



Environmental Approval & Compliance Solutions

**Mission Beach Clump Point
Boating Infrastructure
Project:
Erosion and Sediment
Control Plan**

MGN Civil

Document Control Summary

NRA Environmental Consultants

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Report Summary	
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Abstract	Erosion and Sediment Control Plan (ESCP) construction for works at Clump Point Boat Ramp. Works include expansion of existing facilities and construction of a new breakwater. The ESCP has been prepared as per requirements for the contract, including TMR technical specification MRTS52 and best practice erosion and sediment control.

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Table of Contents

1. Introduction	1
1.1 ESCP objective and scope	1
1.2 Project location	2
1.3 Project description	3
1.4 Approach to construction	3
1.5 Persons responsible	5
1.6 Modifying the ESC measures	5
2. Site Conditions	7
2.1 Seasonal conditions	7
2.2 Soil types	7
2.3 Topography and drainage	8
2.4 Project-specific matters	8
3. Erosion and Sediment Control Measures	10
3.1 Erosion risk.....	10
3.2 The works area.....	10
3.3 Project schedule and prioritisation of works	12
3.4 Site establishment	12
3.5 Vegetation clearing.....	13
3.6 Drainage control measures	13
3.7 Erosion control measures.....	14
3.8 Sediment control measures.....	14
3.9 Dewatering control measures.....	14
3.10 Dust control measures.....	15
3.11 Removal of temporary ESC measures	15
3.12 Significant rain events	15
3.13 Design calculations.....	16
3.14 Monitoring and maintenance requirements	16
4. Monitoring and Review of the ESCP	20
4.1 Independent verifier.....	20
4.2 Independent audits	20
5. References	21

Tables

Table 1: Change management decision matrix	6
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Table 2: ESC measures.....	17
-----------------------------------	-----------

Graphs

Graph 1: Monthly rainfall average for Bingil Bay	7
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Figures

Figure 1: Project area	2
-------------------------------------	----------

Figure 2: Site set up.....	4
-----------------------------------	----------

Figure 3: Temporary erosion and sediment control measures	11
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Appendices

Appendix A: Land Detail and Hydrographic Survey Plans

Appendix B: Erosion and Sediment Control Design Specifications

1. Introduction

MGN Civil Pty Ltd (MGN) has been contracted by the Queensland Department of Transport and Main Roads (TMR) to complete the Clump Point Boating Infrastructure Project, as part of the Department of Transport and Main Roads (TMR) Marine Infrastructure Investment Program. The TMR contract number is CN-10244. NRA Environmental Consultants (NRA) was commissioned by MGN to prepare an Erosion and Sediment Control Plan (ESCP) for the construction works associated with the Clump Point Boating Infrastructure Upgrade Project (the Project). Due to the location and timing of the works, TMR has determined that the Project risk level, for the ESCP, is ‘high risk’.

This ESCP has been prepared in accordance with the TMR technical specification MRTS52 – Erosion and Sediment Control (dated July 2018), and with consideration of the following documents.

- Annexure MRTS52.1 for CN-10244.
- *Best Practice Erosion and Sediment Control* (IECA 2008).
- FNQROC Development Manual Specification S1 Earthworks (03/17).
- Site survey drawings (H900-007 and H900-013) issued by Queensland Hydrographic Services.
- Great Barrier Reef Marine Park Authority (GBRMPA) permits G18/38869.1 and G18/39785.1.
- Department of State Development, Manufacturing, Infrastructure and Planning permit (1711-2484).
- Site specific information presented in the *Mission Beach Clump Point Boating Infrastructure Project: Construction Environmental Management Plan* (MGN 2018a).
- Environmental Authority EPPR03740716.

This ESCP has been prepared by appropriately qualified and experienced Senior Environmental Scientist, Shannon Wetherall. Shannon has over 18 years’ experience in the environmental industry and prepared numerous ESCPs in North Queensland for Queensland Department of Transport and Main Roads (TMR) projects and construction projects. Shannon is certified in erosion and sediment control in north Queensland (Certificate No. 1003-001).

1.1 ESCP objective and scope

Erosion and sediment control (ESC) measures will be implemented to reduce soil degradation through minimising erosion, and to not cause environmental harm to water quality values by managing sedimentation.

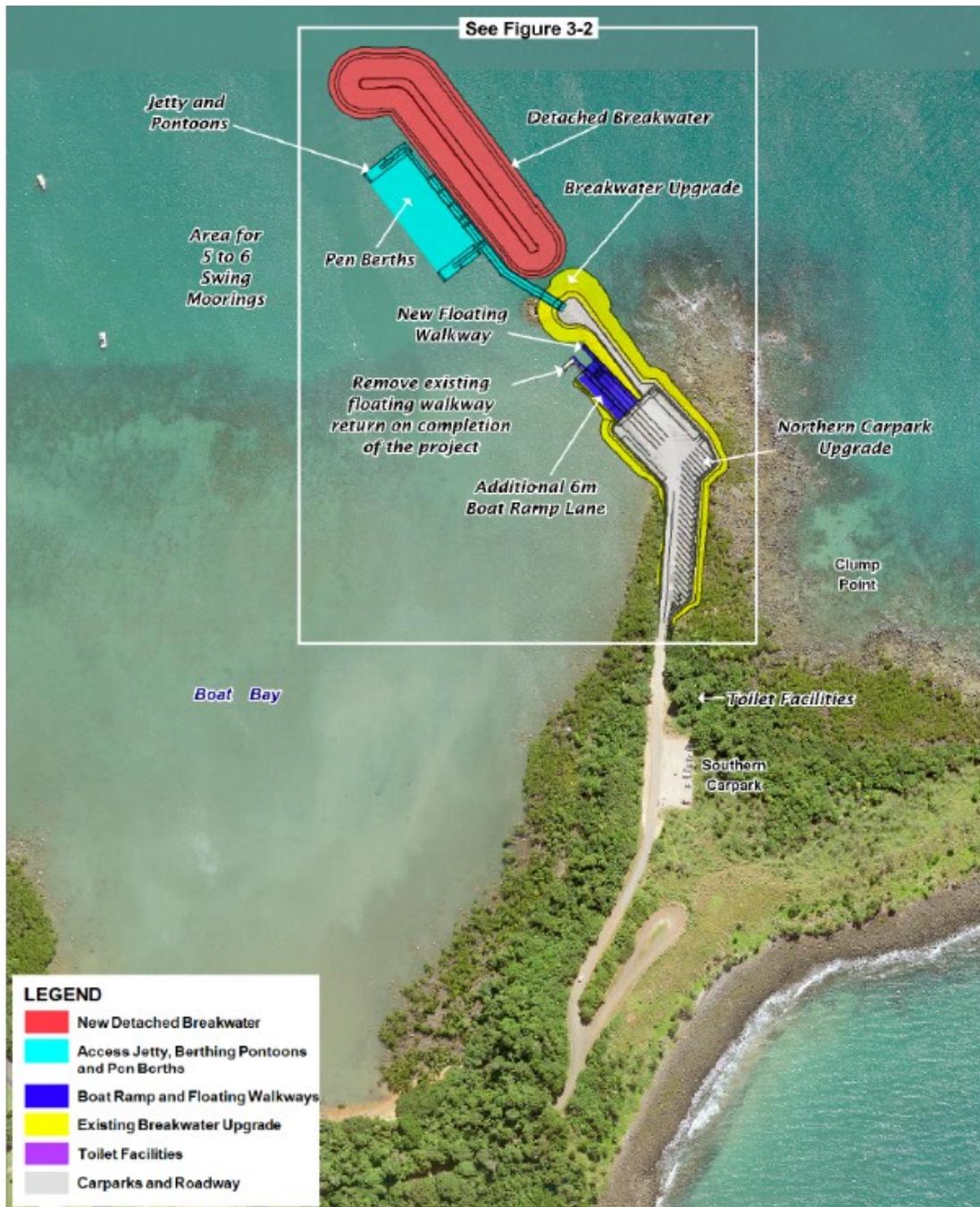
The ESC measures identified in this ESCP will be implemented during the construction phase of the project, and will be maintained until permanent measures have been installed, or the site has been stabilised and rehabilitated.

The scope of this ESCP is limited to temporary erosion and sediment control (ESC) measures to be employed during the construction phase of the project. Permanent ESC measures have been included in the construction design plans, where relevant (*eg* rock-armour).

1.2 Project location

The Project is located at Clump Point, which is approximately 110 km south of Cairns, in north Queensland. The receiving environment for waters that discharge from site include Boat Bay to the west and the open ocean (Coral Sea) to the north and east. These waters are within the Great Barrier Reef Marine Park. The receiving environment is of significant value, the importance of which is reflected in various legislation.

Works will occur in the marine environment, and on the adjacent headland. The Project site and layout of the design is provided in **Figure 1**. A culturally significant fish trap is located in Boat Bay, and the Project works have been designed to avoid this area.



Source: BMT (2018), figure 3-1.

Figure 1: Project area

1.3 Project description

The construction works will occur at an existing boat ramp facility (**Figure 1**), and will involve the following.

- Construction of a new detached breakwater.
- Upgrade of existing breakwater, including removal of existing breakwater return and reclamation of intertidal and subtidal land.
- Upgrade of northern and southern carparks.
- Upgrade of boat launching facility, including extension of the existing ramp, new heavy-duty boat ramp, and treatment of inner breakwater to bind armour.
- Construction of a composting toilet near the southern carpark.
- Installation of solar-powered navigational lighting and public access lighting.

1.4 Approach to construction

The site set up is shown on **Figure 2** and the proposed project sequence is as follows.

- Site establishment.
- Clearing of vegetation followed by filling of cleared area and expansion of northern carpark facility.
- Breakwater upgrade works.
- Upgrade of boat ramp facilities.
- Maintenance dredging works (undertaken as site conditions permit).

Specific construction methods for activities with distinct erosion and sediment control risk are outlined below.



Source: MGN, dated 30 December 2018.

Figure 2: Site set up

Vegetation clearing and northern carpark expansion

The northern carpark expansion will require vegetation clearing, removal of existing rock armour revetments, and placement of new clean fill rock material. Vegetation clearing will be carried out in accordance with the *Mission Beach Clump Point Boating Infrastructure Project: Vegetation Clearing Plan* (VCP) (NRA 2019a).

Where practicable, all works to remove and place rock will be undertaken during low tides to minimise the risk of erosion and sediment laden run-off from wave action. To minimise the disturbance footprint and limit the exposure of the rock fill to erosion from wave action, the

works will be undertaken progressively, with rock armouring installed on the newly filled area as the faces become available. Imported rock fill will be geotextile wrapped.

Maintenance dredging works

Maintenance dredging works will use an excavator to remove silt material from the tidal area at the existing boat ramp basin. Clean rock will be used to establish temporary access fingers in the basin, and this rock will be removed and incorporated into the site works once the dredging is completed. Prior to dredging, a silt curtain will be established around the perimeter of the maintenance dredging works.

The removed silt material will be temporarily stockpiled on the northern carpark area, near the boat ramp, and contained within an earthen bund. Where practicable, the stockpile area will drain towards the boat ramp basin. The silt will be stored until it is sufficiently dry and PASS (Potential Acid Sulfate Soil) testing confirms it is suitable for off-site disposal.

Breakwater upgrade

The upgrade of the existing breakwater involves multiple stages, and is the largest package of work in the project. The new breakwater structure is detached from the existing breakwater (which will also be modified as part of these works). Construction details relevant to ESC are noted below.

MGN plan to begin construction on the new breakwater, prior to upgrading the existing breakwater, this will require construction of a temporary access way along the existing breakwater.

Imported rock fill must be clean to prevent sediment introduction into the marine environment. All fill material will be placed on a geotextile layer placed on the sea floor.

The temporary access way will be removed at the end of the new breakwater construction.

Boat ramp upgrade

Upgrade works for the boat ramp will include removal of silt from the toe of boat ramp (following the same process and controls as the maintenance dredge activity) and then placement of geofabric wrapped crushed rock fill and subgrade. A silt curtain will be used to contain sediment from the boat ramp upgrade works.

1.5 Persons responsible

The nominated person responsible for the implementation of this ESCP will be the MGN Site Engineer for the Clump Point Boat Ramp construction works.

1.6 Modifying the ESC measures

It is possible that some ESC measures will require modification as the project is constructed and in response to the performance of ESC measures or changes in project circumstances. The modifications may be considered minor, moderate or significant. Moderate and minor changes will occur, and it is expected that significant modifications will be the exception. If significant erosion events occur (*eg* failure of controls through undermining or sedimentation), significant changes to the measures used will be required and should be approved by an Appropriately Qualified Person (AQP) (as per TMR MRTS52 requirements).

To accommodate the range of circumstances likely to occur, a change management decision matrix is presented in **Table 1**.

