



ERM

APPENDIX T CONCEPTUAL SOIL AND WATER
MANAGEMENT PLAN



Conceptual Soil and Water Management Plan

1. INTRODUCTION

This Conceptual Soil and Water Management Plan (SWMP) has been prepared by ERM to outline the fundamental principles that are to be followed in the planning of erosion and sediment control measures for the Project. The SWMP has been prepared to provide guidance on the suite of best management practices that may be relevant to the control of erosion and sediment to minimise water and soil impacts during construction. There are a combination of controls that have been outlined to be used during particular activities.

In NSW, best practice guidance on soil and water management at construction sites is provided in the document *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition (Landcom, 2004)*. Landcom (2004) provides an overarching guideline, though is particularly targeted to urban development. A number of more targeted supporting guidelines are published under Volume 2 of the *Managing Urban Stormwater* series and include the following that are particularly relevant to construction of the Project:

- *Managing Urban Stormwater: Soils and Construction, Volume 2A, Installation of Services* (NSW Department of Environment and Climate Change, 2008a) (hereafter referred to as "Volume 2A"); and
- *Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads* (NSW Department of Environment and Climate Change, 2008b) (hereafter referred to as "Volume 2C").

It is not feasible to prepare a detailed SWMP at this stage that addresses all work sites, as works will be dispersed over large distances, will occur in stages, and in many cases have not yet been subject to detailed design.

This Conceptual SWMP does not include detailed engineering design of structures, nor does it provide plans showing the layout of all erosion controls across the site. It is recommended that Progressive ESCPs should be prepared for this purpose once detailed design plans are available, particularly any detailed road, drainage and creek crossing designs. In many cases these progressive ESCPs will be relatively simple documents, such as a sketch plan showing the layout of controls with attached commentary, prepared on topographic or drainage plans.

The head construction contractor will prepare their own CEMP including a detailed Soil and Water Management Plan that will include elements of this Conceptual SWMP and any additional measures required to manage the erosion, sedimentation and water quality risks of the project. The SWMP will outline the requirements for preparation of Progressive ESCPs for each area of works, and with a particular focus on high-risk locations such as on steep lands and in the vicinity of watercourses. It is recommended that the SWMP be prepared in accordance with the *Managing Urban Stormwater* guidelines, particularly Volumes 2A and 2C.



2. GENERAL MANAGEMENT PRACTICES

Landcom (2004) provides a range of soil and water management principles for construction sites. These principles should be a key component of the decision making process as earthworks are planned and undertaken. These principles are to:

- investigate site features and assess constraints;
- develop and implement plans for the management of soil and water;
- minimise disturbance;
- strip and stockpile topsoil for use in subsequent rehabilitation;
- divert upslope (clean) stormwater around the disturbed site;
- reduce erosion;
- capture sediment-laden run-off from within the disturbed site for diversion to sediment control devices;
- rehabilitate the site promptly and progressively as works progress; and
- inspect and maintain erosion and sediment control devices for the duration of the Project.

Industry standard erosion and sediment control measures are outlined in the following sections that will assist in meeting the principles outlined above.

Standard Drawings which further detail a management measure are referenced where relevant and provided throughout this document.

2.1 STAGING OF WORK

Staging of works is one of the simplest and most effective forms of erosion and sediment control. By limiting the exposed area to the minimum possible at any one time, reduces the risk of soil loss than if the entire sites earthworks are exposed.

Prior to disturbing an area the following management measures should be implemented:

- have a single stabilised site access point defined by barrier or sediment fencing, to prevent unnecessary disturbance at access locations;
- prior to disturbance, install sediment fence downslope and boundary fencing/flagging around perimeter of site to define the work areas and minimise disturbance outside construction boundaries (to be regularly maintained);
- install upstream stormwater diversion drains / bunds and stabilise their outlets (where required);
- install sediment traps with stabilised outlets as shown in Progressive ESCPs;
- direct run-off from disturbed areas to sediment traps during construction, using earth banks or drains;
- install checks at regular intervals to reduce scour velocity of flows;
- remove vegetation and store in appropriate locations (e.g. away from watercourses and riparian lands) and respread cut / mulched vegetation where appropriate during rehabilitation;



- commence earthworks, stripping topsoil and subsoil independently and storing these separately. Topsoil should be preserved for use later in rehabilitation;
- install erosion and sediment controls as required during progression of construction works and maintain existing controls;
- rehabilitate site as soon as practicable after completion of construction; and
- decommission / remove controls when site is successfully stabilised and vegetation established.

2.2 STORMWATER MANAGEMENT

The following stormwater management controls apply to all construction activities and will be utilised during site development:

- where required, divert clean stormwater run-on away from areas to be disturbed by construction activities using earth banks or catch drains. Note that in some cases low-impact diversions can be created using sandbags or similar. Earth banks may also be used and construction requirements are shown in:
 - SD 5-5 for temporary earth banks (low flow) (refer **Figure 2-1**); and
 - SD 5-6 for permanent earth banks (high flow) (refer **Figure 2-2**).
- permanent diversion banks will be sized by a suitably qualified person, using hydrological data and design standards as recommended in Landcom (2004). Note that the need for upslope diversion may be removed where construction sites have minimal upslope catchment or the risk of stormwater run-on is low. This is likely to be the case for the vast majority of WTG sites;
- collect dirty water in earth banks or catch drains for diversion to sediment control structures as determined in the Progressive ESCP Drawings;
- install temporary earth diversion banks (refer **Figure 2-1**) at the direction of the site manager to mitigate against unforeseen erosion hazards, particularly when rain is forecast. These shall be used to shorten slope lengths, or to divert localised run-on away from high hazard areas (such as unstable batters);
- check dams (SD 5-4, refer **Figure 2-3**) using rock aggregate, sandbags or geotextile “sausages” may be installed within drains and diversion channels to help reduce flow velocity and consequent erosion, especially on steep sections. Care to be taken to ensure there is adequate provision for a spillway that allows flows to be retained within the diversion channel and not escape thereby potentially causing scouring and/or flooding of adjacent lands; and
- maintain slope lengths no greater than 80 m in disturbed areas and preferably <50 m on exposed road surfaces and steep slopes. To reduce slope lengths in construction areas install temporary earth diversion banks following SD 5-5 (**Figure 2-1**). On roads consider the use of cross banks and mitre drains to shed water from the surface.

FIGURE 2-1 SD 5-5 EARTH BANK (LOW FLOW) (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)

