EXHIBIT E

## Enbridge Pipelines (North Dakota) LLC

# Environmental Mitigation Plan
# North Dakota Expansion Projects

**September 2010**

**ENBRIDGE PIPELINES (NORTH DAKOTA) LLC**

**ENVIRONMENTAL MITIGATION PLAN**
**NORTH DAKOTA EXPANSION PROJECTS**

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[1] **Site-specific plans supersede any design presented in the typical details.**

## INTRODUCTION

This Environmental Mitigation Plan (EMP) outlines construction-related environmental policies, procedures, and mitigation measures developed by Enbridge Pipelines (North Dakota) LLC (Enbridge or Company) for the construction of four pipeline projects in the state of North Dakota (*SORTI Pipeline Project, Dunn Pipeline Project, Beaver Lodge Loop Project, and the Bakken Pipeline Project US; collectively, North Dakota Expansion Projects*). The EMP was developed based on Enbridge's experience implementing best management practices during construction. It is intended to mesh with applicable federal, state and local environmental protection and erosion control specifications and practices. This EMP is designed to address typical circumstances that may be encountered along the above-referenced North Dakota projects.

Project specific permit conditions and/or landowner agreements may supersede general practices described in this document. Project-specific procedures for North Dakota Expansion Projects have been incorporated into the EMP. The measures described in the EMP are consistent with relevant portions of North Dakota's *Guide to Temporary Erosion-Control Measures for Contractors, Designers and Inspectors,*[2] the *Erosion and Sediment Control Handbook,*[3] and *Construction Stormwater NPDES General Permit NDR-10-0000*.[4]

This document includes the following sections:

- Section 1.0 of the EMP describes general mitigation measures, including soil erosion and sedimentation control procedures, to be implemented during construction;
- Section 2.0 discusses stream and river construction and crossing procedures;
- Section 3.0 describes practices for wetland construction and crossings;
- Section 4.0 discusses highway, road, and rail crossings;
- Section 5.0 discusses construction dewatering;
- Section 6.0 outlines water appropriation practices;
- Section 7.0 addresses restoration; and
- Section 8.0 addresses winter construction issues.

Alternative construction procedures implemented in lieu of EMP guidelines must provide an equal or greater level of protection to the environment, and must be approved in writing by Enbridge.

Unless otherwise specified, the construction contractor (Contractor) will be responsible for implementing the requirements of this EMP. Enbridge will make the requirements of the EMP and applicable environmental permits known to the contractor. If the contractor has questions concerning these environmental requirements, the contractor will contact an Enbridge representative.

[2] North Dakota Department of Health-Division of Water Quality (June 2001)
[3] North Dakota Department of Transportation (June 2004)
[4] North Dakota Department of Health – General Permit No. NDR10-0000 (effective October 12, 2009-September 30, 2014)

Enbridge will provide appropriate construction oversight to confirm Company and Contractor compliance with the measures of this EMP and requirements of applicable federal, state, and local permits. Environmental Inspectors (EIs) will assist the contractor in interpreting and implementing the requirements of the EMP, and verify compliance with these procedures for the Company. Enbridge hires experienced EIs to manage unforeseen situations that are not directly addressed by the project documents. Enbridge relies on the experience and judgment of the EIs through coordination and consultations with project management staff to manage those unforeseen situations should they occur in the field. The EIs will be expected to use judgment in the field to interpret environmental conditions and requirements, but will not have the authority to authorize major modifications or changes without the prior written approval of Enbridge. EIs will have the authority to stop activities and order corrective mitigation for actions that are not in compliance with the measures in this EMP, landowner agreements, or environmental permit requirements. The EIs will maintain appropriate records to document compliance with these and other applicable environmental permit conditions.

# 1.0 GENERAL MITIGATION MEASURES

## 1.1 TEMPORARY EROSION AND SEDIMENT CONTROL

Temporary erosion and sediment control measures include but are not limited to: slope breakers, sediment barriers, stormwater diversions, trench breakers, mulch and revegetation. The goal of temporary erosion and sedimentation control measures is to minimize erosion on site, and prevent construction-related sediment from migrating off site into sensitive resource areas such as streams, wetlands, lakes, or drainage ditches (dry or flowing). The contractor will, at all times, maintain erosion and sediment control structures as required in the project construction documents and as required by all applicable permits. Non-functional erosion and sediment control features must be repaired, replaced, or supplemented with functional materials within 24 hours after discovery or report of discovery by an inspector or other project personnel as soon as field conditions allow the features to be repaired. In the event maintenance, repair, replacement or supplement of erosion and/or sediment controls is required at multiple locations, the work will be conducted in the following order of priority: areas with sensitive species, regulated waterbodies, wetlands of special concern to the agencies, other wetlands, (i.e., agricultural ditches and other non-regulated waterbodies), and non-sensitive upland areas. In any case, a discernible attempt must be made to complete the required maintenance, repair, replacement or supplemental installation within 24 hours of discovery or report of discovery. Temporary erosion and sediment controls are expected to withstand and function properly during precipitation events of up to the 2-year, 24-hour storm event, which is approximately 1.9 inches for northwestern North Dakota. Additional information of the project erosion and sediment control measures are provided in the applicable sections below.

Temporary erosion controls will be installed after initial clearing and before disturbance of the soil, and will be replaced by permanent erosion controls as restoration is complete. Temporary erosion control measures are discussed further in sections 1.5.8 and 1.5.9.

## 1.2 RIGHT-OF-WAY ACCESS

Access to the right-of-way will be from public roadways and Enbridge-approved private access roads only. The contractor is responsible for creating signs or other visible methods to identify approved access roads in the field and to ensure that access is confined to only the approved roads. Vehicle tracking of soil from the construction site will be minimized by installation of Best Management Practices (BMPs) such as stone pads or equivalent, where not specified by permit. Street sweeping will be used if Enbridge and/or the Environmental Inspectors (EIs) determine that BMPs are not adequate to prevent soil from being tracked onto public roads. The Contractor will repair private roads, lanes, and public roads damaged caused by equipment or obtaining access to the ROW.

## 1.3 RIGHT-OF-WAY REQUIREMENTS

All construction equipment and vehicles will be confined to the approved right-of-way and extra workspace. Right-of-way requirements may vary between projects. For the North Dakota Expansion Projects, construction activities will generally use a right-of-way as shown in Exhibit 1.1. This drawing illustrates a typical right-of-way configuration.

Prior to commencement of clearing operations, construction right-of-way and extra workspace areas will be marked with distinctive stakes and flagging. Construction activities will be restricted to the

approved designated areas. Other areas (pipe storage and contractor yards, borrow and disposal areas, access roads, etc.) will be posted for use during construction activities.

The construction right-of-way (construction workspace) for the North Dakota Expansion Projects will include a portion of Enbridge's existing easement (in areas pipeline looping is occurring), new permanent easement (in greenfield areas where no existing pipeline exists), permitted temporary workspace, and site-specific extra workspaces as defined below. Typically the construction right-of-way will be between 90- and 110-feet-wide. The right-of-way width may be reduced in selected locations (e.g., wetlands, waterbodies, and forested windbreaks) in accordance with applicable permit conditions, as indicated on the project construction alignment sheets and in the field by the use of staking.

(a) Right-of-Way (Permanent Easement)

Enbridge is acquiring up to an additional 50 feet of permanent easement from landowners. The right-of-way/permanent easement is maintained to facilitate access and aerial inspection of the pipeline system post-construction.

(b) Temporary Workspace

In addition to the right-of-way/permanent easement, construction activities will require Temporary Workspaces (TWS). The TWS will be located adjacent to and contiguous with the proposed right-of-way/permanent easement and will be identified on the construction alignment sheets and by distinctive staking of construction limits prior to clearing.

(c) Extra Workspace

Site-specific extra workspace (EWS) locations (construction work areas beyond the permanent easement and TWS previously described), will be required at select locations such as steep slopes (placed on the side slope), road, waterbody, railroad and some wetland crossings, and where it is necessary to cross under existing pipelines or foreign utilities. EWS will typically be located in uplands adjacent to the construction right-of-way and a minimum of 50-feet back, in non-cultivated areas, from sensitive resource boundaries where site-specific field conditions allow. In actively cultivated areas, approval may be obtained from the EI to locate the EWS with a 10-foot setback where no additional or less environmental impact would occur. To complete work safely, Enbridge may need to locate EWS within a wetland or within the 50-foot setback from a wetland based on site-specific conditions or 10 feet from a wetland in actively cultivated areas. Such exceptions will require Enbridge and EI approval before the modification can be implemented. EWS in wetlands is addressed further in Sections 2.4 and 3.3.1.

Enbridge will acquire additional extra workspace from the landowner where necessary; use of unauthorized workspace is prohibited without Enbridge's approval. In all cases, the size of extra workspace will be kept to the minimum necessary to safely conduct work. Enbridge has conducted a preconstruction review of the entire project area to determine specific extra workspace locations. EWS locations are depicted on the construction alignment sheets.

## 1.4 LINE LIST AND PERMITS

Enbridge will provide the contractor with a construction Line List that describes special requirements (*e.g*., timber salvage, topsoil segregation, restoration measures, fencing requirements, etc.) as agreed upon with landowners. The contractor must comply with these special requirements and take all appropriate precautions to protect livestock and crops affected by construction activities.

The Line List reflects requirements and comments provided by landowners; however, it is not a comprehensive list of construction requirements. The Line List must be considered in conjunction with other project documents and permit conditions. Any third-party agreements between the contractor and the landowner must be pre-approved in writing by Enbridge.

Enbridge will obtain the necessary permits for the installation of the pipeline. Permit requirements may be more stringent than the requirements of this EMP. In all cases, the more restrictive requirements will apply.

## 1.5 UPLAND CLEARING AND GRADING

The initial stage of construction involves the clearing of brush, trees, and vegetation from the right-of-way. Clearing may be accomplished with chain saws, brush hogs, hydraulic tree-cutting equipment, or similar equipment. Unless otherwise directed by the EI, the clearing crew will typically mow, chip, mulch and/or haul off all non-merchantable wood. No chips, mulch, or mechanically cut woody debris will be stockpiled in a wetland and no upland woody debris will be disposed of in a wetland. Please refer to Sections 1.5.1 and 1.5.2 for discussion of disposal methods for woody debris.

Grading generally follows clearing and involves leveling and smoothing the construction right-of-way, including TWS and EWS areas, as necessary, to create an even working surface for equipment and vehicles. To facilitate proper cleanup and restoration in upland areas, tree stumps outside the ditchline will be ground no more than the depth of topsoil to be stripped, where required, or less than 4 inches below normal ground surface in non-cultiviated areas. Stumps in the ditchline will be completely removed, ground, and/or hauled off to an approved disposal facility. Topsoil and subsoil disturbed during grading operations will not be mixed with foreign material (e.g., stumps and brush).

### 1.5.1 Disposal of Non-Merchantable Timber

Non-merchantable timber and slash will be disposed of by mowing, chipping, grinding, and/or hauling off site to an approved disposal facility. Non-merchantable timber must not be disposed of by placing it off the right-of-way. No woody debris disposal will be allowed in agricultural areas or wetlands. Burning of non-merchantable woody debris may be allowed only where the contractor has acquired all applicable permits and approvals (e.g. Agency and Landowner) and in accordance with all federal, state and local regulations. Prior to initiating any burning, the contractor will submit a Burning Plan to Enbridge for approval. Burning is prohibited in wetlands.

### 1.5.2 Disposal of Merchantable Timber

All merchantable timber will be the property of the company and the contractor will be responsible for merchandising all merchantable timber. If a commercial buyer cannot be found, the timber may be considered non-merchantable and disposed of as referenced in Sections 1.5 and 1.5.1.

### 1.5.3 Fencing

Before or during clearing of the right-of-way, existing fences and livestock barriers will be cut as necessary to access the right-of-way. Existing fencing will be braced and secured prior to cutting to prevent the slacking of wires. Temporary gates and/or fencing will be installed where necessary to maintain existing access restrictions, contain livestock, and protect sensitive areas. These temporary measures will remain in place until construction is completed and permanent repairs or new fencing can be installed.

### 1.5.4 Trees and Shelterbelts

Care will be taken to minimize tree removal. To the extent possible, windbreaks and shelterbelts will be crossed by minimizing the width of the right-of-way to that necessary for the trench line, equipment traffic, and a passing lane. When clearing, trees will be felled onto the right-of-way to minimize damage to off-right-of-way vegetation. Shelterbelts within the TWS must be re-established in accordance with applicable project permits and/or landowner agreements.

A tree and shrub survey will be conducted prior to construction to document tree removal. The North Dakota Public Service Commission requires woody vegetation be replaced at a 2:1 ratio.

### 1.5.5 Irrigation Systems

If pipeline construction activities interfere with the operation of spray irrigation systems, Enbridge will establish with the landowner or Tenant, an acceptable amount of time the irrigation system may be out of service. If feasible, temporary measures will be implemented to allow an irrigation system to continue to operate across the right-of-way during pipeline construction. Any damage to irrigation systems caused by construction-related activities will be repaired immediately following backfilling.

### 1.5.6 Drain Tile Inlets

Enbridge will attempt to locate existing drain tile inlets prior to construction. Located drain tile inlets with the potential to receive stormwater from the construction project will be protected using the appropriate BMPs until sources with the potential to discharge have been stabilized.

### 1.5.7 Topsoil Segregation

Topsoil generally has physical and chemical properties that are conducive to good plant growth. Because subsoil properties are usually less favorable, mixing of topsoil and subsoil can result in lowering the overall productivity of soils. To prevent soil mixing during construction, topsoil will be segregated in selected areas where soil productivity is an important consideration. These areas include cropland, hay fields, pasture, residential areas, and other areas as requested by the landowner. A minimum separation of one-foot must be maintained between the topsoil and subsoil piles to prevent mixing. Where the one-foot separation cannot be maintained, a physical barrier, such as an adequately thick layer of weed-free straw mulch, may be used between the spoil and topsoil piles to prevent mixing. Topsoil must not be used to construct trench breakers (see Section 1.9) or to pad the pipe. Gaps must be left in stockpiled topsoil and spoil piles at water conveyances (i.e., ditches, swales, and waterways) to maintain natural drainage.

**Topsoil Segregation Methods**

The following topsoil segregation methods may be employed during construction:

- Ditch Plus Spoil Side (see Exhibit 1.1)
- Full Right-of-Way (see Exhibit 1.2)
- Trench Line Only (in unsaturated wetlands, see Exhibit 1.3)

For the North Dakota Expansion Projects, the full construction right-of-way width segregation method will typically be used in active cropland unless ditch-plus-spoil or an alternative topsoil segregation method is requested by the landowner.

The trench-line-only topsoil segregation method will be used in unsaturated wetlands or where Enbridge determines that the width of the construction right-of-way is insufficient for other methods to be used. In upland areas with a fairly thick sod layer such as hay fields, pasture, and residential areas, the trench-line-only method may be used unless otherwise requested by the landowner. Segregated topsoil is usually stored on the spoil side, separate from subsoil (see Exhibit 1.3).

Topsoil is not typically segregated in forested areas and saturated wetlands. However, in areas of steep side slopes adjacent to wetlands and waterbodies, including forested areas, where subsoil will be excavated (e.g. two-toned, side-cut, etc.) to create a level workspace, topsoil will be segregated to the extent practicable and at the direction of the EI.

**Depth of Topsoil Stripping**

Topsoil will be stripped to a maximum depth of 12 inches in cultivated lands, unless otherwise requested by the landowner. Additional space may be needed for spoil storage if more than 12 inches of topsoil are segregated. If less than 12 inches of topsoil are present, the contractor will attempt to segregate to the depth that is present.

## 1.5.8 Slope Breakers

Slope breakers are to be installed to minimize concentrated or sheet flow run-off in disturbed areas in accordance with the following maximum allowable spacing unless otherwise specified in permit conditions.

| Slope (%) | Approximate Spacing (ft) |
|---|---|
| 3-5 | 250 |
| 5-15 | 200 |
| 15-25 | 150 |
| >25 | <100 |

If the length of the slope is less than the distance of the required spacing, slope breakers are not required unless a sensitive resource area (*e.g.*, wetland) is located immediately down slope, or as directed by the EI. Slope breakers will be constructed according to the following specifications:

- slope breakers may be constructed using earthen material, silt fence, or hay bales;
- earthen berms will be installed with a two to eight percent out-slope, with a four-foot base and a height of 1.5 feet (see Exhibits 1.4 and 1.5);
- earthen berms will be constructed of compacted subsoil where practicable;
- the outfall of slope breakers will be directed off the construction right-of-way into a stable well-vegetated upland area or into an appropriate energy-dissipating device/sediment control device (e.g., silt fence, straw bales, rock aprons) to prevent the discharge of sediments (see Exhibit 1.4);
- proper slope breaker outfalls will be established where topsoil segregation and/or grading has created a barrier at the edge of the construction workspace;
- gaps will be created through spoil piles where necessary to allow proper outletting of temporary berms;
- slope breakers will be inspected daily and repaired as necessary within 24 hours after discovery of maintenance and/or repair issues to maintain operational integrity and prevent erosion in active construction areas;
- a hard plug will be left in place where a slope breaker crosses the open trench.

### 1.5.9 Temporary Sediment Barriers

Sediment barriers are intended to stop the movement of sediments off the construction right-of-way and to prevent the deposition of sediments into sensitive resources that may be on or adjacent to the right-of-way. Temporary sediment barriers may be constructed with silt fence (36 inches high or greater) and/or staked straw bales (see Exhibits 1.6 and 1.7) and other barriers such as compacted earth (e.g., drivable berms across travelways), sand bags, or other appropriate materials. Silt fence should be placed in ditches with slopes of five percent or less; in ditches with slopes steeper than five percent, rock checks or an appropriate alternative should be used. If temporary sediment barriers are removed to allow equipment access, the barriers will be reinstalled at the end of the day or sooner based on weather events.

Temporary sediment barriers will be installed after clearing and prior to grubbing and grading activities and maintained at the base of sloped approaches to streams, wetlands, and roads, and at the edge of the right-of-way as needed to prevent siltation of waterbodies and wetlands downslope or outside of the construction right-of-way (e.g., swales and side slopes). Temporary sediment barriers will be placed across the entire construction right-of-way at the base of slopes greater than five percent where the base of the slope is less than fifty feet from tile line openings, natural drainage ways, wetlands and/or waterbodies, and other sensitive environmental areas until the area is revegetated and there is no potential scouring or sediment transport to surface waters.

When the depth of sediment reaches about one-third of the height of a sediment barrier, the barrier will be replaced and/or the sediment removed. Non-functional erosion and sediment control features must

be repaired, replaced, or supplemented with functional materials immediately following discovery, or report of discovery by an inspector or other project personnel, or as soon as field conditions allow the features to be repaired. In the event maintenance, repair, replacement or supplement of erosion and/or sediment controls is required at multiple locations, the work will be conducted in the following order of priority: areas with sensitive species, regulated waterbodies, wetlands of special concern to the agencies, other wetlands, agricultural ditches and other non-regulated waterbodies, and non-sensitive upland areas. In any case, a discernible attempt must be made to complete the required maintenance, repair, replacement or supplemental installation within 24 hours of discovery or report of discovery.

Staked straw bale temporary sediment barriers may be constructed across equipment travel lanes, as necessary, in sensitive areas, and reinstalled after equipment passage is completed or activities in the area are completed for the day (see Exhibit 1.7).

Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

Install and maintain temporary sediment barriers around surface drain tile inlets located within the construction work area. Where surface drain tile inlets are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the inlet.