Table 1: Change management decision matrix

Authority required	Minor	Moderate		Significant
	Maintenance of all structures	Removal or relocation of minor temporary controls	Permanent measure relocation	Permanent measure removal / Revisions to ESCP
Site Supervisor	✓	✗	✗	✗
Responsible Person (Site Engineer)	-	✓	✗	✗
Appropriately Qualified Person in Erosion and Sediment Control	-	-	✓	✓
Consulting Engineer	-	-	✓	✓

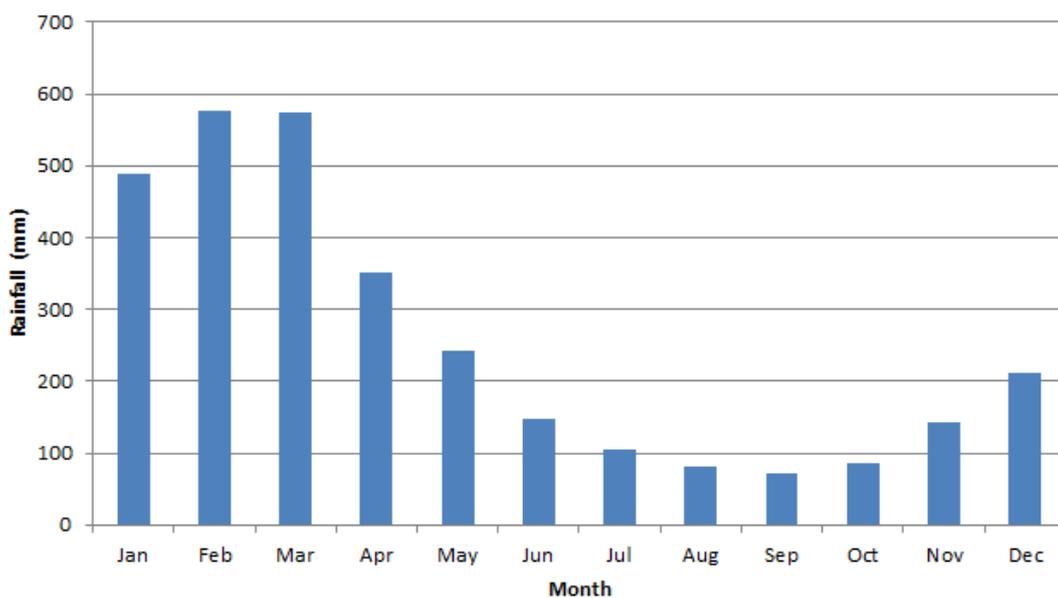
✓ Authorised to undertake; ✗ Not authorised to undertake; - denotes that authority level is not required.

Minor temporary controls refers to sandbag check dams, sediment fence, *etc.* Permanent measure relocation refers to rock armour and rehabilitation.

2. Site Conditions

2.1 Seasonal conditions

The project area, located in the north Queensland wet tropics, experiences distinct wet and dry seasons. The wet season is nominally November to April, when the highest rainfall occurs (**Graph 1**). During the wet season, there is a heightened risk of erosion and sediment issues resulting from construction activities. This is reflected in the ‘high’ risk level nominated by TMR for this ESCP. The controls identified in this ESCP have been derived considering this risk level, and noting that significant rainfall events may occur at any time of the year.



Source: BoM (2019)

Graph 1: Monthly rainfall average for Bingil Bay

2.2 Soil types

The soils of the project area have been mapped by Murtha (1986) as the *Eubenangee* series, which are described as a red gradational textured soils formed on basalt that are often weakly lateralised. Clay content in the reported profile description increases from 48-49% at the top, to 57% at the bottom (profile described to a depth of 1.5 m). Chemical data indicates that the Eubenangee soils are not sodic and not saline.

Aurecon (2014a) conducted a soil and geotechnical survey of the area (primarily for the project area in the marine environment) and identified sands in shallow waters (0 to -1 m AHD), with rock and clay in slightly deeper waters (below -1 m AHD). Photography of the area¹ and the proposed construction methodology (MGN 2018) suggests rock over PASS (or simply marine sediments) in the area of vegetation removal.

¹ Publicly available images observed from Google Street view.

The marine floor along the alignment of the breakwater expansion was identified by Aurecon (2014b) as a ‘sandy bottom’ with occasional rocks.

2.3 Topography and drainage

The site is relatively flat with a general slope less than 1-2% towards the north eastern corner of Clump Point, and the majority of stormwater generated under existing conditions is overland flow (MGN 2019a). There are no rivers or creeks in the area, and run-off reports to the adjacent marine environment.

The northern carpark has a low level of formal stormwater drainage infrastructure. Sheet flow is expected across the carpark, generally from the carpark centre area to its perimeter. The lowest point of the carpark is on the eastern perimeter, adjacent to the lowest point of the proposed cleared area (as shown on the Queensland Government Hydrographic Services plan No. H900-013). A copy of the land detail surveys and hydrographic survey for the project is provided in **Appendix A**. These details were used to inform the flow direction for run-off at the project site.

Some of the area proposed for vegetation clearing is within tidal influence, and works in this area will require specific management to minimise sediment laden run-off from the Project entering the marine environment.

2.4 Project-specific matters

Some of the activities to be undertaken for the Project are regulated under Queensland and/or Commonwealth legislation. Where required, permits/approvals have been obtained for these works. Some of the permit/approvals include conditions relevant to ESC; these have been summarised here and incorporated into this ESCP where relevant.

Vegetation clearing

Clearing remnant vegetation in Queensland requires a development approval. For the Project, DA 1711-2484 prescribes the conditions relevant to vegetation clearing for the Clump Point works. A Vegetation Clearing Plan has been prepared for the works (NRA 2019a) and it outlines the following controls to minimise disturbance and ESC risk.

- The area not to be cleared will be clearly marked with boundary tape or webbing and signage.
- Mangrove vegetation that is cleared will be cut at ground level, leaving the root system intact.
- Vegetation that is not mangrove will be cleared with heavy plant and a chain saw operator.
- Loose soil and other debris will be removed from the intertidal zone.

Maintenance dredging

The maintenance dredging activity will occur in the Great Barrier Reef Marine Park, and is an environmentally relevant activity (ERA) under the Queensland *Environmental Protection Act* 1994 (*ie* ERA 16-(1a) dredging >1000 t but <10,000 t per year). The following permits have been obtained by TMR for the maintenance dredging activity:

- Permit G18/38869.1 (granted 26/10/18 to 31/10/2028), from the Australian Government Great Barrier Reef Marine Park Authority (GBRMPA) and Queensland Government Department of Environment and Science (DES).

- Environmental Authority (EA) EPPR03740716 (effective from 1/4/16), from the Queensland Government Department of Environment and Heritage Protection.

Although the GBRMPA permit for maintenance dredging works does not include specific requirements for sediment control, a silt curtain will be used for the maintenance works to control sediment generated by the activity. The EA has specific conditions relating to ESC for the maintenance dredging, as follows.

- EA Condition DG2: *The only contaminants to be released to surface waters are turbid plumes within the bounds of a silt curtain, to waters described as Clump Point boat ramp navigational channel in accordance with Table 2 – Surface water release limits and the associated monitoring requirements.*

Table 1 – Surface water release limits

Release Point(s) Description	Quality characteristic (units)	Limit	Limit Type	Minimum monitoring frequency
<i>The bounds of a silt curtain</i>	<i>Turbid plumes</i>	<i>No visible turbid plume</i>	<i>Maximum</i>	<i>Continuous visual monitoring</i>

- EA condition DG2 associated monitoring requirements: *Monitoring must be undertaken at all reasonable times during the dredging campaign and at the frequency stated.*

Water quality monitoring for the effectiveness of the silt curtain is detailed in the project Water Quality Management Plan (WQMP) (NRA 2019b).

Breakwater

TMR has obtained a permit (G18/39785.1, granted 5/7/18 to 30/6/2038) from the GBRMPA and DES for the breakwater works, which will be undertaken in the Great Barrier Reef Marine Park. The permit requires a sediment curtain (*ie* silt curtain) to be deployed as part of the CEMP.

The deployment of silt curtains in unsheltered, open waters for the breakwater works is considered impractical, as follows.

- Conditions other than calm seas may result in reduced effectiveness of a silt curtain and may cause a loss of contained sediment.
 - Heavy seas may result in the sediment curtain breaking a mooring line and becoming entangled elsewhere in the environment.
- The agitation of the anchor chains and silt curtain on the sea floor (due to wave action) may induce a sustained sediment load greater than the sediment that may be produced by the proposed works during the work day.

As such, silt curtains will not be used in open waters as an erosion and sediment control measure for the breakwater works. Other control measures to reduce the generation of sediment (where practicable) have been identified in this ESCP, and water quality monitoring (NRA 2019b) will determine the effectiveness of the controls and identify if corrective actions are required. A silt curtain will be used in the sheltered waters of Boat Bay for the maintenance dredging works. The silt curtain may also be used to contain sediment from breakwater works that occur adjacent to the maintenance dredging area.

3. Erosion and Sediment Control Measures

The ESC measures in this ESCP have been selected with consideration of:

- the timing of the construction works (*ie* commencement in late wet season with the majority of works to be completed during the dry season)
- the construction schedule and approach
- the soil types and landform slopes in the project area
- the drainage pathways and receiving environment
- the materials available for use during the construction phase
- the restricted nature of the land area to implement ESC measures.

A summary of the temporary ESC structures to be used, including the location, timing and maintenance for each structure, is included in **Table 2**. The locations of ESC measures are shown on **Figure 3**. Specifications and drawings for the ESC measures described below were obtained from IECA (2008) and are provided in **Appendix B**.

3.1 Erosion risk

In Annexure MRTS52.1, the erosion risk for this project was nominated by TMR as ‘high’ with no change to the risk for different times of the year (items 2.1 and 2.2 in MRTS52.1 for CN-10244).

3.2 The works area

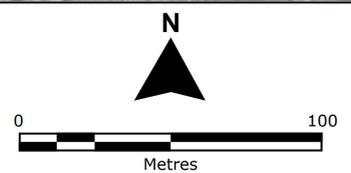
The works area for the project includes the following.

- The existing southern carpark, which will be used for site parking, demountable buildings and equipment storage.
- Toilet facilities to be constructed, at the northern end of the southern carpark.
- The northern carpark, which will be used for temporary delivery laydown and stockpiling and will be upgraded as part of the works, including minor expansion.
- The maintenance dredging area, which is within the existing boat ramp and breakwater area.
- The breakwater upgrade, which will extend the existing breakwater by approximately 185 m out to sea.



Figure 3: Temporary erosion and sediment control measures

Project: Mission Beach Clump Point Boating Infrastructure Project: Erosion and Sediment Control Plan



Source: Source: © MGM Civil 2018, Queensland Globe

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3.3 Project schedule and prioritisation of works

The high risk areas for erosion and sediment control for this project are the works to be undertaken within, or immediately adjacent to the marine environment which involve disturbance to soil or sediments (*eg* maintenance dredging).

The works program will be staged to reduce the amount of disturbed ground at any one time, and to complete surface stabilisation and/or rehabilitation as quickly as possible. This will be achieved by implementing the following.

- Undertake disturbance to marine sediments over as short as time as possible.
- Undertake major soil disturbance works during the dry season only. This includes temporary stockpiling of material removed during the maintenance dredging and boat ramp upgrade works, which will be temporarily stored on-site to dewater prior to further handling and transporting.
- Remove dredged material from site as soon as it has been sufficiently dewatered for handling and transport.
- Permanently stabilise or seal areas as soon as possible and prior to the end of the 2019 dry season.
- Complete rehabilitation of disturbed areas in accordance with the project Rehabilitation Plan (included as an appendix in NRA 2019a), and prior to the 2019 dry season.
- Temporary ESC measures will remain in place until permanent ESC measures have been installed, or the site has been sufficiently stabilised.

There is limited capacity for materials storage on-site, and the construction schedule involves expansion of the northern carpark as a priority to increase the area available for the construction works.

The ESC measures nominated below must be installed as soon as practicable and before relevant disturbance activities.

3.4 Site establishment

Appropriate site establishment is an important measure for ESC. The following controls will be implemented.

- Clearly mark disturbance areas on-site. The Vegetation Clearing Plan (VCP) (NRA 2019a) identifies the clearing areas for the project.
- Clearly mark exclusion zones, where identified on the construction plans or in the project CEMP (MGN 2018a), on-site and/or identify these areas to project personnel (*eg* culturally significant fish trap area).
- Establish the site entry/exit point at the commencement of the works. All access to the project will occur through this point. The site entry/exit will be established on the southern side of the existing southern carpark, and will use appropriately sized rock to remove sediment from vehicle tyres prior to leaving the construction area. If excessive sediment is observed being moved on tyres between the northern and southern carpark areas, a second entry/exit point may be installed at the southern end of the northern carpark upgrade area.
- Install a small whoa-boy (earthen diversion bank) on the track at the southern end of the northern carpark area to divert water from up-gradient of the proposed cleared area to existing vegetated areas. Sand bags (natural fibre) will be placed at the ends of the whoa-boy to trap any sediment in run-off water.

- Establish sediment controls around the temporary stockpile area(s) in the northern carpark. The type and location of the controls will be dependent on the materials being stockpiled. For example, clean large rock will not require sediment controls, however soil/silt stockpiles will require sediment control. These are discussed below for each construction stage.
- Ensure that materials for ESC measures are available on-site (eg sediment fence, natural fibre sand-bags).

3.5 Vegetation clearing

Vegetation clearing is required and will be managed as per the VCP (NRA 2019a). The following ESC measures are to be used to during vegetation clearing activities.

- Clearly mark areas to be cleared.
- Where practicable, stage clearing works so that only areas required for the immediate works are cleared.
- Undertake vegetation clearing activities during dry conditions, and not during the wet season.
- Where vegetation clearing occurs above the high tide mark, install sediment fences on the downslope side, to trap sediment laden run-off water.
- Manage vegetation clearing as per the VCP. This includes:
 - cutting mangroves at ground level to leave roots *in situ* and prevent disturbance to the soils
 - mulching and stockpiling cleared vegetation in the northern carpark area
 - if mulch will not be used during construction or rehabilitation for the project, transport the mulched material from site and manage as green waste as soon as practicable (note that mulch is recommended for use as an ESC measure below, and sufficient supplies should be retained on-site for this purpose).
- Store all soil stripped during construction (including topsoil and subsoil) in a bunded area, and cover the soil material (to protect from wind and rain). Refer to the VCP for direction on topsoil preservation and management.

