



Post-Construction Aquatic Monitoring Plan

Grand Rapids Pipeline Project

Applications No. 1771853, et al.
Decision 2014 ABAER 012

Grand Rapids Pipeline GP Ltd.

February 2015

1 Project Description

Grand Rapids Pipeline GP Ltd. (Grand Rapids), a jointly owned subsidiary of Transcanada Pipelines Limited and Phoenix Energy Holdings Ltd., is constructing the Grand Rapids Pipeline Project (“the project”). The Project consists of one transmission pipeline system (made up of two parallel pipelines, described below), one lateral pipeline system (made up of two parallel pipelines, described below), as well as various associated pipeline installations.

The Project consists of:

- one approximately 460.5 kilometre (km) pipeline with an outside diameter (OD) of 508 millimetres (mm) from the Grand Rapids MacKay Terminal to terminals in the Edmonton area (the 508 mm pipeline) to:
 - initially transport approximately 90,000 barrels per day (bbl/d) of blended crude bitumen from the Grand Rapids MacKay Terminal at NW 34-89-14 W4M, approximately 30 km northwest of Fort McMurray, to the Edmonton area at 8-5-53-23 W4M; and
 - subsequently transport approximately 330,000 bbl/d of diluent from the Edmonton or Heartland areas to delivery points in the west Athabasca oil sands area.
- one approximately 460.5 km pipeline with an OD of 914 mm from the Grand Rapids MacKay Terminal to terminals in the Edmonton area to transport approximately 900,000 bbl/d of blended crude bitumen from the west Athabasca oil sands area to the Edmonton and Heartland areas (the 914 mm pipeline);
- one 4.5 km 610 mm OD pipeline to transport approximately 400,000 bbl/d of blended crude bitumen from the Grand Rapids MacKay Receipt Station to the Grand Rapids MacKay Terminal (the 610 mm lateral pipeline);
- one 4.5 km 406 mm OD pipeline to transport approximately 200,000 bbl/d of diluent from the Grand Rapids MacKay Terminal to the Grand Rapids MacKay Receipt Station (the 406 mm lateral pipeline);
- associated pipeline installations, which include two tank farms and five pump stations located at the following five pipeline installation sites:
 - Grand Rapids MacKay Terminal, located at NW 34-89-14 W4M, which includes a tank farm and pump station;
 - Grand Rapids Thornbury Terminal, located at NE 29-79-14 W4M, which includes a pump station;
 - Grand Rapids Wandering River Pump Station, located at NW 19-73-16 W4M, which includes a pump station;

- Grand Rapids Grassland Pump Station, located at NE 15-67-18 W4M, which includes a pump station; and
- Grand Rapids Heartland Terminal, located at SE 28-55-21 W4M, which includes a tank farm and pump station.

On October 9, 2014, Alberta Energy Regulator Decision 2014 ABAER 012 issued approval to Grand Rapids was issued to Grand Rapids for the construction of the project. This Post Construction Monitoring Plan has been developed and is submitted in compliance with condition 19 of that approval, stating:

“Grand Rapids must develop, submit and implement to the satisfaction of the AER, a post-construction aquatic monitoring and mitigation plan that is specific to watercourse crossings, fish, and fish habitat. The temporal scope of the plan must extend beyond the construction season to the operation of the pipeline to ensure that installation, reclamation, and habitat recovery have been adequate. The plan must outline monitoring frequency, mitigation, and proposed response timing to address any issues noted in the monitoring. The plan must be provided to the AER on or before February 28, 2015.”

2 Watercourse Reclamation Objectives and Methods

Where the Grand Rapids pipeline crosses a watercourse, reclamation efforts aim to restore bed, banks and riparian vegetation present at the crossing location to match pre-existing conditions and to be congruent with upstream and downstream characteristics. These physical features of the watercourse provide the basis for re-establishment of aquatic organisms to pre-disturbance levels.