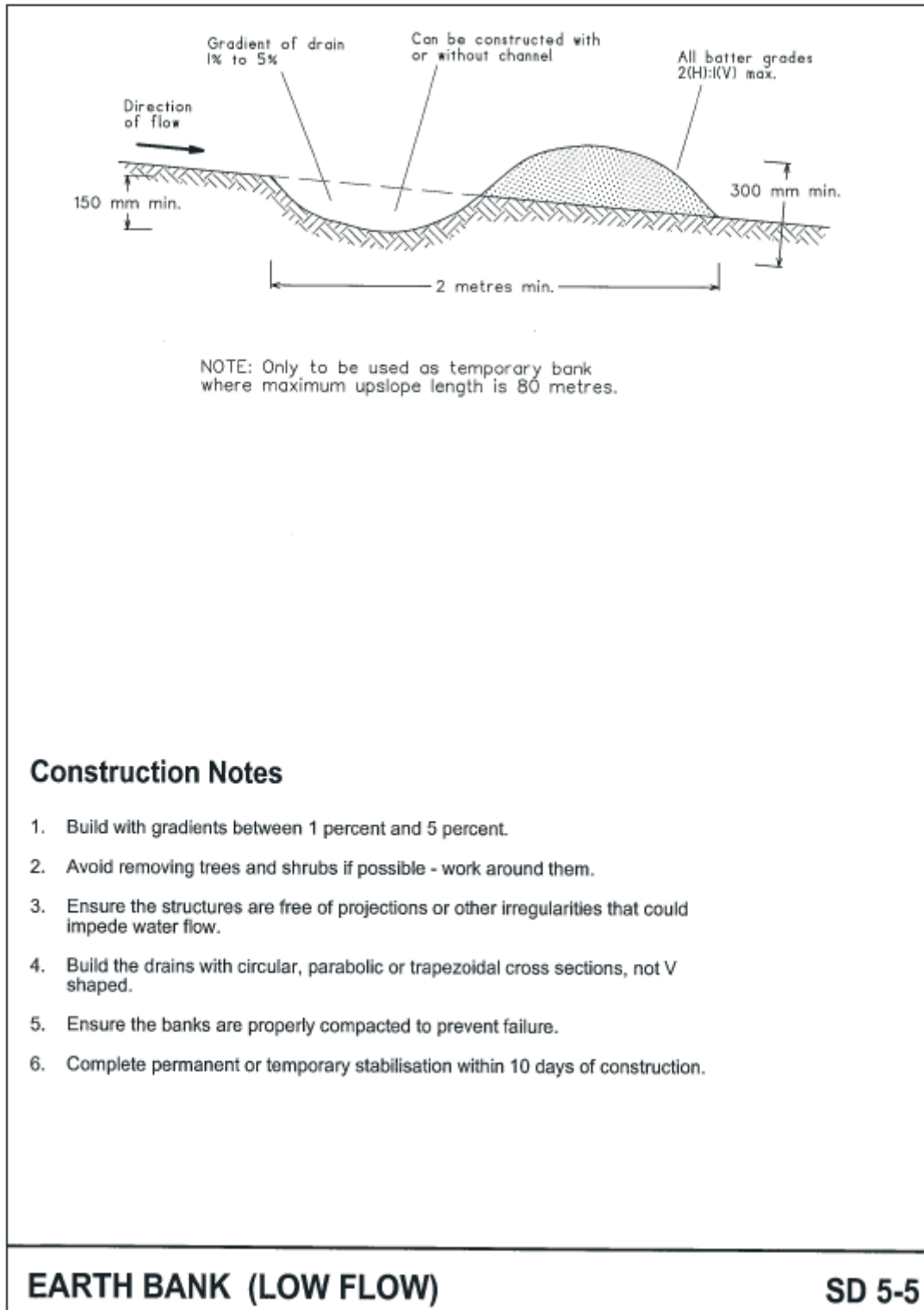


FIGURE 2-2 SD 5-6 EARTH BANK (HIGH FLOW) (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)

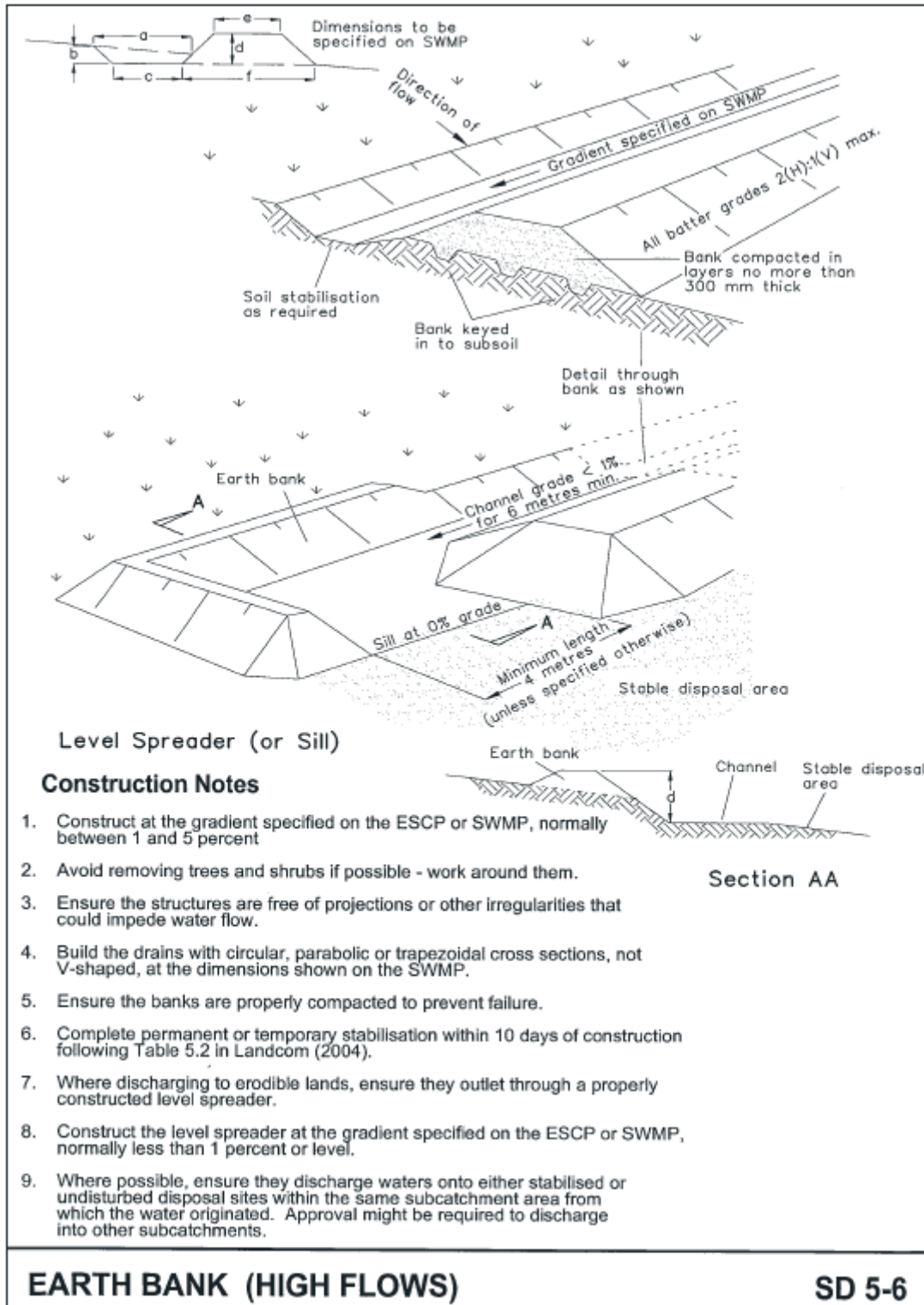
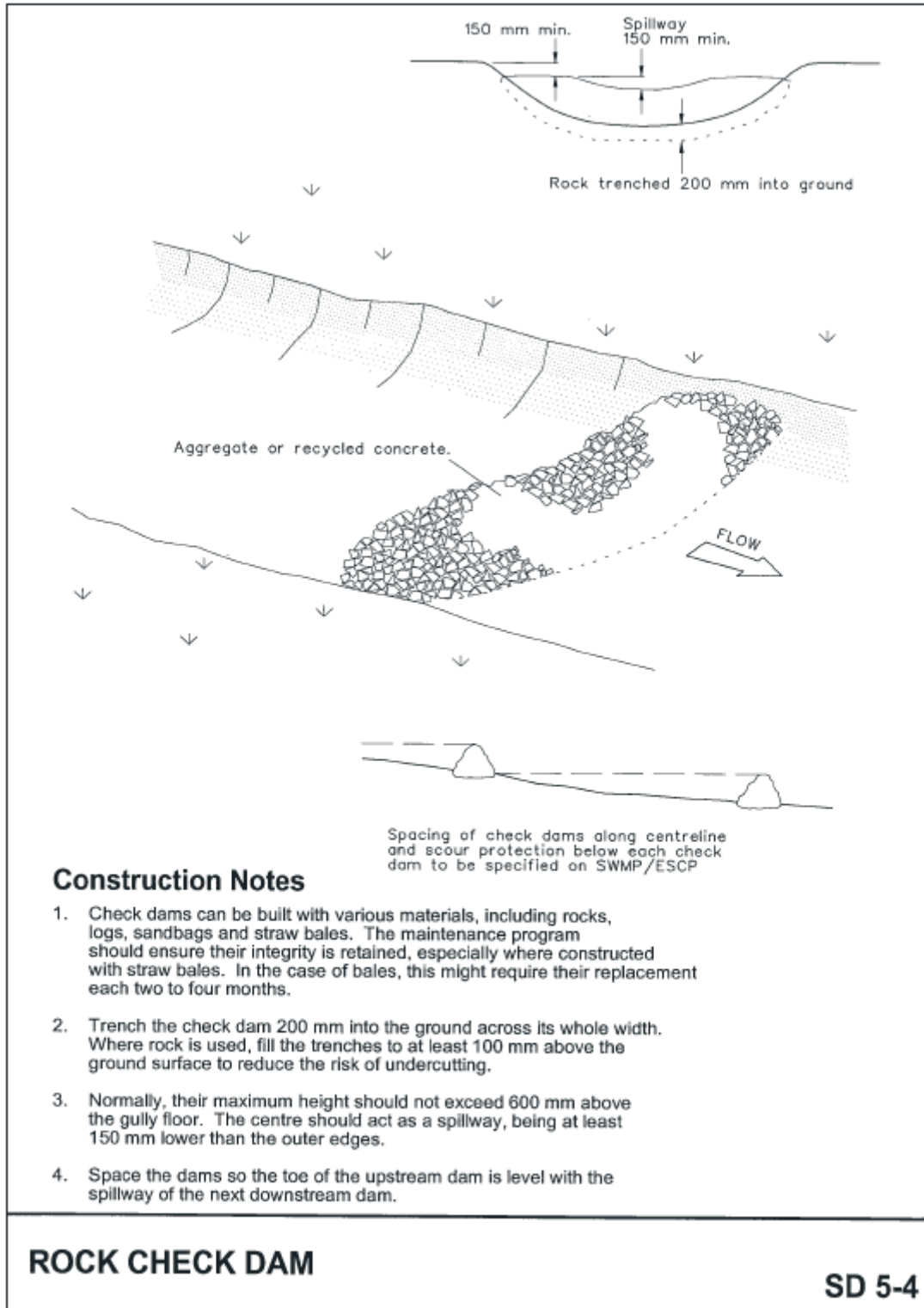




FIGURE 2-3 SD 5-4 ROCK CHECK DAM (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)





2.3 EROSION CONTROL

Erosion control should be prioritised in all aspects of the work – this being the most effective way to minimise site degradation and reduce potential impacts on land and water resources. Effective erosion control reduces the loss of sediment and improves the effectiveness and reliability of downstream sediment and pollution controls.

