

Temporary Sedimentation Pond Design and Management Procedure

BBA-MPR-1000-1400-0002

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Rev	Date	Prepared By	Reviewed By	Approved By	Remarks
A0	22 Jan 2008	GB	JD		Released for Implementation
B0	30 Jan 2008	JRD	JD	CF	Revise following DTAE Comment

1 PURPOSE & SCOPE

The purpose of this procedure is to set out criteria for the design of temporary sedimentation ponds for the project to be used for the construction phase only.

Design of the permanent sedimentation ponds will be by the Design Consultants.

2 DEFINITIONS

The following definitions are used in this document:

Average Recurrence interval (ARI)

ARI is defined as:

“The average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration.”

It is implicit in this definition that the periods between exceedances are generally random.

3 PROCEDURE

3.1 Estimation of Sedimentation Pond Volume

Sedimentation Pond volume will be decided using the following criteria:

Table 1 : Sedimentation Pond Storage Volume - Recommended Requirements

Location	Expected Life of Sedimentation Pond	Recommended design Storm ARI for a 6 Hour Storm	6 Hour Design Storm Intensity mm/hr See Notes	Estimated Runoff Volume in m3/Hectare (Initial losses of zero)	Comments
Pulp Mill Site	Up to and including 1 year	1 in 2 year	5.3	319	
	Over 1 year	1 in 20 year	7.01	421	

Notes

1. The recommended (base) design storm comes from EPA Publication No 480 Environmental Guidelines for Major Construction Sites, Page 15.
2. Allow about 30% of the volume of a sediment pond as non-effective storage to provide for sediment build up and dead storage.

3.2 Key Sediment Pond Design Criteria

3.2.1 General Requirements

Site Environmental Officers (SEO) shall have regard for the following when designing sedimentation ponds. Additional in-house training will be provided to support these guidelines:

1. Consider the location of the permanent sediment ponds. Wherever possible avoid the permanent sedimentation pond locations when siting temporary sedimentation ponds to avoid conflicts during the transition from the temporary to permanent drainage systems.
2. Consider the possible location of other road infrastructure such as permanent drainage, landscaping, etc. The SEO should consult with the relevant Design Manager in this regard.
3. It may be decided that temporary basins may be left in place permanently as part of the project drainage system and urban design. This should be borne in mind during design and construction of temporary ponds.
4. The storage volume of ponds shall be based on Sec 3.1. The contributing catchment area shall be based on the anticipated area of exposed soil draining to a given site. Carefully consider the changing circumstances during the life of the pond. The area used as a basis for design should be that area of exposed soil that will contribute for the longest period. Remember the chance of the design storm reduces as the time of exposure reduces. Have regard for the establishment of cover crops or permanent surface protection when considering the life of a basin.
5. The required volume of sedimentation pond should preferably be achieved by using more than one pond in series. Ponds serving the same catchment as a system do not have to be adjacent.
6. In the transition from reliance on the temporary drainage system to the permanent drainage system for sediment control at a site there will be a substantial reduction in the storage volume required for a catchment because, at the same time the drainage system is in transition the catchment is being progressively protected by landscaping and rehabilitation works. In addition to the soil protection afforded by the finished works, the amount of runoff from landscaped areas, particularly mulched areas, will be reduced due to increased infiltration of rainfall. In view of this during the transition phase the volume of storage provided can be reduced (from those set out in Table 1). The following is a guide to the storage that could be provided:

Catchment Condition	Sediment Pond Capacity (% of Table 3.1)	Comment
Raw earthworks	100	
Earthworks completed and trimmed. Hardstands constructed.	50	

Batters topsoiled and mulched.	25	
Roof structures and pavement placed.		
Landscaping completed.	0	The site is reliant upon permanent stormwater drainage.
Structures and pavements completed.		
Drainage and swales completed.		

In applying the above reduction factors a substantial amount of judgement needs to be applied in deciding the minimum volume to be provided. Other factors that should be considered are:

- The time of year. Less storage would be required in the winter than in the summer due to the lower intensity winter rainfall.
- The duration of reliance on the sedimentation pond until the permanent drainage system is established. If the period is one month there would be less storage required than if it was for say a 3 month period.
- The nature and sensitivity of the receiving environment.