These conditions are restored by replacing bed materials and substrate, restoration of bed contours, and restoration of bank slopes to resemble pre-existing conditions to the extent possible. Soil and other bank materials are salvaged and stored separately to ensure that, once replaced, native seed banks are available in the riparian habitat. Sediment and Erosion control measures are also installed to reduce potential for sedimentation and erosion until vegetation has been re-established. Furthermore, cross ditches and berms are installed on moderate and steep slopes as required to prevent runoff and subsequent erosion.

Appendix A contains typical design drawings showing the type of watercourse mitigation and reclamation measures employed according to site conditions.

3 Post-Construction Aquatic Monitoring Plan

The objective of the Grand Rapids Aquatic monitoring program is to assess the

success of environmental mitigation and reclamation measures implemented to minimize potential environmental impacts at watercourse crossings as part of the overall Post Construction Monitoring Program. The overall program assesses the effectiveness of reclamation and mitigation measures on soils, vegetation, watercourses, and wetlands.

The monitoring activity specific to watercourse crossings and fish habitat will assess:

- the effectiveness of both standard and project-specific mitigation measures as planned in the *Environmental Protection Plan for the Proposed Grand Rapids Pipeline GP Ltd.* (White Area and Green Area), Qualified Aquatic Environmental Specialist Assessment Report, and other mitigative measures developed in accordance with industry standards and provincial regulatory guidelines, including:
 - Fisheries Act (Fisheries and Oceans Canada)
 - Alberta Water Act (Government of Alberta);
 - Navigation Protection Act (Transport Canada);
 - Pipeline Associated Watercourse Crossings (Canadian Association of Petroleum Producers 2005);
 - The Life Cycle of Pipeline Watercourse Crossings in Canada (Canadian Pipeline Environment Committee 2009);
 - Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body and Code of Practice for Watercourse Crossings (AER 2013);
- the success of reclamation and enhancement measures as determined by site stability and whether or not the installations are functioning as designed (see Appendix A for typical design drawings of watercourse reclamation)
- the progress of reclamation towards achieving a target of equivalent land capability
- the success of riparian vegetation re-establishment
- areas susceptible to erosion or that are difficult to re-vegetate
- the effectiveness of erosion and sediment control structures adjacent to watercourses

The monitoring activity will identify the need for follow-up actions, as required, to ensure long term reclamation and mitigation success. Grand Rapids has produced an internal, project-specific Environmental Commitments Tracking List (ECTL) designed to ensure all environmental mitigation and permit conditions and commitments are documented and addressed during construction and reclamation. The ECTL also serves as documentation of any variances and related explanations. The Post construction monitoring program will include a review of the ECTL to confirm that all of the conditions and commitments were met; identify outstanding issues and serve as a means of establishing a corrective action plan. The outstanding issues identified from the ECTL will then be reviewed during the field investigation component of the post construction monitoring.

4 Post-Construction Monitoring Plan Activities

To assess the progress of restoring specified lands to an equivalent land capability, Grand Rapids shall carry out the activities described below and document the findings in a Post Construction Reclamation Report. The following activities are intended to measure the effectiveness of mitigation and reclamation.

4.1 Watercourse Landforms

The form and function of reclaimed watercourses will be assessed on site by an Environmental Inspector during the final cleanup stages of construction to ensure that slopes and contours are returned to preconstruction conditions to the extent possible. These characteristics will be assessed and compared to off RoW to determine any construction effects. Drainages and associated slopes will be assessed to ensure proper surface flows.

4.2 Riparian Vegetation

Riparian vegetation will be assessed in the first full growing season after construction when vegetation is mature enough for identification and evaluation. Re-establishment of native plants from seed bed, as well as success of willow cuttings, is assessed. Vegetation composition such as weed infestations and percent ground cover of re-establishment vegetation will be documented. Soil erosion potential on slopes and around water crossings will be monitored.

4.3 Aquatic Habitat and Watercrossings

Vegetation, slope, and contours will be assessed as indicators of aquatic habitat. Any aquatic habitat structures prescribed in site-specific reclamation plans will be evaluated for success as part of the monitoring

program. Evidence of siltation into water courses resulting from runoff or other construction activities will be identified and the effectiveness of erosion control measures assessed.

