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Coastal GasLink
Pipeline Project

Environmental Management Plan

CGL4703-CGP-ENV-PLN-008

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Revision 5

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1.0 INTRODUCTION

This Environmental Management Plan (EMP) outlines environmental protection measures to avoid or reduce potential adverse effects during construction of the Coastal GasLink Pipeline Project (the Project).

Coastal GasLink Pipeline Ltd. (Coastal GasLink) will construct and operate a natural gas pipeline from the area near the community of Groundbirch (about 40 km west of Dawson Creek, British Columbia [BC]) to the LNG Canada Development Inc. (LNG Canada) liquefied natural gas (LNG) export facility (LNG Canada export facility) near Kitimat, BC.

The Project involves the construction and operation of:

- approximately 670 km of 48-inch (NPS 48) (1,219 mm) diameter pipeline
- metering facilities at the receipt and delivery points at up to three locations
- compressor stations at up to eight locations

The Project will have an initial capacity of about 2 to 3 billion cubic feet/day (bcf/d) (56 million cubic metres per day [mmcm/d] to 85 mmcm/d), with the potential for expansion up to about 5 bcf/d (142 mmcm/d). The expansion scenarios do not involve the construction of additional pipeline; only the number of compressor stations would change.

The Project will also require temporary infrastructure during construction, such as access roads, temporary bridges, stockpile sites, borrow sites, Contractor yards and construction workforce accommodations.

The EMP should be read in conjunction with the environmental worksheets and all applicable regulatory approvals and permits. The EMP provides Project-related environmental mitigation and commitments to be addressed during the detailed engineering design, construction and post-construction reclamation phases.

The EMP is based on:

- TC Energy Health, Safety and Environment (HSE) Commitment
- TC Energy's HSE Management System
- feedback obtained through consultation and engagement
- results of the biophysical field programs
- professional experience

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Revisions to the EMP could occur as a result of:

- additional information becoming available
- commitments made during the regulatory review process
- BC Oil and Gas Commission (BC OGC) permits and authorizations conditions
- engagement programs with Indigenous groups and other stakeholders

Pending the necessary regulatory approvals and Project decisions, Coastal GasLink is preparing to start construction in winter 2019. Cleanup and post-construction reclamation of areas disturbed by construction will be conducted immediately after construction or as soon as weather, ground and seasonal conditions allow.

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2.0 PURPOSE

The purpose of the EMP is to describe the recommended environmental management measures and commitments that should be implemented to avoid or reduce potential adverse effects of construction and operations of the Project, and are to be carried out by Coastal GasLink and its Contractors. The EMP includes general environmental management measures that have been developed based on past project experience, TC Energy standards (adopted by Coastal GasLink) as well as current industry accepted best management practices.

Specifically, the EMP:

- outlines environmental management measures related to Project activities
- provides instructions for carrying out construction activities to avoid or reduce potential adverse environmental effects
- serves as reference information for the environmental management program to be undertaken during construction of the Project

After construction is completed, the EMP will be used as a guide during Project Operations. The EMP describes the general Environmental Management measures to be used during the construction of the Project to avoid or reduce the potential adverse effects identified in Section 5 Geophysical Environment to Section 23 Aboriginal Consultation, of the Application for an Environmental Assessment Certificate (EAC) (EAC Application).

2.1 ENVIRONMENTAL MANAGEMENT PLAN SCOPE, REGULATIONS AND NON-ROUTINE MITIGATION

The EMP provides environmental management measures to address known environmental issues in the Project area, including issues to be considered should the location of Project components be revised to accommodate any potential future variances.

Non-routine mitigation has been developed for areas that require special attention or have unique characteristics regarding the protection of environmental resources. All non-routine mitigation is subject to modification in accordance with Section 4.4 depending on site-specific conditions. Specifically, non-routine mitigation applies to:

- rare plants and rare plant communities
- wildlife habitat and specific features
- watercourse crossings
- soil handling techniques

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- terrain stability, erosion and acid rock drainage
- contingency plans for the handling of specific unplanned circumstances

2.2 THE USE OF 'WHERE PRACTICAL', 'WHEN PRACTICAL' AND 'IF PRACTICAL'

Phrasing such as 'where practical', 'when practical' and 'if practical' (which are used interchangeably) is intended to allow for consideration of on-site conditions, weather conditions, environmental factors, construction factors and safety in determining the appropriate mitigation. In such situations, the Environmental Inspector, the Environmental Advisor and/or the Construction Manager and other members of the construction management team, will determine an appropriate approach to mitigation. Coastal GasLink will determine whether consultation with a Resource Specialist or Qualified Professional is required, unless otherwise stated in the commitment(s) in the EMP/management plan(s).

Section 4.4, Mitigation Identification Protocol, presents the process by which the most appropriate mitigation will be determined, including the personnel involved in the decision-making process and the factors to be considered in the decision-making process.

In addition, circumstances may arise in which a site-specific and/or one-time variance may be required to address site conditions, environmental or safety risks, or other factors. Variances to EMP/management plans must be approved by Coastal GasLink and will be tracked, including rationale for the variance, to support effective contractor oversight and compliance management.

2.3 ENGAGEMENT WITH RESPONSIBLE REGULATORY AUTHORITIES

Some EMP and management plan commitments refer to engagement with Responsible Regulatory Authorities (RRAs). These RRAs vary depending on the nature of the commitment, the management plan, or the applicable condition. The following table provides clarity regarding Coastal GasLink's understanding of which agencies are considered RRAs for which commitments. Where the EMP and management plans commit to engagement with applicable RRAs, including Section 4.5 of the EMP, Coastal GasLink will engage with the RRAs as identified for the topics below. While these RRAs are subject matter experts that will be engaged as per the commitments in the EMP/management plans, EAO conducts oversight to ensure compliance with commitments within the plans.

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Topic	Relevant Regulatory Authority
Access	BC Oil and Gas Commission (BC OGC)
	Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD)
	Environment and Climate Change Canada (ECCC) (where there is a permit or other regulatory requirement)
	Ministry of Transportation and Infrastructure (MOTI)
Acid Rock	BC OGC
Adverse weather	BC OGC
	Agricultural Land Commission (ALC) – for activities within Agricultural Land Reserve
Bats	MFLNRORD
Birds	MFLNRORD
	ECCC (with respect to Marbled Murrelet)
Bears	BC OGC
	MFLNRORD
Caribou	BC OGC
	MFLNRORD
	ECCC (where there is a permit or other regulatory requirement)
Heritage sites	BC OGC
	Archaeology Branch of MFLNRORD
Instream activity	BC OGC
	MFLNRORD
	DFO (where there is a permit or other regulatory requirement)
Sensitive timing periods	MFLNRORD
Species at Risk	ECCC
Timber	BC OGC
	MFLNRORD
Ungulates, general	MFLNRORD
	BC OGC
Vegetation	BC OGC
	MFLNRORD
	ECCC (where there is a permit or other regulatory requirement)
Waste and disposal	BC OGC
Water Quality	BC OGC
	DFO (where there is a permit or other regulatory requirement)
Wetlands	BC OGC
	MFLNRORD
	ECCC (where there is a permit or other regulatory requirement)

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Topic	Relevant Regulatory Authority
Wildlife, general	BC OGC
	MFLNRORD
	ECCC (where there is a permit or other regulatory requirement)

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3.0 ENVIRONMENTAL MANAGEMENT PLAN ORGANIZATION

This section provides an overview of the organization and environmental setting of the EMP. Additionally, this section covers non-routine mitigation, extent and limits of the environmental management plan and environmental worksheets, and roles and responsibilities.

3.1 ORGANIZATION

The EMP addresses the environmental mitigation and post-construction reclamation of the Project. A large portion of environmental protection measures are standard across all TC Energy projects. Additional Project-specific measures are identified in Section 7, Project-specific Protection Measures, of the EMP.

The EMP applies to the entire Project footprint, including the pipeline ROW, temporary workspace, workforce accommodation sites, temporary access roads and shooflies, staging areas, facility sites, construction yards and pipe storage areas, and all activities associated with the construction of the Project.

Environmental protection measures are identified under the headings below in accordance with the progression of construction activities. The EMP is intended to provide an understanding of the general environmental setting of the Project, extent and limitations of the EMP, specific or unique mitigation of the Project, general mitigation or industry accepted best practices that are typically applied to a pipeline project, and generally reflect the sequences of construction of a pipeline project.

The initial EMP was developed as part of Coastal GasLink's EAC Application. A detailed set of environmental worksheets has been developed based on biophysical field programs. The environmental worksheets, along with the updated EMP, will be used to identify and avoid potential adverse effects to environmentally sensitive resources.

Sections 1 to 3 outline the purpose and organization of the EMP, and place the EMP in context with respect to geographic location, and where information can be found in the EMP.

Section 4 provides information about the tools and processes to facilitate compliance with all the regulatory approvals, permits, commitments and the specific requirements of the EMP.

Section 5 provides details regarding notification of stakeholders of construction activities.

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Section 6 outlines activities to clearly delineate the boundaries of approved work areas and to ensure environmentally sensitive features are properly identified before any ground disturbance occurs. Proper identification avoids potential adverse effects to resource features and ensures that Coastal GasLink and its contractors are aware of the limits of the approved work areas.

Section 7 outlines procedures to be undertaken to protect environmental and cultural features. Locations of features are documented and displayed on the environmental worksheets.

Section 8 outlines the environmental protection measures associated with general pipeline construction, surface materials salvage and grading, water crossings, pipe installation activities, backfill, erosion control, pressure testing and cleanup, and reclamation activities that will be completed for the Project.

Section 9 outlines activities to take place once construction and post-construction reclamation activities have been completed to evaluate the success of reclamation activities, compliance with commitments and the stability of the disturbed lands.

Appendices to the EMP include emergency contacts, typical drawings, contingency plans, management plans, and mitigation and monitoring plans to support the specific mitigation identified in the EMP and provide guidance to decision-making processes if conditions arise that require implementation of contingency measures.

3.2 ENVIRONMENTAL SETTING

The Project route from Groundbirch to Kitimat crosses four physiographic regions in BC from east to west (the Great Plains, the North and Central Plateaus and Mountains, the Interior Plateau, and the Coast Mountains and Islands) and six biogeoclimatic (BGC) zones (Boreal White and Black Spruce, Engelmann Spruce-Subalpine Fir, Sub-Boreal Spruce, Interior Mountain-heather Alpine, Coastal Mountain-heather Alpine, Mountain Hemlock, and Coastal Western Hemlock).

The mean annual precipitation along the Project route varies from areas with approximately 330-570 mm per year to areas that receive as much as 4,000-5,000 mm per year, with approximately 20-75% of precipitation occurring as snowfall. The mean annual temperature for long-term climatic stations in the BGC zones crossed by the Project route varies from approximately -4°C to approximately 8°C (Meidinger and Pojar 1991). The elevation of the Project route varies from sea level to 1,445 m above sea level (asl).

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The majority of the Project route crosses provincial Crown lands, but about 4.5% of the Project route crosses private (freehold) lands. The area crossed by the Project route supports a variety of activities including forestry, agriculture and grazing, mineral and coal exploration and development, oil and gas, recreation, trapping, traditional cultural activities, hunting and guide outfitting, and tourism.

A brief summary of the environmental setting of the Project is provided below. The Coastal GasLink Pipeline Project:

- interacts with approximately 2,278 streams, as defined by the WSA; 812 are watercourses with riparian classification S1 to S6, of which 349 are considered fish-bearing
- crosses watercourses that support salmon and fish species of concern
- crosses areas that pose constructability challenges, including steep slopes, rocky terrain, areas prone to mass movement events, marine clay substrate and erodible soils
- crosses areas of low to moderate seismic hazards
- crosses areas that support federally and provincially listed rare plant species and communities at risk
- crosses areas that support federally- and provincially-listed wildlife species
- crosses or encroaches on approximately 694 wetlands
- crosses areas considered to be high-value plant and wildlife habitat such as: Old Growth Management Areas, Wildlife Tree Retention Areas, Wildlife Habitat Areas, Ungulate Winter Ranges (UWRs), grizzly bear feeding and denning areas, mountain goat areas, habitat supporting breeding and migratory birds areas
- potentially crosses 38 Blue-listed communities and seven Red-listed communities. Red-listed communities are defined as ecological communities that either no longer exist, face imminent extirpation or extinction, or are likely to become endangered if limiting factors are not reversed. Blue-listed communities include ecological communities that are considered at risk by having characteristics that make them sensitive or vulnerable to human activities or natural events (BC Conservation Data Centre 2013)
- crosses large tracts of forested area that have been affected by the mountain pine beetle (MPB) and spruce beetle epidemics
- may cross the traditional territories of up to 31 Indigenous groups
- traverses lands in one municipality and four regional districts

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- crosses areas subject to, or located within, Land and Resource Management Plans, Sustainable Resource Management Plans and various types of Resource Management Zones
- crosses high-value water resource features such as aquifers and groundwater recharge zones and water supply wells
- crosses or parallels numerous transportation corridors, including paved and non-paved public roads, access trails, pipeline ROW and railroads
- encounters numerous identified sites and features of archeological or heritage significance
- traverses lands in the Agricultural Land Reserve (ALR); the ALR is a provincial zone in which agriculture is recognized as the priority use. Farming is encouraged and non-agricultural uses are controlled (Provincial Agriculture Land Commission 2002)

3.3 NON-ROUTINE MITIGATION

Non-routine mitigation has been developed for areas that require special attention regarding the protection of environmental resources. All non-routine mitigation is identified in Section 7 of the EMP and on the environmental worksheets, where applicable.

3.4 EXTENT AND LIMITS OF THE ENVIRONMENTAL MANAGEMENT PLAN AND ENVIRONMENTAL WORKSHEETS

The EMP applies to the entire Project footprint, including the pipeline ROW, temporary workspace, workforce accommodation sites, temporary access roads and shooflies, permanent access roads where CGL is the holder of the permit or owner, staging areas, facility sites, construction yards and pipe storage areas, and all activities associated with the construction of the Project. There may be a need to revise specific measures as a result of ongoing consultation and engagement with regulatory agencies, Indigenous groups and other stakeholders or to address unforeseen site-specific conditions that might arise during and before construction. If this were to occur, Coastal GasLink will resolve the issue in consultation with the relevant regulatory agencies. The resolution or revision will be documented and communicated to the appropriate parties.

The purpose of the construction-oriented environmental worksheets is to provide visual relevance to spatial information that would support the avoidance of potential adverse effects to environmentally sensitive features.

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3.5 ROLES AND RESPONSIBILITIES

The roles of the key individuals with environmental responsibilities are described below with more specific detail included, as appropriate, in the associated management plans and contingency plans.

Prime Contractor

- Contractually responsible to Coastal GasLink for implementation and compliance with the EMP during all phases of construction

Construction Manager

- Leads the construction management team
- Accountable for managing the Prime Contractor contractual obligations
- Accountable for compliance with the execution and compliance with all environmental regulatory approvals, permits, commitments, contract documents and TC Energy policies
- Responsible for construction site decisions
- Has stop-work authority

Environmental Inspector

- Reports to the Construction Manager and the Environmental Advisor and is an integral part of the construction management team
- Responsible for monitoring and tracking compliance with all environmental regulatory approvals, permits, commitments, contract documents and TC Energy policies
- Responsible for regulatory interface on-site
- Provides advice on major decisions
- Has stop-work authority

Environmental Advisor

- Provides regulatory, permitting and compliance support during all phases of construction and will work closely with the Environmental Inspector where clarification of policies or regulations are required
- Responsible for regulatory interface
- Provides advice on major decisions
- Provides governance over environmental and regulatory aspects

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Resource Specialist

- An internal or third-party resource with a particular skill set that is required to provide advice and on-site support in relation to specific environmental concerns (e.g., wildlife species of concern and important habitat features, watercourse crossings, archaeological sites, palaeontological sites, fish salvage) on a particular element or aspect of the EMP and associated management and contingency plans
- The Resource Specialist may also be a Qualified Professional, as defined in the EAC Table of Conditions, for implementation and oversight of the management plans and advice

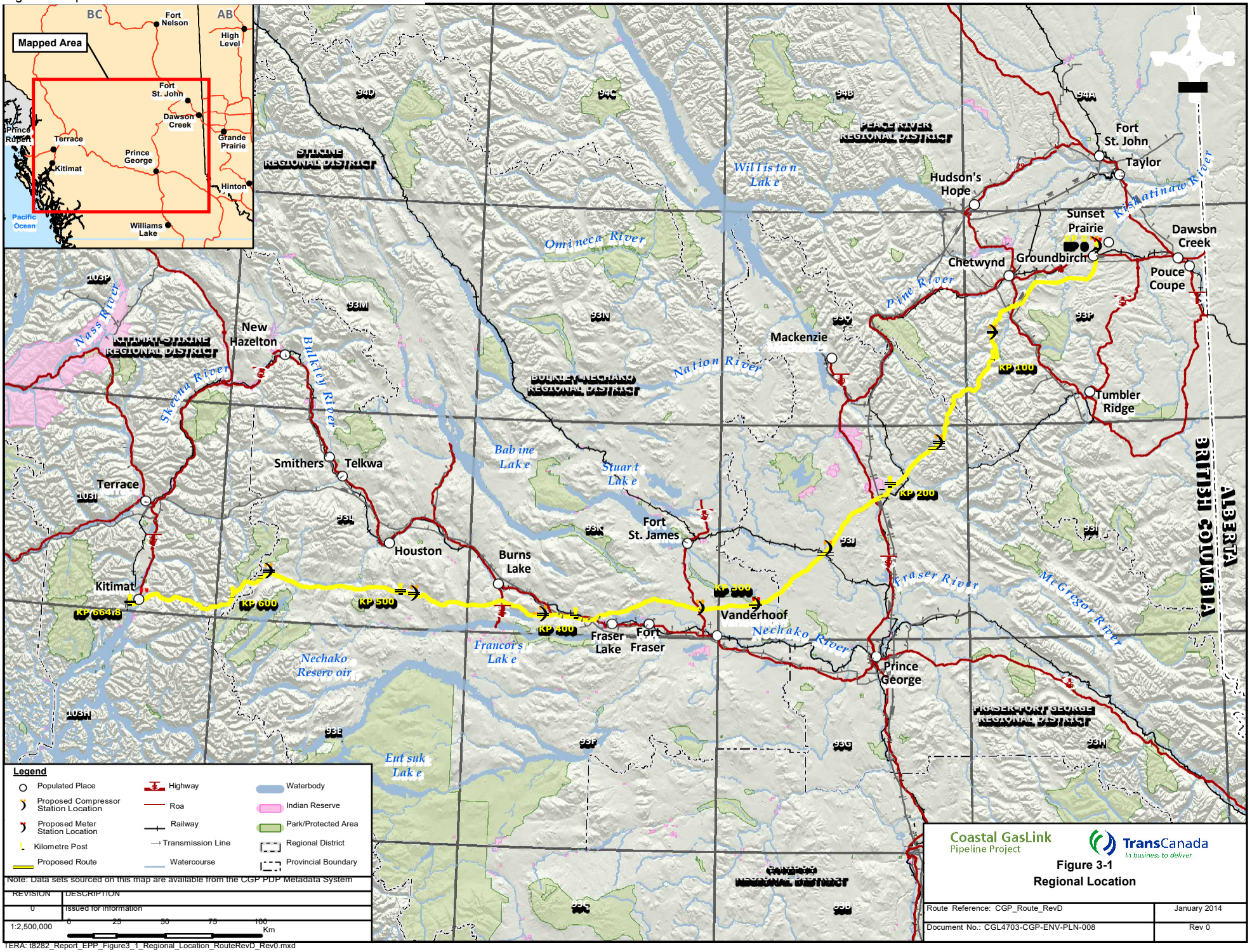
Qualified Professional

- An internal or third-party individual who meets the definition of qualified professional in the EAC and is required to provide advice and oversight as per the EAC.

Site Inspector

- Oversees contractor construction activities and ensures compliance with Coastal GasLink specifications and industry accepted best practices
- Communicates with the Environmental Inspector, Construction Manager or construction management team (if the Environmental Inspector is not readily available) about issues regarding environmental mitigation or compliance

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4.0 ENVIRONMENTAL COMPLIANCE

4.1 INTRODUCTION

Environmental compliance is facilitated through the sharing of information, providing orientation and training, hiring qualified staff, and providing on-site inspection of activities through a proactive and adaptive inspection program.

4.2 OBJECTIVE

The objective of these measures is to ensure that:

- Coastal GasLink, its authorized representative, Contractor(s) and subcontractors are aware of relevant environmental regulatory requirements
- processes are in place that allow Coastal GasLink, its authorized representatives, Contractor(s) and subcontractors to access Project environmental information to aid in decision making at the field level
- Environmental Inspectors hired for the Project are qualified and properly trained

4.3 SPECIFIC MEASURES

Activity	Preparation Measures
Approvals and Licenses	• Obtain and comply with all required licenses, approvals, authorizations and permits before and during construction.
Information Sharing	• The Environmental Inspector(s) and the Environmental Advisor will facilitate the transfer of environmental information and information updates to all Coastal GasLink field staff and the Contractor in a timely manner. • Keep a complete set of environmental worksheets and documents at each construction field office.
EMP and Distribution	• Provide controlled copies of the EMP and associated environmental documents to all key Project construction and Contractor staff members during construction. • The EMP serves as the construction guide for environmental issues and commitments and includes all pertinent environmental information from the EAC Application.
Environmental Worksheets	• The environmental worksheets provide information regarding environmental requirements and serve as detail to the Construction Alignment Sheets.
Application Reports and Construction Preparation Surveys	• Provide all Contractor and Project inspection staff with relevant results of construction preparation surveys to identify known locations of environmentally sensitive features. Indicate specific mitigation for these sites on the environmental worksheets and corresponding tables, with reference to specific environmental information. Identify sites with suitable markers or record GPS locations for any post-construction monitoring (PCM) requirements.
Landowner Line List	• Review landowner requests as they appear on the landowner line list, or as they arise in the field to ensure conformance with the environmental commitments.

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Activity	Preparation Measures
Species of Concern	• If species of concern are identified during construction of the Project, implement the Wildlife Species of Concern Discovery Contingency Plan (Appendix C.10) or Ecological Community of Concern and Species of Concern Discovery Contingency Plan (Appendix C.9). • Report sightings of species of concern to the Environmental Inspector(s). Specific protection measures may be implemented, and the sighting will be recorded.
Industry Guidelines and Regulations	Industry guidelines and legislation and the associated regulations were considered in the creation of the EMP. This includes but is not limited to: • Pipeline Associated Watercourse Crossings 3rd Edition (CAPP, CEPA and CGA 2005) • Environmental Protection and Management Guideline (BC OGC 2018) • BC *Water Sustainability Act* • BC *Environmental Management Act* • BC *Oil and Gas Activities Act* • BC *Forest And Range Practices Act* • BC *Wildfire Act* • BC *Fish Protection Act* • BC *Heritage Conservation Act* • BC *Wildlife Act* • *Migratory Birds Convention Act* • *Fisheries Act* • *Canadian Navigable Waters Act* • *Environmental Protection Act* • *Canadian Explosives Act* • *Transportation of Dangerous Goods Act* • *Species at Risk Act* • *Integrated Pest Management Act* • *Forest Practices Code of BC Act* • *Hazardous Products Act* • *Workers Compensation Act* • *OH&S Act* • *Public Health Act* • *Fire Code Fire Safety Act*
Environmental Inspector Qualifications	• The Environmental Inspector(s) hired for the Project is required to have experience in environmental inspection or planning. The Environmental Inspector(s) will have an understanding of pipeline construction techniques and take a proactive approach to environmental issues. A Resource Specialist or Qualified Professional may be consulted as determined by the Environmental Inspector in consultation with the Environmental Advisory.

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Activity	Preparation Measures

Environmental Inspector Responsibilities	• The Environmental Inspectors' main responsibility is to assure that all environmental commitments, undertakings and conditions of authorizations are met during field activities and that work is completed in compliance with applicable environmental regulations and Coastal GasLink and TC Energy policies, processes, procedures and specifications in the most efficient and effective way practical.
	• In addition to the responsibilities described in Section 3.5, responsibilities of the Environmental Inspector(s) include:
	  • providing expert advice and guidance on environmental aspects of decisions or courses of action
	  • reporting any spills in accordance with federal and provincial regulations and advising Coastal GasLink management on the cleanup and disposal of the material and any affected soils or vegetation
	  • monitoring delivery of environmental orientation presentations to Coastal GasLink, regulatory and Contractor staff, as directed by the Construction Manager and the Environmental Advisor
	  • preparing daily reports
	  • preparing, collecting, organizing, and disseminating all environmentally-related information and documentation that arises during construction
	  • liaising with appropriate government agencies
	  • supervising the environmental Resource Specialists or liaising with the Qualified Professionals that may be required to support the Project
	  • organizing on-site meetings as requested by the Construction Manager as the need arises, to address site-specific issues
	  • reviewing construction methodologies with the Project team
	  • collecting environmental information throughout construction for documentation and project reporting

Project Training and Orientation	• Develop and implement an environmental orientation program to ensure that all personnel working on the construction of the Project are informed of the environmental requirements and sensitivities. • Hire the Environmental Inspector(s) before the commencement of construction with sufficient lead time to enable training and participation in the orientation of other construction staff, as well as sufficient on-site time to facilitate review of environmentally sensitive aspects of the Project. • The Environmental Inspector(s) will be briefed by the Environmental Advisor on the environmentally sensitive aspects of the Project, and the environmental processes and agreements that have taken place to date. • The Environmental Inspector(s) will review all environmental and environmental compliance-related information. • The Environmental Inspector(s) will ensure an environmental orientation program is presented to all Construction Activity Inspection Staff and Contractor staff.

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Activity	Preparation Measures
Non-Compliances and Resolution	• The Environmental Inspector(s) will be notified by the responsible person on site when non-compliance or potential non-compliance or environmental hazards are identified, and it will be the responsibility of the Environmental Inspector(s) to contact the Construction Manager. If the work practice or non-compliance is causing or will cause an imminent threat to the integrity of the environment, the Environmental Inspector will stop the work. • If the Construction Manager is not available during a non-compliance situation, the Environmental Inspector(s) have the authority to modify work procedures or initiate work stoppage. • The Construction Manager will make a determination to either modify the work practice or shut the activity down until corrective actions are determined and implemented. The Environmental Inspector(s) will assist in this decision-making process. • If the work is shut down, it will resume only when corrective actions have been developed and approved by Coastal GasLink. Once approved by Coastal GasLink, the Contractor will inform the work crew and work will proceed and will follow the corrective action plan. • The Environmental Inspector(s) are responsible for documenting all procedure modifications and environmental non-compliances.

4.4 MITIGATION IDENTIFICATION PROTOCOL

Where the EMP or management plan provides flexibility in mitigation, decisions regarding the selection and implementation of the most effective mitigation will be completed by the Environmental Inspector, the Environmental Advisor and/or the Construction Manager. The procedure below outlines the process to be followed.

Contacts	Measures

Identification of Mitigation	• The Environmental Inspector, Environmental Advisor and/or Construction Manager will consider the mitigation options available in the EMP/management plan.
	• Coastal GasLink will determine whether consultation with a Resource Specialist or QP is required, unless otherwise stated in the commitment in the EMP/management plan. Coastal GasLink's decision-making process to determine the appropriate mitigation may consider factors including, but not limited to:
	  • on-site conditions
	  • weather conditions
	  • environmental factors
	  • construction factors
	  • safety
	  • regulatory requirements
	  • Indigenous group input
	  • stakeholder input
	• If the commitment requires engagement with RRAs, Coastal GasLink will conduct engagement as per Section 2.3.
	• The Environmental Inspector, Environmental Advisor and/or the Construction Manager will determine the appropriate mitigation to be implemented.
	• The decision will be communicated to applicable Coastal GasLink personnel and/or the Prime(s) as determined by Coastal GasLink.

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4.5 EDITS TO THE EMP AND MANAGEMENT PLANS

As per EAO's draft Management Plan Guidance (January 2015), EMPs and other management plans required by the EAC[1] are 'living documents' and are therefore anticipated to be updated from time to time to address changing site conditions, practicality, continual improvement from lessons learned during construction, evolving regulatory requirements and best practices, etc.

Edits to the EMP/management plans required by the EAC typically will align with one of three categories:

- Administrative;
  - Including, but not limited to, spelling and grammatical corrections, name changes (e.g., TransCanada to TC Energy), and incorporation of current information on approval conditions (e.g., map updated to reflect current approved route).
- Minor Update;
  - Including, but not limited to, clarifications of text to reduce ambiguity. These clarifications do not result in a material change in field practices, mitigation, or commitments made by CGL in the Coastal GasLink Project: Working Group Comment Tracking Table[2] or in Coastal GasLink correspondence with Indigenous groups. Minor Updates may also include clarification of safety requirements, clarification of responsible party, and updated guidance and permit wording that does not result in a change in practice.
- Revision;
  - Including, but not limited to, changes in field practices, material changes to mitigation, or material changes to commitments made by Coastal GasLink in the Coastal GasLink Project: Working Group Comment Tracking Table or in Coastal GasLink correspondence with Indigenous groups. Any edits to commitments that has been subject to a non-compliance issued by EAO would also be considered Revisions.

[1] Throughout the EMP and management plans, references to 'management plans' mean 'management plans required by the EAC'.

[2] https://projects.eao.gov.bc.ca/api/public/document/58868fcbe036fb0105768740/download/Working%20Group%20Issue-Response%20Tracking%20Table%20%28Including%20Aboriginal%20Groups%29.pdf

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		EMP and management plans requiring EAO approval as per the EAC[3]	Management plans that do not require EAO approval as per the EAC
Administrative	Process	CGL will track Administrative category changes internally and incorporate them into EMP/management plan annual updates.	
	Engagement with Indigenous Groups and/or Agencies	None required. Upon request, CGL will provide these edits to agencies and Indigenous Groups as identified in the relevant EAC condition(s) for information.	
	EAO Approval	Not required	
Minor Update	Process	CGL will track Minor Updates internally. Minor Updates are implemented immediately following approval by Coastal GasLink.	
	Endorsement by QP	For management plans that must be developed by a QP as per the EAC, Minor Updates must be endorsed by a QP prior to implementation.	
	Engagement with Indigenous Groups and/or Agencies	None required. Upon request, CGL will provide these edits to agencies and Indigenous Groups as identified in the relevant EAC condition(s) for information.	
	EAO Approval	CGL will provide Minor Updates to EAO for information prior to implementation. While EAO approval is not required for Minor Updates, upon review EAO may advise Coastal GasLink that EAO considers the edit a Revision and therefore requires EAO approval.	Not required
Revision	Process	Following engagement of the EAO (if applicable, see below) and EAO approval, Coastal GasLink will implement the Revision(s). Revisions may result in issuance of an updated version of the EMP/management plan as determined by Coastal GasLink.	Following engagement (if applicable, see below), Coastal GasLink will implement the Revision(s). Revisions may result in issuance of an updated version of the EMP/management plan as determined by Coastal GasLink.
	Endorsement by QP	For management plans that must be developed by a QP as required by the EAC, Revision(s) must be endorsed by a QP prior to implementation.	

[3] Under the EAC, the EMP, Grizzly Bear Mitigation and Monitoring Plan, Caribou Mitigation and Monitoring Plan and the Social and Economic Effects Management Plan required EAO approval.

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		EMP and management plans requiring EAO approval as per the EAC[3]	Management plans that do not require EAO approval as per the EAC
Revision (cont'd)	Engagement with Indigenous Groups	For the EMP and management plans that must be developed in consultation with Indigenous Groups[4] under the EAC, Coastal GasLink will generally provide the Indigenous groups with the proposed Revision(s) for a 21-day review period. Coastal GasLink may exercise discretion to vary the length of the review period, for example a shorter timeframe may be required for time sensitive Revisions, or a longer timeframe may be required for extensive Revisions. A summary of feedback from engagement, including any potential unresolved concerns, will be provided to the EAO for consideration	Not required
	Engagement with Agencies	As the EMP and management plans must be developed in consultation with Agencies as per the EAC, Coastal GasLink will generally provide the Agencies with the proposed Revision(s) for a 14-day review period. Coastal GasLink may exercise discretion to vary the length of the review period, for example a shorter timeframe may be required for time sensitive Revisions, or a longer timeframe may be required for extensive Revisions. A summary of feedback from engagement, including any potential unresolved concerns, will be provided to the EAO for consideration for the EMP and management plans which required EAO's approval as per the EAC.	
	EAO Approval	EAO approval is required prior to implementing Revisions to these management plans.	Not Required

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[4] Under the EAC, the EMP, Grizzly Bear Mitigation and Monitoring Plan and the Caribou Mitigation and Monitoring Plan require engagement with Indigenous groups in the development of these plans.

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5.0 NOTIFICATION OF CONCERNED PARTIES

5.1 INTRODUCTION

Notification of the construction schedule and timing of specific construction activities will facilitate awareness of upcoming activities and allow regulatory agencies and other stakeholders to plan as appropriate for construction activities in their area. With the exception of parties requiring notification in accordance with a permit condition or regulation, Coastal GasLink will cease providing notifications to parties who have advised that they no longer require or wish to receive notifications.

5.2 OBJECTIVE

The objective of these measures is to ensure:

- interruptions to other land use activities are reduced during construction of the Project
- affected Indigenous groups and stakeholders are aware of Project activities
- communication is maintained with relevant regulatory agencies throughout construction

5.3 SPECIFIC MEASURES

Contacts	Measures
Federal, Provincial and Municipal Agencies	• Inform all appropriate federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted. • A notice of Construction Start must be submitted to BC OGC prior to cutting merchantable timber or commencing physical construction activities (including earthworks, blasting, grading and stripping) as per BC OGC requirements. For pipeline activity (including pipeline and ancillary permits), notice must be submitted at least 48 hours prior to construction. For road activity, notice must be submitted within 72 hours and not more than 30 days prior to starting construction. • At least one week before the beginning of each month, a schedule must be submitted to the BC OGC indicating the location and timing of HDD, microtunnelling or instream work.
Landowners and Lessees	• Notify all landowners and lessees along the Project route of the intended Project schedule a minimum of 14 days before the start of clearing and construction to prevent or reduce effects to their operations or activities. Ensure schedule changes are communicated to these groups in a timely manner.
Indigenous Groups	• Provide Indigenous groups with the proposed construction schedule and proposed route maps. Ensure schedule changes are communicated to these groups in a timely manner, as appropriate and in accordance with Condition 28 of Schedule B to the EAC.

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Contacts	Measures
Trappers and Guide Outfitters	• Notify registered trappers and guide outfitters at least 2 weeks prior to construction to confirm the timing and location of Project activities.
Mine Operations	• Notify representatives of mining operations prior to constructing the pipeline under the access roads to the mines.
Mineral, Timber and Recreation Tenure Holders	• Notify mineral, timber and recreation tenure holders prior to the commencement of construction activities to confirm the timing and location of Project activities. Provide Project routing and scheduling information, as necessary.
Ministry of Transportation and Infrastructure	• Confirm the Project construction schedule and road crossing procedures with BC Ministry of Transportation and Infrastructure staff prior to construction activities.
Public Notification	• Use signage and local and community media sources (e.g., newspapers, radio stations) to notify the public, hunters, fishers and gatherers and recreational users of the location and timing of construction activities and distribute construction schedules, maps and other relevant information on anticipated trail, road and area closures to government agencies, community representatives, Indigenous groups and potential user groups to inform them of the presence of construction activity, potential access restrictions or noise disturbance in recreational areas or navigable waterways.
Recreational Facilities	• Communicate with municipal recreation facility operators to confirm Project construction and work force schedules (i.e., 6 days on, 1 day off on Sundays) to ensure municipal recreational service providers have sufficient notice regarding potential increased use.

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6.0 CONSTRUCTION PREPARATION

6.1 INTRODUCTION

The following mitigation will be implemented before the initiation of ground disturbance activities.

6.2 OBJECTIVE

The objective of this mitigation is to ensure:

- all resources are properly identified and marked in the field before the initiation of ground disturbance to avoid or reduce potential adverse project effects
- ROW is properly delineated to prevent inadvertent trespass
- all access to and from the work sites are properly marked to maintain safety and environmental compliance

6.3 SPECIFIC MEASURES

Activity/Concern	Mitigation
Staking	• To prevent inadvertent trespass, stake the construction footprint to clearly delineate all boundaries. • Mark and locate all foreign utility lines and cables using One-Call services before the start of construction to ensure the safety of the workers and public. • Reduce damage to vegetation by flagging or fencing sensitive areas for avoidance. • Flag areas identified as having noxious weed infestations prior to starting construction. • Carefully expose all known locations of underground facilities in accordance with precise, safe methods. • Use flagging and signage at overhead power line crossings to alert equipment operators of hazards.
Environmental Resource Delineation	• Clearly mark all sensitive resources identified on the environmental worksheets and environmental tables and in accordance with applicable management plans appended to this EMP, within the immediate vicinity of the ROW before the start of clearing. Following clearing, visual identification (e.g., snow fencing) will be installed to delineate sensitive resources. • Supplement fencing with signage after clearing. • The Environmental Inspector(s) will confirm the accuracy of all environmentally sensitive resource locations and will ensure fencing is maintained during construction. • The Environmental Inspector(s), will determine in consultation with an Environmental Advisor whether consultation with a Resource Specialist or Qualified Professionals is necessary, and will identify and notify the Contractor of the appropriate locations for wildlife gaps.

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Activity/Concern	Mitigation
Cultural Resource Delineation	• Clearly mark all cultural resources identified on the environmental worksheets and environmental tables within the immediate vicinity of the ROW before the start of clearing. After clearing, visual identification (e.g., snow fencing) will be installed to delineate cultural resources. • Supplement fencing with signage after clearing. • The Environmental Inspector(s) will confirm the accuracy of all cultural resource locations and will ensure fencing is maintained during construction.
Access Delineation	• Use existing access, where practical. • Clearly delineate areas that have access restrictions. Restrict access to essential construction personnel only. Direct all other personnel to the ROW via alternate access routes.
Hotline Exposure: Hydrovac	• Salvage topsoil and surface material prior to exposing hotlines. • Empty the hydrovac truck onto subsoil at Environmental Inspector approved locations (e.g., at road crossings where the topsoil/surface materials has been stripped). Ensure that hydrovac material is contained within the designated release area (i.e., will not migrate to a waterbody or onto topsoil/surface materials). Refer to the Hydrovac Cuttings Handling Plan (Appendix D.4). • Surface material salvage is not required prior to exposing hot lines for holes less than 1 m in diameter, if soil will be removed using a hydrovac during frozen soil conditions or where the area to be exposed will be subsequently subject to surface material salvage as part of ROW preparation activities.
Grade Plan	• The Contractor shall provide preliminary ROW grade plan(s). The grade plan will be reviewed by the Environmental Inspector(s). • Obtain approval for additional temporary workspace required for storage of grade or ditch spoil during construction from the Environmental Inspector(s) and Construction Manager before disturbance.
Construction Material Transport	• Transport pipe materials to the Project area by rail, where practical.

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Activity/Concern	Mitigation

Blasting Activities	• Employ blasting where grading is required on the ROW only where grading cannot be completed with conventional grading techniques and only when it can be completed safely. Use techniques in blasting that reduce potential adverse effects from the blasting shockwaves such as:
	  • using monitoring equipment to monitor the effects of the shockwaves
	  • determining borehole location and patterns to reduce associated shock waves
	  • using the appropriate type and quantity of explosives as per Coastal GasLink direction
	• Employ blasting mats to control projectiles, where reasonable or practical. Where blasting is required, storage, handling and operations shall be conducted according to all applicable federal and provincial laws and regulations governing explosives (*Canadian Explosives Act* (R.S.C., 1985, c. E-17).
	• Before any blasting commences, a specific blasting procedure shall be developed for the site. Ensure location of potentially required erosion control such as trench plugs that may be required to key in are identified in the blasting procedure.
	• Review blasting procedures, safety protocols and applicable erosion control measures with Contractor personnel prior to commencing blasting activities to ensure there is a full understanding of the procedures and mitigation to be implemented.
	• Communicate blasting activities to local authorities. Ensure that notification of blasting activities that are near adjacent roads, railway tracks and recreational areas is provided to local authorities and landowners before starting blasting activities. Place signage along areas, in accordance with regulatory requirements, during blasting activities.
	• The blasting plan will include measures to mitigate potential effects for environmental resources identified on the environmental worksheets.

Blasting Bedrock	• Prior to blasting, rip bedrock in trench, if encountered and if practical. Contractor blasting specifications must meet or exceed Coastal GasLink's blasting specifications. • Notify local residents of blasting schedule at least 48 hours prior to blasting and provide updates to the schedule as necessary to reflect changes in overall duration and timing.

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Activity/Concern	Mitigation
Use of Explosives	• Transport explosives in accordance with the *Transportation of Dangerous Goods Act* and other applicable provincial or federal regulations. • Blasting near watercourses will follow the blasting near watercourses mitigation outlined in Section 8.4 of the EMP. • Blasting will only be conducted by licensed blasters. • Conduct pre-blast surveys for any structure within 150 m of the blast site. • Store explosives on-site in compliance with permits and provincial or federal regulations. Ensure that explosives are stored in a secured container to reduce accessibility to wildlife and the public. • Control traffic on highways/roads as applicable within the fly rock zone and in accordance with requirements of existing regulations. • Place double matting on blast sites adjacent to urban areas. • Conduct a pre- and post-construction well water sampling program for all registered or known potable water wells within 200 m of blasting activities to measure and document water quality and quantity before and after blasting activities.
Disposal of Explosives	• Should there be deteriorated or damaged explosives which require disposal, the Contractor will consult with the explosive supplier to determine if the explosives can be returned or if they must be destroyed on site. Preference will be to send the deteriorated or damaged explosives back to the supplier. If this is not safe or practical as determined by the Contractor, they will be disposed of in a production blast. • Ensure disposal and destruction sites for explosive materials are located as per the applicable federal regulations and legislation. Coastal GasLink will review disposal and destruction sites requested by the Contractor for environmental constraints.
Disposal of Excess Rock	• Dispose of excess rock displaced from the trench or from blasting in rock piles and windrows approximately 1 m in height or scattered along ROW or through extraneous haul to an approved disposal site as directed by Coastal GasLink, landowner or appropriate government agency. Excess rock shall not be buried on or adjacent to the right of way unless approved by the landowner or relevant regulatory authority. • Gaps shall be left in the rock windrow every 500 m at a minimum if the top height of these barriers exceeds 1.5 m for 72 hours (BC Ministry of Environment and Climate Change Strategy [BC MECCS] 2011), at obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s) who will determine in consultation with an Environmental Advisor, whether consultation with a Resource Specialist or Qualified Professional is necessary. Gaps should align to allow wildlife and livestock passage. • Gravel and rocks may not be piled, windrowed, or concentrated in one area unless it is approved by the landowner and improves the agricultural capability of the surface lease, or a qualified professional concludes it will not impede agricultural capability.

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7.0 PROJECT-SPECIFIC PROTECTION MEASURES

The following sections provide mitigation specific to environmental values and geographic locations. These sections also reference construction preparation surveys. Construction preparation surveys were initiated in 2015 and will continue to the start of construction activities. These surveys include:

- aerial surveys for raptor nests and great blue heron nests along the full extent of the Project route
- wildlife habitat features, such as mammal dens, bat maternity roosts and hibernacula, and mineral licks
- coastal tailed frog breeding sites on components of the Project footprint, where the species may overlap with the Project
- surveys for western toad breeding sites and migration and dispersal routes where Project activities are scheduled to occur during these periods, where the species may overlap with the Project
- site habitat assessment surveys for red- and blue-listed plants and ecological communities identified by the BC Conservation Data Centre at all locations within the Certified Pipeline Corridor
- site habitat assessment surveys for red- and blue-listed plants and ecological communities identified by the BC Conservation Data Centre for each known occurrence of red- or blue-listed plants and communities in the Certified Pipeline Corridor, based on known or recorded occurrences at the time of the EAC Application

7.1 RESOURCE-SPECIFIC PROTECTION MEASURES

7.1.1 Introduction

This section of the EMP describes the specific mitigation that will be used on the Project to protect sensitive environmental features. Locations of features requiring site-specific mitigation are indicated on the environmental worksheets and included in the Resource-Specific Mitigation Table (Table 7-1). Watercourse crossing requirements are provided in the Master Watercourse Crossing Table (CGL4703-JEG-ENV-TBL-0004 Master Water Crossing Table) and in Section 8.4 of the EMP, and locations are indicated on the environmental worksheets.

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7.1.2 Objective

The objective of this mitigation is to ensure that:

- mitigation is relevant to the Project area and unique circumstances of the Project
- unique Project mitigation is easily identifiable and clearly understood by Coastal GasLink and their Contractors

7.1.3 Specific Measures

Activity/Concern	Mitigation
Signage	• Post signs to clearly identify sensitive environmental features to ensure they are protected. Refer to the environmental worksheets for a listing of sensitive environmental features located along the pipeline ROW.
Water Wells	• Provide shallow domestic well owners within 200 m of the Project the option to participate in a water well monitoring program prior to construction to determine construction preparation quality and quantity conditions. • Clearing and site preparation, inclusive of workspace, must be confined to the construction corridor and must not, without leave of the BC OGC, occur within 100 metres of where water is diverted by a waterworks, water supply well or water storage reservoir
Hydrology	• If springs and ground water are encountered, Coastal GasLink will notify affected parties, review the area and determine the appropriate mitigation. • Leave gaps in windrows, at identified drainages, on sidehill terrain and wherever seepage occurs to reduce interference with natural drainage patterns. • Ensure drainages are marked accordingly in winter to allow for appropriate breaks in snow windrows and allow adequate drainage in deep snow conditions. • In the event that construction activities result in a reduction of domestic well water quality and quantity, in consultation with a well specialist, Coastal GasLink will provide well replacement or the replacement of equal or better quality and quantity of water.

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Activity/Concern	Mitigation

Wildlife – General	• Complete construction preparation wildlife surveys to identify habitat features that warrant site-specific mitigation. Survey locations should be selected to focus on habitats or segments of the Project route determined to have potential for occurrence of site-specific habitat features that could be adversely affected by the Project (survey details are included in Section 5.2.1 of the Wildlife and Wildlife Habitat Management Plan [WWHMP], Appendix D.13).
	• Do not clear timber, stumps, brush or other vegetation beyond the marked construction footprint boundaries.
	• Where grading is not required, identify shrub (including young forest) areas before construction; cut, mow, or walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration; walk down tall shrubs and tree saplings and pack sufficient snow/ice over walked-down vegetation on the travel and work surfaces during frozen conditions to allow tall vegetation to recover quickly after construction.
	• Conduct work expeditiously to maintain a tight construction section (i.e., interval between front-end work activities such as grading and back-end activities such as cleanup) to reduce the duration of the open trench and to reduce potential barriers
	• Additional mitigation for general wildlife is included in
	  • WWHMP (Appendix D.13)
	  • Human-Wildlife Conflict Management Plan (HWCMP) (Appendix D.9)
	  • The Reclamation Program

Mountain Goats Ungulate Winter Range (UWR) u-6-003 and u-6-001 No Harvest Zone	• Where clearing within goat UWR cannot be practically avoided, apply for exemption from the requirement to comply with the General Wildlife Measures. Include in the application a mitigation strategy for the Project, developed in consultation with relevant provincial regulatory agencies, to address potential adverse effects of the Project within goat UWRs. • Refer to Aerial Survey / Monitoring Guidelines in Section 7.1.3 for mitigation specific to over-flights in UWRs. • Mitigation for Mountain Goats is included in the WWHMP (Appendix D.13).

Migratory Birds	• Clearing and construction activities will be scheduled outside the applicable Primary Nesting Period (PNP), where practical (note, these nesting periods also encompass the nesting period of May 1 to July 31 identified by BC MFLNRORD 2011). The commitment for avoidance of the migratory bird nesting period will be revised if updated or new information is released (e.g., Environment Canada Bird Conservation Strategies). PNPs for the Nest Zones crossed by the Project include:
	• Nest Zone B5 – KP 0 to 56.4
	  • PNP: Wetlands May 2 – Aug 1; Open Habitats May 6 – Aug 10; Forests May 3 – Aug 10
	• Nest Zone A4 – KP 56.4 to 598.8_R7
	  • PNP: Wetlands Apr 27 – Jul 31; Open Habitats May 2 – Aug 9; Forests April 29 – Aug 7
	• Nest Zone A2 – KP 598.8_R7 to 667.4
	  • PNP: Wetlands Apr 11 – Jul 30; Open Habitats Apr 23 – Aug 8; Forests Apr 14 – Aug 5
	• Mitigation for migratory birds is included in the WWHMP (Appendix D.13)

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Activity/Concern	Mitigation
Raptor and Owl Nests	• Retain existing habitats and features (e.g., stick or cavity nests), if practical, by narrowing the Project footprint. Consider opportunities to reclaim availability of nest cavities by replacing damaged or lost cavity nests with suitable nest boxes, to be determined in consultation with the relevant regulatory authority (BC MECCS 2012). • Mitigation for raptors, owls and herons is included in the WWHMP (Appendix D.13). • If nest removal is required, guidance is presented in the Guide to the Preparation of a Nest Removal Management and Compensation Plan (Appendix E.1).
Bear Dens	• Should a Bear Den be identified during construction, implement the Wildlife Species of Concern Discovery Contingency Plan (Appendix C.10). • Mitigation for black bears is included in the WWHMP (Appendix D.13). • Mitigation for grizzly bear is included in the Grizzly Bear Mitigation and Management Plan (GBMMP) (Appendix D.8).