In addition to the erosion control measures outlined in the staging section above, the following are a series of general erosion control measures that apply to the day-to-day construction activities:

- stabilise the access point by sealing with concrete, asphalt or loose rock fill (refer SD6-14, **Figure 2-4**);
- limit unnecessary vehicle movements across the Project Area to those only required for construction activities and ensure movements are contained to the predefined construction access ways;
- limit stripping of topsoil to within two weeks of commencing construction activities to minimise the time and area that soil is exposed to erosive forces;
- where more than one contractor is onsite at any one time, co-ordinate works so that sites do not remain disturbed for longer than is necessary;
- stockpiles should be located greater than 40 m from natural waterways (refer SD 4-1, **Figure 2-5**);
- stockpiles are to have a buffer of at least 5 m from areas likely to receive concentrated water flows, including earth banks and roads;
- cover or stabilise stockpiles when not in use;
- unsealed access roads are to be kept moist by water carts during windy conditions and times of heavy traffic, to prevent dust generation; and
- all areas of concentrated flow (diversion banks and waterways), will be designed by a suitably qualified person to convey and remain stable during the design storm event. Stabilisation with 350 gram per square metre (gsm) jute matting or equivalent may be required (refer SD 5-7, **Figure 2-6**).



2.4 SEDIMENT CONTROL

Sediment traps will be used to treat sediment laden run-off that is generated from disturbed areas and maintain the sediment as close as possible to its source.

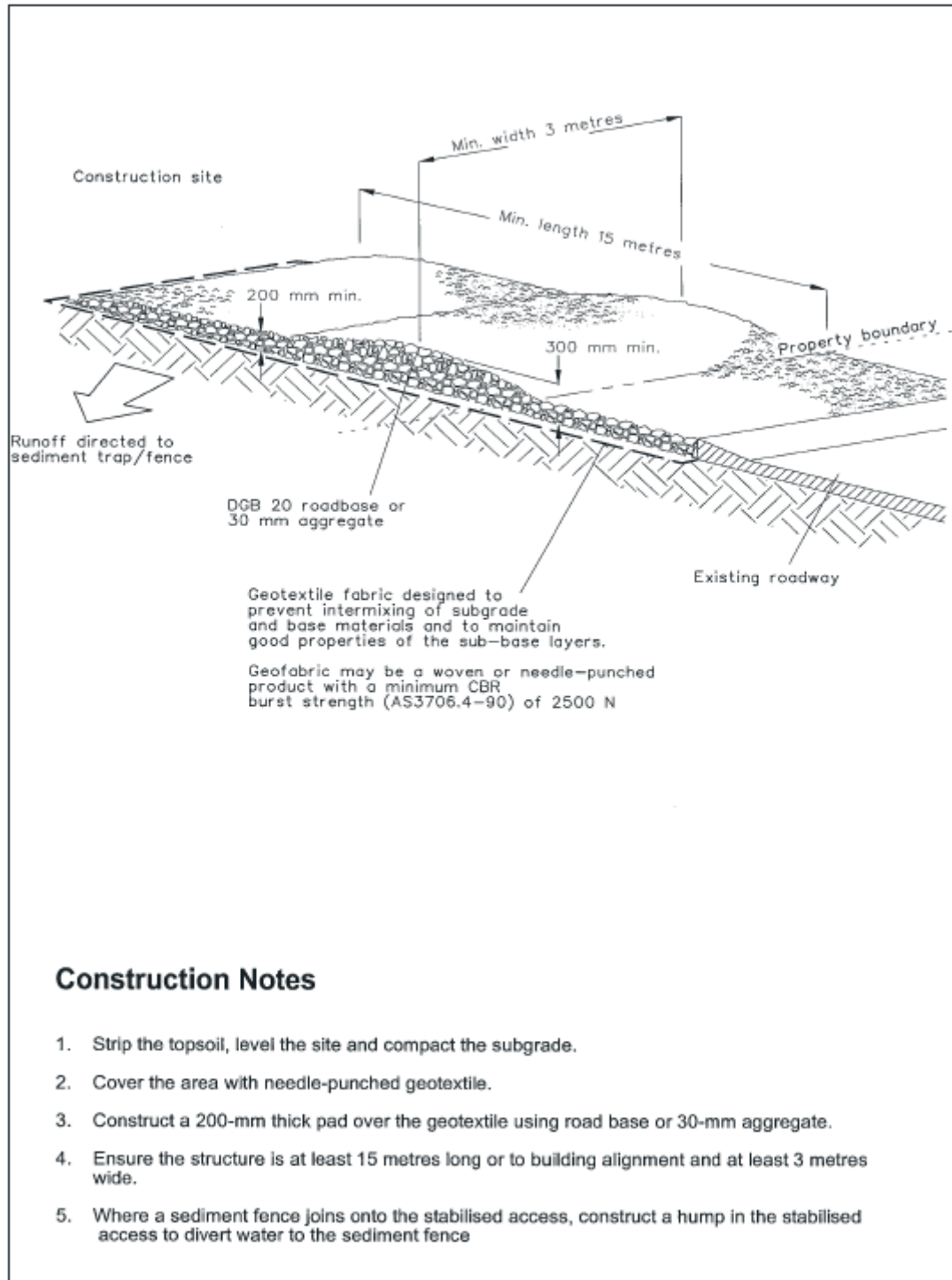
Sediment traps work by trapping water and allowing the coarser fragment of the sediment to settle out under gravity. Sediment traps are most effective for sheet flows of run-off rather than concentrated flow. Use of sediment traps in areas of concentrated flow such as drains are often ineffective, with the result often being scouring and further erosion.

The most easily recognisable and common form of sediment trap is sediment fencing, but sediment traps may also include earth or mulch bunds, geotextiles, rock or a combination of these (such as a rock-sock which involves wrapping rock in geotextile). Installation and sizing of these traps should be such that water does not find an alternative flow path underneath or around the trap. Anchoring of the traps should be sufficient to provide for strength and reliability of the trap. Traps should be designed with consideration to larger storm events, and incorporate spillways and bypasses to prevent scouring and erosion of adjacent areas.

Sediment fencing will be a primary sediment control method used throughout the construction stage of the project. The following principles apply to the use of sediment fencing:

- sediment fence (refer SD 6-8, included in **Figure 2-7**) should be placed downslope of disturbed areas to help retain the coarser sediment fraction;
- sediment fences will have a return of 1 m upslope at intervals of approximately 20 m. Returns are installed to subdivide the catchment area of the sediment fence, to improve its effectiveness and help prevent structural damage during peak flows. The catchment area of each section of fence should be small enough to limit flow if concentrated at one point to less than 50 L/s in the 10% (1 in 10) AEP storm event;
- place sediment fence as close as possible to along the contour, to provide a maximum surface area to the passage of stormwater;
- sediment fences require regular maintenance, with captured sediment to be removed prior to it reaching a third of the height of the sediment fence. Place sediment extracted from maintenance in a suitable location so as to prevent further sedimentation; and
- sediment basins are a specific type of sediment trap comprising large earth dams designed to capture dirty water run-off, and are the most effective of all sediment trapping devices. They may only be required at the larger construction sites such as the concrete batching plant and substation. Otherwise most of the work areas are relatively small and dispersed, and sediment control can be achieved using conventional sediment traps, without the use of sediment basins. Detailed design and sizing of sediment basins, where required, will be included in the Progressive ESCPs.

