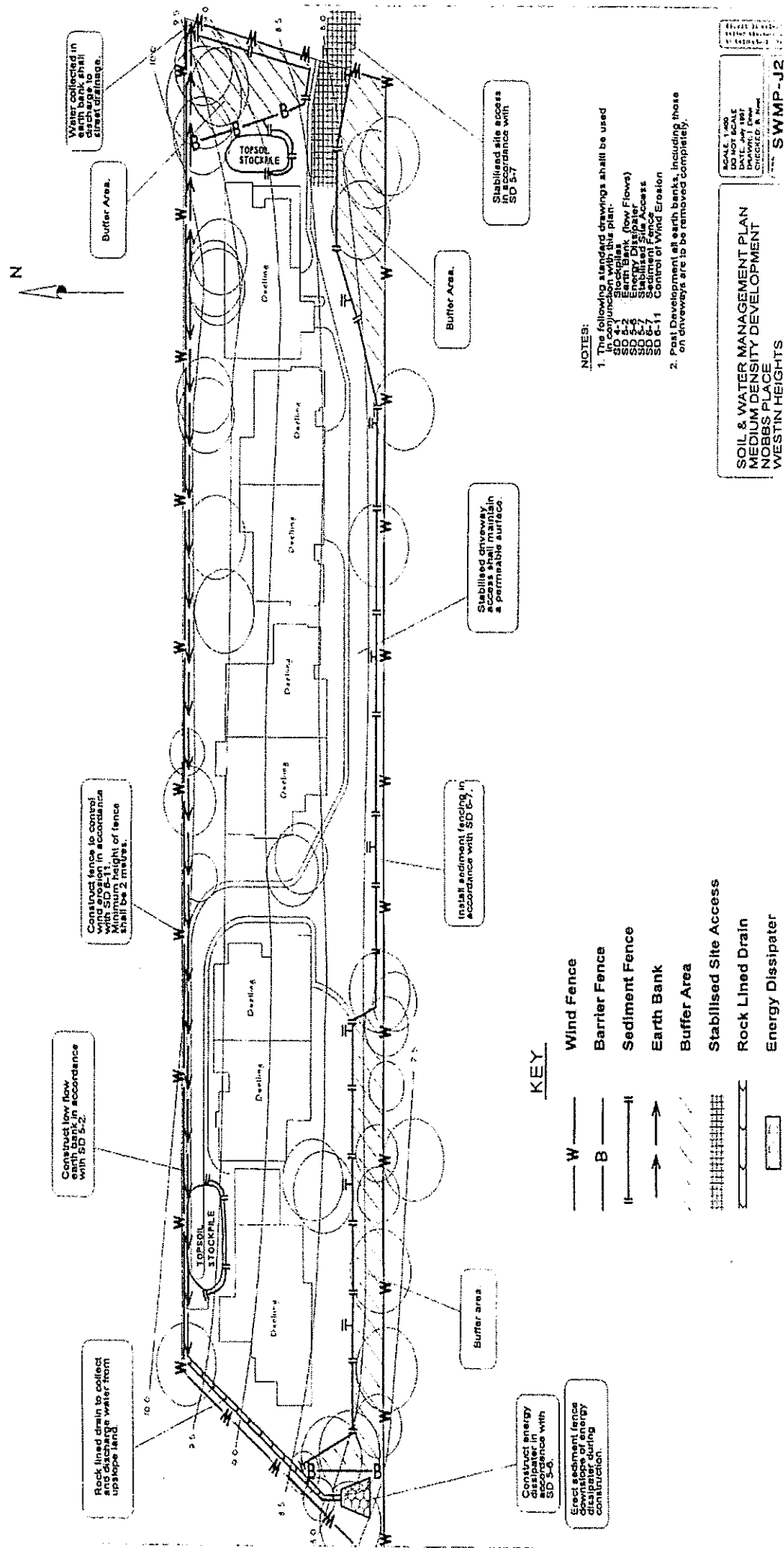


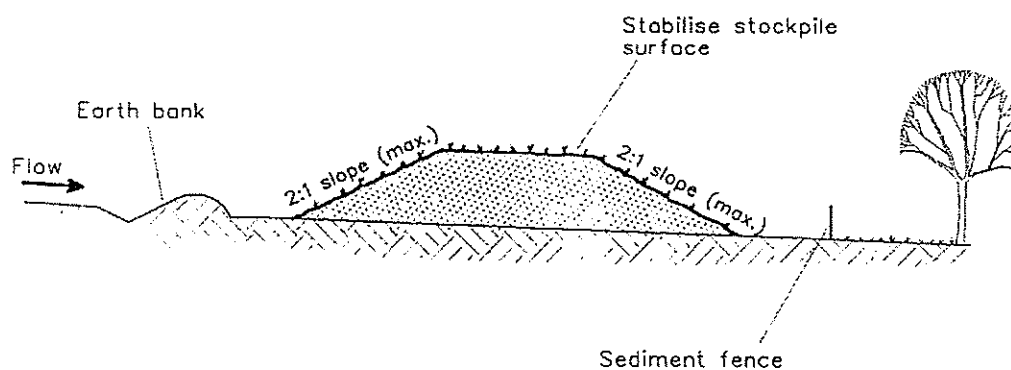
APPENDIX D7

1. **SOIL & WATER MANAGEMENT PLAN FOR MEDIUM DENSITY DEVELOPMENT**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
2. **STANDARD DRAWING SD4-1 (STOCKPILES)**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
3. **STANDARD DRAWING SD5-2 (EARTH BANK – LOW FLOW)**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
4. **STANDARD DRAWING SD5-3 (EARTH BANK – HIGH FLOWS)**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
5. **STANDARD DRAWING SD5-6 (ENERGY DISSIPATER)**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
6. **STANDARD DRAWING SD5-7 (STABILISED SITE ACCESS)**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
7. **STANDARD DRAWING SD6-7 (SEDIMENT FENCE)**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
8. **STANDARD DRAWING SD6-11 (CONTROL OF WIND EROSION)**