Amphibian Breeding Wetlands	If amphibian breeding wetlands are identified prior to construction, implement the following:
	• Identify pond-dwelling amphibian breeding sites within the Project footprint before construction to avoid these sites during final routing, where practical. Where not practical, the Environmental Inspector will determine appropriate action, such as salvage and relocation, in consultation with a wildlife Resource Specialist.
	• If amphibians are identified on the construction ROW during construction, relocate the amphibians in accordance with appropriate guidelines for amphibian salvage (EDI Environmental Services et al. 2013 *in prep.,* Canadian Council on Animal Care (CCAC) 2004) and conditions of provincial permits required for amphibian salvage. Appropriately qualified Resource Specialists will oversee the salvage and relocation of amphibians.
	• Mitigation for amphibian breeding wetlands is included in:
	  • WWHMP (Appendix D.13)
	  • Wetlands Management Plan (WMP) (Appendix D.12)

Coastal Tailed Frog Watercourses	• Mitigation for coastal tailed frog is included in:
	  • WWHMP (Appendix D.13)
	  • WMP (Appendix D.12)
	  • Reclamation Program

Bat Maternity Roost/Hibernation Habitat	• Mitigation for bat maternity roost/hibernation habitat is included in:
	  • WWHMP (Appendix D.13)
	  • HWCMP (Appendix D.9)

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Activity/Concern	Mitigation

Aerial Survey/Monitoring Guidelines	• Condition 12 of Schedule B to the EAC states "The Holder must only conduct low elevation helicopter and fixed wing flights over UWR and WHA within the Certified Pipeline Corridor (i) in accordance with the critical timing windows and recommended minimum separation distances specified in the General Wildlife Measures for those areas, or (ii) as recommended by BC MFLNRORD, where critical timing windows or separation distances are not specified in the General Wildlife Measures for the UWR or WHA, unless exceptions to (i) or (ii) are otherwise authorized by the BC Environmental Assessment Office. This condition does not limit the Holder's actions in emergency circumstances."
	• Coastal GasLink will abide by the applicable BC OGC conditions related to aircraft use in relation to: identified wildlife, UWRs, WHAs and Caribou Ranges. When using aircraft to undertake activities associated with the permit, Coastal GasLink will provide written instructions to the pilot specifying that flights must comply with the flight restrictions outlined in the BC OGC permits.
	• Aerial survey/monitoring mitigation is included in
	  • Caribou Mitigation and Monitoring Plan (CMMP) (Appendix D.6)
	  • GBMMP (Appendix D.8)
	  • WWHMP (Appendix D.13)

Beaver Dams	• In the event that beaver dams or lodges will be disturbed by construction activities, a Beaver Dam Removal Permit for beaver dam removal will be obtained from the relevant regulatory authority to remove a beaver dam or lodge. Removal of beaver dams will be performed in a manner that minimizes potential effects to downstream habitat. • Follow applicable guidance in the BC Best Management Practices for Instream Works for beaver dam removal when beaver dams must be removed. • If beaver dams must be removed, breach the beaver dam slowly to avoid the rapid release of water that could cause fish entrapment or erosion of the bed and banks resulting in subsequent siltation of downstream waters.
Species at Risk	For Species at Risk listed under Schedule I of SARA, Coastal GasLink will confirm whether carrying out the proposed activity requires a permit pursuant to Section 73 of SARA. The proposed activity will not proceed until Coastal GasLink ensures receipt of the required regulatory authorization, if necessary.

Species of Concern	If Species of Concern are identified prior to or during construction:
	• Report sightings of species of concern to the Environmental Inspector(s). Specific protection measures may be implemented, and the sighting will be recorded.
	• Implement the Wildlife Species of Concern Discovery Contingency Plan (Appendix C.10).
	• Additional mitigation for species of concern and listed, sensitive species are included in:
	  • WWHMP (Appendix D.13)
	  • Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (Appendix E.3)

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Activity/Concern	Mitigation

Wildlife, Livestock and Vehicle Passage	• Leave gaps in windrows (i.e., grubbing piles, topsoil and surface materials, grade spoil, rollback, strung pipe) at obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s) in consultation with an Environmental Advisor whether consultation with a Resource Specialist or Qualified Professional is necessary. Gaps should align to allow wildlife and livestock passage.
	• Mitigation for wildlife, livestock and vehicle passage is included in:
	  • Traffic Control Management Plan (Appendix D.2)
	  • HWCMP (Appendix D.9)
	  • WWHMP (Appendix D.13)

Sensory Disturbance	• Construct compressor stations according to regulatory guidelines, using appropriate measures to reduce noise.
	• Prohibit Project personnel from hunting or fishing on the work site.
	• Prohibit the recreational use of ATVs or snowmobiles on the work site.
	• Prohibit construction personnel from feeding or harassing wildlife. Dispose of food wastes and industrial waste properly.
	• Additional mitigation for sensory disturbance is included in:
	  • CMMP (Appendix D-6)
	  • HWCMP (Appendix D-9)
	  • WWHMP (Appendix D-13)

Human/Wildlife Conflict	• Human-wildlife conflict mitigation is included in: • HWCMP (Appendix D-9)

Barriers to Movement	• Leave gaps in windrows (i.e., grubbing piles, topsoil and surface materials, grade spoil, rollback, strung pipe) at obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s) who will determine in consultation with an Environmental Advisor whether consultation with a Resource Specialist or Qualified Professional is necessary. Gaps should align to allow wildlife and livestock passage.
	• Reclaim habitat connectivity by redistributing large-diameter slash (rollback) over select locations on the ROW. Final locations are to be determined as per the ACMP.
	• Mitigation for barriers to movement is included in:
	  • HWCMP (Appendix D.9)
	  • WWHMP (Appendix D.13)
	  • CMMP (Appendix D.6)
	  • GBMMP (Appendix D.8)

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Activity/Concern	Mitigation

Access and Line-of-Sight Management	• Implement measures to reduce access (human and predator) along the pipeline ROW following construction (e.g., during final cleanup).
	• Where rollback for access management is warranted, ensure sufficient timber or slash (e.g., stumps) of appropriate size is retained on-site for spreading over the ROW during final cleanup.
	• Deactivate and reclaim temporary construction access roads unless otherwise approved by the relevant regulatory authority
	• Additional mitigation is included in:
	  • Access Control Management Plan (ACMP) (Appendix D.3)
	  • CMMP (Appendix D.6)
	  • WWHMP (Appendix D.13)
	  • Timber Salvage Strategy
	  • Reclamation Program

Environmental Inspection and Monitoring	• Monitor the effectiveness of reclamation and access control efforts during the PCM Program. Implement remedial measures if warranted (i.e., adaptive management protocol). Schedule remedial work outside of sensitive (e.g., critical and cautionary periods for wildlife) if practical. • Refer to the Post-Construction Monitoring Program (PCMP)
Vegetation - General	• Implement all applicable mitigation outlined in the EMP under the headings of: clearing, maintenance, invasive plants and forest pests.
Red-listed Ecological Communities at Risk	• Mitigation is included in the Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (Appendix E.3). Additional mitigation regarding the White Bark Pine can be found in the *White Bark Pine Mitigation, Reclamation, and Monitoring Plan.*

Pre-Survey, Pest Management Plan (for all Native Vegetation Communities and Extra for Alpine/Subalpine Areas)	• Prior to clearing, assess forests along the Project route for the presence of forest pests that could be moved or worsened by Project activities. In alpine/subalpine areas, white-pine blister rust and mountain pine beetle are of particular concern. The assessment will be conducted by a forest professional. Implement the Forest Pest Management Plan as needed.
	• Mitigation is included in:
	  • Forest Pest Management Plan (Appendix D.7)
	  • Timber Salvage Strategy

Grasslands	• Mitigation is included in:
	  • Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (Appendix E.3)
	  • Reclamation Program

Alpine/Subalpine Areas	• Mitigation is included in:
	  • Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (Appendix E.3)
	  • Reclamation Program

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Activity/Concern	Mitigation
Existing Leave Trees/Patches	• Retain all “leave patches” and single “leave trees” left on the landscape by harvesting companies, and buffer with additional trees and shrubs whenever practical. • Retain leave patches to ensure a natural regeneration seed source is available and the natural range of community structure is retained (especially in areas affected by mountain pine beetle), whenever practical. • Narrow the work area at regular intervals and retain patches of natural species including trees, shrubs, herbs and groundcover species, depending on the type and distribution found in the area. Leave patches are preferred over single, leave trees.

Ecological Community and Species of Concern	• If ecological communities and species of concern are identified prior to or during construction, refer to the Ecological Communities and Species of Concern Discovery Contingency Plan (Appendix C.9).
	• Mitigation of sensitive resources should be reviewed with Contractor personnel before construction, to ensure personnel understand the procedures involved.
	• Additional Mitigation is included in:
	  • Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (Appendix E.3)
	  • Timber Salvage Strategy

Use of Herbicides	• Condition 16 of Schedule B to the EAC states: "The Holder must use alternative methods of vegetation control, as specified in the Holder’s Invasive Plant Management Plan, in the asserted territories of Aboriginal Groups that have requested that pesticides or herbicides not be used, and tracked in the Working Group Issue-Response Tracking Table (including First Nations) for the Coastal GasLink Pipeline Project, provided those alternative methods are consistent with the Integrated Pest Management Act." • Restrict the general application of herbicide near sensitive resources during the operations phase. Spot spraying, wicking, mowing or hand-picking are acceptable measures for weed control in these areas. • Prohibit the use of herbicides in proximity to an open body of water, unless the herbicide application is conducted by ground application equipment, or otherwise approved by the relevant regulatory authority. • Information and mitigation related to the use of herbicides is included in the Invasive Plant Management Plan (IPMP) (Appendix D.10).
Noxious Weed Infestations	• Mitigation for Noxious weed infestations is included in the IPMP (Appendix D.10).
Weeds	• Weed management mitigation is included in the IPMP (Appendix D.10).
Invasive Plants	• Implement the Invasive Plant Management Plan during the Project clearing activities (Appendix D.10).
Forest Parasites	If forest parasites are identified prior to construction, implement the mitigation included in: • Timber Salvage Strategy. • Forest Pest Management Plan (Appendix D.7).

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Activity/Concern	Mitigation
Culturally Modified Trees	If culturally modified trees (CMTs) are identified before construction, implement the following. • All CMTs, or suspected CMTs, will be recorded using Level I CMT Site Recording Forms in conjunction with BC Archaeological Site Recording Forms, following standards outlined in Archaeology Branch CMT handbook, Culturally Modified Trees of BC: A Handbook for the Identification and Recording of Culturally Modified Trees (2001). • Identified CMTs will be flagged for avoidance and a 5 m no-work zone established around them, where practical. • If identified CMTs cannot be avoided, an appropriate mitigation strategy will be determined in consultation with the relevant regulatory authority. If CMTs are identified during construction, refer to the Heritage Resource Discovery Contingency Plan (Appendix C.11).
Old Forest	If old forests are identified prior to construction, implement the following, where practical. • Avoid areas of old forest by: refining the construction footprint, relocating workspace, adjusting the equipment layout or location of the footprint, extending road or watercourse bores or narrowing the ROW or workspace. If that cannot be accomplished, construction methods should be altered to provide the greatest protection to the area. Options for altering construction methods are described in the Ecological Community and Species of Concern Discovery Contingency Plan (Appendix C.9). • In old forests that cannot be avoided, retain old structural elements (including old trees, standing dead trees, large stumps and downed logs supporting small tree and shrub vegetation). Identify areas on environmental worksheets and include in contract documents. • In old forests, if structural elements on the forest floor (e.g., large stumps and downed logs supporting small tree and shrub vegetation) cannot be avoided, cut the elements into large sections that can be moved out of the work area and back onto the work area after construction. Identify areas on environmental worksheets, flag in the field before clearing and include in contract documents. • In old forests, narrow the ROW to retain standing dead trees, where practical. In old forests, if standing dead trees cannot be avoided or are a safety hazard, cut the trees off as high as practical (3 m to 5 m). Stubbed trees will be retained for use by wildlife that transport seeds and plant parts and to assist natural regeneration.

Wetlands and Wetland Habitat	• Obtain required approvals for works in and around water under the *Water Sustainability Act* and the *Environmental Protection and Management Regulation*, where applicable. Authorization or notification under the *Fisheries Act* may also be required. Reduce activity within the riparian management area (RMA) of a wetland, except to facilitate a crossing or where it does not involve new clearing, unless leave is available and granted by BC OGC.
	• Conduct wetland crossings in accordance with Dwgs. STDS-03-ML-05-002, STDS-03-ML-05-003, STDS-03-ML-05-004, STDS-03-ML-05-005, STDS-03-ML-05-006, and STDS-03-ML-05-007 in Appendix B.
	• Wetland mitigation is included in:
	  • WMP (Appendix D.12)
	  • Reclamation Program

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Activity/Concern	Mitigation
Woodlots and Community Forests	• Develop agreements with forest tenure holders for economic losses associated with the reduction in merchantable timber. • Acquire Road Use Agreements with road permit holders for roads potentially affected by the Project. Discuss Project schedules, construction timeframes necessary for access, expected traffic volumes, road maintenance, road safety issues and radio frequencies.
Heritage and Palaeontological Resources	• If heritage or palaeontological features (e.g., arrow heads, modified bone, fossils) not previously identified are found on the ROW or facility site during construction follow conditions outlined in the Heritage Resource Discovery Contingency Plan (Appendix C.11). • Prohibit the collection of Heritage Resources (e.g., archaeological, heritage and palaeontological) by Project personnel. • Remove palaeontological resources from the ROW before construction begins, as recommended by the appropriate Resource Specialist. • Monitor areas flagged as higher potential for palaeontological remains as recommended by the appropriate Resource Specialist.

Traditional Land Use Sites Discovery – Prior to Construction	• In the event that traditional land use (TLU) sites are identified during studies with Indigenous groups carried out during Project development prior to construction for the Project, the sites will be assessed, and appropriate mitigation will be determined. The TLU site will be assessed based on the following criteria:
	  • the location of the TLU site with respect to the proposed area of activity
	  • the relative importance of the TLU site to the community
	  • the potential for an alteration of construction activities to reduce or avoid sensory disturbance
	• The types of accepted mitigation listed in the Resource-Specific Mitigation Table (Table 7-1) have been successful in mitigating effects on TLU sites. Alternative site-specific mitigation strategies may also be recommended by communities. The mitigation that may be implemented will be dependent on the type of site identified.

Traditional Land Use Resources	• If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12).

Grading	• Mitigation related to grading is included in
	  • WMP (Appendix D.12)
	  • Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (Appendix E.3)
	  • Reclamation Program

Seeding and Revegetation	• Refer to the Reclamation Program and detailed Reclamation Plans
Watercourse Crossings	• As required by permit condition, no construction activities will be undertaken within the Salmon River and associated RRZ between July 15 and June 15 except with leave of the BC OGC. • As required by permit condition, no construction activities will be undertaken within the Stuart River and associated RRZ between July 1 and June 15 except with leave of the BC OGC. • As required by permit condition, no clearing or significant maintenance activities will be undertaken within WHAs 6-283, 6-285 and 6-286 between September 1 and June 15 except with leave of the BC OGC.

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Table 7-1: Resource-specific Mitigation Table

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
Caribou Quintette (DU-9 Southern Mountain) KP 62.5_R2 to 65.0 Hart Ranges Caribou Range (DU-9 Southern Mountain) KP 137.2 to KP 189.3 Telkwa Caribou Range (DU-7 Northern Mountain) KP 527.7 to KP 578.0 Caribou UWR u-7-003 KP 139.1_R0 to KP 141.2 KP 157.6 to KP 159.8 KP 172.0 to KP 174.3 Proposed Telkwa Caribou WHA 6-333 KP 586.4_R6 to KP 591.6_R8	Protection of Caribou and Caribou Habitat	Critical timing windows of January 15 to July 15 for the Quintette, Hart and Telkwa herds, December 1 to January 1 for the Telkwa herd (BC MFLNRORD 2014).	• Where avoidance of caribou range is not practical, Coastal GasLink will limit project activities (i.e., clearing, construction and operational maintenance) in caribou range to avoid the timing window of January 15 to July 15 for the Quintette (KP 62.5_R2 to 65.0), Hart Ranges (KP 137.2 to KP 189.3), and Telkwa herd areas (KP 527.7 to KP 578.0), unless otherwise authorized by the relevant regulatory authority, and December 1 to January 1 for the Telkwa herd (KP 527.7 to KP 578.0) (BC MFLNRORD 2014), to the extent practical. Project activities (clearing or significant maintenance activities) that must occur within caribou range will be scheduled outside the calving and rearing period (May 15 to July 15) (consistent with BC OGC permit conditions, unless otherwise authorized). Coastal GasLink will also restrict the use of aircraft over caribou range during this period. Coastal GasLink will not undertake any clearing or significant maintenance activities within UWR u-7-003 between January 15 and July 15 (consistent with BC OGC permit conditions, unless otherwise authorized) and in proposed WHA-6-333 between May 15 and July 15 (consistent with BC OGC permit conditions, unless otherwise authorized); January 15 and July 15, and December 1 to January 1 for the Telkwa herd (KP 527.7 to KP 578.0) (BC MFLNRORD 2014) to the extent practical.	If Caribou or their site-specific habitat is discovered during future wildlife studies, follow conditions outlined in the Wildlife Species of Concern Discovery Contingency Plan (Appendix C.10). Additional detail regarding caribou mitigation and monitoring can be found in the CMMP (Appendix D.6).

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments

			• Report any sightings of caribou during construction and operations to Coastal GasLink's environmental personnel. Wildlife observations will be compiled and submitted to the relevant regulatory authority.
			• Consult with provincial regulators to determine an appropriate mitigation strategy to address potential adverse effects on caribou where the proposed route traverses areas identified as approved or proposed caribou UWR or Wildlife Habitat Area (WHA).
			• Mitigation is included in:
			  • the CMMP (Appendix D.6)
			  • Reclamation Program	

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
UWR u-9-001 (elk, mule deer, moose) u-9-001 UWR Murray River/Coldstream Creek KP 23.9_R3_R3 to KP 24.8 u-9-001 UWR Murray River/Coldstream Creek East KP 24.8 to KP 25.7	Potential Adverse Effects on UWR	Where practical, avoid clearing and construction activities during the critical winter months of November through April, in accordance with the UWR Order (BC MECCS 2005). The cautionary winter period for elk extends from January 15 to May 15. May 15 to July 15 is a critical period for elk (BC MFLNRORD 2011).	• Where practical, avoid clearing and construction activities during the sensitive winter months of November through April, in accordance with the UWR Order (BC MECCS 2005). Where not practical, ensure consultation occurs with the relevant regulatory authority before starting clearing and construction activities. • The cautionary winter period for elk extends from January 15 to May 15. Proceed with operations during this time period, subject to review by the relevant regulatory authority. It is recommended that operators avoid intensive activities or overlapping operations during these timeframes. As well, additional mitigation might be necessary (BC OGC 2013). • May 15 to July 15 is a critical period for elk (BC MFLNRORD 2011). Schedule clearing and construction to avoid the critical period. If this is not practical, consult with the relevant regulatory authority to develop appropriate mitigation and monitoring plans. • Report any wildlife sightings during construction and operation to Coastal GasLink's environmental personnel. Wildlife observations will be compiled and submitted to BC MFLNRORD. • Mitigation is included in the WWHMP (Appendix D.13).	
Mineral Lick Refer to WWHMP	Disturbance to Mineral Licks	Refer to WWHMP	• In the event that shifting/narrowing the Project footprint is not practical to maintain the minimum setback from a mineral lick, submit a leave request to the BC OGC as part of the BC OGC application, including rationale and, if appropriate, a mitigation strategy. • Mitigation is included in the WWHMP (Appendix D.13).	If Mineral Licks are discovered during future wildlife studies, follow conditions outlined in the Wildlife Species of Concern Discovery Contingency Plan (Appendix C.10).

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
VEGETATION				
Ecological Communities of Concern and Plant Species of Concern Tender sedge KP 83.0 Dwarf clubrush KP 83.0 Crawe's sedge KP 139.5 Little fescue KP 139.6 Smooth draba KP 139.6 Northern bog bedstraw KP 140.02 KP 186.1 Sickleleaf *Tomentypnum* moss KP 448.5 KP S_33.22 KP S_32.0 KP 453.3 KP 453.4 Canada anemone KP S_21.3 Whitebark pine KP 600.6_R7 KP 601.0_R7 KP 604.8_R1 KP 606.2_R1 KP 606.9_R1 KP 606.9_R1 Bog rush KP 644.4_R1 Bog-adder mouth orchid KP 644.4_R1	Disturbance to Ecological Communit-ies of Concern and Plant Species of Concern	N/A	• Ecological communities of concern and plant species of concern that are most likely to occur in the Project area are described in the Vegetation TDR (Appendix 2-J of the EAC Application) and include: those listed in the tables of previously documented ecological communities of concern and plant species of concern in the vicinity of the pipeline, and the tables of ecological communities of concern and plant species of concern that have potential to occur in the Project area. Though mitigation is based in part on the rank and biology of a community or species, it is also site-specific, and therefore, cannot be finalized prior to obtaining site-specific information. • Mitigation is included in the Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (Appendix E.3).	If Ecological Communities of Concern or Plant Species of Concern not previously identified are found on the ROW during construction, follow conditions outlined in the Ecological Community and Species of Concern Discovery Contingency Plan (Appendix C.9). All rare plant occurrences are located off the construction footprint with the exception of bog apple moss at KP 553.1, which is within the construction footprint. Only rare plant occurrences (no communities) are provided in this table. For a list of ecological communities, refer to Virtual Data Port or Table 2-1 in Appendix E.3.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
VEGETATION – SPECIFIC LOCATIONS				
Old Growth Management Areas (Legal) and Wildlife Tree Patches OGMA (Legal) Old Growth Management Areas (Legal) and Wildlife Tree Patches OGMA (Legal) KP 15.1_R0 to KP 15.3_R0 KP 15.4 to KP 16.4 KP 46.1 to KP 50.2 KP 135.3 to KP 138.3 KP 404.4 to KP 405.4 KP 459.8 to KP S_50.2 KP S_6.8 to S_6.8	Disturbance to Old Growth Manage-ment Areas (Legal) and Wildlife Tree Patches/ Reserves	N/A	**Old Growth Management Areas (Legal and non-legal)** • Temporary workspace will be limited in old growth management areas (OGMAs). • Coastal GasLink will develop a replacement or recruitment proposal for those areas where an incursion threshold is exceeded in consultation with the timber tenure holder and the relevant regulatory authority. Coastal GasLink will participate in the OGMA replacement process when the Project route is finalized, in consultation with BC MFLNRORD. **Wildlife Tree Patches** • Avoid or reduce disturbance within OGMAs and Wildlife Tree Patches (WTPs), where practical (e.g., narrow the width of the ROW, avoid extra temporary workspace).	None.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
OGMA (Non-Legal) KP S_11.7 to KP S_21.3 KP 550.6 to KP 550.6 KP 550.8 to KP 551.0 KP 557.4 to KP 557.6 KP 567.6to KP 571.0 KP 581.5 to KP 581.8_R0 KP 581.6_R0 to KP 581.8_R0 KP 584.8_R7 to KP 585.8_R7 KP 586.4_R6 to KP 586.4_R6 KP 70.8 to KP 70.9 KP 71.1 to KP 71.1 KP 268.3 to KP 272.6 KP 272.9 to KP 275.2 KP 275.2 to KP 275.3 KP 275.3 to KP 276.7 KP 276.7 to KP 278.8_R1 KP 278.9_R1 to KP 280.8 KP 281.1 to KP 281.1 KP 281.3 to KP 281.4 KP 281.5 to KP 281.6 KP 281.8 to KP 292.5	Disturbance to Old Growth Manage-ment Areas (Legal) and Wildlife Tree Patches/ Reserves	N/A	• A provincial OGMA replacement process has been established to guide the replacement of OGMAs that are affected by resource development activities (BC ILMB 2008). Participate in the OGMA replacement process, when the Project route is finalized, in consultation with relevant regulatory agencies. • In cases where WTPs cannot be avoided, develop an appropriate strategy to address disturbance of site-specific wildlife habitat values in the WTPs, in consultation with the relevant regulatory agencies.	None

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
KP 292.6 to KP 292.9				
KP 311.2 to KP 311.3				
KP 321.2 to KP 321.5				
KP 322.2 to KP 322.2				
KP 322.5 to KP 322.7				
KP 323.9_R0 to KP 324.2_R0				
KP 324.7_R0 to KP 325.0_R0				
KP 358.0_R0 to KP 358.1_R0				
KP 358.2_R0 to KP 358.2_R0				
KP 358.6_R0 to KP 358.8_R0				
KP 360.3_R0 to KP 360.3_R0				
KP 360.7_R0 to KP 360.8_R0				
KP 441.5 to KP 441.6				
KP 446.4 to KP 446.5				
KP 446.6 to KP 446.7				
KP 446.9 to KP 446.9				
KP 447.1 to KP 447.1				
KP S_7.2 to KP S_7.4				
KP S_7.9 to KP S_7.9				
KP S_21.3 to KP S_21.3				
KP 542.8 to KP 542.8				
KP 564.8 to KP 564.9				

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
KP 580.5 to KP 580.5 KP 582.1 to KP 582.1 KP 582.4 to KP 582.4				
AGRICULTURAL LAND RESERVE				
KP 0.0 to KP 15.2_R0 KP 20.6 to KP 23.4_R3 KP 25.2 to KP 27.1_R0 KP 27.2_R0 to KP 28.7_R0 KP 28.9_R0 to KP 28.8_R1 KP 39.5_R1 to KP 39.8_R1 KP 62.3_R3 to KP 64.0 KP 90.3_R0 to 91.1 KP 409.7 to KP 414.6	Disturbance to ALR	N/A	• Notify and maintain communication with agricultural crop producers near the Project route before starting land clearing and construction. Provide Project routing and scheduling information, as required, and identify specific access needs through the construction phase. • Repair damage to agricultural irrigation and drainage infrastructure. Close gates and ensure animals do not stray into planted fields. • Follow the Soil Erosion Contingency Plan (Appendix C.7) and Invasive Plant Management Plan (Appendix D.10) to reduce the introduction and spread of noxious weeds during Project construction activity. • Construction activities should not occur when the soil is extremely wet to prevent compaction and/or rutting of soil or mitigation measures will be implemented in accordance with the Wet Soils Contingency Plan. • Salvage the total thickness of topsoil to a maximum depth as indicated on the environmental worksheets. The Environmental Inspector will provide interpretation based on the Soils Assessment Report. .	None.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
	Disturbance to ALR	N/A	• Salvage upper surface material to a maximum of 15 cm to 20 cm using the environmental worksheets as a guide in forested ALR lands unless otherwise directed by an Environmental Inspector(s) or a soil specialist contracted to Coastal GasLink. • Salvage, store, and subsequently replace separately the upper surface material from subsoil wherever grading occurs. • Do not salvage topsoil or upper surface material under extremely windy or rainy conditions. • Apply water, snow, tackifier, or other suitable material to the salvaged topsoil or upper surface material as directed by Coastal GasLink in order to prevent erosion. • Monitor the effectiveness of the erosion control measures and implement remedial work where warranted. • Surface drainage must be consistent with the original natural drainage patterns, directions, and capacity, or be compatible with the surrounding landscape after construction. • Facilities and structures left in place after construction must not impede natural surface drainage and water flow. • Comply with the Agricultural Land Commission requirements regarding soil handling and reclamation during construction in the ALR. • The frequency and extent of erosion features must be similar to adjacent undisturbed land. • The contour of the surface must conform to adjacent land or be consistent with present or intended land uses after construction.	

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments

	Disturbance to ALR	N/A	• No visible evidence of slope movement, slumping, subsidence or tension cracks are allowed.
			• Gravel and rocks may not be piled, windrowed, or concentrated in one area unless it is approved by the landowner and improves the agricultural capability of the surface lease, or a qualified professional concludes it will not impede agricultural capability.
			• No industrial or domestic debris is allowed. No large wood debris that could be removed with a brush rake is allowed, unless permitted in writing by the landowner.
			• The following requirements must be met within 24 months of applying the seed mixture or introducing vegetation:
			  • seed mixtures must not increase the frequency or distribution of any weed species of the surface lease or on adjacent undisturbed ground
			  • seed mixtures must be Certified No. 1 seed mix or native species that are adapted to the climate and soils conditions of the Peace River region of BC (contact the local Ministry of Agriculture office for information or assistance), where available, in accordance with the Reclamation Program. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority or landowners
			  • native species must be similar to vegetation which would occur naturally on the undisturbed ground	

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
	Disturbance to ALR	N/A	• must be reclaimed to 80% or greater of the density and height on adjacent undisturbed ground • plants should be healthy based on a visual inspection of their vigour, height, and colour • the vegetation must cover 80% or greater of the soil surface if the species on the reclaimed site are similar to the vegetation on the adjacent undisturbed ground • where the species composition on the reclaimed site is different from the vegetation on the undisturbed ground, or the undisturbed ground has been cultivated, vegetation on the reclaimed site must cover 80% or greater of the soil surface • vegetation on the reclaimed site must be evenly distributed, or be similar to the distribution on the undisturbed ground	None.
TRADITIONAL LAND USE SITES – GENERAL				

Hunting and Wildlife Areas	Hunting	N/A	• Hunting and wildlife sites are areas where large mammals such as elk, moose, deer, caribou and bear are commonly harvested. Key wildlife species are identified both in community discussion and by observed game ambushes, blinds and hunting stands, dry meat racks and butchered animal remains. Furthermore, locales where game can be expected, such as mineral licks, calving areas and well-used game trails, are typically prized hunting areas.
			• Successful and accepted mitigation for hunting sites may include:
			  • adhering to species-specific timing constraints
			  • leaving breaks in the pipeline trench to allow animals to cross
			  • limiting the use of chemical applications
				If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12).
				
				Refer to Traditional Land Use environmental worksheets for site-specific mitigation.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments

Trapping Sites	Disturbance to Trapping Activities	N/A	• Indigenous individuals continue the practice of trapping and snaring for food and pelts. These traps and snares may or may not be located within registered trap lines.
			• To avoid accidental damage where the pipeline transects a trap line, mitigation could include:
			  • maintaining access to the trap line
			  • moving of trap line equipment by the trapper prior to construction
				If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12).
				
				Refer to Traditional Land Use environmental worksheets for site-specific mitigation.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments

Fishing Areas	Disturbance to Fishing Activities	N/A	• The practice of traditional fishing relates to the species harvested, fishing techniques, and the nature of specific reaches of lakes and rivers. Fishing methods may include but are not limited to: angling, jigging, spearfishing, dip netting, gill netting, and the construction and use of fish traps and weirs. While fishing activities vary with changes in seasonal water flow and variation in fish stocks, fisheries often exhibit habitual repeated use. Fishing areas include watercourse and waterbodies often in proximity to staging areas and/or access points to the waters. Secondary fishing activities relate to the processing of harvests, and may include processing yards, smokehouses, drying racks, and fish-grease rendering features.
			• Standard and effective mitigation for fishing areas may include:
			  • recording and mapping of fishing locales
			  • strict adherence to the regulations, standards and guidelines set by provincial and federal regulatory agencies for watercourse crossings
			  • use biodegradable hydraulic oil in excavators working within the wetted areas of watercourse crossings
				If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12).
				
				Refer to Traditional Land Use environmental worksheets for site-specific mitigation.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments

Plant Gathering Areas	Disturbance to Plant Gathering Areas	N/A	• Many Indigenous individuals harvest medicinal, ceremonial and food source plants. Plants are gathered in a variety of environments, which include old forests, along watercourses and in rugged or mountainous areas. Detailed information regarding medicinal plants is passed down from the Elders and is considered proprietary by the communities. Successful and proven mitigation for plant gathering areas may include:
			  • limiting the use of chemical applications
			  • replacement of plant species during reclamation
			  • avoidance of the site
				If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12).
				
				Refer to Traditional Land Use environmental worksheets for site-specific mitigation.

Trails and Travelways	Disturbance to Trails and Travelways	N/A	• Travel corridors are essential for conducting traditional activities and accessing cultural landscape features. Trails include well-defined ATV and snowmobile corridors, navigable waterways, river portages and historic foot, dog sled and pack horse pathways.
			• Successful and proven mitigation available to trails transecting the pipeline ROW include:
			  • detailed recording and mapping to within 100 m on both sides of the pipeline ROW; in partnership with community representatives, a decision is then made about the relative importance of the trail and, if warranted, how best to maintain and control access
			  • other mitigation includes signage or scheduling construction during periods of least effect
				If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12).
				
				Refer to Traditional Land Use environmental worksheets for site-specific mitigation.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
Habitation Sites	Disturbance to Habitation sites	N/A	• Habitation sites include traditional campsites, cabins and settlements. Campsites typically have defined hearths (fire rings), de-limbed trees, tent frames or miscellaneous cached or discarded camping supplies and equipment. Cabin structures represent a more permanent occupation of the land and include central log or timber-framed structures, traditional activity areas such as drying racks and smoking tents, and ancillary equipment storage areas. • A group of cabins or campsites may signify a long-term or intermittent occupation. A settlement may have been used seasonally or throughout the year, depending on location or necessity. The relative size and nature of habitation sites continuously evolve based on how families and communities grow and often expand from campsites to cabins and possibly to settlements. • Successful and proven mitigation for habitation sites include: • detailed mapping, photographic recording and avoidance of the location by the proposed development • should avoidance of a site not be practical, mitigation consisting of detailed recording and controlled excavations may be implemented	If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12). Refer to Traditional Land Use environmental worksheets for site-specific mitigation.

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Table 7-1: Resource-specific Mitigation Table (cont'd)

Location[a)]	Issues	Timing Windows and/or Regulatory Guidelines	Mitigation	Comments
Gathering Places	Disturbance to Gathering Places	N/A	• Indigenous people often gathered to share in ceremonial activities, exchange items of trade, arrange and celebrate marriages, and for other activities. Additionally, indigenous grave sites are sometimes recorded in the general area of large gathering places. Such gathering places have historical, ceremonial, cultural and economic significance to Indigenous groups. • Potential adverse effects on gathering places may be mitigated through detailed recording, mapping and avoidance; however, the visual effect will be assessed in the field and mitigation will be refined and optimised, if warranted.	If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12). Refer to Traditional Land Use environmental worksheets for site-specific mitigation.
Sacred Areas	Disturbance to Sacred Areas	N/A	• These areas include burials, vision quest locations, rock art panels, birth locations and ceremonial places, among others. A particular element is often only a small component of a larger spiritual complex, which can encompass topographic features and may, by its very nature in the context of Indigenous spirituality, be inestimable and irreplaceable. • Mitigation for sacred areas may include detailed recording, mapping and avoidance; however, additional mitigation, if warranted, will be refined and optimised in the field and through community discussions.	If TLU sites not previously identified are found on the ROW during construction, follow conditions outlined in the TLU Sites Discovery Contingency Plan (Appendix C.12). Refer to Traditional Land Use environmental worksheets for site-specific mitigation.

Note:
a) All locations are approximate. Refer to environmental worksheet sheets for additional details.

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7.2 ADDITIONAL PROJECT-SPECIFIC PROTECTION MITIGATION

7.2.1 Introduction

This section of the EMP describes the specific mitigation that is unique to the Project, in addition to the resource-specific mitigation outlined in Table 7-1.

7.2.2 Objectives

The objectives of this mitigation are to:

- ensure that mitigation is relevant to the Project area and unique circumstances of the Project
- ensure that unique Project mitigation is easily identifiable and clearly understood by Coastal GasLink, its representatives, Contractors(s), and sub-contractor(s)

7.2.3 Specific Measures

Activity/Concern	Mitigation
Morice River Floodplain	• Avoid road construction in the Morice River 100-year floodplain, where practical.
Area-Specific Management Zones	• Reduce timber harvesting in the Herd Dome and Morice River Area-Specific Management Zones (ASMZs), where practical.
Aggregate Pits	• Avoid construction of the Project in aggregate operations, where practical.
Recreation Areas	• Reduce disturbance to commercial recreation operations in the Project area to the extent practical.
Recreational/Traditional Trails	• Restore any identifiable trails traditionally used by Indigenous groups that were impacted by construction, to the level of access that existed before construction, if the location is made known by an Indigenous group before the notice of construction start. • Restore recreation sites, recreation trails or recreation facilities established or authorized under the *Forest and Range Practices Act* that are affected by construction activities to their construction preparation condition, as soon as practical.
Three-Lift Soils Handling	In areas that have been identified as requiring three-lift soils handling, implement the following: • Salvage topsoil and surface material during non-frozen conditions from the trench and spoil area on lands requiring three-lift soils handling (Dwg. STDS-03-ML-05-426). Salvage topsoil and surface material during frozen soil conditions from a blade width centred over the trench (Dwg. STDS-03-ML-05-411). Salvage the upper subsoil from a width that accommodates the width of the upper trench during both non-frozen and frozen soil conditions. The depth of material to be removed during the upper subsoil lift will be directed by the Environmental Inspector(s). • If minor problems that may result in loss of soil capability arise during construction, follow conditions outlined in the Soil Handling Contingency Plan (Appendix C.6).

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7.3 ADDITIONAL PROJECT-SPECIFIC PROTECTION MITIGATION – MARBLED MURRELET

7.3.1 Assessment of Critical Habitat

Spatial data delineating polygons that may contain critical marbled murrelet habitat were defined in the recovery strategy developed by Environment and Climate Change Canada (ECCC). Coastal GasLink conducted an aerial survey of all areas within 100 m of the Project footprint (i.e., the pipeline route, ancillary sites, and roads) from KP600 to KP666. Specifically, areas surveyed were those that overlapped either an ECCC polygon or were identified as high, moderate or low suitability in the habitat suitability models prepared for the EAC Application. The survey compared actual conditions with the polygons provided by ECCC and the habitat suitability mapping prepared in support of the EAC Application.

Based on the results of the assessment of critical habitat, five route adjustments were recommended that would further avoid or minimize Project effects on marbled murrelet habitat. Coastal GasLink has reviewed the recommendations and is proposing to carry four of the recommendations forward, pending final design considerations. The four route adjustments substantively reduce the amount of suitable marbled murrelet nesting habitat within the ECCC polygons that would have overlapped with the original Project footprint area to be cleared (Table 7-2). Although in some areas the Project footprint, including recommended route adjustments, does overlap with ECCC polygons, there are several areas where the habitat would not be considered critical habitat (i.e., as defined by the biophysical attributers in Appendix C of the recovery strategy). Coastal GasLink was not able to accommodate one of the suggested realignments (between KP 636.6 and KP 637.0) due to terrain and construction constraints and has reviewed this situation with ECCC to validate the acceptable path forward.

Table 7-2: Summary of Changes in the Project Overlap with Environment Canada Polygons

Suggested Adjustment	KP Range of Original Route	Overlap between ECCC Polygons and Original Route (ha)	Overlap between ECCC Polygons and Proposed Re-Route (ha)	Reduction of Overlap with ECCC Polygons (ha)
Adjustment #1	KP 634.4 to KP 635.0	2.27	0.11	2.16
Adjustment #2	KP 636.6 to KP 637.0	Adjustment cannot be accommodated		
Adjustment #3	KP 637.5 to KP 638.5	8.71	5.88	2.83
Adjustment #4	KP 643.7 to KP 644.6	5.28	0.62	4.66
Adjustment #5	KP 659.5 to KP 660	3.31	0.41	2.90

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7.3.2 Implementation of Mitigation

Mitigation that was included in the EAC Application and which pertain to marbled murrelet during the construction preparation and construction phases are described in the following subsections.

Construction Preparation

The following Project-specific mitigation has been implemented during the design phase, prior to construction, to avoid or reduce Project-related effects on marbled murrelet:

- Old Growth Management Areas (OGMAs) and other old-growth forest that may provide nesting habitat for marbled murrelet were avoided, where practical, by aligning the Project route and associated features with existing disturbances.
- Temporary workspace was sited to avoid or minimize overlap with OGMAs, where practical.
- The route was sited along existing linear disturbances (i.e., pipeline, utility, seismic and road ROWs), where practical, to avoid or reduce fragmentation of habitat.
- Existing clearings were identified for use as shared workspace to reduce the amount of new clearing and land disturbance needed.
- The length of route traversing marbled murrelet habitat was minimized, where practical.
- The Project was designed to use existing access, to the extent practical.

Construction

The following Project-specific mitigation to avoid or reduce Project-related effects on marbled murrelet critical habitat during construction will be implemented:

- Application of a 30 m buffer, where practical, if a marbled murrelet or its nest is discovered during construction preparation surveys.
- Activation of the Wildlife Species of Concern Discovery Contingency Plan if a marbled murrelet or its nest is discovered incidentally. This will include:
  - Immediately suspending work in the vicinity of the occupied site or nest
  - Notifying the Environment Inspector

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- Assessing the discovery and either allowing construction to resume if no adverse effect is expected or maintaining the work suspension until the effect can be satisfactorily mitigated. This assessment may require consultation with:
  - applicable government agencies (e.g., BC OGC, BC MFLNRORD, ECCC)
  - a Resource Specialist
- Clearing vegetation in identified critical habitat outside of the marbled murrelet breeding period of April 1 to September 15 (BC MFLNRORD 2014) to the extent practical.
- Altering or delaying construction activities to avoid sensory disturbance (e.g., no burning).
- At the discretion of Coastal GasLink, a Resource Specialist may need to visit the site to develop a site-specific mitigation plan in consultation with Coastal GasLink's Environmental Inspector.

7.3.3 Marbled Murrelet Monitoring

A monitoring program may be developed in consultation with ECCC, BC MFLNRORD and BC OGC. The monitoring program would be consistent with the monitoring strategies outlined in the federal Recovery Strategy. Monitoring provisions may include:

- monitoring for marbled murrelet occupancy in terrestrial habitat before and during Project-related activities
- assessing and reporting on changes in the amount of critical habitat potentially and actually affected
- developing protocols for maintaining records of marbled murrelet observations

7.3.4 Reporting

Reporting may be linked to specific Project phases or to specific milestones pertaining to mitigation and monitoring (if required) of marbled murrelet. Should a monitoring program be required, Coastal GasLink will provide copies of any reports to ECCC, BC MFLNRORD and BC OGC. A single agreed-upon reporting schedule will be developed through consultation with each of these agencies.

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7.4 ADDITIONAL PROJECT-SPECIFIC PROTECTION MITIGATION – WHITEBARK PINE

7.4.1 Introduction

Coastal GasLink will implement mitigation to avoid and reduce the potential environmental adverse effects to whitebark pine and whitebark pine communities, and facilitate fast and successful reclamation of areas disturbed by pipeline construction. The appropriate mitigation will be included on the environmental worksheets.

The recommended whitebark pine mitigation was developed by a registered forest professional in accordance with TC Energy standards, as well as provincial and federal legislation and guidance including:

- SARA
- BC *Wildlife Act*
- Environmental Protection and Management Guideline (BC OGC 2018)
- BC *Forest and Range Practices Act* and Invasive Plants Regulations (BC Reg 18/2004)
- Environmental Protection and Management Regulation (BC Reg 200/2010)
- Community Charter Spheres of Concurrent Jurisdiction - Environment and Wildlife Regulation (BC Reg 144/2004)

Per the provisions of Section 4, Environmental Compliance, of the EMP, the following information will be subject to the processes in place to aid in decision making at the field level. The implementation of mitigation will occur under the direction of the Environmental Inspector with support from Resource Specialists as required.

EAC Condition #18

Where the Project footprint intersects with whitebark pine, the Holder must:

(i) describe the implementation plan for the mitigation set out in the EAC Application Section 8, Table 8-1 and Table 8-7;

(ii) provide a whitebark pine density analysis and identify additional site-specific mitigation that will be carried out by the Holder, such as cone collection, propagation and planting; and

(iii) consult with ECCC and BC MFLNRORD on (i) and (ii) and provide copies to BC OGC prior to the Holder's planned date to commence Construction.

The Holder must implement additional site-specific mitigation as set out above.

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7.4.2 Construction Preparation

Objectives

- All resources are properly identified and marked in the field before the initiation of ground disturbance to avoid or reduce potential adverse project effects.
- Project footprint is properly identified in the field to prevent inadvertent trespass.
- All access to and from the work sites are properly marked to maintain safety and environmental compliance.

Mitigation

- Once the construction footprint is finalized, a supplemental vegetation survey will be done prior to clearing activities within the whitebark pine habitat (approximately KP 580-610) to determine whether all whitebark pine trees have been avoided. Whitebark pine trees that are not avoided must be properly tallied and clearly marked in the field.
- Avoid areas with whitebark pine trees by using a variety of techniques or available technologies (e.g., route refinement, construction footprint planning, detailed engineering design) that are appropriate to the area, where practical, especially in areas that contain several healthy, maturing and mature trees.
- Avoid route alignments that cross mid and upper slopes of rock outcrops, where practical, as these areas are typically where whitebark pine plant community occurs.
- Whitebark pine can occur near subalpine fens. In order to avoid whitebark pine, ensure the Project route is set back from subalpine fens as much as practical.
- Avoid route alignments that traverse south-facing slopes, where practical. Concentrating the alignment and particularly workspace on north aspects (will impact less of whitebark pine habitat).
- If avoidance of whitebark pine areas is not practical, adjust construction methods (e.g., relocate any planned workspace, limit temporary workspace in the area, adjust the equipment layout, extend road or watercourse bores under stands, or narrow the ROW or workspace, provide alternative measures for equipment to travel past the area of concern [e.g., protection matting, or snow under frozen conditions, drive around]) in order to provide the greatest protection to the whitebark pine community.
- If whitebark pine trees are slated to be removed, consider planting whitebark pine seedlings on the ROW during reclamation. The clearing and planting will require a seed collection program (cones take approximately 2 years to mature). Adhere to the appropriate collection techniques.

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- Retain the natural range of alpine/subalpine plant community types and structure by implementing mitigation such as retaining diverse micro-habitats as "leave patches". Flag in the field prior to construction activity.
- Once all whitebark pine have been identified, create a buffer of 20 m between timber decking sites and the plant population.
- Mitigation of sensitive resources (e.g., conditions outlined in the Ecological Community and Species of Concern Discovery Contingency Plan) should be reviewed with Contractor personnel before construction, to ensure personnel understand the procedures involved.
- Ensure ecological communities of concern within or adjacent to the Project footprint are clearly marked with signs to alert workers to these features and ensure they are protected.
- Potential parent trees displaying blister rust resistance will be identified before construction, if cone collection is required. If avoidance of these trees is not practical, coordinate with local Resource Specialists to collect cones from these trees before clearing.

7.4.3 Pipeline Construction

Objectives

- Avoid and reduce the potential environmental adverse effects to whitebark pine associated with general pipeline construction activities.
- Restrict the Project footprint to approved workspace in whitebark pine areas.
- Limit the disturbance to whitebark pine and surrounding vegetation to the extent practical.
- Reduce surface disturbance to the extent practical.
- Conserve surface material to facilitate reclamation of disturbed lands and promote the natural regeneration of vegetation.
- Reduce potential adverse effects to soil capability, surface drainage patterns, land use, and wildlife habitat.
- Establish a vegetative cover compatible with surrounding vegetation and land uses.
- Maintain equivalent land capability, ensuring the ability of the land to support various land uses similar to the uses that existed before construction, but not necessarily identical.

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Mitigation

- If avoidance of whitebark pine areas is not practical, salvage small whitebark pine trees prior to the commencement of construction in the area. Consult the vegetation Resource Specialist on appropriate testing for blister rust resistance. Trees up to 75 cm tall have been salvaged and replanted successfully (Moody, pers comm).
- If avoidance of whitebark pine areas is not practical, narrow the working area in whitebark pine areas, where practical, and retain patches with old dead and dying and younger healthy trees as well as the associated shrub, herb, and groundcover understory. The old dead and dying trees are choice perch sites for corvids, which disperse whitebark pine seeds. In areas, where retained standing dead trees are deemed a safety hazard, cut the trees off as high as is practical and safe (3 m to 5 m).
- If whitebark pine that are not previously identified are found on the ROW during construction, follow the conditions outlined in the Ecological Community and Species of Concern Discovery Contingency Plan, found in Appendix C.9 of EMP.
- Restrict access at the site and clearly mark with flagging and signage to inform all users of the restrictions.
- Reduce topsoil stripping, grading or grubbing to the extent practical to protect plant root systems.
- Conducting careful topsoil salvage at the site, storing topsoil separately and ensuring it is returned to the exact location from where it was stripped.
- Temporary cover the site (e.g., geotextile pads, flex net, snow, rig/swamp mats, plywood) to reduce physical disturbance of the vegetation/soil surface.
- For construction in whitebark pine areas, construct when the ground is frozen and there is full snow cover, if practical.
- Fence and flag community components or populations that are outside the footprint to prevent incidental damage.
- Use only Certified No. 1 seed mix or native species in accordance with the Reclamation Program. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority.
- Areas where whitebark pine seedlings are planted should be monitored for occurrences of white pine blister rust alternative host species, including native currant and gooseberry shrubs (*Ribes* spp.), Indian paintbrush (*Castilleja miniata*) and lousewort (*Pedicularis bracteosa* and *P. racemosa*). These species should be removed if they are found, to limit the spread of white pine blister rust.
- The above-noted species will not be planted or seeded in whitebark pine areas.

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8.0 PIPELINE CONSTRUCTION

8.1 GENERAL ENVIRONMENTAL PROTECTION MEASURES

8.1.1 Introduction

The general environmental protection measures provided below are applicable to all work areas throughout the construction phase. These general measures are followed by detailed specifications for each phase of new pipeline construction.

For the purpose of the EMP, topsoil refers to soils within agricultural lands, including the ALR, and is defined in the following ways:

- the layer of soil that is tilled or cultivated, or the A horizon on agricultural developed lands (including improved hay and pasture lands)
- in ALR forested areas, surface material refers to soils consisting of approximately 50% organic matter (duff layer) and 50% mineral soil, or approximately the upper 15 20 cm (i.e., surface material removal)

As per the Coastal GasLink Erosion and Sediment Control Plan, the Primes Certified Professionals in Erosion and Sediment Control (CPESCs) are responsible for determining erosion and sediment control measures, however the Environmental Inspector(s) may also provide direction to address regulatory requirements and reduce environmental risk.

8.1.2 Objective

The objective of this mitigation is to avoid or reduce the potential environmental adverse effects associated with general pipeline construction activities.

