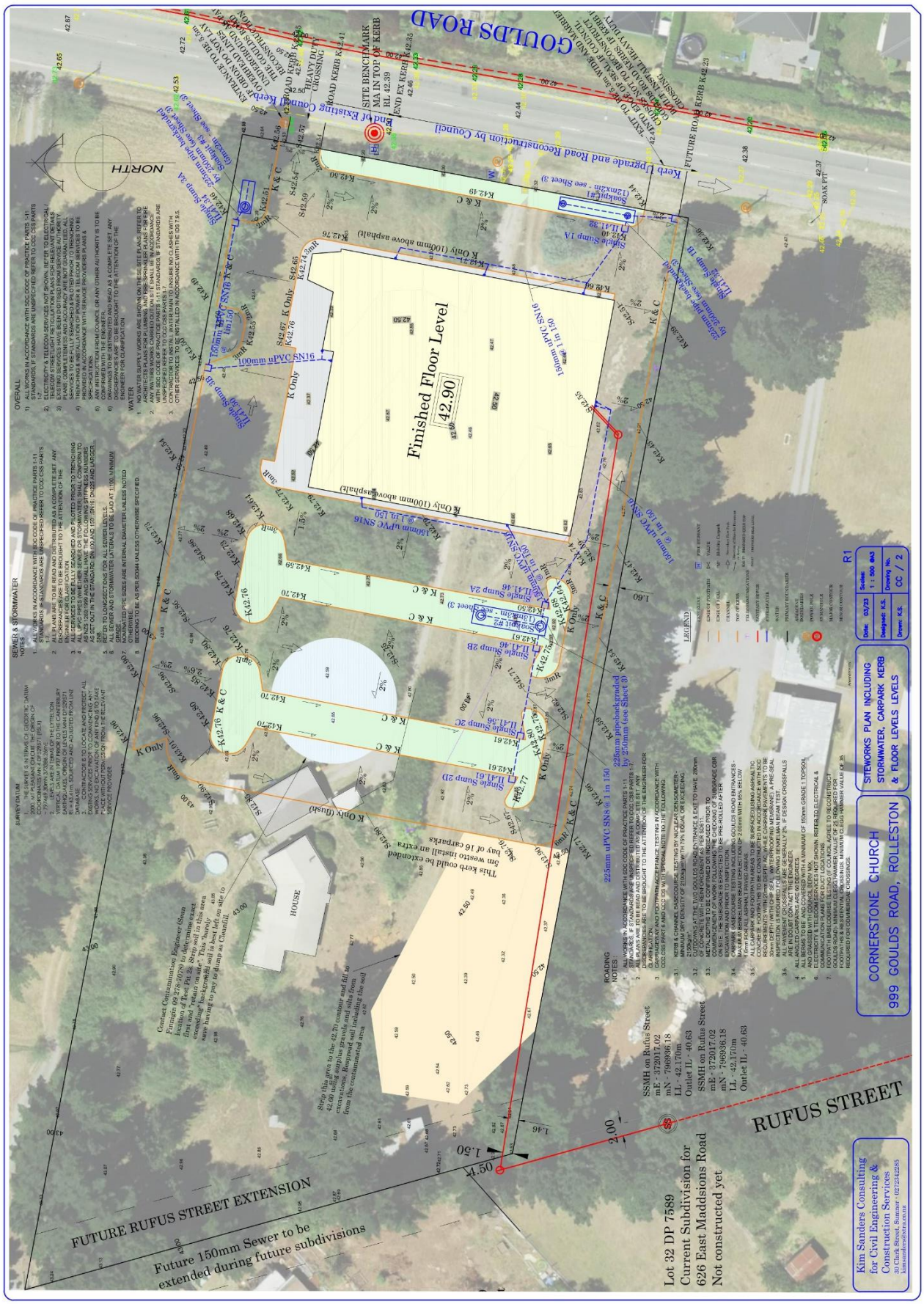
Sediment build-up shall be monitored and removed when necessary.

The facilities will also be checked at regular site meetings.