(Source: - Department of Housing – Managing Urban Stormwater, Soils and Construction- 1998)
9. **SUMMARY OF EROSION AND SEDIMENT CONTROL TECHNIQUES.**
(Source:- Roads and Traffic Authority , Road Design Guide, Section 8- 1993)

EROSION CONTROL AND STORMWATER MANAGEMENT

Contract No.

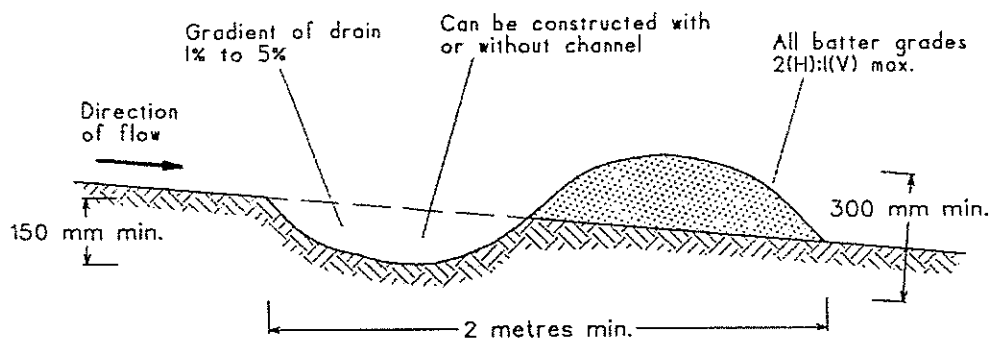




Construction Notes

1. Locate stockpile at least 5 metres from existing vegetation, concentrated water flows, roads and hazard areas.
2. Construct on the contour as a low, flat, elongated mound.
3. Where there is sufficient area topsoil stockpiles shall be less than 2 metres in height.
4. Rehabilitate in accordance with the SWMP/ESCP.
5. Construct earth bank (Standard Drawing 5-2) on the upslope side to divert run off around the stockpile and a sediment fence (Standard Drawing 6-7) 1 to 2 metres downslope of stockpile.