8.1.3 Specific Measures

Activity/Concern	Mitigation
Regulatory Contact	• Document all field regulatory contacts and forward to the Construction Manager and the Environmental Advisor. • Discuss environmental issues that are identified during construction as necessary between the Environmental Inspector(s) and the relevant regulatory agencies.
Waste Disposal	• The Contractor will collect and dispose of all construction debris and other waste materials daily in accordance with the Chemical and Waste Management Plan (Appendix D.1) and the Spill Contingency Plan (Appendix C.1) unless otherwise authorized by the Environmental Inspector(s).
Contaminated Soils	• In the event contaminated soils are encountered during construction, implement the Contaminated Soils Management Plan.

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Activity/Concern	Mitigation
Spill Prevention	• Follow provincial regulations as outlined in the Chemical and Waste Management Plan (Appendix D.1) for dealing with procurement, storing and handling of hazardous materials required for the Project infrastructure.
Fire Prevention	• Ensure that personnel are made aware of the proper disposal methods for welding rods, cigarette butts and other hot or burning material. • Smoke only in designated areas. • Ensure the Contractor has the necessary fire-fighting equipment on hand that is capable of controlling any fire that may occur as a result of their activities. • Only burn slash if permission is granted from the regulating authorities and if conditions permit. If burning is delayed, store slash in approved workspaces as designated by the Environmental Inspector(s) or designate. Other end uses for non-merchantable timber may be employed as accepted by Coastal GasLink. • In the event of a fire or high fire hazard conditions, follow the suppression measures of the Fire Suppression Contingency Plan (Appendix C.5). • Obtain applicable permits prior to burning slash. Follow guidance in the Open Burning Smoke Control Regulation (BC Reg. 145/93). • Maintain a water truck on the ROW when fire hazard is high and air temperatures allow. • Do not burn slash if the fire hazard is high. If burning is delayed, store slash within permitted areas along the ROW and approved workspaces as designated by the Environmental Inspector(s) or designate. Resume burning once the fire hazard is low. Slash may only be burned if conditions permit. • Fire Danger Class Ratings (http://bcwildfire.ca/Weather/danger.htm) must be obtained daily from a representative weather station and work must be conducted within restrictions and durations set out in Schedule 3 of the BC *Wildfire Regulations* (http://www.bclaws.ca/Recon/document/ID/freeside/11_38_2005#Schedule3).
Use of Workspace	• Restrict all construction activities to the approved, surveyed ROW, and approved temporary workspace, existing roads and approved shooflies. All construction traffic will adhere to safety and road closure regulations. • Temporary workspace will be limited in old growth management areas (OGMAs) that are within or outside of old forests, where practical. • Reduce the amount of disturbance by using previously disturbed areas for stockpiles and temporary construction camp sites, where practical.
Fences	• Properly brace all fences cut for construction and equip with temporary gates. Temporary gates will be a minimum of three-wire. Keep gates closed, except during passage of vehicles.

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Activity/Concern	Mitigation

Equipment Refuelling and Servicing	• The Contractor will ensure equipment is well-maintained and free of fluid leaks.
	• Ensure that bulk fuel trucks, service vehicles, and pick-up trucks equipped with box-mounted fuel tanks carry spill prevention, containment, and cleanup materials that are suitable for the volume of fuels or oils carried. Carry spill contingency material on bulk fuel and service vehicles that is suitable for use on land and water.
	• Do not store fuel, oil, or hazardous material within 100 m of a watercourse or waterbody except where secondary containment is provided.
	• Conduct refuelling at least 100 m away from any watercourse or waterbody when practical, or where secondary containment is provided in a location approved by an Environmental Inspector where spills will not enter any watercourse or waterbody.
	• Employ the following measures to reduce the risk of fuel spills in water. Where equipment refuelling is required within 100 m of a watercourse or waterbody, ensure that:
	  • secondary containment is provided
	  • all containers, hoses, nozzles are free of leaks
	  • all fuel nozzles are equipped with automatic shut-offs
	  • operators are stationed at both ends of the hose during fuelling unless the ends are visible and readily accessible by one operator
	  • fuel remaining in the hose is returned to the storage facility
	• In the event of a spill, refer to the Spill Contingency Plan (Appendix C.1).
	• Do not wash equipment or machinery in watercourses or waterbodies or in any location where wash water can enter a watercourse or waterbody.
	• Equipment to be used in or adjacent to a watercourse or waterbody will be clean or otherwise free of external grease, oil or other fluids, excessive muds, soil and vegetation, prior to entering the waterbody.
	• Place an impervious tarp underneath equipment/vehicles when servicing equipment/vehicles with the potential for accidental spills (e.g., oil changes, servicing of hydraulic systems, etc.). Refer to the Spill Contingency Plan (Appendix C.1).

Air Quality and Emissions	• Reduce idling of equipment, where practical. • The Contractor will ensure equipment is well-maintained. • Transport workers between the temporary construction workforce accommodations and muster areas to worksites by multi-passenger vehicles, where practical. • Comply with local government bylaws, the BC Open Burning Smoke Control Regulation and the Forest Fire Prevention and Suppression Regulation when burning land-clearing debris.
Dust Control	• Where traffic as a result of the Project creates a hazardous or irritating level of dust to nearby residents, dust control on existing access roads will be achieved through the application of water or discussion with the appropriate landowner. Only water will be used for dust control on the ROW.
Noise	• Ensure that noise abatement equipment on machinery is in good working order. • Reasonable measures must be undertaken to mitigate noise from construction activity that has the potential to affect public safety or significantly impair the use and enjoyment of lawfully occupied permanent dwellings, significant public use areas during periods of use or other similar areas.

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Activity/Concern	Mitigation
Public Access	• Discourage unauthorized public vehicle access along the ROW during construction through the use of signs.
Firearms/Pets	• Project personnel will not be permitted to have firearms or pets on the worksite with the exception of designated wildlife monitors, where warranted. Refer to Condition 25 of Schedule B to the EAC
Bar Ditch Ramps	• Construct bar ditch ramps with subsoil, or snow or ice. Do not use topsoil to construct bar ditch ramps.
Acid Rock Drainage	• Where acid rock drainage (ARD) conditions or potential acid generating (PAG) exist, mitigation will be implemented in accordance with the Acid Rock Construction Response Plan (Appendix C.13).
Mountainous Terrain (i.e., Avalanches, Landslides, etc.)	• Detailed on-site investigations by a qualified Professional Geoscientist (P.Geo.) or a Professional Geotechnical Engineer (P.Eng) will occur on sites identified as showing evidence of, or showing potential for, landslides or avalanches.
Environmental Worksheets	• The environmental worksheets will include appropriate site-specific mitigation to be implemented at each site where an ecological community of concern or plant species of concern occurs within the Project footprint. • The environmental worksheets provide information about appropriate site-specific mitigation as additional detail to the Construction Alignment Sheets.
Foreign Pipelines	• Construct ramps on the work side of the ROW over existing foreign pipelines as per Crossing Agreements.

8.2 CLEARING

8.2.1 Introduction

The following measures will be implemented by Coastal GasLink's Contractor and subcontractor(s) during the clearing phase of pipeline construction.

8.2.2 Objectives

The objectives of this mitigation are to:

- restrict the Project footprint to approved workspace
- limit the disturbance to vegetation (i.e., merchantable timber and native vegetation) to the extent practical
- reduce surface disturbance to the extent practical
- promote the natural regeneration of vegetation

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8.2.3 Specific Measures

Activity/Concern	Mitigation
Clearing	• Clear timber and brush and other vegetation within the marked ROW and temporary workspace boundaries. Clearing methods will take into account landowner and leaseholder requirements. • Remove off-ROW trees that are a safety hazard during construction activity following notification to the Environmental Inspector(s). • Fell all trees damaged during clearing and construction immediately. A damaged tree is defined as one that has fractures or has bark loss for 50% of its circumference. • Conduct clearing near watercourses or wetlands as described in Section 7.1 and Section 8.4 of the EMP. • During clearing, fell trees towards the ROW, wherever practical. Recover trees that inadvertently fall into adjacent undisturbed vegetation. • Avoid disturbance to environmentally sensitive features during clearing as identified by the appropriate signage or fencing. The Environmental Inspector(s) and appropriate Resource Specialist or Qualified Professional, where required, will determine the size of avoidance buffer surrounding these features, if appropriate. • Where practical, leave stumps in place, particularly on streambanks, to provide surface stability. Dispose of stumps removed from the required work areas by burning or chipping, or stockpile for use in access or line-of-sight control. • Retain a forested or shrub buffer between existing linear corridors (such as utility corridors or roads) and the Project footprint during clearing and construction, as practical, or unless otherwise directed by the relevant regulatory authority.
Known Archaeological Sites	• Limit clearing at known archaeological sites as directed by the relevant regulatory authority, BC OGC or BC MFLNRORD Archaeology Branch.
Rollback	• Where segments of the ROW require rollback for access management or erosion control, ensure sufficient timber of appropriate size is available. • In consultation with the relevant regulatory authority via the Access Control Management Plan and Reclamation Program, determine potential rollback locations and material to be used. If changes to rollback locations and materials are required, refer to Access Control Management Plan and Reclamation Program for additional consultation requirements. • Place rollback in a manner that does not create or enhance a fire hazard along the ROW. • Implement the ACMP (Appendix D.3).
Grading	• Reduce grading throughout the ROW, especially at watercourses, wetlands, and rare plant sites and on moderately steep slopes, if practical. Reduce the width of grading in order to limit the potential for erosion and subsoil compaction, where practical. • Where practical, avoid grading in riparian areas until installation of the vehicle crossing.
Temporary Berms	• Install sediment control structures such as temporary berms on approach slopes to watercourses following grading, as required (Dwgs. STDS-03-ML-05-001, STDS-03-ML-05-608, STDS-03-ML-05-132, STDS-03-ML-12-221, STDS-03-ML-12-222, and STDS-03-ML-12-223). Inspect the temporary sediment control structures on a daily basis and, if repairs are required, complete before the end of each working day.

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Activity/Concern	Mitigation
Wet Terrain/Muskeg	• In the event that nonfrozen soils are encountered during construction, refer to the Wet Soils Contingency Plan (Appendix C.4). Install corduroy, wooden mats or equivalent in areas of wet soils to reduce terrain disturbance and soil structure damage. These materials will be removed during cleanup.
Merchantable or Salvageable Timber	• Adhere to industry guidelines, as appropriate, regulations and Codes of Practice outlined in the Forest Practices Code of BC Act: *Timber Harvesting and Silviculture Practices Regulation and Forest Practices Act*. • Salvage and deck timber as denoted in the Timber Salvage Plan or as directed by the landowner (see Dwgs. STDS-03-ML-05-301 and STDS-03-ML-05-302). • Do not bulldoze salvageable timber. • Suspend timber skidding operations or implement alternative measures, if the potential exists for merchantable timber to be damaged through contact with wet or muddy soils.
Decking Sites	• Locate deck sites in previously-disturbed areas, wherever practical. Avoid grading at deck sites unless otherwise directed by Coastal GasLink. Do not salvage surface materials at deck sites unless Coastal GasLink has directed that grading may occur.
Non-merchantable Timber	• To assist in maintaining an intact ground surface in areas where grading is not necessary, implement minimum surface disturbance techniques, such as brushcutters, brushhogs or other equipment.
Grubbing	• Grub tree roots, where required, to preserve surface organic material. • In forested areas, reduce subsurface root damage by limiting grubbing to the ditch line and areas to be graded. • Use a stump mulcher rather than grubbing on areas where surface material removal and grading are not necessary. • Reduce grubbing near watercourses, muskeg, and other wet areas to facilitate the reclamation of shrub communities. Reduce disturbance at riparian areas where practical.
Disposal	• On Crown lands, timber and brush disposal options are subject to agreements with the relevant regulatory authority. • On private lands, timber and brush disposal options are subject to agreements with landowners, occupants or the relevant regulatory authority where public lands are intersected. • Dispose of all timber material not salvaged for merchantability through burning or mechanical chipping, unless otherwise directed by the Environmental Inspector(s)/Construction Manager. • Merchantable timber will be transported to conversion facilities or other end users including interested Indigenous groups. • Obtain applicable permits prior to burning slash. Follow guidance in the applicable regulations (Open Burning Smoke Control Regulations [BC Regulation 145/93]). • Do not undertake burning within 100 m of a waterbody, unless otherwise authorized by the Environmental Inspector(s). • Implement techniques to limit smoke production including limiting pile size, reducing moisture content, and maintaining loose burning piles with minimal soil.

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Activity/Concern	Mitigation
Disposal (cont'd)	• Avoid locating burn piles on peat-rich areas where residual fires could persist after construction. Burn piles will be located on areas where surface material has been removed. • If timber and brush are disposed of by mechanical means (i.e., mulching), the maximum depth of mulch is 5 cm or in accordance with the applicable provincial regulation, whichever depth is less, or as agreed to with the applicable authorities. Obtain landowner authorization prior to initiating mulching activity, as needed. • Do not bury stumps and debris.

8.3 SURFACE MATERIAL REMOVAL, SALVAGE AND GRADING

8.3.1 Introduction

Construction on forested lands is primarily completed under frozen conditions. Procedures for non-frozen conditions are included in the event that construction takes place in alternate seasons.

8.3.2 Objectives

The objectives of this mitigation are to:

- conserve surface material to facilitate reclamation of disturbed lands
- reduce potential adverse effects to soil capability, surface drainage patterns, land use, and wildlife habitat
- comply with regulatory requirements
- employ environmentally and economically responsible construction practices at all times and in accordance with applicable industry standards

8.3.3 Specific Measures

Activity/Concern	Mitigation
Snow Management	• Gaps in snow berms will be provided at least every 500 m if snow berms reach higher than 1.5 m (BC MECCS 2011) to allow wildlife movement. Gaps in snow berms will correspond to breaks in pipe, soil stockpiles and windrows. Locations of gaps will align with obvious wildlife trails, where practical, and will be determined in the field by the Environmental Inspector(s) who will determine in consultation with an Environmental Advisor whether consultation with a Resource Specialist or Qualified Professional is necessary. If the spacing of breaks cannot be achieved, Coastal GasLink will consult with a Resource Specialist for advice on additional mitigation. • In the event of excessive snow depths, discuss snow management with BC MFLNRORD.

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Activity/Concern	Mitigation
Surface Material Salvage	• Develop and follow site-specific topsoil depth salvage requirements for each soil map unit. • Use machinery appropriate to the season and conditions for all soil salvage operations. • Plan construction operations to reduce the number of times and distances that salvaged soils are moved. • Do not conduct surface material salvage except where grading is required (Appendix B, Dwg. STDS-03-ML-05-443, STDS-03-ML-05-410, STDS-03-ML-05-445, and STDS-03-ML-05-446). The area stripped is to correspond to the area to be graded. • Salvage the organic layer (i.e., leaf litter layer) where surface material salvage is required. • Stabilize exposed surface material and subsoil where the potential for erosion exists. Refer to the Soil Erosion Contingency Plan (Appendix C.7) for additional information. • Ensure surface material storage areas are in approved ROW and temporary workspace. • If wet or thawed soil conditions occur, implement the Wet Soils Contingency Plan (Appendix C.4).
Adverse Weather	• In the event of adverse weather that could result in rutting or compaction, the Construction Manager, in consultation with the Environmental Inspector(s), might implement contingency measures as outlined in the Adverse Weather Contingency Plan (Appendix C.2). A soils specialist or regulatory personnel may be consulted if warranted. • Following an adverse weather event, the Contractor is responsible for confirming the efficiency of sediment and erosion control measures and whether corrective action is required. The Construction Manager, in consultation with the Environmental Inspector(s) will implement contingency measures as outlined in the Adverse Weather Contingency Plan (Appendix C.2). • Avoid working when soils are wet or implement mitigation measures in accordance with the Adverse Weather Contingency Plan and the Erosion and Sediment Control Plan. • Discontinue soil-handling work under wet or windy weather conditions or implement mitigation measures in accordance with the Adverse Weather Contingency Plan, the Wet Soils Contingency Plan, and the Coastal GasLink Erosion and Sediment Control Plan.

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Activity/Concern	Mitigation
Grading	• Undertake all grading with the understanding that original contours and drainage patterns will be re-established during cleanup unless otherwise authorized by the Environmental Inspector(s) or designate. • Contour ROW and areas around facilities to be compatible with surrounding drainage. • Salvage the surface organic layer from areas to be graded. The area stripped is to correspond to the areas graded. • Plan construction operations to reduce the number of times and distances that salvage soils are moved. • Ensure grade material does not spread off the ROW. • Near ecological communities of concern and plant populations of concern, grading should be prohibited except where required to safely install pipe. • Where grading is not required, cut, mow, or walk down shrubs and small diameter deciduous trees at ground level to facilitate rapid regeneration.
Known Archaeological Sites	• Do not permit grading at known archaeological sites unless otherwise approved by the relevant regulatory authority.

8.3.4 Topsoil and Surface Material Salvage

During the course of construction, it may be necessary to address soil conditions in non-forested areas. This procedure outlines the process to be followed.

Activity	Mitigation
Land Preparation: Non-Frozen Conditions	• Arrange for landowners to harvest crops, if practical. Mow, cut or bale any remaining crops and remove them from the ROW to facilitate topsoil or surface material handling. • Disc the ROW prior to topsoil removal on agricultural land unless otherwise approved by the Environmental Inspector(s). • Alleviate compaction by using suitable machinery to loosen subsoil and smooth the surface prior to topsoil replacement.
General Topsoil/Surface Material Salvage Requirements	• Conduct topsoil salvage on all arable or potentially arable lands to promote successful reclamation and ensure equivalent land capability is maintained. • Topsoil and surface material will be salvaged in accordance with the typical drawings (Appendix B, Dwgs. STDS-03-ML-05-410, STDS-03-ML-05-411, STDS-03-ML-05-412, STDS-03-ML-05-401, STDS-03-ML-05-402, STDS-03-ML-05-404, STDS-03-ML-05-412, STDS-03-ML-05-421, STDS-03-ML-05-424, STDS-03-ML-05-426, STDS-03-ML-05-431, and STDS-03-ML-05-443). Salvage locations will be provided on environmental worksheets prior to construction. Should discrepancies arise between the environmental worksheets and the Construction Alignment Sheets, the environmental worksheets will have precedence. • Depending on site-specific conditions, topsoil salvage techniques may include full width, blade width, ditch and spoil side, or ditch and work side. The topsoil salvage technique to be used will be determined by the Environmental Inspector(s), Construction Manager and the appropriate Resource Specialist or Qualified Professional, where required (as determined by the Environmental Inspector in consultation with an Environmental Advisor).

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Activity	Mitigation
General Topsoil/Surface Material Salvage Requirements (cont'd)	• Develop and follow site-specific topsoil depth salvage requirements for each soil map unit. • Where full width surface material removal was not conducted, salvage a greater width of topsoil at sharp sidebends and at crossings of watercourses, roads and foreign lines to accommodate a wider and deeper trench. • Topsoil and surface material handling procedures may be modified based on the need to meet the objective of protecting the soil resources, as directed by the Environmental Inspector(s). Soil storage areas will be approved by the Environmental Inspector(s). • Ensure soil storage areas are in approved ROW and temporary workspace. • If wet soil conditions occur, implement the Wet Soil Contingency Plan (Appendix C.4). • Implement the Soil Handling Contingency Plan (Appendix C.6) if any of the following are encountered; uneven boundary between topsoil and subsoil, uneven surface on pasture; or request for alternate soil handling methods by a landowner. • Use geotechnical matting, rig mats, swamp mats or access mats for access through wet areas. • Construct permanent protection such as geotextile material, matting, corduroy or ramps wherever there is regular traffic through permanently wet, low-lying areas of mineral and organic soil. • A soils specialist will be available as needed to work with the Environmental Inspector(s), inspection team and Contractor to address soils resource issues as they may arise during topsoil/surface material operations, as well as during adverse weather conditions to ensure the soils resources are protected and equivalent land productivity is maintained. • Typical drawings for soil handling (non-frozen and frozen) are provided in Appendix B of the EMP.
Topsoil Handling: Frozen Conditions	• In the event that topsoil is stripped during frozen conditions, the Environmental Inspector(s), in consultation with the Construction Manager, will ensure that proper equipment (i.e., frozen topsoil cutter, grinder or equivalent) is used to reduce mixing of topsoil and subsoil layers and that the equivalent land productivity is maintained. • Snow and topsoil will be salvaged separately.
Topsoil Stockpile Erosion Control	• Following the salvage of the topsoil, if warranted, stabilize topsoil windrows and stockpiles using either water or a suitable tackifier as directed by the Environmental Inspector(s). Refer to the Soil Erosion Contingency Plan (Appendix C.7). • Should high winds or heavy rains damage the tackifier during construction, the Environmental Inspector(s), in consultation with the Construction Manager, may implement contingency measures as outlined in the Adverse Weather Contingency Plan (Appendix C.2). • Should construction traffic or other related construction activities disturb the topsoil piles and there is a potential for wind erosion, apply additional water or tackifier. • Leave gaps in topsoil and surface material windrow at obvious drainage courses and wherever seepage occurs to accommodate surface runoff.

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8.4 WATERCOURSE CROSSINGS

8.4.1 Introduction

At watercourse crossings, the method of vehicle crossing and pipeline crossing has taken into consideration engineering and constructability requirements, fisheries values, and protection of riparian habitats. The mitigation outlined in this section applies to all watercourses. Details on specific watercourse crossing information are provided in the Master Watercourse Crossing Table (CGL4703-JEG-ENV-TBL-0004 Master Water Crossing Table).

8.4.2 Objectives

The objectives of this mitigation are to:

- avoid or reduce potential adverse effects
- comply with the provisions of the federal *Fisheries Act*, which prohibits any work, undertaking, or activity that results in serious harm to fish that are part of a Commercial, Recreational, or Aboriginal (CRA) Fishery, or fish that support such a fishery
- comply with all provincial regulatory requirements
- comply with all regulatory, permit and approval conditions
- employ environmentally and economically responsible construction practices at all times, and in accordance with applicable industry standards
- maintain habitat quality at crossing locations
- protect riparian areas in proximity to watercourse crossings
- maintain the ecosystem function of riparian areas

8.4.3 Specific Measures

Activity/Concern	Mitigation
Permits and Approvals	• Coastal GasLink will obtain and follow all applicable federal and provincial permits or authorizations prior to the commencement of construction and in-stream activities.
Points of Diversion	• Identify the location of registered and unregistered points of diversion within 200 m downstream and 100 m upstream of clearing, construction and reclamation activities and notify appropriate authorities of proposed construction activities. • Provide potable water to residents if water quality of domestic water sources is adversely affected during the construction period.

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Activity/Concern	Mitigation
Notification	• Ensure all notifications are completed in accordance with DFO requirements as well as the BC *Water Sustainability Act* and *Water Sustainability Regulation*. • If directed by the relevant regulatory authority (e.g., Transport Canada), install warning signs along the banks both upstream and downstream of the crossing to caution users of a navigational hazard, where appropriate.
Signage	• Post signs immediately following clearing (including name, number and KP) for watercourses. Signs will be posted 100 m from the watercourse or at the top of the valley slope, whichever is greater, to alert the Contractor of the upcoming watercourse.

Window of Least Risk	• Refer to the Master Watercourse Crossing Table (CGL4703-JEG-ENV-TBL-0004 Master Water Crossing Table) for the windows of least risk associated with the watercourse crossings traversed by the Project.
	• No construction activity will occur outside the instream work window of least risk for any watercourse crossing unless:
	  • it is dry or frozen to the bottom at the time of construction
	  • trenchless techniques are employed
	  • approval from the relevant regulatory authority is obtained

Riparian Buffers	• Prohibit clearing of extra temporary workspace within 10 m of a watercourse to protect riparian areas. This area shall be clearly marked prior to clearing operations. The construction footprint will be narrowed through the riparian area, if practical. • Limit clearing activities at watercourse crossings to the removal of trees and shrubs to the ditch line and work side areas required for vehicle crossings. • In accordance with permit conditions, fall any tree that is harvested within its tree length of a stream or a wetland away from the stream or wetland, and immediately remove any debris or soil deposited below the high water mark. When altering a tree that is located on the bank of a waterbody, where practical, ensure that the root structure and stability are maintained to help bind the soil and encourage rapid colonization of low-growing plant species. • If the working surface is unstable, do not permit clearing equipment within the 10 m riparian buffer, pending consultation with the Environmental Inspector(s). Following clearing, the 10 m riparian buffer will remain intact (i.e., consisting of low-lying understory vegetation). • When riparian areas are being crossed the following mitigation will be implemented: include no extra temporary workspace, limit grubbing to the ditch line, and lay geotextile material or place log corduroy alongside the riparian area for heavy machinery, where applicable.
Riparian and Aquatic Habitat	• Ensure that drilling mud composition is limited to bentonite-based systems (e.g., bentonite, water and industry standard additives). Implement the Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan. • BC MECCS recommends maintaining a 100-m riparian area buffer at ecologically relevant places along streams to help maintain landscape connectivity for fisher (BC MECCS 2004). Implement riparian buffer mitigation in Section 8.4. Extend riparian buffers to 100 m at select locations, if recommended as a result of construction preparation surveys (e.g., old-growth riparian forests where fisher is detected).

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Activity/Concern	Mitigation
Grading	• Where practical, delay grading of the primary banks of watercourses until immediately before construction of the crossing. If warranted, install appropriate temporary erosion and sediment control structures at the discretion of the Environmental Inspector(s) upon initial disturbance of the vegetative mat and surface material. • Direct grading away from waterbodies. Do not place fill material in a waterbody during grading. • Ensure that grubbing, surface material removal and grading on approach slopes to watercourses is restricted to an amount necessary to allow the safe passage of equipment, excavation of the trench, and installation of the pipeline. • Do not allow grading within the 10 m riparian buffer immediately adjacent to the water crossing until installation of the vehicle crossing.
Erosion Control	• Install erosion and sediment control such as silt fences at all watercourses or waterbodies and on approach slopes to watercourses and waterbodies as directed by the Environmental Inspector(s). (Appendix B, Dwgs. STDS-03-ML-05-001, STDS-03-ML-05-131, STDS-03-ML-05-132, STDS-03-ML-05-137, STDS-03-ML-05-608). • Where water erosion is evident and there is potential for runoff from the ROW to flow into a watercourse, refer to the Soil Erosion Contingency Plan (Appendix C.7).

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Activity/Concern	Mitigation

Vehicle Crossings: General	• Construct or install temporary vehicle access across waterbodies, shorelines, and riverbanks in a manner that protects the banks from erosion and maintains the flows in the waterway and follows the BC *Water Sustainability Act* and *Water Regulation* as well as applicable DFO conditions.
	• Construct and install all watercourse vehicle crossings as outlined in the Master Watercourse Crossing Table (CGL4703-JEG-ENV-TBL-0004 Master Water Crossing Table) and in accordance with the typical drawings (Appendix B, Dwgs. STDS-03-ML-05-101, STDS-03-ML-05-103, and STDS-03-ML-05-104).
	• Construct all bridges (ice and snowfill or single-span) beyond the ends of the banks and with a minimum depth of 0.5 m of snowfill or fill material at each bank. Do not place fill within primary banks for bridge abutment construction, unless approved by the relevant regulatory authority.
	• If fill material is required during the construction of bridge abutments with wings, place geotextile fabric between the fill material and the surface layer.
	• The following will apply where bridge installation or upgrades are conducted by Coastal GasLink on all roads permitted to Coastal GasLink as well as ROW and workspace permitted to Coastal GasLink:
	  • Line single span bridges with geotextile, plastic sheeting, plywood or equivalent accepted by Coastal GasLink
	  • All watercourse crossing structures must have a minimum of 30-cm-high side boards
	  • Snow bridges or ice bridges may use watered snow to create and maintain the side boards
	• Install and remove any temporary vehicle crossings in a manner that protects the banks from erosion and maintains the flow in the waterway. These crossings will be returned to their construction preparation condition.
	• Consider alternate methods of vehicle crossings on a site-specific basis. The decision-making process will include the Contractor, Construction Manager and the Environmental Inspector(s). Decision criteria will include protection of the riparian vegetation and fisheries values associated with the crossing, and applicable legislation.

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Activity/Concern	Mitigation
Vehicle Crossings: Frozen Conditions	• Under frozen conditions, where weather permits, employ ice and snowfill bridges as temporary crossing structures. Install ice and snowfill bridges using water drawn from an approved source or clean snow ploughed in from surrounding areas or made. Design, construct and deconstruct ice bridge and snow fill vehicle crossing at waterbodies in a manner that prevents erosion, scouring and sedimentation during spring break-up. • If water withdrawal is necessary for the construction of temporary crossings, ensure that necessary provincial approvals are in place and follow DFO conditions, if applicable. Do not withdraw more than 10% of the instantaneous stream flow at any given time. Pump intakes should not disturb the streambed. Pumps must be screened with a maximum mesh size of 2.54 mm and have a maximum screen approach velocity of less than 0.038 m/s where fish habitat is present. Follow design requirements of DFO *Freshwater Intake End-of-Pipe Fish Screen Guidelines*. • Use only clean ice or snow for construction of an ice or snowfill or ice bridge. Construct approaches to the bridge with compacted snow and ice of sufficient thickness to protect the stream channel and banks. Do not use sand, gravel and soils for ice bridge approaches. • Ensure that ice bridges or snowfills do not interfere with or impede winter flows. Ensure that ice bridges and snowfills are dismantled before spring break-up. Mechanically breach ice bridges and snowfills to the natural ice level, at a minimum. • If conditions will not support the construction of snowfill and ice bridges, then employ other temporary crossing structures approved by relevant regulatory agencies, such as clear-span bridges.
Beaver Dams	• In the event that beaver dams or lodges will be disturbed, obtain the necessary provincial permits prior to commencing activities. Engage the registered trapper(s). • Follow applicable guidance in the BC Best Management Practices for Instream Works for beaver dam removal when beaver dams must be removed. • If beaver dams must be removed, breach the beaver dam slowly to avoid the rapid release of water that could cause fish entrapment and/or erosion of the bed and banks resulting in subsequent siltation of downstream waters.

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Activity/Concern	Mitigation

Watercourse Crossing Plans	• The Contractor shall develop a detailed site-specific watercourse crossing plan and submit the plan to Coastal GasLink prior to initiating watercourse crossing activities.
	• Flow isolation crossings must be planned and conducted in accordance with the relevant detail in the Construction Section's Supplemental Stream Crossings Submission that has been submitted to the satisfaction of the BC OGC, and in accordance with the following requirements:
	  • crossings of fish-bearing streams may commence only after confirming that sufficient equipment and supplies are available to complete the crossing in an efficient and timely manner;
	  • instream activities, including the location and operation of any equipment must be isolated from water flowing in the stream;
	  • spawning gravels must not be disturbed when redds that contain eggs are present;
	  • activities must be suspended if high stream flows present an increased risk to effectively completing the intended crossing installation technique;
	  • welding, coating, weighting and, where applicable testing, of the pipe must be completed prior to commencement of trenching within fish-bearing water bodies;
	  • water from flumes, pump-arounds, diversions, or other methods must be released to downstream areas using dissipation structures to avoid causing erosion or sediment release;
	  • pump intakes must not disturb beds of streams or wetlands and must be screened with a maximum mesh size of 2.54 mm and approach velocity of 0.038 m/s;
	  • water flows downstream of in-stream construction sites must be maintained consistent with upstream flows; and
	  • hard ditch plugs must be installed at or near the banks of the crossing and left in place until the crossing has been initiated (see Dwgs. STDS-03-ML-12-202 and STDS-03-ML-12-203).

Pipeline Installation	• Before the installation of the water crossing and the commencement of instream activity, the Contractor will ensure that all necessary equipment and materials are available and are on-site. • Construct and install all typical and non-typical pipeline crossings as outlined in the Master Watercourse Crossing Table (CGL4703-JEG-ENV-TBL-0004 Master Water Crossing Table) and in accordance with the typical drawings (Appendix B Dwgs. STDS-03-ML-05-105, STDS-03-ML-05-111, STDS-03-ML-05-112, and STDS-03-ML-05-113). • Implement the Water Quality Monitoring Plan (Appendix E.2) to monitor water quality during instream construction activities. Exceedances of water quality parameters will be reported to the Environmental Inspector and corrective actions will be developed in consultation with the Qualified Professional, the construction management team and the BC OGC. If corrective actions are not successful, construction activities will be temporarily suspended until effective solutions are identified. • The Contractor shall weld, coat and weight the water crossing portion of pipe prior to starting instream ditching activities. The Contractor shall make every effort to ditch, lower-in and backfill water crossings during the same working day or in as short a time as practical. • Use biodegradable hydraulic oil in excavators working within the wetted areas of watercourse crossings.

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Activity/Concern	Mitigation
Pipeline Installation (cont'd)	• When implementing a trenched (i.e., open-cut or isolated) pipeline installation method, and where practical, salvage the upper 0.5 m (minimum) of granular material, if present. Stockpile separately from the remainder of the trench spoil so that the salvaged, native granular material can be used to cap the upper portion of the trench. Alternatively, replace with clean cobble material if salvaged material is not of sufficient quantity. • Pile all spoil on the banks, if practical. Construct a temporary storage area for spoil above the high watermark of the watercourse if spoil is likely to be highly saturated to prevent spoil or silty water from flowing back into the watercourse. • If spoil is likely to be highly saturated, excavate a pit or construct berms of packed earth to prevent spoil from flowing back into the watercourse. Locate containment berms and spoil outside of the 10 m riparian area (Dwg. STDS-03-ML-05-131). • Ensure no vehicles or equipment containing petroleum, oil, or lubricants are parked or stationed in a watercourse at any time except for equipment that is required for that immediate phase of construction.
Typical Open-Cut Crossings	• Conduct typical open-cut crossings of seasonally dry or frozen-to–the-bottom watercourses in accordance with Dwg. STDS-03-ML-05-105. • Store excavation material outside the watercourse during the open-cut crossing, above the ordinary high water line, where spoil will not erode back into the watercourse, where practical.
Open-Cut Crossings: Large Flowing Watercourses	• Implement site-specific plans prior to construction for open-cut crossings, developed by a multidisciplinary team, and approved by relevant regulatory agencies. • Schedule open-cut crossings to protect sensitive life stages by adhering to windows of least risk. No construction work will occur outside of the window of least risk unless approval from the relevant regulatory agencies is obtained. • Pile all spoil on the banks, if practical. Construct a temporary storage area for spoil above the high watermark of the watercourse if spoil is likely to be highly saturated. Excavate a pit or construct berms of packed earth or swamp weights, if warranted, to prevent spoil or silty water from flowing back into the watercourse. Containment berms and spoil should be back from the streambank to avoid sloughing into the watercourse. Note: vegetative buffers are to be maintained and, consequently, spoil may require stockpiling an appropriate distance from the banks as determined by an Environmental Inspector. • Place spoil in discrete piles, avoiding areas of highest water velocity if instream spoil storage is required. Do not windrow spoil across or block more than 2/3 of the channel. Maintain stream flow throughout crossing construction. • Schedule instream work for low-flow periods, when practical. • Retain hard plugs in the trench at each bank until just prior to pipe installation.

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Activity/Concern	Mitigation
Isolated Open-Cut Crossings: Large Flowing Watercourses	• Schedule isolated open-cut crossings to protect sensitive life stages by adhering to windows of least risk. No construction work will occur outside of the window of least risk unless approval from the relevant regulatory authority is obtained. • At large watercourse crossings and, where practical, stage construction to install pipe part way across the watercourse from one side, within isolation, followed by installation of the remainder of the pipe, within a separate isolation, from the other side, such that flow is continuous past the crossing site at all times. • Use non-earthen material for isolation structures wherever practical. If earthen material is necessary, develop site-specific plans and drawings for review and approval of relevant regulatory agencies. • If earthen material must be used in construction of isolation dams, ensure that the outside face of the dam is armoured with suitable-sized riprap to protect the dam from erosion. • Ensure pumps, generators and light towers used within 100 m of a waterbody have secondary containment that can hold a capacity of 125% of the fuel tank.
Isolated Open-Cut Crossings (Dry or Frozen to Bottom)	• Conduct crossings of watercourses that are dry or frozen to the bottom in accordance with provincial regulatory requirements (e.g., BC *Water Sustainability Act*), DFO Measures to Avoid Causing Harm to Fish and Fish Habitat, and any required DFO's review or authorisation, if applicable. • Do not use earthen berms to isolate the crossing construction area. • Pump sediment-laden dewatering discharge into a vegetated area or settling basin to prevent sediment and other deleterious substances from entering any water body. • Dewater the trench onto stable surfaces in a manner that does not cause erosion of soils or sedimentation of the watercourse. Water returning to the watercourse should equal or exceed the background water quality of the watercourse. • Ensure pumps, generators and light towers used within 100 m of a watercourse crossing have secondary containment that can hold a capacity of 125% of the fuel tank.

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Activity/Concern	Mitigation
Isolated Open-Cut Crossings (Not Dry or Frozen to Bottom)	• Schedule isolated crossings to protect sensitive life stages by adhering to windows of least risk. No construction work will occur outside of the window of least risk unless approval from the relevant regulatory authority is obtained. • Use dams made of non-earthen material, such as water-inflated portable dams, concrete blocks, sandbags, sheet piling, clean rock or other appropriate designs to separate the dewatered work site from flowing water. If earthen material is necessary, develop site-specific plans and drawings for review and approval of relevant regulatory agencies. • If granular material is used to build dams, use clean material that is adequately sized to withstand anticipated flows during construction. • Ensure maintenance of downstream flow at all times when constructing an isolated crossing. If a pump-around method is used to maintain stream flow, back-up pumping capacity must be on-site and ready to take over immediately if operating pumps fail. Monitor pumps continuously to ensure downstream flow is maintained at all times until the dam materials are removed and normal flows are reclaimed to the channel. • Place sumps and pumps used for bypass flows in a location sufficiently far upstream to avoid undermining the isolation structures. • Ensure water and pump intakes reduce or avoid disturbance of the streambed and are screened with a maximum mesh size of 2.54 mm and an approach velocity of 0.038 m/s. To accomplish this, where pumps larger than 15 cm diameter are used, place the intakes in a mesh cage (2.54 mm) to reduce the approach velocity that fish are exposed to and prevent them from being impinged on the intakes. Maintain the screens free of debris. If a deeper sump is required for success of the isolated crossing refer to Environmental Inspector(s). Follow guidance on screen design found in DFO Freshwater Intake End-of-Pipe Intake Screen Guideline. • Ensure water from flumes, dam and pumps, diversion or other methods do not cause erosion or introduce sediment into the channel. Pump sediment-laden dewatering discharge into a vegetated area or settling basin to prevent sediment and other deleterious substances from entering any water body. • Dewater the trench onto stable surfaces in a manner that does not cause erosion of soils, or sedimentation of the watercourse. Water returning to the watercourse should equal or exceed the background water quality of the watercourse. • Ensure pumps, generators and light towers used within 100 m of a waterbody have secondary containment that can hold a capacity of 125% of the fuel tank. • If the isolation method is not successful in sealing the isolation structure effectively to allow work "in the dry," consult with the relevant regulatory agencies, in accordance with regulatory and permit requirements and consider working within the isolated area "in the wet" in order to contain sediment-laden water within the confined area. • Remove accumulated sediment and excess spoil from the isolated area before removing dams. • Refer to Appendix B, Dwgs STD-03-ML-05-111 and STD-03ML-05-112.
Non-Typical Crossings	• Construct all non-typical pipeline crossings (i.e., crossings that do not meet the requirements of the typical drawings), in conformance with site-specific plans.

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Activity/Concern	Mitigation
Vehicle Crossings: General	• Ensure stormwater from the bridge deck, side slopes and bridge approaches is directed away from the watercourse onto a well-vegetated area. • Adhere to standard measures for construction and installation, maintenance and removal of vehicle crossings. Do not allow grading within the 10-m riparian buffer immediately adjacent to the water crossing until installation of the vehicle crossing.
Vehicle Crossings: Frozen Conditions	• Design, construct and abandon ice bridge and snow fill vehicle crossings at waterbodies in accordance with Dwg. STDS-03-ML-05-104.
Fish Salvage	• A Fish Collection Permit from BC MFLNRORD is required for fish salvage activities. Obtain the Fish Collection Permit in accordance with applicable terms and conditions. • The Contractor shall notify Coastal GasLink 5 days before construction of any watercourse crossing or diversions to ensure fish salvage operations are conducted, where required. • If an isolated method is employed at fish-bearing watercourses and drainages conduct a fish salvage led by an aquatics specialist (i.e., Qualified Environmental Professional). • Conduct fish salvage, in accordance with permit conditions, using appropriate methods and equipment. Release all captured fish to areas which provide suitable habitat.
Trenchless Crossings	• For pipeline crossings conducted using a trenchless crossing method, follow Dwg. STDS-03-LA-SK-001. • Excavate entry and exit sites back from the ordinary high watermark and far enough from the watercourse to provide for containment of sediments and other deleterious substances above the high watermark. Vegetation removal for the entry and exit sites is only to occur within the approved construction ROW and temporary workspace. • Ensure that water from dewatering entry and exit sites with a high sediment load is not discharged or allowed to flow into any waterbody. Remove the sediment load (e.g., filtered or discharged into a vegetated area) before discharge water is allowed to enter any watercourse. • Where warranted, develop a water quality monitoring plan with input from an aquatics specialist that includes monitoring for total suspended solids (TSS) and turbidity if trenchless methods are used. • Develop an emergency response plan that will be implemented in the event of sediment releases or spills of deleterious substances during the construction of the trenchless crossings. • In the event of sediment releases or spills of deleterious substances during the construction of the trenchless crossings, implement the Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan (Appendix C.9). • Dispose of all waste drilling fluid and drilling solids according to and in conformance with the BC Oil and Gas Waste Regulation and the Oil and Gas Handbook.

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<table>
<tr><th>Activity/Concern</th><th>Mitigation</th></tr>
<tr><td>Blasting In or Near Watercourses</td><td>

Coastal GasLink will notify and consult with provincial and federal authorities to ensure that appropriate plans and approvals are in place to protect fish and fish habitat in the event that blasting is required within 150 m of a fish-bearing waterbody.
Restrict blasting activities to use of pre-packaged explosives in order to prevent spillage.
Follow procedures provided in Guidelines for the Use of Explosives in or near Canadian Fisheries Waters (Wright and Hopky 1998), if applicable, when blasting within 150 m of a fish-bearing waterbody.
Use appropriate explosive charges and setback distances from fish habitat to prevent damage to fish and fish habitat, as outlined in Table 2 of Wright and Hopky (1998):
<table>
<tr><th></th><th colspan="7">Weight of Explosive Charge (kg)</th></tr>
<tr><td></td><td>0.5</td><td>1</td><td>5</td><td>10</td><td>25</td><td>50</td><td>100</td></tr>
<tr><td>Setback Distance (m)</td><td>10.7</td><td>15.1</td><td>33.7</td><td>47.8</td><td>75.5</td><td>106.7</td><td>150.9</td></tr>
</table>

Implement a ground vibration and overpressure monitoring program, if deemed necessary by Coastal GasLink in consultation with the appropriate QP, to determine the overpressure zone resulting from the blasting area and its potential adverse effects on fish. Adjust fish exclusion zone to appropriate distances based on monitoring.
Reduce potential detrimental effects to fish by incorporating one or more of the following measures:

subdivide large charges into smaller detonations
use lowest weight of explosive charge practical
use time delays to reduce the pressures created
use bubble or air curtains

Deter fish from the blasting zone prior to each blast by means of:

pre-blast scare tactics
use of noise generating devices
physical removal of fish from the work area

Do not use ammonium nitrate-fuel oil (ANFO) explosives in or near watercourses, drainages or wetlands.

</td></tr>
</table>

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Activity/Concern	Mitigation
Permits and Approvals (Hydrostatic Testing)	• Obtain BC *Water Sustainability Act* approval under Section 10, where warranted from BC OGC for the short-term use of water. • Comply with DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO 2013) during water withdrawal and release activities associated with hydrostatic testing. • Test the hydrostatic test water prior to release to ensure it meets all the requirements in the BC Oil and Gas Waste Regulations (Section 7(2)e). • Obtain approval, if necessary, for use of any chemical additives to be used during the hydrostatic testing program. Provide direction to the hydrostatic testing Contractor related to the handling, storage, use and disposal of the hydrostatic testing additives including water sampling, if warranted, and disposal of hydrostatic test water containing additives. • Ensure that all applicable approvals are in place prior to installing a temporary fill line that extends off of the construction ROW. • Notify and adhere to the advice of the Environmental Inspector(s) at locations where water potentially contaminated with hydrocarbons or other materials is to be discharged from the trench. Measures may include the use of tank trucks to haul discharged water to an appropriate disposal facility or site, ensuring the intake is submerged below the surface sheen, lab testing and use of sorbent booms to hold the sheen away from the pump intake.
Water Withdrawal	• Do not excavate sumps outside of ROW without approval of relevant regulatory agencies. • Excavate sumps within the ROW only with approval of the Environmental Inspector(s).
Contingency Plans	• If excessive flows or flood conditions exist or are anticipated, and construction methods cannot be modified to cope with the increased flow, follow the Flood and Excessive Flow Contingency Plan (Appendix C.3), including postponing watercourse crossing construction if deemed necessary by Coastal GasLink.
Backfill Trench	• Place only imported clean coarse material (gravel or rock), or native material removed from the trench as the final 0.5 m of backfill. Any imported material must be obtained from a Coastal GasLink approved offsite location.

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Activity/Concern	Mitigation

Bank Protection and Reclamation	• Return the bed and banks of each watercourse to as close as practical to their original construction preparation contours. Do not realign or straighten watercourses or change their hydraulic characteristics.
	• Implement permanent bank reclamation measures to re-establish riparian vegetation and fish habitat as a part of backfill operations (Refer to Appendix B, Dwgs. STDS-03-ML-05-601, STDS-03-ML-05-602, STDS-03-ML-05-603, STDS-03-ML-05-604, STDS-03-ML-05-606, STDS-03-ML-05-607, and STDS-03-ML-05-608).
	• Seed disturbed banks and riparian areas with Certified No. 1 seed mix or native species in accordance with the Reclamation Program. The Environmental Inspector(s) will determine on-site whether other reclamation methods need to be applied to stabilize banks (e.g., soil wraps, brush layers, and matting). If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority.
	• Site-specific mitigation will be developed where bank protection is required. Where practical, avoid the use of riprap and use alternative approaches to protect banks, such as, but not limited to:
	  • hedge and brush layering
	  • live willow and shrub staking
	  • planting baskets and eco-pockets

Riprap Armour	• A qualified engineer will design site-specific riprap requirements. Incorporate vegetation into the riprap, where practical, such as:
	  • planting pockets
	  • willow stakes

Channel Realignment	• For watercourse crossings that require channel realignment to facilitate the installation of the crossing, develop individual, site-specific plans that take downstream effects into consideration and ensure:
	  • no net loss of fish habitat
	  • no obstruction to fish migration
	  • no fish mortality or injury

Erosion Control	• Inspect all temporary sediment control structures on a regular basis and following precipitation events and snowmelt. Where repairs are warranted, repair before the end of the working day.

8.5 PIPELINE ACTIVITIES

8.5.1 Introduction

The following mitigation will be implemented during mainline construction, including trenching, stringing, bending, coating and lowering-in.

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8.5.2 Objectives

The objectives of this mitigation are to:

- prevent potential adverse effects to watercourses and waterbodies
- reduce interference with other land uses
- prevent harm to wildlife

8.5.3 Specific Measures

Activity/Concern	Mitigation
Wet Soils	• Implement the Wet Soils Contingency Plan (Appendix C.4) as required.
Soil Pulverization	• Where pulverization of soils has the potential of causing soil loss or potential long-term structural adverse effect, strip topsoil, re-grade or stabilize the ROW using a tackifier or water.
Compaction and Rutting	• Limit heavy equipment travel to machinery and vehicles equipped with low-ground-pressure tires or wide tracks to reduce compaction and rutting if wet/thawed soil conditions are present. Where rutting of wet or thawed soils occurs, the Wet Soils Contingency Plan (Appendix C.4) may be implemented. • Blade rutted organic soils flat before final soil replacement.
Trenching	• To facilitate the free movement of wildlife, do lowering-in and backfill operations as soon as is practical after trenching operations unless it is necessary to have the trench open for an extended period of time for construction purposes. • Reduce trench width during trenching in order to limit spoil storage requirements, if practical. • Reduce the amount of open trench at any one time. • Leave material in trench at identified wildlife trails where it is necessary to have the trench open for an extended period during construction. • Monitor the open trench for trapped wildlife. Should any wildlife be identified, contact the Environmental Inspector(s) and Construction Manager. The Environmental Inspector(s) will contact the relevant provincial regulatory authority or a wildlife Resource Specialist, where warranted, for direction. • As trenching proceeds, identify areas of potential trench wall instability that may affect unstripped topsoil areas. Strip a wider area if the trench walls slough into the ditch and the potential for mixing of topsoil and subsoil exists. Back slope trench wall until stable. • If unstripped topsoil is sloughing into the trench, suspend trenching operations until the topsoil is stripped wide enough to prevent loss. • Windrow surplus snow and any snow over the trench to the closest side of the ROW immediately prior to trenching. Leave gaps in snow windrows to allow for wildlife movement and drainage. Gaps will correspond to breaks in pipe, soil stockpiles and windrows. Locations of gaps will align with obvious wildlife trails, where practical, and will be determined in the field by the Environmental Inspector(s) who will determine, in consultation with an Environmental Advisor, whether consultation with a Resource Specialist or Qualified Professional is necessary.