The following principles should also be applied:

- Construct the permanent sedimentation ponds as quickly as possible,
 - Retain the temporary sedimentation ponds for as long as possible as part of the site's drainage system.
7. The inlet and outlet of ponds should be separated by the maximum distance possible. If site conditions dictate that the inlet and outlet have to be adjacent, a separation curtain should be installed in the pond to maximise the flow distance between the inlet and outlet.
 8. The spillway of ponds should be able to pass the 1:100 ARI discharge without scouring.
 9. The spillway should be lined to prevent scour. Lining can be geofabric, rock, concrete, layflat pipe, etc. The choice should be based on the calculated peak flow, lowest cost and anticipated service life.
 10. All weather access to the pond must be provided to allow for water carts to pump water from the pond. Access must also be provided to the pond to allow for de-silting, particularly to the inlet end.
 11. Where the topography allows, ponds should be designed to be capable of gravity discharge.
 12. Outlets of ponds shall have appropriate access to allow for water quality sampling.
 13. Consider the soil types where the pond is to be located. If dispersive soils are present provide batter protection in the form of a thick layer of hay or other means. Some trials will be required to find an optimal cost effective solution.
 14. Batters should be as flat as site availability will permit. 5H:1V is optimal. Steeper than 3H:1V is undesirable.

15. Where ponds are to be drained by pumping, pump foot valves shall be designed to float so that the cleanest water is being pumped. The footvalve support system shall also be designed to prevent the valve getting closer than 500mm to the bed of the pond to avoid the pumping of sediment.

3.2..2 Mandatory Safety Requirements

Additional requirements designed to ensure the safety of workers and others have been developed following review.

1. Minimum fencing is parawebbing (or similar) and star pickets for all sedimentation ponds. All fencing is to be erected with a minimum 1.5 metre offset from the ponds top of batter unless constrained by lack of space.
2. Review fencing requirements for each sedimentation pond based on the fencing risk assessment for the area (as conducted by the Gunns Safety Group) to account for special risks – install a higher standard of fencing based on this assessment. Consideration of temporary fencing for excavator. Refer to the GNS-MPR-1000-1400 0025 Fencing & Signage Procedure.
3. Signage is required in accordance with GNS-MPR-1000-1400-0025 Fencing & Signage Procedure.
4. Ramps for access to the sed pond should be incorporated wherever possible. Rock bedding could be considered for security of footing.
5. A knotted rope may be installed to allow persons to climb out of ponds. The rope should be of a type that floats and must be of sufficient diameter to ensure that persons within a pond are able to grasp the rope effectively. Length should at least be enough to reach all areas of the pond from the mounting point. A floatation device must be attached to the end of the rope to support the end of the rope when in the water (such as a foam marine float or similar).
6. Maintain the volume of water held in sedimentation ponds at a minimum as far as practical. (Note: This is standard operating procedure).
7. Pumps must be able to be operated and accessible from outside the fencing, including access to the rope attached to the pump foot valve for removal purposes. (Note: This rope **cannot** double as the rope described in point 5 above – a separate rope is required for this purpose).
8. Any works within the fencing surrounding a sedimentation pond requires a Job Safety and Job Safety and Environmental Analysis (JSEA).

3.2..3 Records of Design

The SEO shall retain a record of sedimentation pond design including all assumptions and calculations.

3.2..4 Confirmation of Design Volumes

The SEO shall confirm that the volume of the pond as constructed is at least that as specified in the design. Records shall be kept centrally of design and actual volumes. Any pond with less than its design volume shall be modified to meet the design criteria, or alternatively additional storage added elsewhere as appropriate.

3.3 Management of Sedimentation Ponds

3.3.1 Reuse On-Site

The preferred option for disposing of water collected in sedimentation ponds is reuse onsite for dust suppression and other activities. If this is not possible then consideration must be given to discharge offsite or transport off site for disposal as liquid waste.