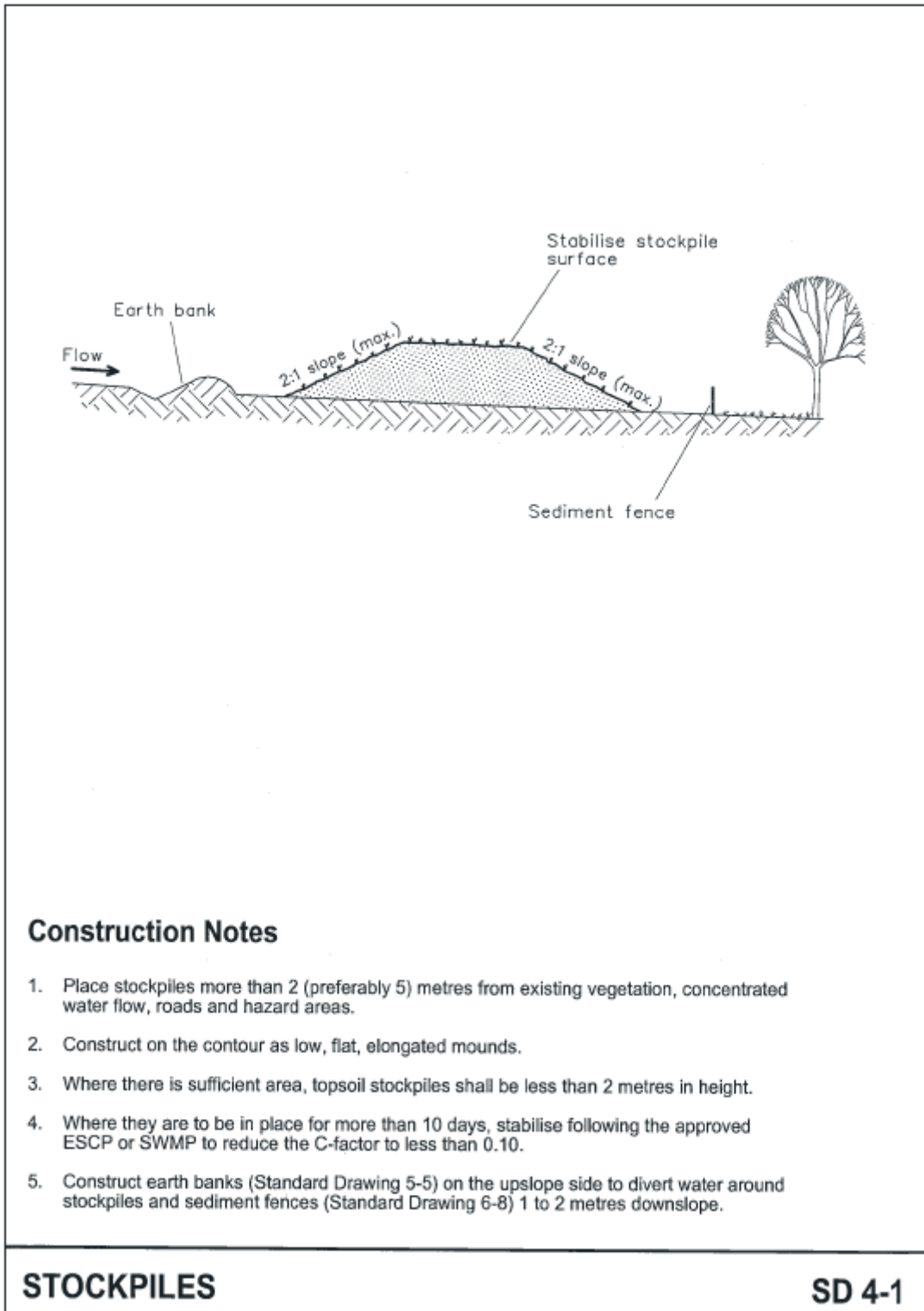
FIGURE 2-4 SD 6-14 STABILISED SITE ACCESS (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

FIGURE 2-5 SD 4-1 STOCKPILES (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)





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FIGURE 2-6 SD 5-7 RCEP: CONCENTRATED FLOW (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)

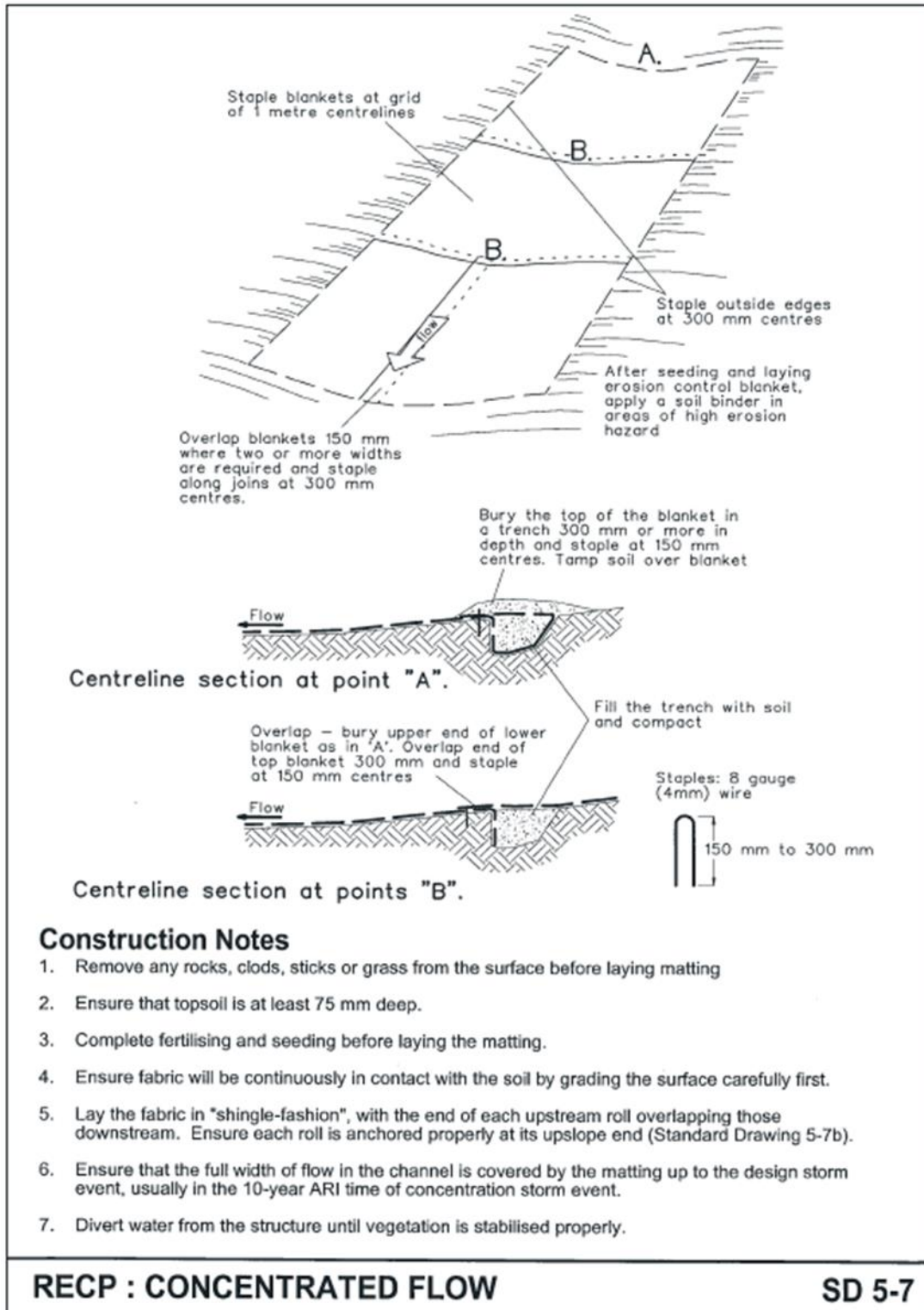
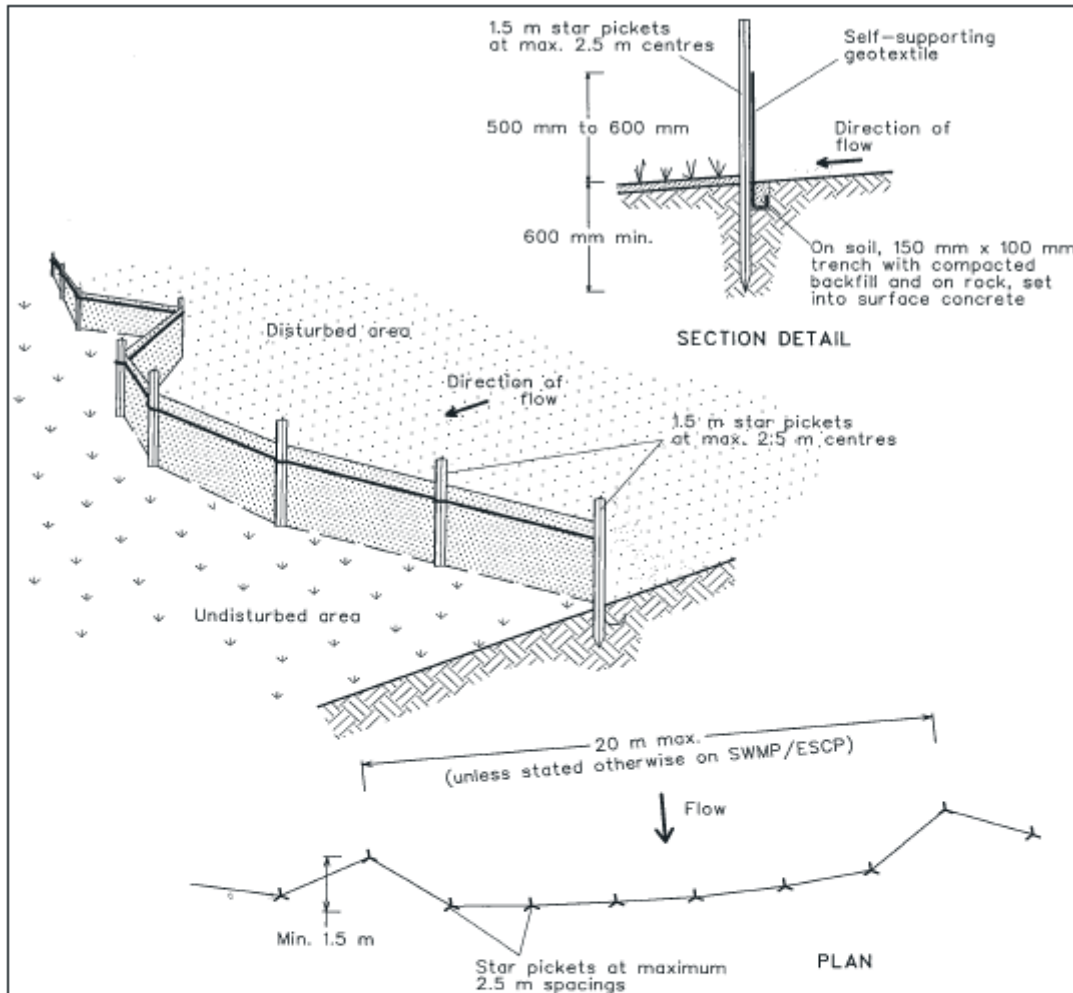