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Activity/Concern	Mitigation
Spoil Handling	• If construction occurs under frozen conditions, do not mix snow with spoil material. • At locations where the organic layer has been stripped, place spoil in a manner that allows the spoil to be replaced separately from the organic material. • Place trench spoil to maintain an adequate separation between topsoil and surface material, and subsoil piles. Avoid overlap of the trench spoil and topsoil or surface material in agricultural lands. If the potential of overlap is identified, move the topsoil or surface material, or in some space restricted cases, protect with a geotextile cover. • Ensure spoil material does not spread off ROW.
Water Management	• Monitor water levels in all open trenches. • Where practical, grade the ROW to divert surface water away from the open trench. • Inspect and install erosion control measures such as cross ditches and berms where required on long or moderately steep to steep slopes. • If water levels or flow rates in the trench could overwhelm existing trench water control measures (berms, take offs, etc.), thereby increasing the risk of sediment-laden water affecting wetlands or watercourses (e.g., if heavy rains are forecast), dewater and backfill the trench to create a soft plug, or maintain an existing hard plug. • Ensure temporary trench plugs and breakers consist of material with low permeability that will effectively block water flowing along the trench. • Where the open trench has the potential to dewater a wetland, conduct trenching in a manner that prevents the flow of water along the trench. • Through wetland areas where sumps are required, pump water to an appropriate area so that erosion is not accelerated. • The location of all discharge areas shall be approved by the Environmental Inspector(s). • If the trench requires dewatering, pump water onto stable, well-vegetated areas, tarpaulins, sheeting, rocks, sand bags, or into settling ponds, filter bags or other appropriate sediment filtering devices. Ensure dewatering is completed in a manner that does not cause erosion or allow sediment to re-enter a watercourse. • Monitor the discharge area and change the discharge location if conditions become saturated to the point that adequate natural filtration is no longer practical. • Do not permit pumped trench water to flow directly into any watercourse. If water is released onto private land, landowner consent must be acquired prior to release. • The Contractor will ensure the pump intake is elevated from the bottom of the trench to reduce the pumping of sediment. • The Contractor will ensure hoses and pumps are of sufficient length and capacity to transfer trench water to the desired location. • The Contractor will ensure hoses are in good working condition, and hoses with tears or ruptures will be repaired or replaced. • Ensure adequate erosion control crews are present to manage off ROW runoff on an ongoing basis, if necessary, throughout construction activities. If additional erosion control is necessary at the end of a work day, consider conducting rough ROW cleanup on daily spreads to ensure water is managed appropriately.

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Activity/Concern	Mitigation
Welding Waste	• Use magnets to collect the bevel shavings immediately after completing the bevel. Collect all welding refuse as generated by each welding rig and dispose of at an approved waste facility.
Coating	• Where spray or paint-on coatings are applied, use a tarp or alternative devices of sufficient size to block overspray or catch drippings. Cleanup any coating that comes in contact with the ground.

8.6 BACKFILL

8.6.1 Introduction

The following mitigation will be implemented during backfill operations.

8.6.2 Objectives

The objectives of this mitigation are to:

- protect the pipeline and prevent subsidence of the trench
- ensure excavated materials from the trench are properly replaced
- properly re-establish subsurface drainage
- facilitate cross-ROW drainage

8.6.3 Specific Measures

Activity/Concern	Mitigation
Padding	• Do not use topsoil or surface material to pad the pipe under any circumstances. • Where sand padding has been employed on agricultural land, resulting in excess spoil, remove the displaced spoil that cannot be adequately feathered out on the ROW to an approved location.
Rock in Backfill	• Do not backfill large rocks into the upper 0.5 m of the trench on agricultural lands. • In designated ALR land, pick all rocks greater than 10 cm in width in the top 30 cm of subsoil and remove from the ROW, unless otherwise directed by the Environmental Inspector(s) or designate.
Topsoil/Surface Material Separation	• Place spoil back into the trench in such a way as to prevent loss or mixing of topsoil or surface material.

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Activity/Concern	Mitigation
Trench Breakers and Subdrains	• Install trench breakers (e.g., sack, foam or bentonite), or subdrains on slopes to control subsurface flow, where warranted. Mark the location of each breaker prior to backfilling to facilitate correct placement of the diversion berm immediately downslope of the breaker. Similarly, subdrains may be installed to work in concert with surface drainage structures to control the persistent subsurface flow of water (refer to Appendix B, Dwgs. STDS-03-ML-12-211, STDS-03-ML-12-212, STDS-03-ML-12-221, and STDS-03-ML-12-222). • Coastal GasLink will determine the locations of trench breakers and subdrains in the field. A Resource Specialist or Qualified Professional may be consulted as determined by Coastal GasLink. • If trench breakers are required in bedrock, ensure the locations are contained within the blasting plan. • Install stub berms, as required, in high groundwater areas to prevent surface water flow along the ditch line (refer to Appendix B, Dwg. STDS-03-ML-12-223). • Coastal GasLink will determine the locations of trench breakers and sub-surface drains will be finalized in the field. A Resource Specialist or Qualified Professional may be consulted as determined by Coastal GasLink. General locations where breakers may be required are identified on the environmental worksheets.
Backfill Trench	• Avoid scalping the sod layer for seeded pasture and hay land during backfill. • Backfill the trench as soon as practical following lowering-in to reduce hazards to wildlife. • Backfill the clay or subsoil first if salvaged separately from topsoil or surface material in shallow muskeg or peaty areas. • To reduce the potential for ditch line subsidence, roach all available spoil over the ditch line to allow for settlement. Ensure that all backfill is complete prior to spring break-up. • Do not mix snow with spoil material during backfill.
Trench Crown	• Return all excavated material back into the trench minus the displacement of the pipe and other pipeline materials, such as weights. • Feather out spoil material displaced by the pipe and other pipeline materials that will not fit back into the trench across the stripped portion of the ROW, with a maximum 10 cm crown measured over the trench-line, where practical.
Winter Construction	• Do not mix snow with spoil material during backfill. • Where construction occurs under frozen conditions, replace backfill material and if necessary rework spoil material to break-up frozen clumps prior to ditch backfill.
Drainage Patterns	• Leave openings in the trench crown and all windrows at appropriate locations to allow for temporary and permanent cross-ROW drainage. • Regrade after backfilling to reclaim natural drainage patterns and remove potential barriers or conduits to water flow.

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8.7 PRESSURE TESTING

8.7.1 Introduction

Hydrostatic testing is the use of water to pressure test sections of pipeline. Water is typically withdrawn from nearby dugouts, lakes, watercourses or municipal sources in accordance with applicable permits for withdrawal of water.

8.7.2 Objectives

The objectives of this mitigation are to:

- ensure pressure testing activities are conducted in accordance with all approval conditions, and permits
- reduce potential adverse effects to watercourses and wetlands

8.7.3 Specific Measures

Activity/Concern	Contingency Mitigation
Permits and Approvals	• Conduct all hydrostatic testing activities in accordance with the *Oil and Gas Activities Act*, Oil and Gas Waste Regulations under the *Environmental Management Act*, the *Water Sustainability Act*, and the Pipeline Regulation. • Coastal GasLink must authorize the water withdrawal sources for testing purposes (i.e., must have sufficient quantity and quality of water) as well as the Contractor's test plan, including discharge locations, no less than 30 days prior to testing. • Obtain *Water Sustainability Act* Section 10 Approval from the Ministry of Environment Water Stewardship Division for the short-term use of water. • Abide by applicable provincial or federal approval conditions.
Withdrawal	• Restrict water withdrawal for hydrostatic testing to less than 10% of the stream flow of the watercourse at the time of withdrawal or as otherwise specified by the relevant regulatory authority.
Water Trucks	• Ensure water hauling trucks for test water, if used, are clean and inspected prior to use.
Pumps	• Ensure pumps, generators, and light towers used at water intake locations have secondary containment that can hold a capacity of 125% of the fuel tank. • Ensure any leaks in the fill and discharge lines are controlled to prevent erosion.
Screen Intake	• Screen all water intakes in accordance with the Freshwater Intake End-of-Pipe Fish Screen Guideline published by DFO (DFO 1995). Maintain screens so they are clear of debris. • Ensure water and pump intakes reduce or avoid disturbance of the streambed and are screened with a maximum mesh size of 2.54 mm and approach velocity of 0.038 m/s. To accomplish this, place the intakes in a mesh cage (2.54 mm) to reduce the approach velocity that fish are exposed to and prevent them from being impinged on the intakes. Maintain the screens free of debris.

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Activity/Concern	Contingency Mitigation
Dewatering	• Shunt test water ahead from test section to test section to the extent practical to reduce water hauling, water usage and the number of dewatering points. • Prior to discharge of hydrostatic test water, ensure that the appropriate testing and treatment measures are implemented in accordance with local regulatory requirements. • Discharge hydrostatic test water into the same drainage basin from which it was withdrawn, unless otherwise approved by the appropriate authority. • Discharge water into a well-vegetated area. Provide scour protection or an energy diffuser at the discharge site as directed by Coastal GasLink. • Preserve water quality, including preventing the introduction of foreign material (debris, sediment, etc.) into the receiving waterbody/watercourse. Do not dewater directly to watercourses or wetlands. • Monitor the discharge area for erosion.

8.8 CLEANUP AND RECLAMATION

8.8.1 Introduction

Cleanup and reclamation are important steps in returning construction sites to a condition similar to construction preparation. For construction in frozen conditions, cleanup is generally a two-phase process, with rough cleanup being completed immediately following construction, and final cleanup occurring in non-frozen conditions. For construction in non-frozen conditions, cleanup is generally completed immediately following construction, or as soon as conditions permit.

8.8.2 Objectives

The objectives of this mitigation are to:

- effectively use reclamation techniques that prevent surface material loss from wind and water erosion
- establish a vegetative cover compatible with surrounding vegetation and land uses
- comply with regulatory requirements
- re-establish the ROW or Project site to a stable condition acceptable for operational requirements
- maintain equivalent land capability, ensuring the ability of the land to support various land uses similar to the uses that existed before construction, but not necessarily identical

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8.8.3 Specific Measures

Activity/Concern	Mitigation
Scheduling	• Complete machine cleanup immediately following construction, prior to spring break-up. If machine cleanup cannot be completed prior to spring break-up, ensure cross ROW drainage is re-established, and sedimentation and erosion controls are installed to protect the ROW and sensitive environmental features. Final cleanup and reclamation will generally occur under non-frozen conditions, or as soon as conditions permit. • Cleanup activities will follow completion of backfill operations as closely as practical. • Schedule final cleanup to occur under non-frozen conditions, when soil moisture conditions permit. • Where construction occurs during frozen conditions, delay final cleanup (i.e., soil feathering, grade touch-ups, final contouring and topsoil and surface material replacement) until the area is in a non-frozen condition consistent with the Wet Soils Contingency Plan. • If reclamation is postponed, contact the relevant regulatory agencies before the initiation of the cleanup and reclamation activities and notify upon completion, as required. • If clearing or construction activities occur within the applicable migratory bird nesting period, conduct low disturbance nest searches in combination with breeding bird point counts to mitigate the potential for incidental take. Additional mitigation for migratory birds and nesting periods is included in the WWHMP (Appendix D.13).
Scenic Viewing	• Assess the feasibility of installing visual barriers such as berms or vegetative screening at locations (e.g., trail crossings) where appropriate, as determined by the Environmental Inspector.
Level of Cleanup	• The level of cleanup on all agricultural lands will ensure the land is returned to as close to construction preparation conditions as practical to allow for continued agricultural operations and equivalent land capability.
Staking	• Remove all flagging and temporary staking from the Project area and dispose in a manner consistent with the Chemical and Waste Management Plan (Appendix D.1) following the completion of construction.
Corduroy/Subsoil Ramping	• During final cleanup, remove subsoil, if used, and overlying corduroy or geotextile and return the material to its construction preparation location unless otherwise requested or approved by the applicable government agency. • Dispose of corduroy, slash and any remaining leaning trees or incorporate into rollback, where required.
Matting	• Remove all matting and non-biodegradable geotextile from all locations on the ROW.
Wet Soils	• If saturated conditions exist at the time of cleanup on agricultural lands, refer to the Wet Soils Contingency Plan (Appendix C.4). If necessary, suspend final cleanup activity until soil conditions are appropriate.

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Activity/Concern	Mitigation
Secondary Surface Material Removal	• On agricultural areas, where construction occurred during frozen ground conditions, and where reduced width surface material removal was conducted, final cleanup will require surface material removal of a wider area (secondary surface material removal) to maintain land capability. • Strip back topsoil and surface material on both sides of the ditchline to ensure sufficient space is available for feathering excess soil and subsoil preparation. • Once subsoil preparation is complete, replace topsoil and surface material uniformly over the stripped area.
Grade Replacement	• Replace grade material to construction preparation contours, where practical. • Re-establish surface drainage patterns following construction, install drainage and erosion control measures and complete the installation of sedimentation control measures at all watercourse crossings. • Re-contour the ROW and areas around facilities to be compatible with surrounding drainage patterns and to prevent concentration of runoff down a slope or parallel to the trench line.
Grade Replacement in Agricultural Land Reserves	• On ALR lands and areas with agriculture use outside ALR, recontour after backfilling (using subsoil prior to replacing topsoil to reclaim natural drainage patterns) and remove potential barriers or conduits to water flow.
Grade Replacement: Frozen Conditions	• Where construction occurs under frozen conditions, replace grades. Some re-grading under non-frozen conditions may be required to touch up areas and to ensure pre-disturbance contours are maintained.
Surface Material Replacement	• Replace surface material evenly over all portions of the ROW that have been stripped. • Postpone replacement of surface material during wet conditions to prevent erosion or damage to the soil structure.
Compacted Subsoils	• Environmental Inspector(s) will determine the locations where subsoil compaction is an issue. Prior to topsoil or surface material replacement, rip compacted subsoils on the construction ROW with a multi-shank ripper, breaking disc, or other appropriate implement to a depth of 30 cm or the depth of compaction, whichever is deeper. If soils are moist, postpone ripping of subsoils until soils dry to ensure that the soils fracture when ripped. • In areas where the topsoil or surface material is in place, use special equipment such as a paratiller to relieve compaction with reduced potential for admixing at the discretion of the Environmental Inspector(s) in consultation with the Construction Manager.
Subsoil Preparation	• Re-grade areas with vehicle ruts or erosion gullies. • Re-grade areas of rutted mineral subsoil before topsoil replacement on ALR lands and non-ALR areas in agricultural use. • Smooth and level the ripped subsoil surface to prevent admixing of subsoil and topsoil or surface material when the topsoil or surface material is replaced.
Trench Crown	• Feather out spoil material displaced by the pipe and other pipeline materials that will not fit back into the trench across the stripped portion of the ROW, with a maximum 10 cm crown measured over the trench-line, where practical.
Root and Rock Picking	• As per agreement with the landowner, pick rocks and roots to an equivalent size and distribution of that on adjacent land, or rocks greater than 10 cm in width. • Dispose of all rock material collected at an appropriate off ROW location, as directed by the Environmental Inspector(s) or as approved by the landowner.

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Activity/Concern	Mitigation
Topsoil Replacement	• Replace topsoil to a uniform depth on all portions of the ROW that were stripped. Match topsoil depth to the unstripped edges of the ROW. • If construction occurs under frozen ground conditions, delay topsoil replacement until the topsoil pile and trench spoil has completely thawed. • Postpone replacement of topsoil during wet weather or high winds to prevent erosion or damaging soil structure.
Cultivation	• On cultivated land, disc or cultivate the areas on which topsoil has been replaced to reclaim soil tilth, unless otherwise approved by the Environmental Inspector(s). Discing and cultivation depth will not exceed the topsoil depth. • Under extremely dry soil conditions, use a cultivator rather than a disc.
Fencing	• All fences will be replaced and will match the number of wires in the connecting fence line. • New posts and bracing will be installed to match the connecting fence. • Coastal GasLink will explore options to improve fencelines to minimize disturbance of third-party users (e.g., livestock grazing) to sensitive areas, such as riparian zones. • Coastal GasLink will consult with landowners and occupants regarding fenceline removal and fencing to exclude livestock.
Access Removal	• Remove bar ditch ramps and reclaim all temporary access trails and shooflies to stable conditions. Re-contour to construction preparation conditions and seed with Certified No. 1 seed mix or native species in accordance with the Reclamation Program. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority. • Remove all mats and ramps used so that they do not impede the reclamation of natural drainage patterns. • Remove all temporary vehicle crossing structures prior to spring break-up. Ensure that removal of access does not disturb the bed or banks of the crossing.
Access Removal: Frozen Conditions	• Remove all temporary vehicle crossing structures, prior to spring break-up. Remove or breach snow or ice bridges to ensure they do not impede flow.
Sedimentation/Erosion Control	• Remove unnecessary silt fence or other temporary erosion control measures not required, as specified by the Environmental Inspector(s) or designate. • Install sedimentation and erosion control measures, where required, in accordance with Dwgs. STDS-03-ML-05-001, STDS-03-ML-05-132, STDS-03-ML-05-137, STDS-03-ML-05-604, STDS-03-ML-05-606, STDS-03-ML-05-607, and STDS-03-ML-05-608 in Appendix B, unless otherwise approved by the Environmental Inspector(s) or designate to adjust for site conditions and suitability. • The Environmental Inspector(s) or designate will determine the location of sedimentation and erosion control measures. • Install cross ditches and berms on moderately steep and steep slopes in order to prevent runoff along the ROW and subsequent erosion. Install berms immediately downslope of all trench breakers (Dwg. STDS-03-ML-12-221, STDS-03-ML-12-222, and STDS-03-ML-12-223). • Install stub berms, as required by Coastal GasLink, in high groundwater areas to prevent ditch line surface water flows.

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Activity/Concern	Mitigation
Natural Recovery	• Natural recovery is the preferred method of reclamation in appropriate areas. • Use natural recovery in peatland and non-peatland wetlands. • Use cover crops, where required, to prevent erosion of disturbed areas prior to final cleanup and reclamation.
Recreational Trails	• Reclaim recreation trails and use areas disturbed by the Project to the extent practical, to their construction preparation condition and according to the Reclamation Plan.
Seeding and Revegetation	• Reclaim native vegetation in accordance with applicable federal and provincial laws and regulations, or as agreed to with the relevant regulatory authorities. • Restore habitat by mounding or planting seeds along disturbed areas as outlined in Dwgs. STDS-03-ML-05-314, STDS-03-ML-05-315, STDS-03-ML-05-316, STDS-03-ML-05-317, STDS-03-ML-05-318, or other drawings provided by Coastal GasLink as directed by the Environmental Inspector in consultation with an appropriate Resource Specialist. Use only Certified No. 1 seed mix or native species, where available, in accordance with the Reclamation Program. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority. • Acquire Certificates of Analysis for all seed mixes. • Seed riparian and erosion prone areas with Certified No. 1 seed mix or native species in accordance with the Reclamation Program approved by the relevant regulatory authority as soon as practical after construction prior to spring freshet, wherever practical. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority. • Seeding will follow as close as practical to rough cleanup and topsoil and surface material replacement, pending seasonal or weather conditions. • On privately-owned lands such as pasture and hay land, the seed mix may be varied based on input from landowners and the availability of seed at the time of reclamation. • Landowners are responsible for seeding cultivated lands. • On Crown land, allow for natural regeneration, or seed with Certified No. 1 seed mix or native species in accordance with the Reclamation Program. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority. • Apply seed to all disturbed surfaces (except cultivated fields and wetlands), unless otherwise specified on the environmental worksheets. • Use natural recovery in wetlands and areas of ecological communities or plant species of concern and traditionally important plant species unless invasive species or noxious weeds are a concern, unless otherwise specified by Coastal GasLink. • Restrict vehicle access over newly seeded areas. • Inspect vegetation regularly during the PCM program to ensure adequate vegetation cover is established and maintained. Take appropriate action if post-construction monitoring indicates an undesirable outcome. • Commence reclamation as soon as practical.

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Activity/Concern	Mitigation
Seed Mix Application	• Seed will be applied using a rangeland drill or equivalent. Use broadcast application on steep terrain, fence lines, road ditches, watercourse banks, etc. • Apply seed as per the Reclamation Program for non-agricultural lands. On agricultural lands, apply seed at a rate specified in project approvals or at a rate of 10 kg/ha for drill seeding and 15 kg/ha for broadcast seeding. Drill seeding is the primary method of seed application, unless otherwise specified by the Environmental Inspector(s) or designate.
Straw Crimping	• Straw crimping may be used as specified by the Environmental Inspector(s) to prevent wind erosion and reduce evapotranspiration on pasture, cultivated lands, and erosion prone soils. Straw sources, which will be weed-free and located in Alberta or British Columbia, must be approved by the Environmental Inspector(s) and are subject to landowner approval on private land or regulatory approval where there is a statutory requirement. Other erosion control measures may be used as per the Coastal GasLink Erosion and Sediment Control Plan. • To prevent the introduction or spread of noxious weeds, inspect all potential source locations for noxious weeds before procurement of the straw. Straw sources, which will be weed-free and located in Alberta or British Columbia, must be approved by the Environmental Inspector(s) and is subject to landowner approval on private land or regulatory approval where there is a statutory requirement. Other erosion control measures may be used as per the Coastal GasLink Erosion and Sediment Control Plan.
Rollback	• Install rollback as specified by the Environmental Inspector(s) and approved by the relevant regulatory authority. • Rollback slash and small diameter, non-merchantable timber on erosion prone slopes when deemed necessary by the Environmental Inspector. Walk down erosion control rollback with a dozer (refer to Appendix B, Dwg. STDS-03-ML-05-313). • Install rollback to prevent access along portions of the ROW as indicated on the environmental worksheets or directed by the Environmental Inspector(s) and Construction Manager. Spread evenly over ROW. Do not walk over access control rollback (refer to Appendix B Dwg. STDS-03-ML-05-312). • Use slash (rollback) during revegetation in wooded areas in accordance with landowner wishes, or the relevant regulatory authority, to create microsites. • Install rollback at watercourses as specified by the Environmental Inspector(s) and approved by the relevant regulatory authority.
Access Control	• Implement the ACMP (Appendix D.3). The location of site-specific measures will be determined in consultation with the relevant regulatory authority.
Tackifiers	• The Environmental Inspector(s) or designate will determine locations where tackifier will be used. • Review areas where tackifier has been applied and other potential erosion areas to ensure soils stabilization is effective where topsoil and surface material, and piles and windrows are left in place through winter construction and spring thaw. Follow-up monitoring and applications will be conducted as required.
Burn Piles	• Confirm burn piles are properly extinguished. Conduct infrared scanning of burn pile locations to locate any hot spots.
Weed Control	• Implement PCM and treat weed infestation on the ROW and facility sites as needed.

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9.0 POST-CONSTRUCTION MONITORING

Coastal GasLink has developed a project-specific Post-Construction Monitoring Program under separate cover, which describes monitoring to review the effectiveness of mitigation and the approach to adaptive management.

9.1 OBJECTIVES

The objectives of PCM are to:

- evaluate the effectiveness of environmental protection and mitigation during construction
- document the reclamation and recovery of areas disturbed by Project construction activities and review the success or re-establishing equivalent land capability
- identify any new environmental issues that may have arisen after the post-construction reclamation phase of the Project
- recommend, coordinate and implement any remedial measures that are warranted and any additional measures to address outstanding or new environmental issues
- monitor wildlife and wildlife habitat, as required, through ongoing consultation with the relevant regulatory authority
- compare the predicted effects (including cumulative effects) and mitigation with actual documented effects
- document opportunities for procedural learnings and improvement

9.2 POST-CONSTRUCTION RECLAMATION MONITORING

Effective post-construction reclamation is key to re-establishing habitat and stabilizing ground cover in areas subject to ground disturbance during installation of the pipeline; thus an important part of post-construction monitoring. Coastal GasLink will implement a program to ensure compliance with specific reclamation performance expectations and conditions. Mitigation methods will be based on the principle that success of land reclamation is measured against adjacent representative site conditions or pre-disturbance on-site data while taking into consideration the status of reclamation of the time of assessment.

Preliminary assessments will be conducted during the most appropriate time of the season, which depends on the various biophysical resources and their growth stage or life cycle. This is usually in the spring and summer, and involves identifying deficiencies and proposing recommendations for corrective actions.

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The program may entail specifically designed evaluation criteria depending on the concerns and issues that were highlighted through the EAC Application or encountered during the construction process. Seasonal influences, species life cycle or habitat periods may require evaluations to be conducted during specific periods throughout the year.

Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, under non-frozen or dry conditions, but may be outside this timing window due to environmental timing restrictions (reproductive periods, migration periods), field and weather conditions, or social and public concerns. A final assessment would then be scheduled for the fall, or as deemed appropriate to ensure the remedial actions are stable and successful.

Areas of potential terrain instability will be monitored for five years after final cleanup and the Contractor warranty period. Slope stability will be inspected on a routine basis for the life of the pipeline. Remedial work will be conducted where warranted to protect pipeline integrity.

The ROW will be inspected during operations with regular aerial patrols. Remedial work will be conducted, where warranted, to protect pipeline integrity in a timely manner.

Areas that are susceptible to erosion or difficult to revegetate (e.g., due to high salinity) will be identified, and records maintained of remedial measures implemented and the success of these measures. This information will be made available to construction Contractors and supervisors prior to and during operations and maintenance activities to allow implementation of adaptive mitigation strategies to reduce potential adverse effects on soil and soil productivity.

Coastal GasLink will record locations of concerns identified during construction related to weeds, vegetation establishment, general ROW conditions, water crossing stability, and reclamation success. This issues list will be used to measure the success of mitigation used during construction of the Project, and to ensure outstanding issues are investigated, resolved, and reported during Project operations.

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Environmental Management Plan

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Appendix A Emergency Contacts
Appendix B Typical Drawings
Appendix C Contingency Plans
Appendix D Management Plans
Appendix E Mitigation and Monitoring Plans

Environmental Management Plan

Appendix A Emergency Contacts

A.1 EMERGENCY CONTACTS

Contact	Location	Phone Number / Email
RCMP		911
Ambulance		911
Hospital		911
Fire		911
Technical Safety BC		1-866-566-7233
BC Oil and Gas Commission (BC OGC) – 24 hour Incident Reporting		1-800-663-3456
Emergency Management BC (EMBC)		1-800-663-3456
BC Forest Fire Reporting Centre		1-800-663-5555 (or *5555)
Fisheries and Oceans Canada (DFO) Spill Reporting Line		1-800-465-4336
BC One-Call		1-800-474-6886
WorkSafeBC (Emergency and Accident Reporting)		1-888-621-7233
Environmental Assessment Office (EAO) – Compliance and Enforcement		eao.compliance@gov.bc.ca
Transport Safety Board Emergency/Incident Line	Calgary	1-819-997-7887

Environmental Management Plan

Appendix B Typical Drawings

B.1 TYPICAL DRAWINGS

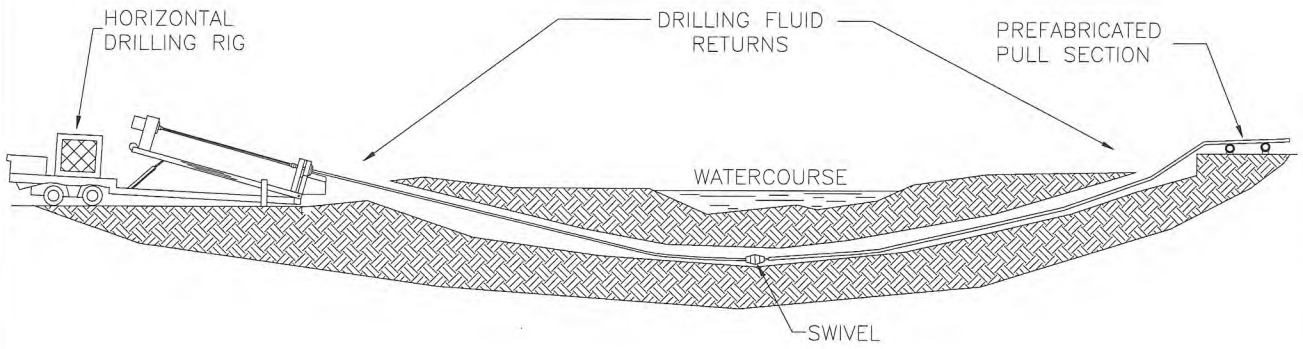
Drawing Number	Title
STDS-03-LA-SK-001	Typical Horizontal Directional Drill
STDS-03-ML-03-214	Drain Tile Restoration
STDS-03-ML-05-001	Typical Erosion and Sediment Control Measures
STDS-03-ML-05-002	Wetland Mitigation Open Water Crossing (Sheet 1 of 2)
STDS-03-ML-05-003	Wetland Mitigation Open Water Crossing (Sheet 2 of 2)
STDS-03-ML-05-004	Wetland Mitigation Typical Crossing (Sheet 1 of 2)
STDS-03-ML-05-005	Wetland Mitigation Typical Crossing (Sheet 2 of 2)
STDS-03-ML-05-006	Peatland Materials Conservation Trench Spoil 2 Lift (Sheet 1 of 2)
STDS-03-ML-05-007	Peatland Materials Conservation Trench Spoil 2 Lift (Sheet 2 of 2)
STDS-03-ML-05-101	Temporary Clear Span Bridge Crossing (Sheet 1 of 3)
STDS-03-ML-05-101	Temporary Clear Span Bridge Crossing (Sheet 2 of 3)
STDS-03-ML-05-101	Temporary Clear Span Bridge Crossing (Sheet 2 of 3)
STDS-03-ML-05-103	Pipeline Vehicle Crossing - Culvert with Native Fill Material (Sheet 1 of 2)
STDS-03-ML-05-103	Pipeline Vehicle Crossing - Culvert with Native Fill Material (Sheet 2 of 2)
STDS-03-ML-05-104	Temporary Snowfill/Ice Bridge Crossing

Drawing Number	Title
STDS-03-ML-05-105	Typical Open Cut Watercourse Crossings (Sheet 1 of 2)
STDS-03-ML-05-105	Typical Open Cut Watercourse Crossings (Sheet 2 of 2)
STDS-03-ML-05-111	Flume Watercourse Crossings (Sheet 1 of 3)
STDS-03-ML-05-111	Flume Watercourse Crossings (Sheet 2 of 3)
STDS-03-ML-05-111	Flume Watercourse Crossings (Sheet 3 of 3)
STDS-03-ML-05-112	Dam and Pump Water Course Crossings (Sheet 1 of 3)
STDS-03-ML-05-112	Dam and Pump Water Course Crossings (Sheet 2 of 3)
STDS-03-ML-05-112	Dam and Pump Water Course Crossings (Sheet 3 of 3)
STDS-03-ML-05-113	Dragline Typical Water Course Crossings
STDS-03-ML-05-131	Soil Retaining Berm
STDS-03-ML-05-132	Sediment Control - Silt Fence Construction
STDS-03-ML-05-137	Sediment Control - Check Dam / Filter
STDS-03-ML-05-301	Timber Salvage Quality and Defects
STDS-03-ML-05-302	Salvage of Merchantable Timber
STDS-03-ML-05-312	Typical Rollback For Access Control
STDS-03-ML-05-313	Typical Rollback For Erosion Control
STDS-03-ML-05-314	Mounding and Habitat Restoration (Sheet 1 of 2)
STDS-03-ML-05-315	Mounding and Habitat Restoration (Sheet 2 of 2)

Drawing Number	Title
STDS-03-ML-05-316	Habitat Restoration Seedling Planting for Line of Sight (Sheet 1 of 3)
STDS-03-ML-05-317	Habitat Restoration Seedling Planting (Sheet 2 of 3)
STDS-03-ML-05-318	Habitat Restoration and Line of Sight Seedling Planting Notes (Sheet 3 of 3)
STDS-03-ML-05-401	Topsoil Conservation - Full Width Stripping (Sheet 1 of 2)
STDS-03-ML-05-401	Topsoil Conservation - Full Width Stripping (Sheet 2 of 2)
STDS-03-ML-05-402	Topsoil Conservation - Ditchline and Spoil Side
STDS-03-ML-05-404	Topsoil Conservation, Blade Width
STDS-03-ML-05-410	Topsoil Conservation Ditch and Workside Stripping (Sheet 1 of 2)
STDS-03-ML-05-410	Topsoil Conservation Ditch and Workside Stripping (Sheet 2 of 2)
STDS-03-ML-05-411	Topsoil Conservation, Ditchline Winter Construction (Sheet 1 of 2)
STDS-03-ML-05-411	Topsoil Conservation, Ditchline Winter Construction (Sheet 2 of 2)
STDS-03-ML-05-412	Topsoil Conservation, Foreign Pipeline Crossings Winter Construction (Sheet 1 of 2)
STDS-03-ML-05-412	Topsoil Conservation, Foreign Pipeline Crossings Winter Construction (Sheet 2 of 2)
STDS-03-ML-05-421	Topsoil Conservation for Side Hill Grading in Agricultural Land

Drawing Number	Title
STDS-03-ML-05-424	Soil Handling For Ramped Line Crossing (Sheet 1 of 2)
STDS-03-ML-05-424	Soil Handling For Ramped Line Crossing (Sheet 2 of 2)
STDS-03-ML-05-426	Topsoil Conservation Full Width Stripping 3 Lift (Sheet 1 of 2)
STDS-03-ML-05-426	Topsoil Conservation Full Width Stripping 3 Lift (Sheet 2 of 2)
STDS-03-ML-05-431	Secondary Stripping For Spoil Displacement (Sheet 1 of 2)
STDS-03-ML-05-431	Secondary Stripping For Spoil Displacement (Sheet 2 of 2)
STDS-03-ML-05-443	Grubbing and Topsoil Conservation for Treed Land (Sheet 1 of 2)
STDS-03-ML-05-443	Grubbing and Topsoil Conservation for Treed Land (Sheet 2 of 2)
STDS-03-ML-05-445	Frozen Forested Lands Right-of-Way Preparation (Minimal Surface Disturbance)
STDS-03-ML-05-446	Non-Frozen Forested Lands Surface Materials/Stripping Conservation
STDS-03-ML-05-601	Streambank Reclamation - Rootwad
STDS-03-ML-05-602	Streambank Reclamation - Deflectors
STDS-03-ML-05-603	Streambank Reclamation - Logwall
STDS-03-ML-05-604	Streambank Reclamation - Brush Layer in Cross Cut Slope
STDS-03-ML-05-606	Streambank Reclamation - Vegetated Geotextile Installation
STDS-03-ML-05-607	Streambank Reclamation - Tree Revetment

Drawing Number	Title
STDS-03-ML-05-608	Watercrossing Bank Erosion Protection
STDS-03-ML-12-202	Typical Bentonite Ditch Plug (Sheet 1 of 2)
STDS-03-ML-12-202	Typical Bentonite Ditch Plug (Sheet 2 of 2)
STDS-03-ML-12-203	Typical Bentonite Ditch Plug Using Nudrain or Equivalent (Sheet 1 of 2)
STDS-03-ML-12-203	Typical Bentonite Ditch Plug Using Nudrain or Equivalent (Sheet 2 of 2)
STDS-03-ML-12-204	Typical Polyurethane Foam Breaker
STDS-03-ML-12-211	Typical Subdrain Using Gravel (Sheet 1 of 3)
STDS-03-ML-12-211	Typical Subdrain Using Gravel (Sheet 2 of 3)
STDS-03-ML-12-211	Typical Subdrain Using Gravel (Sheet 3 of 3)
STDS-03-ML-12-212	Typical Subdrain (Sheet 1 of 3)
STDS-03-ML-12-212	Typical Subdrain (Sheet 2 of 3)
STDS-03-ML-12-212	Typical Subdrain (Sheet 2 of 3)
STDS-03-ML-12-221	Typical Diversion Berms (Sheet 1 of 2)
STDS-03-ML-12-221	Typical Diversion Berms (Sheet 2 of 2)
STDS-03-ML-12-222	Typical Diversion Berms with Flow Channel (Sheet 1 of 2)
STDS-03-ML-12-222	Typical Diversion Berms with Flow Channel (Sheet 2 of 2)
STDS-03-ML-12-223	Typical Stub Berm
4703-09-ML-SK-001	Typical Corduroy Wetland Road Crossing
16442-09-ML-04-005	Pipeline Vehicle Crossing – Culvert with Native Fill Material



PLAN VIEW
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NOTES

1. OBTAIN GEOTECHNICAL DATA PRIOR TO INITIATING DRILLING. DRILLING MAY NOT BE FEASIBLE IN SOME MATERIAL SUCH AS UNCONSOLIDATED GRAVEL.

2. ENSURE TEMPORARY WORKSPACE RIGHTS HAVE BEEN OBTAINED TO CONDUCT MONITORING AND THAT ACCESS IS AVAILABLE FOR MONITORING ACTIVITIES.

3. SET UP DRILLING EQUIPMENT BACK FROM THE EDGE OF THE WATERCOURSE; DO NOT CLEAR OR GRADE WITHIN THE BUFFER ZONE.

4. EMPLOY FULL TIME INSPECTORS OR MONITORS TO OBSERVE FOR ANY INADVERTENT MUD RELEASE INTO THE WATERCOURSE.

5. ENSURE THAT ONLY BENTONITE BASED DRILLING MUD IS USED. ALL BENTONITE BASED SYSTEMS SHALL MEET APPLICABLE REGULATORY REQUIREMENTS AND THE COMPANY SHALL APPROVE ALL ADDITIVES AND CONCENTRATIONS PRIOR TO USE.

6. INSTALL SUITABLE DRILLING MUD TANKS OR SUMPS TO PREVENT CONTAMINATION OF WATERCOURSE,

7. INSTALL SUMPS AND BERMS, OR EQUIVALENT BARRIERS DOWNSLOPE FROM THE DRILL ENTRY AND ANTICIPATED EXIT POINTS TO CONTAIN ANY RELEASE OF DRILLING MUD.

8. DISPOSE OF DRILLING MUD IN ACCORDANCE WITH THE APPROPRIATE REGULATORY AUTHORITY REQUIREMENTS.

9. PREPARE A DRILLING MUD RELEASE CONTINGENCY PLAN.

Source: Adapted from Fisheries and Oceans Canada 2005, Pipeline Associated Watercourse Crossing. 3rd addition

REVISIONS	ID	ISSUED FOR APPLICATION
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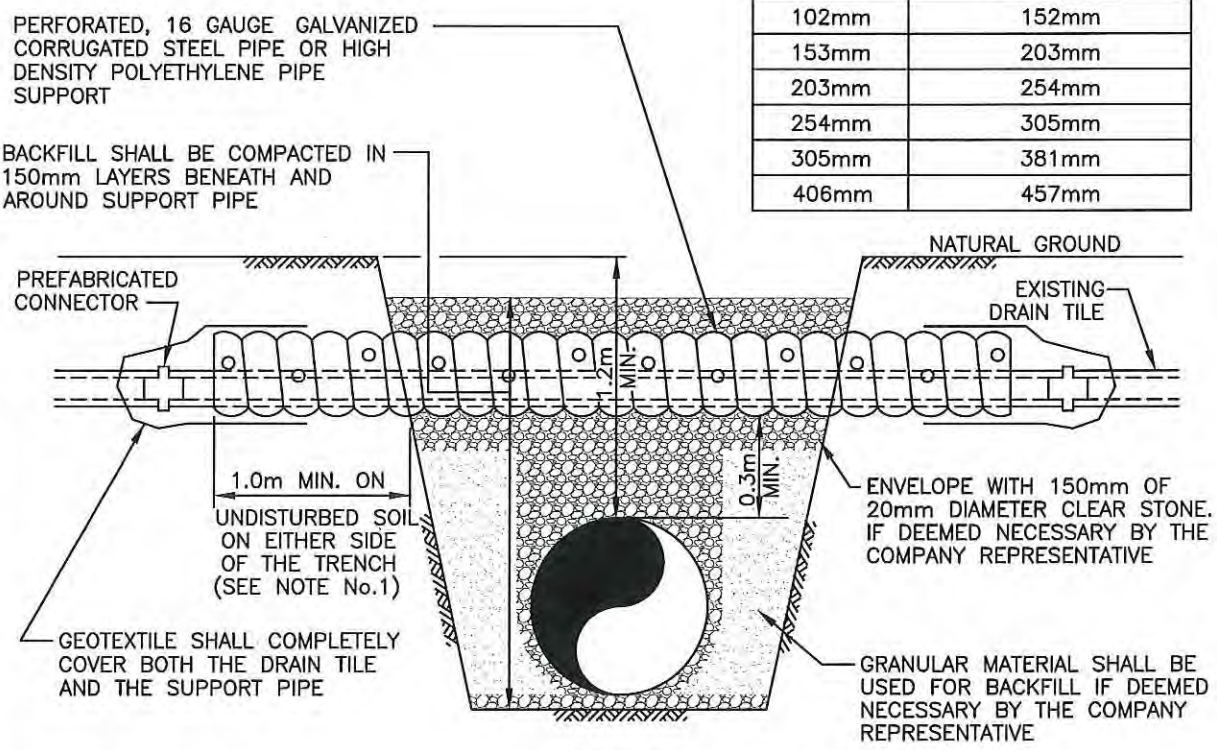
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NAME	DATE	FIA # STDS	CHAINAGE:	DISCIPLINE # 03
M Lor	12-04-2017	TITLE: TYPICAL HORIZONTAL DIRECTIONAL DRILL		
CHECKED BY:	DESIGN CHECKER:	SCALE NTS	DWG No STDS-03-LA-SK-001	REV 00

TIME — DESIGNFILE

TC_A4_BR.DWG 210X280

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TUBING SIZE	CORRUGATED PIPE SIZE (SEE NOTE 7)
102mm	152mm
153mm	203mm
203mm	254mm
254mm	305mm
305mm	381mm
406mm	457mm



SECTION

N.T.S.

NOTES

1. IF THE WIDTH OF THE TRENCH DOES NOT ALLOW FOR THE INSTALLATION OF THE SUPPORT PIPE ON A MINIMUM OF 1.0m OF UNDISTURBED SOIL, ONE OF THE FOLLOWING MITIGATION MEASURES SHALL BE ADHERED TO AS DIRECTED BY THE COMPANY REPRESENTATIVE.
   A) RELOCATE THE DRAIN TILE CROSSING TO A LOCATION THAT WOULD ACCOMMODATE THE CROSSING OF THE DITCH AS OUTLINED ABOVE PROVIDED THAT INTENDED DIRECTION OF FLOW WERE RESPECTED
   B) BUILD UP THE BEARING SURFACE WITH GRANULAR MATERIAL WHICH MUST BE SUFFICIENTLY COMPACTED TO ALLOW FOR THE PROPER INSTALLATION OF THE SUPPORT PIPE.
   C) ALL OTHER METHODS APPROVED BY THE COMPANY REPRESENTATIVE.
2. SUPPORT PIPE AND DRAINAGE TUBING SHALL BE OF QUALITY AT LEAST EQUAL TO CANADIAN GOVERNMENT SPECIFICATION BOARD STANDARD 41G.P.29 AND QUEBEC STANDARDS NQ 3624-115 AND NQ 3624-120.
3. ALL MATERIAL REQUIRED TO COMPLETE THE WORK AND RESTORE THE SITE SHALL BE SUPPLIED BY THE CONTRACTOR.
4. SUPPORT PIPE AND PLASTIC DRAINAGE TUBING TO BE INSTALLED SO THAT THE HOLES ARE CENTERED ON EACH SIDE OF THE PIPE.
5. DRAIN TILE SHALL BE RESTORED AS PER THIS DRAWING OR AS DIRECTED BY THE COMPANY.
6. IN GENERAL, AT DRAIN TILE CROSSING, A MINIMUM OF 8 METRES OF PLASTIC DRAIN TILE AND 6m OF SUPPORT PIPE WILL BE REQUIRED.
7. THE NOMINAL SIZE MAY VARY DEPENDING ON THE TYPE OF SUPPORT PIPE UTILIZED.

REVISIONS | 00 | STANDARD ISSUE, SUPERCEDES ASK-18-85 | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC | 02 | GENERAL ISSUE - REVIEWED FOR 2016 SPEC

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DRAIN TILE RESTORATION

SCALE	DWG No	REV
N.T.S.	STDS-03-ML-03-214	02

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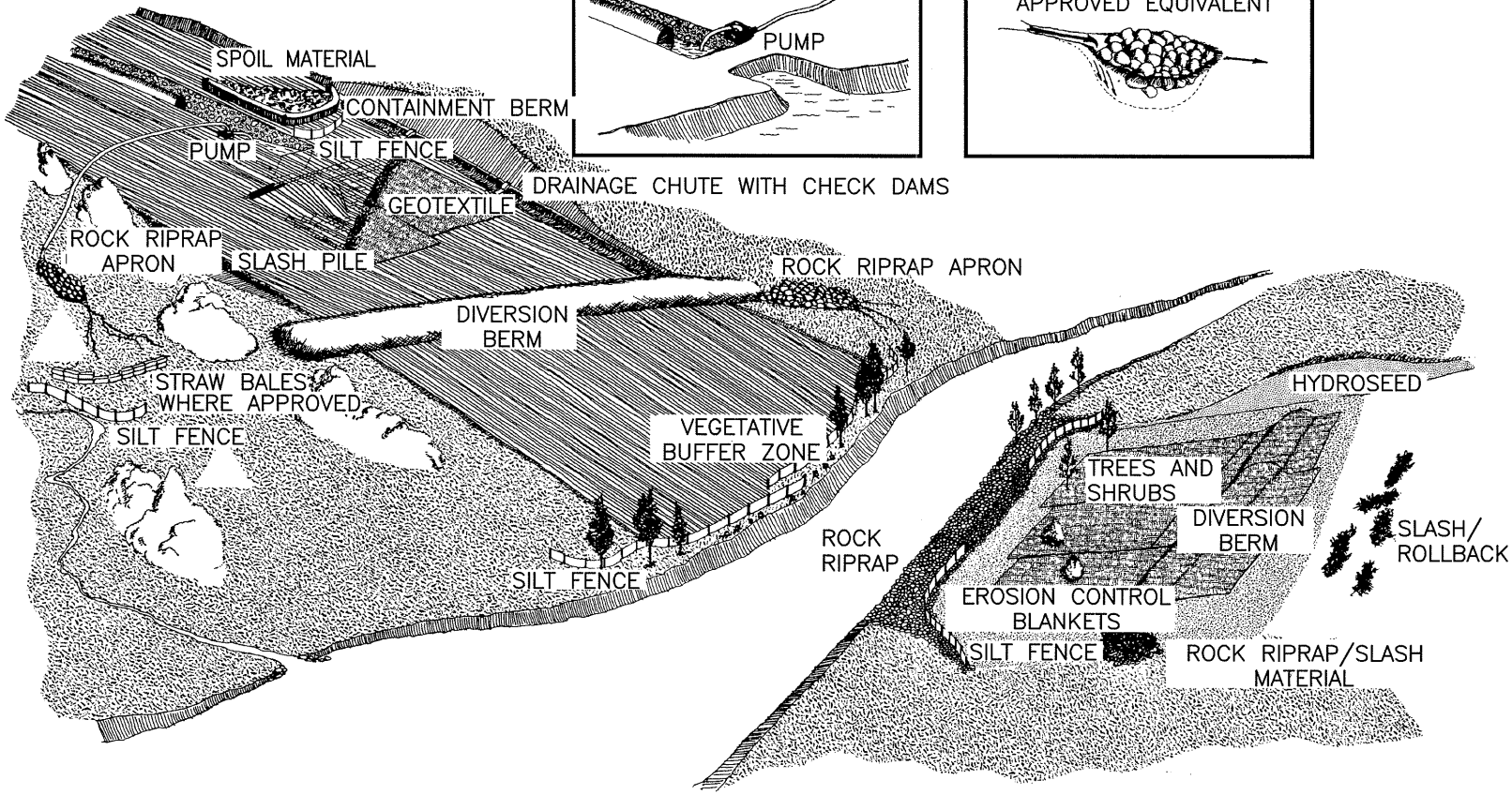
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DESIGNER: Darby Ryan June 15/15 (NAME / DATE)

CHECKED BY:

DESIGN CHECKER:



TITLE: TYPICAL EROSION AND SEDIMENT CONTROL MEASURES

FIA # STDS

CHAINAGE:

DISCIPLINE # 03

DESIGN STANDARD

SCALE N.T.S.