STOCKPILES**SD 4-1**

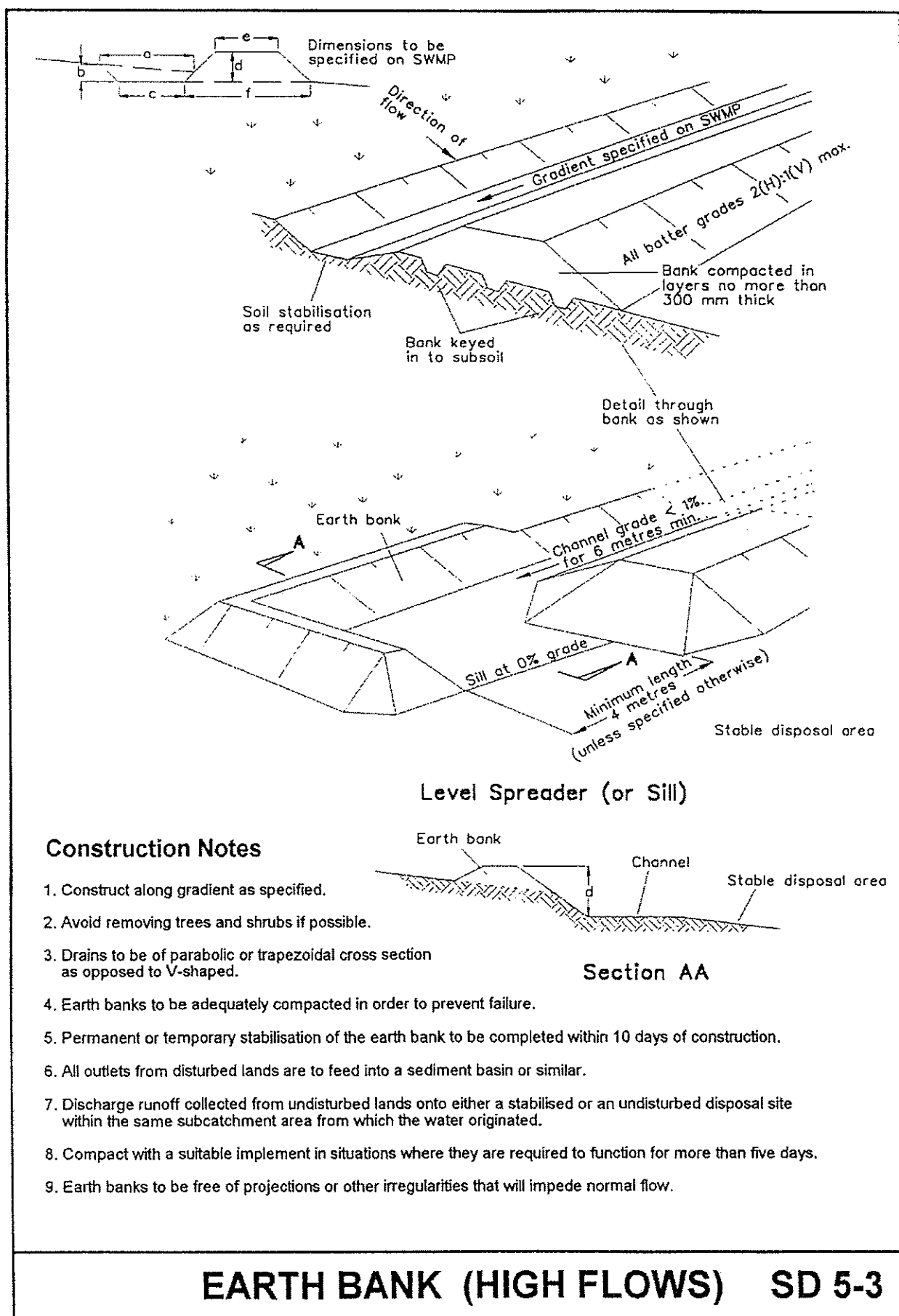


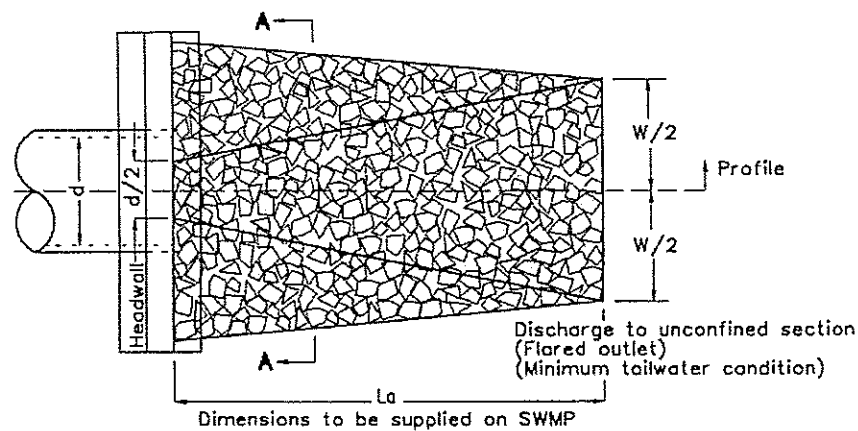
NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

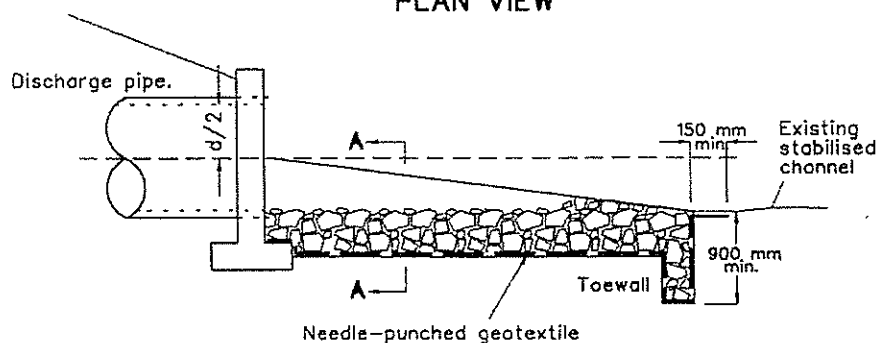
1. Construct with gradient of 1 per cent to 5 per cent.
2. Avoid removing trees and shrubs if possible.
3. Drains to be of circular, parabolic or trapezoidal cross section not V-shaped.
4. Earth banks to be adequately compacted in order to prevent failure.
5. Permanent or temporary stabilisation of the earth bank to be completed within 10 days of construction.
6. All outlets from disturbed lands are to feed into a sediment basin or similar.
7. Discharge runoff collected from undisturbed lands onto either a stabilised or an undisturbed disposal site within the same subcatchment area from which the water originated.
8. Compact bank with a suitable implement in situations where they are required to function for more than five days.
9. Earth banks to be free of projections or other irregularities that will impede normal flow.