4.4 Activity Schedule

Aerial reconnaissance of the right-of-way, including watercourse crossings, will be performed up to three times per year, beginning immediately following construction and continually throughout the operation of the pipeline. These aerial inspections will identify erosion and wash-out areas, areas of sparse vegetation, damage to permanent erosion and sediment control structures, exposed pipes, and other potential problems.

Ground-based assessment of the right of way will take place up to three times per year, where ground conditions permit. These assessments will allow a more detailed account of the same key indicators assessed in the aerial assessments.

4.5 Response Timing

If monitoring identifies an issue, a detailed site inspection and assessment will be conducted immediately. After completion of the site inspection and assessment, on-site personnel will develop a response plan based on the severity of the issue, weather conditions, access requirements and resources available. Upon approval of the response plan from Grand Rapids, the appropriate personnel and equipment will be mobilized to the site and the response plan will be implemented. During implementation of the response plan, daily reports will be sent to Grand Rapids to communicate with all applicable regulators. Grand Rapids will also maintain communication with any affected landowner(s) to ensure reclamation concerns are addressed.

5 Reporting and Follow-up

Grand Rapids will document the findings of the post construction monitoring in a Post Construction Reclamation Assessment report. The report will document monitoring findings and effectiveness of mitigation and/or reclamation measures on watercourse landforms, riparian vegetation, and aquatic habitat affected by the construction of the pipeline. The report will include pre construction and post construction photographs of the project in a photo reference file.

Any of the changes to standard environmental protection measures identified in carrying out the post construction monitoring, will be documented and communicated within Grand Rapids to support continuous improvement of pipeline construction practices and procedures.

Appendix A

Typical Design Drawings - Watercourse Reclamation and Mitigation

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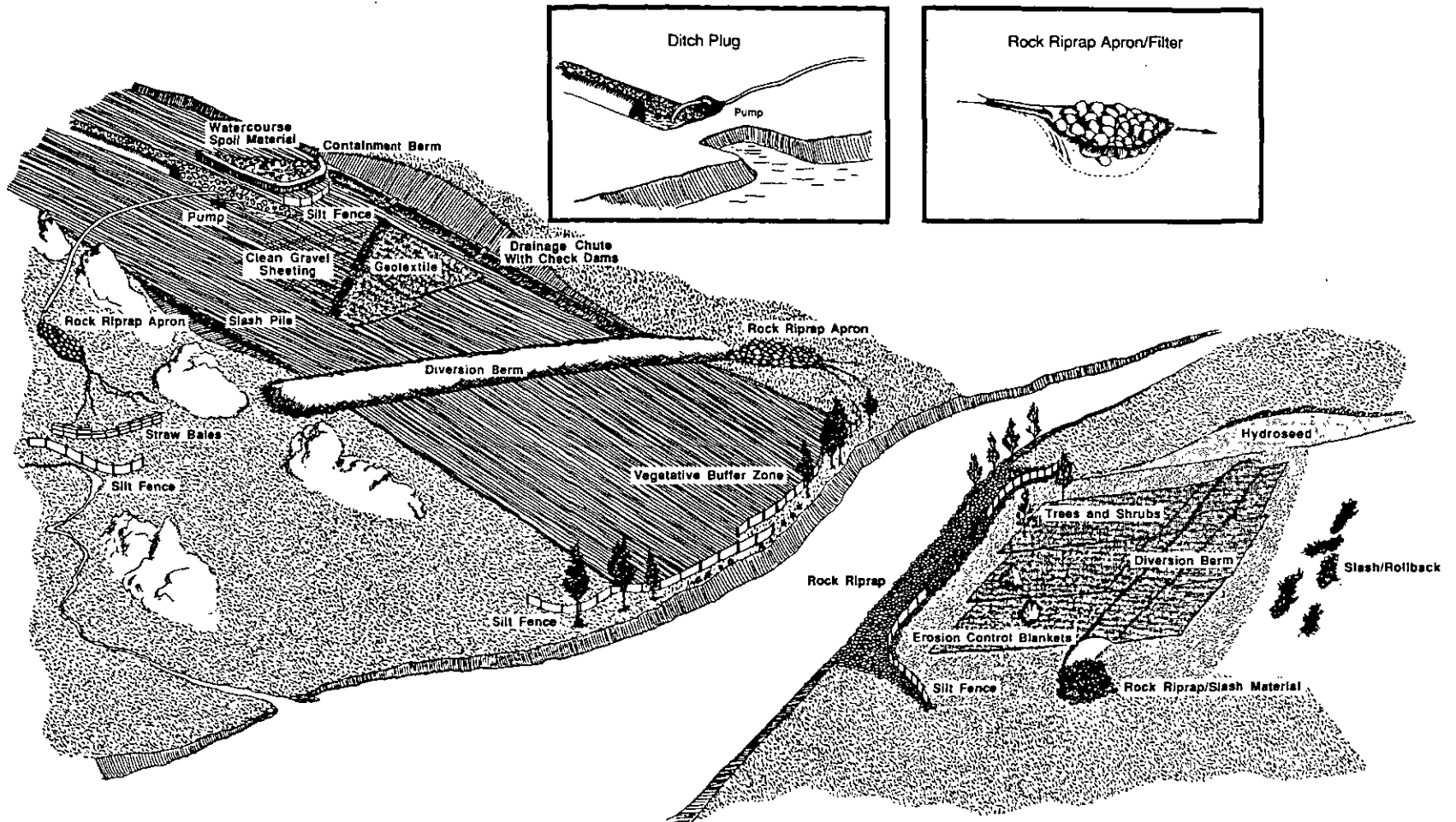
TYPICAL EROSION AND SEDIMENT CONTROL MEASURES