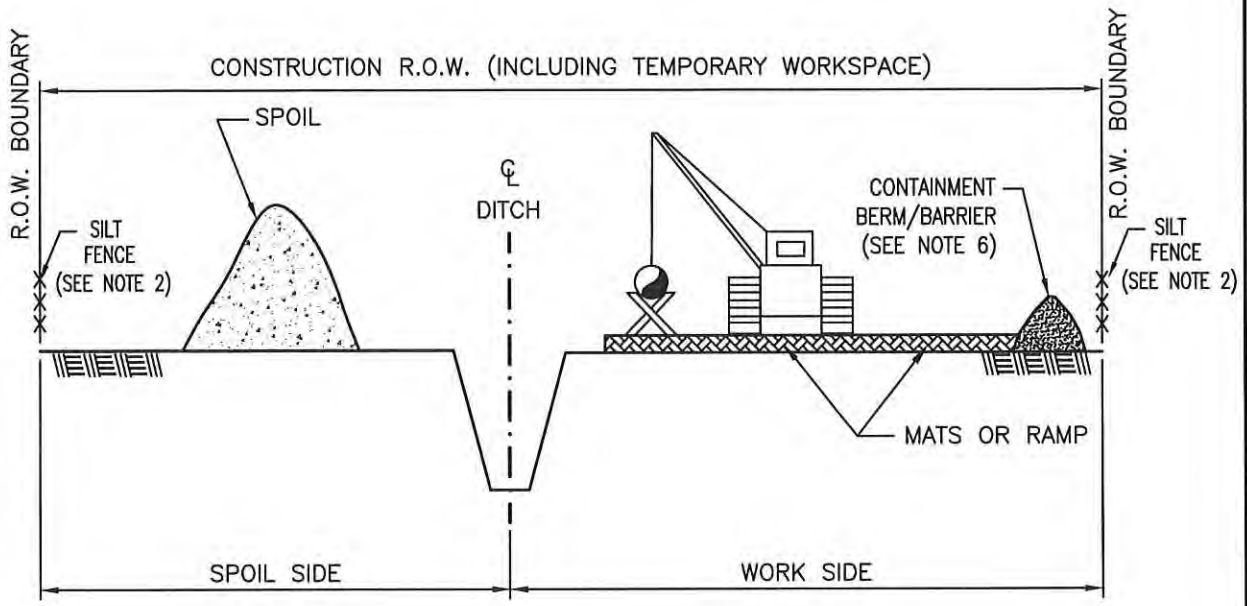
DWG No STDS-03-ML-05-001

REV 01

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CROSS SECTION VIEW

REVISIONS	NO	STANDARD ISSUED	2018-05-28	KPL

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DESIGNER: May 30 2018 (NAME / DATE)

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DESIGN STANDARD

FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: WETLAND MITIGATION OPEN WATER CROSSING (SHEET 1 OF 2)

SCALE N.T.S. | DWG No STDS-03-ML-05-1002 | REV 00

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

NOTES:

1. APPLIES TO WETLANDS IN ALL LAND–USE DESIGNATIONS WHERE OPEN WATER OR SATURATED GROUND CONDITIONS ARE ENCOUNTERED THAT WOULD PRECLUDE PRACTICAL TOPSOIL/SURFACE MATERIALS SALVAGE, OR WHERE OTHER PROCEDURES MAY BE SPECIFIED TO ADDRESS RARE PLANT OCCURRENCES.
2. SILT FENCE OR EQUIVALENT BARRIER SHALL BE INSTALLED ON THE PERIMETER OF RIGHT–OF–WAY DISTURBANCES THROUGH THE WETLAND WHERE DIRECTED BY THE COMPANY. THE INTENT IS TO AVOID SEDIMENT/SOIL MIGRATION BEYOND THE CONSTRUCTION FOOTPRINT. REFER TO DRAWING STDS–03–ML–05–132.
3. RESTRICT VEGETATION REMOVAL TO ONLY AREAS OVER THE TRENCH. MINIMIZE VEGETATION REMOVAL WIDTHS OVER THE AREA WHERE MATS OR GEOTEXTILE AND CLAYCAP ARE PLACED TO THE EXTENT PRACTICAL.
4. IF GROUND CONDITIONS ARE ENCOUNTERED THAT CREATES POTENTIAL FOR ADMIXING OR COMPACTION ON THE WORKSIDE, MINIMIZE GROUND DISTURBANCE BY USING A PROTECTIVE LAYER SUCH AS MATTING OR BIODEGRADABLE GEOTEXTILE AND CLAY RAMPS OR OTHER APPROVED MATERIALS BETWEEN WETLAND ROOT/SEED BED AND CONSTRUCTION EQUIPMENT.
5. IN LESS SENSITIVE AREAS, AND ONLY WHERE APPROVED BY THE COMPANY, SURFACE MATERIALS MAY BE STRIPPED ON THE WORKSIDE DOWN TO FIRM GROUND (EG. BEDROCK) TO FACILITATE CONSTRUCTION THROUGH THE WETLAND.
6. WHERE WATER IS ENCOUNTERED, SOIL MAY BE USED AS A CONTAINMENT BERM/BARRIER IF DEEMED NECESSARY TO FACILITATE CONSTRUCTION THROUGH THE WETLAND. GEOTEXTILE MAY BE REQUIRED TO PROVIDE AN ADEQUATE SEPARATION LAYER BETWEEN THE WETLAND VEGETATION AND CONTAINMENT BERM/BARRIER, AND TO ACHIEVE PROPER MATERIAL REMOVAL DURING CLEANUP. CONTAINMENT BERM/BARRIER MATERIALS SHALL BE APPROVED BY THE COMPANY.
7. LOCATE ALL EXTRA TEMPORARY WORK SPACE (IE. STAGING AREAS, GRADE/BORROW AREAS FOR RAMPING, ADDITIONAL SPOIL STORAGE AREAS) OUTSIDE THE WETLAND BOUNDARIES, UNLESS OTHERWISE APPROVED BY THE COMPANY.
8. WATER PUMPING SHALL BE TO STABLE OR WELL–VEGETATED AREAS AS APPROVED BY THE COMPANY. MONITOR DISCHARGE AREAS AND CHANGE HOSE/DISCHARGE LOCATION OR PUMP INTO FILTER BAGS OR OTHER FILTRATION DEVICES IF ADEQUATE NATURAL FILTRATION IS NO LONGER POSSIBLE AND SEDIMENTATION MAY OCCUR.
9. EXCAVATE TRENCH, INSTALL PIPE, BACKFILL TRENCH.
10. REMOVE MATS OR GEOTEXTILE/CLAYCAP, AND CONTAINMENT BERM/BARRIER DURING CLEANUP AND UTILIZE APPROPRIATE EQUIPMENT TO MINIMIZE SCALPING AND DEPOSITION ON UNSTRIPPED AREAS.
11. RESTORE SURFACE PROFILE TO THE EXTENT PRACTICAL LEAVE MINIMUM 1m WIDE GAPS IN THE TRENCH CROWN TO ENSURE CONTOURS DO NOT AFFECT DRAINAGE FOLLOWING CLEANUP.
12. INSTALL EROSION CONTROL MEASURES AS DIRECTED BY THE COMPANY.
13. ALSO REFER TO WETLAND MITIGATION MEASURES PROVIDED IN THE EPP.

REVISIONS	00	STANDARD ISSUED	2018-05-28	KPL

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DESIGNER: Douglas B — May 30 2018 (NAME / DATE)

CHECKED BY: MJK — DESIGN CHECKER: MJS

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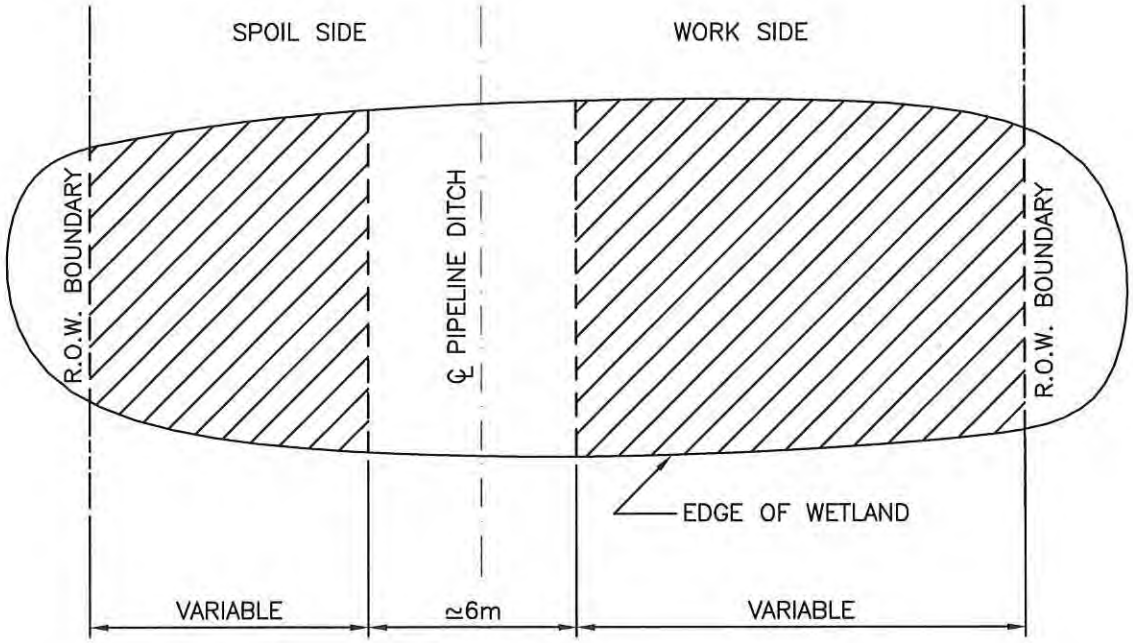
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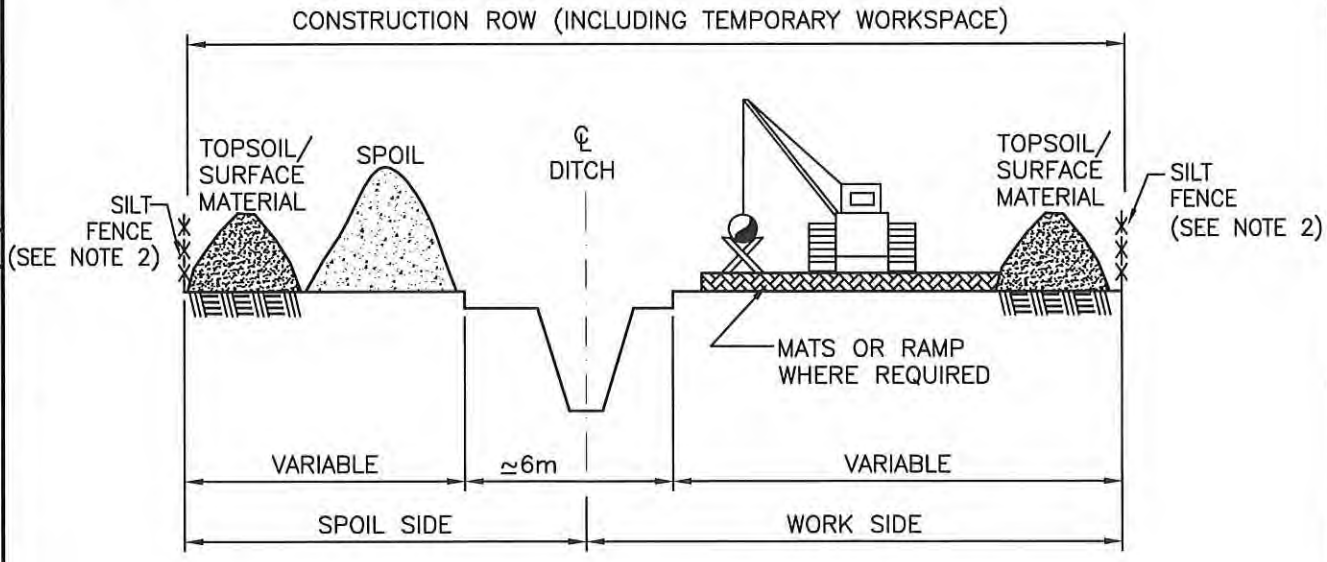
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PLAN VIEW

DESIGNATES AREA WHERE NO STRIPPING SHALL OCCUR.



CROSS SECTION VIEW

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: WETLAND MITIGATION TYPICAL CROSSING (SHEET 1 OF 2)

SCALE N.T.S.	DWG No STDS-03-ML-05-004	REV 00

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NOTES:

1. APPLIES TO WETLANDS IN AGRICULTURE LAND–USE DESIGNATIONS THAT DO NOT HAVE OPEN WATER OR SATURATED GROUND CONDITIONS THAT WOULD PRECLUDE PRACTICAL TOPSOIL/SURFACE MATERIALS SALVAGE, OR WHERE OTHER PROCEDURES MAY BE SPECIFIED TO ADDRESS RARE PLANT OCCURRENCES. SALVAGE TOPSOIL/SURFACE MATERIALS FROM THE DITCHLINE AREA ONLY. PLACE ALONG EDGE OF ROW OR OTHER APPROVED LOCATION.
2. SILT FENCE OR EQUIVALENT BARRIER SHALL BE INSTALLED ON THE PERIMETER OF R.O.W. DISTURBANCES THROUGH THE WETLAND WHERE DIRECTED BY THE COMPANY. INTENT IS TO AVOID SEDIMENT/SOIL MIGRATION BEYOND THE CONSTRUCTION FOOTPRINT. REFER TO DRAWING STDS–03–ML–05–132.
3. RESTRICT VEGETATION REMOVAL TO ONLY AREAS OVER THE TRENCH. MINIMIZE VEGETATION REMOVAL WIDTHS OVER THE AREA WHERE MATS OR GEOTEXTILE AND CLAYCAP ARE PLACED TO THE EXTENT PRACTICAL.
4. IF GROUND CONDITIONS ARE ENCOUNTERED THAT CREATES POTENTIAL FOR RUTTING, ADMIXING OR COMPACTION ON THE WORKSIDE, MINIMIZE GROUND DISTURBANCE BY USING A PROTECTIVE LAYER SUCH AS MATTING OR BIODEGRADABLE GEOTEXTILE AND CLAY RAMPS OR OTHER APPROVED MATERIALS BETWEEN WETLAND ROOT/SEED BED AND CONSTRUCTION EQUIPMENT.
5. IN LESS SENSITIVE AREAS AND ONLY WHERE APPROVED BY THE COMPANY, SURFACE MATERIALS MAY BE STRIPPED ON THE WORKSIDE DOWN TO FIRM GROUND (EG. BEDROCK OR OTHER) TO FACILITATE CONSTRUCTION THROUGH THE WETLAND.
6. WHERE WATER IS ENCOUNTERED, SOIL MAY BE USED AS A CONTAINMENT BERM/BARRIER IF DEEMED NECESSARY TO FACILITATE CONSTRUCTION THROUGH THE WETLAND. GEOTEXTILE MAY BE REQUIRED TO PROVIDE AN ADEQUATE SEPARATION LAYER BETWEEN THE WETLAND VEGETATION AND CONTAINMENT BERM/BARRIER, AND TO ACHIEVE PROPER MATERIAL REMOVAL DURING CLEANUP. CONTAINMENT BERM/BARRIER MATERIALS SHALL BE APPROVED BY THE COMPANY.
7. LOCATE ALL EXTRA TEMPORARY WORK SPACE (IE. AS STAGING AREAS, GRADE/BORROW AREAS FOR RAMPING, ADDITIONAL SPOIL STORAGE AREAS) OUTSIDE OF THE WETLAND BOUNDARIES, UNLESS OTHERWISE APPROVED BY THE COMPANY.
8. WATER PUMPING SHALL BE TO STABLE OR WELL–VEGETATED AREAS AS APPROVED BY THE COMPANY. MONITOR DISCHARGE AREAS AND CHANGE HOSE/DISCHARGE LOCATION OR PUMP INTO FILTER BAGS OR OTHER FILTRATION DEVICES IF ADEQUATE NATURAL FILTRATION IS NO LONGER POSSIBLE AND SEDIMENTATION MAY OCCUR.
9. EXCAVATE TRENCH, INSTALL PIPE, BACKFILL TRENCH.
10. REMOVE MATS OR GEOTEXTILE/CLAYCAP AND CONTAINMENT BERM/BARRIER DURING CLEANUP AND UTILIZE APPROPRIATE EQUIPMENT TO MINIMIZE SCALPING AND DEPOSITION ON UNSTRIPPED AREAS.
11. RESTORE SURFACE PROFILE TO THE EXTENT PRACTICAL LEAVE MINIMUM 1m WIDE GAPS IN THE TRENCH CROWN TO ENSURE CONTOURS DO NOT AFFECT DRAINAGE FOLLOWING CLEANUP.
12. INSTALL EROSION CONTROL MEASURES AS DIRECTED BY THE COMPANY.
13. ALSO REFER TO WETLAND MITIGATION MEASURES PROVIDED IN THE EPP.

REVISIONS	00	STANDARD ISSUED	2018-05-28	KPL

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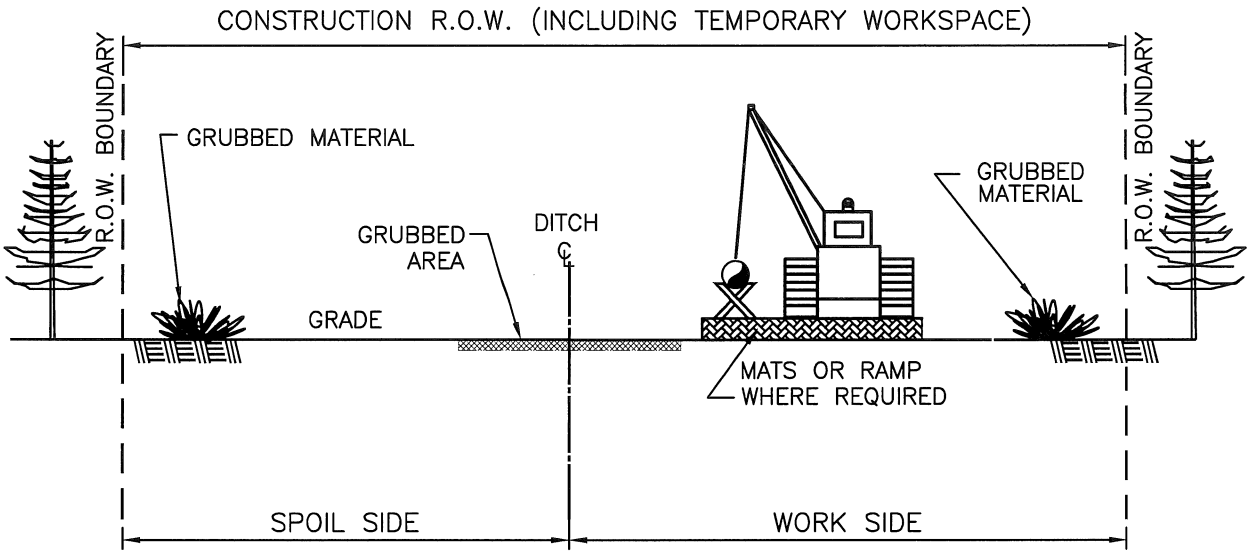
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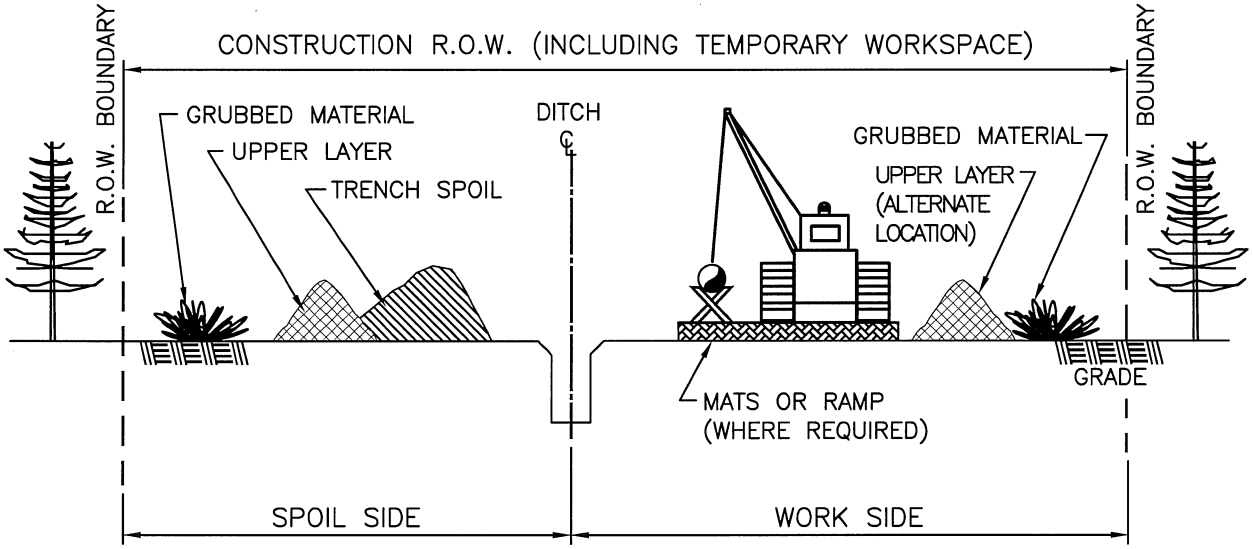
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CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



1. GRUB ROOTS/STUMPS FROM DITCH AREA OR GRADE AREAS ONLY, PLACE IN A WINDROW IN TEMPORARY WORK SPACE OR AREAS AS DIRECTED BY THE COMPANY. WHERE DICTATED BY PROJECT REQUIREMENTS, RESTRICT/MINIMIZE DISTURBANCE TO THE ROOT ZONE IN OTHER AREAS BY MULCHING OR CUTTING OF VEGETATION TO THE SURFACE ONLY TO FACILITATE CONSTRUCTION.



2. EXCAVATE THE UPPER LAYER OF THE TRENCH DEPTH SPECIFIED IN THE EPP, AND EAS. EXCAVATE THE REMAINDER OF THE TRENCH. PLACE IN STOCK PILES AS INDICATED ABOVE USING PRECAUTION TO MINIMIZE UNACCEPTABLE MIXING OF THE UPPER LAYER AND TRENCH SPOIL. THE UPPER LAYER MAY BE STOCKPILED IN THE ALTERNATE LOCATION AS SHOWN ABOVE WHERE APPROVED BY THE COMPANY. STOCKPILE PLACEMENT SHALL ALLOW FOR RE-PLACEMENT OF THE UPPER LAYER AND TRENCH SPOIL BACK IN THEIR ORIGINAL SEQUENCE TO THE EXTENT PRACTICAL.

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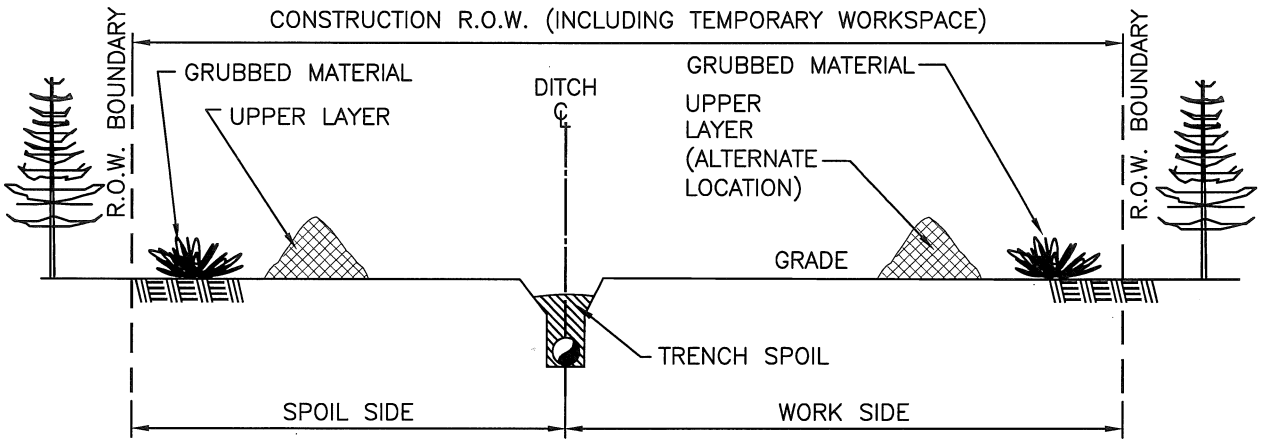
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TITLE: PEATLAND MATERIALS CONSERVATION TRENCH SPOIL 2 LIFT (SHEET 1 OF 2)

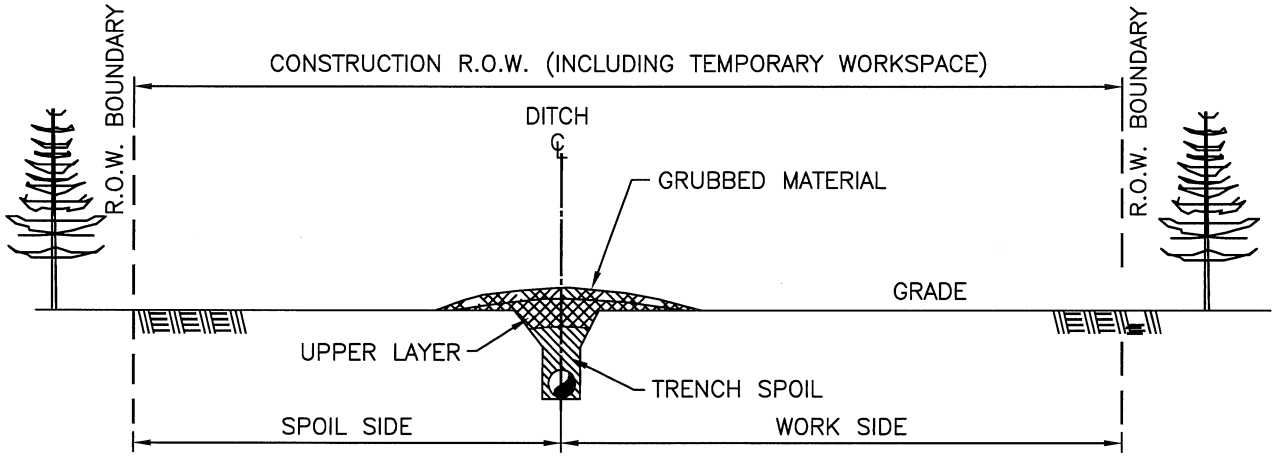
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3. BACKFILL TRENCH SPOIL.



4. BACKFILL AND REPLACE UPPER LAYER PILE EVENLY OVER TRENCH AREA TO THE DEPTHS AS SPECIFIED IN THE EPP AND EAS. PREPARE SURFACE PER APPROVED RECLAMATION PROCEDURE. GRUBBED MATERIALS SHALL BE REDISTRIBUTED ACROSS THE AREA OR DISPOSED OFF-SITE AS DIRECTED BY THE COMPANY.

5. LEAVE OPENINGS OVER THE TRENCH AREA TO ENSURE CROSS RIGHT-OF-WAY DRAINAGE IS MAINTAINED.

6. WHERE UTILIZED REMOVE MATS OR RAMP.

APPLICATION: AS DIRECTED BY THE COMPANY.

REVISIONS	00	STANDARD ISSUED	2018-05-28	KPL

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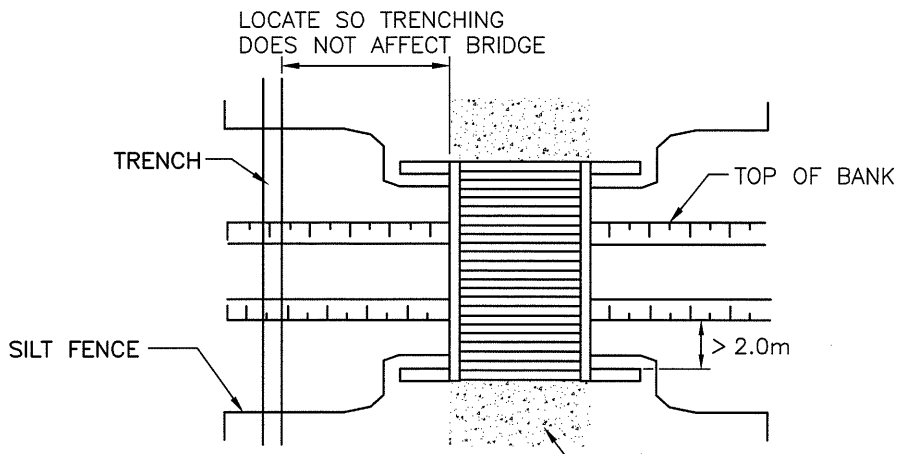
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CHECKED BY:	DESIGN CHECKER:	TITLE: PEATLAND MATERIALS CONSERVATION TRENCH SPOIL 2 LIFT (SHEET 2 OF 2)		
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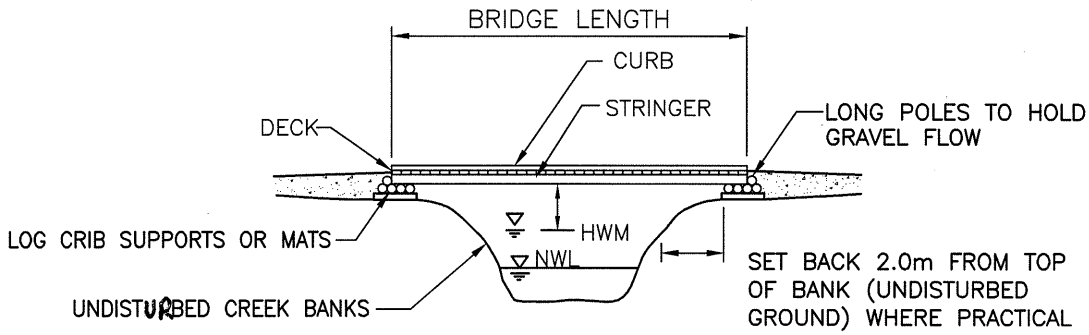
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PLAN

SCALE : N.T.S.



BRIDGE PROFILE

SCALE : N.T.S.

REVISIONS | 00 | DRAWING SUPERSEDES ASK-18-387, A2-SK-18-434, A2-SK-18-425
01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC.

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TIME

DESIGNFILE

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DESIGNER: Douglas B. NAME — June 15, 2015 DATE

CHECKED BY:

DESIGN CHECKER:

DESIGN STANDARD

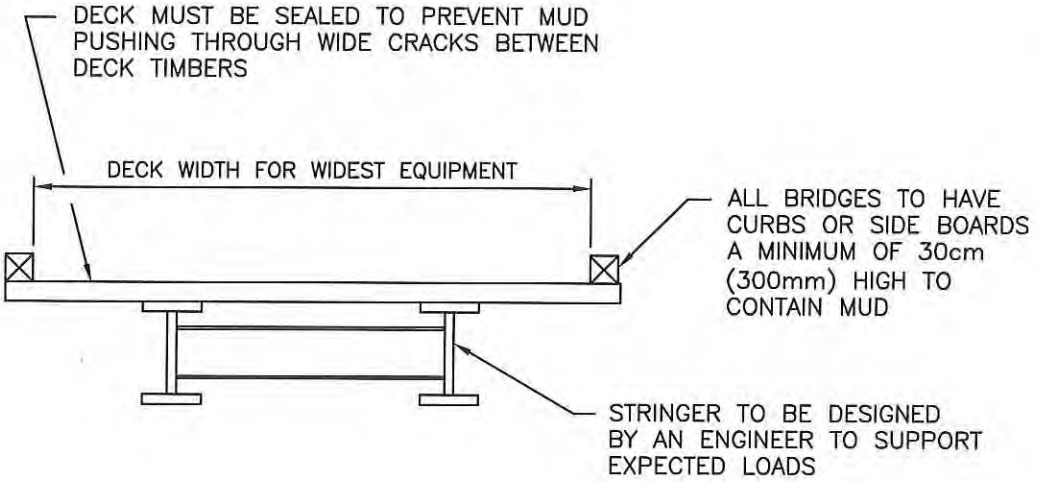
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: TEMPORARY CLEAR SPAN BRIDGE CROSSINGS (SHEET 1 OF 3)

SCALE N.T.S. | DWG No STDS-03-ML-05-101 | REV 01

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CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



TYPICAL STEEL BRIDGE SECTION

SCALE: N.T.S.

REVISIONS		
00	DRAWING SUPERSEDES ASK-18-387, A2-SK-18-434, A2-SK-18-425	
01	GENERAL ISSUE - REVIEWED FOR 2015 SPEC.	
02	GENERAL ISSUE - REVISED BRIDGE CURBS OR SIDE BOARDS HEIGHT	

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DESIGNER: NAME April 7/15 DATE

CHECKED BY:

DESIGN CHECKER:

DESIGN STANDARD

FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE

TEMPORARY CLEAR SPAN BRIDGE CROSSINGS (SHEET 2 OF 3)

SCALE N.T.S. | DWG No STDS-03-ML-05-101 (2/3) | REV 02

TIME

DESIGNFILE

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CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

REVISIONS	00	01	02	03
	DRAWING SUPERSEDES ASK-18-387, A2-SK-18-434, A2-SK-18-425	GENERAL ISSUE - REVIEWED FOR 2015 SPEC.	GENERAL ISSUE - REVISED NOTE 5	GENERAL ISSUE - REVISED NOTE 2 KPL 2017-10-23

DETAILED CONSTRUCTION SEQUENCE – TEMPORARY BRIDGES

THE FOLLOWING SEQUENCE OF CONSTRUCTION AND MITIGATION MEASURES WILL BE FOLLOWED AT ALL TEMPORARY CLEAR SPAN BRIDGES:

1. MEASURE THE APPROXIMATE BRIDGE LENGTH REQUIRED TO SPAN FROM BANK TO BANK. A MINIMUM 2.0m SETBACK FROM TOP OF BANK MUST BE PRESERVED AS A "NO DISTURBANCE AREA, WHERE PRACTICAL.
2. INSTALL THE BRIDGE TO MINIMIZE DISTURBANCE TO STREAMBANK AND VEGETATION WITHIN THE MINIMAL DISTURBANCE AREA. STRINGERS MUST BE ENGINEERED TO SUPPORT THE LOADS EXPECTED ON THE BRIDGE. CURBS MUST BE INSTALLED WITH A MINIMUM OF 300mm HIGH ALONG THE EDGE OF THE DECK TO CONTAIN MUD ON THE BRIDGE. FASTENERS CONNECTING COMPONENTS MUST BE STRONG TO HOLD THEM IN POSITION DURING THE LIFE OF THE BRIDGE. CRIBS ARE TO BE FILLED WITH ROCK OR COBBLE. RIP RAP EROSION PROTECTION IS TO BE PLACED AROUND THE CRIBS AND ON THE FILL SLOPES PROJECTING INTO THE WATER, WHERE INSTREAM WORK IS APPROVED BY THE COMPANY.
3. AN IMPERMEABLE MEMBRANE SUCH AS PLASTIC SHEETING, GEOTEXTILE AND OR PLYWOOD SHALL BE REQUIRED TO PREVENT DIRT AND DEBRIS FROM ENTERING INTO THE WATER BODY.
4. ROAD APPROACHES LEADING TO BRIDGE AND FLUME VEHICLE CROSSINGS MUST BE RAISED AND STABLE SO EQUIPMENT LOADS ARE SUPPORTED A SUFFICIENT DISTANCE BACK FROM THE WATER TO REDUCE MUD ENTERING THE STREAM FROM EQUIPMENT TRACKS. THIS MAY REQUIRE USING MATERIALS SUCH AS GRAVEL, ROCK OR CORDUROY. IF CUTS ARE NEEDED TO OBTAIN A SATISFACTORY GRADE, THEY ARE TO BE DUG WITH SIDE DITCHES AND STABLE SLOPES, AND ONLY WHERE APPROVED BY THE COMPANY. EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE INSTALLED TO KEEP SEDIMENT ON LAND (E.G., CHECK DAMS, FILTER CLOTH, RIP RAP, SEED AND MULCH, SEDIMENT TRAPS, ETC.)
5. WHILE THE BRIDGE IS IN USE, ANY BUILDUP OF MUD ON THE BRIDGE DECK IS TO BE SCRAPED OFF PRIOR TO AFFECTING WATER QUALITY.
6. TEMPORARY CROSSINGS SHALL BE REMOVED AS QUICKLY AS POSSIBLE WHEN NO LONGER REQUIRED. REMOVAL SHALL NOT OCCUR OUTSIDE THE CONSTRUCTION WINDOWS. WHERE APPROVED BY THE COMPANY, SURPLUS GRAVEL IS TO BE SPREAD ON THE RIGHT-OF-WAY AS GRAVEL SHEETING, IF GRADATION IS SUITABLE, OR MOVED MORE THAT 30m FROM WATER FOR DISPOSAL. BRIDGE MATERIALS ARE TO BE REMOVED FROM THE CROSSING AREA. THE CREEK BED AND BANKS ARE TO BE RESTORED TO A STABLE SLOPE AND PROTECTED WITH EROSION RESISTANT MATERIAL COMPATIBLE WITH FLOW VELOCITY

SIZING OF WATER OPENING

IT IS IMPORTANT THAT THE SIZE OF THE WATER OPENING BE SELECTED SO THE STRUCTURE CAN SAFELY PASS FLOOD FLOWS THAT CAN REASONABLY BE EXPECTED TO OCCUR DURING THE LIFE OF THE CROSSING.

(a) INSTALL A BRIDGE THAT CLEAR SPANS THE CREEK FROM TOP OF BANK TO TOP OF BANK (AS SHOWN) AND WITH A CLEARANCE ABOVE THE ANNUAL HIGH WATER MARK.

(b) A HYDROLOGY ANALYSIS MAY BE REQUIRED TO DETERMINE THEORETICAL OPENING SIZE. REFER TO APPLICABLE DRAWINGS FOR REQUIREMENTS.

GENERAL

1. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF THE PORTABLE BRIDGE OR OTHER STRUCTURE BASED ON REGULATORY CONDITIONS, COMPANY DRAWINGS AND OTHER APPLICABLE REQUIREMENTS.
2. MATS MAY BE USED IN THE PLACE OF A LOG CRIB TO PROPERLY SUPPORT BRIDGE ENDS AND TO CONTAIN RAMP MATERIAL.

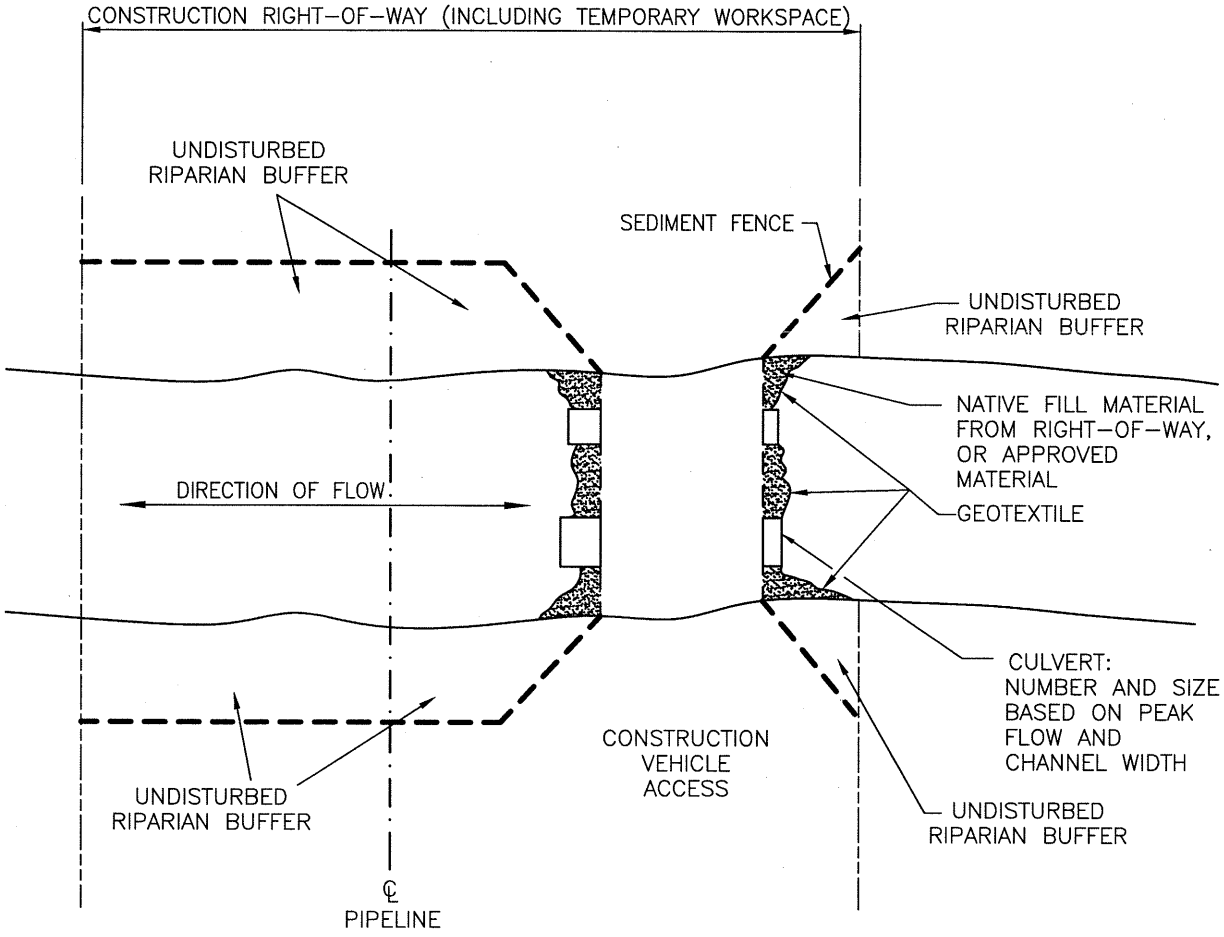
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DESIGNER:		DESIGN STANDARD		
NAME	DATE	FIA # STDS	CHAINAGE:	DISCIPLINE # 03
CHECKED BY: KL	DESIGN CHECKER: TP	TITLE: TEMPORARY CLEAR SPAN BRIDGE CROSSINGS (SHEET 3 OF 3)		
		SCALE N.T.S.	DWG No STDS-03-ML-05-101 (3/3)	REV 03

ID | TIME | DESIGNFILE

TC_A4_EE.DWG 210X280

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PLAN VIEW

SCALE : N.T.S.

REVISIONS	00	DRAWING SUPERSEDES A2-SK-18-435	01	GENERAL ISSUE - REVIEWED FOR 2015 SPEC.

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DESIGNER: June 16, 2015 (NAME / DATE)

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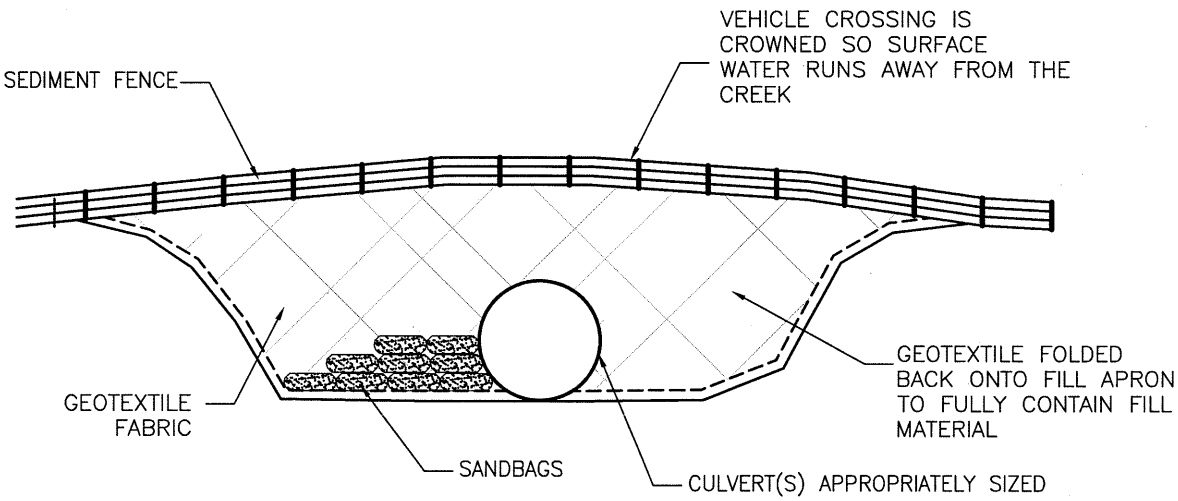
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: PIPELINE VEHICLE CROSSING – CULVERT WITH NATIVE FILL MATERIAL (SHEET 1 OF 2)

SCALE N.T.S.	DWG No STDS-03-ML-05-103	REV 01

TC_A4_EE.DWG 210X280

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NOTES:

1. SEE APPLICABLE WATERCOURSE CROSSING TABLE AND/OR EPP FOR ALL LOCATIONS WHERE THIS TECHNIQUE CAN BE APPLIED.
2. NATIVE FILL IS FROM RIGHT-OF-WAY OR APPROVED MATERIAL AND SOURCE, BUT NOT FROM WATERCOURSE BED OR BANKS.
3. CULVERT(S) SIZED FOR EXPECTED PEAK FLOW OR OTHERWISE APPROVED BY THE COMPANY.
4. SEDIMENT FENCE TO BE INSTALLED AS PER MANUFACTURERS DIRECTIONS AND SPAN WIDTH OF WATERCOURSE PLUS 10m EACH SIDE OF WATERCOURSE ON BOTH SIDES OF VEHICLE ACCESS,
5. MONITORING AND MAINTENANCE OF SEDIMENT FENCE AND GEOTEXTILE IS REQUIRED.
6. SANDBAGS MAY BE REQUIRED TO ANCHOR GEOTEXTILE AND TO SEAL AROUND THE CULVERTS ON THE UPSTREAM AND DOWNSTREAM SIDES OF THE FILL APRON.

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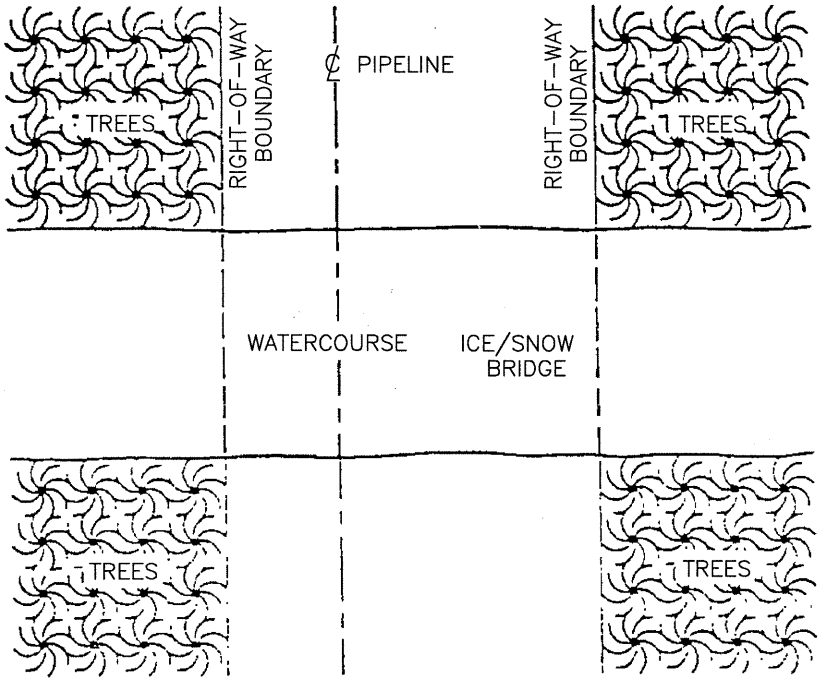
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: PIPELINE VEHICLE CROSSING – CULVERT WITH NATIVE FILL MATERIAL (SHEET 2 OF 2)

SCALE N.T.S.	DWG No STDS-03-ML-05-103	REV 01

TC_A4_EE.DWG 210X280

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PLAN VIEW

NOTES:

1. INSTALL ICE/SNOW BRIDGES ON WINTER PROJECTS WHEN A SAFE ICE THICKNESS CAN BE MAINTAINED.
2. LOCATE BRIDGES AT SITES WITH GENTLY SLOPING BANKS TO MINIMIZE CUTS IN WATERCOURSE BANKS. USE SNOW AND ICE TO SLOPE APPROACHES, RATHER THAN CUT BANKS.
3. FLOOD ICE SURFACE WITH WATER AND COVER WITH SNOW TO INCREASE LOAD BEARING CAPACITY. BREACH ICE BRIDGE BY PHYSICAL MEANS PRIOR TO SPRING BREAK-UP.
4. ICE/SNOW BRIDGE SHALL BE CONSTRUCTED WITH A MINIMUM OF 150mm ICE/SNOW CURB TO PREVENT MATERIAL FROM ENTERING THE WATERCOURSE. THE CURB MUST BE MAINTAINED THROUGH OUT CONSTRUCTION.
5. ICE BRIDGES SHOULD NOT INTERFERE OR IMPEDE WITH FLOW OF WATERCOURSE.
6. MAINTAIN ICE REGULARLY AND REMOVE ALL DEBRIS FROM ICE SURFACE.
7. RESTORE AND STABILIZE BANKS AND APPROACHES PRIOR TO SPRING RUN-OFF, AS REQUIRED.

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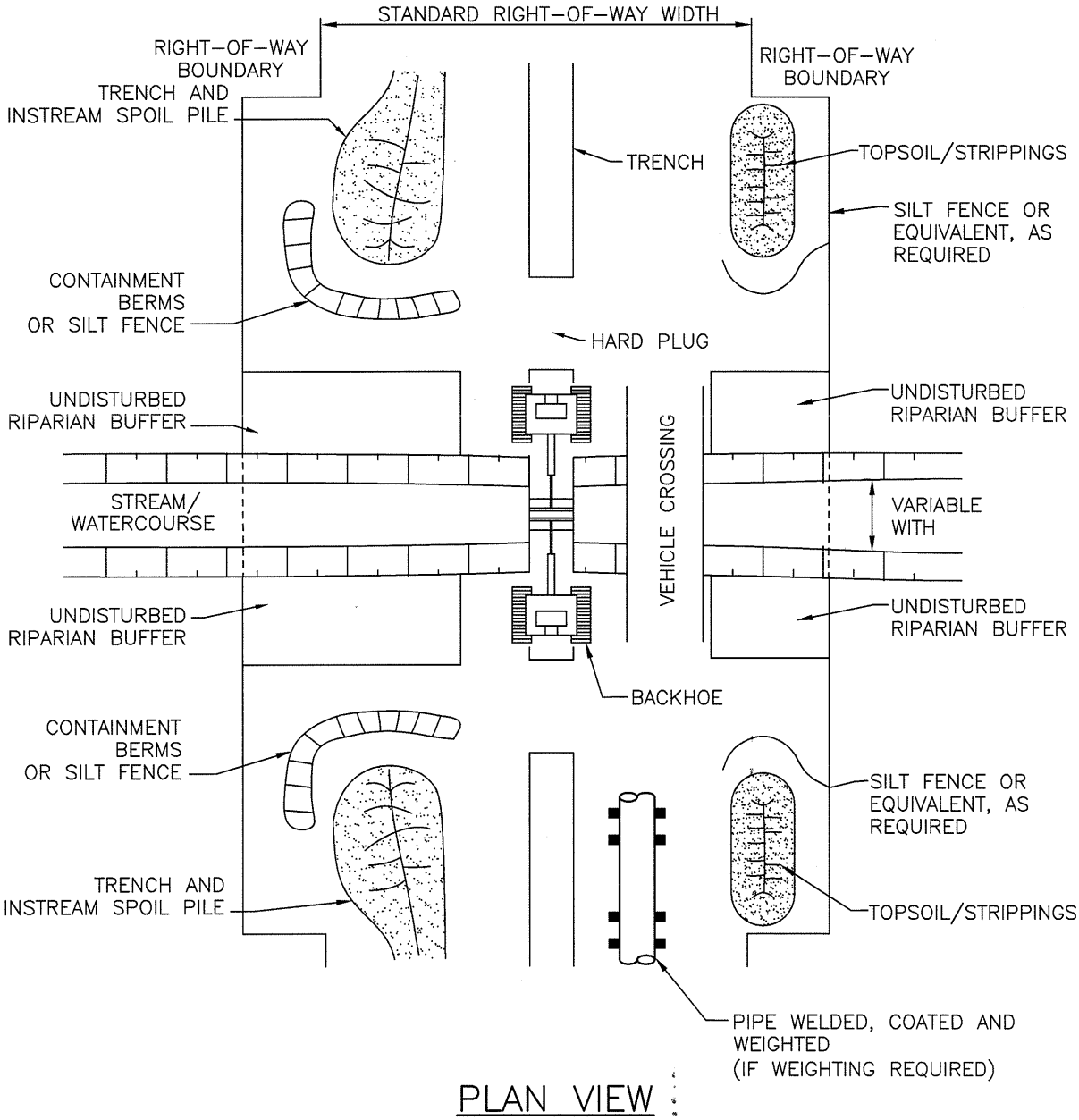
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE TEMPORARY SNOWFILL/ICE BRIDGE CROSSING

SCALE N.T.S. | DWG No STDS-03-ML-05-104 | REV 01

TC_A4_EE.DWG 210X280

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PLAN VIEW

REVISIONS | 00 | STANDARD ISSUE 2015-06-03

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DESIGNER: [signature] June 15, 2015 (NAME / DATE)

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DESIGN STANDARD

FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TYPICAL OPEN CUT WATERCOURSE CROSSINGS (SHEET 1 OF 2)

SCALE N.T.S.	DWG No STDS-03-ML-05-105	REV 00

TC_A4_EE.DWG 210X280

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NOTES:

1. SCHEDULE INSTREAM ACTIVITY FOR LOW FLOW PERIODS AND FOR THE APPROPRIATE TIMING WINDOW.

2. INSTALL APPROVED VEHICLE CROSSING.

3. LEAVE HARD PLUGS AT END OF STANDARD TRENCH.

4. COMPLETE FABRICATION OF THE INSTREAM PIPE SECTION WEIGHT AND PRETEST PIPE IF REQUIRED PRIOR TO COMMENCEMENT OF INSTREAM ACTIVITY.