EARTH BANK (LOW FLOW) SD 5-2

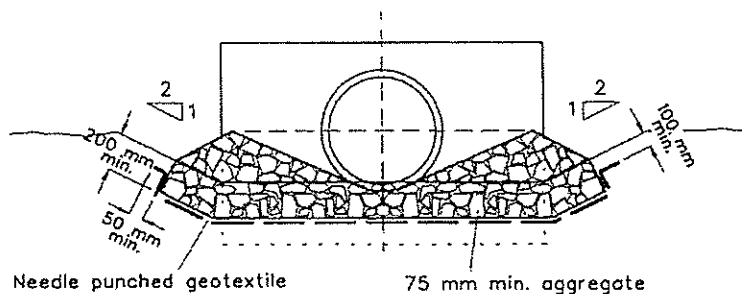




PLAN VIEW



PLAN VIEW



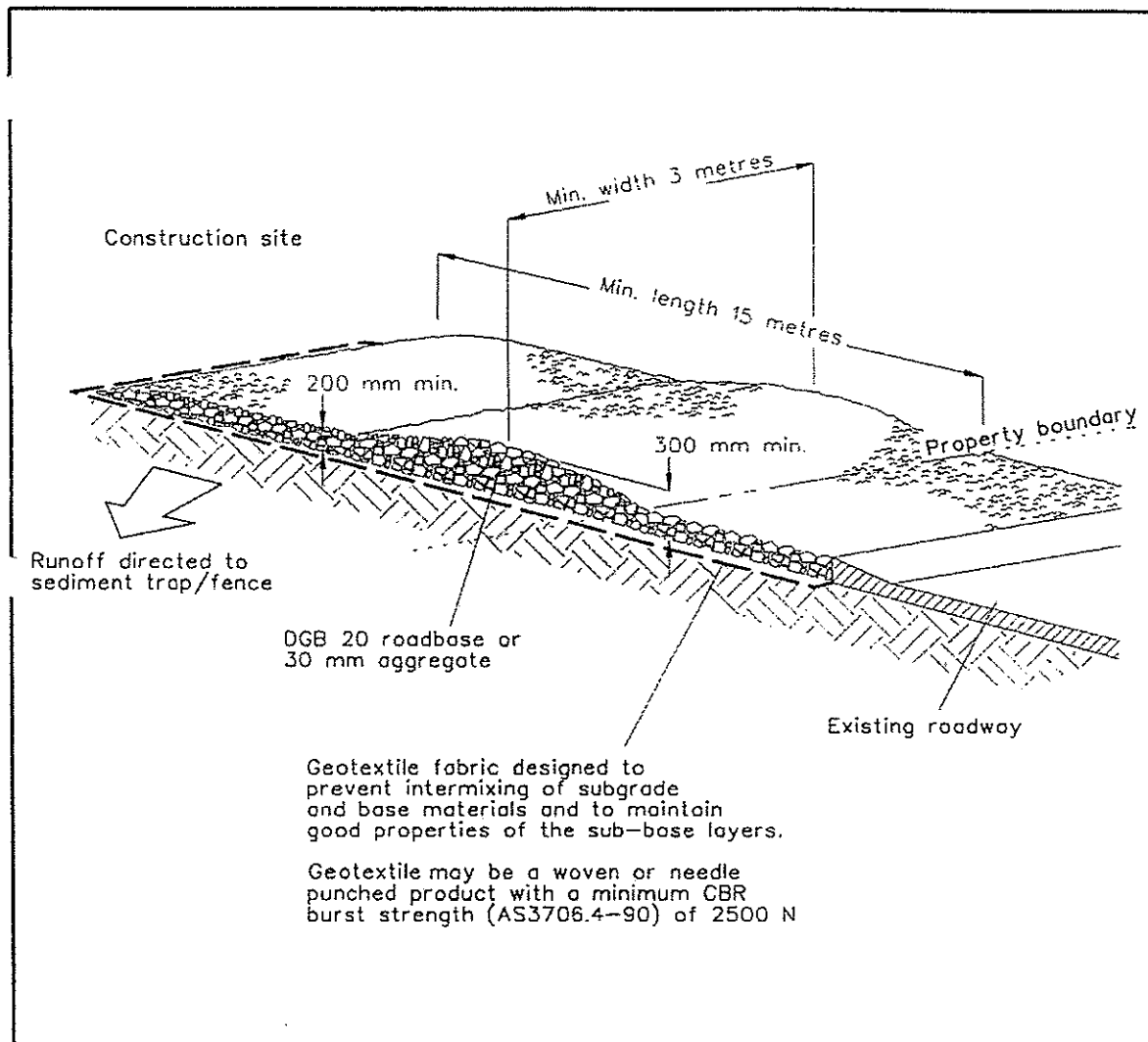
CROSS SECTION AA

Construction Notes

1. Subgrade fill to be compacted to the density of the surrounding undisturbed material.
2. Ensure that concrete or riprap used for energy dissipater or outlet protection conforms to the grading limits specified on the SWMP/ESCP.
3. Ensure that the geotextile does not sustain serious damage by preparing a smooth, even foundation.