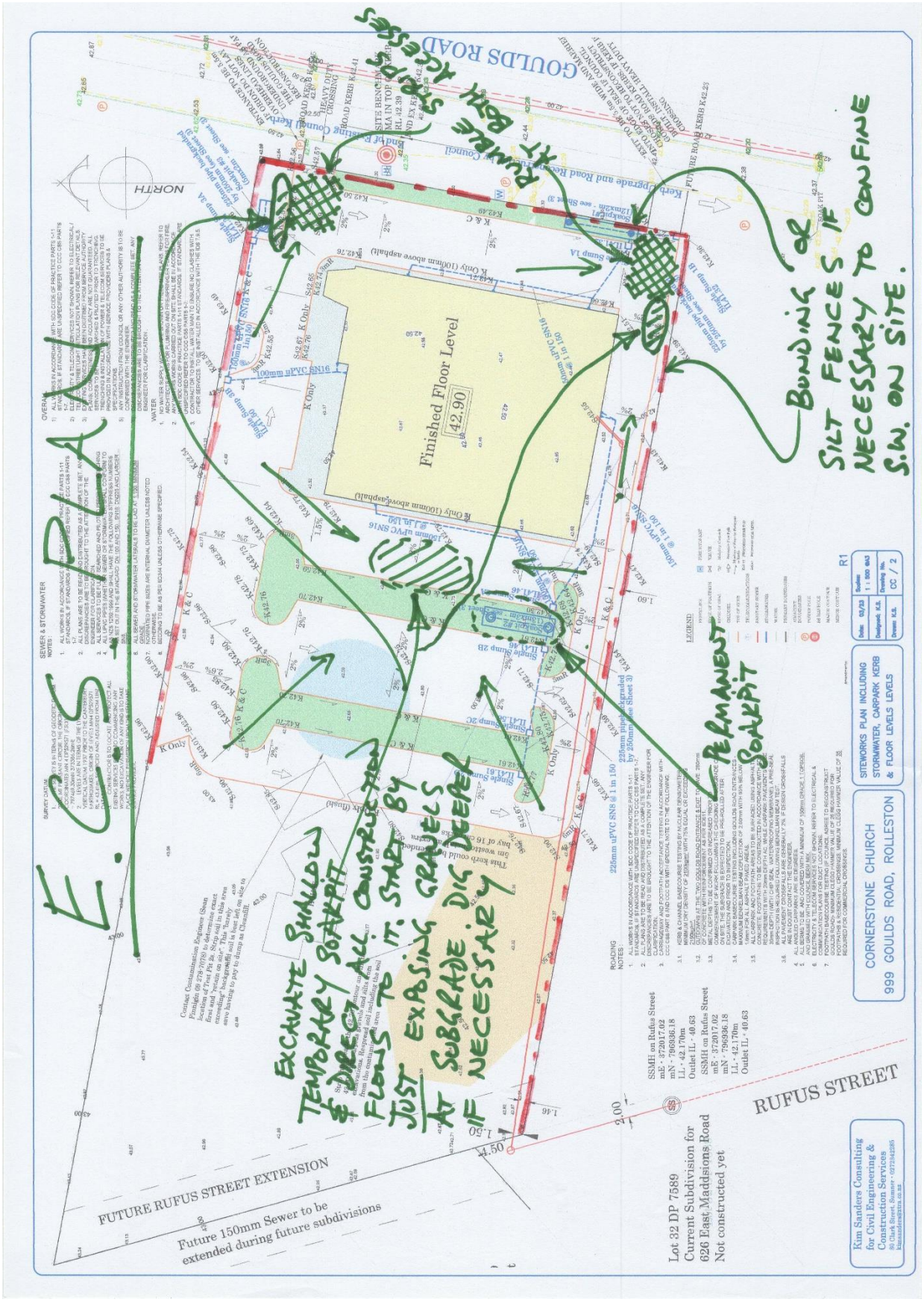
It remains the contractor's responsibility to ensure that sediment is not discharged from the site as a result of their activities. Should it become evident that the control measures specified in this document are failing to prevent erosion or sediment discharge then the contractor shall take further action to remedy this. The contractor is to be fully conversant with Environment Canterbury's Erosion and Sediment Control Guidelines but may contact the Siteworks Engineer to seek further advice on erosion and sediment control management.

## *6.0 Limitations*

This ESCP is set up for guidance, and a common sense approach to sediment control is expected. If the suggested works are not practical, it is expected that best practice principles (using the ECan excerpts listed below) are applied to achieve the best erosion & sediment control result possible.




**Appendix A – SITEWORKS PLAN including aerial**




**Appendix B – Erosion & Sediment Control Plan**

## Appendix C - "Excerpts from Environment Canterbury Erosion and Sediment Control Guidelines."



- check that chloride dust suppression agents have not been removed by excessive traffic movements, track runoff during wet conditions, routine grading or other haul road maintenance activities; and
- reapply as required to minimise dust generation.