3.6 Drainage control measures

The following drainage control measures will be implemented to manage water flows on disturbed areas.

- When disturbing the ground, ensure that drainage pathways are not altered or concentrated, unless otherwise directed by this ESCP.
- Use flow diversion banks (DB)² (or earthen bund) or mulch filter berms (MFB) to divert overland flow around stockpiles and disturbance areas. The location of all temporary stockpiles has not been shown on **Figure 3**, as the locations will be dependent on the site activity works.

² Note that a diversion bank is different to a diversion drain, and therefore does not trigger design requirements listed in Table 10.2 of MRTS52.

3.7 Erosion control measures

Bare exposed soils in the project area will require erosion protection during rainfall events. Erosion control measures to be implemented are as follows.

- Complete construction works, rehabilitation and site stabilisation as soon as possible, and prior to the on-set of the 2019/2020 wet season.
- Cut mangrove vegetation at ground level, leaving the root structure intact (as per the VCP).
- Do not stockpile soil more than 2 m high. Where practicable, and where stockpiles will remain for more than 2 weeks, cover the stockpiles with mulch or plastic to prevent raindrop impact and wind erosion.
- Compact road surfaces and seal/stabilise as soon as possible.
- Install geofabric on the sea floor prior to placing rock for the breakwater upgrade and expansion.

3.8 Sediment control measures

Sediment laden run-off generated as a result of the construction works will be managed by diverting the run-off to naturally vegetated areas (where possible) and, where necessary, passing through temporary sediment control measures, as follows.

- Retain naturally vegetated areas to trap sediment in run-off from the existing track between the southern and northern carpark areas.
- Use sediment fences (SF) to trap sediment laden run-off in overland flow from disturbed areas.
- Use mulch filter berms to trap sediment laden run-off from soil stockpiles (alternatively, a sediment fence may be used).
- Use sandbags (natural fibre) to trap sediment laden run-off in channelized flow, where required (*eg* at the end of the whoa-boy across the access track).
- Use only clean rock (*ie* free from loose soil material) for the breakwater and rock protection works.
- For works in the enclosed water marine environment (*ie* maintenance dredging, boat ramp upgrade and some of the breakwater works), use silt curtains³ to contain mobilised sediment. The curtain must remain in place until the suspended sediment has sufficiently settled (as determined by water quality monitoring).
- For works in the open water marine environment (*ie* the breakwater upgrade), material must be placed into position using suitable heavy plant. Material must not be dumped out of handling trucks into the marine environment.

3.9 Dewatering control measures

For dewatering activities, *ie* for the sediment removed during the maintenance dredging, the following controls will be implemented.

- A designated dewatering area will be established near to the existing boat ramp. Where practicable, the stockpile area will be located within the catchment reporting to the maintenance dredging area.

³ In addition to being best practices, silt curtains are a requirement of the EA for maintenance dredging, and of GBRMPA permit G18/39785.1 for reclamation works.

- Establish a mulch filter berm or diversion bank (earthen bund) on the downslope edge of the dredged material stockpile to trap and filter drainage waters from the removed silt.
- As soon as the stockpiled material is able to be handled and transported, remove the material from site for appropriate disposal.

3.10 Dust control measures

The following measures will be implemented to minimise dust erosion from the proposed activities.

- Disturbance footprints will be minimised.
- Vegetation clearing and topsoil stripping will not be undertaken during excessively windy conditions.
- Soil stockpiles will be no more than 2 m tall and will be covered if left in place for more than 2 weeks.
- Water trucks will dampen the work areas, as necessary. The requirement for water trucks will be managed by visual observation by site personnel.
- Disturbed areas will be sealed, stabilised or rehabilitated as soon as practicable.
- Respond to all dust complaints promptly.

3.11 Removal of temporary ESC measures

All temporary ESC measures such as sediment fence and sand bags will be removed once the site has stabilised. Synthetic fibres used in temporary ESC (*eg* sediment fence) should be removed no later than when the project is demobilised in December 2019. This is to prevent sections of sediment fence becoming torn and washing into the receiving waters where it may become a hazard to wildlife.

Guidance on the removal of ESC measures is included in **Table 2**.

3.12 Significant rain events

The majority of the disturbance works for the project are scheduled to occur during the 2019 dry season. Notwithstanding this, the possibility remains for significant rainfall events to occur during the construction period. As previously documented, the receiving environment for the project is of significant value, and sediment laden run-off during rainfall events requires awareness and appropriate management, as follows.

- For the project, a significant rainfall event is any event which may generate run-off leaving the site.
- Where rainfall is forecast to occur at the project within 24 hours, the environmental representative will inspect all ESC measures that are in place, and identify if new controls are needed.
- Where reparation action is required, or new ESC measures are needed, these will be prioritised in the daily works schedule.
- Plastic cover will be placed on soil stockpiles, including the material removed during the maintenance dredging works.
- No excavation works will be undertaken during rainfall.
- Water quality monitoring, as per the WQMP (NRA 2019b) will be implemented as necessary.

For Tropical Cyclone events, refer to the project Severe Weather Management Plan (SWMP) (MGN 2019b).

3.13 Design calculations

ESC measures that are Prescribed Engineering Service (PES) must be certified by a Registered Professional Engineer of Queensland (RPEQ). MGN have RPEQ staff capable of ESC measure design certification, however no designs requiring this certification have been detailed in this ESCP.

3.14 Monitoring and maintenance requirements

As the construction works progress to different stages, the ESC measures will require progressive installation (or removal). The requirement for ESC measures will be identified as part of the daily work tasks.

The ESC measures will be monitored by the environmental representative on a daily basis, and inspections will be recorded. Where repair is required, these will be completed within 48 hours, or prior to rainfall, whichever is sooner.

Following rainfall events that generate run-off, the environmental representative will inspect each ESC measure. Repair works (*eg* removal of sediment, repair of scour) will be completed within 48 hours, or prior to rainfall, whichever is sooner.

The environmental representative will monitor the rainfall forecast daily. Where rainfall is forecast to occur over 24 hours, or over the weekend, all ESC measures that are in place will be inspected. Where repair is required, these will be prioritised in the daily works schedule.

Visual monitoring of the receiving water will be undertaken during all in-water construction activities (see NRA 2019b). In the event that turbid plumes are seen beyond ESC measures (*ie* silt curtains) or 10 m from construction activities, physical monitoring is required. Investigation and suitable mitigation measures shall be undertaken to rectify the source of turbid waters.

The discharge limits (performance criteria) for water leaving ESC measures at the project site is 50 mg/L total suspended solids (TSS). Refer to the project WQMP (NRA 2019b) for further information on monitoring site locations, parameters and criteria.

Table 2: ESC measures

ESC measure	Where and how to be used	When and how to install	When to remove	Monitoring and maintenance	Performance measure
Site Entry/Exit	<ul style="list-style-type: none"> At the point of entry/exit for the project area to control sediment on vehicle tyres exiting the site, <i>ie</i> on the south side of the southern carpark. If excessive sediment is observed being tracked between the northern carpark and southern carpark areas, install a second entry/exit on the south side of the northern carpark. 	<ul style="list-style-type: none"> At the commencement of the project, prior to commencing ground disturbance or vegetation removal. Maintain run-off towards the disturbed areas of the project site. Minimum 10 m length, 2 m width, 75 – 150 mm clean rock. 	<ul style="list-style-type: none"> At the completion of the project, after disturbed areas have stabilised. 	<ul style="list-style-type: none"> Inspect the approach to the project site (<i>ie</i> Clump Point Lookout Road) regularly for excessive sediment or erosion. Maintain run-off from the rock pad towards the disturbed areas of the project site. Replenish with rock when the pad becomes full of sediment. 	<ul style="list-style-type: none"> No sediment tracked from site. No sediment-laden run-off from the rock pad immediately to the receiving environment.
Whoa-boy	<ul style="list-style-type: none"> Whoa-boys are small earthen diversion banks/cross banks installed on access tracks to reduce flow velocities and direct run-off to vegetated areas. Install the whoa-boy on the access track to the south of the northern carpark. 	<ul style="list-style-type: none"> At the commencement of the project. 	<ul style="list-style-type: none"> At the completion of the project, after disturbed areas have stabilised. 	<ul style="list-style-type: none"> Inspect the whoa-boy following rainfall events. Remediate with soil material. Review source of scour and re-instate whoa-boy if required. Use natural fibre sand bags to reduce flows and at the end of the whoa-boy. 	<ul style="list-style-type: none"> Drainage along access track is diverted to naturally vegetated areas and does not run onto the northern carpark construction area. Run-off from the whoa-boy does not cause erosion to the surrounding vegetated area.
Sediment Fence	<ul style="list-style-type: none"> In areas of overland flow, downslope of disturbed areas, or stockpiled soil, to trap sediment in run-off water. Note: sediment fence should not be placed in areas which will be inundated by tides. 	<ul style="list-style-type: none"> For vegetation cleared areas, install prior to, or as soon as possible (and before rainfall) following vegetation clearing. For temporary stockpiles, as soon as the soil stockpile is established (if an earthen bund or mulch filter berm are not used). 	<ul style="list-style-type: none"> After the disturbed areas have been stabilised. For stockpile areas, after the stockpile material has been removed. 	<ul style="list-style-type: none"> Inspect sediment fence before and following rainfall events. Remove built-up sediment and dispose of in a suitable manner that will not cause erosion or remobilise the sediment to drainage lines. Repair scour around or under the sediment fence and repair with additional sediment fence if required. 	<ul style="list-style-type: none"> Mobilised sediment is captured. No undermining. No collapsing. No run-off around edges of sediment fence.

ESC measure	Where and how to be used	When and how to install	When to remove	Monitoring and maintenance	Performance measure
		<ul style="list-style-type: none"> Keyed 200 mm into the ground, stakes at 3 m intervals, 1 m returns placed at intervals of <50 m. 			
Mulch Filter Berm (MFB)	<ul style="list-style-type: none"> Vegetation removed during clearing will be mulched and stockpiled. The mulch may be used to established MFB upslope of stockpile areas, or downslope to capture sediment laden run-off. 	<ul style="list-style-type: none"> As soon as vegetation is mulched. Minimum 0.3 m high, 0.5 m crest, 1.5 m base. 	<ul style="list-style-type: none"> After the stockpile material has been removed. 	<ul style="list-style-type: none"> Inspect MFB before and following rainfall events. Repair scour along the MFB, as needed. Check for integrity (weak spots that allow concentrated flows), repair as required. 	<ul style="list-style-type: none"> Mobilised sediment is captured. No undermining. No break-throughs. No run-off around edges of the MFB.
Diversion bank (or earthen bund)	<ul style="list-style-type: none"> Around stockpiles, to divert clean water around stockpiles and retain sediment laden water within the stockpile area. 	<ul style="list-style-type: none"> As soon as stockpiles are established. 	<ul style="list-style-type: none"> After the stockpile material has been removed. 	<ul style="list-style-type: none"> Inspect the diversion bank (or earthen bund) before and following rainfall events. Repair scour along the bank, as needed. Check for integrity (weak spots that allow concentrated flows), repair as required. 	<ul style="list-style-type: none"> Clean water is diverted around the stockpile. Mobilised sediment is retained. No break-throughs. If water discharges from the stockpile area to the receiving environment, the discharged water quality meets the water quality criteria in the WQMP.
Silt curtain	<ul style="list-style-type: none"> In the enclosed water marine environment, to trap sediment mobilised during maintenance dredging, boat ramp upgrade and breakwater works near to shore. 	<ul style="list-style-type: none"> Prior to activities that may generate suspended sediment in the marine environment. 	<ul style="list-style-type: none"> After suspended sediment has settled (to be confirmed by visual observation and water quality monitoring). 	<ul style="list-style-type: none"> Inspect silt curtains daily. If sediment plumes are observed escaping from the silt curtain, cease the sediment generating activity immediately and investigate cause of the escaped plume. Undertake water quality monitoring as per the WQMP (NRA 2019b). 	<ul style="list-style-type: none"> Water quality monitoring criteria, in the WQMP (NRA 2019b) are achieved.

ESC measure	Where and how to be used	When and how to install	When to remove	Monitoring and maintenance	Performance measure
Ground disturbance stabilisation	<ul style="list-style-type: none"> All disturbed area will be stabilised. Stabilisation may include compaction, gravel protection, rock armour, concrete, vegetative cover. 	<ul style="list-style-type: none"> As areas are completed. 	<ul style="list-style-type: none"> To remain permanently. 	<ul style="list-style-type: none"> Inspect stabilisation works after rainfall events and remediate where needed. 	<ul style="list-style-type: none"> No loose soil material. Rehabilitation completed in accordance with the project Rehabilitation Plan (provided as an Appendix in NRA 2019a).

4. Monitoring and Review of the ESCP

4.1 Independent verifier

Technical specification MRTS52 requires that contracts classified as a high erosion risk in their project MRTS52.1 annexure receive independent verification for their ESCP suitability.

No independent verifier has been nominated at this time.

4.2 Independent audits

Audits will be undertaken during the construction phase of the project to assess compliance of the ESC measures against the following.