4. Repair minor damage to the geotextile before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.

ENERGY DISSIPATER

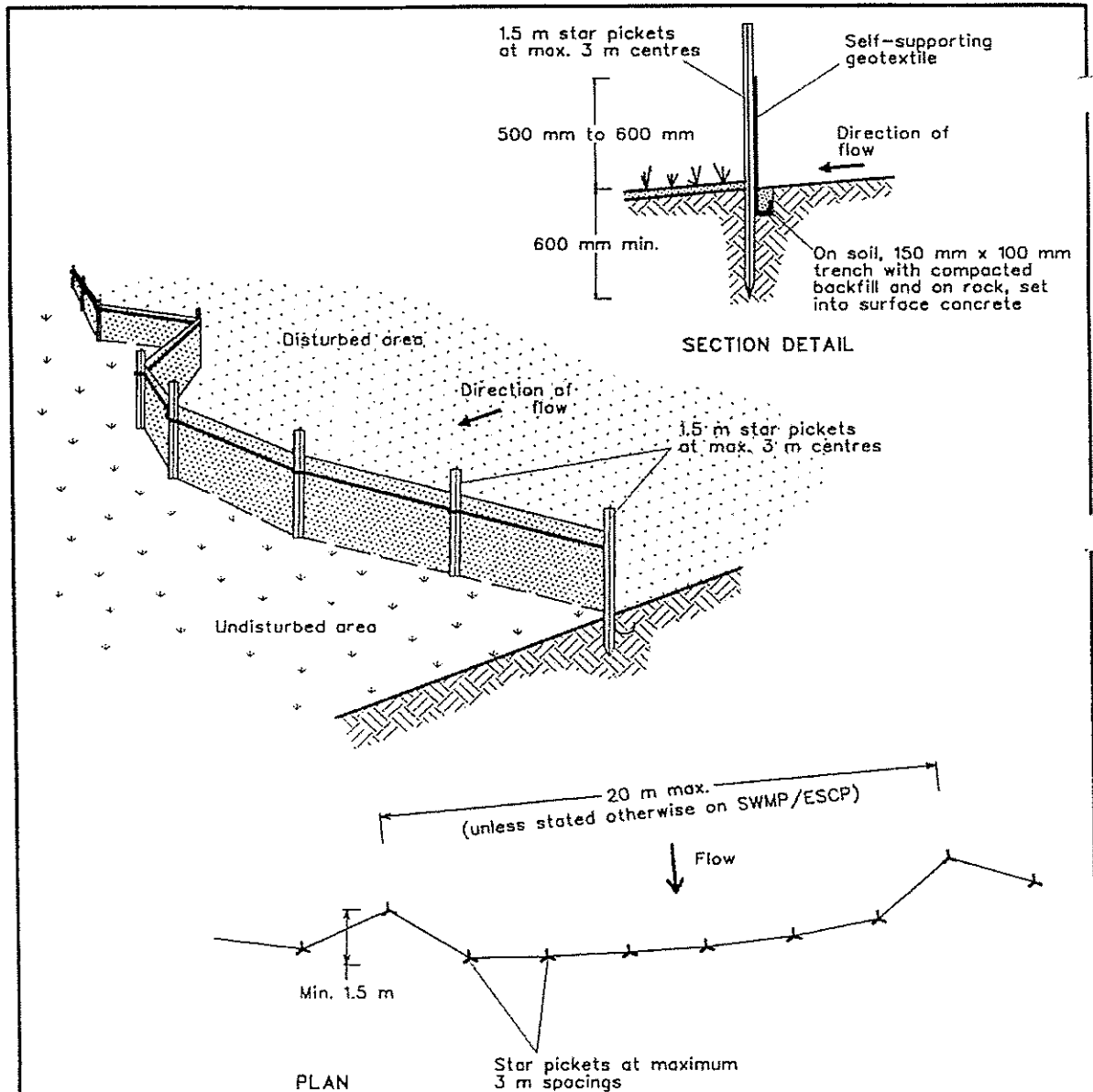
SD 5-6



Construction Notes

1. Strip topsoil and level site.
2. Compact subgrade.
3. Cover area with needle-punched geotextile.
4. Construct 200 mm thick pad over geotextile using roadbase or 30 mm aggregate. Minimum length 15 metres or to building alignment. Minimum width 3 metres.
5. Construct hump immediately within boundary to divert water to a sediment fence or other sediment trap.