Installation of temporary mulch and erosion control mats may be necessary in certain locations if there are construction delays or other conditions that increase sediment transport potential.

### 1.5.10 Noise and Dust Control

The contractor will take all reasonable steps to control construction-related noise and dust near residential areas and other areas as directed by Enbridge. Control practices may include wetting the right-of-way, limiting working hours in residential areas, re-establishment of vegetation, and/or additional measures as appropriate based on site-specific conditions.

## 1.6 PIPE DELIVERY, BENDING & WELDING

Typically, individual joints of pipe will be strung along the construction right-of-way and arranged to be accessible to construction personnel prior to excavation of the pipeline trench. This operation involves specially designed equipment to deliver pipe from pipe storage yards to the right-of-way. Where practical, Enbridge will drive stringing trucks along an alignment which corresponds closely to the pipeline centerline to minimize the potential for soil compaction in actively cultivated areas.

After pipe stringing is complete, the pipe will be bent, as necessary, to conform to changes in ground contour and pipeline alignment. Individual pipe joints will be welded together and the welds will be radiographically inspected. The welds will then be coated with a material to protect them from corrosion.

## 1.7 UPLAND TRENCHING

Trenching in uplands consists of excavating the trench for the pipeline, and is typically accomplished with a backhoe excavator or a rotary wheel ditching machine. Excavated subsoil will be sidecast within the approved construction right-of-way separate from topsoil (see Section 1.5.7), and stored such that

the area subject to erosion is minimized. Enbridge will coordinate with Landowners to minimize disruption of access caused by the trench during construction. Where deemed appropriate, Enbridge will leave plugs of soil in the ditch or will construct temporary access bridges across the trench for the landowner to move livestock or equipment. Trenches will also be sloped where started and ended to allow ramps for wildlife to escape in the event they become trapped in the trench.

### 1.7.1 Timing

The length of time a trench is left open will be minimized to ensure that installation of the pipe and restoration of the right-of-way occurs in a timely fashion. Typically, trenching will be conducted after pipe has been delivered and welded so that no trench location stays open more than two days, weather permitting. This does not include site-specific activities conducted separate from mainline trenching such as HDDs, road bores, repair or inspection excavations, hydro-test header excavations, or tie-in work.

### 1.7.2 Pipeline Depth

At a minimum, the pipeline will be buried in accordance with U.S. Department of Transportation (DOT) regulations (40 CFR Part 195), which stipulate a minimum of three feet of topcover (measured from the top of set-on weights, concrete coating or other weight/shield) for normal excavations, and 18 to 30 inches of cover for rock excavations (depending on the location), to prevent damage to the pipeline from normal use of the land.

If a state-level agency specifies a more stringent requirement for pipeline depth than the DOT and/or landowner requirements, the Company may request a waiver of that requirement. Increased pipeline depth will result in greater amounts of ditch spoil and, consequently, may require additional temporary workspace for storage of the spoil.

## 1.8 PIPE INSTALLATION

Once the trench has been inspected for proper depth, rocks, or other obstructions, the welded pipe is lowered into the trench. The pipe may be wrapped with a protective shielding if necessary to protect the pipe coating while backfilling.

## 1.9 TRENCH BREAKERS

After the pipe has been lowered into the trench, trench breakers will be installed as deemed necessary by Enbridge in sloped areas. Trench breakers protect against subsurface water flow erosion along the pipe after the trench is backfilled. Trench breakers will be constructed with bags filled with rock-free subsoil or sand or other materials approved for use by Enbridge. They will be placed from the bottom of the trench to near the top of the trench, keyed into the trench walls and completely surrounding the pipe (see Exhibit 1.8). The following conditions apply to the placement and installation of trench breakers unless otherwise directed by the Environmental Inspector:

- Trench breakers will be spaced as described for permanent berms (see Section 7.3) or as otherwise specified by Enbridge.
- Trench breakers will be installed on slopes greater than five percent adjacent to streams, wetlands, or other waterbodies.

- Topsoil will not be used to construct trench breakers.

- Where the pipeline exits a wetland towards areas of lower relief, trench breakers will be installed where there is a potential for underground drainage along the pipe in order to prevent wetland or waterbody drainage, as identified by the EI.

## 1.10 DRAIN TILE REPAIR

Where drain tiles are cut during trenching, the locations will be flagged by the contractor. Prior to backfilling, drain tiles crossed by the trench will be probed with a sewer rod or pipe snake to determine if tiles were damaged during construction. Drain tiles damaged during construction will be repaired to their preconstruction condition or better.

## 1.11 BACKFILLING

Backfilling follows pipe installation and generally consists of replacing the material excavated from the trench. In areas where topsoil has been segregated, the subsoil will be replaced first, and the topsoil will be spread uniformly over the area from which it was removed. Prior to backfilling, the trench will be dewatered in accordance with the methods discussed in Section 5.1. An earth crown will be left over the trench line to allow for future settling of the backfill material. Crowns will be no more than 6 inches in height in upland areas. The contractor will restore contours as near as practicable to pre-construction conditions.

## 1.12 WET WEATHER SHUTDOWN

During construction, certain activities may be suspended in wet soil conditions, based on consideration of the following factors:

- plasticity of the surface soil to a depth of approximately four to eight inches;
- extent of surface ponding;
- extent and depth of rutting and mixing of soil horizons;
- areal extent and location of potential rutting and compaction (i.e., can traffic be rerouted around wet area); and
- type of equipment and nature of the construction operations proposed for that day.

If the above factors cannot be achieved to the satisfaction of Enbridge and the EI, the contractor will cease work in the applicable area until such a time that Enbridge determines that site conditions are such that work may continue. The contractor is responsible for appropriately planning for work and considering for the potential for wet conditions, and being prepared to implement mitigative measures in the event of wet weather conditions. This is particularly important when conducting work in unsaturated wetlands. If the contractor attempts to construct through the “dry” wetland without matting or an approved equivalent, the contractor is responsible for implementing any and all such corrective measures should conditions subsequently worsen where the above described criteria cannot be met.

## 1.13 CONTROLLING SPREAD OF UNDESIRABLE SPECIES

Enbridge will require that all construction equipment be cleaned before arriving on site to prevent the introduction of undesirable species to the project area. It is Enbridge’s intent to minimize the potential introduction and/or spread of invasive species along its right-of-way due to pipeline construction

activities. It is not possible for Enbridge to eradicate invasive species along its right-of-way where invasive species exist adjacent to Enbridge's construction right-of-way. Enbridge will minimize the potential for the establishment of invasive species by minimizing the time duration between final grading and permanent seeding. If undesirable species are determined to be present within the construction right-of-way, Enbridge will implement the following plans:

- Prior to ground disturbing activities, areas of infestation may be treated with herbicide upon approval from Enbridge.

- Enbridge and its contractors will make every reasonable effort to prevent the spread of noxious weed seeds during clearing and grading activities, and to use straw mulch and seed mix that are free of noxious weed seed to revegetate the right-of-way. Contractors and inspectors will receive information aiding in the identification of noxious weeds. Enbridge will also provide training to its Environmental Inspectors to identify and prevent the spread of undesirable species.

- During preconstruction walkovers, EIs will flag areas containing noxious weeds. The construction crews will be informed of these areas. Enbridge will instruct the Contractors to minimize the number of construction equipment and to limit the number of passes of these equipment through infested areas. Construction mats may be required to minimize the transport of weed seed or plant material via construction equipment.

- Equipment and construction mats will be cleaned immediately after passing through infested areas. Cleaning will consist of removing large soil clods and/or plant parts from the equipment and construction mats using shovels and brooms, and if necessary, washing the equipment with water or cleaning using compressed air. Soil and water from cleaning activities will not be allowed to flow to non-infested areas. After topsoil is stripped and stockpiled, equipment leaving areas of weed infestation may be cleaned by knock-down only, unless otherwise specified by permit condition.

- Final seeding will be initiated within 24-hours of final grading, pending appropriate weather and soil conditions, to prevent the establishment of noxious weed seeds that may be present in the existing seed bed.

# 2.0 STREAM AND RIVER CROSSING GENERAL REQUIREMENTS

Pre-construction planning is an essential part of stream crossings. Stream crossing requirements, including construction methods, timing, erosion control, and restoration are described in this section and in the stream crossing permits issued by state and federal agencies. If the contractor considers certain parts of these procedures to be technically impractical due to site-specific engineering constraints, the contractor may seek modifications through the On-Site Modification Request Process. Prior to construction, the contractor must identify alternative provisions that would provide an equal or greater level of protection to stream and river ecosystems. Enbridge will review the contractor's alternatives and consult with appropriate regulatory agencies. The EI will confer with the agency representative, if applicable, during construction at waterbodies during wet and high runoff conditions to determine whether conditions warrant additional considerations for construction activities.

The procedures in this section apply to streams, rivers, and other permanent waterbodies such as drainage ditches, ponds and lakes. The intent of the mitigation procedures is to minimize construction-related disturbance to streams and waterbodies by limiting the duration of construction in these areas and by minimizing erosion and sedimentation.

## 2.1 TIME WINDOW FOR CONSTRUCTION

In-stream trenching will be conducted during periods permitted by the appropriate regulatory agencies and applicable permits.

## 2.2 PRE-CONSTRUCTION CONSIDERATIONS

### 2.2.1 Hazardous Materials

Enbridge or its Contractors will not store hazardous materials, chemicals, fuels, lubricating oils, or perform concrete coating activities within 100 feet of streams and waterbodies. Refer to Enbridge's Spill Prevention, Containment and Control Plan (Spill Plan) for additional requirements pertaining to hazardous materials. Please see Sections 3.2.1 and 3.2.2 for discussion of hazardous material storage and refueling near wetlands.

### 2.2.2 Refueling/Equipment Care

Construction equipment will be refueled at least 100 feet from streams and waterbodies. Where the contractor in conjunction with the EI determines that conditions require construction equipment (e.g., trench dewatering pumps) to be refueled within 100 feet of streams, the contractor must follow the procedures described in Enbridge's Spill Prevention, Containment and Control Plan (Spill Plan). No equipment will be washed, lubricated, or parked overnight within 100 feet of streams or waterbodies unless special provisions have been implemented in accordance with Enbridge's Spill Plan. Refer to Enbridge's Spill Plan for additional requirements pertaining to refueling and equipment care near waterbodies.

### 2.2.3 Alignment of Crossing

Stream crossings will be designed as close to perpendicular to the axis of the stream channel as engineering and routing constraints allow, creating the shortest crossing length.

## 2.3 CLEARING AND GRADING

The contractor will leave a 20-foot buffer (from the waterbody bank) of undisturbed herbaceous vegetation on all stream banks during initial clearing, except where grading is needed for bridge installation, or restricted by applicable regulations and/or permit conditions. Woody vegetation within this buffer may be manually cut and removed during clearing. Non-woody vegetation and the soil profile will be left intact until the contractor is ready to begin trenching the stream crossing. The contractor will properly install and maintain sediment control measures adjacent to streams immediately after clearing and prior to initial ground disturbance (see Exhibits 2.1, 2.2, 2.3, and 2.4). This buffer should not be confused with the 50-foot setback required for extra workspace (see Section 2.4).

## 2.4 EXTRA WORKSPACE

Extra workspaces, as defined in Section 1.3, include work areas outside the boundary of the typical construction right-of-way. These areas are used to assemble pipe segments and for temporary spoil storage. Clearing of forested and brushy areas for EWS will be avoided as much as possible. Woody vegetation in wetlands and riparian areas will typically not be cleared for the purpose of EWS unless approved by appropriate regulatory agencies as stipulated in permits issued for the project. Extra workspaces will be constructed as follows:

- Extra workspaces will be located at least 50 feet away from water's edge if topographic or other physical conditions such as stream channel meanders permit (see Exhibits 2.1, 2.2 and 2.3).

- If conditions do not allow for a 50-foot setback, extra workspaces should be located no closer than 10 feet from the water's edge, subject to site-specific approval by Enbridge.

- In actively cultivated areas, approval may be obtained from the EI to locate the EWS with a 10-foot setback where no additional or less environmental impact would occur.

- Extra workspaces will be limited to the minimum size needed to construct the stream crossing.

## 2.5 BRIDGES

Temporary equipment bridges will be used on most waterways, including small waterways such as ditches and intermittent streams with significant flow, where there is a potential for stormwater runoff or rain events to transport sediment downstream from equipment crossing the waterway. Bridges will be constructed as described below and will be removed during final restoration. Bridges will not typically be installed at directionally drilled streams (see Exhibit 2.4) unless specifically approved by Enbridge and the applicable permitting agencies.

Only clearing equipment and equipment necessary for installation of equipment bridges will cross waterbodies prior to bridge installation. The number of such crossings of each waterbody will be limited to a single crossing per piece of clearing equipment.

### 2.5.1 Types of Bridges

Equipment bridges will be constructed using one of the following techniques:

- Timber mats (see Exhibit 2.5)
- Clean rock and flume (see Exhibit 2.6)
- Railroad flat-cars
- Flexi-floats
- Other methods as approved by Enbridge and appropriate agencies

### 2.5.2 Bridge Design and Maintenance

Equipment bridges will be designed to withstand the maximum foreseeable flow of the stream, and may be required by permit condition to be securely anchored with cables or cable-like material. Bridges will not restrict flow or pool water while the bridge is in place, and will be constructed with clean materials. They will be designed and maintained to prevent soil from entering the waterbody and soil will be removed from the bridges as often as necessary to prevent soil from entering the waterbody.

### 2.5.3 Impaired Waters

Where discharges of stormwater may occur to waters designated under Section 303(d) of the Clean Water Act as Impaired Waters, additional BMPs will be implemented as indicated on the site-specific drawings provided in the Stormwater Pollution Prevention Plan (SWPPP). These additional measures may include the following:

- During construction all exposed soil areas with a slope of 3:1 or steeper and with a continuous positive slope to a designated Impaired Water must have temporary erosion protection or permanent cover within 3 days after the areas is no longer actively being worked. All other slopes with a continuous positive slope to an Impaired Water must have temporary erosion protection or permanent cover within seven days after the area is no longer actively being worked.

- An undisturbed buffer zone of not less than 100 linear feet from the special water will be maintained at all times, until the water crossing is installed. In areas where the preconstruction vegetation provides less than a 100 foot buffer, the existing buffer will be maintained and documented unless otherwise directed by the applicable agency.

## 2.6 STREAM AND RIVER CROSSING CONSTRUCTION METHODS

The following stream and river crossing methods are typically used, subject to further restrictions by Enbridge and applicable permits and subject to modifications as approved by appropriate regulatory agencies during construction. Clearing equipment will be allowed one opportunity to ford waters crossed by the project, unless otherwise stated in applicable permits.

### 2.6.1 Wet Trench Method

**Installation**

The wet trench method will be used to cross streams and rivers not scheduled to be flumed, dammed and pumped, or directionally drilled (see Exhibit 2.1). The following procedures will be used during wet trench crossings:

- Sediment control measures will be in place before grading from the 20-foot vegetative buffer left on each stream bank. Spoil containment structures made of silt fence and/or straw bales will be installed back from the stream bank so that spoil does not migrate into the stream. Grading will be directed away from the waterbody to minimize the potential for sediment to enter the stream. Grading of stream banks will be restricted to the trench line and areas necessary for safe bridge installation, if required.

- After grading, backhoes or draglines will be used to excavate the trench. Excavating equipment will operate from one or both banks, without entering the stream. If equipment must encroach into the stream, it will operate on construction mats. Existing streambed material will be segregated and placed within a spoil containment structure in approved construction work area limits.

- In-stream trenching and backfilling will typically be completed within 24 hours or less on minor waterbodies (<10 feet wide) and 48 hours or less on intermediate (> 10 feet to 100 feet wide) or major waterbodies (>100 feet wide) (not including HDD crossings) or as directed by applicable permits.

- Earthen trench plugs (hard plugs) between the stream and the upland trench will be left undisturbed during excavation of the in-stream trench to prevent diversion of the stream flow into the open trench and to prevent water that may have accumulated in the adjacent upland trench from entering the waterbody. Trench plugs will be removed immediately prior to pipe placement, and then replaced when the pipe is in place.

- If trench dewatering is necessary, the pump intake will be suspended off the trench bottom and dewatering will take place into a sediment filter bag or a straw bale dewatering structure (see Exhibits 2.7 and 2.8). The trench will be dewatered in such a manner that no heavily silt-laden water flows into streams or wetlands (see Section 5.1). Only non-woven fabric will be used for filter bags. It is the contractor's responsibility to meet applicable water quality standards**.**

- Backfilling will begin after the pipe is positioned in the trench at the desired depth. Backfill material will consist of the spoil material excavated from the trench and parent streambed unless otherwise specified in state or federal permits. The in-stream trench will be backfilled so that the stream bottom is as near as practicable to its pre-construction contour, with no impediments to normal water flow.

**Temporary Erosion Control**

After pipe installation and backfilling, the stream banks will be shaped to their original contours or to a 3:1 slope, whichever is less steep. Such measures will be installed within 24 hours of backfilling the crossing. Temporary erosion and sediment control measures (e.g., erosion blankets, straw bales, silt

fence, etc.) will be installed within 24 hours of backfilling the crossing. Temporary slope breakers will be installed on all sloped approaches to streams in accordance with the spacing requirements outlined in Section 1.5.8.

### 2.6.2 Dam and Pump Method

**Installation**

The dam and pump method is a dry crossing method that is suitable for low flow streams and is a preferred alternative to fluming for crossing meandering channels. The dam and pump method involves damming of the stream with sandbags, inflatable dams, and/or steel plates upstream and downstream of the proposed trench before excavation (see Exhibit 2.2) and pumping water around the construction area. The following procedures will be used for dam and pump crossings:

- Pumping of the stream across the right-of-way will commence simultaneously with dam construction to prevent interruption of downstream flow. Stream flow will be pumped across the construction area through a hose and will be discharged onto an energy-dissipation device such as plywood boards to prevent scouring of the stream bed.

- The pumps will be located on the upstream side of the crossing and will be placed in impermeable, sided structures which will act as containment units for the pumps and fuel containers. The pumps used for the dam and pump crossing will not be placed directly in the stream or on the streambed. The discharge will be directed into an energy dissipation device to prevent scouring of the streambed. Pumps will have a capacity greater than the anticipated stream flow. The pumping operation will be staffed 24 hours a day and pumping will be monitored and adjusted as necessary to maintain an even flow of water across the work area and near-normal water levels upstream and downstream from the crossing. A backup pump of equal or greater capacity will be on-site at all times in the event that the primary pump fails.

- Spill kits will be stored adjacent to pumps and fuel.

- Dams will be constructed of sandbags, inflatable dams, and/or steel plates. The dams will prevent the stream from flowing into the construction area. The dams will be continuously monitored by the contractor for a proper seal. The contractor will add additional sandbags, plastic sheeting, steel plating, or similar materials where deemed necessary by Enbridge and the EI to minimize the amount of water seeping around the dams and into the construction work area.

- Trackhoes located on one or both stream banks will excavate a trench across the stream bed. Spoil generated during trenching will be stored in a straw bale/silt fence containment area within approved construction work area limits. Existing streambed material will be segregated and placed within a spoil containment structure in approved construction work area limits.

- Earthen trench plugs between the stream and the upland trench will be used if deemed necessary by the EI during excavation of the in-stream trench to prevent diversion of the seeped groundwater into the open trench. Trench plugs will be removed immediately before pipe placement, and then replaced when the pipe is in place.

- Standing water that is isolated in the construction area by the dams will be pumped into a sediment filter bag or a straw bale dewatering structure located in an upland area in such a manner that no heavily silt-laden water flows into streams or wetlands (see Section 5.0). Only non-woven fabric will be used for filter bags.