- TMR technical specification MRTS52 (dated July 2018)
- The accepted ESCP for the project
- ESC principles in section 1.4 of MRTS52 (dated July 2018)
- Discharge limits (refer to section 3.14).

The audit will be undertaken by an independent appropriately qualified person⁴.

The audits will be undertaken at the following frequency.

- One audit immediately following vegetation clearing.
- One audit during maintenance dredging.
- One audit at the completion of major earthworks.
- Final audit at practical-completion stage.

The auditor will prepare an independent audit report which MGN will provide to TMR with proposed and completed actions to address identified issues. This report and associated actions will be provided to TMR within seven days following the audit.

Where non-conformances and incidents relating to erosion and sediment control occur, these will be managed as per the requirements in the MGN Construction Environmental Management Plan for the Project.

⁴ An appropriately qualified person (AQP) is defined in MRTS52. An example of someone likely to be an AQP for erosion and sediment control matters is a Certified Professional in Erosion and Sediment Control (CPESC).

5. References

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MGN 2019b, *Severe Weather Management Plan - Mission Beach Clump Point, Boating Infrastructure Project, Element 1: CN-10244*, MGN Civil Pty Ltd, Hemmant, 15 January 2019.

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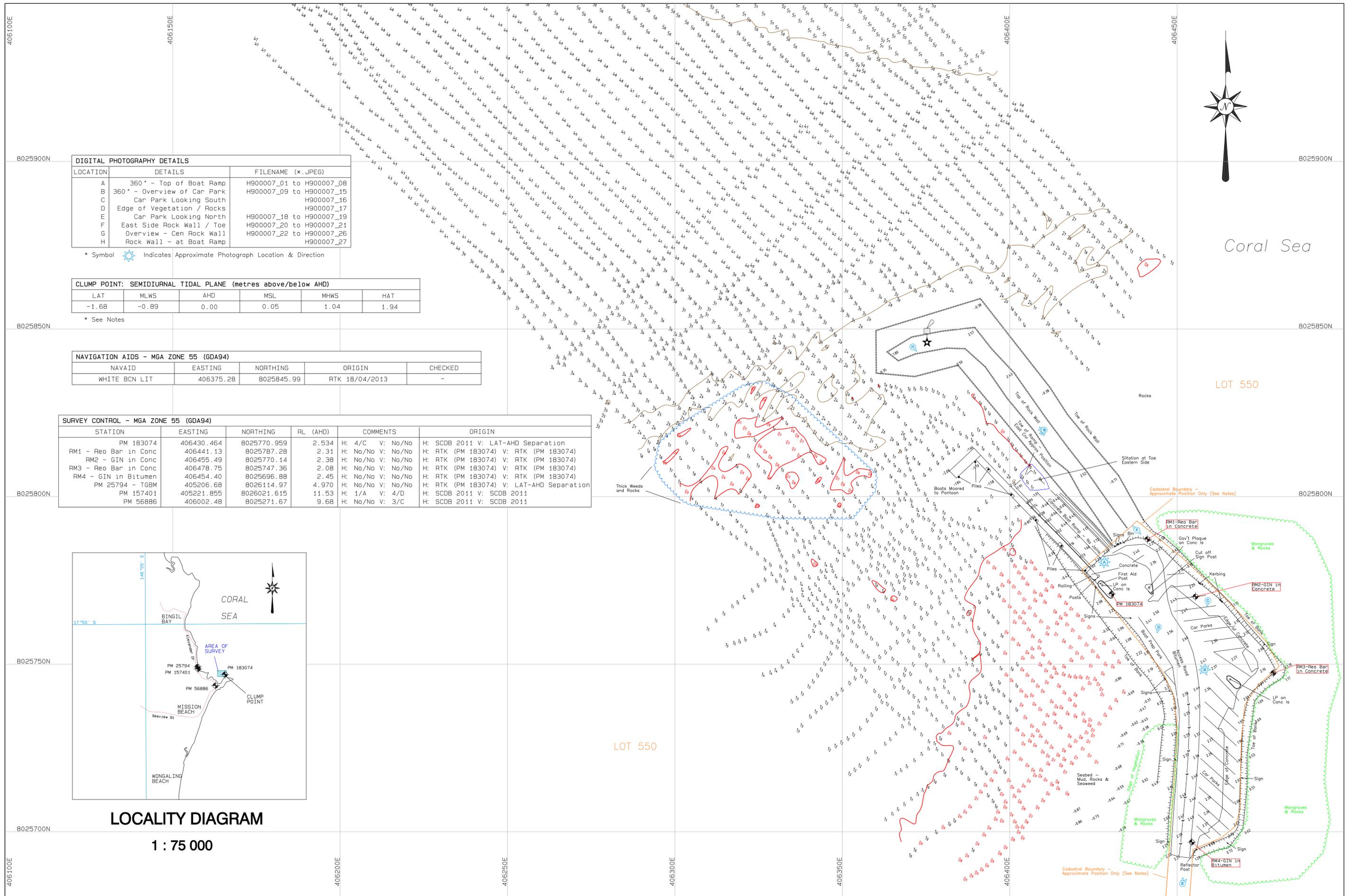
NRA 2019a, *Mission Beach Clump Point Boating Infrastructure Project: Vegetation Clearing Plan*, R01 (Working copy), prepared by NRA Environmental Consultants for MGN Civil 22 January 2019.

NRA 2019b, *Mission Beach Clump Point Boating Infrastructure Project: Water Quality Monitoring Program*, R01 (Working copy), prepared by NRA Environmental Consultants for MGN Civil 22 January 2019.

Qld 2013, *Clump Point Boat Ramp Hydrographic and Land Detail Survey Plan No. H900-007*, Queensland Government Department of Transport and Main Roads, 20 April 2013.

Qld 2017, *Clump Point Boat Ramp Land Detail Survey Plan No. H900-013 (sheet 2 of 2)*, Queensland Government Department of Transport and Main Roads, 20 July 2017.

Appendix A:
Land Detail and Hydrographic
Survey Plans



DIGITAL PHOTOGRAPHY DETAILS		
LOCATION	DETAILS	FILENAME (*.JPEG)
A	360° - Top of Boat Ramp	H900007_01 to H900007_08
B	360° - Overview of Car Park	H900007_09 to H900007_15
C	Car Park Looking South	H900007_16
D	Edge of Vegetation / Rocks	H900007_17
E	Car Park Looking North	H900007_18 to H900007_19
F	East Side Rock Wall / Toe	H900007_20 to H900007_21
G	Overview - Cen Rock Wall	H900007_22 to H900007_26
H	Rock Wall - at Boat Ramp	H900007_27

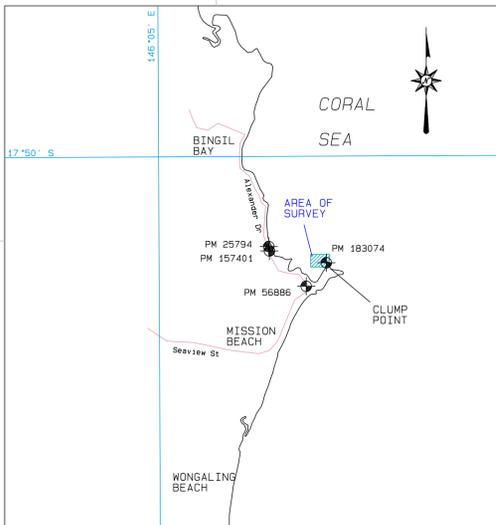
* Symbol Indicates Approximate Photograph Location & Direction

CLUMP POINT: SEMIDIURNAL TIDAL PLANE (metres above/below AHD)					
LAT	MLWS	AHD	MSL	MHWS	HAT
-1.68	-0.89	0.00	0.05	1.04	1.94

* See Notes

NAVIGATION AIDS - MGA ZONE 55 (GDA94)				
NAVAID	EASTING	NORTHING	ORIGIN	CHECKED
WHITE BCN LIT	406375.28	8025845.99	RTK 18/04/2013	-

SURVEY CONTROL - MGA ZONE 55 (GDA94)					
STATION	EASTING	NORTHING	RL (AHD)	COMMENTS	ORIGIN
PM 183074	406430.464	8025770.959	2.534	H: 4/C V: No/No	H: SCDB 2011 V: LAT-AHD Separation
RM1 - Reo Bar in Conc	406441.13	8025787.28	2.31	H: No/No V: No/No	H: RTK (PM 183074) V: RTK (PM 183074)
RM2 - GIN in Conc	406455.49	8025770.14	2.38	H: No/No V: No/No	H: RTK (PM 183074) V: RTK (PM 183074)
RM3 - Reo Bar in Conc	406478.75	8025747.36	2.08	H: No/No V: No/No	H: RTK (PM 183074) V: RTK (PM 183074)
RM4 - GIN in Bitumen	406454.40	8025696.88	2.45	H: No/No V: No/No	H: RTK (PM 183074) V: RTK (PM 183074)
PM 25794 - TGBM	405206.68	8026114.97	4.970	H: No/No V: No/No	H: RTK (PM 183074) V: LAT-AHD Separation
PM 157401	405221.855	8026021.615	11.53	H: 1/A V: 4/D	H: SCDB 2011 V: SCDB 2011
PM 56886	406002.48	8025271.67	9.68	H: No/No V: 3/C	H: SCDB 2011 V: SCDB 2011



LOCALITY DIAGRAM

1 : 75 000

NOTES:
 1) This survey meets the mandatory class requirements as outlined in the MSD document 'Standards for Hydrographic Surveys within Queensland Waters V1.3'.
 2) Contours are computer generated to hydrographic standard (inclusive).
 3) Soundings coloured to -1.0m AHD for clearance purposes.
 4) Coastline digitised from aerial photography to approximate only.
 5) Semidiurnal Tidal Plane obtained from Queensland Tide Tables 2013.
 6) Cadastral boundaries are indicative only and are not to be used for the purpose of reinstatement or design. For actual property boundary locations consult a registered cadastral surveyor.
 7) Western corner of boat ramp toe located. Eastern corner of boat ramp toe unable to be accurately located due to siltation and field conditions.
 8) Horizontal position check carried out over PM 15740

Horizontal Datum		MGA Zone 55 (GDA94)	
Base Station	Easting	Northing	
PM 183074	406430.464	8025770.959	
Vertical Datum		AHD based on PM 25794 (RL 4.970m)	
Tide Notes			
* Soundings reduced to datum using QINSY v8.0 software and the Leica 1230 GG RTK GPS survey system.			
* PM 25794 is the tide gauge bench mark for TSN 035002B			
* AHD derived from LAT-AHD separation value			
Depth Tolerance	Horizontal Tolerance	Weather	
0.2m	1.5m	5 - 10 knots SE	

Vessel	GG MAXON
Echo Sounder	ATLAS DESO 300
Heave meter	LEICA 1230 GG RTK GPS
Horizontal Positioning	LEICA 1230 GG RTK GPS
Data Collection/Processing	QINSY v8.0 TERRACON 10.61H
Tidal Reference Station	TSN 035002B

SOUNDINGS (m)	2.5 below datum 2.7 above datum
LEVELS (m)	2.5 below datum

SCALE 1 : 500 AT A1

CLASS C

CLIENT
Engineering & Technology Marine Infrastructure

Signature	P FINGER
Hydrographic Surveyor	T REISE
Checked	



CLUMP POINT BOAT RAMP
 HYDROGRAPHIC AND LAND DETAIL SURVEY
 20 APRIL 2013

Copyright The State of Queensland 2013 (Transport and Main Roads)

Plot File: H900007.pdf
 Job No: M0040006
 Plan No: **H900-007**



NOTES:
 1) Horizontal position check carried out over PM 157401.
 2) Semi-diurnal Tidal Plane obtained from Queensland Tide Tables 2017.
 3) Background data shown in blue taken from plan number H900-007 (03/04/2013).
 4) Cadastral Boundaries have been sourced from the Digital Cadastral Database (DCDB) and are approximate only. They should not be used for reinstatement or set-out. For actual property boundaries consult a licensed Cadastral Surveyor.

Horizontal Datum	MGA Zone 55 (GDA84)	Eastings	406430.464	Northing	8025770.959
Base Station	PM 183074				
Vertical Datum	AHD based on	PM 25794 RL 4.970m			
Tide Note	JHD of PM25794 based on LAT-AHD separation from Tidal Station 150350028 - Clump Point Storm Surge Vertical control referenced to PM183074 RL2.53 AHD				
Depth Tolerance	0.2m	Horizontal Tolerance	1.5m	Weather	5 - 10 knots SE
Vessel	N/A	Echo Sounder	N/A	Heave-meter	N/A
Horizontal Positioning	LEICA GS10 RTK GNSS				
Data Collection/Processing	LEICA GS10 RTK GNSS Terramodel 10.61				
Tidal Reference Station	TSN 035002B				

SOUNDINGS (m)	2.5 below datum	0.7 above datum
LEVELS (m)	0.99 above datum	0.13 below datum

CLASS	N/A
CLIENT	PMD

Signature	
Hydrographic Surveyor	C Brocklehurst
Checked	D Ning



Queensland Government
HYDROGRAPHIC SERVICES
Ph: 07 5506 5500
Email: hydro@maq.qld.gov.au

CLUMP POINT BOAT RAMP
LAND DETAIL SURVEY
20 JULY 2017

Plot File: H900013P2.PDF
Job No: M0040012
Plan No:
H900-013
SHEET 2 of 2

Appendix B:
Erosion and Sediment Control
Design Specifications

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND CONSTRUCTION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE LOCATION FOR THE BANK, CLEARING ONLY THE AREA THAT IS NEEDED TO PROVIDE ACCESS FOR PERSONNEL AND EQUIPMENT.