STABILISED SITE ACCESS SD 5-7

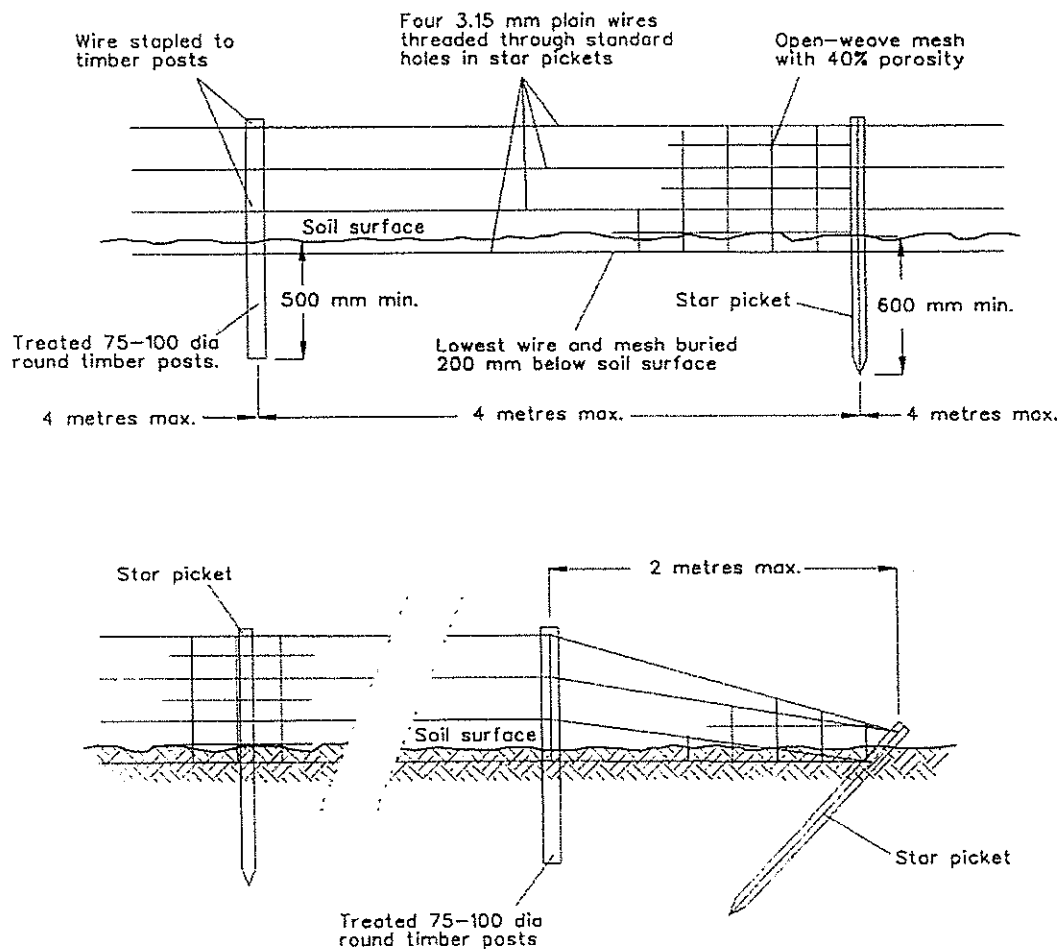


Construction Notes

1. Construct sediment fence as close as possible to parallel to the contours of the site.
2. Drive 1.5 metre long star pickets into ground, 3 metres apart.
3. Dig a 150 mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
4. Backfill trench over base of fabric.
5. Fix self-supporting geotextile to upslope side of posts with wire ties or as recommended by geotextile manufacturer.
6. Join sections of fabric at a support post with a 150 mm overlap.

SEDIMENT FENCE

SD 6-7

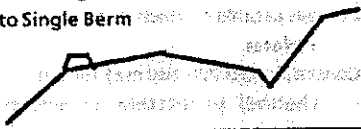

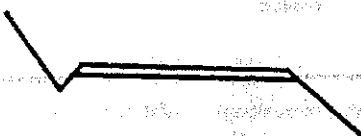


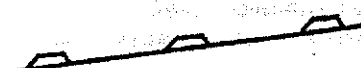


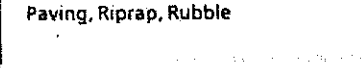


Construction Notes


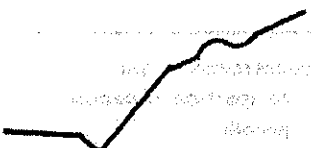
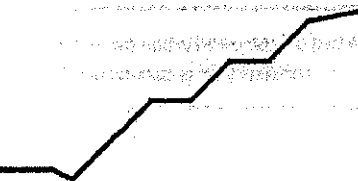
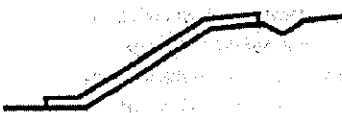
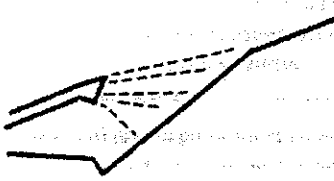
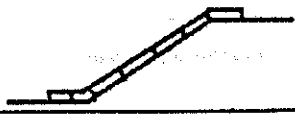