3.3.2 Water Quality

Water quality within the sedimentation pond must be of an acceptable quality before discharge. The acceptable quality for individual receiving waters are:

Parameter	Limit
Total Suspended Solids (TSS)	50 mg/l
BOD	15 mg/l
TPH	0.5 mg/l
Oil and grease	5 mg/l

If water quality is unacceptable for discharge then treatment of the water may be attempted to bring the water to an acceptable quality for discharge. If water is to be discharged from a sedimentation pond to receiving waters then Form GNS-FRM-1000-1400-0001 "Internal Permit to Discharge" must be issued – no discharge is permitted without this form being completed.

3.3.3 Water Treatment

Treatment options include:

- pH adjustment (acids);
- turbidity adjustment (flocculation – gypsum, Magnafloc products, etc.); and
- filtration (straw bales, natural filters such as grass and vegetation buffers).

3.3.4 General Discharge Requirements

Any discharge offsite should be conducted in a fashion which will avoid erosion and any impact on receiving waters. Use of existing vegetation is recommended where possible and also straw bales and silt fences if necessary to address turbidity issues. Attachment 8 – Discharge Flowchart describes in detail the steps to be followed when planning to discharge offsite.

Attachment 6 shows an example of the use of 'lay-flat' pipe or geofabric for discharge down batters.

3.3.5 Transport Off-Site for Disposal

In the event that the water is of a quality unacceptable for re-use or discharge in the normal manner, for example in the event contamination due to a chemical or hydrocarbon spill, a blue green algae problem, or if water quality requirements cannot be achieved through on-site treatment, disposal off-site will need to be considered. Any

disposal offsite must be conducted in accordance with Environmental Management and Pollution Control (Waste Management) Regulations 2000 as applicable.

4 REFERENCES

In addition to the general guidelines outlined above, the following will be used as a general guide in the design of sedimentation ponds:

1. *Managing Urban Stormwater, Soils and Construction, Volume 1, 4th edition, March 2004, NSW Landcom.*
2. *Auckland regional Council, Publication No 90,*
3. *Environmental Management and Pollution Control (Waste Management) Regulations 2000.GNS-MPR-1000-1400-0025 Fencing & Signage Procedure (This required for internal use only)*

5 ANNEXURES

Annexure 1 - Sediment retention pond example showing decant systems

Annexure 2 - Sediment retention pond example – decant detail

Annexure 3 - Sediment retention pond example for catchments between 3 and 5 ha

Annexure 4 - Sediment retention pond example for catchments between 1.5 and 3 ha

Annexure 5 – Example of Sedimentation Pond Discharge/Treatment Record

Annexure 6 – Lay Flat Pipe or Geofabric Batter Drain

Annexure 7 – Typical Spillway Design

Annexure 8 – Discharge Flowchart

Annexure 1 (source: *Erosion & Sediment Control – Guidelines for Land Disturbing Activities*)

2.1 Sediment Retention Pond



Plate 2.1.1 Sediment Retention Pond Showing Decant Systems

Annexure 2: (source: *Erosion & Sediment Control – Guidelines for Land Disturbing Activities*)