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APPROVED BY: *APR 30/02*

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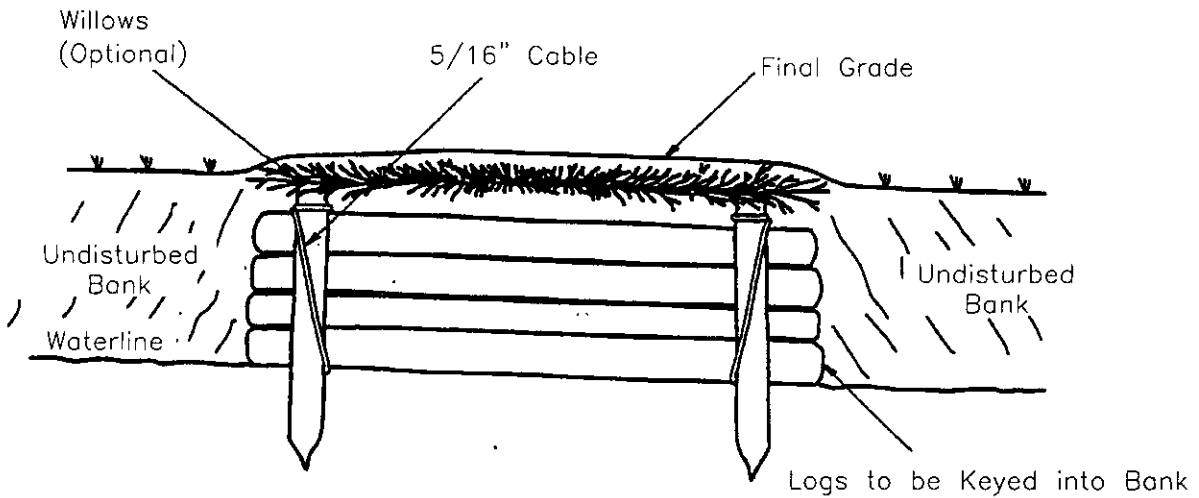
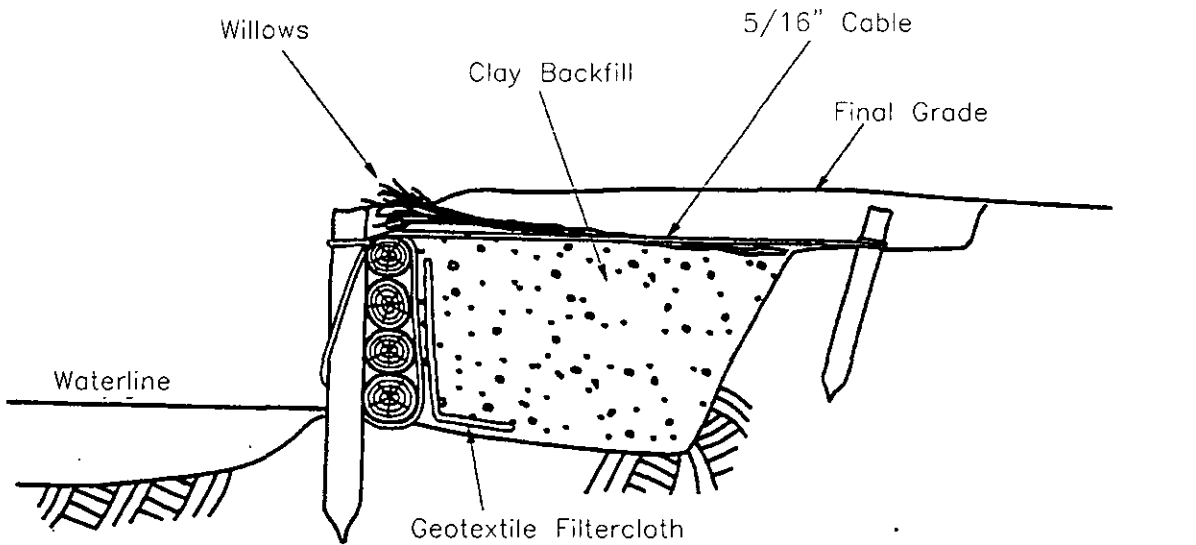
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Note:

1. Log walls to be constructed using coniferous material
2. Unfrozen backfill or loose grade material should be used as fill material
3. Anchor pilings or deadman anchors to be used to secure cable in bank
4. Non-woven filter cloth (Nylex C34 or equivalent) to be used to line log wall

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ORIGINATOR:
R. J. Albert 9/29/02
NAME DATE
JALBERT
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STREAMBANK RECLAMATION -
LOG WALL

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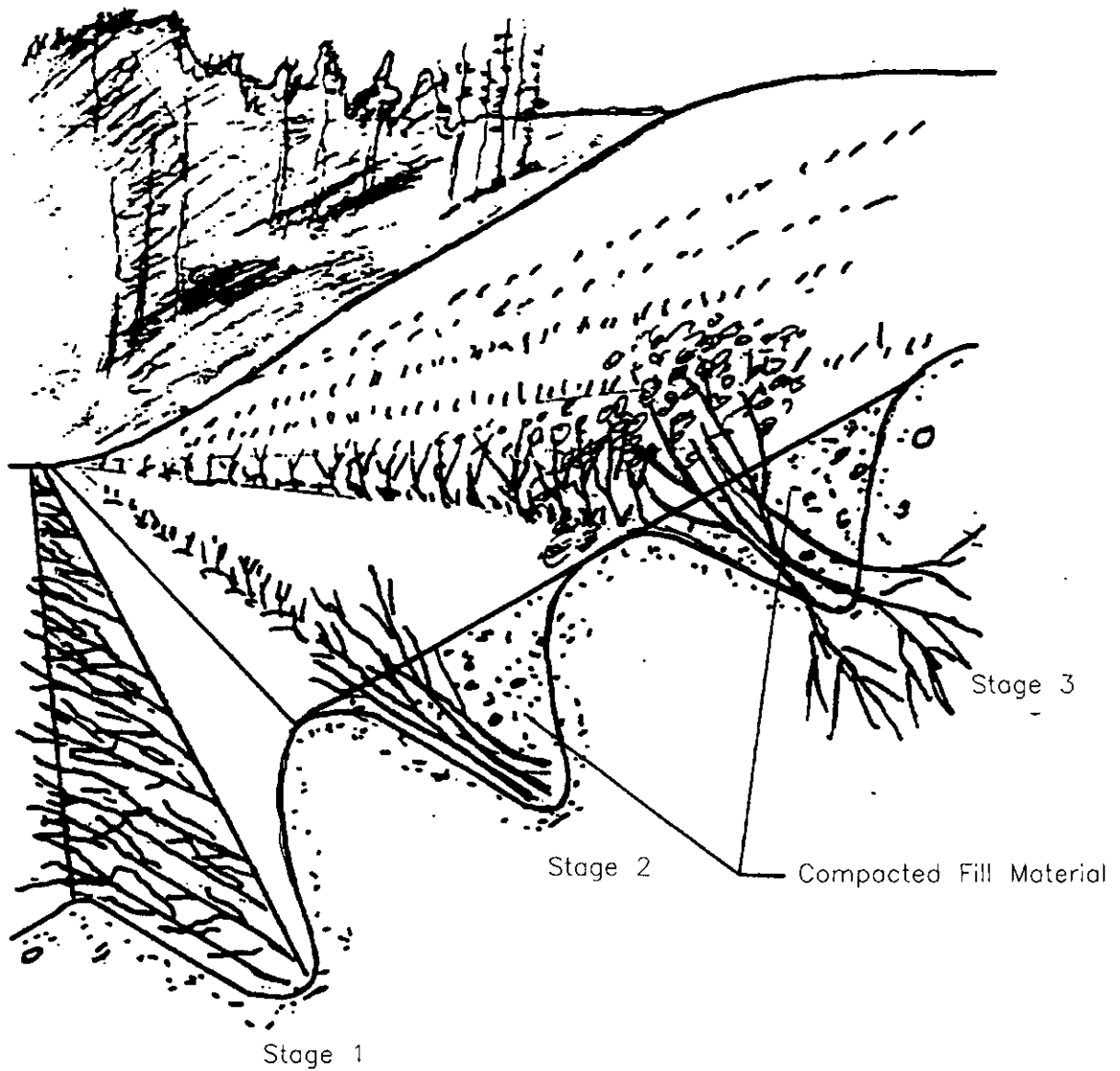
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- Stage 1. Cut trench across slope. Fill with dormant woody plant material.
- Stage 2. Fill is placed on top of branch layer and compacted.
- Stage 3. Potential growth after 2 - 3 growing seasons.