1. Install fence to height and location as specified on SWMP/ESCP.
2. Cut a channel 200 mm deep along the fence line.
3. Place wire and light resistant, open-weave polymer mesh with 40% porosity on prevailing wind side of fence.
4. Fasten mesh to all wires using ring fasteners at 100 mm -150 mm intervals on top wire and 300 mm intervals on other wires.
5. Use one 75 mm -100 mm dia. treated round timber post every 20 metres.
6. Star pickets to be fitted with safety caps.

CONTROL OF WIND EROSION SD 6-11

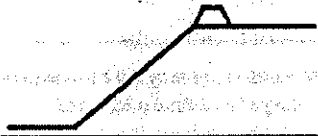
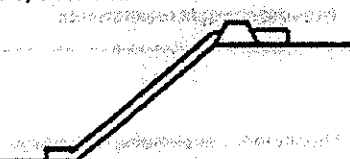



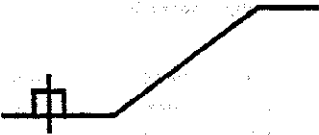
APPENDIX 8.1 SUMMARY OF EROSION AND SEDIMENTATION CONTROL TECHNIQUES

TECHNIQUE	ADVANTAGES	DISADVANTAGES
1. Roadway Surface Crowning to Ditch or Sloping to Single Berm 	Directs surface water to protected channel. Minimises erosion.	None - Should be part of good construction procedures.
Compaction 	The final lift of each day's work should be compacted and bladed to drain to a ditch or berm.	None - Should be part of good construction procedures.
Aggregate Cover 	Minimises surface erosion. Permits construction traffic during adverse weather. May be used as part of permanent base construction.	Requires reworking and compaction if exposed for long periods. Loss of surface aggregates can be anticipated.
Seed/Mulch 	Minimises surface erosion.	Must be removed when pavement construction is commenced.
2. Roadway Channels Sediment Traps / Straw Bale Filters 	Can be located as required to collect sediment during construction. Clean-out can usually be done by the equipment on-site.	Little guidance on spacing and size. Sediment removal may be difficult. Specifications must include provisions for periodic clean-out. May require seeding, sodding or paving during final clean-up.
Check Dams 	Maintains low velocities. Catches sediment. Can be constructed of logs, rock, timber, masonry or concrete.	Close spacing on steep grades. Requires clean-out. Unless keyed at sides and bottom, erosion may occur.
Sodding 	Easily placed, minimum preparation. Can be repaired during construction. Immediate protection. May be used on sides of lined channels to increase capacity.	Requires watering during first few weeks. Sod not always available. Will not withstand high velocity or severe abrasion from sediment load.
Seeding with Mulch and Matting 	Usually least expensive. Effective for channels with low velocities. Easily placed in small quantities by inexperienced personnel.	Will not withstand medium to high velocities.
Paving, Riprap, Rubble 	Effective for high velocities. May be part of the permanent erosion control features.	Cannot always be placed when needed due to construction traffic and final grading and dressing. Initial cost is high.

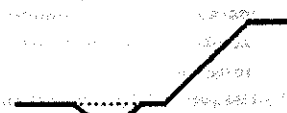






APPENDIX 8.1 SUMMARY OF EROSION AND SEDIMENTATION CONTROL TECHNIQUES (continued)