- Backfilling will begin immediately after the pipe is positioned in the trench to the desired depth. Backfill material will consist of the spoil material and parent streambed excavated from the trench unless otherwise specified in state or federal permits. The in-stream trench will be backfilled so that the stream bottom is similar to its pre-construction contour, with no impediments to normal water flow.

**Temporary Erosion Control**

Restoration of the right-of-way and the installation of temporary erosion controls will be similar to that described for the wet trench method above. Once the stream banks have been stabilized, the dams and pump will be removed.

### 2.6.3 Flume Method

**Installation**

The flume method is a dry crossing method that is suitable for crossing sensitive, relatively narrow streams that have straight channels and are relatively free of large rocks and bedrock at the point of crossing. This method involves placement of flume pipe(s) in the stream bed to convey stream flow across the construction area without introducing sediment to the water (see Exhibit 2.3). The procedures for using the flume method are described below.

- The flume(s) will be of sufficient diameter to transport the maximum flows anticipated to be generated from the watershed. The flume(s), typically 40 to 60 feet in length, will be installed before trenching and will be aligned so as not to impound water upstream of the flume(s) or cause downstream bank erosion. The flumes will not be removed until after the pipeline has been installed, trench has been backfilled, and the stream banks have been stabilized.

- The upstream and downstream ends of the flume(s) will be incorporated into dams made of sandbags and plastic sheeting (or equivalent). The upstream dam will be constructed first and will funnel stream flow into the flume(s). The downstream dam will prevent backwash of water into the trench and construction work area. The dams will be continuously monitored for a proper seal. Adjustments to the dams will be made where necessary to prevent large volumes of water from seeping around the dams and into the trench and construction work area.

- After the streambed between the dams is dewatered, trackhoes located on one or both stream banks will excavate a trench across the stream bed. Spoil generated during trenching will be stored in a straw bale/silt fence containment area located away from the stream banks within approved construction work areas. Existing streambed material will be segregated and placed within a spoil containment structure in approved construction work area limits.

- Earthen trench plugs between the stream and the upland trench will be used, if deemed necessary by the EI, during excavation of the in-stream trench to prevent diversion of the stream flow into the open trench. Trench plugs will be removed immediately before pipe placement, and then replaced when the pipe is in place.

- If trench dewatering is necessary to complete the installation of the pipe, the discharge will be pumped into a sediment filter bag or a straw bale dewatering structure located in an upland area in such a manner that no heavily silt-laden water flows into streams or wetlands (see Section 5.0). Non-woven fabric must be used for filter bags.

- Backfilling will begin after the pipe is positioned in the trench to the desired depth. Backfill material will consist of the spoil material excavated from the trench and parent streambed unless otherwise specified in state or federal permits. The in-stream trench will be backfilled so that the stream bottom is similar to its pre-construction contour, with no impediments to normal water flow.

**Temporary Erosion Control**

Restoration of the right-of-way and the installation of temporary erosion controls will be similar to that described for the wet trench method above. After the stream banks have been stabilized, the dams and flume pipe(s) will be removed from the streambed allowing water to resume its flow in the channel.

### 2.6.4 Directional Drill Method

**Installation**

Directionally drilling the pipe underneath a stream will involve placing a drill unit on one side of the stream (see Exhibit 2.4). A small-diameter pilot-hole will be drilled under the stream along a prescribed profile. After the pilot hole has been completed, barrel reams will be used to enlarge the pilot-hole to accommodate the desired pipeline diameter. Drilling mud (bentonite clay) will be necessary to remove cuttings and maintain the integrity of the hole. Water from an approved source (typically the river to be crossed) will be used to prepare the slurry of drilling mud, and will be appropriated according to applicable permits. The pipe section will be pulled through the hole by the drilling rig and welded to the adjoining sections of pipe on each side of the river.

**Temporary Erosion Control**

Directional drilling normally does not result in the disturbance of the stream banks or riparian vegetation, which reduces the potential for erosion and sedimentation at the stream crossing. Consequently, temporary erosion control measures that are installed at open-cut crossings typically are not necessary for drilled crossings.

During drilling operations, drilling mud and slurry will be stored back from the river bank in an earthen berm sediment control structure, in tanks, or by other methods so that it does not flow into the stream, adjacent wetlands, or off the workspace.

Enbridge has developed a directional drill contingency plan to address measures to be performed in the event of a release of drilling fluid onto the ground surface or waterbody. See the Enbridge *Drilling Mud Containment, Response, and Notification Plan* for additional details.

After the pipe is in place, excess drilling mud and slurry will be spread over an upland area approved by Enbridge and the landowner, or hauled off site to an approved disposal location.

## 2.7 DRAINAGE DITCHES AND INTERMITTENT STREAMS

Intermittent streams and agricultural ditches will be crossed using the wet trench method (see Section 2.6.1) if water is present and flowing. For dry intermittent streams and agricultural drainage ditches, standard upland construction procedures will be used, which involve stringing, welding, excavating the trench with backhoes, installing the pipe in the trench, and backfilling the trench with native material. However, materials will be readily available to complete the crossing using a dry method in the event it begins flowing during the time of crossing. As soon as deemed practical by the EI, the banks of each crossing will be reshaped, mulched, and, if required, seeded with the required mix to stabilize the crossing until permanent erosion control is implemented. No refueling or fuel storage is allowed within 100 feet of a drainage ditch or intermittent stream. Where dry swales cross the right-of-way, silt fence or straw bales will be installed at the edge of the right-of-way to prevent the flow of sediment from the right-of-way.

# 3.0 WETLAND CROSSING GENERAL REQUIREMENTS

Typical pipeline construction in wetlands will consist of clearing, trenching, dewatering, installation, backfilling, final grading, cleanup, and revegetation. However, due to the unstable nature of some wetland soils, construction activities may differ somewhat from those described for upland areas. Construction activities will be minimized in wetlands and/or special construction techniques will be used to minimize the disturbance to plants and soils and to protect wetland hydrology.

Pre-construction planning is an essential part of wetland crossings. Wetland crossing requirements, including construction methods, timing, erosion control, and restoration, are described in this section and in the wetland crossing permits issued by state and federal agencies. If the contractor considers certain parts of these procedures to be technically impractical due to site-specific engineering constraints, the contractor may seek modifications via the On-Site Modification Request Process. Prior to construction, the contractor must identify alternative provisions that would provide an equal or greater level of protection to wetland ecosystems. Enbridge will review the contractor's alternatives and consult with appropriate regulatory agencies. The contractor must receive approval from Enbridge prior to implementing the alternatives.

The procedures in this section apply to all jurisdictional wetlands that will be affected by the project. These procedures require that judgment be applied in the field and will be implemented under the supervision of Enbridge and the EI. The intent of these procedures is to minimize construction-related disturbance and sedimentation of wetlands and to restore wetlands as nearly as possible to pre-existing conditions.

## 3.1 WETLAND ACCESS

The contractor must use the construction right-of-way and approved roads to access wetland areas.

## 3.2 SPILL PREVENTION

### 3.2.1 Storage of Fuels and Other Materials

No storage of hazardous materials, chemicals, fuels, and lubricating oils, and no concrete coating activities will be permitted in, or within 100 feet of, any wetland. All vehicles must be parked overnight 100 feet or more from delineated wetlands. Where the contractor and EI determine that conditions require construction equipment to be parked overnight within 100 feet of a delineated wetland, the contractor must follow the procedures described in Enbridge's Spill Plan and implement additional provisions based on site-specific conditions.

### 3.2.2 Refueling and Fuel Handling

Attempts will be made to refuel all construction equipment in an upland area at least 100 feet from a wetland boundary. Where conditions require that construction equipment (e.g., pontoon-mounted backhoes, trench dewatering pumps) be refueled in a wetland or within 100 feet of any wetland boundary, these activities will be in accordance with Enbridge's Spill Plan, and in consultation with the EI.

## 3.3 CLEARING

Clearing the construction right-of-way in wetlands will be similar to clearing in uplands. For construction to proceed, obstructions (e.g., trees, brush, and logs) need to be removed. Typically, low ground pressure equipment will be used, limiting disturbance to the wetland. When clearing in wetlands, the following restrictions apply:

- The construction right-of-way width will typically be limited to 85 feet or less.
- Staging areas, additional spoil storage areas, and other additional work areas will be located in upland areas at least 50 feet away from wetland boundaries (see Exhibit 3.1), where topographic conditions permit. If topographic conditions do not permit a 50-foot setback, then these areas will be located as far away from the wetland as is practicable. Vegetation will not be cleared between these areas and the wetland in any event. In actively cultivated areas, approval may be obtained from the EI to locate the EWS with a 10-foot setback where no additional or less environmental impact would occur.
- No construction activities including vegetation clearing or earthwork will occur between the EWS and sensitive resource areas (wetlands or waterways). Attempts were made to place EWS outside of wetlands wherever practicable. This requirement will not apply where a wetland occurs within the extra workspace for a stream crossing.

### 3.3.1 Extra Workspace in Wetlands

Clearing of forested wetlands for EWS should be avoided as much as possible. Woody vegetation in wetlands must not be cleared for the purpose of EWS unless approved by appropriate regulatory agency.

- The size of the additional workspace areas will be limited to the minimum needed to construct the wetland crossing.
- Vegetation and trees within wetlands will be cut off at ground level, leaving existing root systems intact; clearing debris will generally be removed from the wetland for disposal. Chips, hydro-axe debris, or similar can be left in the wetland if spread evenly in the right-of-way to a depth not to exceed 1-inch in thickness and in a manner, as determined by the EI, which will allow for normal revegetation.

## 3.4 GRADING

Grading will be conducted in a manner consistent with applicable federal, state, and local permits. Grading activities will be confined to the area of the trench. Grading outside the trench is only permitted where required to ensure safety and restore contours after backfilling the trench.

Sedimentation control practices (e.g., silt fence) will be installed across the entire construction right-of-way upslope of the wetland boundary where necessary to prevent sediment flow into wetlands. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetlands, sediment barriers will be installed along the edge of the construction right-of-way as necessary to prevent sediment flow into the wetlands. Sediment barriers will be installed along the edge of the

construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way through wetlands.

All erosion and sediment controls will be maintained in proper working order to prevent the flow of sediment into wetlands from spoil piles or sloped approaches that are adjacent to the wetlands. When the depth of sediment reaches one-third of the height of a sediment barrier, the barrier will be replaced and/or the sediment removed. Non-functional sediment-control measures will be repaired, replaced, or supplemented with functional features as soon as possible but in all cases within 24 hours of discovery.

## 3.5 RIGHT-OF-WAY STABILIZATION

Tree stumps, brush riprap, imported soil, and rock fill will not be brought in to stabilize the right-of-way in wetlands. Where a wetland cannot support construction equipment, and low-ground-weight equipment is not used, construction activities will be accomplished from timber construction mats (see Exhibit 3.1). The contractor is responsible for having a sufficient number of construction mats to perform the work. Timber riprap (also known as corduroy road) cannot be used without prior written approval from Enbridge and the appropriate regulatory agencies. Pre-existing corduroy roads in wetlands may be used but may not be improved, maintained, restored, or replaced without site-specific authorization from applicable agencies. The contractor will remove any portion of a corduroy road damaged during construction activities.

Subsoil from the pipeline trench within the immediate wetland may be placed on top of equipment mats for additional stabilization. Timber mats may be placed over the ditch line or on the working side to facilitate trench excavation. All timber mats, construction debris, and larger vegetative debris will be removed during cleanup of wetlands.

## 3.6 TRENCHING

Excavation of the pipeline trench in wetlands typically will be accomplished using backhoe excavators. The duration of open trench will be minimized to the extent possible, but typically not longer than 24 hours.

### 3.6.1 Topsoil Segregation

Typically, when constructing in wetland areas without standing water, up to one-foot of topsoil will be stripped from the trench line and stockpiled separate from trench spoil (see Exhibits 1.3 and 3.1). The organic soil segregation methods/locations in wetlands are based on wetland saturation conditions. Where standing water is present, organic soil segregation is not practical and will not be performed unless specifically required by project-specific permits or licenses.

### 3.6.2 Trench Breakers

Where the Enbridge and the EI determines that the pipeline trench has the potential to partially drain a wetland, trench breakers will be installed as necessary to maintain the original wetland hydrology.

## 3.7 PIPELINE INSTALLATION

The following procedures are intended to minimize siltation and disturbance to wetlands during installation.

### 3.7.1 Construction Matting

If the wetland right-of-way is stable (dry work area or construction mats), the pipe may be strung, welded, and lowered into the trench as in upland areas. Supplemental equipment supports, such as timber mats, will be used in wetlands to provide temporary portable support for heavy construction equipment to reduce ground pressure and minimize soil compaction and/or soil mixing. No more than two layers of equipment mats will be used to support equipment on the construction right-of-way. All equipment mats will be removed upon completion of construction.

### 3.7.2 Push/Pull Method

Large wetlands with standing water cannot be crossed with typical crossing methods. In these areas, the pipeline will be assembled in an upland area and positioned in the trench using the “push-pull" and/or "float" techniques.

Usually this fabrication requires use of extra temporary workspace adjacent to the right-of-way. The trench will typically be dug by a backhoe supported on timber mats. The prefabricated section of pipeline will then be pushed-pulled into position or floated across the wetland. When the pipeline is in position, floats, if used, will be removed and the pipeline will sink into position. The trench will then be backfilled and the wetland will be restored as near as practical to preconstruction conditions by a backhoe (or equivalent) working from construction mats.

### 3.7.3 Sediment Controls

Sediment control practices will be installed as described in section 1.5.9 and 3.4, according to the specifications presented on Exhibits 1.6 and 1.7.

### 3.7.4 Concrete Coating

Concrete will generally be mixed off-site, and concrete coated pipe will be transported to the right-of-way on trucks. If required, pre-fabricated concrete weights or gravel-filled set-on sacks may also be used to provide negative buoyancy. Concrete weights will be manufactured off-site and transported to the right-of-way. Weights will be strung along the construction right-of-way, where necessary, until they are placed over the pipe within the excavated ditch. Limited mixing and coating activities may occur on the construction right-of-way for coating pipe joints and concrete weight repairs. Washing equipment used for mixing, pouring, casting, or coating will not be conducted within 100-feet of any wetland. Erosion and sediment control BMPs will be installed at equipment wash areas where needed to prevent erosion control sedimentation (see Exhibits 1.6 and 1.7).

## 3.8 BACKFILLING

During backfilling of wetland areas, subsoil material removed from the trench during construction must be replaced so that any crowning that remains will be within limits designated by applicable permits or licenses. After the trench has been backfilled with subsoil to the appropriate elevation, previously segregated topsoil will be returned to the disturbed areas. Any excess subsoil backfill material will be removed to an upland area approved by Enbridge. Segregated topsoil will not be used as padding and must be returned to its original horizon over the backfilled trench.

## 3.9 ROUGH GRADING, CLEANUP, AND TEMPORARY RESTORATION

Cleanup and rough grading activities may take place simultaneously. Cleanup typically will involve removing construction debris and replacing fences removed during construction. Rough grading will

include restoring original contours and installing or repairing temporary erosion control measures. Temporary slope breakers will be installed near the boundary between the wetland and adjacent sloped approaches, to prevent sediment flow into the wetland.

### 3.9.1 Timing

Every effort will be made to begin cleanup and rough grading (including installation of temporary erosion control measures) as soon as practical after the trench is backfilled, weather permitting.

### 3.9.2 Temporary Revegetation

Where necessary, disturbed wetland areas will be revegetated with oats (40 lbs/acre) and/or a temporary seed mix, unless standing water is prevalent or unless permanent planting or seeding with native wetland vegetation is required by applicable permits. No fertilizer, lime, or mulch will be applied in wetlands. It has been Enbridge's experience that the natural seed bank within the wetland provides the most effective revegetation.

# 4.0 HIGHWAY, ROAD AND RAIL CROSSINGS

## 4.1 ADDITIONAL WORKSPACE

Additional workspaces for bored road and railroad crossings and open-cut road crossings will be determined on a site-specific basis. These workspaces will be adjacent to the road or railroad and limited to the size needed to contain spoil from the crossing.

## 4.2 MAINTENANCE

Roadway crossings will be maintained in a condition that will prevent tracking of mud onto the roadway. If mud is tracked onto a roadway, the contractor will have it shoveled or swept off the road and placed within a sediment barrier as soon as possible, but in no circumstances more than 24 hours after discovery.

Rock tracking pads or similar will be installed adjacent to paved public roads to prevent or minimize the tracking of soil onto the roadway (see Exhibit 4.1). If the roadside ditch is part of a jurisdictional waterway, a permit must be obtained prior to installing the tracking pad or culvert. If permitted in wetlands, tracking pads will be limited in size to reduce impacts. Tracking pads installed in wetlands must be constructed with clean rock placed on geo-textile fabric. All rock must be removed from the wetland during cleanup.

In the case of mud incorporation into the aggregate road surface as a result of construction activities, the contractor will remove the fouled surface aggregate or cover with an equal layer of new aggregate (not less than six inches compacted depth). The new aggregate will be consistent with the existing road surface and must be approved by Enbridge and the applicable agency or landowner.

## 4.3 SEDIMENT BARRIERS

Temporary sediment barriers (e.g., silt fence and/or double-staked straw bales) will be installed on sloped approaches to road crossings where vegetation has been disturbed (see Exhibits 1.6 and 1.7).

# 5.0 CONSTRUCTION DEWATERING AND HYDROSTATIC TESTING DISCHARGES

## 5.1 TRENCH DEWATERING

Before the pipe is lowered into the trench, dewatering may be necessary to visually inspect the trench bottom for the presence of rocks. Trench dewatering may also occur where tie-in welds are necessary, at road-boring sites adjacent to wetlands or waterbodies where groundwater has seeped into the trench, locations where set-on weights are placed over the pipe, and in other areas where increased visibility or physical access to the trench is needed. Dewatering pumps and equipment placement are displayed in Exhibits 2.7 and 2.8. Dewatering will be performed in accordance with applicable appropriation and discharge permits, but at a minimum, must comply with the following procedures:

- The trench will be dewatered into a well-vegetated upland area with an appropriate energy-dissipation device (See Exhibits 2.7 and 2.8). Whenever possible, the slope at the point of discharge will be away from any streams or wetlands. The contractor will consult with the EI regarding suitability of the dewatering discharge location. Enbridge and the EI must approve the location prior to any discharge.

- If the flow of a discharge cannot be kept out of streams, wetlands, drainage ditches, etc., the discharge will be filtered by one of the methods described below. Dewatering discharge will be directed into a sediment filter bag or a straw bale/silt fence dewatering structure which discharges into a vegetated area to prevent heavily silt-laden water from flowing into wetlands and waterbodies (see Exhibits 2.7 and 2.8).

- Filter bags and dewatering structures must be maintained in a functional condition throughout dewatering activity (e.g., clogged or ripped bags must be replaced) and will be attended at all times during active pumping. Non-functioning dewatering structures must be repaired prior to continuing dewatering activities. Accumulated sediment from the filter bags will be spread in an approved upland location.

- The contractor will assist Enbridge in complying with applicable permit requirements, including tracking volumes of water pumped, obtaining water samples (if requested by Enbridge) for testing, and taking necessary measures to meet effluent limitations.

### 5.1.1 Flow Measurement

At no time will the discharge rate exceed the applicable discharge rates specified in state-issued or other discharge permits. The discharge rate must be monitored and adjusted as necessary to prevent failure of the filtration structure.