5. TRENCH THROUGH WATERCOURSE RETAINING HARD PLUGS AT EACH BANK UNTIL JUST PRIOR TO PIPE INSTALLATION.

6. STOCKPILE ALL INSTREAM SPOIL ON BANKS WITHIN DESIGNATED AREA. IF NECESSARY TO CONTROL WATER FLOW AND TRENCH SLOUGHING, INSTALL TEMPORARY SOFT PLUGS AND DEWATER TRENCH ONTO STABLED VEGETATED LAND, NOT DIRECTLY TO WATERCOURSE.

7. CONSTRUCT BERM TO PREVENT SATURATED SPOIL FROM FLOWING BACK INTO STREAM. MAINTAIN STREAMFLOW, IF PRESENT, THROUGHOUT CROSSING CONSTRUCTION.

8. INSTALL PIPE AND BACKFILL IMMEDIATELY. RESTORE STREAM CHANNEL TO APPROXIMATE PRECONSTRUCTION PROFILE.

9. ATTEMPT TO COMPLETE ALL INSTREAM ACTIVITY WITHIN 24 HOURS, UNLESS OTHERWISE APPROVED BY THE COMPANY.

10. RESTORE AND STABILIZE STREAM BANKS AND APPROACHES TO AS CLOSE TO ORIGINAL GRADE AS POSSIBLE. INSTALL BANK PROTECTION, AS REQUIRED.

11. IN ALL WATERCOURSES, EXCAVATED MATERIALS SHALL BE REMOVED TO A POINT OUT OF WATER, EXCEPT WHERE OTHERWISE APPROVED BY THE COMPANY.

12. RIPARIAN BUFFER WIDTH MAY VARY BASED ON APPROVALS. THE BUFFER SHALL REMAIN UNDISTURBED, UNLESS APPROVED BY THE COMPANY.

13. THE CONTRACTOR SHALL PROVIDE A DETAILED WATERCOURSE CROSSING PLAN TO THE COMPANY FOR REVIEW AND APPROVAL AS DIRECTED BY THE COMPANY.

REVISIONS | 00 | STANDARD ISSUE 2015-06-03

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TYPICAL OPEN CUT WATERCOURSE CROSSINGS (SHEET 2 OF 2)

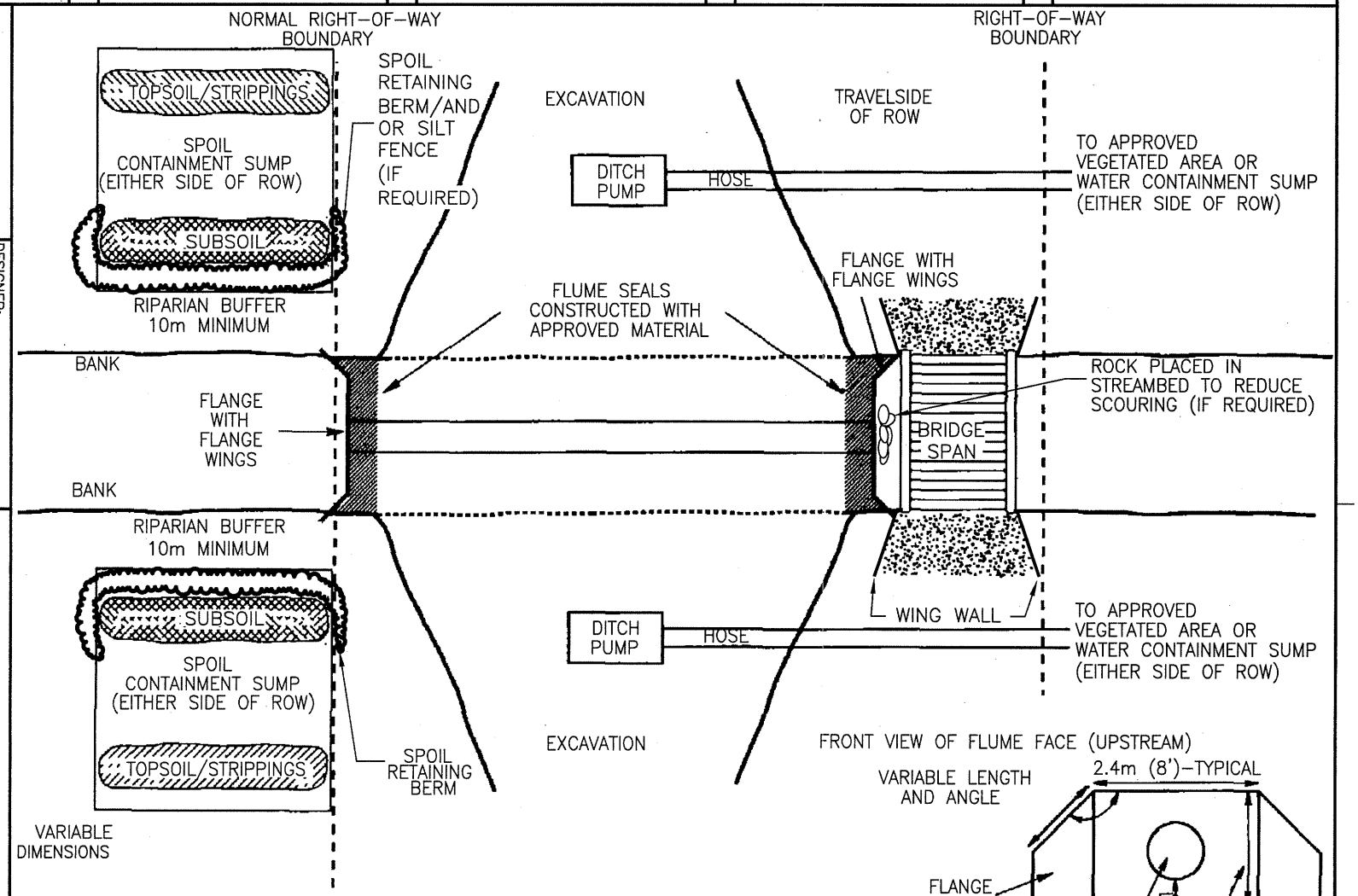
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DESIGNER: Douglas

CHECKED BY: NAME

DESIGN CHECKER: DATE June 16, 2015

TITLE: FLUME WATERCOURSE CROSSINGS (SHEET 1 OF 3)

SCALE N.T.S.

DWG No STDS-03-ML-05-111

REV 01

FIA # STDS

CHAINAGE:

DISCIPLINE # 03

DESIGN STANDARD

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APPLICATION:

FLUME OPERATIONS WILL BE REQUIRED ON STREAMS WHERE FLOW MUST BE MAINTAINED AND SILTATION MUST BE MINIMIZED TO PREVENT IMPACT ON FISH POPULATIONS AND DOWNSTREAM USERS. FLUME INSTALLATIONS WILL ALSO BE CONSIDERED WHERE MAINTENANCE OF FLOW IS THE ONLY REQUIREMENT.

THE FOLLOWING SPECIFICATIONS AND PROCEDURES ARE GENERAL REQUIREMENTS FOR INSTALLATION OF FLUMED WATERCOURSE CROSSINGS WHICH ARE TO BE APPLIED UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENTS.

SPECIFICATIONS:

1. FLUMING OPERATIONS WILL BE COMBINED WITH A BRIDGED VEHICLE CROSSING. CULVERT AND GRADE INSTALLATIONS WILL BE CONSIDERED FOR STREAMS HAVING A LOWER SENSITIVITY.

2. FLUME LENGTH WILL SPAN FROM THE SPOIL SIDE EDGE OF THE RIGHT-OF-WAY TO THE SPOIL SIDE EDGE OF THE VEHICLE CROSSING, OR TO THE WORK SIDE EDGE OF THE RIGHT-OF-WAY IN THE CASE OF A GRADE MATERIAL VEHICLE

3. BASED ON EXPECTED STREAM FLOWS; FLUME CAPACITY WILL BE RECOMMENDED BY THE CONTRACTOR FOR DIAMETER AND NUMBER OF PIPES REQUIRED. THE REQUIREMENTS MAY BE ADJUSTED BY THE COMPANY IN THE FIELD IN CONSULTATION WITH THE CONTRACTOR AND AUTHORITIES.

4. FLANGES WILL BE REQUIRED ON BOTH ENDS OF THE FLUME. THE FLANGES WILL BE CONSTRUCTED OUT OF STEEL AND MUST BE OF A THICKNESS AND DIMENSION TO WITHSTAND SITE BED AND BANK CONDITIONS, AS WELL AS FLUCTUATIONS IN WATERCOURSE FLOW CONDITIONS. REQUIREMENTS FOR LARGER FLANGES OR FLANGE WINGS WILL BE PRE-SPECIFIED OR DETERMINED BY THE COMPANY IN THE FIELD DURING CONSTRUCTION. CONTRACTOR MUST BE PREPARED TO CONSTRUCT THE FLUME ON SITE.

5. FLUMES MUST BE CONSTRUCTED OF STEEL PIPE OR OTHER MATERIAL APPROVED BY THE COMPANY. CORRUGATED CULVERT IS UNACCEPTABLE.

6. BOTH ENDS OF THE FLUME WILL BE SEALED USING APPROVED COMBINATIONS OF WASHED ROCK, PLASTIC SHEETING, FILTER CLOTH, AND SANDBAGS. IF LOOSE MATERIALS ARE USED TO CREATE THE SEALS, THE FLUME SEALS MUST BE A MINIMUM OF 2 METRES THICK AND EXTEND FROM BANK TOP TO BANK TOP, OR A MINIMUM OF 1 METRE ABOVE WATER LEVEL. IF SANDBAGS ARE USED THE FLUME SEALS MUST BE A MINIMUM OF 1 METRE THICK AND EXTEND FROM BANK TOP TO BANK TOP. IF PLASTIC SHEETING OR FILTER CLOTH ARE SPECIFIED THEY MUST BE LAID OVER BOTH SIDES OF BOTH FLUME SEALS. THE GOAL IS TO PREVENT CLEAN SURFACE WATER FROM ENTERING THE EXCAVATION AND PREVENT SILTED WATER FROM LEAVING THE EXCAVATION.

7. CONTRACTOR SHALL CONSTRUCT SUMPS WHEN DIRECTED BY THE COMPANY TO CONTAIN EXCAVATED MATERIAL AND/OR SILT LADEN WATER PUMPED FROM THE TRENCH. TOPSOIL OR ORGANICS SHALL BE REMOVED AND CONSERVED PRIOR TO EXCAVATION OF SUMPS. THE SUMPS SHALL BE SIZED TO CONTAIN ALL EXCAVATED MATERIAL, AND ALLOW PUMPING OF THE TRENCH WITHOUT ANY DOWNSTREAM SILTATION.

8. THE CONTRACTOR MUST HAVE PUMPS OF SUFFICIENT CAPACITY ON SITE TO PUMP OUT THE EXCAVATION TO PREVENT DOWNSTREAM FLOW OF SILTED WATER. BACK UP PUMPS TO BE SUPPLIED BY CONTRACTOR. CONTRACTOR MUST HAVE SUFFICIENT LEAK FREE HOSE ON SITE TO PUMP THE EXCAVATION WATER TO ANY LOCATION IN PROXIMITY TO THE FLOODPLAIN OF THE CROSSING SPECIFIED BY THE COMPANY. THIS IS TO FACILITATE SETTLEMENT AND FILTRATION OF THE SILTED WATER BEFORE IT RE-ENTERS THE STREAM. FLOW DISSIPATERS WILL BE REQUIRED AT THE DISCHARGE END OF ALL HOSES TO PREVENT FURTHER SILTATION AND EROSION.

9. CONTRACTOR WILL BE RESPONSIBLE FOR SUPPLY AND DELIVERY OF ALL MATERIALS TO THE SITE.

10. FISH SALVAGE WILL BE CONDUCTED AS REQUIRED IN ISOLATED AREA AFTER FLUME IN PLACE, AND PRIOR TO DEWATERING AND TRENCHING.

11. SIGNAGE WILL BE INSTALLED PER NAVIGATION PROTECTION ACT, AND OTHER REGULATIONS AND PROGRAMS, WHERE APPLICABLE.

REVISIONS | 00 | STANDARD ISSUE, SUPERCEDES SK-1396 (1) | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: FLUME WATERCOURSE CROSSINGS (SHEET 2 OF 3)

SCALE N.T.S. | DWG No STDS-03-ML-05-111 | REV 01

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PROCEDURES:

1. INSTALL THE VEHICLE CROSSING ON THE WORK SIDE OF THE RIGHT–OF–WAY TO ALLOW FOR A WIDE EXCAVATION.

2. STOCKPILE ALL REQUIRED MATERIALS AND EQUIPMENT ON THE SITE PRIOR TO BEGINNING INSTREAM WORK.

3. GRADE THE BANKS OF THE WATER CROSSING AND PREPARE THE SPOIL CONTAINMENT AREAS.

4. CONSTRUCT THE FLUME WITH CORRECT FLANGES AND FLANGE WINGS. COMPLETE WELDING, COATING, AND WEIGHTING (PRESSURE TESTING OF DRAG SECTION, IF APPLICABLE) OF THE WATERCOURSE PIPE SECTION.

5. BEGINNING IN THE EARLY MORNING, INSTALL THE FLUME IN THE STREAM CHANNEL USING APPROVED SEALING TECHNIQUES. PERFORM FISH SALVAGE AS DIRECTED, THEN DEWATER THE AREA BETWEEN THE FLANGE WINGS.

6. EXCAVATE THE TRENCH AS QUICKLY AS POSSIBLE PLACING SPOIL OUT OF THE STREAM CHANNEL. CREATE SPOIL CONTAINMENT SUMPS IF NECESSARY TO KEEP SPOIL FROM FLOWING BACK INTO THE STREAM CHANNEL.

7. PUMP EXCAVATION AS REQUIRED TO PREVENT DOWNSTREAM FLOW OF SILTED WATER. DIRECT THE PUMPED WATER INTO VEGETATED AREAS WELL BACK FORM THE WATERCOURSE. CONSTRUCT WATER CONTAINMENT SUMPS.

8. INSTALL PIPE.

9. BACKFILL THE STREAM CHANNEL FIRST PUSHING THE SILTED WATER INTO THE BANK EXCAVATIONS, WHERE PRACTICAL. PUMP OR DRAIN THE EXCAVATIONS WHILE PROGRESSIVELY BACKFILLING AS REQUIRED. CONSTRUCT WATER CONTAINMENT SUMPS IF NECESSARY.

10. COMPLETE BACKFILL

11. RE–ESTABLISH THE BED AND BANKS OF THE STREAM CHANNEL.

12. REMOVE THE DOWNSTREAM SEAL MATERIALS.

13. REMOVE THE UPSTREAM SEAL MATERIALS.

14. REMOVE THE FLUME.

NOTE:

THE CONTRACTOR SHALL PROVIDE A DETAILED WATERCOURSE CROSSING PLAN TO THE COMPANY FOR REVIEW AND APPROVAL AS DIRECTED BY THE COMPANY.

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE

FLUME WATERCOURSE CROSSINGS
(SHEET 3 OF 3)

SCALE N.T.S.	DWG No STDS–03–ML–05–111	REV 01

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DESIGNER: Darlene Ryz NAME July 16, 2015 DATE

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SCALE N.T.S.

TITLE

DAM AND PUMP WATER COURSE CROSSINGS (SHEET 1 OF 3)

DWG No STDS-03-ML-05-112

REV 01

FIA # STDS

CHAINAGE:

DISCIPLINE # 03

DESIGN STANDARD

BOUNDARY NORMAL RIGHT-OF-WAY

SPOIL RETAINING BERM AND/OR SILT FENCE (IF REQ'D)

RIGHT-OF-WAY BOUNDARY

EXCAVATION

TRAVELSIDE OF RIGHT-OF-WAY

TEMPORARY WORK SPACE

STRIPPING/TOPSOIL

SPOIL CONTAINMENT SUMP (EITHER SIDE OF RIGHT-OF-WAY)

SUBSOIL

DITCH PUMP

HOSE

TO APPROVED VEGETATED AREA OR WATER CONTAINMENT SUMP (EITHER SIDE OF RIGHT-OF-WAY)

DOWNSTREAM DAM VEHICLE CROSSING AS REQUIRED

RIPARIAN BUFFER 10m MINIMUM

UPSTREAM DAM AS REQUIRED

BANK

STREAM FLOW

INSTREAM PUMP

HOSE

USE SUPPORT PIPE IF NECESSARY

APPROVED FLOW DISSIPATION TO PREVENT SCOURS EROSION

2.54mm SIEVE HEAD

CULVERT PLUG

BANK

RIPARIAN BUFFER 10m MINIMUM

WING WALL

REMOTE PUMP

SUBSOIL

HOSE

DITCH PUMP

SPOIL CONTAINMENT SUMP (EITHER SIDE OF RIGHT-OF-WAY)

TO APPROVED VEGETATED AREA OR WATER CONTAINMENT SUMP (EITHER SIDE OF RIGHT-OF-WAY)

STRIPPING/TOPSOIL

SPOIL RETAINING BERM AND/OR SILT FENCE (IF REQ'D)

EXCAVATION

HOSE

TEMPORARY WORK SPACE

DAM AND PUMP BY INSTREAM PUMPING ACROSS EXCAVATION AND/OR BY REMOTE PUMPING AROUND EXCAVATION

-------TIME-------

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APPLICATION:

DAM AND BYPASS PUMPING OPERATION WILL BE APPLIED ON STREAMS HAVING A LOW FLOW RATE. THE PRIME CONSIDERATION WILL BE MAINTENANCE OF DOWNSTREAM FLOW.

DAM AND PUMP INSTALLATIONS MAY ALSO BE CONSIDERED FOR ANY STREAM WHERE FLUMES ARE PREVENTED BY PIPE BEND AND TIE–IN CONSTRAINTS. THE FOLLOWING SPECIFICATION AND PROCEDURES ARE GENERAL REQUIREMENTS FOR DAM AND PUMP INSTALLATIONS AND SHOULD TO BE APPLIED UNLESS OTHERWISE SPECIFIED IN THE CONTRACT DOCUMENT.

SPECIFICATIONS:

1. DAM AND BYPASS OPERATIONS MAY BE COMBINED WITH CULVERT AND GRADE VEHICLE CROSSINGS. OTHER APPROVED BRIDGING TECHNIQUES WILL BE USED IN PLACE OF CULVERT AND GRADE ON STREAMS HAVING GREATER SENSITIVITY.
2. BYPASS PUMPING UNIT MUST BE CAPABLE OF HANDLING 150% OF MAXIMUM SPECIFIED STREAM FLOW DURING THE PERIOD OF INSTALLATION FOR SUMMER CONSTRUCTION, AND 110% FOR WINTER CONSTRUCTION. A BACKUP UNIT OF EQUAL CAPACITY MUST BE INSTALLED IN CASE OF MAIN PUMP FAILURE.
3. PUMPS MUST BE MANNED CONTINUOUSLY UNTIL OPERATION IS COMPLETE (24 HRS/DAY).
4. PUMPS AND FUEL SUPPLY MUST BE PLACED IN A PLASTIC/IMPERMEABLE LINED BERMED AREA TO CONTAIN ACCIDENTAL SPILLS.
5. BYPASS PUMP INTAKE MUST HAVE A 2.54mm SIEVE TO PROTECT FISHERIES RESOURCES.
6. DAMS WILL BE CONSTRUCTED AS REQUIRED USING APPROVED COMBINATIONS OF AQUA DAM, STEEL PLATES, SHEET PILING, WASHED ROCK, PLASTIC SHEETING, FILTER CLOTH AND SANDBAGS. IF LOOSE MATERIALS ARE USED TO CREATE THE DAMS, THE DAMS MUST BE A MINIMUM OF 2 METERS THICK, UNLESS OTHERWISE APPROVED, AND EXTEND FROM BANK TOP TO BANK TOP. IF SANDBAGS ARE USED TO CREATE THE DAMS, THE DAMS MUST BE A MINIMUM OF 1 METER THICK AND EXTEND FROM BANK TOP TO BANK TOP, OR AS APPROVED BY THE COMPANY. IF PLASTIC SHEETING OR FILTER CLOTH ARE SPECIFIED, THEY MUST BE LAID OVER BOTH SIDES OF BOTH DAMS. THE GOAL IS TO PREVENT CLEAN SURFACE WATER FROM ENTERING THE EXCAVATION AND TO PREVENT SILTED WATER FROM LEAVING THE EXCAVATION. THE LEVEL OF EXISTING WATER COURSE SILTATION WILL BE CONSIDERED/MEASURED AT THE START OF CONSTRUCTION.
7. CONTRACTOR MUST HAVE SUFFICIENT LEAK FREE HOSE OR PIPE ON SITE AND INSTALLED TO BYPASS PUMP AROUND THE EXCAVATION AND/OR THROUGH THE EXCAVATION. THE CONTRACTOR SHALL ALSO INSTALL BACK–UP HOSES AND/OR PIPE TO ENSURE FLOW IS MAINTAINED IN THE EVENT OF A BYPASS FAILURE.
8. THE BYPASS PUMP DISCHARGE HOSE MUST BE EQUIPPED WITH FLOW DISSIPATORS AND PLACED IN SUCH A MANNER THAT PREVENTS FURTHER EROSION AND SILTATION DOWNSTREAM OF THE DAM AND PUMP INSTALLATION.
9. THE CONTRACTOR MUST HAVE AT LEAST TWO PUMPS ON SITE OF SUFFICIENT CAPACITY TO PUMP OUT THE EXCAVATION TO PREVENT DOWNSTREAM FLOW OF SILTED WATER. BACKUP PUMPS MUST BE SUPPLIED BY THE CONTRACTOR. SUFFICIENT LEAK FREE HOSE MUST BE ON SITE TO PUMP THE EXCAVATION WATER TO ANY LOCATION IN PROXIMITY TO THE FLOODPLAIN OF THE CROSSING. THIS IS TO FACILITATE SETTLEMENT AND FILTRATION OF THE SILTED WATER BEFORE IT RE–ENTERS THE STREAM. CONTRACTOR MUST ALSO BE PREPARED TO CREATE SUMPS FOR SILTATION SETTLING. FLOW DISSIPATORS WILL BE REQUIRED AT THE DISCHARGE END OF ALL HOSES TO PREVENT FURTHER SILTATION AND EROSION DOWNSTREAM OF THE DAM AND PUMP INSTALLATION.
10. CONTRACTOR WILL BE RESPONSIBLE FOR SUPPLY AND DELIVERY OF ALL MATERIALS TO THE SITE.
11. FISH SALVAGE WILL BE CONDUCTED AS REQUIRED IN ISOLATED AREA AFTER DAM AND PUMP IN PLACE, AND PRIOR TO TRENCHING.
12. SIGNAGE WILL BE INSTALLED AS PER NAVIGATION PROTECTION ACT AND OTHER REGULATIONS AND PROGRAMS WHERE APPLICABLE.

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DESIGNER: Douglas B. June 16, 2015 (NAME / DATE)

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TYPICAL DAM AND PUMP WATER COURSE CROSSING (SHEET 2 OF 3)

SCALE N.T.S.	DWG No STDS–03–ML–05–112	REV 01

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

PROCEDURE:

1. INSTALL THE VEHICLE CROSSING ON THE WORK SIDE OF THE RIGHT–OF–WAY TO ALLOW FOR A WIDE EXCAVATION.
2. COMPLETE WELDING, COATING, AND WEIGHTING (PRESSURE TESTING OF DRAG SECTION, IF APPLICABLE) OF THE WATERCOURSE PIPE SECTION.
3. PERFORM THE BANK GRADE AND PREPARE SPOIL CONTAINMENT SUMPS AS CIRCUMSTANCES DICTATE.
4. PRIOR TO INSTREAM WORKS, THE LENGTH OF TRENCHING SHALL BE SHORTENED UP AS MUCH AS TERRAIN AND PIPE SECTION LENGTH ALLOW TO DECREASE THE DURATION OF INSTREAM WORKS.
5. STOCKPILE ALL REQUIRED MATERIALS AND EQUIPMENT ON THE SITE PRIOR TO BEGINNING INSTREAM WORK.
6. INSTALL PUMPS AND CHECK OPERATION TO EQUALIZE FLOW. INSTALL CLEAN WATER BYPASS AND GRAY WATER HOSES AND ASSOCIATED SEDIMENTATION AND/OR EROSION CONTROLS.
7. BEGIN THE ISOLATION IN THE EARLY MORNING TO ALLOW FOR SAME DAY INSTALLATION
8. INITIATE PUMPING AND CHECK OPERATION TO EQUALIZE FLOW.
9. CONSTRUCT THE UPSTREAM DAM USING SPECIFIED DAM BUILDING TECHNIQUES. DAM SHOULD BE CONSTRUCTED TO ALLOW FOR A WIDE EXCAVATION. CONTINUE TO MONITOR UPSTREAM AND DOWNSTREAM WATER LEVEL.
10. PLUG THE VEHICLE CROSSING CULVERT OR CONSTRUCT THE DOWNSTREAM DAM USING SPECIFIED DAMMING TECHNIQUES. WHERE A BRIDGE IS USED, THE DAM SHOULD BE CONSTRUCTED TO ALLOW FOR A WIDE EXCAVATION. CONTINUE TO MONITOR UPSTREAM AND DOWNSTREAM WATER LEVEL.
11. FISH SALVAGE TO BE DONE AFTER DAM AND PUMP INSTALLATION, AND PRIOR TO TRENCHING EXCAVATION.
12. EXCAVATE TRENCH AS RAPIDLY AS POSSIBLE WITH TWO HOES EXCAVATING FROM MID CHANNEL WORKING OUTWARDS, UNLESS OTHERWISE APPROVED.
13. INSTALL PIPE.
14. BACKFILL THE STREAM CHANNEL FIRST PUSHING THE SILTED WATER BACK INTO THE BANK EXCAVATIONS, WHERE PRACTICAL. PUMP OR DRAIN THE EXCAVATIONS WHILE PROGRESSIVELY BACKFILLING AS REQUIRED. CONSTRUCT WATER CONTAINMENT SUMPS IF NECESSARY.
15. RESTORE BED AND RECLAIM BANKS OF THE STREAM CHANNEL.
16. REMOVE GREY WATER AND SEDIMENT CREATED BY INSTREAM WORK FROM THE ISOLATED AREA.
17. REMOVE THE DOWNSTREAM DAM OR VEHICLE CROSSING PLUG.
18. REMOVE UPSTREAM DAM OR VEHICLE CROSSING PLUG.
19. REMOVE BYPASS PUMPS.

NOTE:

THE CONTRACTOR SHALL SUBMIT A DETAILED WATER COURSE CROSSING PLAN TO THE COMPANY FOR REVIEW AND APPROVAL AS DIRECTED BY THE COMPANY.

REVISIONS	00	STANDARD ISSUE, SUPERCEDES SK–1551 (3)	01	GENERAL ISSUE – REVIEWED FOR 2015 SPEC

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TIME

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DESIGNER: [signature] NAME June 16, 2015 DATE

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DESIGN STANDARD

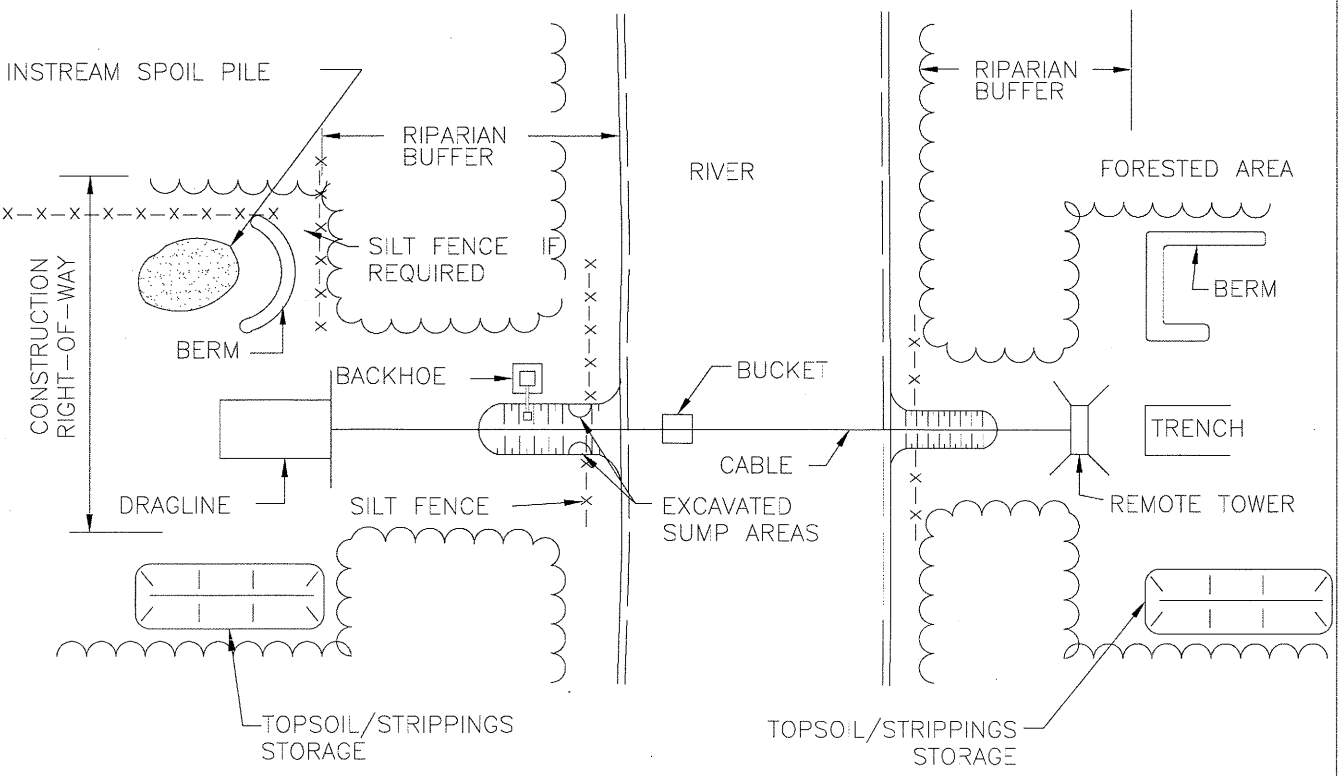
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TYPICAL DAM AND PUMP WATER COURSE CROSSING (SHEET 3 OF 3)

SCALE N.T.S.	DWG No STDS–03–ML–05–112	REV 01

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



NOTES:

1. SCHEDULE INSTREAM ACTIVITY AND APPROPRIATE TIMING WINDOW, WHERE FEASIBLE.
2. CONSTRUCTION RIGHT-OF-WAY WIDTHS WILL VARY BASED ON LOCATION AND PROJECT REQUIREMENTS (e.g. PIPE SIZE, PIPE COVER, TRENCH SPOIL COMPOSITION/TRENCH STABILITY AND CORRESPONDING SPOIL CONTAINMENT AREAS, PIPE SECTIONS AND BUOYANCY CONTROL, ETC.)
3. SPOIL IS REMOVED FROM SUMP BY BACKHOE AND MOVED TO CONTAINMENT AREA BY BULL-DOZER, LOADER OR TRUCK.
4. INSTALL SILT FENCE OR APPROVED EQUIVALENT WHERE DIRECTED BY THE COMPANY, ACROSS THE RIGHT-OF-WAY ADJACENT TO THE BANKS TO MINIMIZE POTENTIAL FOR SILT INTRODUCTION IN THE WATERCOURSE FROM OVERLAND FLOW.
5. SPOIL IS USED AS BACKFILL FOLLOWING PIPE INSTALLATION BY REVERSING THE SPOIL HANDLING PROCEDURE AND THE DRAGLINE BUCKET.
6. RESTORE WATERCOURSE CHANNEL TO APPROXIMATE PRE-CONSTRUCTION PROFILE. RESTORE, STABILIZE AND RECLAIM BANKS AND APPROACHES TO ORIGINAL GRADES AS PRACTICAL.

NOTE:

THE CONTRACTOR SHALL SUBMIT A DETAILED WATER COURSE CROSSING PLAN TO THE COMPANY FOR REVIEW AND APPROVAL AS DIRECTED BY THE COMPANY.

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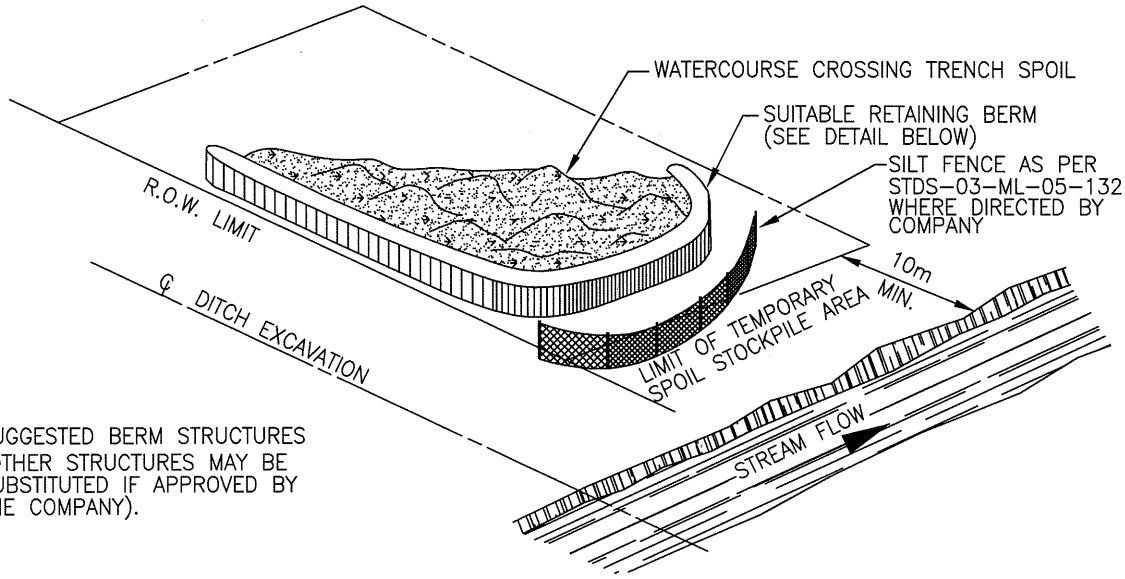
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: DRAGLINE TYPICAL WATER COURSE CROSSINGS

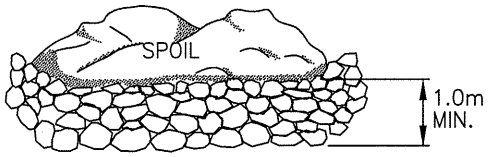
SCALE N.T.S.	DWG No STDS-03-ML-05-113	REV 01

TC_A4_EE.DWG 210X280

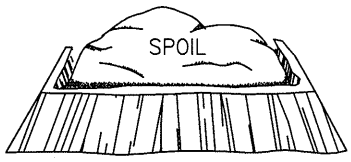
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



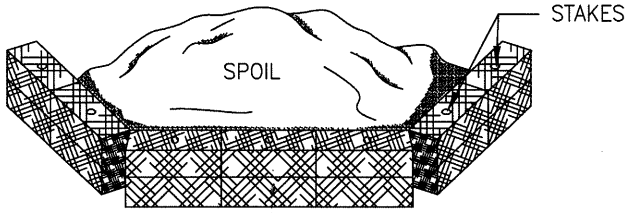
DETAILS: SUGGESTED BERM STRUCTURES (OTHER STRUCTURES MAY BE SUBSTITUTED IF APPROVED BY THE COMPANY).



1. WINDROW BOULDERS/SHOT ROCK



2. DIRT BERM



4. STAW BALES (STAKED)
(IF APPROVED BY COMPANY)

NOTES:

1. CONTAINMENT BERMS ARE TO BE USED WHERE STREAM OR CREEK SPOIL COULD RE-ENTER THE WATERCOURSE DIRECTLY OR INDIRECTLY.
2. TRENCH SPOIL WHICH IS SLURRIED MUCK OR DEBRIS, SHALL BE HAULED AWAY AND NOT STOCKPILED FOR BACKFILLING. AS DIRECTED BY THE COMPANY.
3. MATERIAL USED FOR THE CONTAINMENT BERM SHALL BE A MINIMUM OF 10m FROM THE TOP OF BANK OR OTHERWISE SPECIFIED BY TH ECOMPANY.
4. CONSTRUCT BERM WITH SUFFICIENT HEIGHT AND WIDTH TO ENSURE ADEQUATE CONTAINMENT DURING THE CONSTRUCTION PERIOD.
5. BERMS MUST BE MAINTAINED.
6. STAGED MOVEMENT OF SOIL MAY BE REQUIRED IF QUANTITIES ARE EXCESSIVE.
7. WHERE POSSIBLE, RIPARIAN VEGETATION TO BE MAINTAINED.
8. THE CONTAINMENT BERM SHALL BE DISMANTLED AND THE SITE RESTORED TO THE ORIGINAL CONDITION UPON COMPLETION OF THE WATER CROSSING.

REVISIONS | 00 | STANDARD ISSUE, SUPERCEDES A-SK-18-327 | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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FIA # STDS | CHAINAGE: | DISCIPLINE # 03

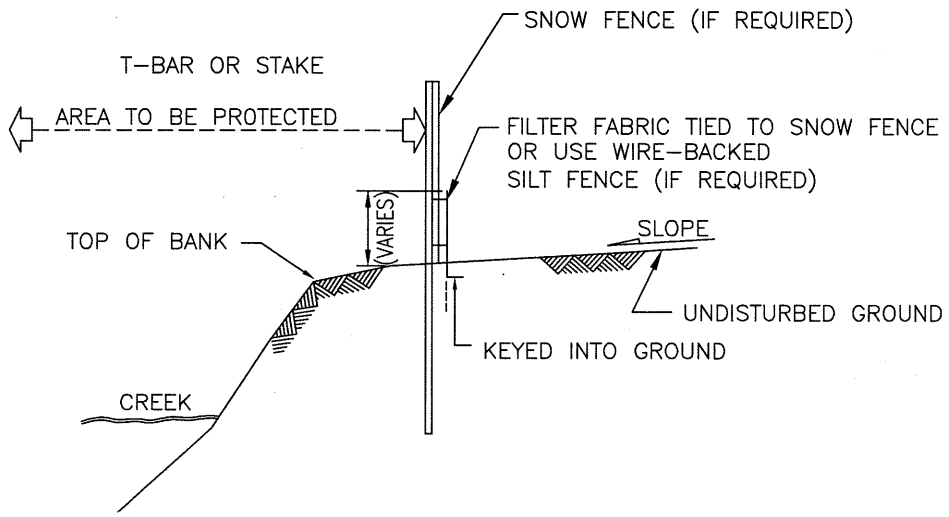
TITLE

SOIL RETAINING BERM

SCALE N.T.S. | DWG No STDS-03-ML-05-131 | REV 01

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



SIDE VIEW OF SILT FENCE

NOTES:

1. INSTALL SILT FENCES AS PER THE MANUFACTURES SPECIFICATIONS, UNLESS OTHERWISE DIRECTED BY THE COMPANY.
2. SILT FENCING SHALL BE KEYED INTO THE GROUND, UNLESS APPROVED BY THE COMPANY.
3. SILT FENCES ARE TO BE USED IN AREAS WHERE SHEET FLOW OR RELATIVELY SMALL VOLUMES OF WATER CAN BE EXPECTED TO OCCUR.
4. T-BAR OR STAKES ARE TO BE PLACED EVERY 3m OR CLOSER AS CONDITIONS REQUIRE.
5. WHERE POSSIBLE, RIPARAN VEGETATION IS TO BE LEFT UNDISTURBED.
6. SILT FENCE ARE TO BE CHECKED AND MAINTAINED ON A REGULAR BASIS AND TRAPPED SEDIMENT REMOVED.
7. MATERIAL TO BE EITHER A WOVEN GEOTEXTILE FABRIC SUCH AS MIRAFI 600X OR 700X OR TERRAFIX 400W, OR EQUVALENT. BIO-DEGRADABLE MATERIALS MAY BE UTILIZED WHERE APPROVED BY THE COMPANY.
8. WHERE A SITE SPECIFIC APPLICATION OR ASSESSMENT DICTATES THE REQUIREMENT TO UTILIZE REINFORCED MATERIALS, WIRE-BACKED SILT FENCE CAN BE USED IN PLACE OF SNOW FENCE.

REVISIONS | 00 | STANDARD ISSUE, SUPERCEDES A-SK-18-391 | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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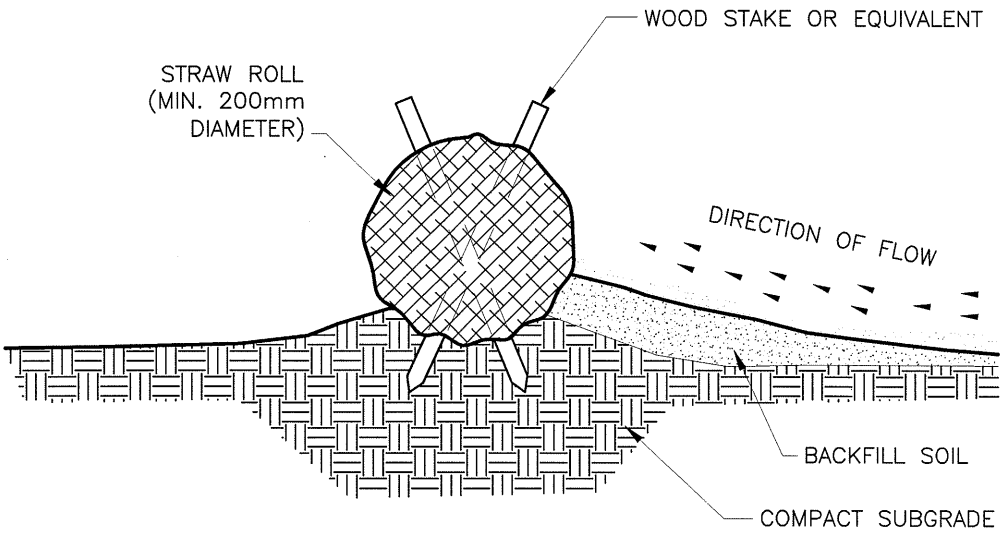
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: SEDIMENT CONTROL- SILT FENCE CONSTRUCTION

SCALE N.T.S.	DWG No STDS-03-ML-05-132	REV 01

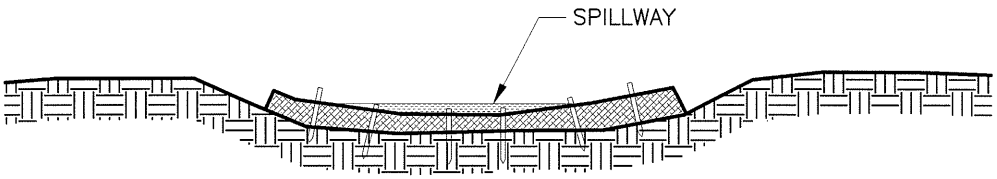
TC_A4_EE.DWG 210X280

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SIDE VIEW

N.T.S.



PROFILE

N.T.S.

NOTES:

1. SEDIMENT CONTROL DEVICES CAN BE USED TO CONTROL EROSION IN LOCATIONS WHERE NO CHANNEL/SWALE EXISTS; OR WHERE A DEFINITE CHANNEL/SWALE EXISTS, AND ARE USEFUL IN AREAS OF LOW FLOW. WHERE LARGE VOLUMES OF WATER CAN BE EXPECTED, A MORE EXTENSIVE CHECK DAM MAY BE REQUIRED (I.E. SANDBAGS; CLEAN ROCK FILL.)

2. THE CENTER SECTION OF SANDBAGS, STRAW ROLLS, GEO–RIDGE, SILT FENCE, CLEAN ROCK OR EQUIVALENT APPROVED MATERIAL FILL WILL BE SLIGHTLY LOWER THAN THE ADJACENT SECTIONS TO PROVIDE A NATURAL SPILLWAY FOR ANY OVERFLOW.

3. INSTALL THE SEDIMENT CONTROL DEVICES (I.E. STRAW ROLL, GEO–RIDGE, SILT FENCE, ROCK, SANDBAGS OR EQUIVALENT APPROVED MATERIAL) AS PER MANUFACTURES SPECIFICATIONS AND THE COMPANY AUTHORIZED REPRESENTATIVE. SEDIMENT CONTROL DEVICES CAN BE USED IN LOCATIONS THAT ARE PARALLEL OR PERPENDICULAR TO THE FLOW (DEPENDING ON SLOPE DIRECTION).

REVISIONS | 00 | STANDARD ISSUE, SUPERCEDES A–SK–18–392 | 01 | GENERAL ISSUE – REVIEWED FOR 2015 SPEC

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: SEDIMENT CONTROL CHECK DAM/FILTER

SCALE N.T.S.	DWG No STDS–03–ML–05–137	REV 01

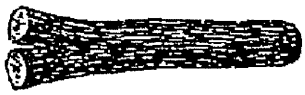
TC_A4_EE.DWG 210X280

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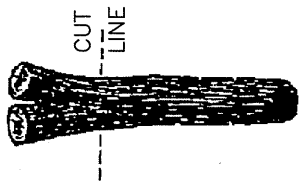
FORK



IMPROPER CUT

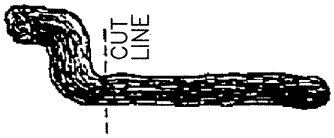


IMPROPER CUT

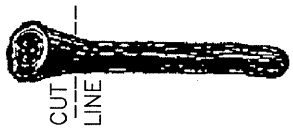


CUT BEHIND FORK

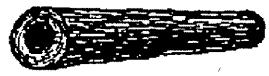
PISTOL BUTT, BUTT FLARE, BUTT ROT



CUT BEHIND DEFECT



CUT BEHIND FLARE



MUST BE <50% BUTT ROT

CROOK, DOG LEG



SORT TO PULP



CUT OUT EFFECT



CUT OUT EFFECT

SWEEP



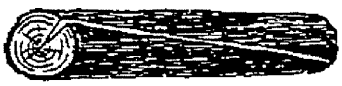


UNACCEPTABLE IF > 6" IN 12' OR
>18" IN TREE LENGTH



ACCEPTABLE IF <6" IN 12' OR
<18" IN TREE LENGTH

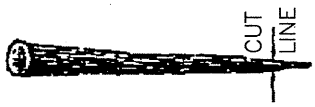
SPIRAL CHECK, LIMBS, RAT TAIL



SORT TO PULP



CUT FLUSH WITH STEM



MUST BE > 4" TOP

NOTES:

1. ALL OF THE ABOVE DEFECTS MUST BE REMOVED FROM SALVAGE WOOD UNLESS OTHERWISE SPECIFIED BY THE COMPANY'S DOCUMENTS.
2. TREE STEMS WILL BE DELIMBED INDIVIDUALLY. MULTIPLE STEMS WILL NOT BE FED THROUGH MECHANICAL DELIMBERS.