TECHNIQUE	ADVANTAGES	DISADVANTAGES
3. Cutting Slopes Berm at Top of Cutting 	Diverts water from cutting. Collects for slope drains or lined channels. May be constructed prior to excavation.	Access to top of cutting. Difficult to build on steep slopes or rock surfaces. Concentrates water and may require channel protection or energy dissipation devices.
Diversion Dyke 	Collects and diverts water at selected location reduces erosion potential. May be incorporated in permanent drainage system.	Access for construction. May be continual maintenance problem if not lined. Disturbed material or berm easily eroded.
Benching 	Slows velocity of runoff. Collects sediment. Provides access to slope for seeding, mulching and maintenance. Collects water for slope drains or may divert to natural ground. Assists in establishing vegetation.	May cause sloughing of slopes due to water infiltration. Requires additional ROW. May not be possible in unsuitable material. Requires maintenance to be effective. Increases excavation quantities.
Slope Drains 	Prevents erosion of slope. Can be part of temporary or permanent system. Can be constructed or extended as excavation progresses.	Requires other structure to collect water. Permanent construction not always compatible with other project work. Usually requires some type of energy dissipation.
Seeding/Mulching 	Contributes to a grassed slope. Mulch provides temporary erosion protection until grass is rooted. Temporary or permanent seeding may be used. Mulch should be anchored. Larger slopes can be seeded in stages if smaller equipment is used.	Difficult to schedule high production units for small increments. Success depends largely on season. May require supplementary watering.
Sodding 	Provides immediate protection. Can be used to protect adjacent property from sediment and turbidity.	Difficult to place until embankment is complete. Sod not always available. May be expensive.
Riprap, Rock Mattresses or Hard Sealing 	Provides immediate protection for high risk areas and under structures. Sealing may be pre-cast or cast-in-situ.	Expensive. Difficult to place on high slopes. May be difficult to maintain.

APPENDIX 8.1 SUMMARY OF EROSION AND SEDIMENTATION CONTROL TECHNIQUES (continued)

TECHNIQUE	ADVANTAGES	DISADVANTAGES
3. Cutting Slopes (continued) Temporary Cover (Plastic Sheeting, Geotextiles etc)	Easily placed and removed. Useful for providing some degree of protection for high risk areas.	Provides only temporary protection. Original surface usually requires additional treatment when cover is removed. Must be anchored to prevent wind damage.
4. Embankment Slopes Berms at Top of Embankment 	Prevents runoff running down face. Collects runoff for slope drains or channels. Can be placed as part of the normal construction operation.	Requires monitoring to ensure effective placement. Failure to compact properly results in failure of berm. Sediment build up.
Slope Drains 	Prevents runoff running down face. Can be full or half pipe, pre-cast sections, rock mattresses, or other materials. Can be extended as construction progresses. Can be either temporary or permanent.	Energy dissipator required at outlet. Removal of temporary drain may disturb growing vegetation.
Embankment Berms or Benches 	Reduces velocity of slope runoff. Collects sediment. Provides access for maintenance. Collects water for slope drains. Can be used to spoil excess material.	Requires additional material if excess spoil is not available. May cause sloughing. Additional ROW may be needed.
Seeding/Mulching 	Can decrease slope exposure if applied at appropriate time. Mulch that is cut in or otherwise anchored will collect sediment.	Difficult to place until cutting is complete. Sod not always available. May be expensive.
5. Protection of Adjacent Property Brush Barriers 	Use slashing and logs from clearing operation. May be covered and seeded later. Eliminates need for burning or disposal of cleared material.	May be considered unsightly in urban areas.
Straw Bale Barriers 	Bales readily available in most areas. When properly installed and maintained, they filter sediment and some turbidity from runoff.	Require removal. Subject to damage by vandals. Flow is slow through straw, requiring considerable area. May introduce unwanted species of vegetation.

APPENDIX 8.1 SUMMARY OF EROSION AND SEDIMENTATION CONTROL TECHNIQUES (continued)

TECHNIQUE	ADVANTAGES	DISADVANTAGES
4. Embankment Slopes (continued) Sediment Traps 	Collects much of the sediment from embankment slopes and channels Inexpensive Can be cleaned and expanded to meet need	Do not remove all sediment and turbidity Space not always available Require constant maintenance Usually need to be removed
Energy Dissipators 	Minimises erosion away from project Slows velocity, permits sediment deposition and collection downstream	May collect debris Require special design Can be expensive May be quite large structures
Level Spreaders 	Converts concentrated channel or pipe flow back to sheet flow Avoids channel easements and construction off project Simple to construct	Adequate space may not be available Sodding of overflow is required Must be part of permanent erosion control effort Requires constant maintenance
6. Protection of Stream Construction Dyke 	Permits work to continue during normal stream stages	Usually requires pumping of seepage water out of the work site Subject to erosion from stream and from direct rainfall on dyke
Cofferdam 	Work can be continued during most anticipated stream conditions Clear water can be pumped directly back into stream No material deposited in stream	Expensive
Temporary Stream Channel Change	Prepared channel keeps flow away from construction	Channel will usually require protection Stream must be returned to old channel and temporary channel refilled when finished
Riprap	Easy to stockpile and place Can be installed in increments as needed	Can be expensive
Temporary Culverts for Haul Roads 	Minimises turbulence and turbidity Provides uninterrupted route for fish Normal flow can be provided by pipes, higher flows can pass over roadway	Space not always available without conflicting with permanent structure work Larger pipe sizes may be expensive May be subject to washouts
Rock Lined Low-Level Crossing 	Minimises stream turbidity Inexpensive May also serve as a channel flow check or sediment trap	May not be fordable during high flows During periods of low flows, passage of aquatic life may be blocked