The total volume of water discharged will be determined with a flow meter (or equivalent), or as required by the applicable state permit. The contractor must track the total volume of water discharged and ensure that the total volume does not exceed the volume specified in the applicable permit. The contractor will provide Enbridge with completed dewatering logs on a weekly basis.

### 5.1.2 Erosion Control

Dewatering of the trench will be conducted in a manner which will prevent soil erosion. Discharge rates will be monitored and regulated to prevent erosion. Energy-dissipation devices (i.e., filter bags or straw bale structures) will be used to prevent sediment discharge into a wetland or waterbody.

### 5.1.3 Regulatory Notification and Reporting

If required, Enbridge will notify appropriate state agencies prior to each discharge in accordance with its NPDES or state equivalent (e.g. NDPDES) permit.

Reports regarding the volume and quality of the water withdrawn will be submitted by Enbridge, as required by the state NPDES permit, if required. The contractor will assist Enbridge in collecting appropriate data and any water samples required or in determining volumes of water appropriated.

### 5.1.4 Water Sampling

Water discharged from trench dewatering locations may need to be sampled as required by the state-issued NPDES discharge permit. If required, the construction contractor will assist Enbridge in obtaining these samples and will be responsible for complying with the permit limitations.

## 5.2 HYDROSTATIC TEST DISCHARGES

Hydrostatic testing involves filling the new pipeline segments with water acquired in accordance with applicable permits (See Section 6.0), raising the internal pressure level, and holding that pressure for a specific period of time per federal DOT specifications. Hydrostatic testing will be done to verify that there are no flaws in the pipe or welds. Pre-built sections may be hydrostatically tested prior to installation at significant streams and wetland crossings. Water used for hydrostatic testing typically will be taken from, and returned to, local streams and rivers. After the hydrostatic test is completed, the line will be depressurized and the water expelled. During withdrawal and discharge, the water will be sampled as required by permits to determine if contaminants are present. Water volumes must be measured and recorded. Contractor will consult with the EI regarding suitability of the dewatering discharge location. Enbridge and the EI must approve the location prior to any discharge, for those not permitted to be discharged directly to the source or other waterbody.

If site conditions or engineering constraints make adhering to these hydrostatic testing procedures and documentation impractical, Enbridge will propose alternative provisions to the regulatory agency issuing the NPDES discharge permit. Any such alternative will provide an equal or greater level of protection to the environment than the condition from which Enbridge or its Contractor seeks relief.

### 5.2.1 Refueling

The operation and refueling of hydrostatic test equipment will be in accordance with the conditions outlined in Enbridge's SPCC Plan.

### 5.2.2 Permit Requirements

Hydrostatic testing will be conducted in accordance with applicable appropriation and discharge permits obtained by Enbridge.

### 5.2.3 Siting of Test Manifolds

Hydrostatic test manifolds will be installed where necessary to ensure proper test pressures. However, the selected location of test manifolds is based on engineering requirements to meet proper test pressures and incorporates changes due to topography. Where feasible, Enbridge will incorporate minor adjustments to the test manifold locations to avoid placement in wetlands and riparian areas. However, completely avoiding the placement of a test manifold in a wetland may not always be possible. The contractor will install appropriate erosion control measures where the EI determines that topographic conditions, primarily elevation changes, require test sections to be located in a wetland or riparian area.

### 5.2.4 Water Sampling

Water discharged from hydrostatic tests will be sampled as required by state-issued water appropriation or discharge permits. The contractor will assist Enbridge in obtaining these samples and will be responsible for complying with all permit conditions.

### 5.2.5 Flow Measurement

At no time will the discharge rate exceed the applicable discharge rates specified in state-issued or other discharge permits. The discharge rate must be monitored and adjusted as necessary to prevent failure of the filtration structure.

The total volume of water discharged will be determined with a flow meter (or equivalent), or as required by the applicable state permit. The contractor must track the total volume of water discharged and ensure that the total volume and total discharge rate does not exceed the volume or rate specified in the applicable permit. The contractor will provide Enbridge volume and discharge information immediately upon request.

# 6.0 WATER APPROPRIATION

## 6.1 GENERAL

After the pipeline has been installed and the trench backfilled, the entire pipeline system will be hydrostatically tested to ensure its integrity. Water used to conduct hydrostatic testing may need to be appropriated from nearby waterbodies. The following outlines the procedures that will be performed for water appropriation. Intake hoses will be suspended off of the stream or lake bottom and will be screened to prevent entrainment of fish. During withdrawal, adequate waterbody flow rates and volumes will be maintained to protect aquatic life and allow for downstream uses.

## 6.2 WATER SOURCES

Water will only be withdrawn from sources approved by Enbridge and in accordance with applicable permits. No additives to the water are permitted unless written approval is received from Enbridge and applicable permits authorize such additives.

If appropriation is scheduled to occur during possible periods of low flow, including frozen conditions, a backup source will be identified.

## 6.3 FLOW MEASUREMENT

The contractor will record withdrawal rate and total volume of water appropriated with a flow meter (or equivalent) and provide this information to Enbridge immediately upon request. The contractor will be responsible for complying with all permit conditions and will ensure that at no time the withdrawal rate for the water source exceeds the rate specified in the applicable permits.

## 6.4 WATER SAMPLING

Water withdrawn for hydrostatic tests will be sampled as required by state-issued water appropriation or discharge permits. The contractor will assist Enbridge in obtaining these samples.

## 6.5 REGULATORY NOTIFICATION AND REPORTING

Enbridge will notify appropriate state agencies of the time of appropriations if required by the state appropriations permits. Reports regarding the volume and quality of the water withdrawn will be submitted by Enbridge if required by the state permit.

# 7.0 RESTORATION

Permanent soil erosion and sediment control will begin as soon as soil conditions permit seed bed preparation and seed germination. Agricultural lands will be restored but will not be reseeded unless requested by the landowner.

## 7.1 ROUGH GRADING AND CLEANUP

Cleanup and rough grading activities may take place simultaneously. Cleanup involves removing construction debris (including litter generated by construction crews and excess rock 2-inches or greater in diameter) and replacing fences removed during construction. Rough grading includes restoring the original contours, and installing or repairing temporary erosion control measures.

### 7.1.1 Timing

The contractor will begin cleanup and rough grading (including installation of temporary erosion control measures) within 72 hours after backfilling. The contractor will make every effort to complete this cleanup within 1 week, weather and soil conditions permitting.

## 7.2 FINAL CLEANUP AND FINAL GRADING

Permanent erosion and sediment control will begin with general cleanup of the construction area. Extraneous material that would impede seed bed preparation will be removed from the right-of-way. Final grading will restore the disturbed areas as near as practicable to the contours of the land that existed before construction.

If not previously removed during rough cleanup and grading, all remaining construction-related debris and material that are not an integral part of the pipeline (including litter generated by pipeline crews) will be removed from the landowner's property.

## 7.3 PERMANENT EROSION CONTROL MEASURES

After final grading, slopes in areas other than cropland will be stabilized with erosion control structures (see Exhibit 1.4). Erosion control treatments of specific physical land features are described below.

### 7.3.1 Slopes

Permanent berms (diversion dikes or slope breakers) will be installed on all slopes, according to the following maximum spacing requirements unless otherwise specified in permit conditions:

| Slope (%) | Approximate Spacing (ft) |
|---|---|
| 3-5 | 250 |
| 5-15 | 200 |
| 15-25 | 150 |
| >25 | <100 |

Permanent berms will be constructed according to the following specifications:

- Permanent berms will be installed with a two to eight percent outslope.

- Permanent berms will be constructed of compacted earth.
- The outfall of berms will be directed toward appropriate energy-dissipating devices, and off the construction right-of-way if possible
- Permanent berms will be inspected and repaired as deemed necessary by the EI to maintain function and prevent erosion. Exhibits 1.4 and 1.5 illustrate berm specifications.
- Erosion control blankets (Curlex, jute, or equivalent) will be placed on slopes over 30 percent.

### 7.3.2 Stream Banks

Stream banks will be permanently restored with erosion control fabric and permanent seeding and other measures as necessary and as required by appropriate regulatory agencies. Permanent stabilization will be initiated within 24 hours after installation of the crossing, unless site and permit conditions delay permanent installation. Where the banks have been disturbed, Enbridge will restore the slopes to pre-construction contours unless that slope is determined to be unstable. Bank restoration will attempt to transition the disturbed areas into the natural stream bank with the intent to stabilize the bank and create a blended, natural appearance.

Berms or other sediment filter devices will be installed at the base of sloped approaches to streams greater than five percent and the outlet of the berm will be directed away from the stream into a well vegetated area (see Exhibit 1.4). Temporary sediment control devices will remain in place until the area has stabilized and adequate revegetation has occurred.

#### 7.3.2.1 Vegetative Bank Restoration

Typically, waterbody banks will be restored as near as practicable to preconstruction contours after backfilling is complete and will be seeded with an approved seed mix, and covered with an erosion control blanket. Erosion controls, (e.g. erosion control blankets, silt fences, etc.) will be installed as necessary based on site-specific conditions.

#### 7.3.2.3 Rock Riprap Restoration

The stability of the soil during bank restoration along with the velocity and direction of the stream flow will factor into the need for riprap. Rock riprap will be used only where Enbridge deems that site-specific conditions require, and as approved by the regulating agency, or where required by state permits or approvals. Geo-textile fabric and rock riprap will be placed according to site and permit conditions.

#### Bridge Removal

Equipment bridges will be removed during final cleanup or, if access is needed, after final cleanup and permanent seeding. Restoration of the bridge area will be completed upon bridge removal. Bridges installed for winter construction (if required) will be removed before spring break up.

### 7.3.3 Swales

Swales across the right-of-way will be restored during cleanup to original contours as near as practicable. Swales will be seeded and mulched with straw for the width of the right-of-way. Erosion control blankets (e.g., jute) will be used as needed on a site-specific basis.

### 7.3.4 Drainage Ditches and Intermittent Streams

Drainage ditches and intermittent streams will be permanently restored to as near preconstruction conditions as possible and stabilized with erosion control blanket, permanent seeding, or other appropriate measures.

## 7.4 SOIL COMPACTION TREATMENT

Cultivated fields and any other severely compacted or rutted areas will be tilled with a deep tillage device or chisel plowed to loosen compacted soils. The EI(s) will determine the presence of compaction by comparing on and off right-of-way penetrometer readings. If subsequent construction and cleanup activities result in further compaction, additional measures will be undertaken to reduce soil compaction.

## 7.5 STONE REMOVAL

The contractor will remove excess stones larger than four inches in diameter from the upper 12 inches of soil or as specified in permit conditions or landowner agreements. Stone removal efforts will continue until the size and density of stones on the right-of-way are similar to undisturbed areas adjacent to the right-of-way. Excess rock will be piled in upland areas where landowner permission has been obtained, or will be hauled off-site for disposal.

## 7.6 OFF-ROAD VEHICLE BARRIERS AND FENCES

Off-road vehicle control measures will be installed as requested by Landowners and documented in the Line List. The contractor will replace or repair all fences and gates removed or damaged during construction or restoration activities.

## 7.7 REVEGETATION

General guidance regarding revegetation efforts is provided in this section. More detailed information regarding revegetation can be found in Enbridge's Revegetation and Restoration Plan.

Permanent revegetation will involve preparing the seedbed and seeding disturbed, non-agricultural areas. The right-of-way will be seeded as soon as possible after backfilling, weather and soil conditions permitting. With the exception of wetland areas, fertilizer and pH modifying agents (e.g., lime) will be applied as specified by Enbridge, in consultation with appropriate state and federal agencies and landowners.

The following steps will be taken to establish permanent vegetation in those portions of the site where the landowner does not plan to plant a crop during the next growing season.

- Seed will be purchased in accordance with Pure Live Seed (PLS) specifications for the seed mix based on the calculation formula provided in Enbridge's Revegetation and Restoration Plan.

- Seed will be used within 12 months of testing.

Legume seed will be treated with an inoculant specific to the species. When hydroseeding, four times the manufacturer's recommended rate of inoculant will be used. Inoculated seed will not be held in a slurry with fertilizer for more than one hour.

A seed drill equipped with a culti-packer is preferred for applying seed, but broadcast or hydroseeding methods may be used at double the recommended seeding rate. When broadcast seeding, the seedbed will be firmed with a culti-packer or roller after seeding.

Specific seed mixes, application rates, and seeding dates will be specified by Enbridge, and will take into account recommendations of appropriate state and federal agencies and landowner requests, as appropriate.

Mulch will not be applied to cropland unless specifically requested by the landowner. In other areas, mulch will be applied according to the following specifications:

- After seeding, slopes greater than five percent or dry, sandy areas will be mulched with two tons per acre of straw or hay or as specified by Enbridge.

- All areas of dormant seeding must be mulched with two tons per acre of hay or straw or as specified by Enbridge.

Mulch will be anchored after placement to minimize loss by wind and water. If soil conditions allow, a mulch anchoring tool or farm disc set in the straight position will be used to crimp the mulch to a depth of two to three inches. Liquid tackifiers may be used with advance written approval from Enbridge.

Where conditions allow (e.g., unsaturated and unponded areas and wetland/upland boundaries), wetlands will be revegetated with the mix specified in the Revegetation and Restoration Plan to foster natural vegetative growth. The natural revegetation process will be encouraged by the seeds and rhizomes in the topsoil spread back over the right-of-way after pipe installation.

Permanent revegetation at stream crossings will be restored using the methods described in Section 7.3, and will also take into account recommendations of appropriate regulatory agencies. Temporary fencing may be required to keep livestock off streambanks and other sensitive areas until re-establishment of vegetation.

## 7.8 ROAD REPAIR

The contractor will repair private roads and lanes damaged when moving equipment or obtaining access to the right-of-way.

## 7.9 REPAIR OF DAMAGED CONSERVATION PRACTICES

All soil conservation practices (such as terraces, grassed waterways, etc.) that are damaged by the pipeline construction will be restored to preconstruction conditions to the extent practicable.

## 7.10 LAND LEVELING FOLLOWING CONSTRUCTION

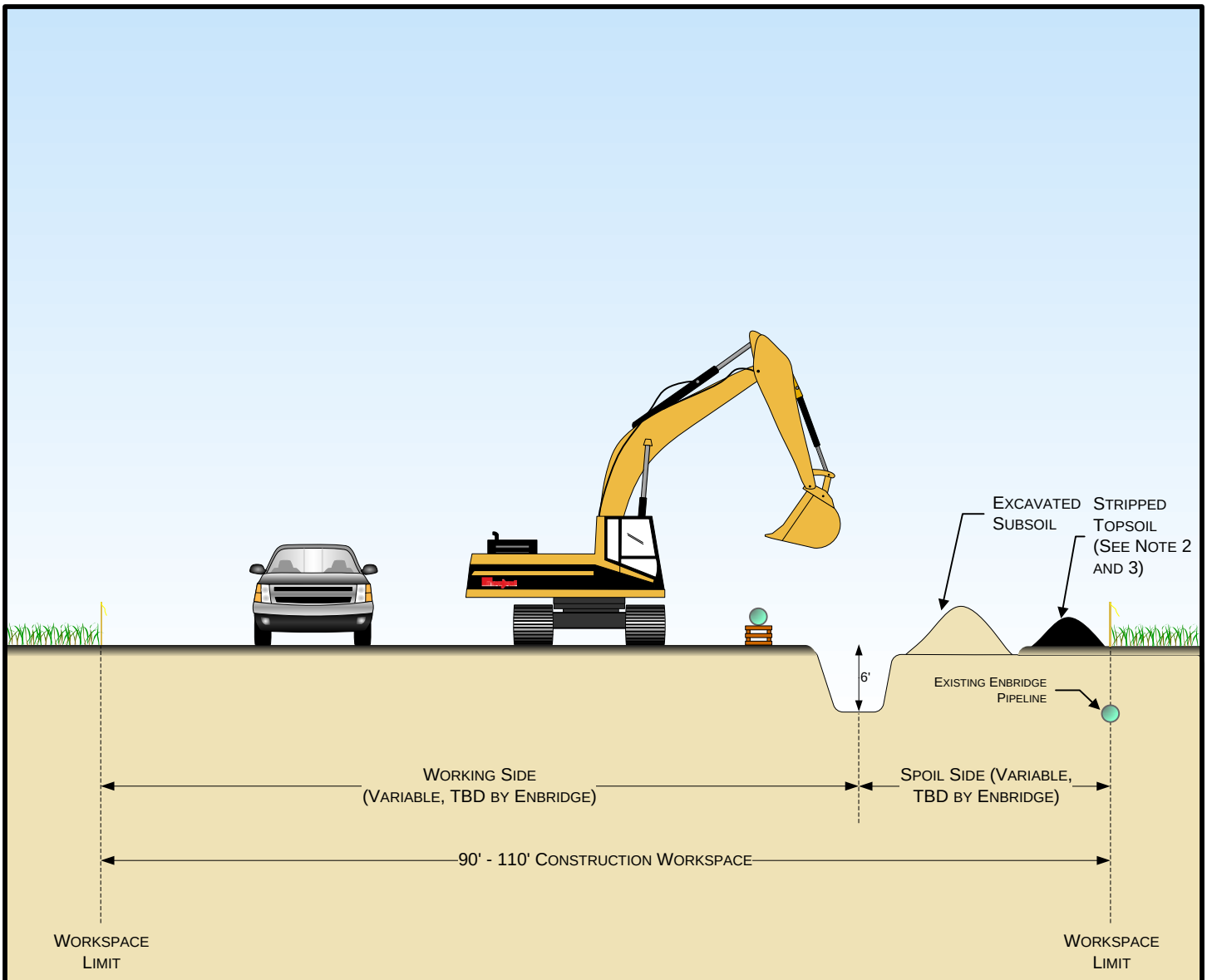
Following the completion of the pipeline, the right-of-way will be restored to its pre-construction elevation and contour as practical. Should uneven settling or documented surface drainage problems occur following the completion of pipeline construction, the contractor will take appropriate steps to remedy the issue.

# 8.0 WINTER CONSTRUCTION

No winter construction is planned or anticipated for the Enbridge North Dakota Expansion Projects. If winter construction appears likely, Enbridge will develop plans that address changed circumstances affecting relevant portions of this plan. Enbridge's winter construction plan would address clearing, grading, erosion control, topsoil separation and storage, backfilling, cleanup and restoration during frozen ground conditions. The winter construction plans will be submitted to appropriate agencies for review and comment.