FIGURE 2-7 SD 6-8 SEDIMENT FENCE (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.



2.5 DUST MANAGEMENT

The majority of potential dust impacts from the Project will occur during the construction phase. Dust particles can be released from a range of activities, including:

- clearing of vegetation;
- stockpiles;
- haulage activities along unsealed roads; and
- excavation works.

The expected quantities of dust produced during the construction of the Project can be appropriately managed with the implementation of an Air Quality and Dust Management Plan. This would be sub-plan of the CEMP for the Project and would include appropriate preventative and management measures to mitigate dust impacts. Dust deposition gauges would be installed at select locations within the Project Area to monitor dust emissions in accordance with the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales (NSW EPA, 2022)*. The trigger levels for deposited dust in accordance with the above guideline is presented in **Table 2-1**.

TABLE 2-1 DEPOSITED DUST TRIGGER LEVELS

Averaging Period	Maximum increase in deposited dust level.	Maximum total deposited dust level.
Annual	2 g/m ² /month	4 g/m ² /month

In addition to the management practices to be implemented for the Project outlined in the above subsections, mitigation measures to manage potential dust impacts are presented in **Section 2.9**.

2.6 POLLUTION CONTROL AND WASTE MANAGEMENT MEASURES

All fuels, oils and hazardous substances used onsite will be stored in appropriately bunded locations to prevent release to the environment. Bulk storage areas for fuels, oils and chemicals used during construction will be contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. Storage will comply with AS 1940- 2004 The Storage and Handling of Flammable and Combustible Liquids.

Spill clean-up kits will be located in numerous, well known locations throughout the site, and particularly within the precinct where the main infrastructure is proposed. Use of items within the spill kit will be demonstrated to all construction personnel. Spill kits should include floating booms in locations close to waterways (where relevant). Spill kits require regular maintenance to ensure that sufficient material is available in the event of a spill.

Material Safety Data Sheets (MSDS) will be available for all chemicals used on the site. All site personnel should be aware of the location of the MSDS.



Refuelling of equipment onsite or any other activity which could result in a spillage of a chemical, fuel or lubricant will be undertaken away from watercourses and stormwater drainage lines. In the event water is polluted by chemicals and/or firefighting materials (e.g. foams), the water will be collected, and disposed at an approved Liquid Waste Treatment Facility. A designated refuelling area should be established with drip trays installed and spill kits on stand-by. Should refuelling in the field be required, absorptive mats and drip trays are to be used in the refuelling process.

Bins will be available for the deposit of waste materials. Where possible, bins for recycling will be made available to facilitate separation and appropriate reuse or disposal of recyclable materials.

2.7 SITE REHABILITATION

Predominately the majority of the areas that will be disturbed will be stabilised by the placement of concrete or the construction of a hardstand surface. However, rehabilitation of distributed soil will still be required progressively on the site as different aspects of the project are completed. As some individual construction areas are completed, rehabilitation should be undertaken immediately to stabilise and effectively finalise areas to prevent erosion and sediment issues. Site stabilisation can be achieved by several measures including the following:

- vegetative cover;
- mulch;
- rock armouring;
- paving;
- concrete;
- geofabrics; and
- synthetic soil binders.

It is essential that all disturbed lands be stabilised to mitigate ongoing erosion problems and prevent sediment pollution of downstream lands and waterways. The preferred site stabilisation method will be identified on a site by site basis and included within the Progressive ESCPs.

When selecting stabilisation methods a key factor that will be considered is the form of water run-off over the stabilised area. Areas subject to concentrated flow (i.e. watercourses and drains) will require different stabilisation techniques to those subject to sheet flow.

In areas of sheet flow, vegetation will generally be acceptable and the revegetation goal over much of the site will be to re-establish pasture grasses, to achieve a similar condition and pasture species composition to present so that the lands may continue to be used for grazing purposes.



Areas of concentrated flow can be subject to scouring velocities and periodic inundation that render vegetation establishment difficult or impossible. Therefore, measures like hard armouring, and use of geofabrics to assist vegetation establishment is often required. To determine appropriate stabilisation techniques in areas of concentrated flow peak flows will be calculated and stabilisation designed accordingly, by reference to guidelines such as Landcom (2004) that provide advice for acceptable velocities within vegetated channels. Particularly steep slopes may require protection in the form of hard armouring if it is considered unlikely that vegetation will become established or will become stressed and jeopardise the stability of the slope. This detail will be outlined in the Progressive ESCPs.

2.8 SPECIFIC CONSTRUCTION ACTIVITY MITIGATION MEASURES

2.8.1 PAD SITES

The term 'pad sites' is used to describe areas that may be cleared, levelled and then stabilised with road base and aggregate, for example crane hardstand areas, the substation site, and the concrete batching plant. Pad sites should be established in accordance with **Section 2.1**.

A Generic Erosion Sediment Control Plan (ESCP) has been developed for the layout of a pad site, refer to **Figure 2-8**. An outline of the erosion and sediment control measures to be undertaken during trenching activities is also provided in **Figure 2-9** to **2-11**. The relevant Progressive ESCP will be developed following detailed design.

2.8.2 TRENCHING

The WTGs will be linked across the Project Area through a network of underground electricity and fibre optic cables that predominately follow the internal access road network. The following management measures are relevant to trenching activities:

- minimise the land area to be disturbed;
- avoid trenching in locations of concentrated, permanent water flows;
- where possible utilise directional drilling techniques in areas of concentrated, permanent water flow;
- monitor weather and avoid opening trenches prior to forecast rainfall;
- fill trenches as soon as possible after opening – aim for three days from opening to closing trench;
- separate topsoil and subsoil during excavation and ensure that topsoil is replaced on the surface;
- manage topsoil resources to minimise the risk of erosion and sedimentation, and maximise reuse of topsoil during rehabilitation;
- when trenching parallel to site contours (across grade), soil from the excavation should be placed and compacted on the uphill side of the trench to form an earth bank. This is to prevent clean stormwater entering the trench (where after it must be managed as "dirty" water) by directing stormwater around and away from the open trench. This measure may be avoided where trenches are expected to be open for less than 24 hours and where the likelihood of rain is low;

- when trenching perpendicular to contours use sandbag plugs or bulkheads to shorten the length of stormwater flow and consequent erosion in the trench; and
- progressively backfill trenches and rehabilitate as soon as possible. Leave backfilled trenches with a slightly elevated profile to allow for settlement, and to prevent the trenches from becoming a depression that can concentrate stormwater run-off, and potential erode the replaced soil.