REVISIONS | 00 | DRAWING SUPERSEDES SK-1564 | 01 | GENERAL ISSUE – REVIEWED FOR 2015 SPEC

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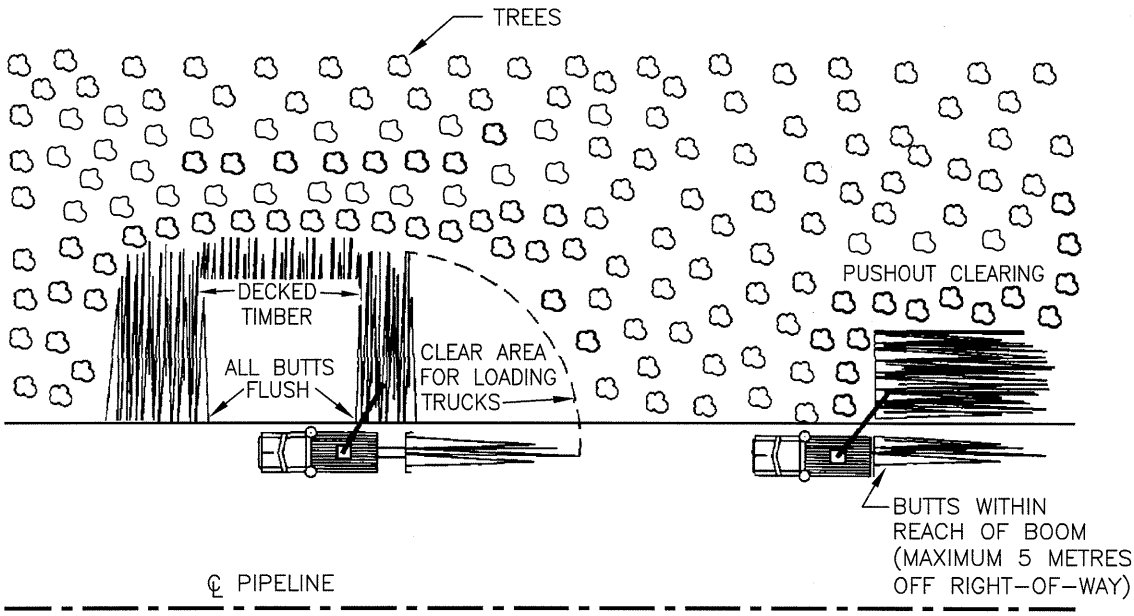
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

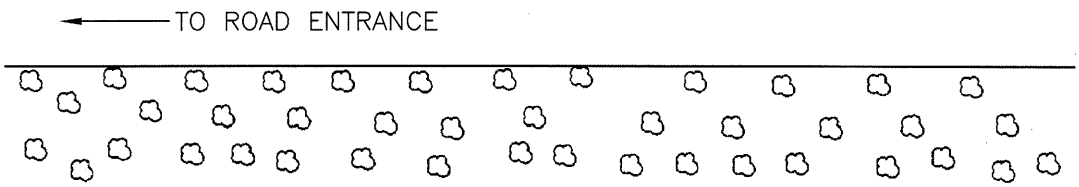
TITLE: TIMBER SALVAGE QUALITY AND DEFECTS

SCALE N.T.S.	DWG No STDS-03-ML-05-301	REV 01

TC_A4_EE.DWG 210X280

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS





PLAN VIEW
N.T.S.

NOTES:

1. SALVAGE MERCHANTABLE TIMBER AS DIRECTED BY THE COMPANY USING CUTOFF TYPE SAW EQUIPMENT. DO NOT BULLDOZE MERCHANTABLE TIMBER.
2. LOGS SHALL NOT BE SKIDDED ACROSS WATERCOURSES, UNLESS A SUITABLE CROSSING STRUCTURE HAS BEEN INSTALLED.
3. TIMBER IS TO BE SKIDDED TO THE PROCESSOR OR DELIMBER OUTSIDE OF THE LOG DECK. LIMBS AND TOPS SHALL NOT BE STORED INSIDE THE LOG DECK, UNLESS APPROVED BY THE COMPANY. SALVAGE LOGS SHALL HAVE LIMBS TRIMMED FLUSH WITH THE STEMS. TIMBER SHALL NOT BE SKIDDED THROUGH MUD OR GRAVEL.
4. DECK FACES MUST BE KEPT STRAIGHT AND FLUSH.
5. PERPENDICULAR DECK FACE MUST BE WITHIN 3 METERS OF THE RIGHT-OF-WAY OR ROAD. PARALLEL DECKS MUST BE WITHIN 5 METERS OF THE RIGHT-OF-WAY OR ROAD.
6. PRIME CONTRACTOR SHALL MAINTAIN ACCESS ALONG THE RIGHT-OF-WAY AND SALVAGED TIMBER SHALL BE REMOVED FROM THE PROJECT PRIOR TO PIPE STRINGING ACTIVITIES, WHERE POSSIBLE.
7. CONIFEROUS AND DECIDUOUS TIMBER SALVAGE WILL BE DECKED IN SEPARATE PILES.

REVISIONS | 00 | STANDARD ISSUE, SUPERCEDES A-SK-18-392 | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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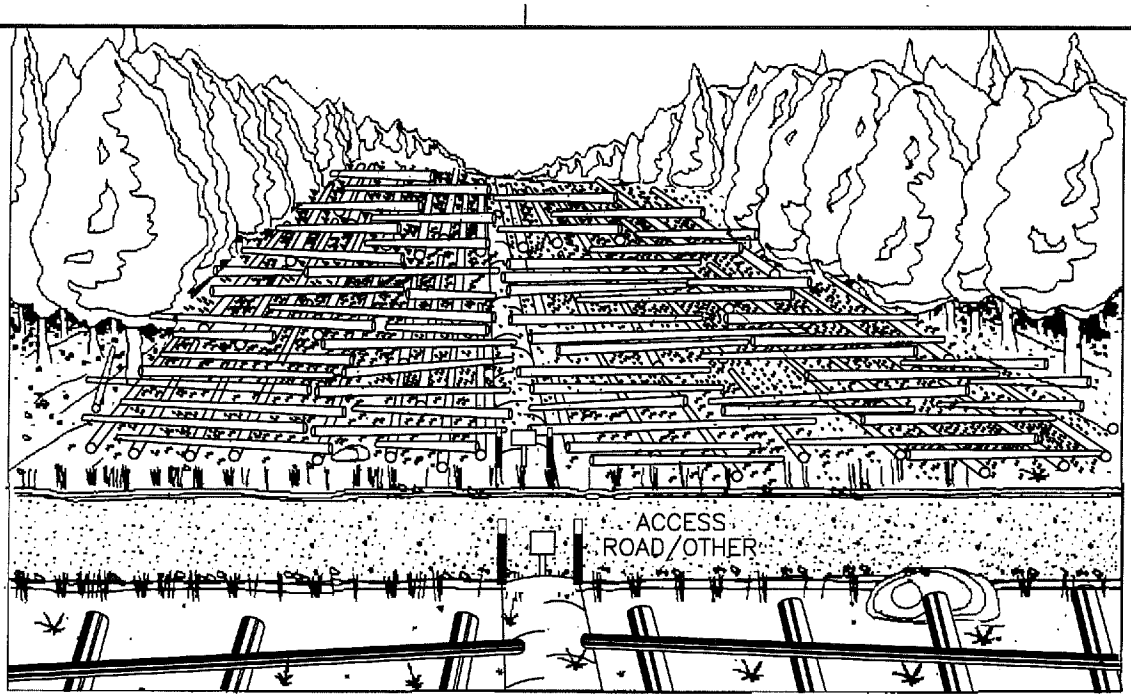
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: SALVAGE OF MERCHANTABLE TIMBER

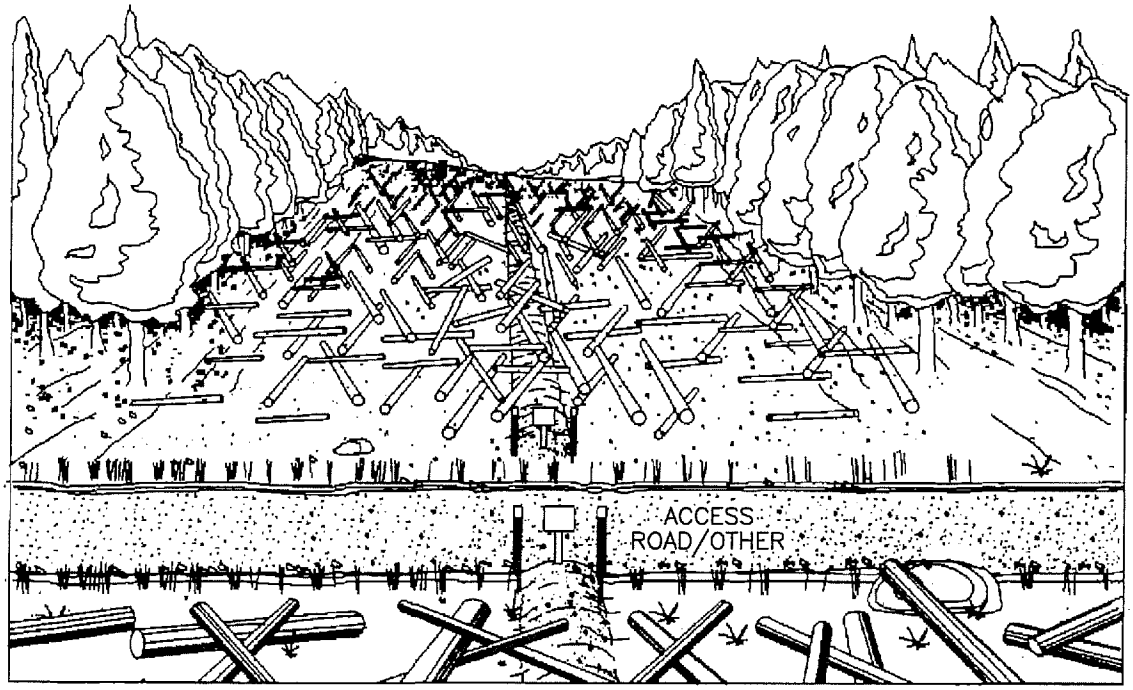
SCALE N.T.S. | DWG No STDS-03-ML-05-302 | REV 01

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OPTION A



OPTION B

1. PLACE ROLLBACK AS INDICATED ON THE DRAWING (OPTION A OR B). REFER TO THE EPP FOR SITE SPECIFIC DETAILS. THE COMPANIES AUTHORIZED REPRESENTATIVE WILL DETERMINE THE OPTION AND LOCATION OF ROLLBACK TO FIT WITHIN THE RIGHT-OF-WAY.

2. ENSURE ROLLBACK IS EXTENDED TO THE TRENCH ROACH AND TO THE EDGE OF THE CONSTRUCTION FOOTPRINT (STANDING TIMBER WHERE APPLICABLE). TO ENSURE EFFECTIVENESS, TYPICAL LENGTH AND DENSITY OF ROLLBACK IS APPROXIMATELY 500 M3/HA.

3. IF SITE CONDITIONS WARRANT MODIFICATIONS TO THE PROCEDURE, THE COMPANY'S AUTHORIZED REPRESENTATIVE SHALL ENSURE THE MODIFICATIONS MEET THE INTENT OF THE MITIGATION MEASURE.

REVISIONS	ID	DESCRIPTION
02		GENERAL ISSUE
01		GENERAL ISSUE - REVIEWED FOR 2015 SPEC
00		DRAWING SUPERSEDES SK-1543

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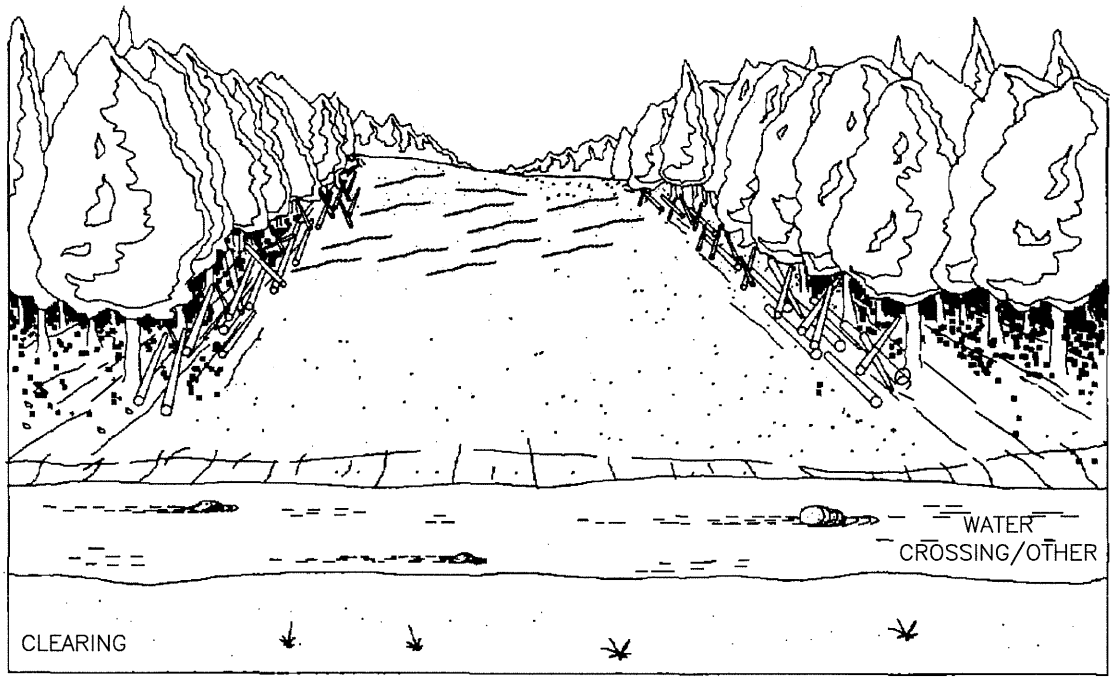
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

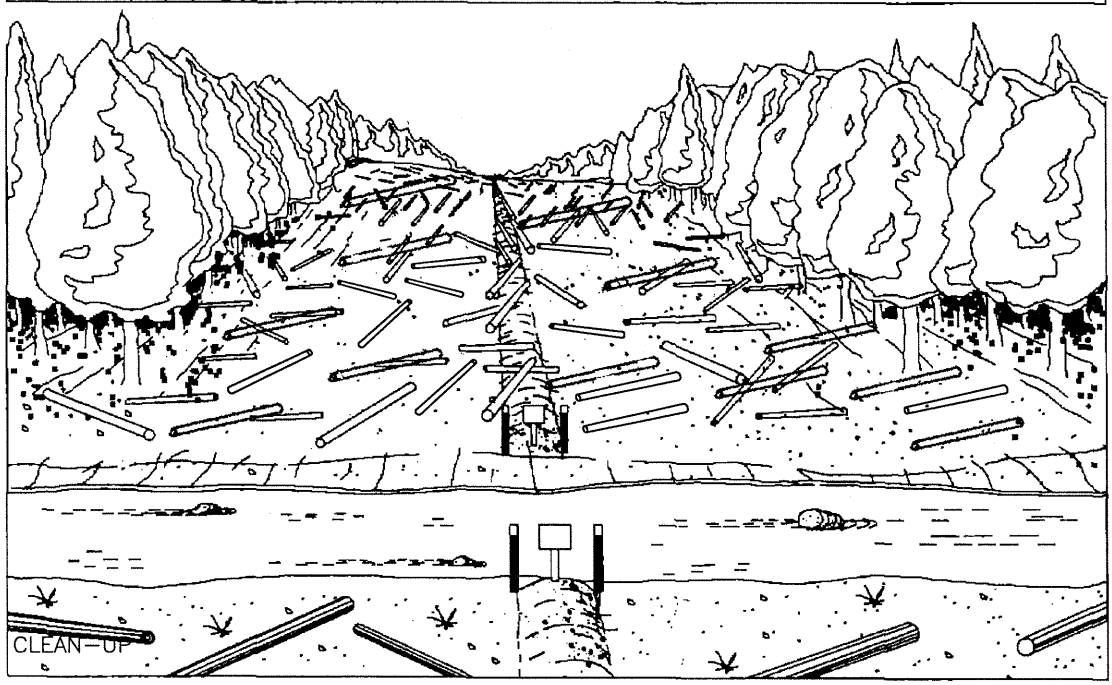
TITLE: TYPICAL ROLLBACK FOR ACCESS CONTROL

SCALE N.T.S. | DWG No STDS-03-ML-05-312 | REV 02

TC_A4_EE.DWG 210X280

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NOTES:

1. WINDROW WOODY DEBRIS ON SIDES OF RIGHT-OF-WAY, OR WHERE APPROVED BY THE COMPANY.
2. MAINTAIN EXISTING ACCESS RIGHTS-OF-WAY THROUGH ROLLBACK (i.e. TRAILS, SEISMIC LINES).
3. ROLLBACK SHOULD BE EVENLY DISTRIBUTED OVER RIGHT-OF-WAY AND COMPACTED WITH A DOZER, OR OTHER APPROVED EQUIPMENT.

REVISIONS | 00 | DRAWING SUPERSEDES SK-1555 | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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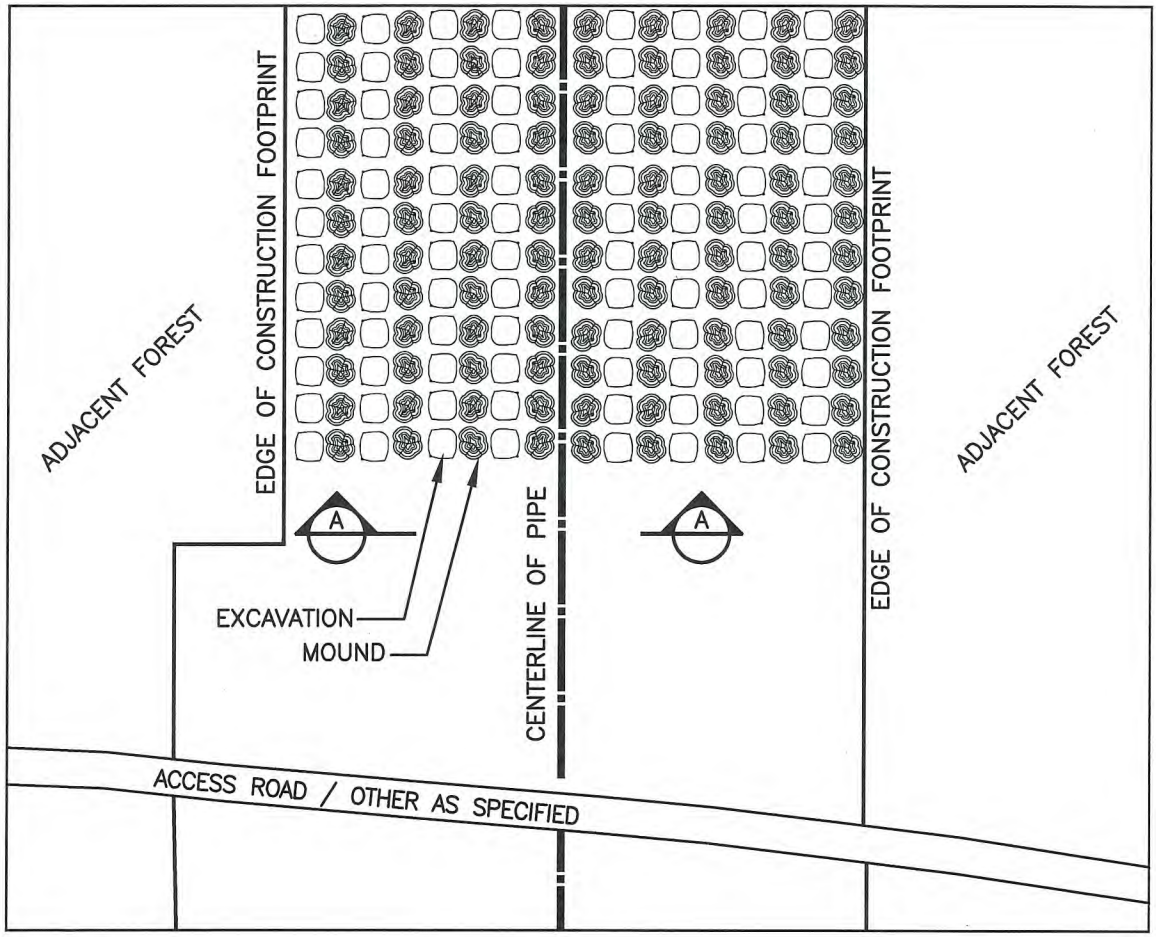
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TYPICAL ROLLBACK FOR EROSION CONTROL

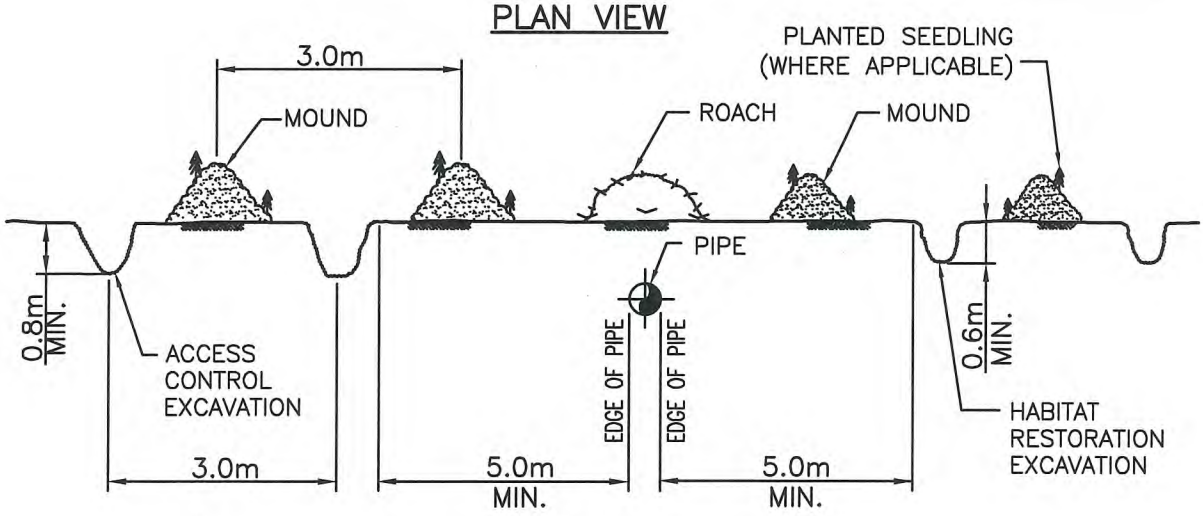
SCALE N.T.S.	DWG No STDS-03-ML-05-313	REV 01

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PLAN VIEW



CROSS SECTION A–A

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DESIGN STANDARD

FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: MOUNDING AND HABITAT RESTORATION (SHEET 1 OF 2)

SCALE N.T.S.	DWG No STDS-03-ML-05-314	REV 00

TIME — DESIGNFILE

TC_A4_EE.DWG 210X280

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NOTES:

1. MOUNDING WILL BE USED PRIMARILY FOR ACCESS CONTROL IN AREAS SPECIFIED ON PROJECT PLANS, AND AS DIRECTED BY THE COMPANY. MOUNDING WILL BE COMBINED WITH HABITAT RESTORATION MEASURES WHERE INDICATED IN PROJECT PLANS, AND AS DIRECTED BY THE COMPANY.

2. EXCAVATIONS SHALL NOT BE CONDUCTED WITHIN 5m OF THE COMPANY'S PIPELINE. ENSURE APPLICABLE COMPANY AND THIRD PARTY PERMITS AND AGREEMENTS ARE IN PLACE AND ADHERED TO.

3. THE EDGE OF THE EXCAVATION SHALL BE JUST BEYOND THE 5m BUFFER LIMIT AND THE MOUND SHALL BE PLACED WITHIN THE 5m BUFFER LIMIT ADJACENT TO THE COMPANY'S PIPELINE.

4. FOR ACCESS CONTROL PURPOSES, THE EXCAVATED AREA SHALL BE MINIMUM 0.8m DEEP AND APPROXIMATELY 1m IN DIAMETER, WHERE SITE CONDITIONS ALLOW.

5. WHERE MOUNDING IS COMBINED WITH HABITAT RESTORATION MEASURES, THE EXCAVATED AREA SHALL BE APPROXIMATELY 0.6m DEEP AND APPROXIMATELY 1m IN DIAMETER, WHERE SITE CONDITIONS ALLOW.

6. THE EXCAVATED MATERIAL IS PLACED BESIDE THE HOLE TO CREATE THE MOUND.

7. MOUNDS SHALL BE SPACED APPROXIMATELY 3m APART, WITH FINAL SPACING IMPLEMENTED TO ENSURE ACCESS BY OFF-ROAD VEHICLES IS DETERRED.

8. DENSITY SHALL BE A MINIMUM OF 700 MOUNDS/HA. MOUND DENSITY IS DEPENDENT ON SOIL CHARACTERISTICS, AMOUNT OF FROST AND TYPE OF EQUIPMENT USED. TYPICAL LENGTH OF MOUNDING TO MEET THE MINIMUM DENSITY IS APPROXIMATELY 50m.

9. WHERE MOUNDING IS COMBINED WITH HABITAT RESTORATION MEASURES, LIVE SEEDLING PLANTING DENSITY SHALL BE A MINIMUM OF 2 SEEDLINGS PER MOUND, OR 1,400 TO 2,000 SEEDLINGS/HA.

10. IF SITE CONDITIONS WARRANT MODIFICATIONS TO THE PROCEDURE, THE COMPANY'S AUTHORIZED REPRESENTATIVE SHALL ENSURE THE MODIFICATIONS MEET THE INTENT OF THE MITIGATION MEASURE.

GENERAL:

- MOUNDING IS TYPICALLY CONDUCTED DURING FINAL CLEANUP AND NOT IN THE SAME SEASON AS CONSTRUCTION/ INTERIM CLEANUP.
- PRECAUTIONS SHALL BE TAKEN TO MINIMIZE FROST PENETRATION WHERE PRACTICAL IN AREAS WHERE MOUNDING IS SPECIFIED. DEEPER FROST PENETRATION CAN LIMIT THE ABILITY TO EXCAVATE HOLES AND SUBSEQUENT EFFECTIVENESS OF THE MITIGATION MEASURES.
- SITE SPECIFIC SOIL PROPERTIES (E.G. SUBSTRATE AND DRAINAGE) MAY AFFECT THE HOLE AND MOUND SIZE, STABILITY AND OVERALL STRUCTURE.
- MOUNDING MAY ALSO BE USED IN COMBINATION WITH HABITAT RESTORATION BY CREATING MICROSITES FOR PLANTED SEEDLINGS.

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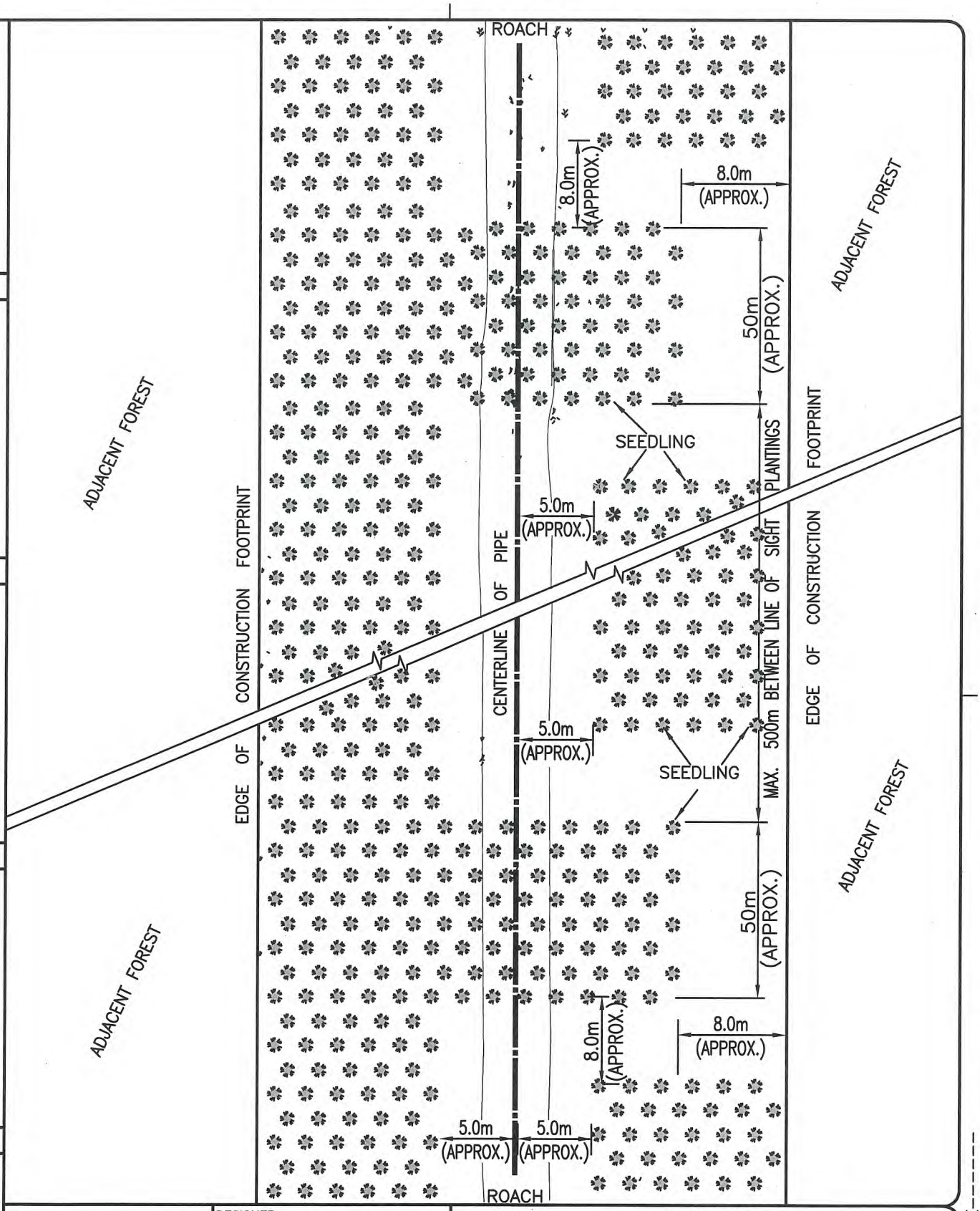
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: MOUNDING AND HABITAT RESTORATION (SHEET 2 OF 2)

SCALE N.T.S. | DWG No STDS-03-ML-05-315 | REV 00

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STDS		03

TITLE

HABITAT RESTORATION
SEEDLING PLANTING FOR LINE OF SIGHT
(SHEET 1 of 3)

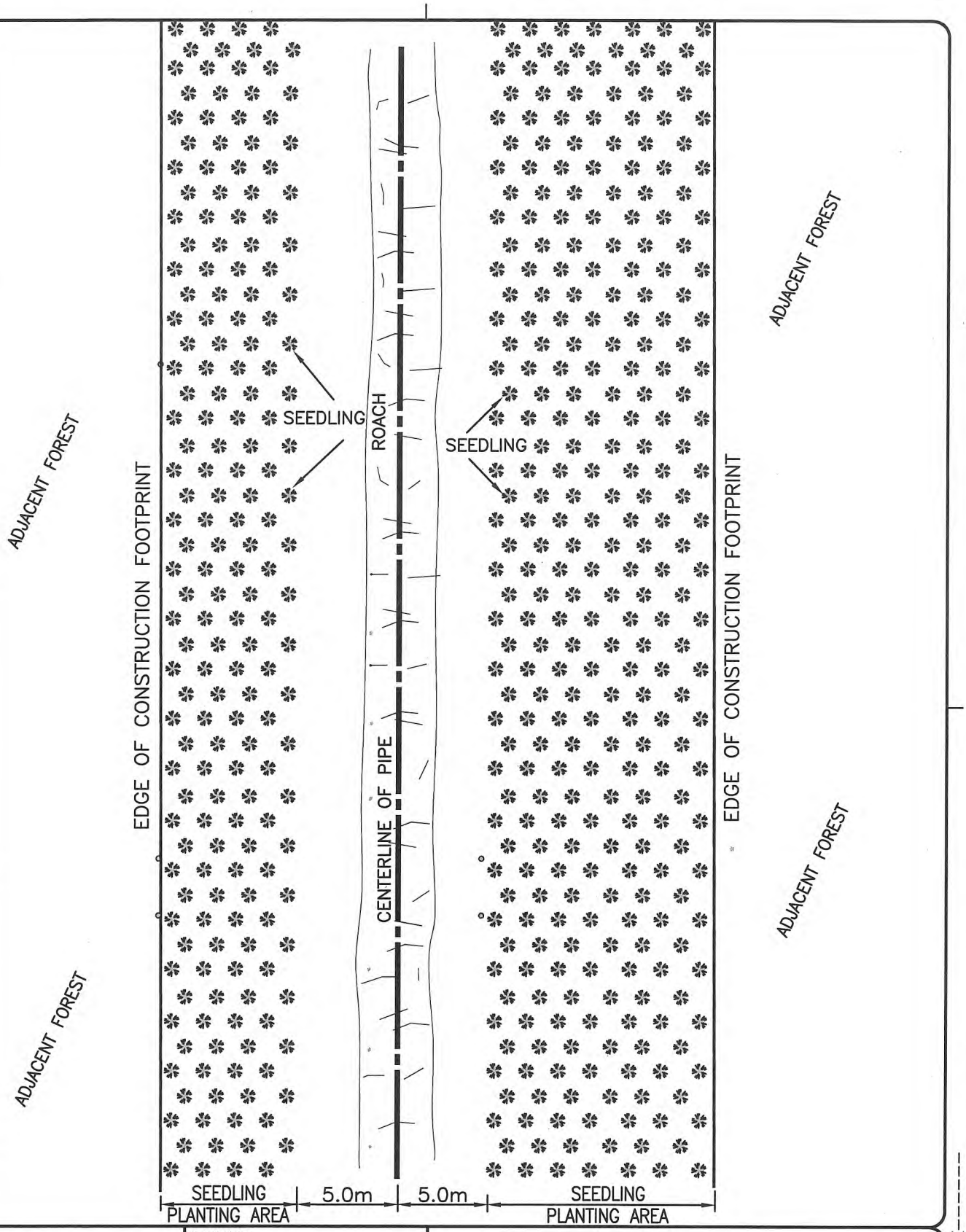
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FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: HABITAT RESTORATION SEEDLING PLANTING (SHEET 2 OF 3)

SCALE N.T.S. | DWG No STDS-03-ML-05-317 | REV 00

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NOTES:

1. CONDUCT SEEDLING PLANTING FOR HABITAT RESTORATION AND LINE OF SIGHT WHERE INDICATED IN PROJECT PLANS, AND AS DIRECTED BY THE COMPANY.

2. ENSURE APPLICABLE COMPANY AND THIRD PARTY AGREEMENTS ARE IN PLACE AND FOLLOWED.

3. SEEDLING PLANTING SHALL BE CONDUCTED IN NON–FROZEN GROUND CONDITIONS IN THE SEASON FOLLOWING WINTER FINAL CLEANUP, AND OUTSIDE OF APPLICABLE RESTRICTED ACTIVITY PERIODS WHERE WAIVERS ARE NOT OBTAINED.

4. DO NOT PLANT IN THE SEASON FOLLOWING CONSTRUCTION/ INTERIM CLEANUP UNLESS APPROVED IN PROJECT PLANS OR DIRECTED BY THE COMPANY.

5. SEEDLING PLANTING DENSITY SHALL BE (A) 1,600–2,000 STEMS PER HA IN UPLAND (CONIFER /DECIDUOUS); (B) 1,200–2,000 STEMS PER HA IN LOWLAND (CONIFER ONLY). PLANT IN A STRAIGHT LINE PARALLEL TO THE ROACH. OFF–SET THE ADJACENT PARALLEL LINE OF PLANTING TO AVOID A GRID PATTERN.

6. WHERE THE LINE OF SIGHT PROCEDURE IS REQUIRED, IT SHOULD BE IMPLEMENTED AT MAXIMUM 500m SPACING OR AS DIRECTED BY THE COMPANY. TO ADDRESS ACCESS REQUIREMENTS DURING PIPELINE OPERATIONS, THE LINE OF SIGHT PLANTING PATTERN SHALL ENSURE AN APPROXIMATE 8m WIDE GAP IS LEFT UNPLANTED ADJACENT TO THE EDGE OF THE CONSTRUCTION FOOTPRINT. WHERE ACCESS IS REQUIRED ADJACENT TO THE OPERATING PIPELINE, PLANTING SHALL NOT BE CONDUCTED WITHIN 5m OF THE PIPELINE.

7. SEE DRAWING STDS–03–ML–05–316 AND STDS–03–ML–05–317 FOR EXAMPLES OF THE ALTERNATING PLANTING PATTERN AND LAYOUT TO BE APPLIED FOR HABITAT RESTORATION AND LINE OF SIGHT LOCATIONS.

8. ALTERNATING PLANTING PATTERN SHALL BE APPROXIMATELY 50m IN LENGTH OR AS INDICATED BY THE COMPANY TO MEET THE INTENT OF THE LINE OF SIGHT REQUIREMENTS.

9. IF SITE CONDITIONS WARRANT MODIFICATIONS TO THE PROCEDURE, THE COMPANY'S AUTHORIZED REPRESENTATIVE SHALL ENSURE THE MODIFICATIONS MEET THE INTENT OF THE HABITAT RESTORATION MITIGATION MEASURES.

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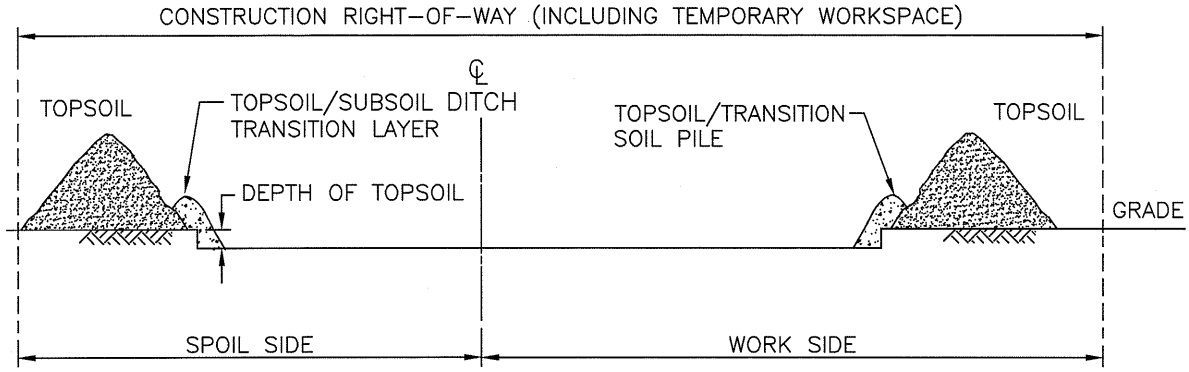
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NAME	DATE May 18/17	FIA # STDS	CHAINAGE:	DISCIPLINE # 03
CHECKED BY:	DESIGN CHECKER:	TITLE HABITAT RESTORATION AND LINE OF SIGHT SEEDLING PLANTING NOTES (SHEET 3 OF 3)		
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TIME

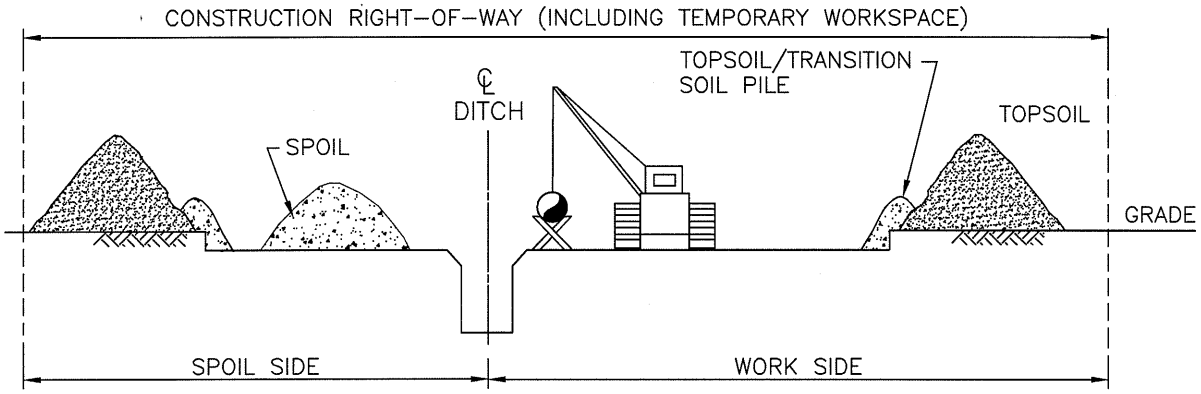
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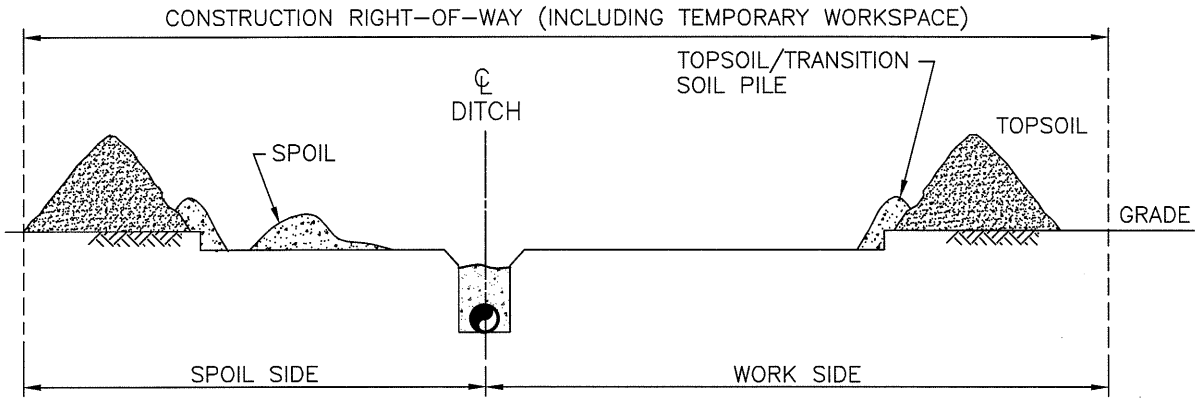
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1. STRIP TOPSOIL AND TOPSOIL/SUBSOIL TRANSITION LAYER FROM SPOIL AND WORK AREAS. PLACE TOPSOIL IN TEMPORARY WORK SPACE ON OUTSIDE EDGES OF RIGHT–OF–WAY. HOWEVER, IN AREAS OF THICKER TOPSOILS, TOPSOIL MAY BE SPLIT TO BOTH SIDES OF THE RIGHT OF WAY. APPLY TOPSOIL STABILIZERS TO TOPSOIL PILE.



2. EXCAVATE TRENCH



3. PIPE LOWERING AND BACKFILL TRENCH AS PER APPROVED PROCEDURE.

REVISIONS | 00 | DRAWING SUPERSEDES SK–1609 (1 OF 2) | 01 | GENERAL ISSUE – REVIEWED FOR 2015 SPEC.

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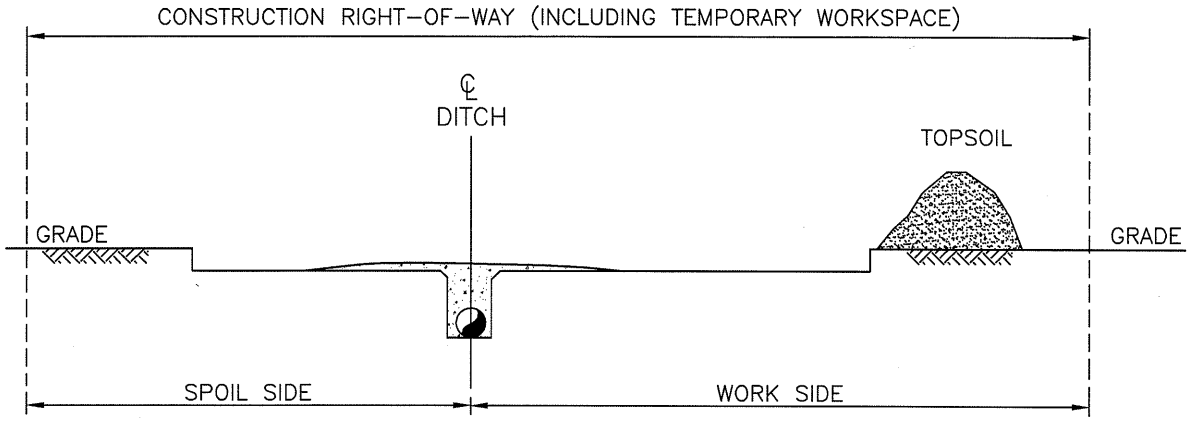
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION FULL–WIDTH STRIPPING (SHEET 1 OF 2)

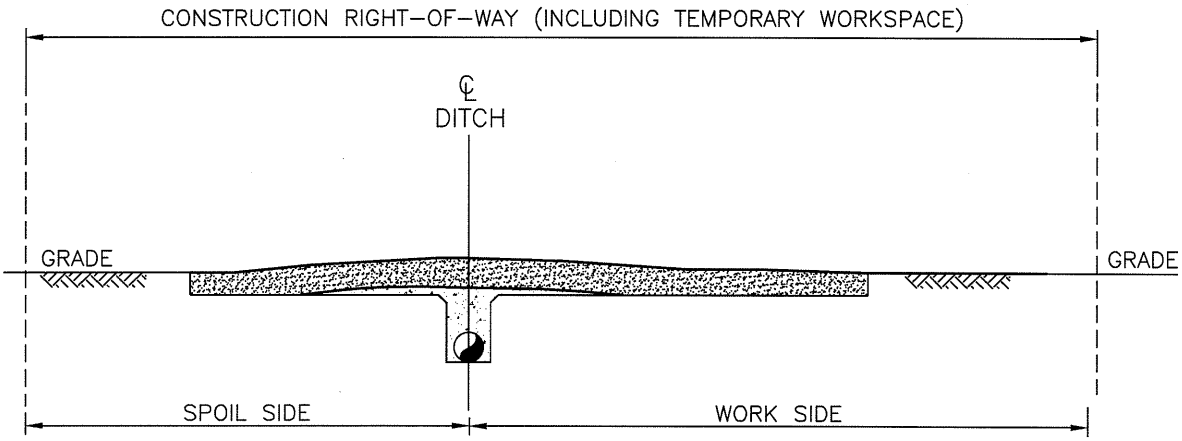
SCALE N.T.S. | DWG No STDS–03–ML–05–401 | REV 01

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4. COMPACT ROACH INTO DITCH AS PER APPROVED PROCEDURE.



5. REPLACE TOPSOIL/SUBSOIL TRANSITION LAYER UNIFORMLY, FOLLOWED BY REPLACEMENT OF THE TOPSOIL EVENLY OVER STRIPPED AREA, AND PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

NOTE:

FOLLOWING TRENCH COMPACTION, FEATHER THE REMAINING SPOIL DISPLACED BY THE PIPE OVER THE APPLICABLE STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DOES NOT EXCEED 10cm.

REVISIONS | 00 | DRAWING SUPERSEDES SK-1609 (2 OF 2) | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC.

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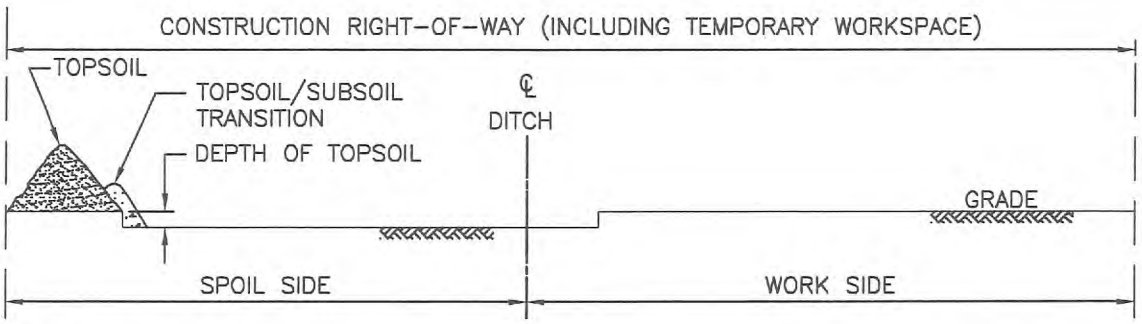
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TOPSOIL CONVERVATION FULL-WIDTH STRIPPING (SHEET 2 OF 2)

SCALE N.T.S.	DWG No STDS-03-ML-05-401	REV 01

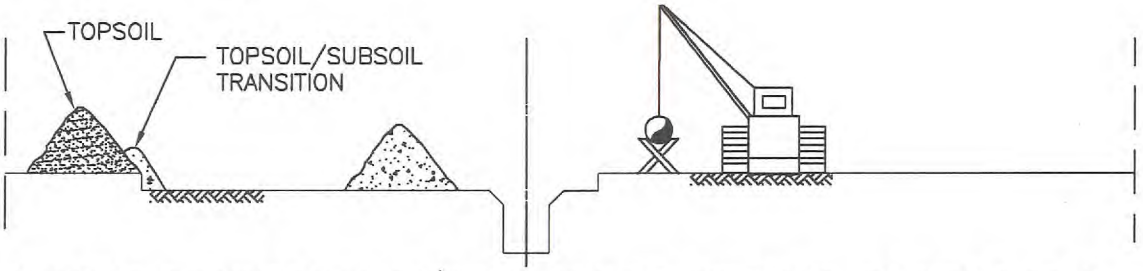
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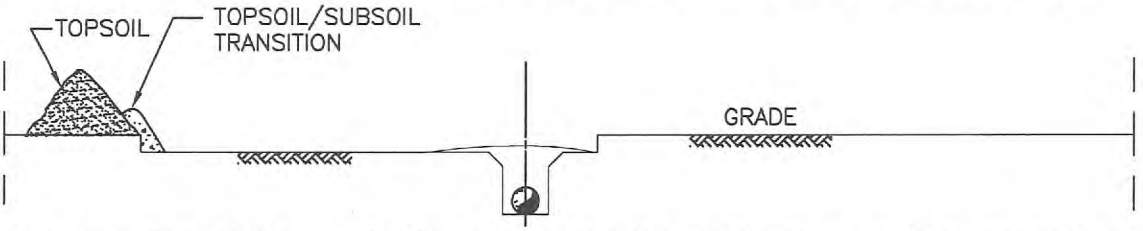


1. STRIP TOPSOIL AND TOPSOIL/SUBSOIL TRANSITION LAYER AND STOCKPILE AT EDGE OF RIGHT-OF-WAY. APPLY TOPSOIL STABILIZERS TO TOPSOIL PILE, AS REQUIRED.