**Decommissioning**

Soil binders and chloride dust suppression agents do not generally require a specific decommissioning procedure, because they are broken up and incorporated into the soil by routine earthmoving and/or construction activities.

### 6.3 Water management – concentrated water flows

#### 6.3.1 Perimeter diversion measures

**Description and purpose**

Perimeter diversion measures include:

- upslope diversions of clean run-on water;
- downslope diversions of dirty water.

**Upslope diversions of clean run-on water** (also called clean water diversions) intercept clean' run-on water – that is, runoff from above the earthworks site (this is 'clean' in the sense that it is not contaminated by sediment from the site itself) – and prevent it from entering work areas, site offices, stockpiles etc, then safely direct it to stable outlets for disposal.

This minimises the potential for erosion damage to the site, with a corresponding reduction in sediment loads and also reduces the volume of water needing treatment onsite, with a corresponding significant reduction in the size of most of the site's sediment control facilities.

Diverting significant quantities of water away from the work area also allows works to restart much sooner after rain and reduces the time and money needed to repair, maintain and/or rework the site and any associated drainage infrastructure.

Upslope diversions may be permanent drainage works, but are often 'long-term temporary' structures maintained for the duration of the earthworks. They may take the form of catch drains (usually lined with an erosion-resistant material such as needle-punched fabric), combination bank or bund with excavated upslope channel, or earthen bank (often made from compacted topsoil).

**Downslope diversion works** ('dirty water' diversions) generally collect sediment-laden runoff from below disturbed areas such as work sites, compound areas and stockpiles, and direct it to sediment treatment facilities.

Downslope diversions can be short, medium or long-term temporary structures maintained for the duration of the disturbance above them and are usually constructed by pushing site soils into a simple earthen bund or bank along the downslope perimeter of the work site.

All temporary diversion works must remain in place until the disturbed areas above them or below them, as the case may be, have been permanently stabilised against erosion.
Concentrated flows can also cause tunnel gullies (under-runners) to form along the channels. It is important to keep channels shallow to avoid getting into the subsoil, or armour them as suggested in sections 6.3.5 and 6.3.6.

**Where to use it**

✓DO use upslope diversions to intercept and divert all possible clean run-on water.

✓DO construct upslope diversions as one of the first steps in the land development process.

✓DO use downslope perimeter banks as a last line of defence to collect dirty site runoff water and direct it into sediment controls.

✓DO take care with excavations on very erodable soils such as the Port Hills. Channels may need to be carefully stabilised in these areas, for example with lime.

×DON'T discharge diversions onto unstable soils, unconsolidated fill slopes or directly over the unprotected bank of a stream.

×DON'T forget about sediment deposition in low-grade diversions. Schedule in a regular inspection and removal programme as sediment deposition can severely affect the capacity and function of the diversion channel.

**Limitations**

- It is often difficult to construct a channel bank or drain with the required channel capacity on steep slopes (greater than 20 percent).
- Access for maintenance can be difficult once construction activities have commenced – for example, unlined drains above steep slopes can become isolated.
- For unlined drains or channels, site topography and boundaries must allow for an alignment with even and stable channel grade (generally less than 2 percent). Protect channels from erosion where grades exceed 2 percent; for example, with temporary, geotextile fabric channel liner (section 6.3.5).
- Erodable or tunnelling subsoils may be exposed along the invert of excavated catch drains. If left unchecked, serious lower slope stability problems may result.
- All upslope diversions need a stable outlet. Paved drains need an energy dissipation structure.

### Design criteria

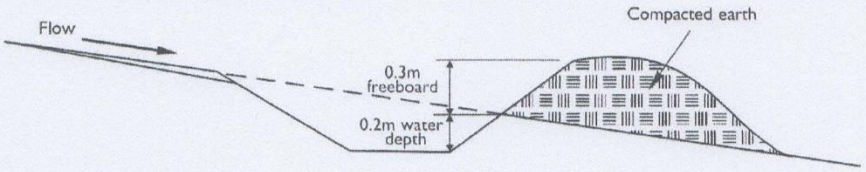
**Upslope diversions of 'clean' run-on water (clean water diversions)**