3. REMOVE ROOTS, STUMPS, AND OTHER DEBRIS AND DISPOSE OF THEM PROPERLY. DO NOT USE DEBRIS TO BUILD THE BANK.

4. FORM THE BANK FROM THE MATERIAL, AND TO THE DIMENSION SPECIFIED IN THE APPROVED PLANS.

5. IF EARTH IS USED, THEN ENSURE THE SIDES OF THE BANK ARE NO STEEPER THAN A 2:1 (H:V) SLOPE, AND THE COMPLETED BANK MUST BE AT LEAST 500mm HIGH.

6. IF FORMED FROM SANDBAGS, THEN ENSURE THE BAGS ARE TIGHTLY PACKED SUCH THAT WATER LEAKAGE THROUGH THE BAGS IS MINIMISED.

7. CHECK THE BANK ALIGNMENT TO ENSURE POSITIVE DRAINAGE IN THE DESIRED DIRECTION.

8. THE BANK SHOULD BE VEGETATED (TURFED, SEEDED AND MULCHED), OR OTHERWISE STABILISED IMMEDIATELY, UNLESS IT WILL OPERATE FOR LESS THAN 30 DAYS OR IF SIGNIFICANT RAINFALL IS NOT EXPECTED DURING THE LIFE OF THE BANK.

9. ENSURE THE EMBANKMENT DRAINS TO A STABLE OUTLET, AND DOES NOT DISCHARGE TO AN UNSTABLE FILL SLOPE.

MAINTENANCE

1. INSPECT FLOW DIVERSION BANKS AT LEAST WEEKLY AND AFTER RUNOFF-PRODUCING RAINFALL.

2. INSPECT THE BANK FOR ANY SLUMPS, WHEEL TRACK DAMAGE OR LOSS OF FREEBOARD. MAKE REPAIRS AS NECESSARY.

3. CHECK THAT FILL MATERIAL OR SEDIMENT HAS NOT PARTIALLY BLOCKED THE DRAINAGE PATH UP-SLOPE OF THE EMBANKMENT. WHERE NECESSARY, REMOVE ANY DEPOSITED MATERIAL TO ALLOW FREE DRAINAGE.

4. DISPOSE OF ANY COLLECTED SEDIMENT OR FILL IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

5. REPAIR ANY PLACES IN THE BANK THAT ARE WEAKENED OR IN RISK OF FAILURE.

REMOVAL

1. WHEN THE SOIL DISTURBANCE ABOVE THE BANK IS FINISHED AND THE AREA IS STABILISED, THE FLOW DIVERSION BANK SHOULD BE REMOVED, UNLESS IT IS TO REMAIN AS A PERMANENT DRAINAGE FEATURE.

2. DISPOSE OF ANY SEDIMENT OR EARTH IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

3. GRADE THE AREA AND SMOOTH IT OUT IN PREPARATION FOR STABILISATION.

4. STABILISE THE AREA BY GRASSING OR AS SPECIFIED IN THE APPROVED PLAN.

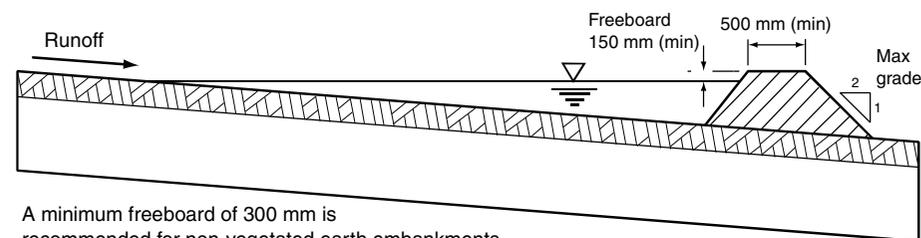
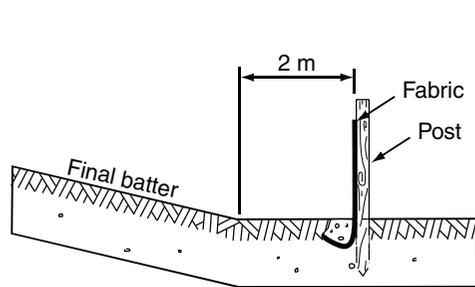


Figure 1 - Typical profile of flow diversion bank formed from earth

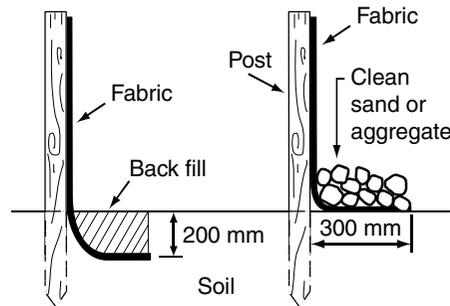
Table 1 - Recommended dimensions of flow diversion banks

Parameter	Earth banks	Vegetated banks	Compost berms	Sandbag berms
Height (min)	500 mm	500 mm	300 mm	N/A
Top width (min)	500 mm	500 mm	100 mm	N/A
Base width (min)	2500 mm	2500 mm	600 mm	N/A
Side slope (max)	2:1 (H:V)	2:1 (H:V)	1:1 (H:V)	N/A
Freeboard	300 mm	150 mm	100 mm	50 mm

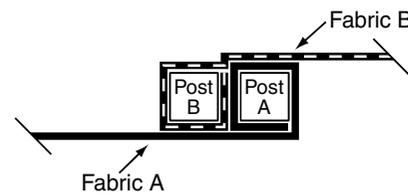
Drawn:	Date:		
GMW	Dec-09	Flow Diversion Banks	DB-01



(a) Location of fence relative to base of slope

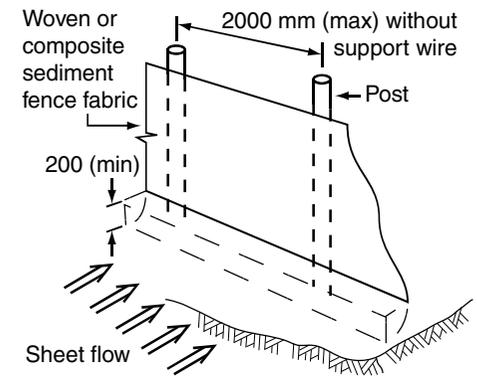


(b) Anchoring base of fabric

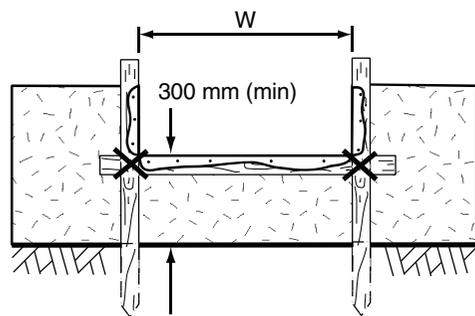


Fabric to fold around each stake one full turn. Stake B to be drive tightly against Stake A. The tops of both stakes to be secured with wire.

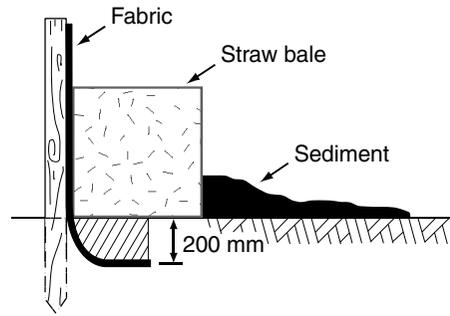
(c) Joining fabric - Method 1



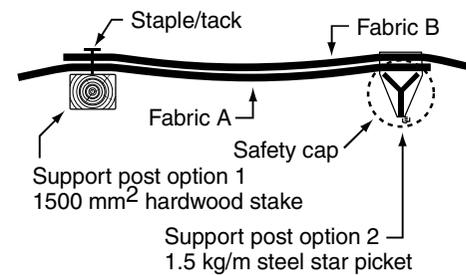
(d) Installation without backing support



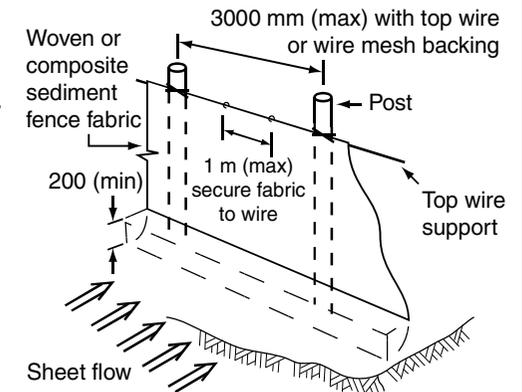
(e) Spill-through weir



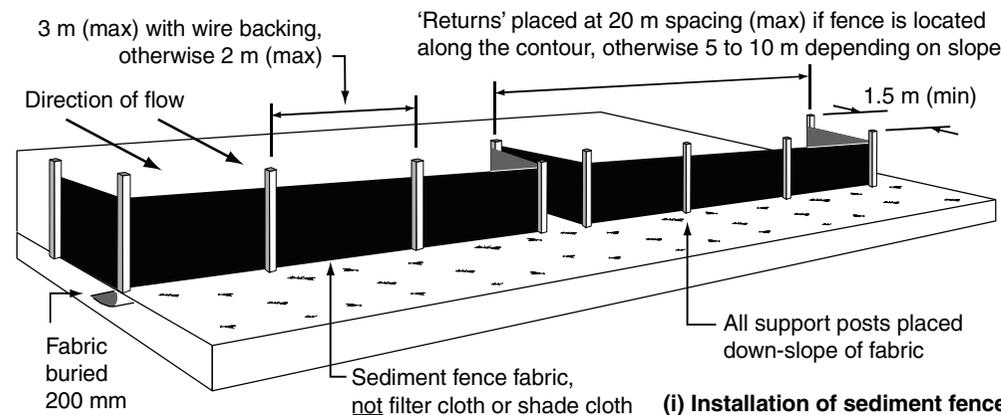
(f) Placement of up-slope straw bale



(g) Joining fabric - Method 2



(h) Installation with top wire support



(i) Installation of sediment fence

Notes:

1. Sediment fence to be installed along a line of constant ground elevation wherever practical.
2. Both end of the sediment fence to extend up the slope at least 1m.
3. Support post to be spaced a maximum 2m unless the fence is supported by a top wire or wire mesh backing, in which case 3m maximum spacing.
4. Fence 'returns' shall be installed at maximum 20m spacing if fence is installed along the contour, otherwise 5 to 10m maximum spacing.
5. Minimum 4 staples or tie wires per stake.

Drawn:	Date:		
GMW	Dec-09	Sediment Fence	SF-01

MATERIALS

FABRIC: POLYPROPYLENE, POLYAMIDE, NYLON, POLYESTER, OR POLYETHYLENE WOVEN OR NON-WOVEN FABRIC, AT LEAST 700mm IN WIDTH AND A MINIMUM UNIT WEIGHT OF 140GSM. ALL FABRICS TO CONTAIN ULTRAVIOLET INHIBITORS AND STABILISERS TO PROVIDE A MINIMUM OF 6 MONTHS OF USEABLE CONSTRUCTION LIFE (ULTRAVIOLET STABILITY EXCEEDING 70%).

FABRIC REINFORCEMENT: WIRE OR STEEL MESH MINIMUM 14-GAUGE WITH A MAXIMUM MESH SPACING OF 200mm.

SUPPORT POSTS/STAKES: 1500mm² (MIN) HARDWOOD, 2500mm² (MIN) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PICKETS SUITABLE FOR ATTACHING FABRIC.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION, EXTENT, AND REQUIRED TYPE OF FABRIC (IF SPECIFIED). IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, FABRIC TYPE, OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. TO THE MAXIMUM DEGREE PRACTICAL, AND WHERE THE PLANS ALLOW, ENSURE THE FENCE IS LOCATED:

- (i) TOTALLY WITHIN THE PROPERTY BOUNDARIES;
- (ii) ALONG A LINE OF CONSTANT ELEVATION WHEREVER PRACTICAL;
- (iii) AT LEAST 2m FROM THE TOE OF ANY FILLING OPERATIONS THAT MAY RESULT IN SHIFTING SOIL/FILL DAMAGING THE FENCE.

3. INSTALL RETURNS WITHIN THE FENCE AT MAXIMUM 20m INTERVALS IF THE FENCE IS INSTALLED ALONG THE CONTOUR, OR 5 TO 10m MAXIMUM SPACING (DEPENDING ON SLOPE) IF THE FENCE IS INSTALLED AT AN ANGLE TO THE CONTOUR. THE 'RETURNS' SHALL CONSIST OF EITHER:

- (i) V-SHAPED SECTION EXTENDING AT LEAST 1.5m UP THE SLOPE; OR
- (ii) SANDBAG OR ROCK/AGGREGATE CHECK

DAM A MINIMUM 1/3 AND MAXIMUM 1/2 FENCE HEIGHT, AND EXTENDING AT LEAST 1.5m UP THE SLOPE.

4. ENSURE THE EXTREME ENDS OF THE FENCE ARE TURNED UP THE SLOPE AT LEAST 1.5m, OR AS NECESSARY, TO MINIMISE WATER BYPASSING AROUND THE FENCE.

5. ENSURE THE SEDIMENT FENCE IS INSTALLED IN A MANNER THAT AVOIDS THE CONCENTRATION OF FLOW ALONG THE FENCE, AND THE UNDESIRABLE DISCHARGE OF WATER AROUND THE ENDS OF THE FENCE.