FIGURE 2-8 GENERIC EROSION AND SEDIMENT CONTROL PLAN FOR PAD

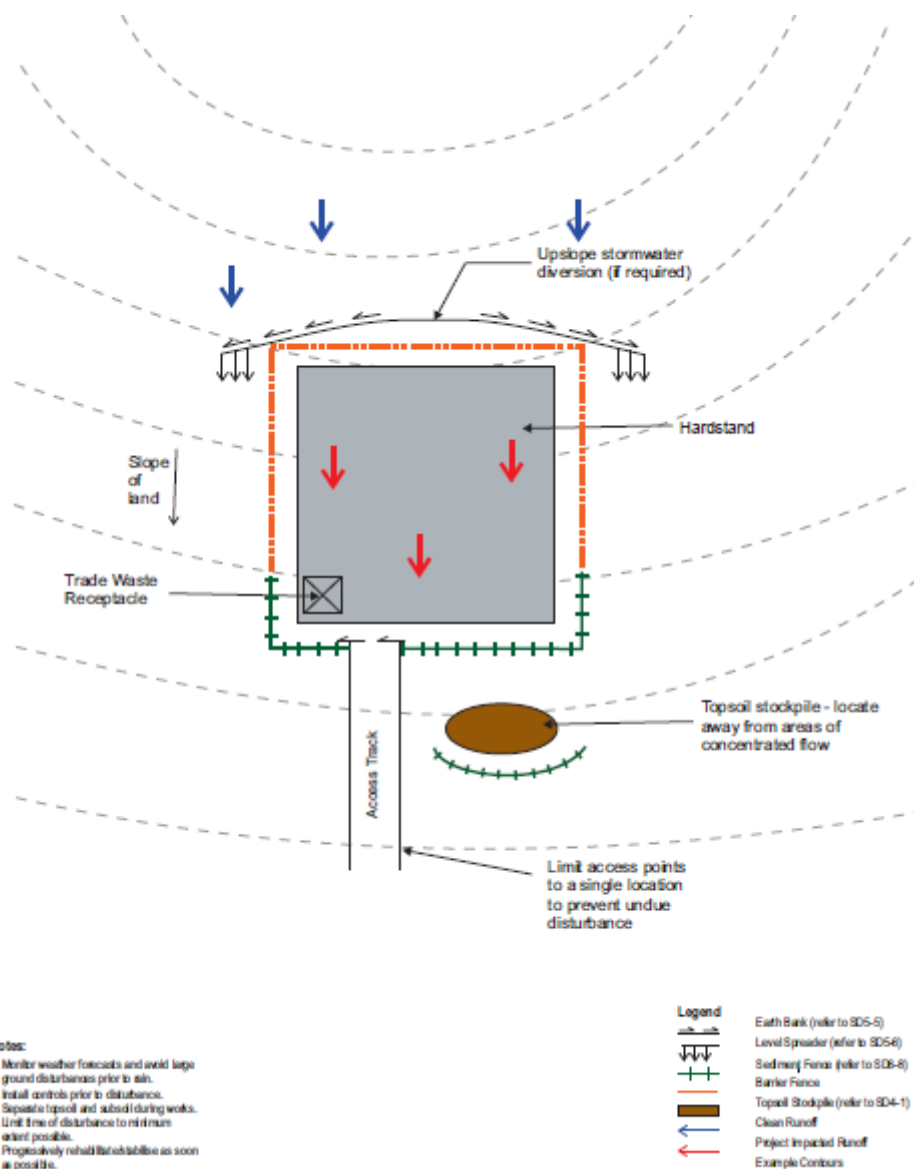




FIGURE 2-9 EROSION AND SEDIMENT CONTROL MEASURES DURING TRENCHING ACTIVITIES (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)

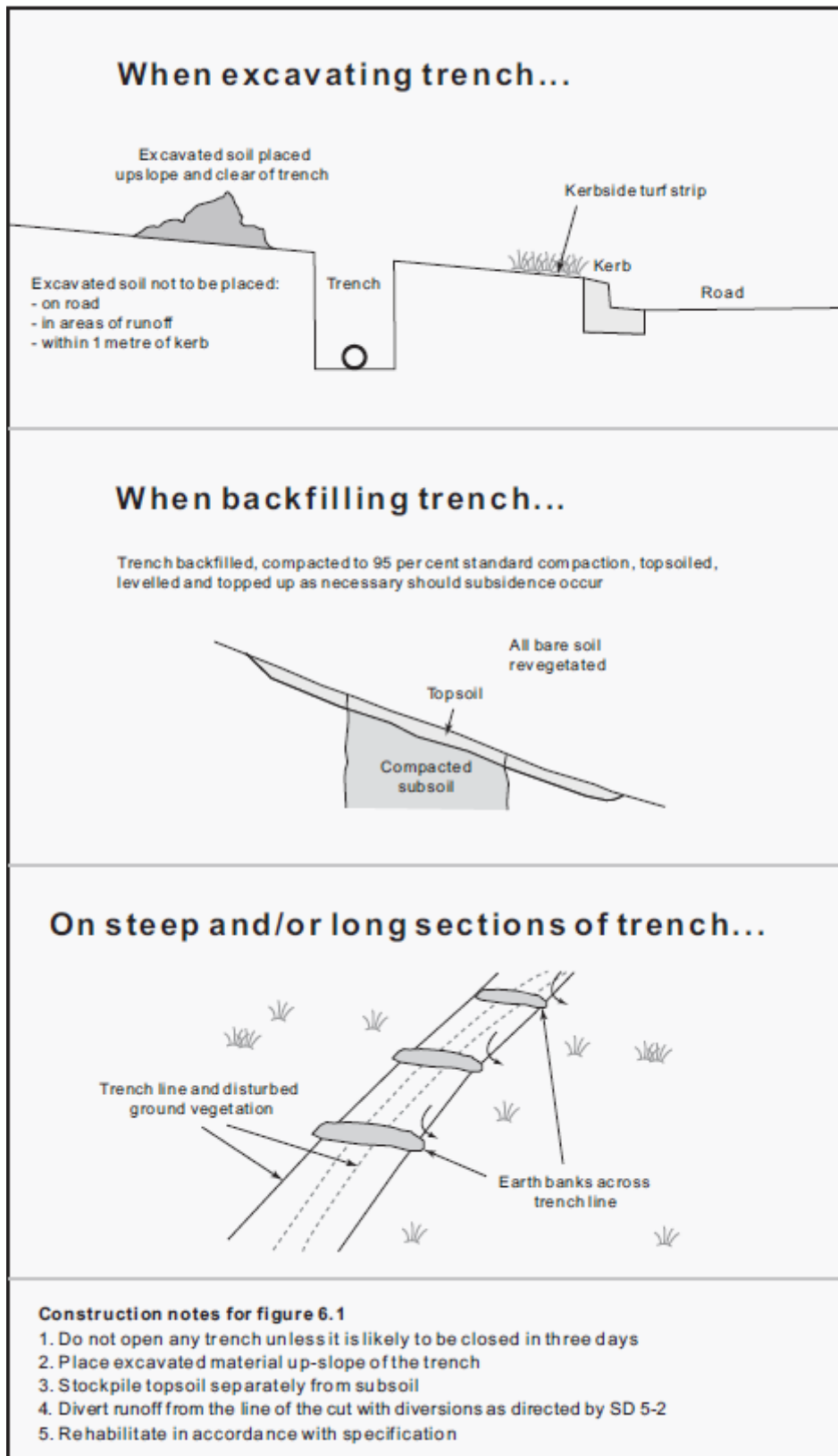


FIGURE 2-10 TYPICAL TRENCH STOP DETAIL (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)