- Formally design all upslope perimeter diversions where catchments exceed 5 hectares.
- A standard 'low flow bank' arrangement may be used on sites below this threshold, as shown in Figure 6.3.
- Designed diversion works must have enough capacity to safely carry the peak runoff from the 10 minute, 5 percent AEP (20 year) storm (refer section 2.2 and Appendix A).
- Extend this capacity to include a minimum freeboard of 300 millimetres.
- Include all calculations, design notes, drawings, etc. in the site erosion and sediment control plan.
- Where practicable, choose a route for permanent structures that avoids trees, existing or proposed service infrastructure, existing or proposed fence lines and other natural or built features.
- Where design velocities generally exceed one metre per second, a channel liner is usually necessary to prevent scour (see section 6.3.5).
- Line temporary clean water diversions with needle-punched geotextile fabric (see section 6.3.5).
- Unlined temporary diversions with a design life longer than 60 days must be seeded and fertilised as soon as possible, but no later than within two weeks of construction.
- Outlets from all upslope perimeter diversions must discharge water so that the erosion hazard to downslope lands and waterways is no greater than that in the predevelopment condition, up to the design storm event.
- Include appropriate energy dissipation structures at the outlet of all paved drains.

**Downslope diversion works ('dirty' water diversions)**

- Formally design all downslope perimeter diversions where catchments exceed 5 hectares.
- A standard 'low flow bank' arrangement may be used on sites below this threshold as shown in Figure 6.3 below.
- Where practicable, choose a route for permanent structures that avoids trees, existing or proposed service infrastructure, existing or proposed fence lines and other natural or built features.
- Unless specifically designed, downslope perimeter banks should have a minimum compacted bank height of 600 millimetres and base width of 2,400 millimetres.
- All unlined perimeter diversions should aim to convey water at a velocity of less than one metre per second.
- Reduce water velocities by keeping gradients as low as possible (generally less than 2 percent).
- Where practicable, ensure a uniform grade along the invert of the bank, because sudden increases can cause scour, while sudden decreases may cause sediment to accumulate, causing the bank to overtop.

**Figure 6.3 Standard low flow bank**




Cross section

### Construction specifications

- Plan and construct all perimeter diversion works as part of the initial site establishment/development activities discussed in sections 4 and 5.
- Prioritise these works and install the most important upslope control measures first.
- Define the route and survey it to get the gradient right.
- Remove and correctly dispose of trees, brush, stumps, etc. along alignment.
- Remove and stockpile topsoil.
- Build unlined drains with a uniform grade along the invert, because sudden increases can cause scour, while sudden decreases may cause sediment to accumulate, causing the bank to overtop.
- Thoroughly compact all earthen banks by tracking with construction equipment.
- Take particular care to ensure that the channel does not erode. Robust channel liners may be necessary, particularly in erodable loess soils.
- Ensure finished cross section meets all design requirements; this is particularly important with drains lined with loose rock.

### Performance inspection and maintenance

Inspect weekly and before and after each rainfall event, and:

- check for scour along invert, and at or below the outlet;
- look for low spots, areas of water ponding and/or formation of tunnel gullies;
- check for sediment deposition and debris blockage;
- check for bank slumping and/or overtopping;
- check for holes in the ground that may indicate that tunnels are beginning to form, and, if any are found, promptly seal them off and fill them in and take any other water management action necessary to prevent further water ingress; and
- immediately repair, remove deposition or blockage and/ or reconstruct as required.

### Decommissioning

- Remove temporary structures only when all disturbed areas below the bank have been stabilised.
- Fill, compact and shape all disturbed areas to blend in with the finished landform.
- Stabilise all areas disturbed as part of the removal process; apply seed and fertiliser, protect with surface mulch or erosion-control blankets if required.