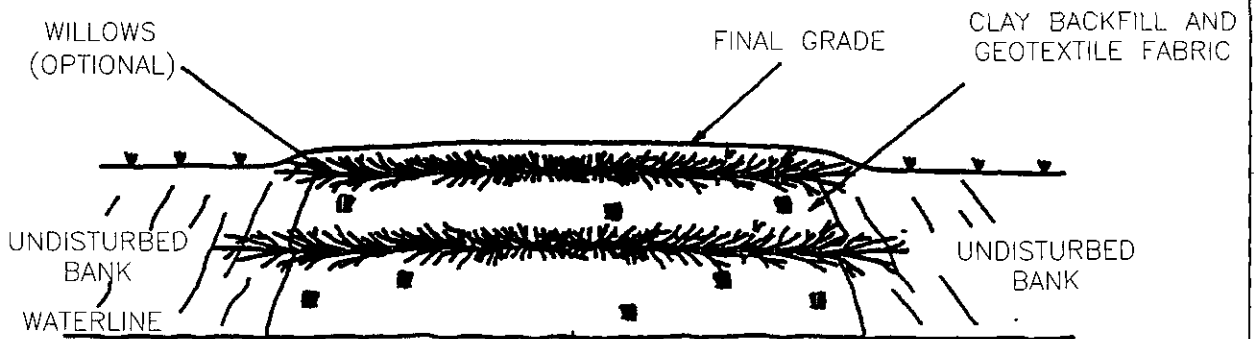
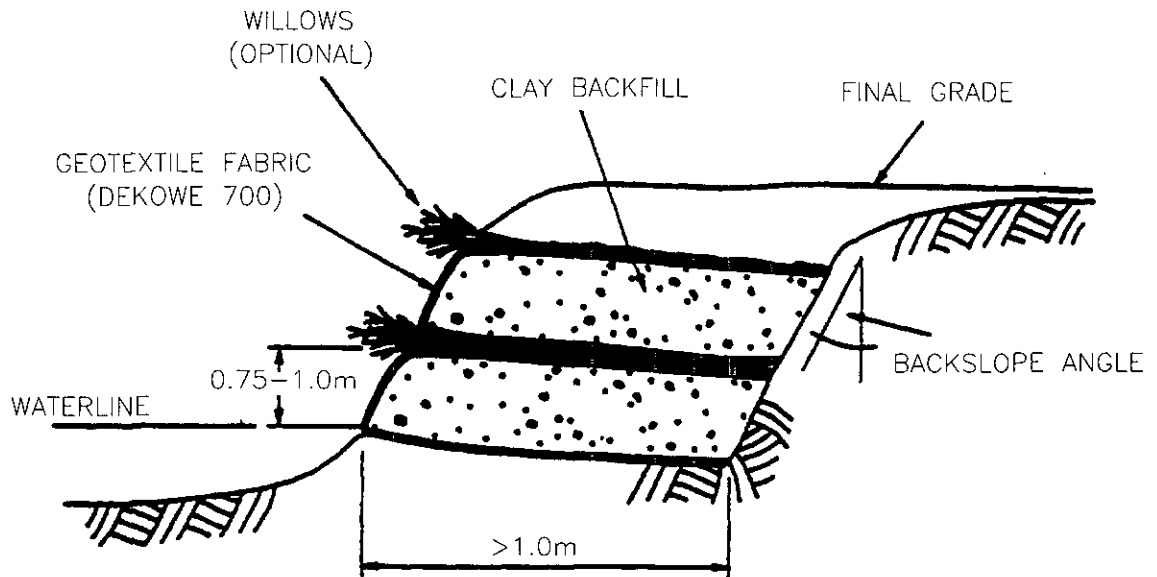
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<i>A. J. Jellison</i>	<i>Apr 29/02</i>
NAME	DATE
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STREAMBANK RECLAMATION - BRUSH LAYER IN CROSS CUT SLOPE	
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NOTE:

1. DURING WINTER CONSTRUCTION, VEGETATED GEOGRIDS SHOULD BE INSTALLED IN CONJUNCTION WITH DITCH BACKFILLING AND BANK RECONSTRUCTION.
2. UNFROZEN BACKFILL (OR LOOSE GRADE MATERIAL) SHOULD BE USED TO MINIMIZE AIR SPACES. THIS ALLOWS PROPER SOIL FABRIC CONTACT, WHICH MINIMIZES STEELING AND SCOURING DURING RUNOFF AND ENSURES SURVIVAL OF THE WILLOW CUTTINGS.
3. PLYWOOD FORMS (8x2 FEET) MAY BE REQUIRED TO HELP RECONSTRUCT STEEP OR VERTICAL BANKS.
4. GRID LAYERS SHOULD NOT EXCEED 1.0m IN HEIGHT (0.75m OPTIONAL) WITH A MINIMUM OF 1.0m SET IN BANK.
5. WILLOWS SHOULD BE HARVESTED AS CLOSE TO INSTALLATION AS POSSIBLE, PREFERABLY THE PREVIOUS DAY BUT NO MORE THAN 2 DAYS EARLY.
6. WILLOWS SHOULD BE 1.5 TO 2.5cm IN DIAMETER AND 2-3.0m LONG WITH NO MORE THAN 25cm LEFT EXPOSED.
7. PLANTING RATE SHOULD BE APPROXIMATELY 1 STEM PER 15cm.