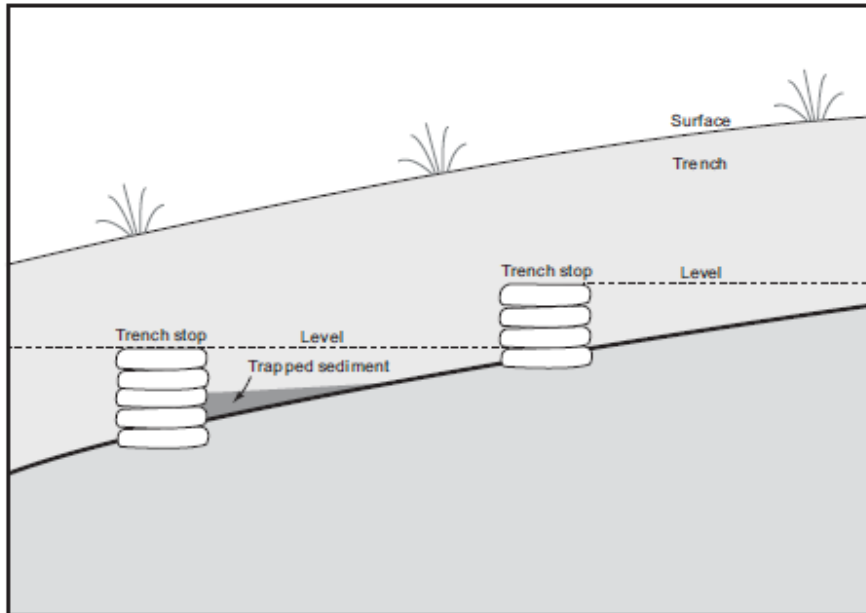
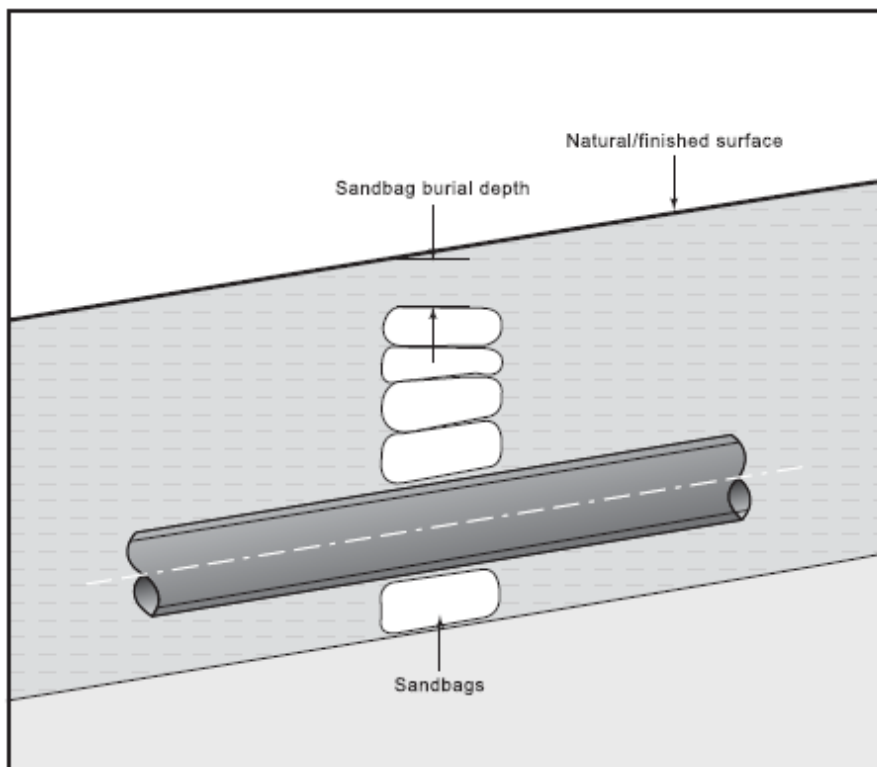


FIGURE 2-11 DETAIL OF TYPICAL SEEPAGE COLLAR OR BULKHEAD (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)





2.8.3 DEWATERING

Water has the potential to collect in trenches, sediment traps and low lying depressions in the construction areas following rainfall events. This water is likely to become contaminated with suspended sediment and will require management to ensure that downstream waterways are not polluted.

Dewatering can be undertaken such that water collected is reused on the site within water carts, for dust suppression on unsealed access roads and watering of rehabilitated areas. Discharging run-off directly to a natural waterway is not supported. Low volumes of water can be discharged through vegetated areas to encourage infiltration and settlement of entrained sediment. Vegetated areas act as a filter, assisting in the removal of sediment from the discharged water. Dewatering bags may also be used.

2.8.4 UNSEALED INTERNAL ACCESS TRACKS

A network of unsealed roads will be developed throughout the Project Area to allow access to the WTGs, batching plant and other project infrastructure.

The focus of erosion and sediment control for unsealed roads will be on maintaining good stormwater drainage. The primary aim is to ensure that stormwater is readily shed from the road surface and, most importantly, is not allowed to track longitudinally along the road for any great distance. Onsite assessment and review of topographical mapping noted that proposed roads are located along ridgelines and in areas without large upslope catchments thus minimising the erosion hazard and drainage requirements.

The primary access point is from Sturt Highway. Mud tracking will be a risk in these locations and as such stabilised entry points will be required. Options may involve the sealing of the internal roads with bitumen for 50 m into the Project Area at confluence points with the access roads or the use of cattle grids and wheel washes, or a layer of crushed rock.

The following mitigation measures should also be considered during the planning and implementation phases of the access road construction:

- limit the clearing width to the minimum that is practicable;
- retain any cleared vegetation (i.e. as mulch and sheared timber) for use later in rehabilitation;
- strip and stockpile topsoil separately for use in rehabilitation;
- minimise cut and fill by constructing the road at-grade where ever possible;
- ensure the road surface has a cross-sectional grade to allow free surface drainage and avoid excessive ponding and concentration of flow in wheel ruts;
- employ outfall drainage where practicable to shed water over the downslope batter of the road, especially where the road alignment is generally parallel to the contours;
- where the road is positioned along a crest or ridge use a crowned road surface that sheds water to both sides;
- when grading roads, avoid the formation of windrows along the shoulders. These retain water on the road surface and increase erosion;



- where table drains are used, ensure these are properly stabilised and install regularly spaced mitre drains to discharge water from drains, releasing to well vegetated, stable areas;
- mitre drains shall be installed regularly to convey run-off from the road shoulders and any table drains to disposal areas away from the road alignment. As a general rule the maximum spacing between mitre drains should be 50 m, however this may be reduced in high erosion hazard areas (e.g. on steep slopes). Mitre drains should have a grade of no more than 5 %. They should discharge to areas that are well stabilised and free of obstructions (e.g. large rocks, tree trunks);
- cross-banks (or rollover banks) or cross-drains should be considered in suitable locations to shed water from the road surface, discharging water in well vegetated, stable areas. Cross-banks are earth banks that extend across the road roughly perpendicular to the road alignment. They contain a bank and upstream channel to direct run-off across the road surface, to prevent the concentration of run-off along the road surface and reduce runoff velocities, thereby reducing erosion. These measures are highly useful where roads are aligned acutely to or perpendicular to the contours over long distances; and
- stabilise road batters using a suitable combination of rolled erosion control products (RECPs) such as jute matting, mulching, spray-on stabilisation measures (e.g. hydromulching or bitumen emulsion) and hard armouring where required (e.g. within flow lines).

A recommended waterway crossing standard drawing (SD5-1, refer **Figure 2-12**).