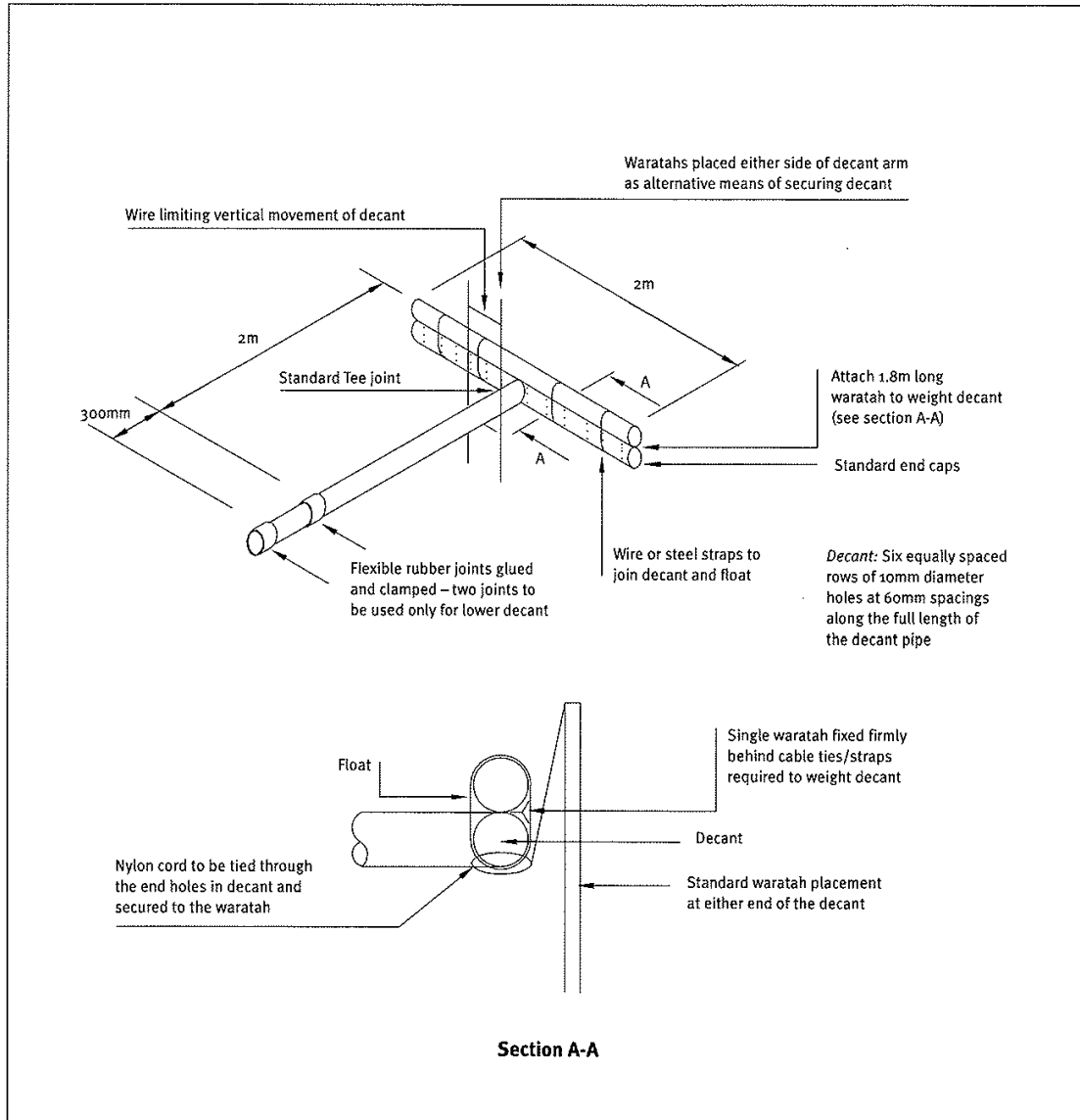


Figure 2.1.5 Sediment Retention Pond – Decant Detail

Annexure 3: (source: *Erosion & Sediment Control – Guidelines for Land Disturbing Activities*)