# Environmental Mitigation Plan

## Exhibits



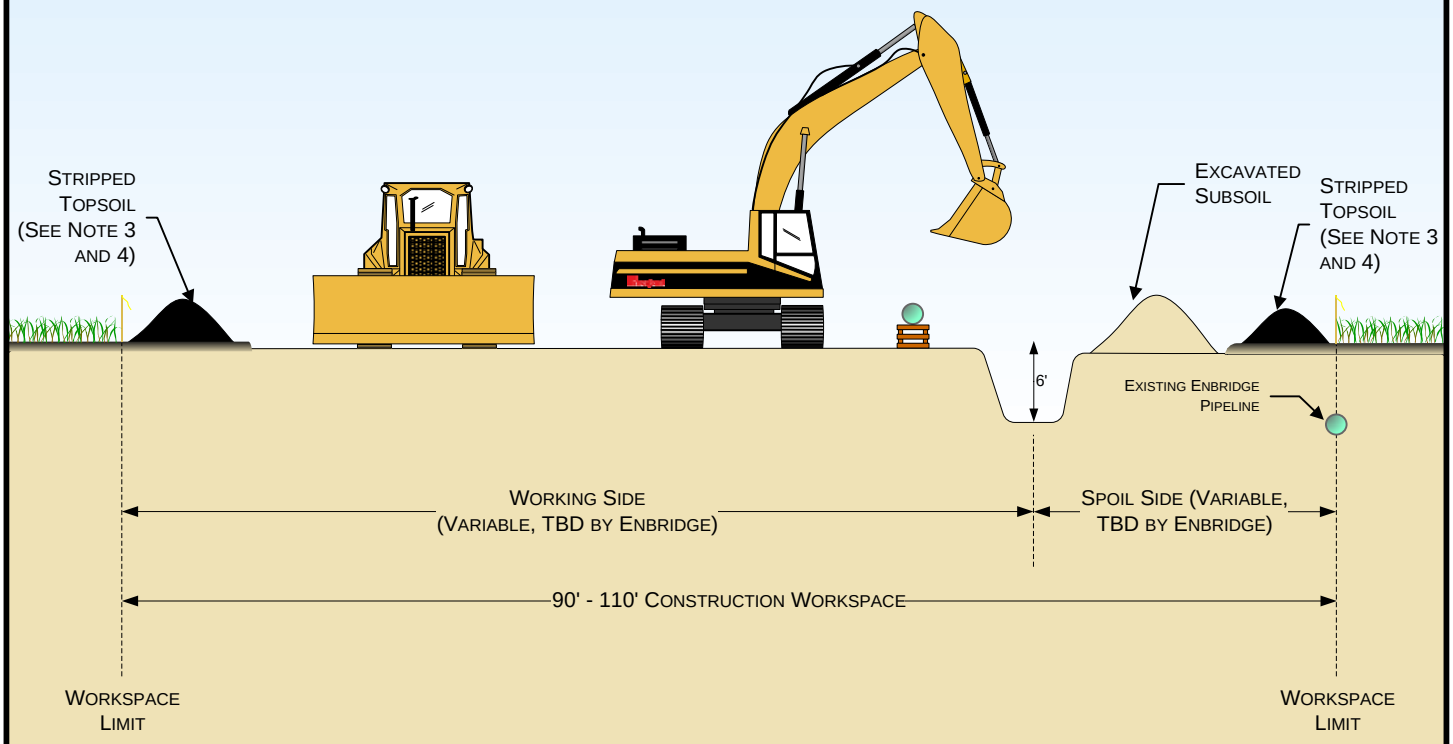

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 90 – 110 FEET WIDE. THE PERMANENT RIGHT-OF-WAY WILL BE 50 FEET WIDE CENTERED ON THE PIPE. AS REQUIRED, ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDE SLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES.
2. TOPSOIL IS TO BE STRIPPED OVER THE DITCH AND SPOIL SIDE.
3. STOCKPILE TOPSOIL SEPARATELY FROM DITCH SPOIL.

ENBRIDGE

# Exhibit 1.1
## Typical Workspace Configuration
### Ditch and Spoil Side Topsoiling

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010



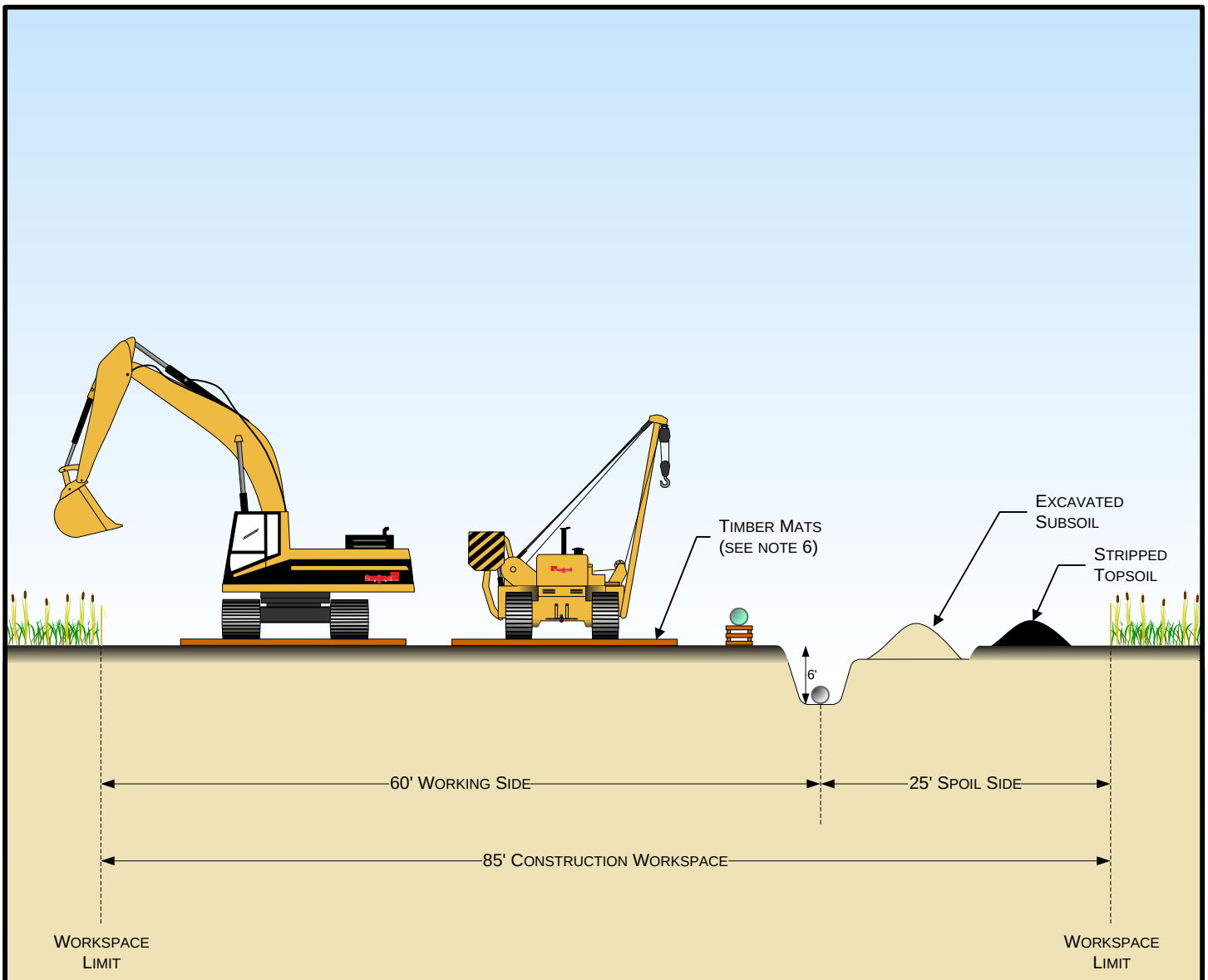

NOTES:

1. CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 90 – 110 FEET WIDE. THE PERMANENT RIGHT-OF-WAY WILL BE 50 FEET WIDE CENTERED ON THE PIPE. AS REQUIRED, ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL, RIVER CROSSINGS, SIDE SLOPES, WHERE FULL RIGHT-OF-WAY TOPSOIL STRIPPING IS CONDUCTED, AND OTHER SPECIAL CIRCUMSTANCES.
2. TOPSOIL IS TO BE STRIPPED OVER THE DITCH AND SPOIL SIDE EXCEPT AS NOTED BELOW.
3. TOPSOIL IS TO BE STRIPPED ACROSS THE ENTIRE CONSTRUCTION RIGHT-OF-WAY IN NOXIOUS WEED AREAS, AGRICULTURAL AREAS, AT LANDOWNERS REQUEST AND/OR AS REQUIRED BY THE ENVIRONMENTAL INSPECTOR. PLACE TOPSOIL ON THE OUTSIDE EDGE OF THE CONSTRUCTION RIGHT-OF-WAY. SNOW MAY ALSO BE PLACED IN THIS AREA.
4. STOCKPILE TOPSOIL SEPARATELY FROM DITCH SPOIL.

ENBRIDGE

# Exhibit 1.2
## Typical Workspace Configuration
### Full Right-of-Way Topsoiling

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010




NOTES:

1. FLAG WETLAND BOUNDARIES PRIOR TO CLEARING.
2. WETLAND CONSTRUCTION RIGHT-OF-WAY WILL BE LIMITED TO 85 FEET WIDE ACROSS ANY WETLANDS UNLESS INCREASED OR DECREASED BY SPECIFIC CONSTRUCTION REQUIREMENTS. THE PERMANENT RIGHT-OF-WAY WILL BE 50 FEET WIDE CENTERED ON THE PIPE.
3. EXTRA WORKSPACE AREAS WILL NOT BE LOCATED WITHIN 50 FEET OF THE WETLAND BOUNDARY UNLESS APPROVED BY THE ENVIRONMENTAL INSPECTOR.
4. TOPSOIL STRIPPING IS NOT REQUIRED IN SATURATED WETLAND SOILS.
5. STOCKPILE TOPSOIL ON THE OUTSIDE OF THE CONSTRUCTION RIGHT-OF-WAY IF GRADING OF ENTIRE RIGHT-OF-WAY IS REQUIRED OR REQUIRED BY THE ENVIRONMENTAL INSPECTOR. SNOW MAY ALSO BE PLACED IN THIS AREA.
6. INSTALL TIMBER MATS AS NECESSARY TO PREVENT RUTTING.
7. NO REFUELING OR EQUIPMENT STORAGE IS ALLOWED WITHIN 100 FEET OF WETLAND BOUNDARIES.

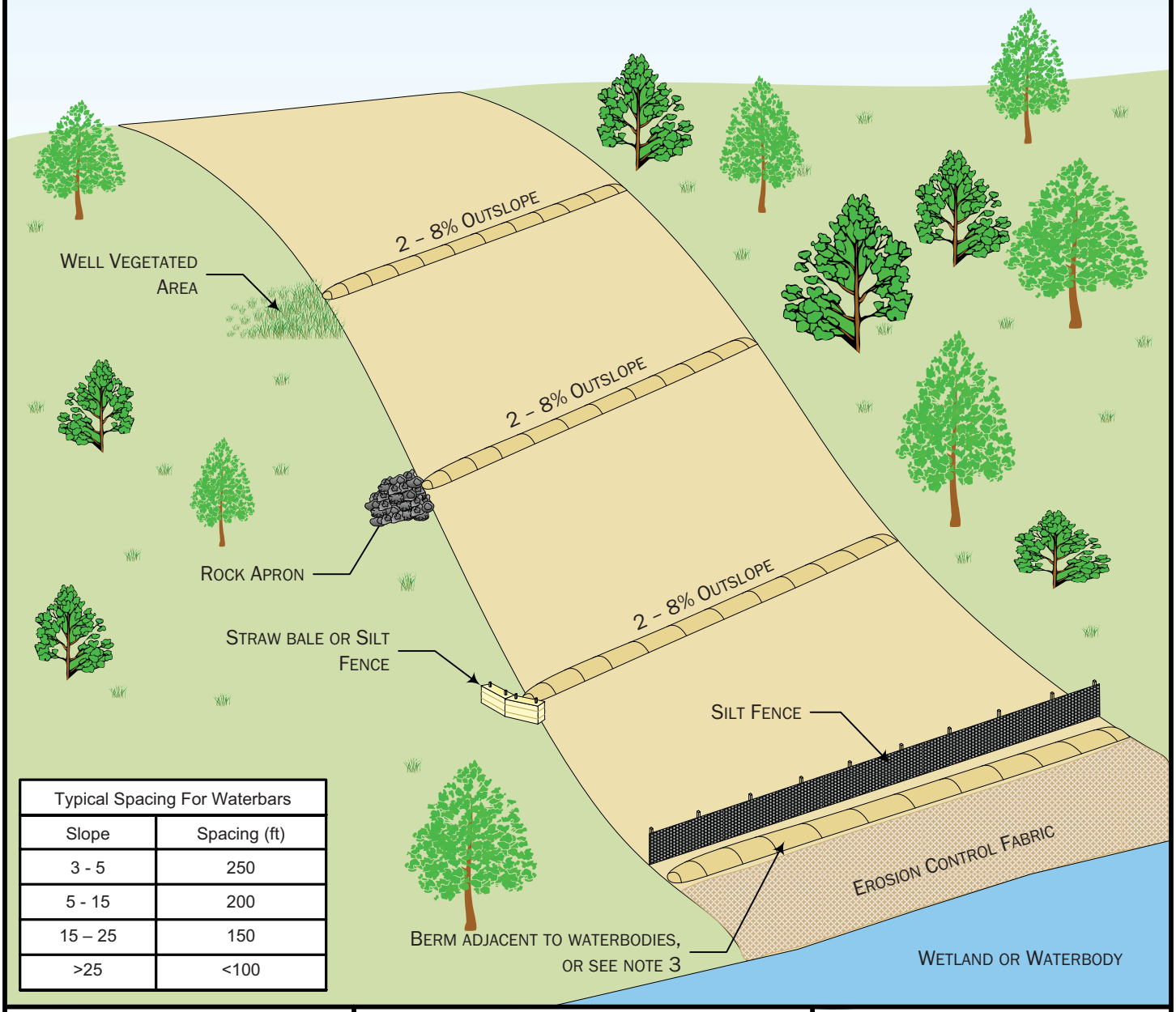
ENBRIDGE™

# Exhibit 1.3
## Typical Workspace Configuration
### Trench Line Only Topsoiling

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010

NOTES:

1. WATERBARS AND BERMS ARE PERMANENT EROSION CONTROL STRUCTURES.
2. STRAW BALES OR SILT FENCE SHALL BE REMOVED AFTER VEGETATION IS ESTABLISHED.
3. LOWEST BERM MAY BE OMITTED IF SILT FENCE OR STRAW BALES ARE INSTALLED AT THAT LOCATION, AS APPROVED BY THE ENVIRONMENTAL INSPECTOR.

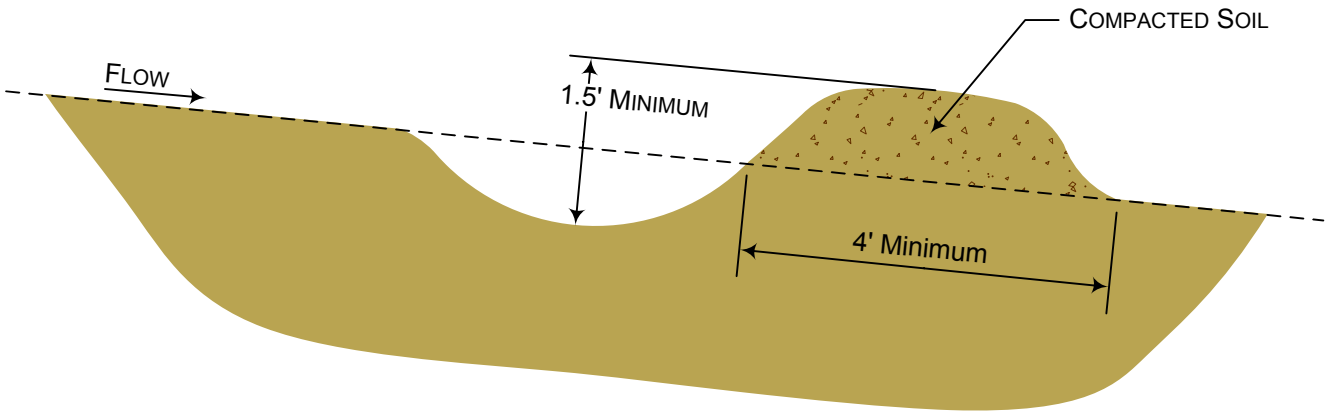



| Typical Spacing For Waterbars | |
|---|---|
| Slope | Spacing (ft) |
| 3 - 5 | 250 |
| 5 - 15 | 200 |
| 15 – 25 | 150 |
| >25 | <100 |

ENBRIDGE

Exhibit 1.4
Slope Breaker Installation

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010



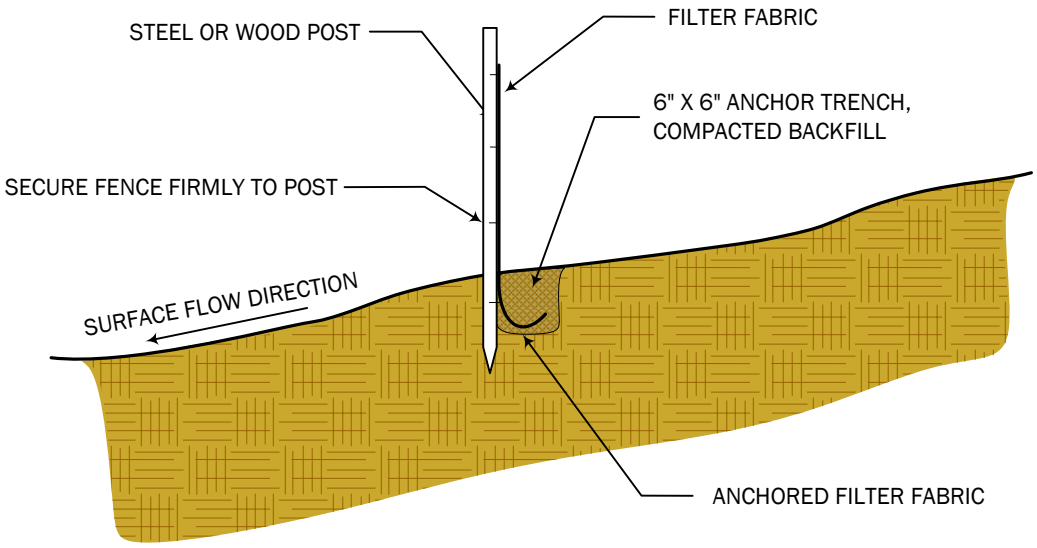

NOTES:

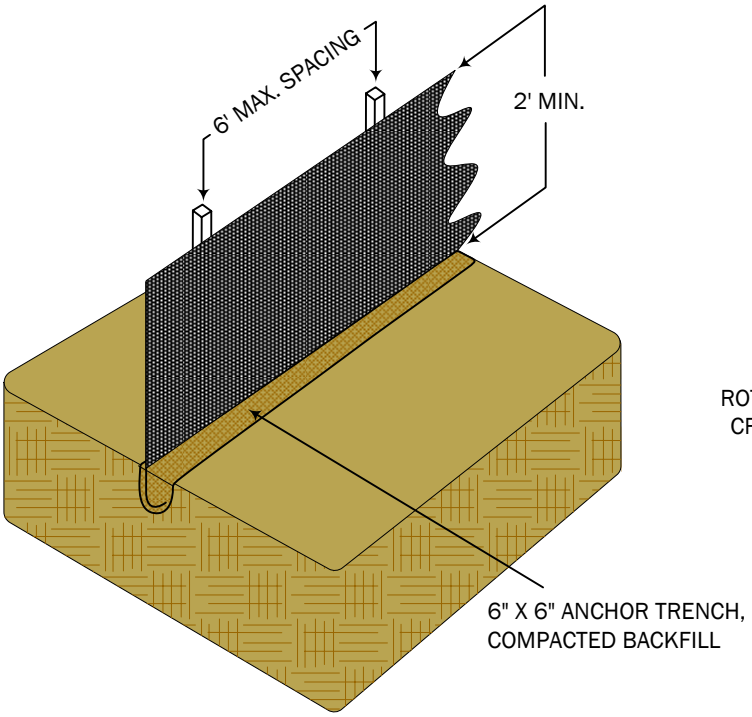
1. WATERBARS OR BERMS SHOULD BE CONSTRUCTED WITH 2 TO 8 PERCENT OUTSLOPES.
2. WATERBARS OR BERMS SHALL BE DIRECTED TO WELL VEGETATED AREAS, ROCK APRONS, OR SILT FENCE OR STRAW BALE STRUCTURES.