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ORIGINATOR
J. Jalbert
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STREAMBANK RECLAMATION-
VEGETATED GEOTEXTILE
INSTALLATION

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CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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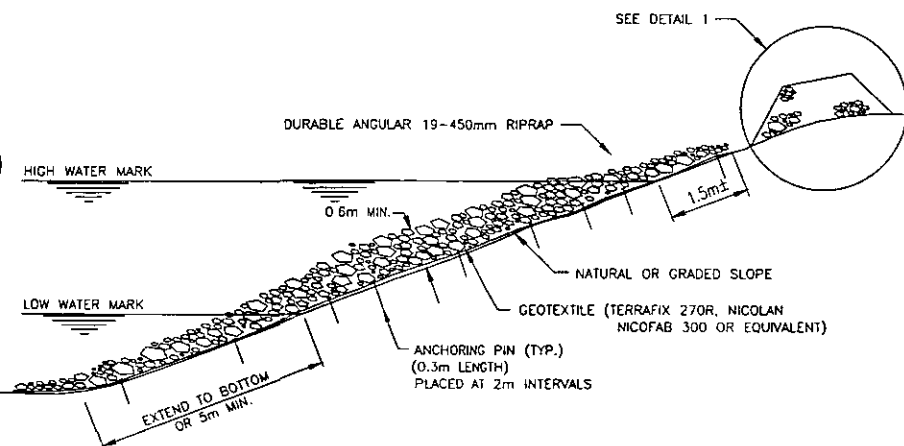
1. REMOVE ALL STUMPS, ORGANIC MATERIAL AND PREPARE BANKS TO A MAXIMUM SLOPE OF 2 : 1 IF PRACTICAL.
2. INSTALL FILTER CLOTH (GEOTEXTILE) UNDER ROCK RIPRAP AS DIRECTED BY THE COMPANY.
3. SIZE OF RIPRAP IS DEPENDENT ON SLOPE OF BANK AND WATER VELOCITY.
4. INSTALL RIPRAP TO A DEPTH OF APPROXIMATELY 1.5 TO 2 TIMES THE MAXIMUM EQUIVALENT DIAMETER OF THE RIPRAP.
5. KEY IN EDGES OF RIPRAP & FILTER CLOTH TO NATURAL GROUND CONTOURS SO THAT UNDERMINING DOES NOT OCCUR.
6. RIPRAP IS TO BE INSTALLED TO 0.5m ABOVE HIGH WATER MARK OR 1.5m± ALONG THE SLOPE, WHICHEVER IS LESS.
7. FILTER BERM TO BE CONSTRUCTED ON AN AS REQUESTED BASIS BY THE COMPANY REPRESENTATIVE.

WATERCROSSING BANK
EROSION PROTECTION

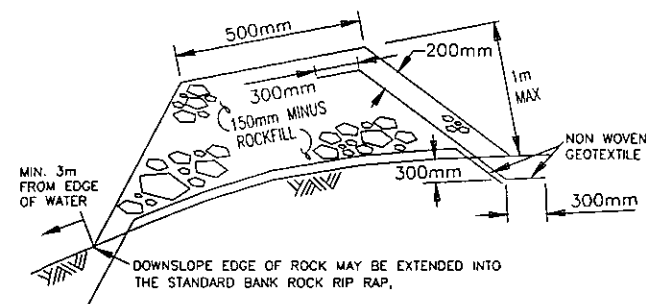
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DETAIL1 FILTER BERM



NOTES:

1. GEOTEXTILE TO BE A NON WOVEN FABRIC SUCH AS MIRAFI P250 OR TERRAFIX 300R.
2. FILTER BERM TO BE CONSTRUCTED ON STABLE SLOPE SURFACES ONLY.
3. GEOTEXTILE FOR FILTER BERM TO BE INDEPENDENT OF GEOTEXTILE REQUIRED FOR THE EMBANKMENT.
4. MINIMUM 300mm OVERLAP OF GEOTEXTILE