Useful tips

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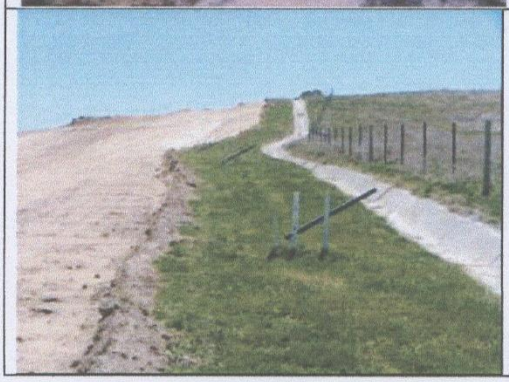
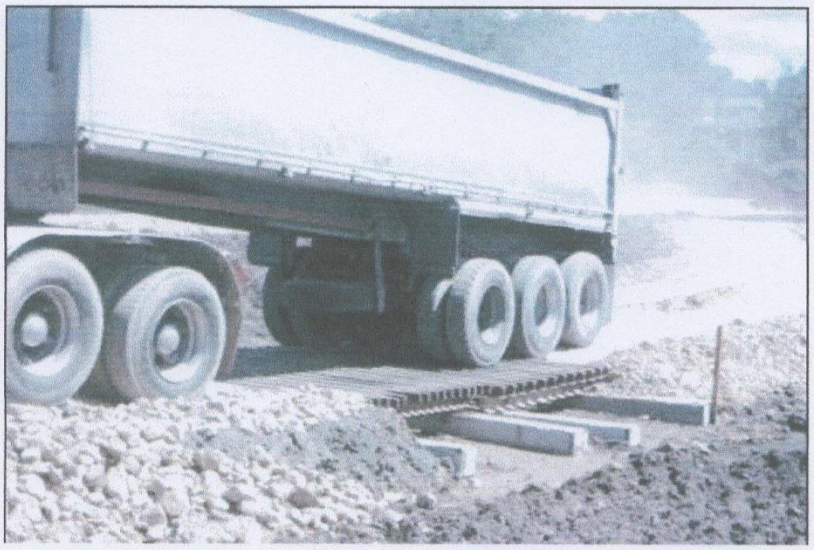
|---|---|
|  | ✓ Perimeter channel surveyed and well constructed.<br>✓ Constant 2 percent grade.<br>✓ 3:1 side slopes.<br>× Needs stabilisation (hydroseed, geotextile fabrics, etc.). |
|  | ✓ Good perimeter bund with some straw mulch stabilisation.<br>✓ Gentle slope to site which minimises erosion at the entry point to the diversion measure.<br>✓ All runoff from site captured by bund.<br>✓ Grade generally acceptable; any steeper would require stabilisation (e.g. needle-punched geotextile).<br>× More mulch, grass stabilisation needed on bund. |
|  | ✓ A low, raised earth bund can be effective on low-gradient sites. |

### 7.1.4 Site exit points



**Description and purpose**

Site exit points include all points where construction traffic leaves disturbed areas and enters sealed roadways or public streets. Devices here aim to remove mud or soil from tyres as vehicles leave the site, thereby reducing dust generation, mud tracking and/or sedimentation of stormwater systems.

Minimising sediment egress onto public roads also reduces road safety hazards.

A rock apron placed over a needle-punched geotextile fabric is the simplest form of site exit, but is only suited to small-scale development or building works. Shaker ramps are suited to most medium to large-scale developments; however, in some specific cases a semi-automatic high-pressure wheel wash system may be required to provide a more appropriate level of control.

**Where to use it**

- ✓DO locate rock aprons, shaker ramps or wheel wash stations as close as possible to the boundary of the works area.
- ✓DO use formalised site construction exits at all points where traffic will leave a site and enter a sealed roadway or a public street.
- ×DON'T use rock aprons as site exit points on sites larger than 1 hectare.
- ×DON'T locate site exit points on steep slopes, in areas of concentrated flows, or next to watercourses, streams or stormwater inlets.

### Limitations

- Rock aprons and shaker ramps will reduce sediment movement, but will not eliminate it completely.
- Operation and maintenance of semi-automatic, high-pressure wheel wash systems can be expensive, but will provide much higher efficiencies.
- All devices will require ongoing inspection and maintenance during wet conditions.

### Design criteria

- Temporary construction exits do not necessarily need to be located at the permanent site entry/exit point.
- Minimise the number of site exit points.
- Locate all site exit points so that departing vehicles cannot bypass these devices.
- Show the location and discuss the management of all site exit points in the erosion and sediment control plan.

#### Rock aprons

- Minimum dimensions are 15 metres long and either 3 metres wide (one-way exit) or 6 metres wide (two-way entry and exit).
- Fabricated from crushed rock or recycled concrete 50 to 75 millimetre diameter with a minimum thickness of 150 millimetres.
- Place the rock over a needle-punched geotextile fabric membrane.
- Continue the rock apron right up to the edge of the sealed pavement.
- Pass the runoff from the apron through an appropriate sediment control device.

#### Shaker ramps

- Fabricate a purpose-built shaker ramp (this may also include a wheel wash trough) or use a prefabricated cattle grid.
- Must be minimum of 5 metres long to allow at least one full revolution of a truck tyre. Two cattle grids should be placed one in front of the other to provide enough length.
- Locate shaker ramps as close to the edge of the sealed pavement as possible (considering public safety issues).
- Stabilise with rock or gravel the section of access road between the shaker ramp and the sealed pavement.
- Pass the runoff from the shaker ramp area and/or effluent wheel wash systems through an appropriate sediment control device.