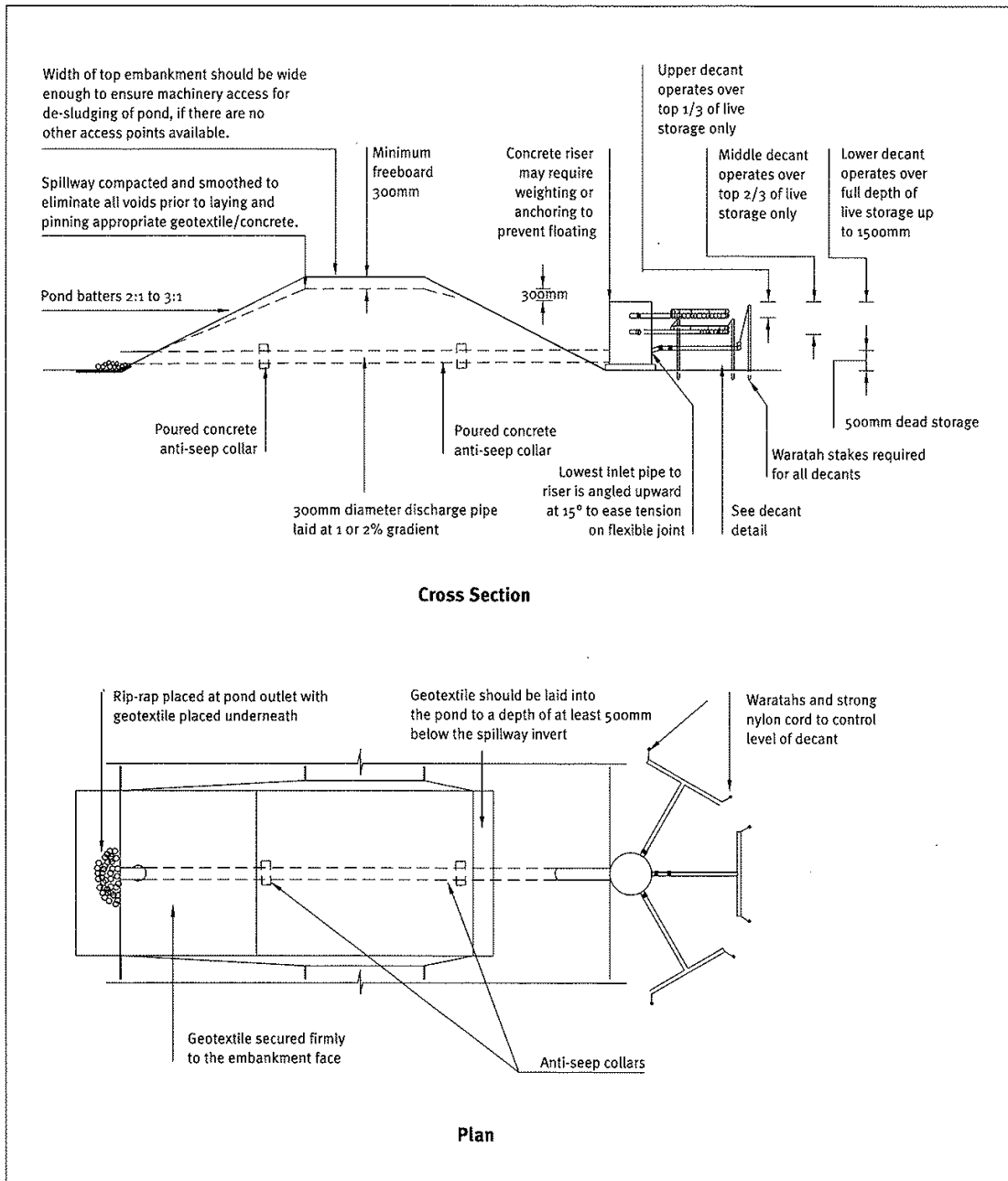


Figure 2.1.4 Sediment Retention Pond for Catchments Between 3 and 5 ha

Annexure 4: (source: *Erosion & Sediment Control – Guidelines for Land Disturbing Activities*)