6. IF THE SEDIMENT FENCE IS TO BE INSTALLED ALONG THE EDGE OF EXISTING TREES, ENSURE CARE IS TAKEN TO PROTECT THE TREES AND THEIR ROOT SYSTEMS DURING INSTALLATION OF THE FENCE. DO NOT ATTACH THE FABRIC TO THE TREES.

7. UNLESS DIRECTED BY THE SITE SUPERVISOR OR THE APPROVED PLANS, EXCAVATE A 200mm WIDE BY 200mm DEEP TRENCH ALONG THE PROPOSED FENCE LINE, PLACING THE EXCAVATED MATERIAL ON THE UP-SLOPE SIDE OF THE TRENCH.

8. ALONG THE LOWER SIDE OF THE TRENCH, APPROPRIATELY SECURE THE STAKES INTO THE GROUND SPACED NO GREATER THAN 3m IF SUPPORTED BY A TOP SUPPORT WIRE OR WEIR MESH BACKING, OTHERWISE NO GREATER THAN 2m.

9. IF SPECIFIED, SECURELY ATTACH THE SUPPORT WIRE OR MESH TO THE UP-SLOPE SIDE OF THE STAKES WITH THE MESH EXTENDING AT LEAST 200mm INTO THE EXCAVATED TRENCH. ENSURE THE MESH AND FABRIC IS ATTACHED TO THE UP-SLOPE SIDE OF THE STAKES EVEN WHEN DIRECTING A FENCE AROUND A CORNER OR SHARP CHANGE OF DIRECTION.

10. WHEREVER POSSIBLE, CONSTRUCT THE SEDIMENT FENCE FROM A CONTINUOUS ROLL OF FABRIC. TO JOIN FABRIC EITHER:

- (i) ATTACH EACH END TO TWO OVERLAPPING STAKES WITH THE FABRIC FOLDING AROUND THE ASSOCIATED STAKE ONE TURN, AND WITH

THE TWO STAKES TIED TOGETHER WITH WIRE; OR
(ii) OVERLAP THE FABRIC TO THE NEXT ADJACENT SUPPORT POST.

11. SECURELY ATTACH THE FABRIC TO THE SUPPORT POSTS USING 25 X 12.5mm STAPLES, OR TIE WIRE AT MAXIMUM 150mm SPACING.

12. SECURELY ATTACH THE FABRIC TO THE SUPPORT WIRE/MESH (IF ANY) AT A MAXIMUM SPACING OF 1m.

13. ENSURE THE COMPLETED SEDIMENT FENCE IS AT LEAST 450mm, BUT NOT MORE THAN 700mm HIGH. IF A SPILL-THROUGH WEIR IS INSTALLED, ENSURE THE CREST OF THE WEIR IS AT LEAST 300mm ABOVE GROUND LEVEL.

14. BACKFILL THE TRENCH AND TAMP THE FILL TO FIRMLY ANCHOR THE BOTTOM OF THE FABRIC AND MESH TO PREVENT WATER FROM FLOWING UNDER THE FENCE.

ADDITIONAL REQUIREMENTS FOR THE INSTALLATION OF A SPILL-THROUGH WEIR

1. LOCATE THE SPILL-THROUGH WEIR SUCH THAT THE WEIR CREST WILL BE LOWER THAN THE GROUND LEVEL AT EACH END OF THE FENCE.

2. ENSURE THE CREST OF THE SPILL-THROUGH WEIR IS AT LEAST 300mm THE GROUND ELEVATION.

3. SECURELY TIE A HORIZONTAL CROSS MEMBER (WEIR) TO THE SUPPORT POSTS/ STAKES EACH SIDE OF THE WEIR. CUT THE FABRIC DOWN THE SIDE OF EACH POST AND FOLD THE FABRIC OVER THE CROSS MEMBER AND APPROPRIATELY SECURE THE FABRIC.

4. INSTALL A SUITABLE SPLASH PAD AND/OR CHUTE IMMEDIATELY DOWN-SLOPE OF THE SPILL-THROUGH WEIR TO CONTROL SOIL EROSION AND APPROPRIATELY DISCHARGE THE CONCENTRATED FLOW PASSING OVER THE WEIR.

MAINTENANCE

1. INSPECT THE SEDIMENT FENCE AT LEAST WEEKLY AND AFTER ANY SIGNIFICANT RAIN. MAKE NECESSARY REPAIRS IMMEDIATELY.

2. REPAIR ANY TORN SECTIONS WITH A CONTINUOUS PIECE OF FABRIC FROM POST TO POST.

3. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SYSTEM TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED OR SPECIFIED.

4. IF THE FENCE IS SAGGING BETWEEN STAKES, INSTALL ADDITIONAL SUPPORT POSTS.

5. REMOVE ACCUMULATED SEDIMENT IF THE SEDIMENT DEPOSIT EXCEEDS A DEPTH OF 1/3 THE HEIGHT OF THE FENCE.

6. DISPOSE OF SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

7. REPLACE THE FABRIC IF THE SERVICE LIFE OF THE EXISTING FABRIC EXCEEDS 6-MONTHS.

REMOVAL

1. WHEN DISTURBED AREAS UP-SLOPE OF THE SEDIMENT FENCE ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, THE FENCE MUST BE REMOVED.

2. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. REHABILITATE/REVEGETATE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.

Drawn:

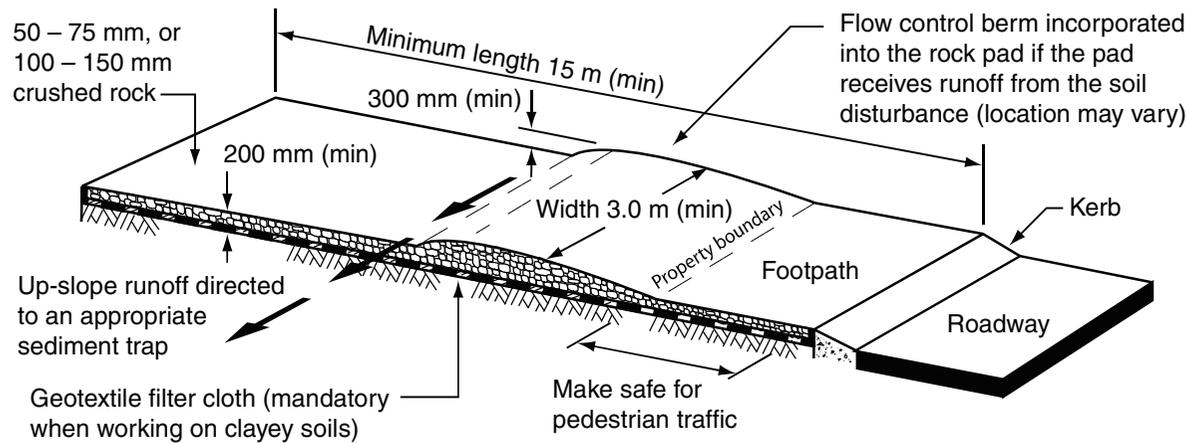
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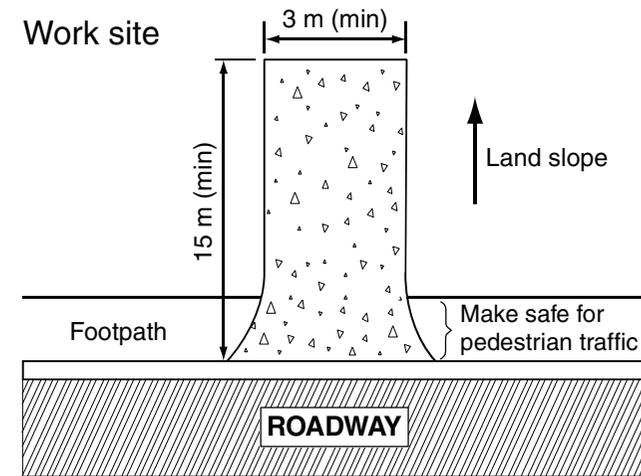
Apr-10

Sediment Fence

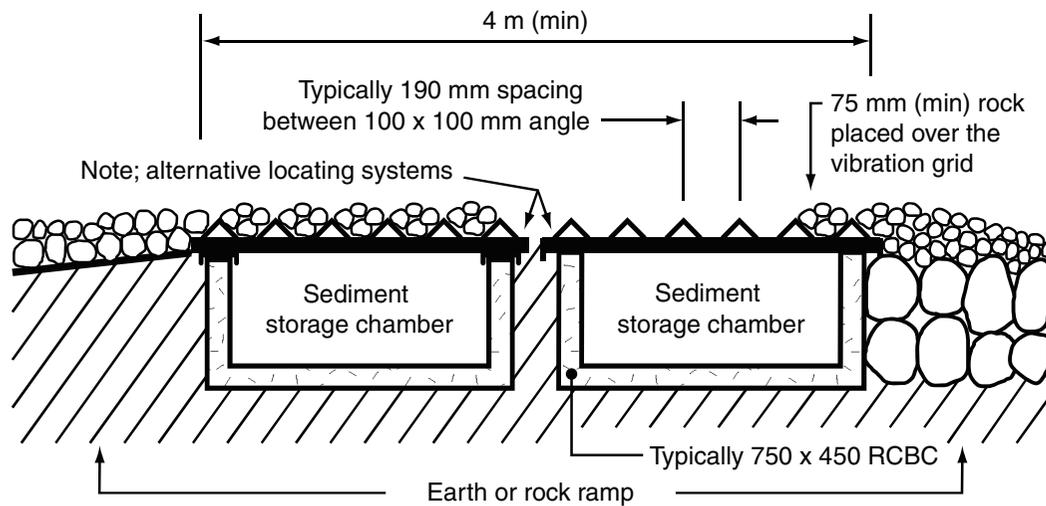
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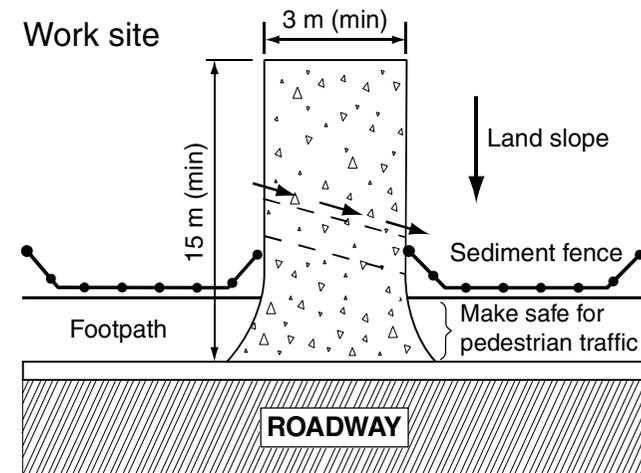
**(a) Rock entry/exit pad for construction sites
(refer to Standard Drawing Exit-03 for building sites)**



(b) Rock pad sloping away from road



**(c) Alternative low maintenance arrangement
(still under development)**



(d) Rock pad sloping towards the road

Drawn: GMW	Date: Apr-10	Construction Exit - Rock Pad (construction sites only)	Exit-01
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MATERIALS

ROCK: WELL GRADED, HARD, ANGULAR, EROSION RESISTANT ROCK, NOMINAL DIAMETER OF 50 TO 75mm (SMALL DISTURBANCES) OR 100 TO 150mm (LARGE DISTURBANCES). ALL REASONABLE MEASURES MUST BE TAKEN TO OBTAIN ROCK OF NEAR UNIFORM SIZE.

FOOTPATH STABILISING AGGREGATE: 25 TO 50mm GRAVEL OR AGGREGATE.

GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH ('BIDIM' A24 OR EQUIVALENT).

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION AND DIMENSIONAL DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS, OR METHOD OF INSTALLATION, CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. CLEAR THE LOCATION OF THE ROCK PAD, REMOVING STUMPS, ROOTS AND OTHER VEGETATION TO PROVIDE A FIRM FOUNDATION SO THAT THE ROCK IS NOT PRESSED INTO SOFT GROUND. CLEAR SUFFICIENT WIDTH TO ALLOW PASSAGE OF LARGE VEHICLES, BUT CLEAR ONLY THAT NECESSARY FOR THE EXIT. DO NOT CLEAR ADJACENT AREAS UNTIL THE REQUIRED EROSION AND SEDIMENT CONTROL DEVICES ARE IN PLACE.

3. IF THE EXPOSED SOIL IS SOFT, PLASTIC OR CLAYEY, PLACE A SUB-BASE OF CRUSHED ROCK OR A LAYER OF HEAVY-DUTY FILTER CLOTH TO PROVIDE A FIRM FOUNDATION.

4. PLACE THE ROCK PAD FORMING A MINIMUM 200mm THICK LAYER OF CLEAN, OPEN-VOID ROCK.

5. IF THE ASSOCIATED CONSTRUCTION SITE IS UP-SLOPE OF THE ROCK PAD, THUS CAUSING STORMWATER RUNOFF TO FLOW TOWARDS THE ROCK PAD, THEN FORM A MINIMUM 300mm HIGH FLOW CONTROL BERM ACROSS THE ROCK PAD TO DIVERT SUCH RUNOFF TO A SUITABLE SEDIMENT TRAP.

6. THE LENGTH OF THE ROCK PAD SHOULD BE AT LEAST 15m WHERE PRACTICABLE, AND AS WIDE AS THE FULL WIDTH OF THE ENTRY OR EXIT AND AT LEAST 3m. THE ROCK PAD SHOULD COMMENCE AT THE EDGE OF THE OFF-SITE SEALED ROAD OR PAVEMENT.