### Construction specifications

- Plan and construct all site exit points as part of the initial site establishment/development activities discussed in section five.
- Construction traffic must not be permitted to bypass these structures; erect appropriate signage, barricades or temporary fencing to ensure all traffic passes over/through the site exit points.

#### Rock aprons

- Direct any surface water flows away from the apron area.
- Remove all topsoil from area beneath the rock apron.
- Working away from the edge of the sealed pavement, lay out needle-punched geotextile fabric and place rock to the required thickness.
- Pass the runoff from the apron area through a suitable sediment control device.

**Shaker ramps**

- Direct any surface water flows away from the ramp area.
- Place cattle grids or shaker ramps in the desired location and construct stabilised approach and departure ramps if required.
- Continue stabilised access track surface (e.g. gravel) from the device all the way to the edge of the sealed pavement; do not leave any sections of unstabilised track surface in between the shaker ramp and the sealed pavement.
- Pass the runoff from the grid/ramp area through a suitable sediment control device.

### Performance inspection and maintenance

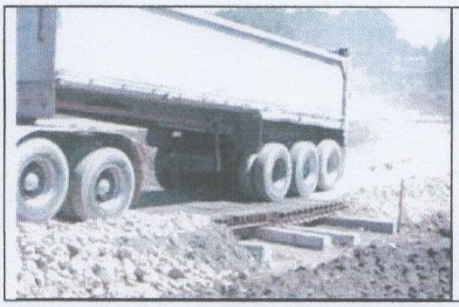
Inspect weekly and after each rainfall event and:

- remove accumulated sediments from beneath shaker ramps or from wheel wash sumps;
- top-dress rock apron with additional aggregate when mud blockage becomes evident; and
- remove sediments from sealed pavements by sweeping or vacuuming; do not allow sediment to be washed into the stormwater system or any adjoining water body.

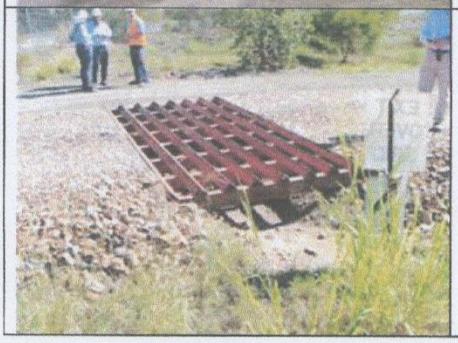
### Decommissioning

- Only remove the site exit points when all contributing access tracks and haul roads within the construction area have been stabilised.
- Remove rock from apron and reuse or incorporate into other works where practicable; dispose of geotextile fabric.
- Remove shaker ramps and reuse at another location/project.
- Remove stabilised approach/departure ramps and any other rock-stabilisation works; reuse or incorporate into other works where practicable.
- Stabilise all disturbed areas.
- Remove adjacent sediment control devices and safely dispose of accumulated sediments.

### Useful tips



- ✓ Two cattle grids have been placed one in front of the other to provide enough length.
- ✓ Section of access between shaker ramp and sealed pavement has been stabilised with rock (under drive wheels of truck).

| | |
|---|---|
|  | ✓ Rock apron has been placed over a geotextile membrane.<br>✓ Correct length and width.<br>× Poor location for site exit, immediately adjacent to stormwater inlet.<br>× Construction traffic can easily bypass the apron as they leave the site.<br>× Straw bale is serving no useful purpose. |
|  | ✓ High-pressure wheel wash systems may be required where a high standard of public safety and/or environmental protection is required. |
|  | ✓ A combination shaker ramp and wheel wash trough can be easily fabricated and moved from site to site.<br>✓ Section of access track between device and sealed pavement has been stabilised with rock (on left-hand side of device).<br>✓ Signposted (on right-hand side of device). |
|  | ✓ Signposted.<br>✓ Good roughness element to grid to shake mud and soil from tyres.<br>✓ Gravel protection to access between grid and sealed pavement.<br>× Not long enough: two grids should be placed one in front of the other. |

Common problems

| | |
|---|---|
|  | × Grid not long enough; minimum 15m required.<br>× No stabilisation between grid and sealed pavement. |
|  | × Rock apron has filled with soil and sediment and needs maintenance.<br>× No geotextile membrane under rock apron.<br>× Not long enough; minimum 15m required. |
|  | × Site exit point not being used, resulting in disturbance of other parts of the site and sediment being tracked off site. |