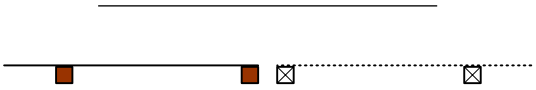
ENBRIDGE

Exhibit 1.5
Typical Waterbar Installation
(Profile View)

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
4/20/2010

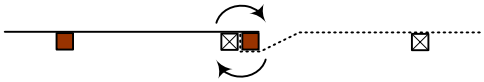


PLACE THE END POST OF THE SECOND FENCE INSIDE THE END POST OF THE FIRST FENCE.

ROTATE BOTH FENCE POST 180 DEGREES CLOCKWISE TO CREATE A TIGHT SEAL BETWEEN THE FABRIC MATERIAL.

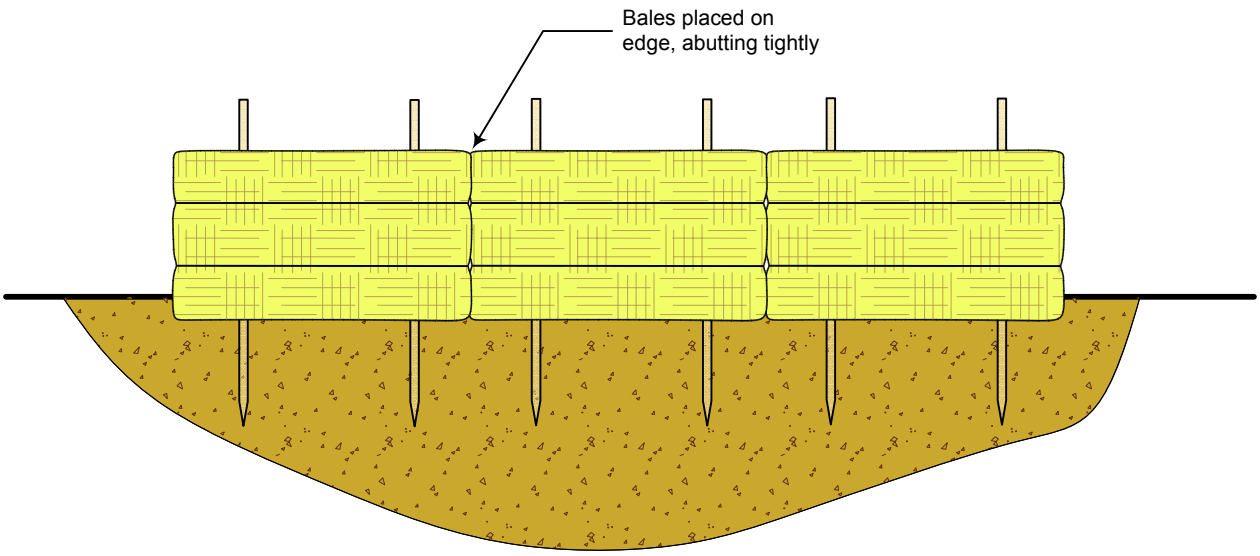


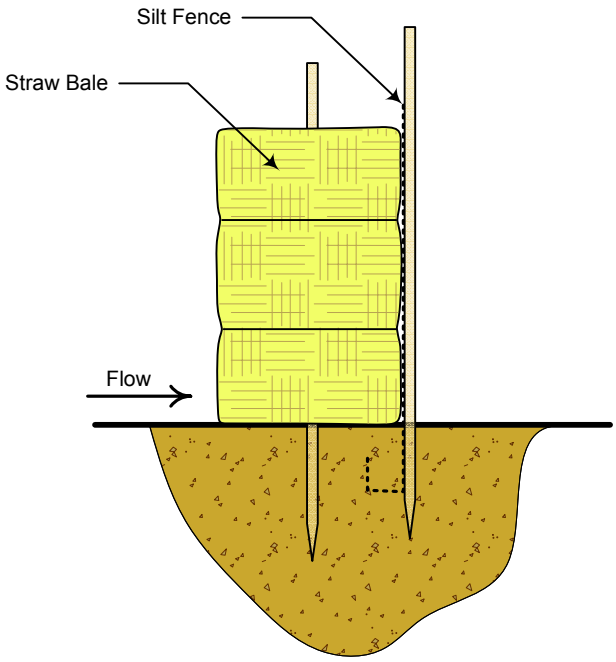
DRIVE BOTH POSTS AT LEAST 10" INTO GROUND AND BURY FLAP.

NOTES:

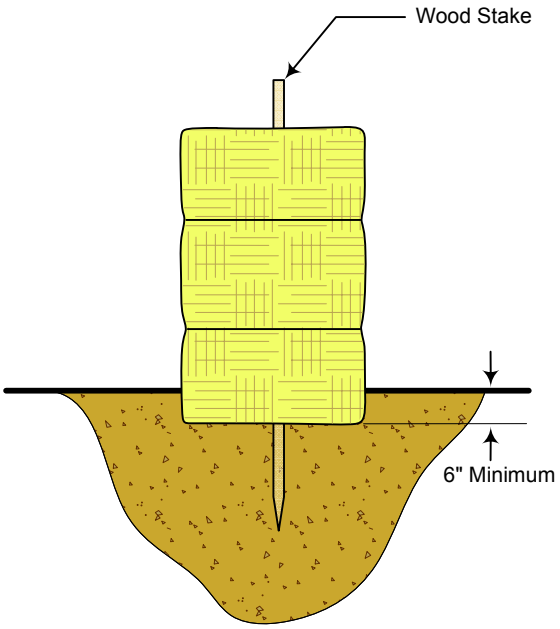
1. SILT FENCE FABRIC SHOULD CONFORM TO THE AASHTO M288 96 SILT FENCE SPECIFICATION.
2. THE POSTS USED TO SUPPORT THE SILT FENCE FABRIC SHOULD BE A HARDWOOD MATERIAL WITH THE FOLLOWING MINIMUM DIMENSIONS: 50 MILLIMETERS (2 INCHES) SQUARE (NOMINAL) BY 1.2 METERS (4 FEET) LONG. FOR STRUCTURAL STABILITY, METAL POSTS SHOULD BE USED IN AREAS THAT WILL POND WATER.
3. PERPENDICULAR TO THE DITCH FLOWLINE, EXCAVATE A TRENCH THAT IS AT LEAST 150 MILLIMETERS (6 INCHES) DEEP BY 100 MILLIMETERS (4 INCHES) WIDE. EXTEND THE TRENCH IN A STRAIGHT LINE ALONG THE ENTIRE LENGTH OF THE PROPOSED DITCH CHECK. PLACE THE SOIL ON THE UPSTREAM SIDE OF THE TRENCH FOR LATER USE. ANOTHER COMMON AND LESS LABOR INTENSIVE INSTALLATION METHOD USES A TRENCHER OR CHISEL PLOW TO INSTALL THE SILT FENCE. THE SILT FENCE WILL LAST LONGER AND IS LESS LIKELY TO BLOW OUT UNDERNEATH.
4. ROLL OUT A CONTINUOUS LENGTH OF SILT FENCE FABRIC ON THE DOWNSTREAM SIDE OF THE TRENCH. PLACE THE EDGE OF THE FABRIC IN THE TRENCH STARTING AT THE TOP UPSTREAM EDGE OF THE TRENCH. LINE ALL THREE SIDES OF THE TRENCH WITH THE FABRIC. BACKFILL OVER THE FABRIC IN THE TRENCH WITH THE EXCAVATED SOIL, AND COMPACT. AFTER FILLING THE TRENCH, APPROXIMATELY 600 MILLIMETERS TO 900 MILLIMETERS (24 INCHES TO 36 INCHES) OF SILT FENCE FABRIC SHOULD REMAIN EXPOSED.

| | | |
|---|---|---|
| ENBRIDGE | Exhibit 1.6<br>Typical Silt Fence Installation | Environmental Mitigation Plan<br>North Dakota Expansion Projects<br>Drawn by: merjent<br>10/9/2010 |




STRAW/HAY BALES & SILT FENCE




STRAW/HAY BALES ONLY

NOTES:

1. BALE DITCH CHECKS MAY BE CONSTRUCTED OF WHEAT STRAW, OAT STRAW, PRAIRIE HAY OR BROMEGRASS HAY THAT IS FREE OF WEEDS DECLARED NOXIOUS BY THE NORTH DAKOTA STATE BOARD OF AGRICULTURE.
2. THE STAKES USED TO ANCHOR THE BALES SHOULD BE MADE OF A HARDWOOD MATERIAL WITH THE FOLLOWING MINIMUM DIMENSIONS: 50 MILLIMETERS (2 INCHES X2 INCHES) SQUARE (NOMINAL) BY 1.2 METERS (4.0 FEET) LONG.
3. TWINE SHOULD BE USED TO BIND BALES. THE USE OF WIRE BINDING IS PROHIBITED BECAUSE IT DOES NOT BIODEGRADE READILY.
4. PERPENDICULAR TO THE DITCH FLOWLINE, EXCAVATE A TRENCH THAT IS 150 MILLIMETERS (6 INCHES) DEEP AND A BALE'S WIDTH WIDE. EXTEND THE TRENCH IN A STRAIGHT LINE ALONG THE ENTIRE LENGTH OF THE PROPOSED DITCH CHECK. PLACE THE SOIL ON THE UPSTREAM SIDE OF THE TRENCH TO SAVE FOR LATER USE.

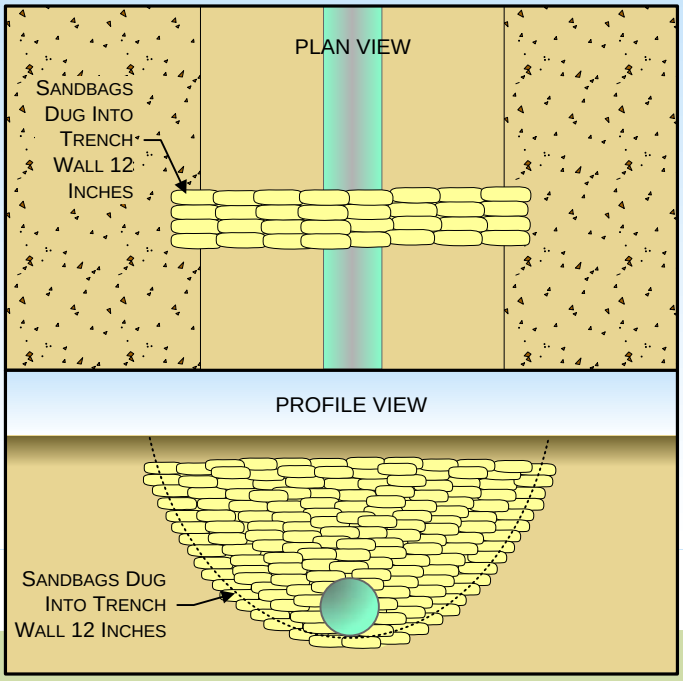
SOURCE: A GUIDE TO TEMPORARY EROSION-CONTROL MEASURES FOR CONTRACTORS, DESIGNERS, AND INSPECTORS (ND DEPARTMENT OF HEALTH – DIVISION OF WATER QUALITY, JUNE 2001)

NOTE:

At a minimum, install trench breakers at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a wetland or waterbody, or where needed.

A minimum cover of 12 inches of soil is required over the installed trench breaker.

Trench breakers must be constructed of sandbags or other approved material and must be a minimum 2 sacks wide.



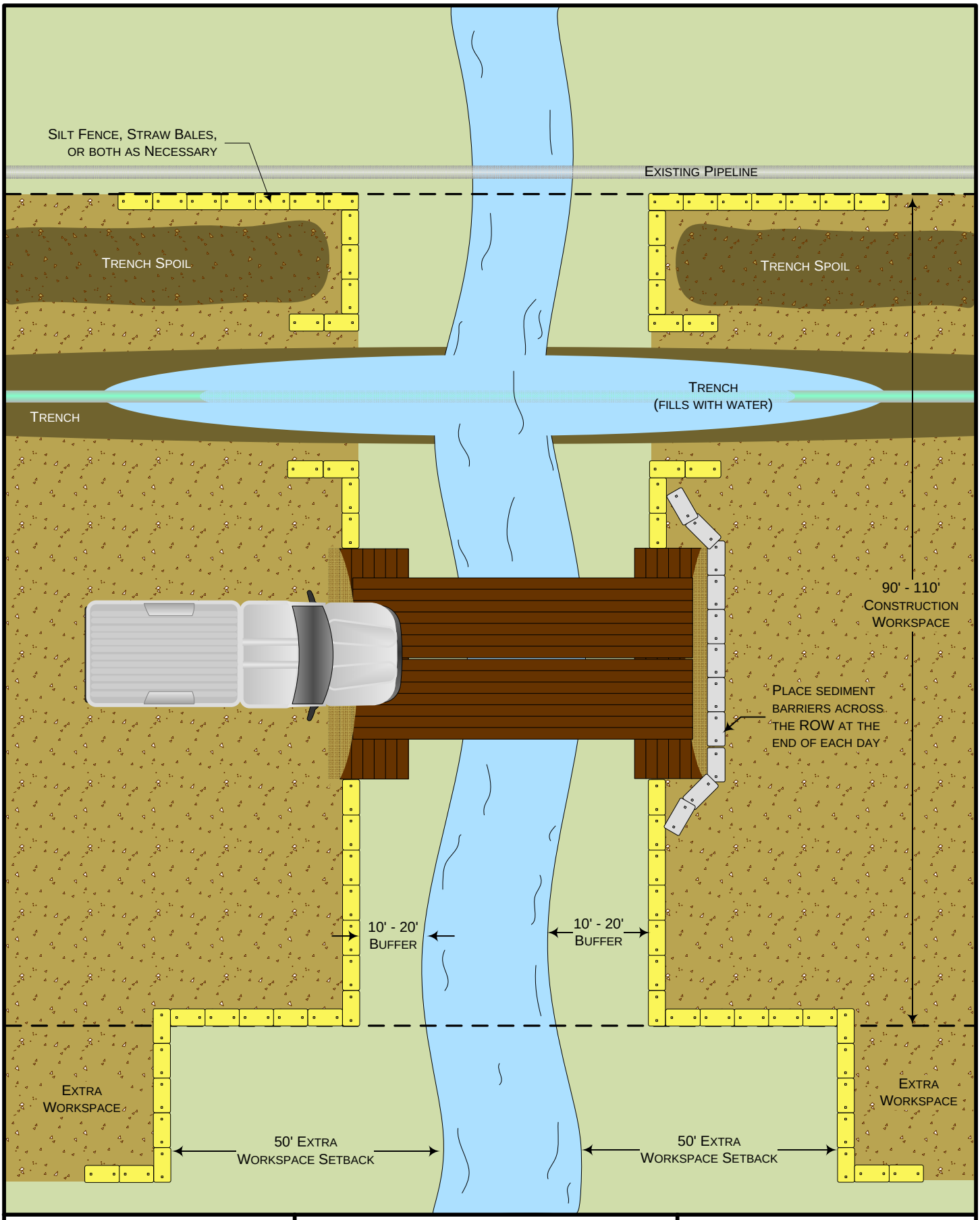

| Typical Spacing For Waterbars | |
|---|---|
| Slope | Spacing (ft) |
| 3 - 5 | 250 |
| 5 - 15 | 200 |
| 15 – 25 | 150 |
| >25 | <100 |

FOAM TRENCH BREAKER

ENBRIDGE

# Exhibit 1.8
# Typical Trench Breaker Installation

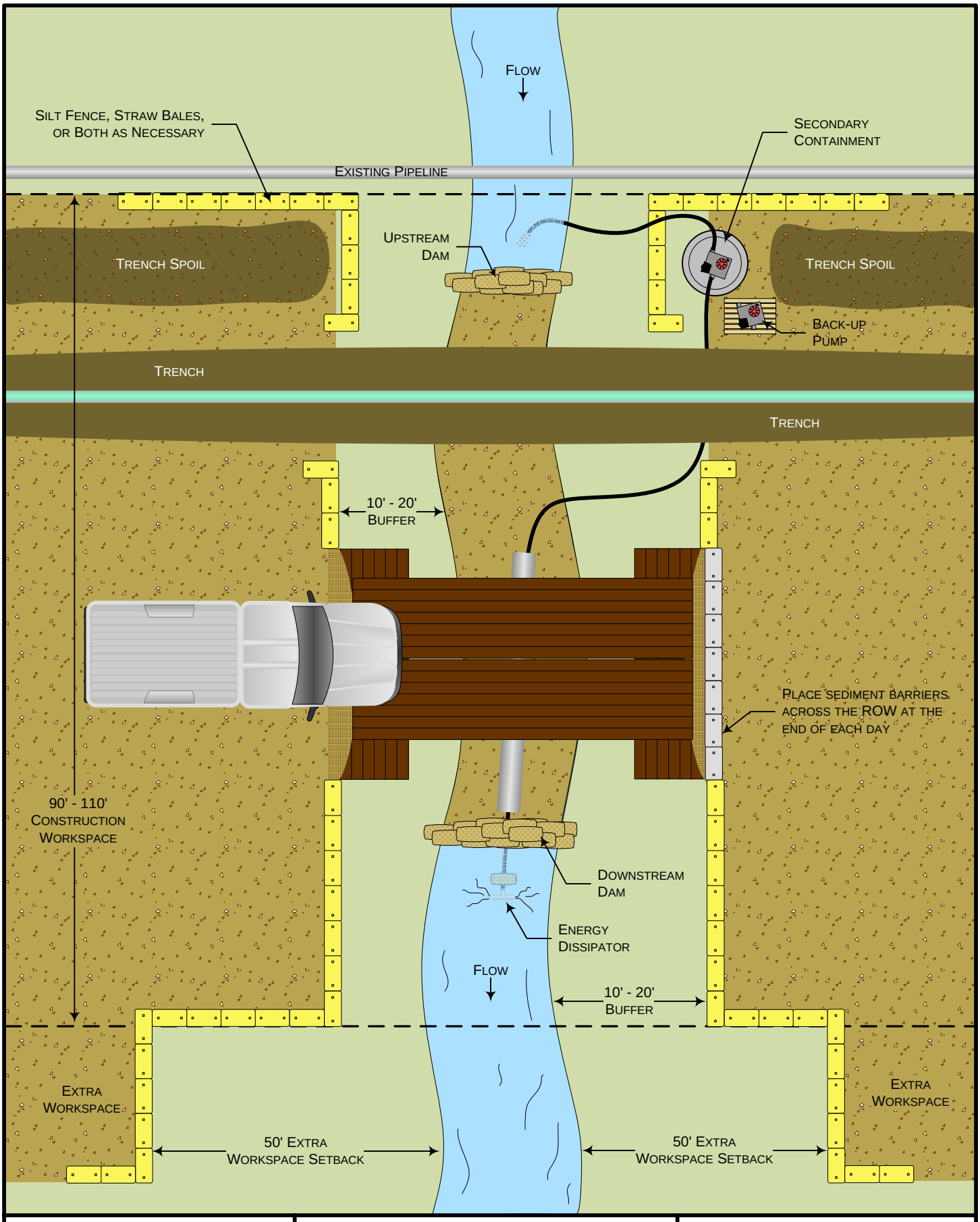
Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010