7. FLARE THE END OF THE ROCK PAD WHERE IT MEETS THE PAVEMENT SO THAT THE WHEELS OF TURNING VEHICLES DO NOT TRAVEL OVER UNPROTECTED SOIL.

8. IF THE FOOTPATH IS OPEN TO PEDESTRIAN MOVEMENT, THEN COVER THE COARSE ROCK WITH FINE AGGREGATE OR GRAVEL, OR OTHERWISE TAKE WHATEVER MEASURES ARE NEEDED TO MAKE THE AREA SAFE.

MAINTENANCE

1. INSPECT ALL SITE ENTRY AND EXIT POINTS PRIOR TO FORECAST RAIN, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER RUNOFF-PRODUCING RAINFALL, OR OTHERWISE AT FORTNIGHTLY INTERVALS.

2. IF SAND, SOIL, SEDIMENT OR MUD IS TRACKED OR WASHED ONTO THE ADJACENT SEALED ROADWAY, THEN SUCH MATERIAL MUST BE PHYSICALLY REMOVED, FIRST USING A SQUARE-EDGED SHOVEL, AND THEN A STIFF-BRISTLED BROOM, AND THEN BY A MECHANICAL VACUUM UNIT, IF AVAILABLE.

3. IF NECESSARY FOR SAFETY REASONS, THE ROADWAY SHALL ONLY BE WASHED CLEAN AFTER ALL REASONABLE EFFORTS HAVE BEEN TAKEN TO SHOVEL AND SWEEP THE MATERIAL FROM THE ROADWAY.

4. WHEN THE VOIDS BETWEEN THE ROCK BECOMES FILLED WITH MATERIAL AND THE EFFECTIVENESS OF THE ROCK PAD IS REDUCED TO A POINT WHERE SEDIMENT IS BEING TRACKED OFF THE SITE, A NEW 100mm LAYER OF ROCK MUST BE ADDED AND/OR THE ROCK PAD MUST BE EXTENDED.

5. ENSURE ANY ASSOCIATED DRAINAGE CONTROL MEASURES (e.g. FLOW CONTROL BERM) ARE MAINTAINED IN ACCORDANCE WITH THEIR DESIRED OPERATIONAL CONDITIONS.

6. DISPOSE OF SEDIMENT AND DEBRIS IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

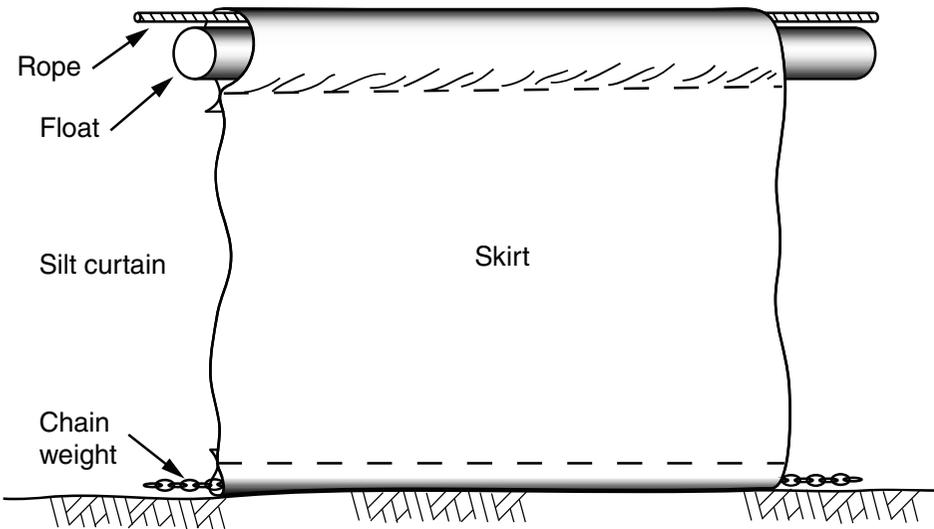
REMOVAL

1. THE ROCK PAD SHOULD BE REMOVED ONLY AFTER IT IS NO LONGER NEEDED AS A SEDIMENT TRAP.

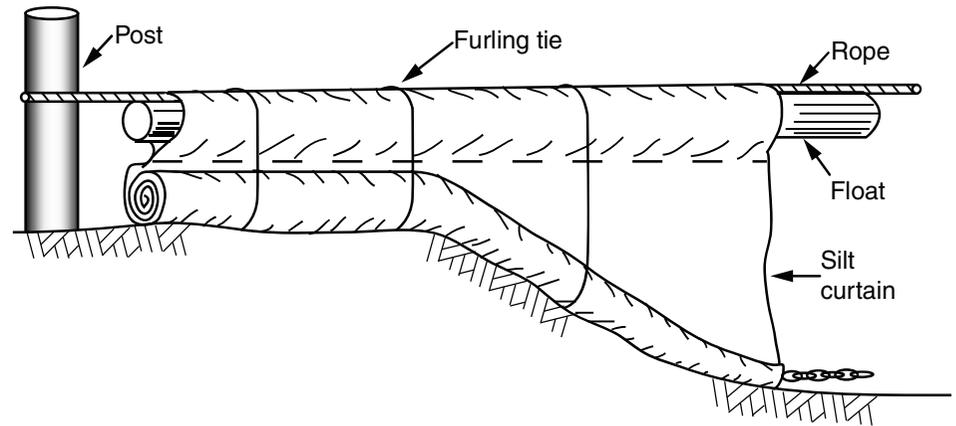
2. REMOVE MATERIALS AND COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. RE-GRADE AND STABILISE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.

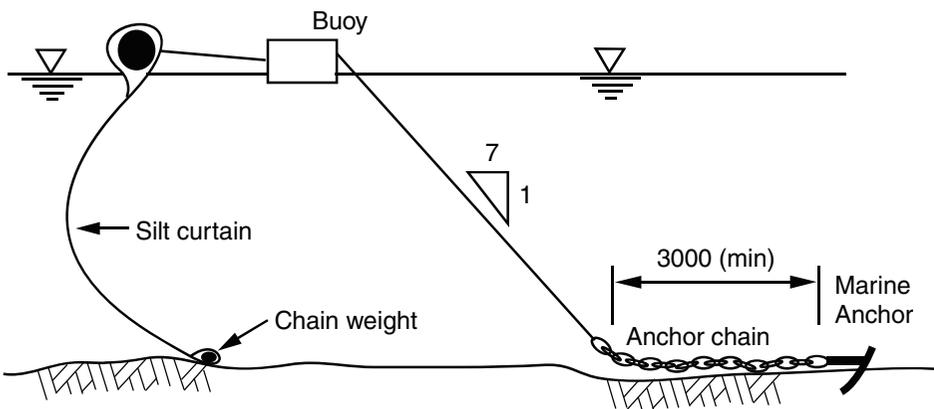
Drawn: GMW	Date: Apr-10	Construction Exit - Rock Pad (construction sites only)	Exit-02
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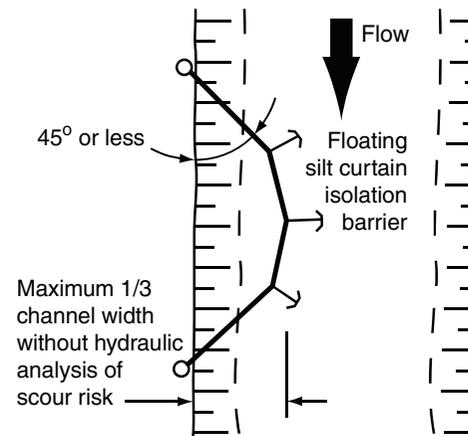
(a) Components of a floating silt curtain



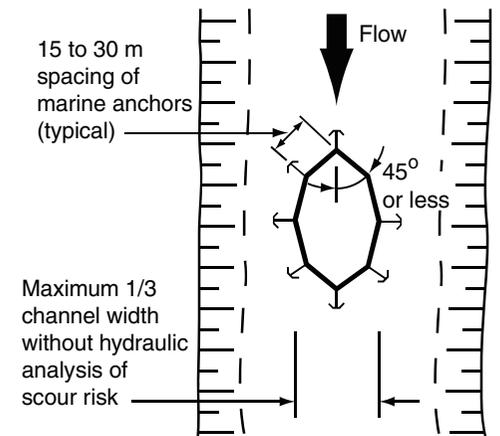
(b) Typical land anchorage system



(c) Typical marine anchorage system



(d) Typical installation of floating silt curtain



(e) Typical installation of floating silt curtain

Drawn:	Date:		
GMW	Feb-10	Floating Silt Curtain	FSC-01

MATERIALS

SILT CURTAIN FABRIC: MANUFACTURED FROM A WOVEN GEOTEXTILE, CANVAS/TARP MATERIAL, OR A COMMERCIALY AVAILABLE SILT CURTAIN SUCH AS NYLON REINFORCED POLYVINYL CHLORIDE (PVC) OR EQUIVALENT.

BALLAST CHAIN: 10 TO 13mm GALVANISED CHAIN WITH MINIMUM 1.9 TO 3.3kg/m WEIGHT.

LAND ANCHOR: MINIMUM 100mm DIAMETER TIMBER POST (OR EQUIVALENT).

MARINE ANCHOR: MINIMUM 5kg LIGHTWEIGHT (DANFORTH) TYPE ANCHOR WITH 10 TO 13mm NYLON TIE ROPE AND MINIMUM 3m LENGTH OF 8mm GALVANISED CONNECTING CHAIN.

INSTALLATION

1. PRIOR TO COMMENCING ANY WORKS, OBTAIN ALL NECESSARY APPROVALS AND PERMITS REQUIRED TO CONDUCT THE NECESSARY WORKS INCLUDING PERMITS FOR THE DISTURBANCE OF RIPARIAN AND AQUATIC VEGETATION, AND THE CONSTRUCTION OF ALL PERMANENT OR TEMPORARY INSTREAM BARRIERS AND INSTREAM SEDIMENT CONTROL MEASURES.

2. PRIOR TO THE INSTALLATION, CHECK WEATHER REPORTS FOR A SUITABLE WINDLESS, CALM DAY. DO NOT PROCEED WITH THE INSTALLATION UNLESS SAFE TO DO SO.

3. REFER TO APPROVED PLANS FOR LOCATION AND DIMENSIONAL DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

4. CLEAR THE IMMEDIATE LAUNCHING AREA OF ROCK AND DEBRIS. AVOID DISTURBING GROUND COVER VEGETATION.

5. LAYOUT A PLASTIC LAUNCHING PAD (SPILLWAY) AT RIGHT ANGLES TO THE WATERCOURSE BANK AND PEG OR ANCHOR IT DOWN. THIS IS TO PROTECT THE CURTAIN AND REDUCE FRICTION WHEN LAUNCHING.

6. UNFOLD THE CURTAIN IN AN OPEN AREA PRIOR TO ITS INSTALLATION. ENSURE THE BARRIER IS FABRICATED WITH SUFFICIENT DIMENSIONS TO BE IN GOOD CONTACT WITH THE BOTTOM OF THE CHANNEL. THE DEPTH OF THE BARRIER SHOULD BE APPROXIMATELY 10% GREATER THAN THE WATER DEPTH TO ENSURE IT RESTS ON THE BED.

7. IDEALLY, THE LENGTH OF THE BARRIER IS 10 TO 20% LONGER THAN THE MEASURED LENGTH OF THE PROPOSED ENCLOSURE.

8. UNFOLD THE FIRST CURTAIN PANEL ON THE SLIPWAY.

9. INSERT THE FLOATS BOTH ENDS FOR EASE OF INSTALLATION.

10. PULL THROUGH THE STEEL CHAIN IN THE BOTTOM SLEEVE USING THE DRAW CORD.

11. PULL THROUGH THE ROPE USING THE DRAW CORD.

12. PRIOR TO DEPLOYING THE BARRIER, GATHER UP THE CURTAIN AND TIE THE CURTAIN WITH LIGHTWEIGHT STRAPS OR ROPE EVERY 1 TO 1.5m. THE AIM OF THIS IS TO ENABLE THE CURTAIN TO BE SET IN PLACE IN THE WATER EASILY WITHOUT THE CURTAIN BEING DRAGGED ALONG THE CHANNEL BED.

13. SET THE UPSTREAM BANK ANCHOR POINT AND TIE OFF ONE END OF THE BARRIER, ENSURING NO WATER WILL BE ABLE TO FLOW INTO THE UPSTREAM END.

14. DEPLOY THE BARRIER FROM THE END OF A BOAT. FASTEN THE FREE END OF THE BARRIER TO THE DOWNSTREAM ANCHOR POINT, THEN ANCHOR THE BARRIER AT INTERMEDIATE POINTS.

15. TAPER THE ENDS OF THE BARRIER TO THE SHAPE OF THE SHORELINE, OTHERWISE TIE THE ENDS OF THE BARRIER WITH FURLING STRAPS SO THE DEPTH OF THE BARRIER CAN BE ADJUSTED TO THE SHAPE OF THE BANK.

16. AFTER THE BARRIER HAS BEEN ANCHORED, CHECK TO SEE THAT THE SKIRT IS NOT TWISTED AROUND THE FLOTATION UNITS. WHEN THE BARRIER IS PROPERLY DEPLOYED, CUT THE TIE ROPES AND LET THE BALLAST WEIGHTS SINK TO THE BED.