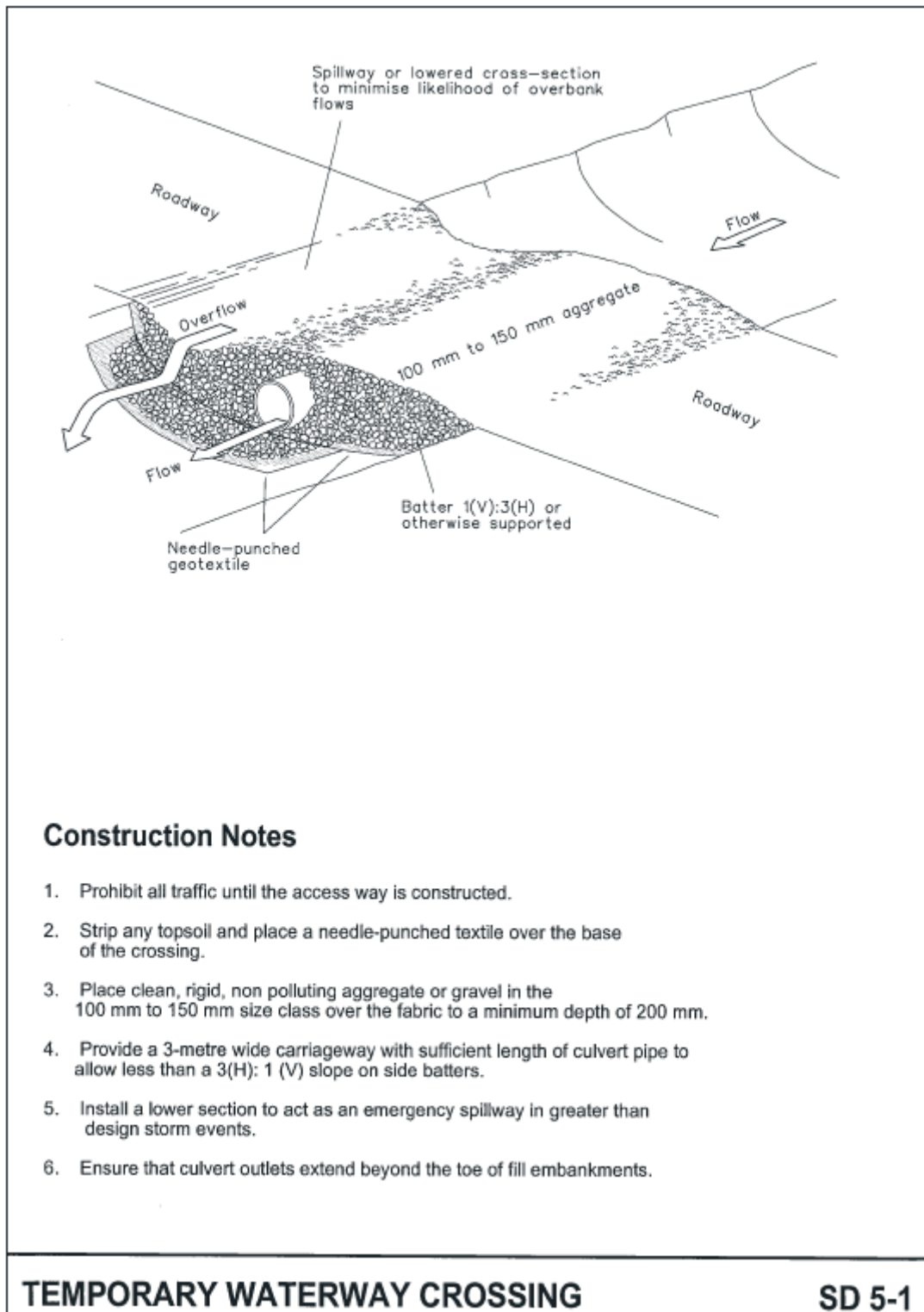
2.8.5 CONCRETE BATCHING PLANT

Establishment of the concrete batching plant will be similar to the establishment of all the pad sites and as such erosion and sediment controls are universal. However new water management issues arise during the operation of the plant due to the creation of run-off with entrained fine sediment and higher alkalinity run-off. The following mitigation measures are proposed during the operation of the concrete batching plant:

- separate stormwater collection and drainage systems will be provided to allow for discharge of clean stormwater (through a system designed to minimise local erosion) and collection and reuse of contaminated stormwater (through a first flush collection pit);
- a stormwater recycling system will be provided with capacity sufficient to store contaminated run-off generated by 20 mm rain within 24 hours, with operating management system to use collected wastewater as soon as possible (to maintain containment capacity);
- suitable washout locations will be provided for the placement of waste concrete and mortar slurries (either at the concrete batching plant or at individual works compounds, or both). These may comprise shallow excavations that are suitably bunded to prevent non-project impacted stormwater from entering the washout. Dried concrete will be disposed by an approved means;
- water within the washout will be encouraged to evaporate and/or infiltrate the soils;
- wet weather stormwater discharges will be monitored for pH and suspended solids;
- any excess contaminated waste water will be disposed of off-site by a licensed waste contractor; and
- the area of the batching plant will be fully rehabilitated after the construction phase is completed.



FIGURE 2-12 SD 5-1 TEMPORARY WATER CROSSING (MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION – VOLUME 1, 4TH EDITION)





2.8.6 SITE MONITORING AND MAINTENANCE

Essential to an effective system of sediment control devices, is an adequate inspection, maintenance and cleaning program. Inspections, particularly during storms, will show whether devices are operating effectively. Where a device proves inadequate, it should be quickly redesigned to make it effective. Visual monitoring of potential dust during construction is required to mitigate air quality impacts.

Recommended Inspection Schedules will be developed in the Detailed Construction Soil and Water Management Plan following approval.

2.9 MITIGATION MEASURES

2.9.1 PROJECT MITIGATION MEASURES

The following measures will be implemented to address potential soil and water impacts:

- prepare a detailed SWMP prior to construction commencing. The SWMP should be prepared by a suitably qualified person, such as a soil conservationist;
- prepare Progressive ESCPs within the SWMP as the Project progresses to address management requirements at individual work sites;
- design and construct the Project to minimise land disturbance and therefore reduce the erosion hazard;
- stage construction activities to minimise the duration and extent of land disturbance;
- schedule dust-generating construction activities when there are favourable wind conditions;
- monitor air quality with dust deposition gauges during the construction phase of the Project;
- manage topsoil resources to minimise the risk of erosion and sedimentation, and maximise reuse of topsoil during rehabilitation;
- where required a water cart or alternative dust suppression would be available and applied to work areas;
- cover or stabilise stockpiles when not in use to reduce dust where practical;
- divert upslope (clean) stormwater around the disturbed sites and capture sediment-laden run-off from within the disturbed site for diversion to sediment control devices;
- rehabilitate the site promptly and progressively as works progress;
- inspect and maintain erosion and sediment control devices for the duration of the Project construction stage;
- avoid land disturbance beyond that identified in the assessment within 20 m of minor streams (first and second order watercourses) and 40 m of third order or higher watercourses;
- ensure appropriate procedures are in place for the transport, storage and handling of fuels, oils and other hazardous substances, including availability of spill clean-up kits;



- construct required access tracks at any early stage to minimise disturbance during construction;
- obtain all necessary water access licences; and
- ensure appropriate stormwater, collection, treatment and recycling at the concrete batch plant, in accordance with good practice and any requirements of the NSW Environmental Protection Authority.

2.9.2 RUNOFF MANAGEMENT

Changes to the catchment runoff characteristics due to project activities primarily relate to upgrading existing access tracks and replacing open vegetated ground cover with hardstand (all weather) access tracks, crane pads and WTG footings as well as construction of sealed areas for the associated infrastructure including substations.

2.9.3 CONSTRUCTION

Mitigation measures in addition to those recommended in **Section 2.9.1** include:

- the drainage design for hardstand and access track infrastructure will aim to direct runoff from all hardstands and access tracks to appropriate sediment control facilities and/or flow velocity controls such where required;
- installation of appropriate erosion and sediment controls near waterways to contain surface water contaminated with sediment runoff entering the waterway;
- procedures to ensure that steep batters are treated appropriately for erosion and sediment control;
- appropriate overland flow management to prevent the concentration and diversion of water onto steep or erosion prone areas; and
- thorough visual inspections following significant rain events with a requirement for actions for localised erosion caused by runoff (within specified response times).

The separation of 'clean' and 'dirty' runoff is the first principle of best management practices in erosion and sediment control and minimises flows to be subject to water quality controls and will be implemented throughout the Project.

Mitigation measures will be included in site specific ESCPS developed by a suitably qualified and experienced person.



2.9.4 OPERATION

Runoff from Project infrastructure is likely to have a marginally higher velocity with less infiltration compared to existing conditions. However, this will be somewhat offset by the installation of erosion and sediment controls such as grass swales with regular rock checks in access track and other constructed drainage lines, level spreaders onto naturally vegetated areas at flow outlets to reduce velocities and encourage infiltration.

Engineered designed and constructed hardstand areas graded to perimeter drains have minimal available fine materials on surfaces and limited potential to erode and hence the potential to generate sediment. Erosion risk is primarily during construction when working on disturbed surfaces and constructing cut and fill batters prior to completion of permanent stabilising works. Erosion risk also continues after construction in concentrated flow paths such as access track drainage lines, however these can be managed with the implementation of appropriate controls as noted above.

2.10 SENSITIVE AREAS MANAGEMENT

The Yanga State Conservation Area is located adjacent to the Project Area, immediately to the west. Additional considerations to ensure activities associated with the Project do not impact on the integrity of the Conservation Area are required. The primary risk to impact upon the "sensitive location" is associated with runoff and sediment deposits.

Suitable measures can be effectively implemented to mitigate impacts associated with the identified sensitive location in the adjacent National Park. Measures are to be included in the progressive ESCP to either;

- direct disturbed runoff away from the catchment areas that flow directly to the National Park, or
- process runoff through additional sediment controls (e.g., sumps and/or sediment basins) and discharge at a low, non-erosive velocity.

These measures are to be included in any environmental management plans to be implemented across the site, to protect the identified sensitive locations.