ENBRIDGE

# Exhibit 2.1
# Typical Waterbody Crossing
# Wet Trench Method

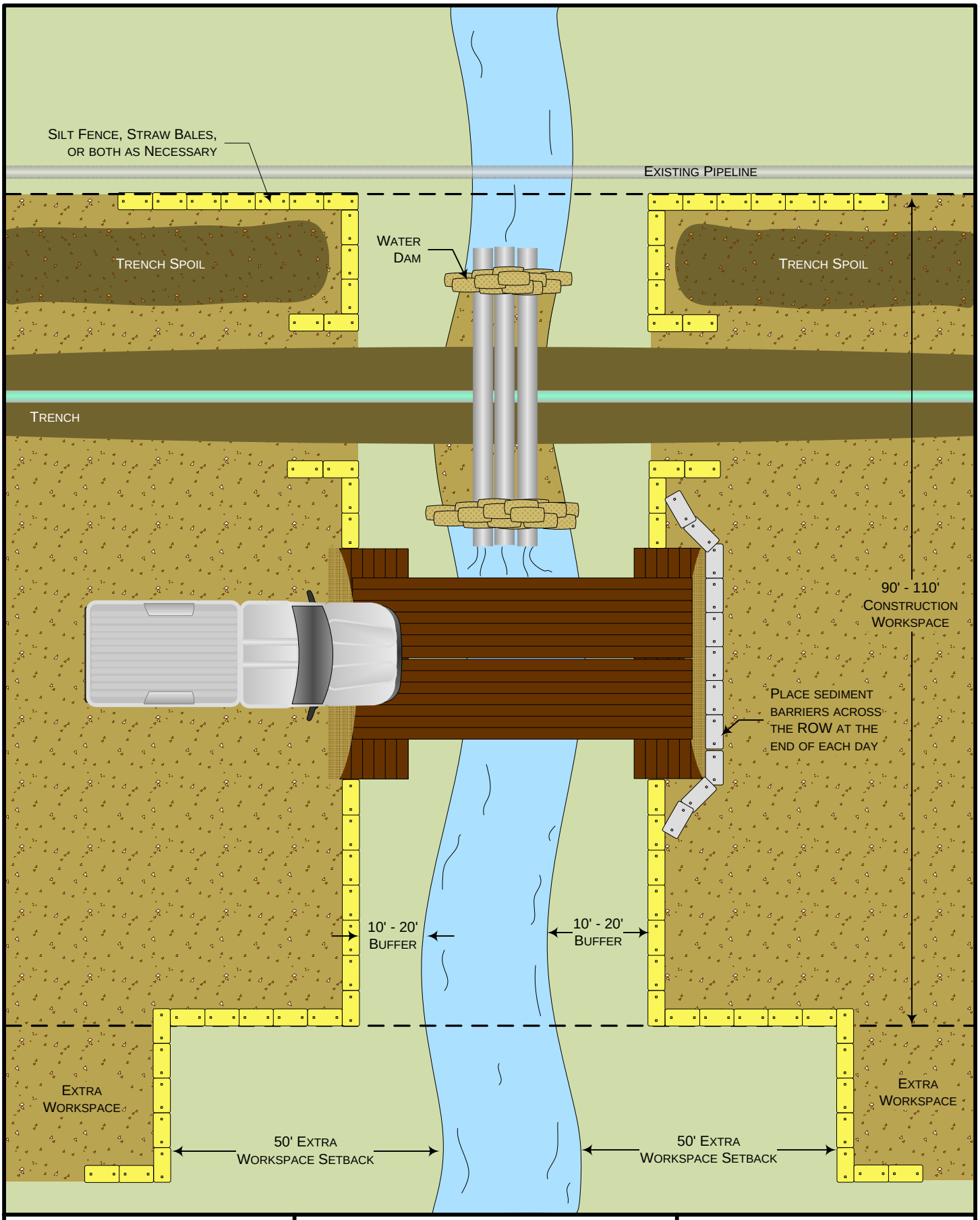
Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010




ENBRIDGE

# Exhibit 2.2
# Typical Waterbody Crossing Dam and Pump Method

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010

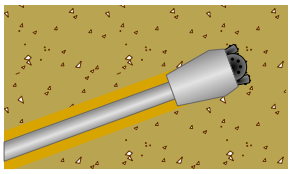


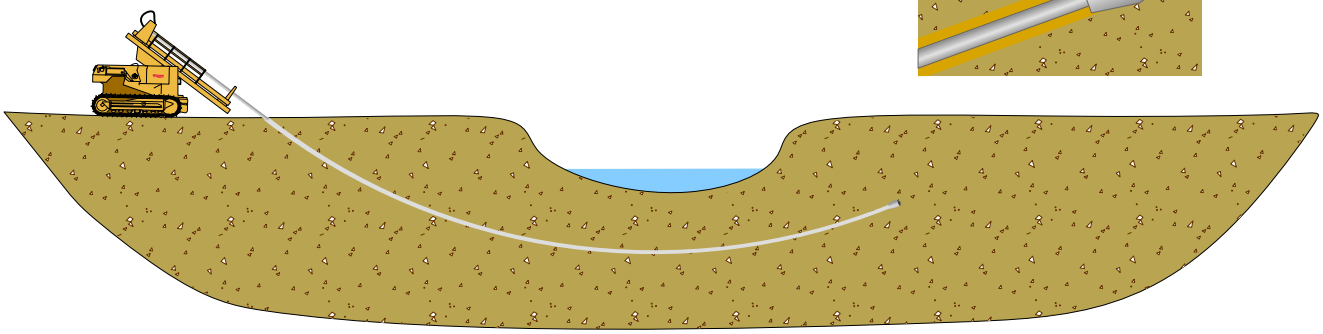

ENBRIDGE

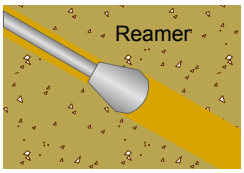
# Exhibit 2.3
# Typical Waterbody Crossing
# Flume Method

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010

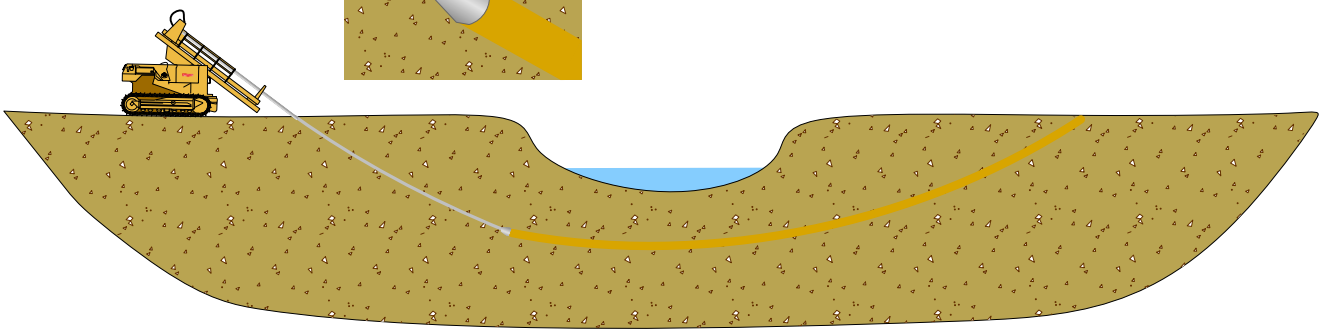
DRILING THE PILOT HOLE

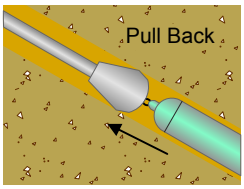




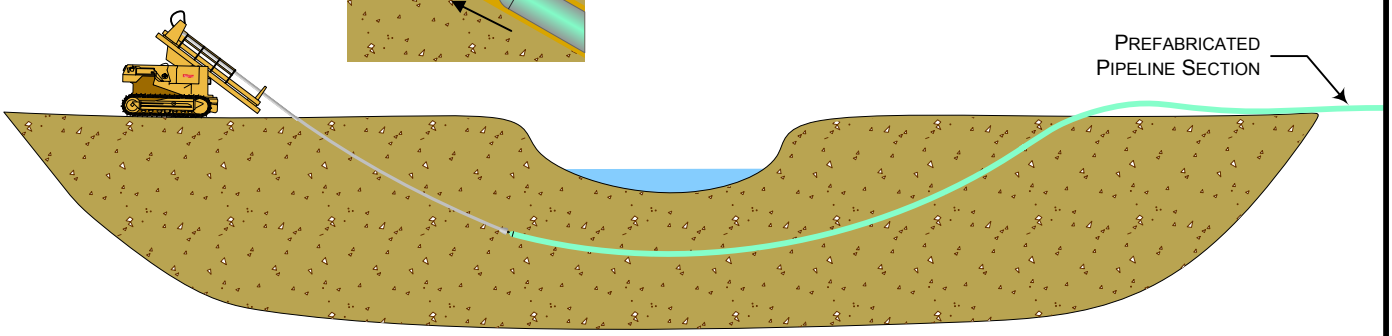



REAMING THE PILOT HOLE






PULL BACK OF THE PIPELINE STRING

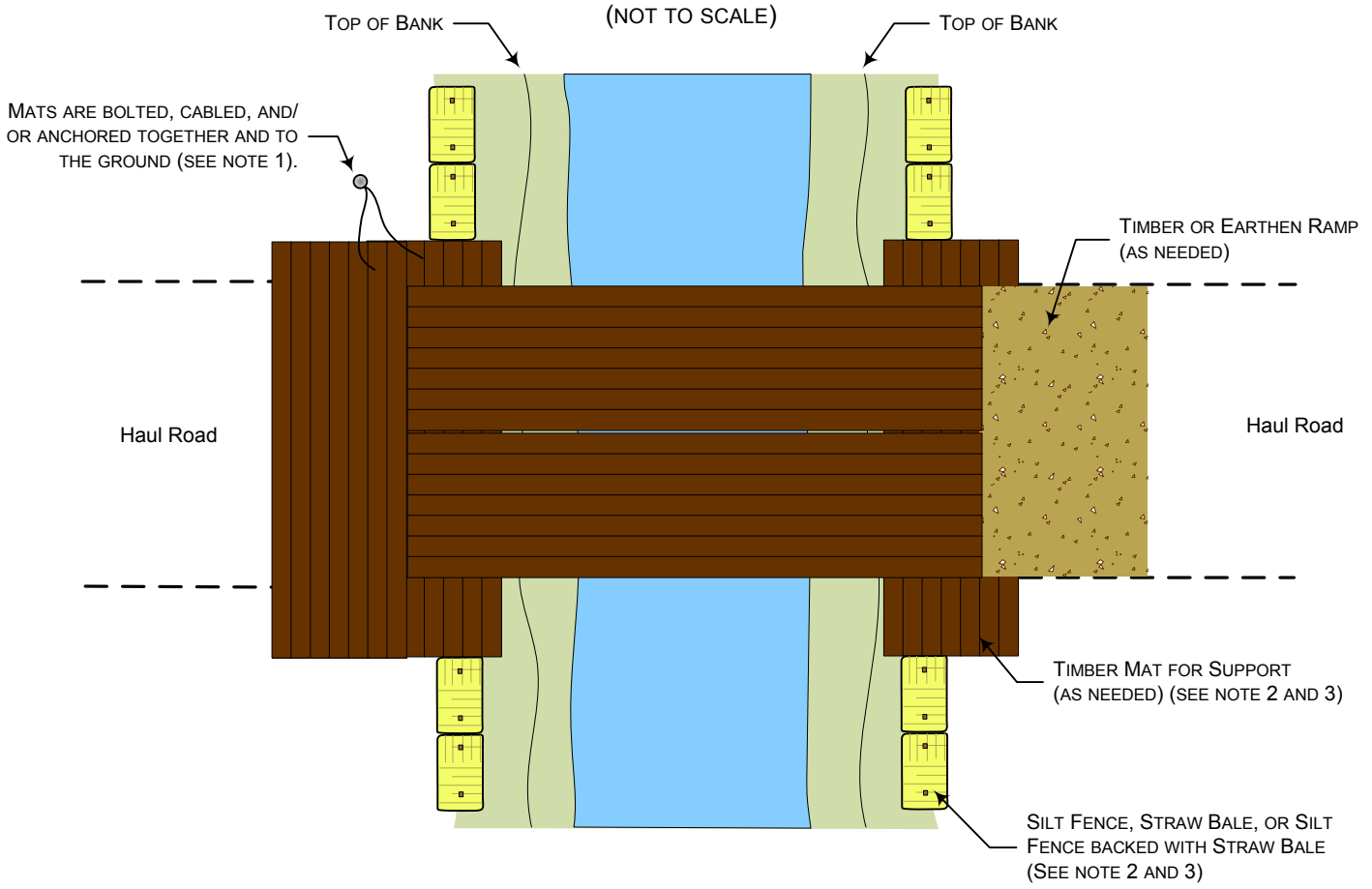



ENBRIDGE

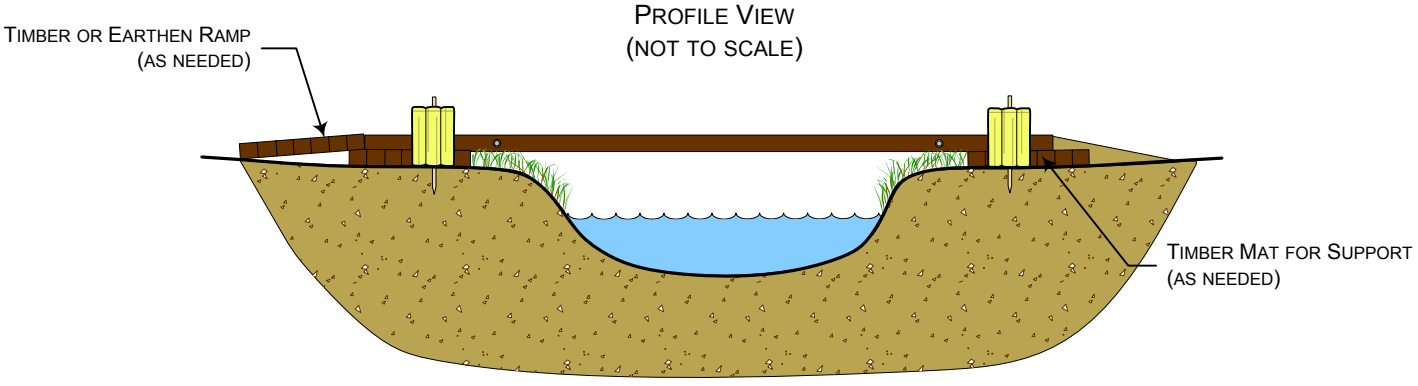
Exhibit 2.4
Typical Horizontal
Directional Drill

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
4/20/2010

PLAN VIEW
(NOT TO SCALE)



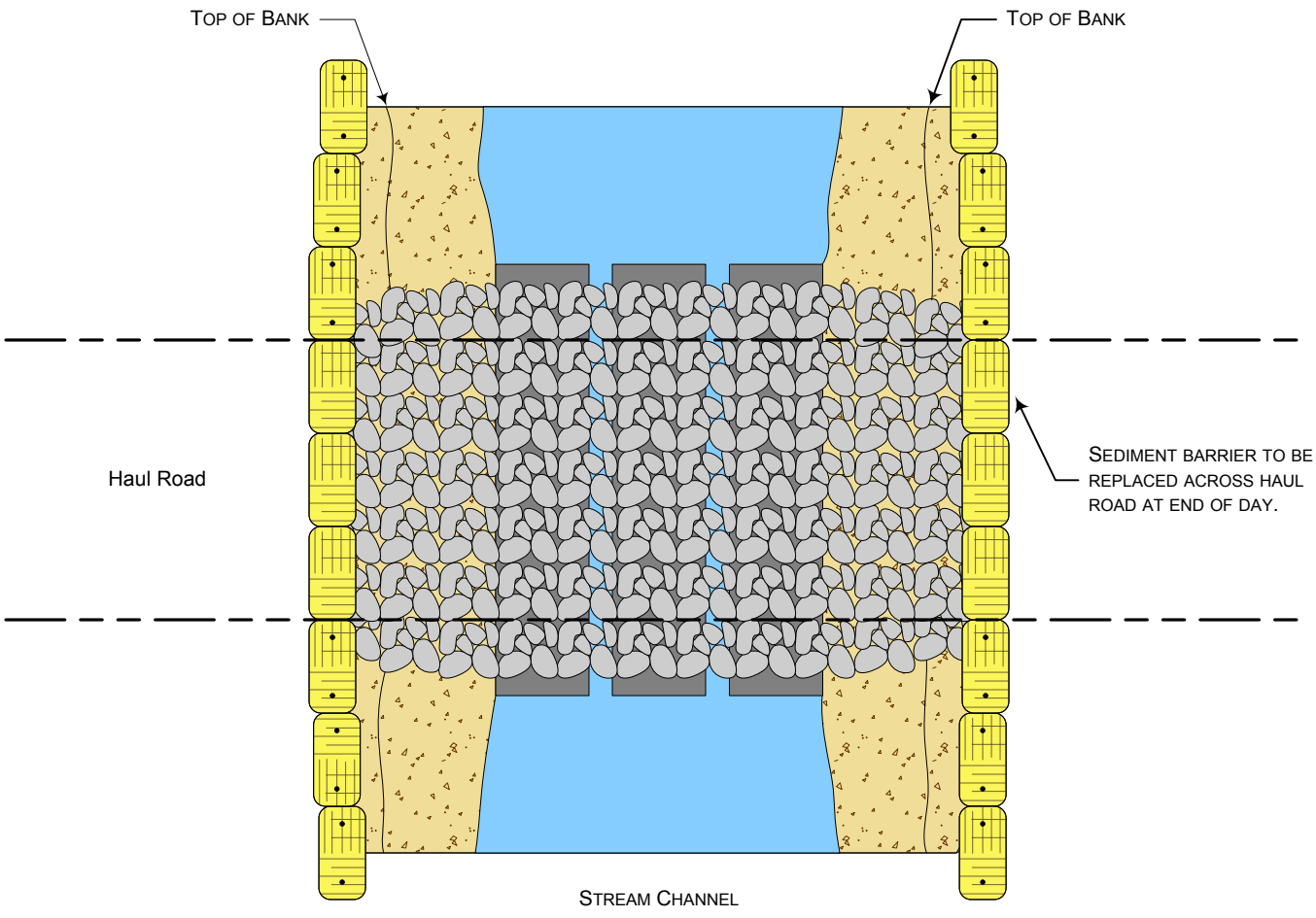

PROFILE VIEW
(NOT TO SCALE)



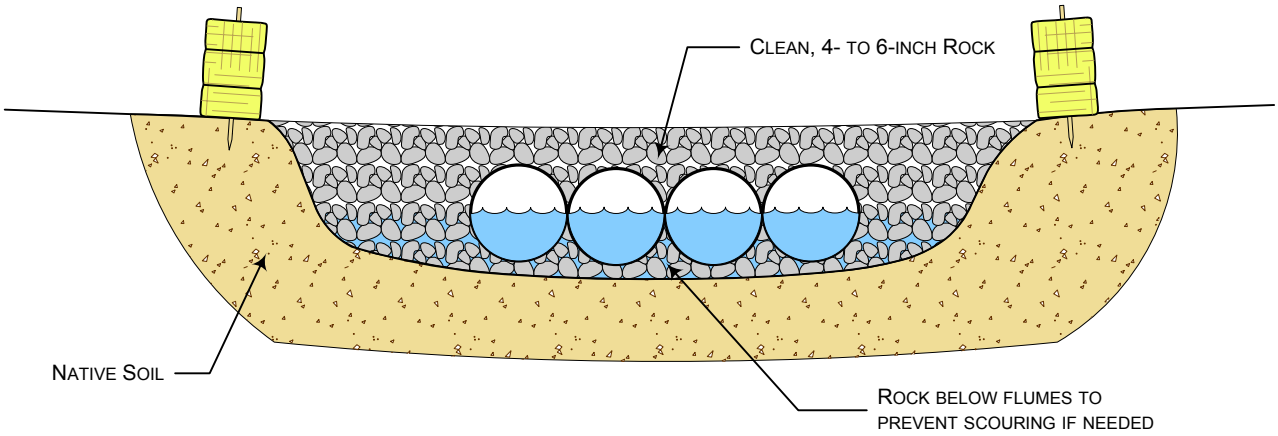

NOTES:

1. THE BRIDGE MUST BE FIRMLY ANCHORED TO PREVENT IT FROM BEING TRANSPORTED DOWNSTREAM DURING HIGH FLOW.
2. THE BRIDGE MUST SPAN FROM TOP OF BANK TO TOP OF BANK.
3. ADDITIONAL SUPPORT MUST BE ADDED ON TOP OF BANK IF INITIAL SUPPORT STARTS TO SETTLE.
4. INSPECT BRIDGE ELEVATION SO BRIDGE REMAINS SUPPORTED ABOVE HIGH BANK AND DOES NOT SINK INTO BANK.
5. INSPECT BRIDGE OPENING PERIODICALLY AND FOLLOWING RAIN EVENTS. REMOVE ANY DEBRIS RESTRICTING FLOW AND DEPOSIT IS AT AN UPLAND SITE OUTSIDE THE FLOODPLAIN.

| | | |
|---|---|---|
| ENBRIDGE | Exhibit 2.5<br>Typical Span Bridge | Environmental Mitigation Plan<br>North Dakota Expansion Projects<br>Drawn by: Merjent 4/20/2010 |



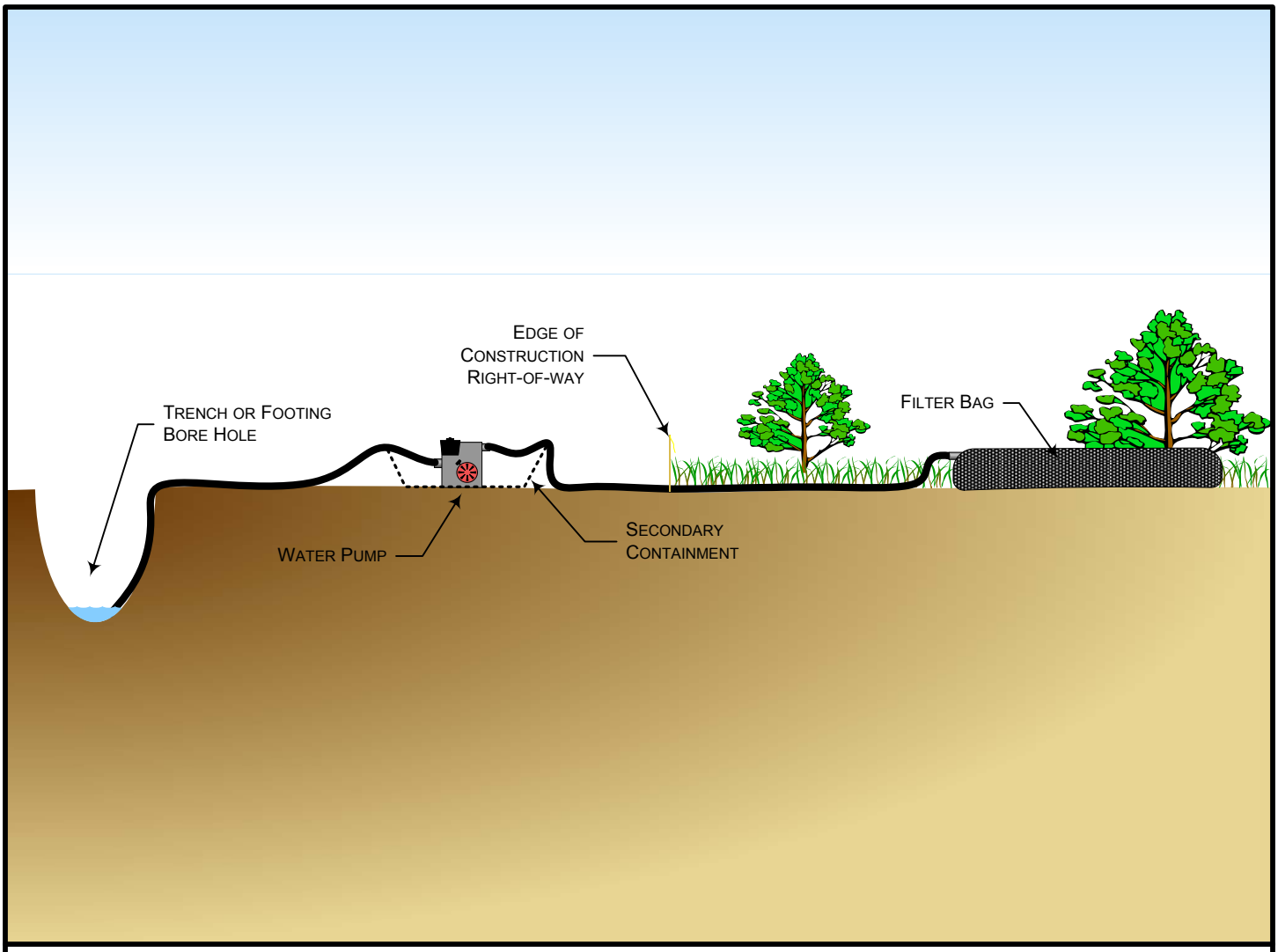

PLAN VIEW
(NOT TO SCALE)




NOTES:

1. STEEL FLUME PIPE(S) SIZED TO ALLOW FOR STREAM FLOW AND EQUIPMENT LOAD.
2. STRAW BALES SHALL BE PLACED ACROSS BRIDGE ENTRANCE EVERY NIGHT.
3. ADDITIONAL INFORMATION INCLUDED ON OTHER DRAWINGS.

| | | |
|---|---|---|
| ENBRIDGE | Exhibit 2.6<br>Typical Rock Flume Bridge | Environmental Mitigation Plan<br>North Dakota Expansion Projects<br>Drawn by: merjent<br>4/20/2010 |



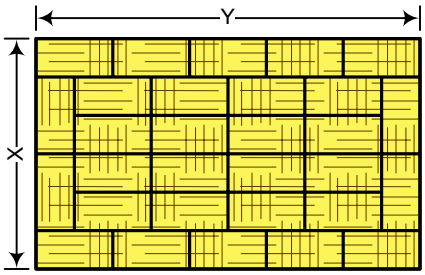
NOTES:

1. WATER PUMPS SHALL BE CONTAINED WITHIN SECONDARY CONTAINMENT DEVICES WHILE WORKING IN WETLAND AREAS.
2. WATER DISCHARGES WILL BE DIRECTED TO WELL VEGETATED UPLAND AREAS.

ENBRIDGE

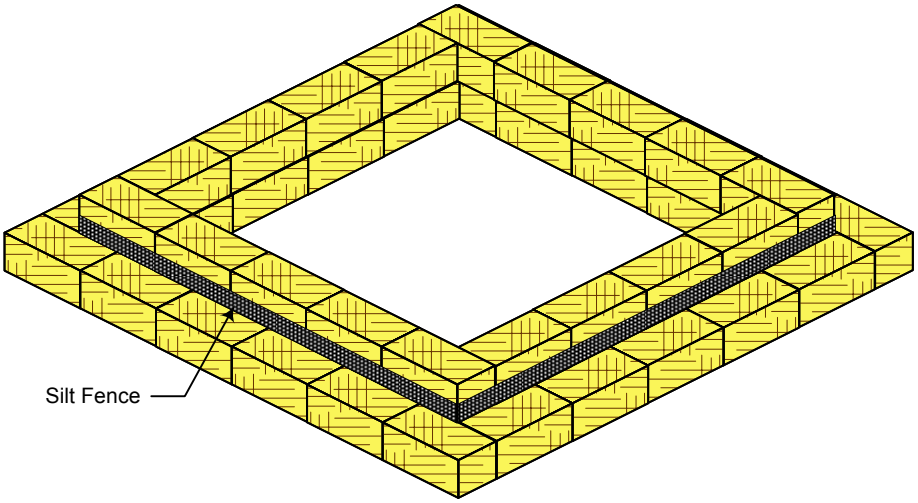
Exhibit 2.7
Typical Dewatering to Filter Bag

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
4/20/2010

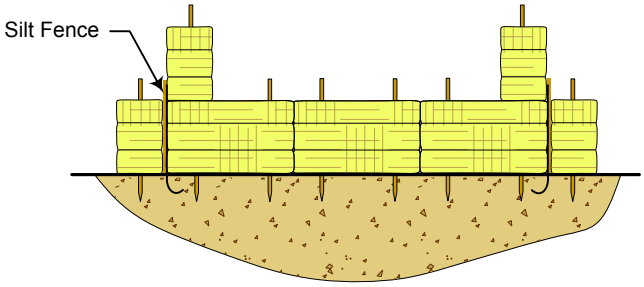



NOTES:

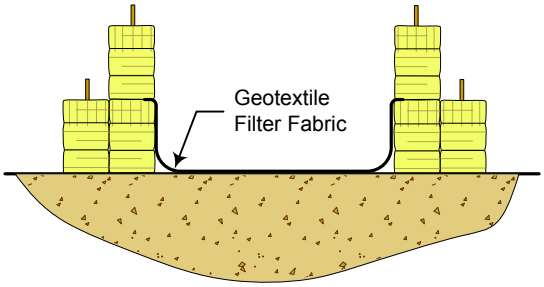
1. ARRANGE THE STRAW BALES TO THE X AND Y DIMENSIONS AS SPECIFIED BELOW.
2. IF BOTTOM OF STRUCTURE IS NOT LINED WITH STRAW BALES (OPTION 1), LINE ENTIRE STRUCTURE WITH GEOTEXTILE FILTER FABRIC.




PERSPECTIVE VIEW




OPTION 1



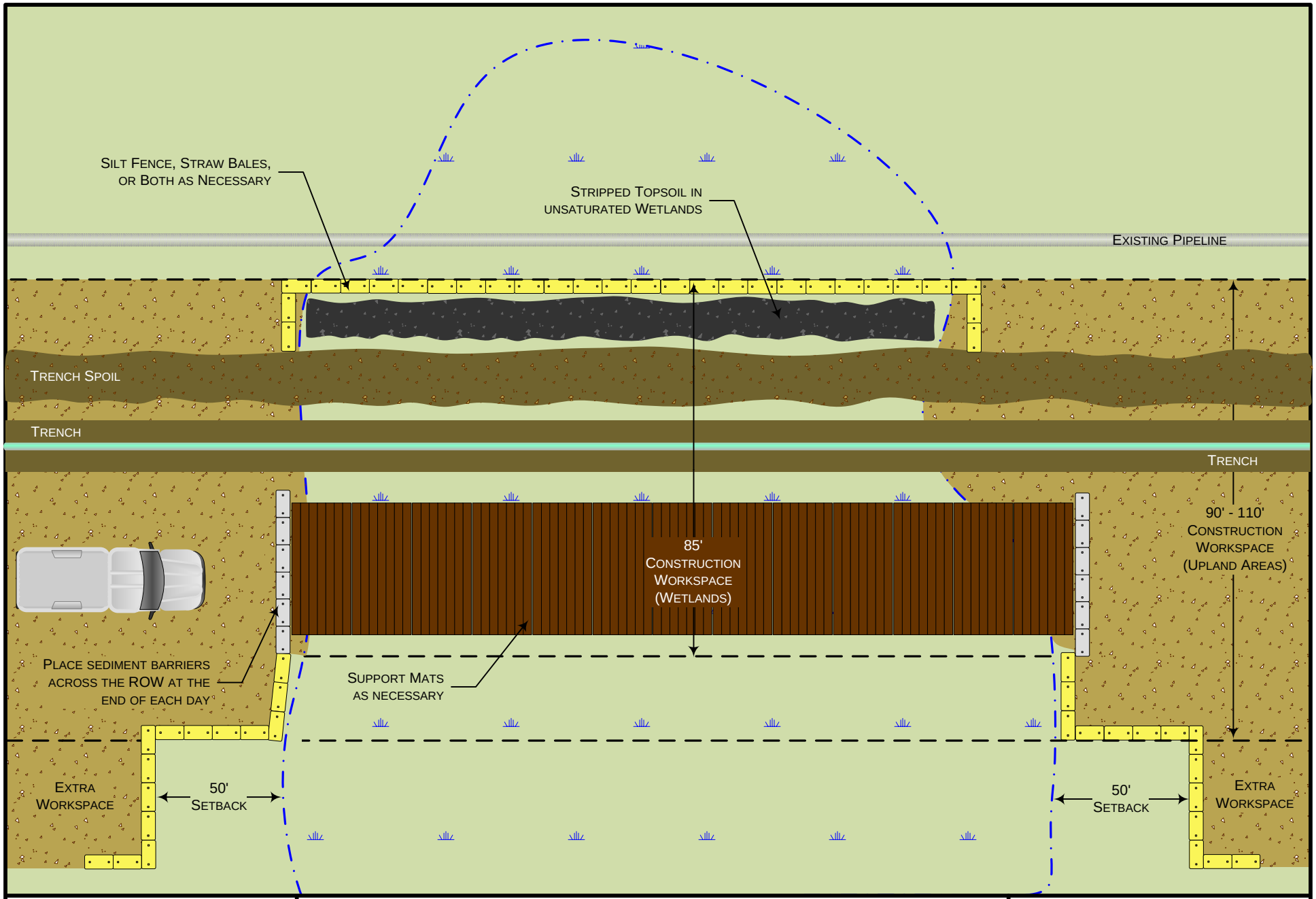

OPTION 2

| MINIMUM SUMP DIMENSIONS (FEET) | | MAXIMUM PUMPING RATE |
|---|---|---|
| X | Y | GALLONS PER MINUTE |
| 10 | 20 | 300 |
| 15 | 20 | 350 |
| 20 | 20 | 400 |
| 20 | 25 | 450 |
| 25 | 25 | 500 |
| 25 | 30 | 550 |
| 30 | 30 | 660 |

ENBRIDGE

# Exhibit 2.8
# Typical Straw Bale Dewatering Structure

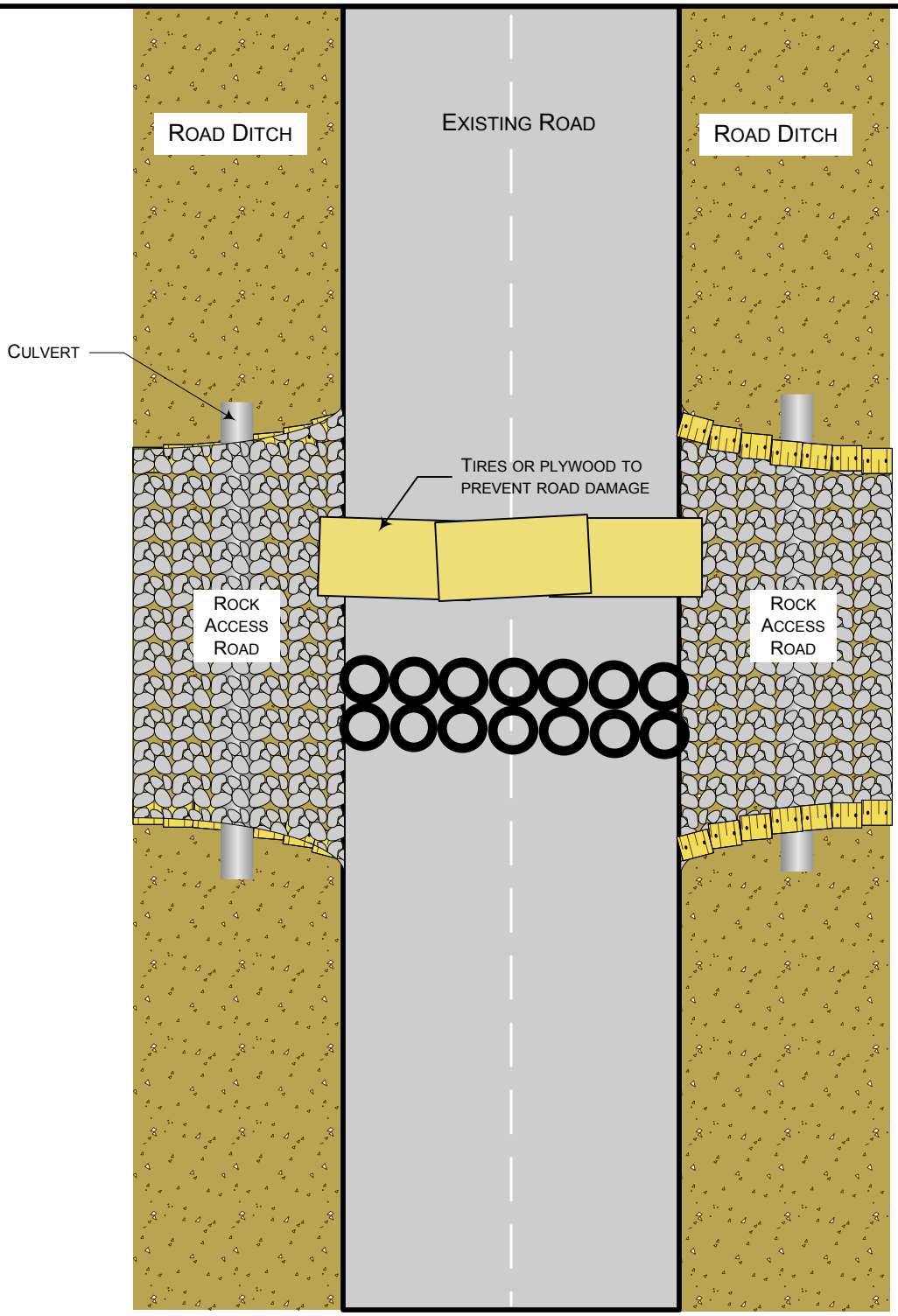
Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
4/20/2010




ENBRIDGE

# Exhibit 3.1
# Typical Wetland Crossing

Environmental Mitigation Plan
North Dakota Expansion Projects
Drawn by: merjent
10/9/2010




NOTES:

1. ACCESS RAMPS, AS ILLUSTRATED ABOVE, ARE TO BE INSTALLED ADJACENT TO EXISTING ROADS AT LOCATIONS IDENTIFIED ON THE PROJECT.
2. CONTRACTOR SHALL KEEP ROAD SURFACES IN CLEAN AND SAFE DRIVING CONDITION.
3. PRIOR TO PERMANENT SEEDING, CONTRACTOR SHALL REMOVE ALL IMPORTED FILL MATERIAL AND CULVERT (IF INSTALLED) AND RESTORE THE GROUND TO NATURAL CONTOURS UNLESS OTHERWISE DIRECTED.
4. DIAMETER OF CULVERT TO BE IN ACCORDANCE WITH STATE, COUNTY OR TOWNSHIP REQUIREMENTS.
5. STRAW BALES SHALL BE INSTALLED PER EXHIBIT 1.7.
6. MONITOR CULVERTS FOR SEDIMENT BUILD-UP AND CLEAN AS NECESSARY.

| | | |
|---|---|---|
| ENBRIDGE | Exhibit 4.1<br>Typical Road Crossing –<br>Sediment Control | Environmental Mitigation Plan<br>North Dakota Expansion Projects<br>Drawn by: merjent<br>4/20/2010 |