17. ENSURE THE SKIRT (AT MAXIMUM WATER LEVEL) IS FREE OF LARGE PLEATS THAT MAY COLLECT SEDIMENT CAUSING THE BARRIER TO BE PULLED UNDER THE WATER SURFACE.

MAINTENANCE

1. INSPECT THE SILT CURTAIN DAILY FOR DAMAGE.

2. ENSURE THE TOP OF THE BARRIER REMAINS ABOVE THE WATER SURFACE, AND THE CURTAIN IS FREE OF TEARS OR GAPS.

3. ENSURE THE BARRIER REMAINS IN THE SPECIFIED LOCATION.

4. CHECK FOR TURBIDITY LEAKS.

5. CHECK ALL ANCHOR POINTS.

6. REPAIR OR REPLACE ANY TORN SEGMENTS.

7. CHECK FOR SEDIMENT BUILD-UP ON THE BOTTOM OF THE SKIRT THAT MAY BEGIN TO PULL THE CURTAIN UNDER THE WATER.

8. DISPOSE OF ANY EXCESSIVE SEDIMENT OR DEBRIS DEPOSITS IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

9. REPAIR ANY PLACES IN THE ISOLATION BARRIER THAT HAVE WEAKENED OR THAT HAVE BEEN SUBJECTED TO DAMAGE FROM INFLOWS OR OVERTOPPING WATER.

REMOVAL

1. THE SILT CURTAIN SHOULD BE REMOVED AS SOON AS POSSIBLE AFTER IT IS NO LONGER NEEDED.

2. IF EXCESSIVE SEDIMENT OR DEBRIS HAS COLLECTED AROUND THE BARRIER, THEN REMOVE SUCH MATERIAL BEFORE THE BARRIER IS REMOVED AND DISPOSE OF SUCH MATERIAL PROPERLY.

3. ENSURE THE CHANNEL WATER CONTAINED WITHIN THE ENCLOSURE HAS ACHIEVED A SUITABLE WATER QUALITY BEFORE REMOVING THE SILT CURTAIN.

4. ENSURE THE RELEASE OF SEDIMENT AND THE DAMAGE TO THE CHANNEL'S BED AND BANKS IS MINIMISED DURING REMOVAL OF THE SILT CURTAIN.

5. IF IT IS NOT FEASIBLE TO WAIT FOR ADEQUATE SETTLEMENT OF SUSPENDED SEDIMENTS, THEN WHERE PRACTICABLE, PUMP THE SEDIMENT-LADEN WATER TO AN OFF-STREAM DE-WATERING SEDIMENT CONTROL SYSTEM FOR TREATMENT. THIS TREATMENT AREA SHOULD IDEALLY BE LOCATED AT LEAST 50m FROM THE CHANNEL.

6. REMOVE ALL CONSTRUCTION MATERIALS, EXCESSIVE SEDIMENT DEPOSITS AND DEBRIS AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

7. RESTORE THE WATERCOURSE CHANNEL TO ITS ORIGINAL CROSS-SECTION, AND SMOOTH AND APPROPRIATELY STABILISE AND/OR REVEGETATE ALL DISTURBED AREAS.

MATERIALS

SILT CURTAIN FABRIC: MANUFACTURED FROM A WOVEN GEOTEXTILE, CANVAS/TARP MATERIAL, OR A COMMERCIALY AVAILABLE SILT CURTAIN SUCH AS NYLON REINFORCED POLYVINYL CHLORIDE (PVC) OR EQUIVALENT.

BALLAST CHAIN: 10 TO 13mm GALVANISED CHAIN WITH MINIMUM 1.9 TO 3.3kg/m WEIGHT.

LAND ANCHOR: MINIMUM 100mm DIAMETER TIMBER POST (OR EQUIVALENT).

MARINE ANCHOR: MINIMUM 5kg LIGHTWEIGHT (DANFORTH) TYPE ANCHOR WITH 10 TO 13mm NYLON TIE ROPE AND MINIMUM 3m LENGTH OF 8mm GALVANISED CONNECTING CHAIN.

ALTERNATIVE LAND-BASED INSTALLATION PROCEDURE

1. UNFOLD THE FIRST CURTAIN PANEL ON THE SLIPWAY.
2. INSERT THE FLOATS BOTH ENDS FOR EASE OF INSTALLATION.
3. PULL THROUGH THE STEEL CHAIN IN THE BOTTOM SLEEVE USING THE DRAW CORD.
4. PULL THROUGH THE ROPE USING THE DRAW CORD.
5. PRIOR TO DEPLOYING THE BARRIER, GATHER UP THE CURTAIN AND TIE THE CURTAIN WITH LIGHTWEIGHT STRAPS OR ROPE EVERY 1 TO 1.5m. THE AIM OF THIS IS TO ENABLE THE CURTAIN TO BE SET IN PLACE IN THE WATER EASILY WITHOUT THE WEIGHTS BEING DRAGGED ALONG THE BOTTOM.
6. SET THE UPSTREAM BANK ANCHOR POINT AND TIE OFF ONE END OF THE BARRIER, ENSURING NO WATER WILL BE ABLE TO FLOW INTO THE UPSTREAM END.
7. INSTALL AN EXTRA LENGTH OF ROPE OR CABLE IN THE FINAL CURTAIN POSITION IN THE WATER.

8. TIE THE END OF THE CURTAIN ROPE TO THE EXTRA LENGTH ALREADY IN POSITION AND PULL THE CURTAIN INTO THE WATER STOPPING WHEN THE END OF THE FIRST SECTION OF CURTAIN IS STILL ON THE BANK.

9. UNFOLD THE SECOND SECTION OF CURTAIN ON THE SLIPWAY MAKING SURE THE CURTAIN IS CORRECTLY ORIENTATED WITH THE FIRST SECTION OF CURTAIN

10. INSERT THE FLOATS, CHAIN AND ROPE AS BEFORE.

11. USING THE DRAW CORD FROM THE FIRST SECTION, TIE UP THE ENDS USING THE EYELETS ALREADY IN THE CURTAIN.

12. GATHER UP THE CURTAIN AND TIE TOGETHER WITH TWINE OR THIN ROPE.

13. LAUNCH AS BEFORE.

14. CONTINUE UNTIL THE ENTIRE CURTAIN IS INSTALLED.

15. ANCHOR WELL TO SHORE ANCHORS.

16. USING A SUITABLE BOAT, MOVE ALONG THE CURTAIN AND CUT THE TIES HOLDING THE CHAIN AND CURTAIN AND ALLOW THE WEIGHTED END TO SINK.

17. ENSURE THE SKIRT (AT MAXIMUM WATER LEVEL) IS FREE OF LARGE PLEATS THAT MAY COLLECT SEDIMENT CAUSING THE BARRIER TO BE PULLED UNDER THE WATER SURFACE.

MAINTENANCE

1. INSPECT THE SILT CURTAIN DAILY FOR DAMAGE.

2. ENSURE THE TOP OF THE BARRIER REMAINS ABOVE THE WATER SURFACE, AND THE CURTAIN IS FREE OF TEARS OR GAPS.

3. ENSURE THE BARRIER REMAINS IN THE SPECIFIED LOCATION.

4. CHECK FOR TURBIDITY LEAKS.

5. CHECK ALL ANCHOR POINTS.

6. REPAIR OR REPLACE ANY TORN SEGMENTS.

7. CHECK FOR SEDIMENT BUILD-UP ON THE BOTTOM OF THE SKIRT THAT MAY BEGIN TO PULL THE CURTAIN UNDER THE WATER.

8. DISPOSE OF ANY EXCESSIVE SEDIMENT OR DEBRIS DEPOSITS IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD.

9. REPAIR ANY PLACES IN THE ISOLATION BARRIER THAT HAVE WEAKENED OR THAT HAVE BEEN SUBJECTED TO DAMAGE FROM INFLOWS OR OVERTOPPING WATER.

REMOVAL

1. THE SILT CURTAIN SHOULD BE REMOVED AS SOON AS POSSIBLE AFTER IT IS NO LONGER NEEDED.

2. IF EXCESSIVE SEDIMENT OR DEBRIS HAS COLLECTED AROUND THE BARRIER, THEN REMOVE SUCH MATERIAL BEFORE THE BARRIER IS REMOVED AND DISPOSE OF SUCH MATERIAL PROPERLY.

3. ENSURE THE CHANNEL WATER CONTAINED WITHIN THE ENCLOSURE HAS ACHIEVED A SUITABLE WATER QUALITY BEFORE REMOVING THE SILT CURTAIN.

4. ENSURE THE RELEASE OF SEDIMENT AND THE DAMAGE TO THE CHANNEL'S BED AND BANKS IS MINIMISED DURING REMOVAL OF THE SILT CURTAIN.

5. IF IT IS NOT FEASIBLE TO WAIT FOR ADEQUATE SETTLEMENT OF SUSPENDED SEDIMENTS, THEN WHERE PRACTICABLE, PUMP THE SEDIMENT-LADEN WATER TO AN OFF-STREAM DE-WATERING SEDIMENT CONTROL SYSTEM FOR TREATMENT. THIS TREATMENT AREA SHOULD IDEALLY BE LOCATED AT LEAST 50m FROM THE CHANNEL.

6. REMOVE ALL CONSTRUCTION MATERIALS, EXCESSIVE SEDIMENT DEPOSITS AND DEBRIS AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

7. RESTORE THE WATERCOURSE CHANNEL TO ITS ORIGINAL CROSS-SECTION, AND SMOOTH AND APPROPRIATELY STABILISE AND/OR REVEGETATE ALL DISTURBED AREAS.

MATERIALS

- (i) MULCH MUST COMPLY WITH THE REQUIREMENTS OF AS4454.
- (ii) MAXIMUM SOLUBLE SALT CONCENTRATION OF 5dS/m.
- (iii) MOISTURE CONTENT OF 30 TO 50% PRIOR TO APPLICATION.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION AND EXTENT. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, EXTENT, MATERIAL TYPE, OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. WHEN SELECTING THE LOCATION OF A MULCH FILTER BERM, TO THE MAXIMUM DEGREE PRACTICAL, ENSURE THE BERM IS LOCATED:

- (i) TOTALLY WITHIN THE PROPERTY BOUNDARIES;
- (ii) ALONG A LINE OF CONSTANT ELEVATION (PREFERRED, BUT NOT ALWAYS PRACTICAL);
- (iii) AT LEAST 1m, IDEALLY 3m, FROM THE TOE OF A FILL EMBANKMENT;
- (iv) AWAY FROM AREAS OF CONCENTRATED FLOW.

3. ENSURE THE BERM IS INSTALLED IN A MANNER THAT AVOIDS THE CONCENTRATION OF FLOW ALONG THE BERM, OR THE UNDESIRABLE DISCHARGE OF WATER AROUND THE END OF THE BERM.

4. ENSURE THE BERM HAS BEEN PLACED SUCH THAT PONDING UP-SLOPE OF THE BERM IS MAXIMISED.

5. ENSURE BOTH ENDS OF THE BERM ARE ADEQUATELY TURNED UP THE SLOPE TO PREVENT FLOW BYPASSING PRIOR TO WATER PASSING OVER THE BERM.

6. ENSURE 100% CONTACT WITH THE SOIL SURFACE.

7. WHERE SPECIFIED, TAKE APPROPRIATE STEPS TO VEGETATE THE BERM.

MAINTENANCE

1. DURING THE CONSTRUCTION PERIOD, INSPECT ALL BERMS AT LEAST WEEKLY AND AFTER ANY SIGNIFICANT RAIN. MAKE NECESSARY REPAIRS IMMEDIATELY.

2. REPAIR OR REPLACE ANY DAMAGED SECTIONS.

3. WHEN MAKING REPAIRS, ALWAYS RESTORE THE SYSTEM TO ITS ORIGINAL CONFIGURATION UNLESS AN AMENDED LAYOUT IS REQUIRED OR SPECIFIED.

4. REMOVE ACCUMULATED SEDIMENT IF THE SEDIMENT DEPOSIT EXCEEDS A DEPTH OF 100mm OR 1/3 THE HEIGHT OF THE BERM.

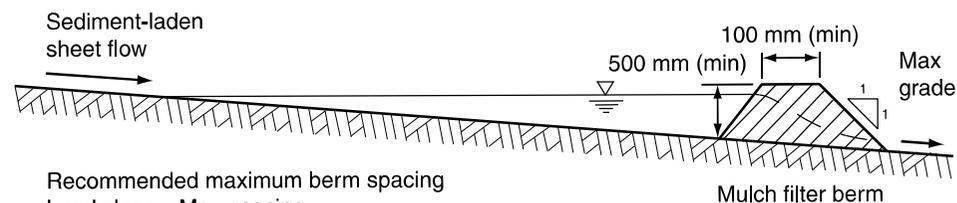
5. DISPOSE OF SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

REMOVAL (IF REQUIRED)

1. WHEN DISTURBED AREAS UP-SLOPE OF THE BERM ARE SUFFICIENTLY STABILISED TO RESTRAIN EROSION, THE BERM MAYBE REMOVED.

2. REMOVE ANY COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. REHABILITATE/REVEGETATE THE DISTURBED GROUND AS NECESSARY TO MINIMISE THE EROSION HAZARD.



Recommended maximum berm spacing	
Land slope	Max spacing
< 2%	30 m
5%	25 m
10%	15 m
20%	8 m

Figure 1 - Typical placement of mulch filter berm

Drawn: GMW	Date: Apr-10	Mulch Filter Berms	MB-01
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