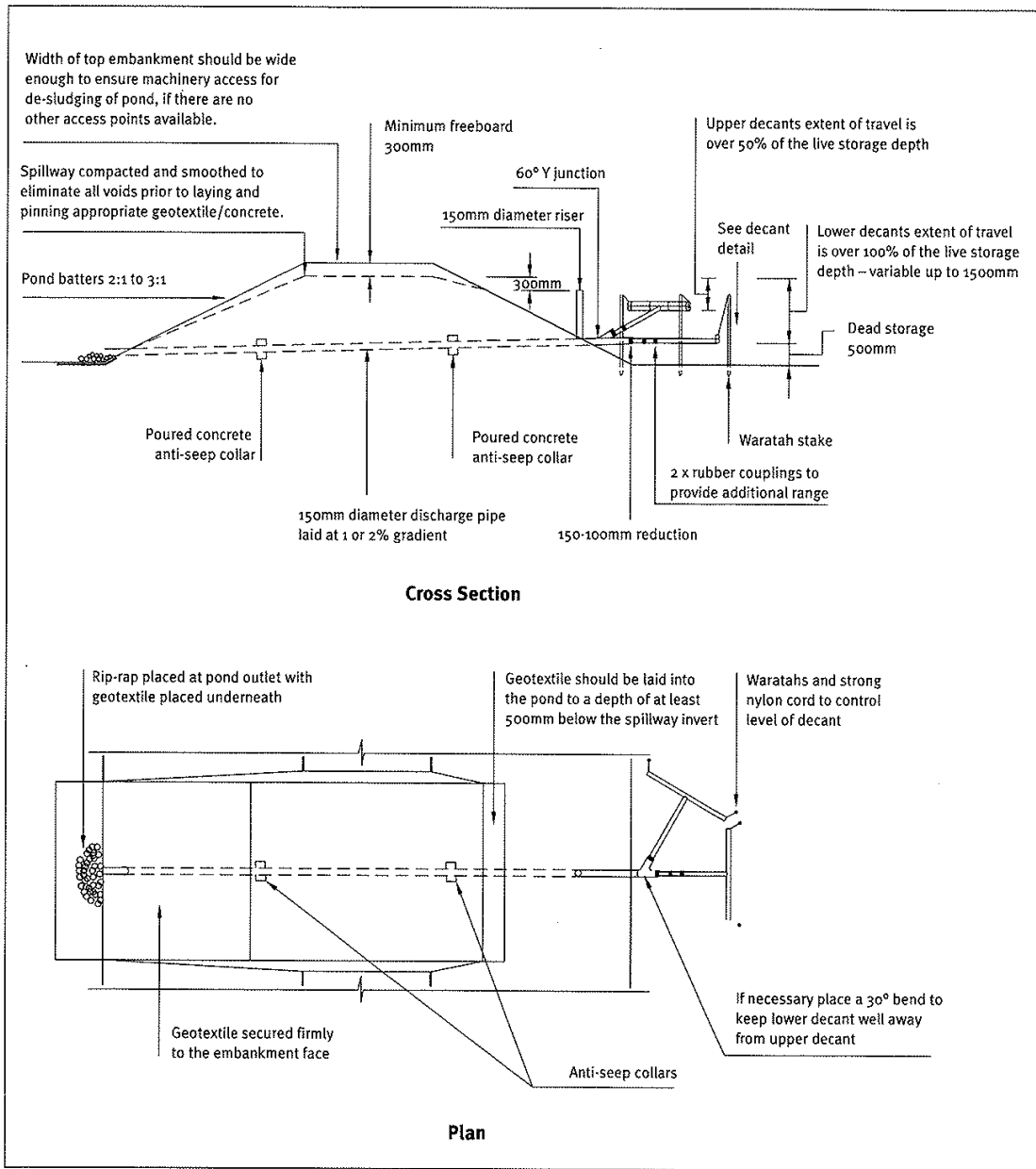


Figure 2.1.3 Sediment Retention Pond for Catchments Between 1.5 and 3 ha

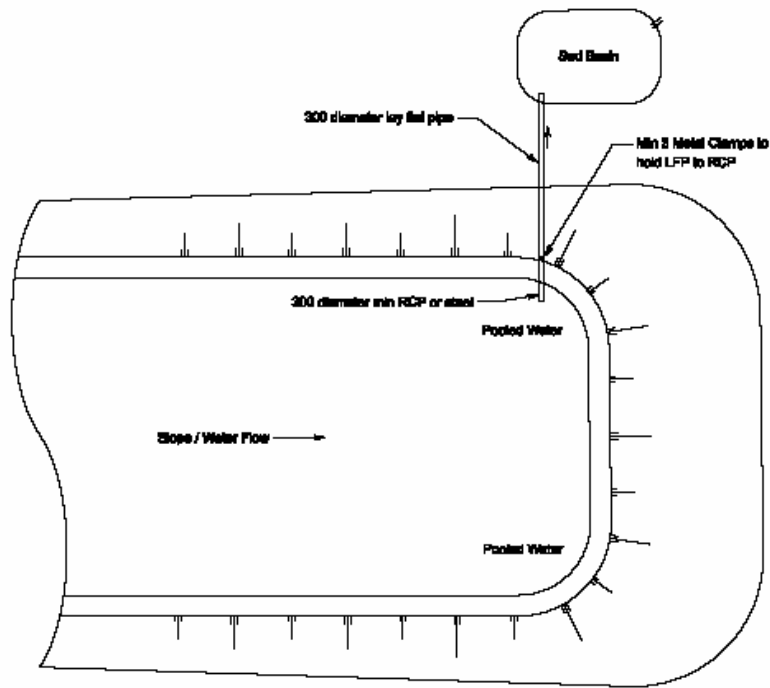
Temporary Sedimentation Pond Design and Management

Annexure 5: – Example of Sedimentation Pond Discharge/Treatment Record

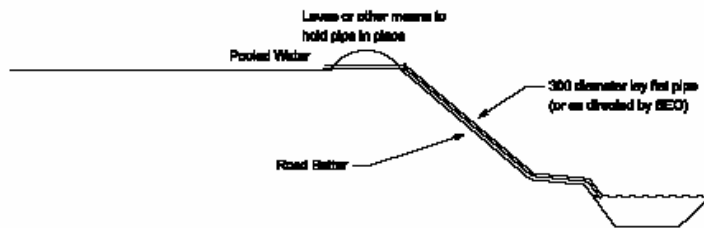
Sed ponds are all numbered starting from North heading South and also West (W) and East (E) depending on which side of cut / fill

Sed Pond	Treated date	Date pumped	Amount Pumped (L)	Where to?	Impact Y/N	Comments / within parameters
Mill Site West Basin No. 1 MSW1						
Mill Site West Basin No. 2 MSW2						
WW Treatment West Basin No. 1 WWW1						
WW Treatment West Basin No. 2 WWW2						
Wharf Access Basin No. 1 WAB1						

Annexure 6: – Lay Flat Pipe Batter Drain



Plan View

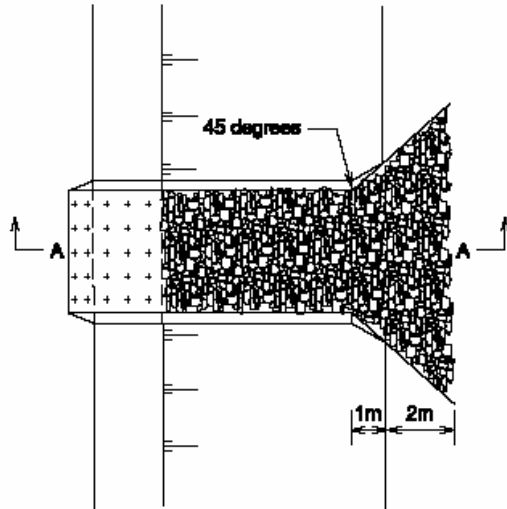


Cross Section

Not to Scale

Lay Flat Pipe Batter Drain

Annexure 7: – Typical Spillway Design



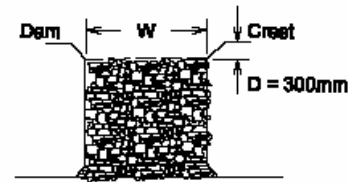
Plan View

$$W = \frac{Q_{100}}{D \cdot v} = \frac{Q_{100}}{0.3 \cdot 1} \text{ (Assume } v = 1\text{m/sec)}$$

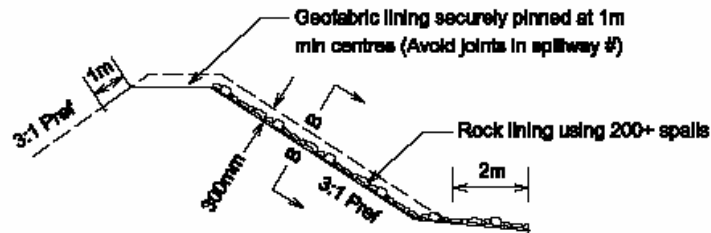
Q100 - 100 yr flood flow

D - Depth

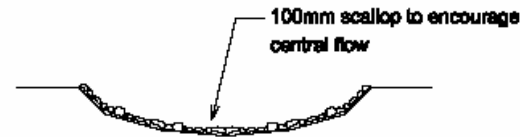
v - Velocity of flow



Front Elevation



Section AA



Section BB



if joints can not be avoided, ensure overlap of 1m with upstream layer overlaid on downstream layer

Typical Spillway Design

Annexure 8: – Flowchart for discharge of water off site in the event that re-use is not possible