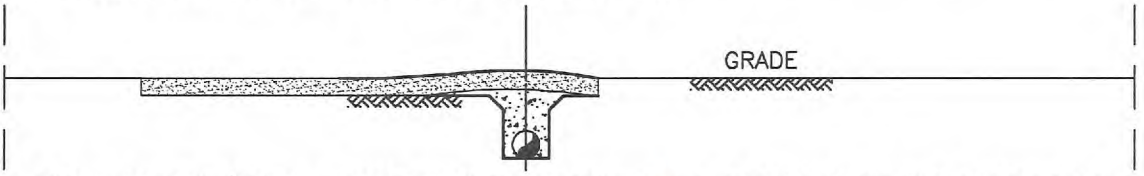
SPECIAL ATTENTION IS NECESSARY TO ENSURE SEPARATION OF TOPSOIL AND SUBSOIL AT SIDE BENDS AND FOREIGN PIPELINE CROSSINGS.



2. AS SUBSOIL IS STOCKPILED, MAINTAIN SEPARATION BETWEEN TOPSOIL AND SUBSOIL PILES.



3. LOWER-IN PIPE, BACKFILL, AND COMPACT TRENCH PER APPROVED COMPACTION PROCEDURE. RELIEVE AREAS OF COMPACTION, AND FEATHER MATERIAL OVER STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DO NOT EXCEED 10cm. WHERE DITCHLINE AND SPOIL SIDE TOPSOIL CONSERVATION IS UTILIZED UNDER FROZEN GROUND CONDITIONS, BACKFILL THE PIPE ONLY. SECONDARY STRIPPING FOR SPOIL DISPLACEMENT WILL BE REQUIRED UNDER NON-FROZEN GROUND CONDITIONS. REFER TO STDS-03-ML-05-431.



4. REPLACE TOPSOIL/SUBSOIL TRANSITION LAYER UNIFORMLY, FOLLOWED BY REPLACEMENT OF TOPSOIL EVENLY OVER STRIPPED AREA. PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

APPLICATION:

1. AGRICULTURAL LAND AND WHERE DIRECTED BY THE COMPANY.

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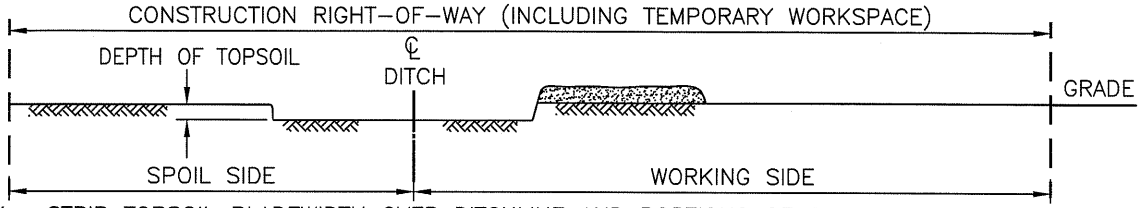
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TITLE: TOPSOIL CONSERVATION DITCHLINE AND SPOIL SIDE

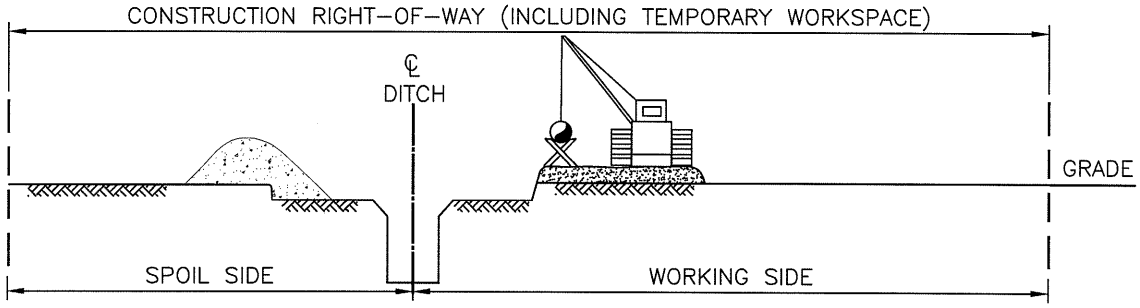
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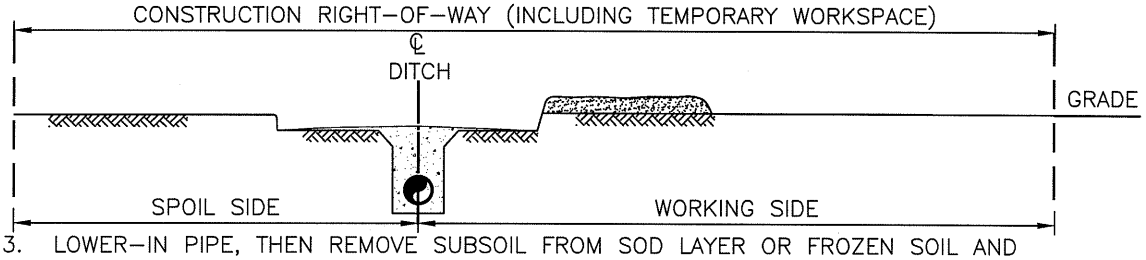
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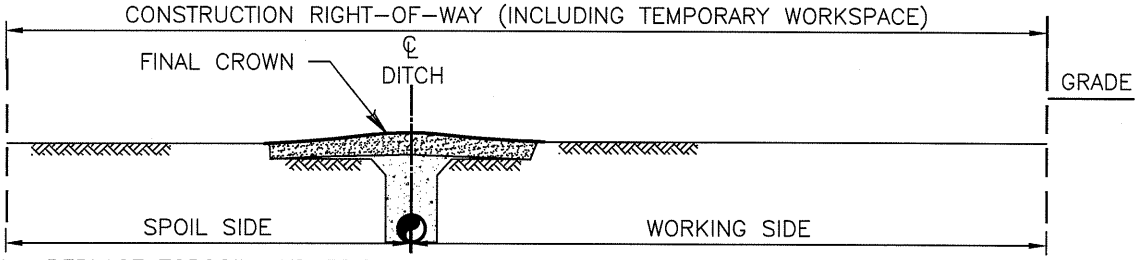
1. STRIP TOPSOIL BLADEWIDTH OVER DITCHLINE AND PORTIONS OF SPOILSIDE AND WORKSIDE (VARIABLE WIDTH AS APPROVED BY THE COMPANY) AREA. STORE TOPSOIL ON WORKING SIDE.



2. TRENCH AND PILE ON SPOILSIDE, OVERLAPPING ON STRIPPED AND UNSTRIPPED AREA



3. LOWER–IN PIPE, THEN REMOVE SUBSOIL FROM SOD LAYER OR FROZEN SOIL AND BACKFILL OVER DITCHLINE AND COMPACT AS PER APPROVED PROCEDURE.



4. REPLACE TOPSOIL AND PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

NOTES:

SECONDARY STRIPPING MAY BE REQUIRED TO ENSURE FINAL CROWN HEIGHT DOES NOT EXCEED LANDOWNER AND REGULATORY APPROVALS.

IF USED AS A WINTER SOIL HANDLING PROCEDURE, BACKFILL TRENCH ONLY AND DO NOT REPLACE TOPSOIL UNTIL THE FOLLOWING SUMMER, OR IN A TIMEFRAME APPROVED BY THE COMPANY.

FOLLOWING TRENCH COMPACTION, FEATHER THE REMAINING SPOIL DISPLACED BY THE PIPE OVER THE APPLICABLE STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DOES NOT EXCEED 10cm.

APPLICATION:

1. WHERE DIRECTED BY COMPANY.
2. PARALLEL OR NON–PARALLEL PIPELINE LOCATIONS.

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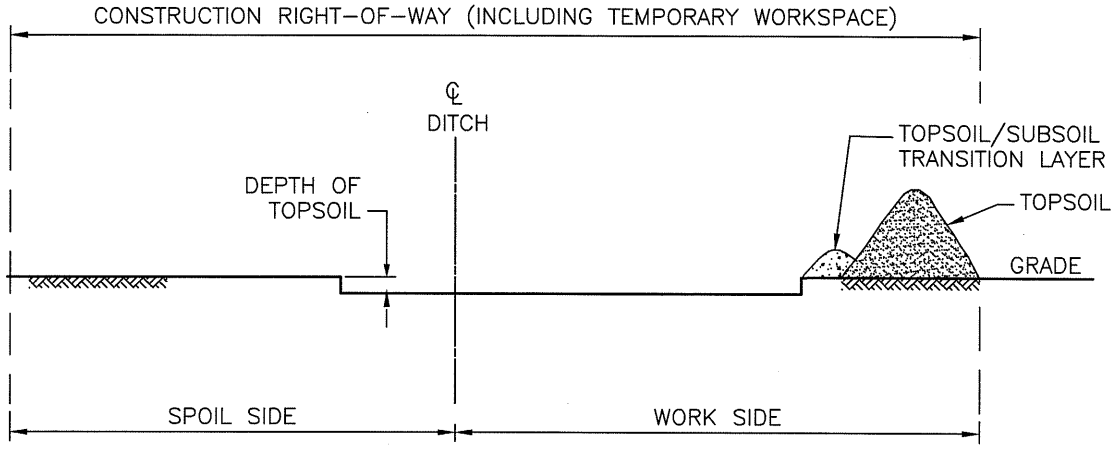
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION BLADE WIDTH

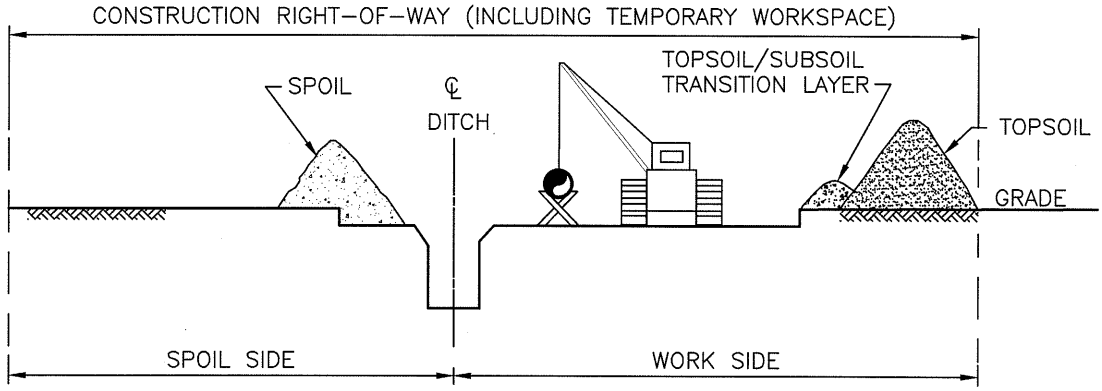
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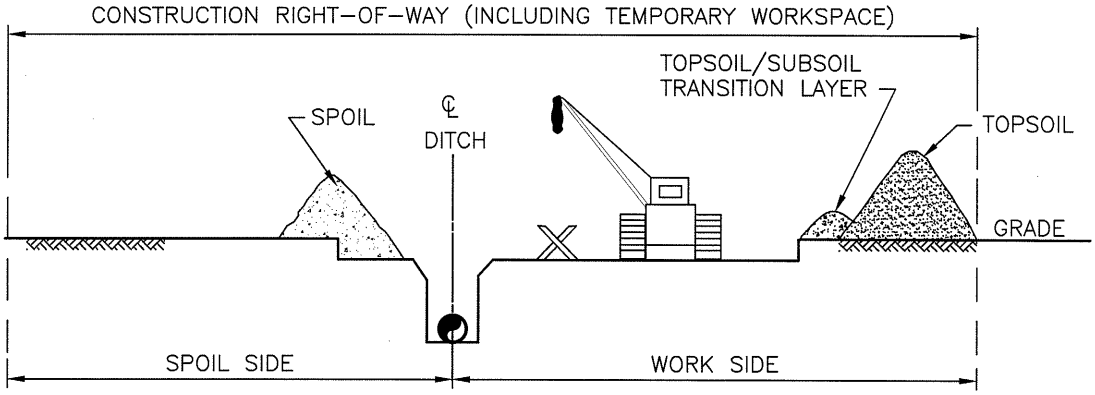
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1. STRIP TOPSOIL AND PILE IN APPROVED LOCATION, THEN REMOVE TOPSOIL/SUBSOIL TRANSITION LAYER FROM DITCHLINE AND WORK SIDE AREAS, AND PLACE BOTH IN WINDROW ON OUTSIDE EDGE OF RIGHT–OF–WAY, OR IN APPROVED IN TEMPORARY WORK SPACE. APPLY TOPSOIL STABILIZERS TO TOPSOIL PILE AS REQUIRED.



2. EXCAVATE TRENCH.



3. LOWER–IN PIPE.

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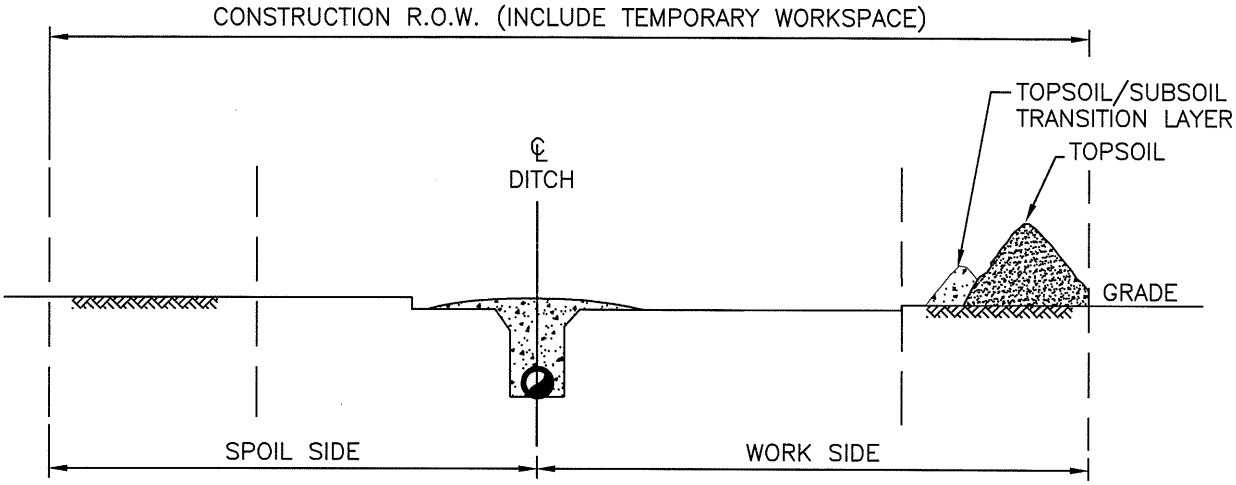
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TITLE: TOPSOIL CONSERVATION DITCH AND WORKSIDE STRIPPING (SHEET 1 OF 2)

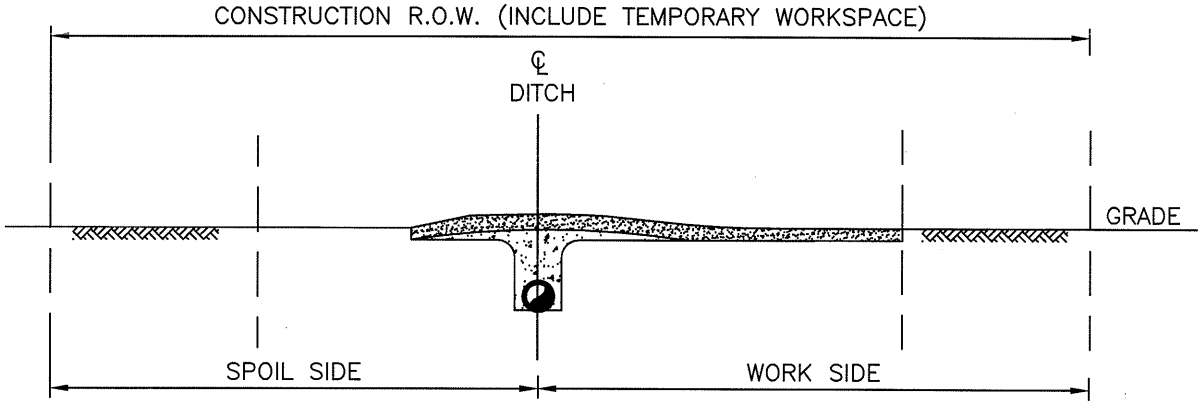
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4. BACKFILL AND COMPACT TRENCH PER APPROVED COMPACTION PROCEDURE. RELIEVE AREAS OF COMPACTION, AND FEATHER MATERIAL OVER STRIPPED AREA TO REDUCE HEIGHT OF ROACH TO A MAXIMUM 10cm. PREPARE SUB GRADE AS DIRECTED BY COMPANY.



5. REPLACE TOPSOIL/SUBSOIL TRANSITION LAYER UNIFORMLY FIRST, FOLLOWED BY REPLACEMENT OF THE TOPSOIL PILE EVENLY OVER STRIPPED AREA. PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

NOTE:

REMOVE ALL ROCKS 10cm AND LARGER WITHIN THE UPPER 30cm OF SUBSOIL, AS WELL AS AFTER TOPSOIL REPLACEMENT.

TOPSOIL/SUBSOIL TRANSITION LAYER DEPTHS SHALL BE DETERMINED BY THE COMPANY AND SHALL NOT EXCEED 5cm DEPTH.

TOPSOIL SHALL BE STRIPPED IN A MANNER THAT MINIMIZES SUBSOIL INCORPORATION WITHIN THE MAIN TOPSOIL STOCKPILE.

FOLLOWING TRENCH COMPACTION, FEATHER THE REMAINING SPOIL DISPLACED BY THE PIPE OVER THE APPLICABLE STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DOES NOT EXCEED 10cm.

APPLICATION:

WHERE SPECIFIED BY THE COMPANY.

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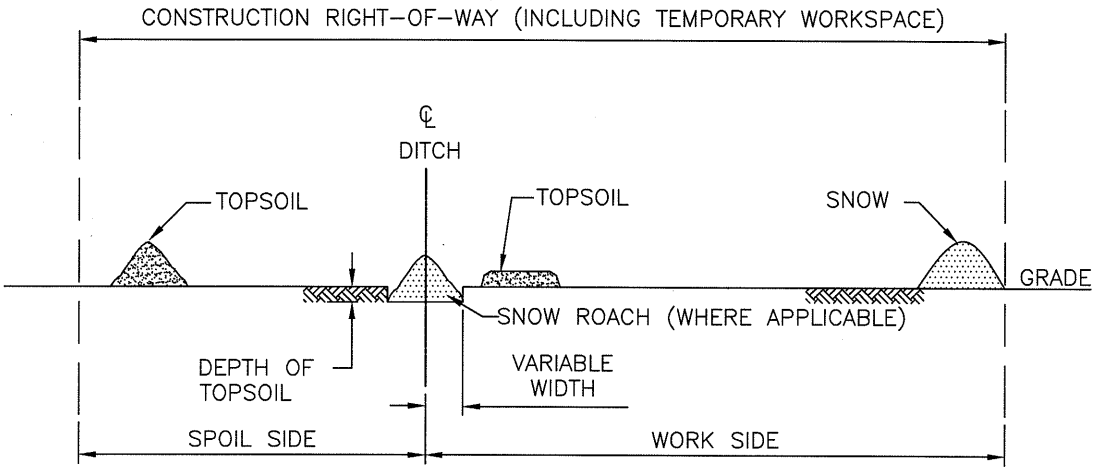
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION DITCH AND WORKSIDE STRIPPING (SHEET 2 OF 2)

SCALE N.T.S.	DWG No STDS-03-ML-05-410	REV 00

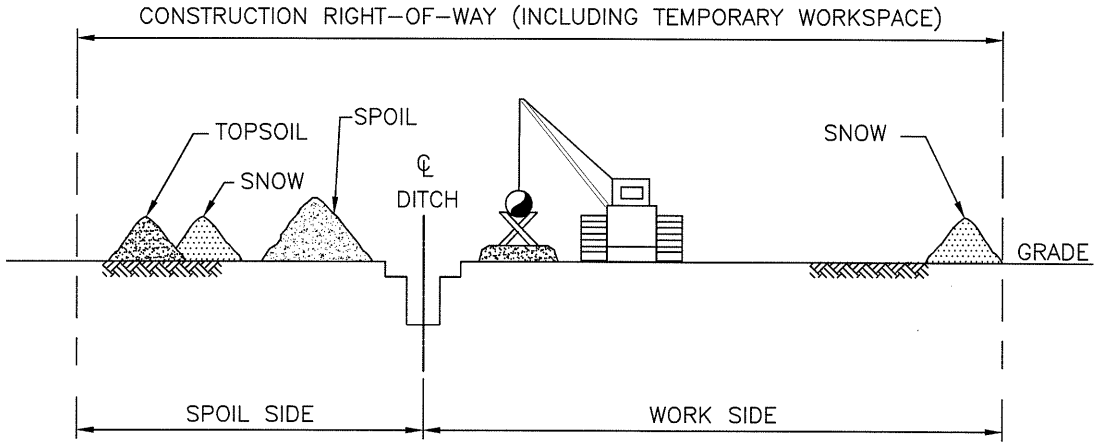
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1. STRIP TOPSOIL OVER DITCHLINE AND STOCKPILE ON WORKING SIDE, ADJACENT TO THE TRENCH. TOPSOIL CAN ALSO BE STOCK PILED ALONG THE RIGHT–OF–WAY BOUNDARY. APPLY TOPSOIL STABILIZERS TO TOPSOIL PILE AS REQUIRED.

NOTE: WIDTH STRIPPED OVER DITCHLINE MUST BE SUFFICIENT TO ACCOMMODATE DITCHER OR BACKHOE BUCKET AND CONSIDERATION FOR SOIL INSTABILITY.



2. SUBSOIL TO BE STOCKPILED ON SPOIL SIDE. PIPE MAY BE STRUNG ON TOPSOIL. WHERE APPLICABLE, USE AVAILABLE SNOW AS A BUFFER BETWEEN TRENCH SPOIL AND FROZEN SURFACE.

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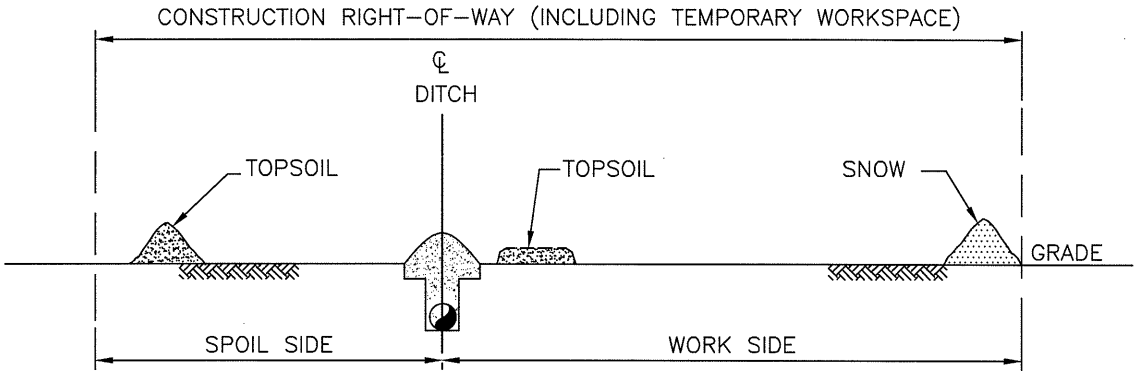
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TITLE: TOPSOIL CONSERVATION DITCHLINE (WINTER CONSTRUCTION) (SHEET 1 OF 2)

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BACKFILL AND MACHINE CLEAN–UP: (WINTER)

3. LOWER–IN PIPE, BACK FILL TRENCH, AND CENTER SPOIL OVER DITCHLINE TO FORM A ROACH.

FINAL CLEAN–UP (SUMMER)

4. REFER TO SECONDARY STRIPPING DRAWING STDS–03–ML–05–431 FOR SPOIL DISPLACEMENT. FOR FINAL CLEANUP PREPARATION, BACKFILL AND COMPACT TRENCH PER APPROVED PROCEDURE. REPLACE TOPSOIL AND PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

APPLICATION:

1. AGRICULTURAL LAND
2. WHERE NECESSARY BLADE SPOIL STORAGE AREA TO A SMOOTH SURFACE. TOPSOIL SHALL BE STORED IN PIPE LAY–UP AREA OR ALTERNATE LOCATION ALONG RIGHT–OF–WAY BOUNDARY WHERE DIRECTED BY THE COMPANY.

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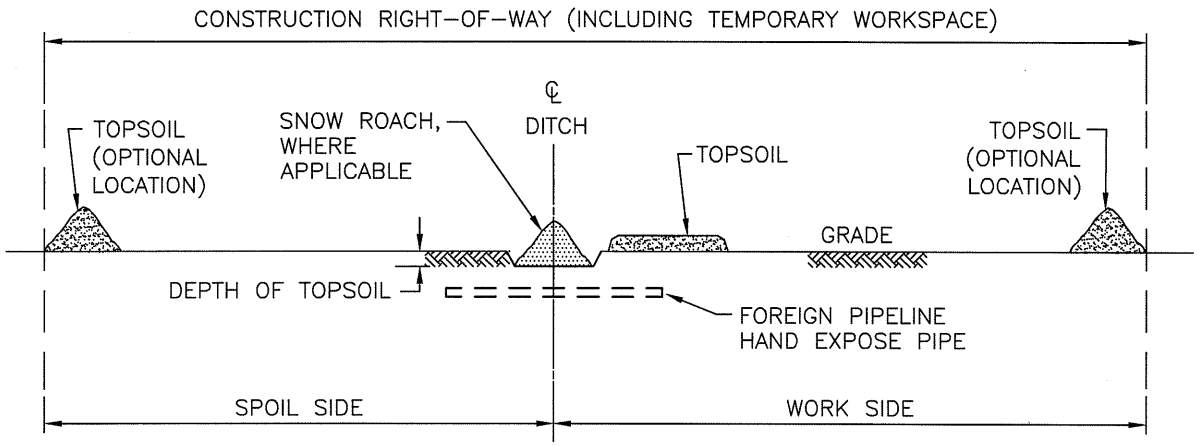
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION DITCHLINE (WINTER CONSTRUCTION) (SHEET 2 OF 2)

SCALE N.T.S. | DWG No STDS–03–ML–05–411 | REV 01

TC_A4_EE.DWG 210X280

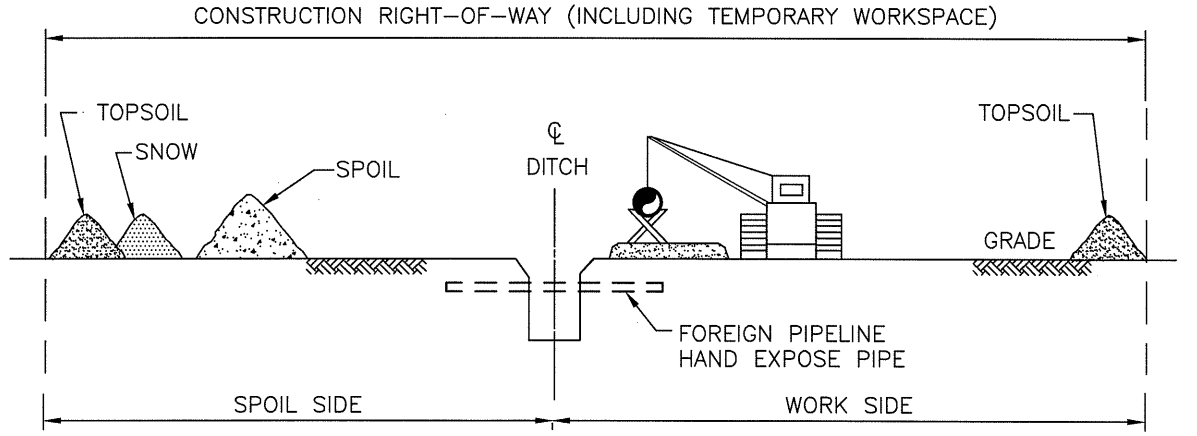
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



1. STRIP TOPSOIL WIDER OVER DITCHLINE UP AND DOWNSTREAM OF THE FOREIGN LINE AND STOCKPILE ON WORKING SIDE OR RIGHT–OF–WAY BOUNDARY. APPLY TOPSOIL STABILIZERS TO TOPSOIL PILE, AS REQUIRED.

NOTES:

TOPSOIL MAY BE PLACED ON THE WORKING SIDE ADJACENT TO THE TRENCH, AND THE PIPE STRUNG ON IT, WHERE APPLICABLE. CROSSING AGREEMENTS MAY REQUIRE ALTERNATE VEHICLE CROSSING METHODS SUCH AS MATS, OR GEOTEXTILE AND SUBSOIL RAMPS. TOPSOIL SHALL THEN BE STOCKPILED ALONG EITHER BOUNDARY OF THE ROW.



2. SUBSOIL TO BE STOCKPILED ON SPOIL SIDE. CONFINE EXCAVATION TO STRIPPED AREA. WHERE APPLICABLE, USE AVAILABLE SNOW AS A BUFFER BETWEEN TRENCH SPOIL AND FROZEN SURFACE.

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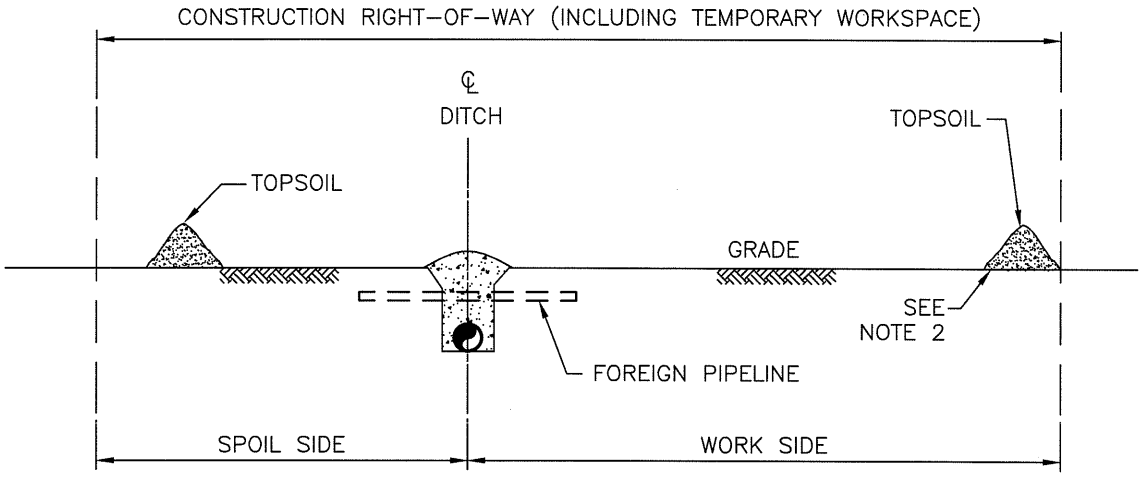
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION FOREIGN PIPELINE CROSSINGS (WINTER CONSTRUCTION) (SHEET 1 OF 2)

SCALE N.T.S.	DWG No STDS–03–ML–05–412	REV 01

TC_A4_EE.DWG 210X280

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3. LOWER–IN PIPE AND BACKFILL. SCRAPE SUBSOIL INTO ROACH CENTRED OVER DITCHLINE.

4. REFER TO SECONDARY STRIPPING FOR SPOIL DISPLACEMENT DWG. STDS–03–ML–05–431 FINAL CLEANUP PREPARATION. BACKFILL AND COMPACT TRENCH PER APPROVED PROCEDURE. REPLACE TOPSOIL AND PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

APPLICATION:

1. AGRICULTURAL LAND.

2. WHERE NECESSARY, BLADE SPOIL STORAGE AREA TO A SMOOTH SURFACE. TOPSOIL SHALL BE STORED IN PIPE LAY–UP AREA OR ALTERNATE LOCATION ALONG ROW BOUNDARY WHERE DIRECTED BY THE COMPANY.

3. THE ADDITIONAL TOPSOIL STRIPPING WIDTH UPSTREAM AND DOWNSTREAM OF THE FOREIGN LINE CROSSING SHALL BE CONDUCTED PER STANDARD RIGHT–OF–WAY SPECIFICATION OR PER PROJECT REQUIREMENTS DETERMINED BY THE COMPANY.

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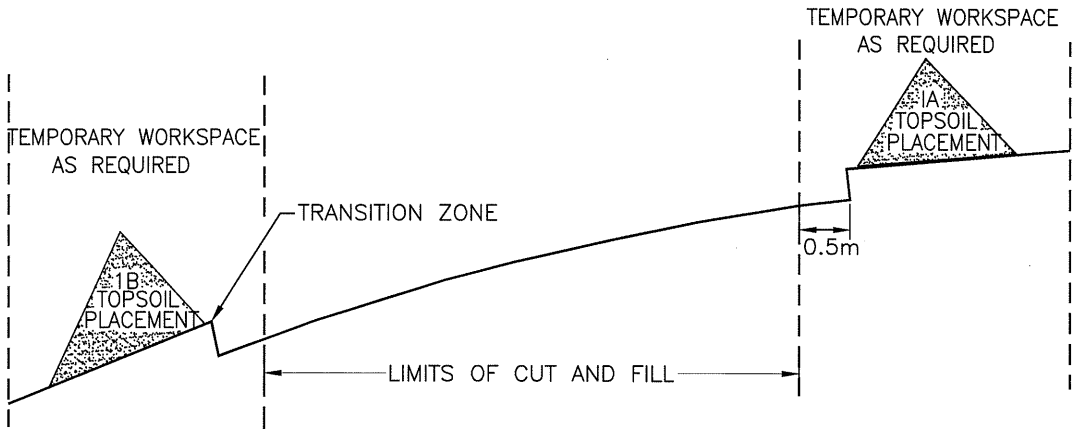
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION FOREIGN PIPELINE CROSSINGS (WINTER CONSTRUCTION) (SHEET 2 OF 2)

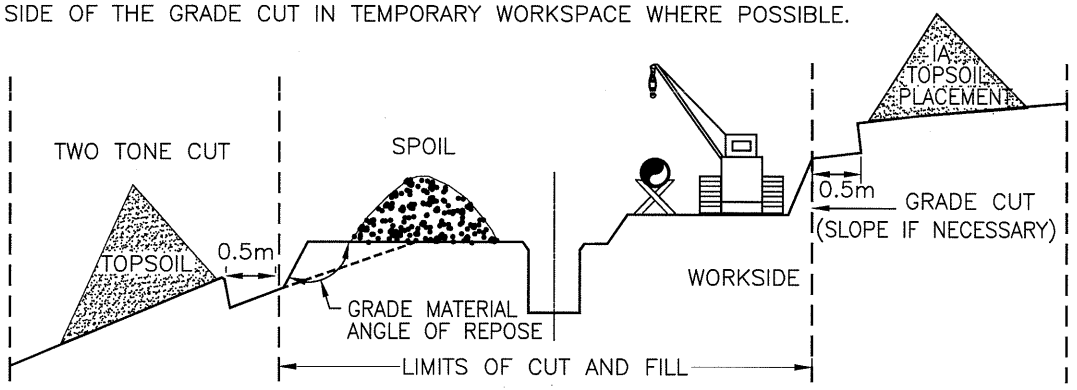
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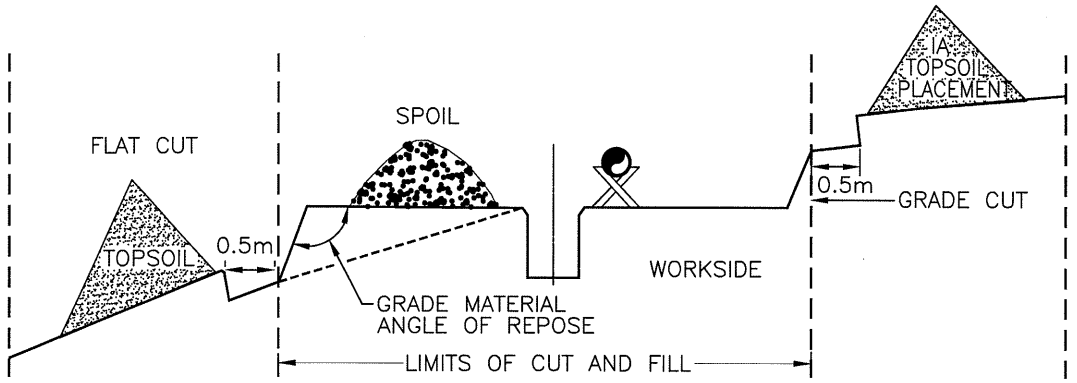
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



1. WHENEVER POSSIBLE, STRIP TOPSOIL OVER THE FULL WIDTH OF THE RIGHT-OF-WAY PLUS EXTRA SPACE ON THE DOWNHILL AND UPHILL EDGE TO ALLOW FOR THE GRADE MATERIAL ANGLE OF REPOSE AND TOPSOIL GRADE CUT SEPARATION. PLACE TOPSOIL ON THE HIGH SIDE OF THE GRADE CUT IN TEMPORARY WORKSPACE WHERE POSSIBLE.



2. MAKE GRADE CUT (FLAT OR TWO TONE) STAYING 0.5m AWAY FROM TOPSOIL EDGE CUT OF PILE ON HIGH SIDE; AND BETWEEN GRADE MATERIAL AND TOPSOIL EDGE CUT OR PILE ON LOW SIDE. PLACE EXCESS GRADE SPOIL IN APPROVED PUSH OUTS ON ACQUIRED TEMPORARY WORK SPACE. PUSH OUTS MUST BE STRIPPED OF TOPSOIL TO THE SATISFACTION OF THE COMPANY. EXCAVATE DITCH AND MAINTAIN SEPARATION. ENSURE DEPTH OF COVER MINIMUMS ARE MET AND PIPE PLACEMENT IS WITHIN NATIVE SOIL PER THE COMPANY SPECIFICATION.



3. REPLACE GRADE CUT TO ORIGINAL CONTOUR, UNLESS APPROVED BY THE COMPANY. RELIEVE COMPACTION AND REPLACE TOPSOIL EVENLY OVER STRIPPED AREA. PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

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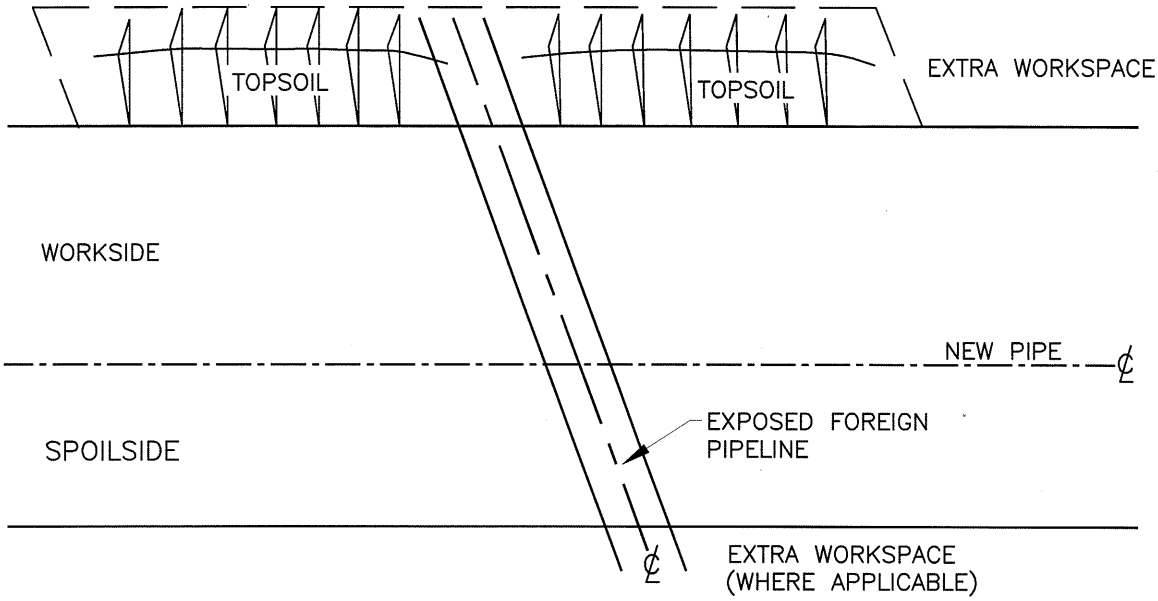
FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION FOR SIDE HILL GRADING IN AGRICULTURE LAND

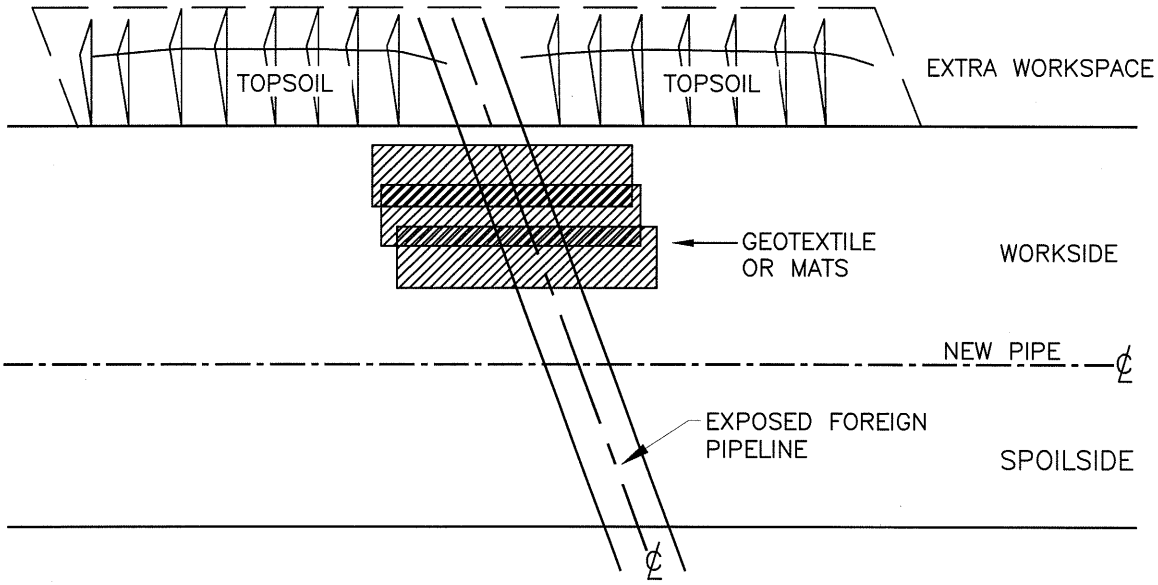
SCALE N.T.S. | DWG No STDS-03-ML-05-421 | REV 01

TC_A4_EE.DWG 210X280.

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



1. EXPOSE FOREIGN PIPELINE/FACILITY AS REQUIRED PER PROCEDURES AND AGREEMENTS. STRIP TOPSOIL AND TOPSOIL/SUBSOIL TRANSITION LAYER FULL WIDTH OF RIGHT-OF-WAY EITHER SIDE OF FOREIGN PIPELINE/FACILTY PER COMPANY STANDARD RIGHT-OF-WAY SPECIFICATION OR PROJECT PLANS.
   LEAVE UNSTRIPPED BUFFER EITHER SIDE OF THE FOREIGN PIPELINE/FACILITY INTACT, OR AS REQUIRED IN APPLICABLE AGREEMENTS.



2. LAY IMPERMEABLE GEOTEXTILE OR MATS ACROSS RIGHT-OF-WAY TO EXCEED WIDTH OF RAMP, AND OVERLAP ON WIDTH. LENGTH OF MATS MAY VARY, AND SHALL BE PLACED PER APPLICABLE AGREEMENTS.

REVISIONS | 00 | DRAWING SUPERSEDES SK-1586 1 OF 2 | 01 | GENERAL ISSUE - REVIEWED FOR 2015 SPEC

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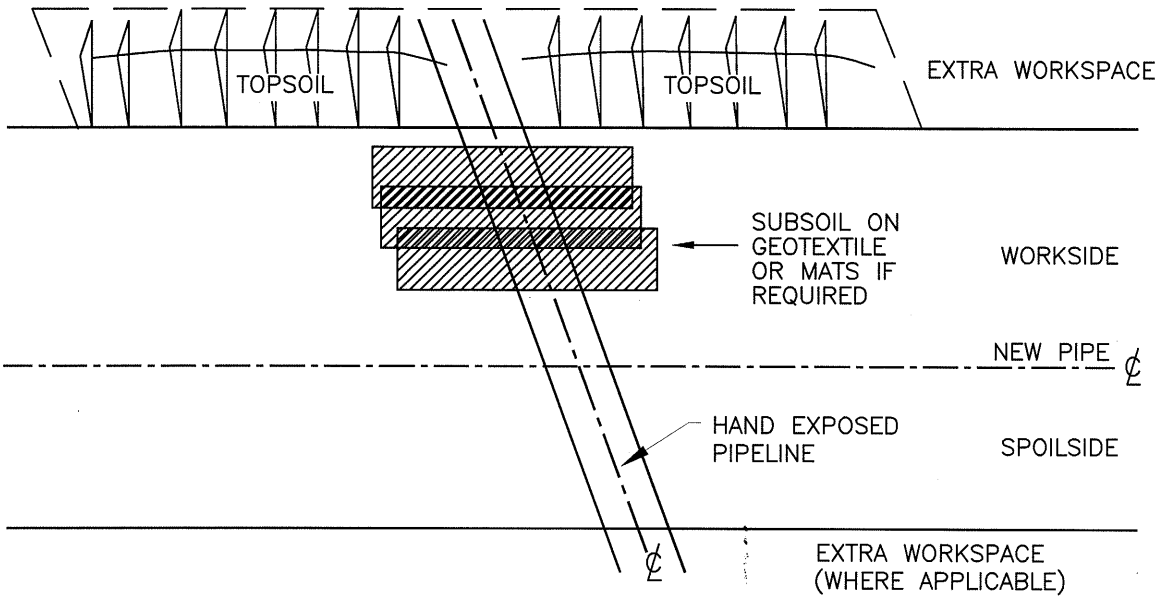
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: SOIL HANDLING FOR RAMPED LINE CROSSING (SHEET 1 OF 2)

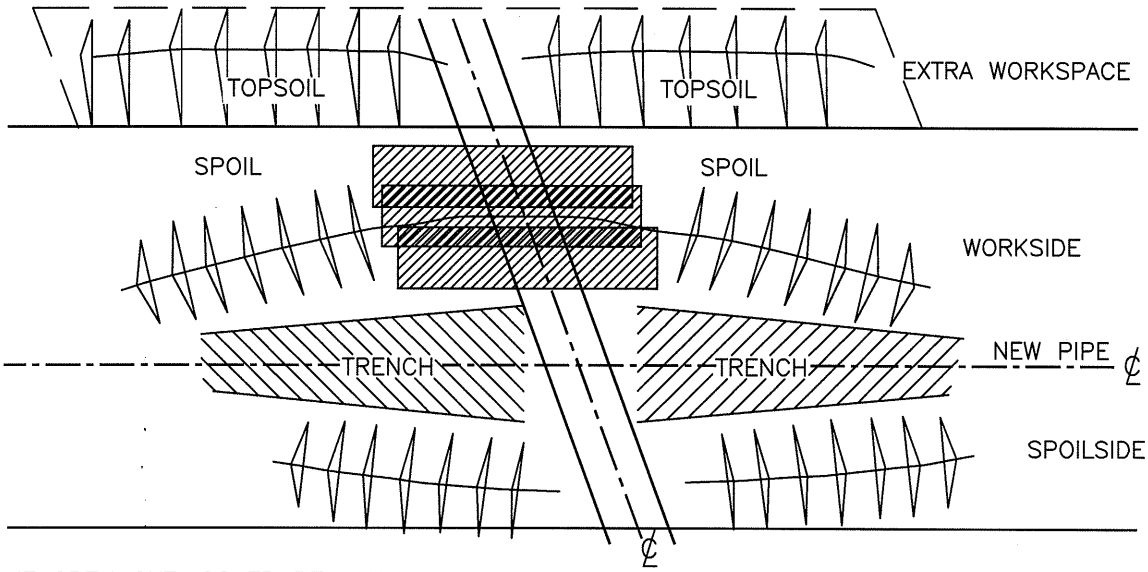
SCALE N.T.S.	DWG No STDS-03-ML-05-424	REV 01

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3. PLACE SUBSOIL FROM THE STRIPPED AREA OVER THE GEOTEXTILE OR MATS TO FORM A RAMP OVER THE FOREIGN PIPELINE.



4. IF OPEN CUT, COVER REMAINING TOPSOIL OVER SPOIL AREA WITH GEOTEXTILE OR OTHER SUITABLE BARRIER, OR OTHER MEASURES TO ENSURE TOPSOIL IS NOT IN CONTACT WITH DITCH SPOIL. DITCH NORMALLY. IF BORED, TOPSOIL OVER SPOIL SIDE DOES NOT NEED TO BE COVERED. PLACE SPOIL FROM EXCAVATION AS REQUIRED ON BOTH SIDES OF TRENCH.

5. INSTALL PIPE AND REPLACE SOILS IN CORRECT ORDER. COMPACT TRENCH PER APPROVED COMPACTION PROCEDURE. RELIEVE AREAS OF COMPACTION. REPLACE TOPSOIL AND PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

NOTE:

FOLLOWING TRENCH COMPACTION, FEATHER THE REMAINING SPOIL DISPLACED BY THE PIPE OVER THE APPLICABLE STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DOES NOT EXCEED 10cm.

REVISIONS | 00 | DRAWING SUPERSEDES SK-1586 2 OF 2 | 01 | GENERAL ISSUE – REVIEWED FOR 2015 SPEC

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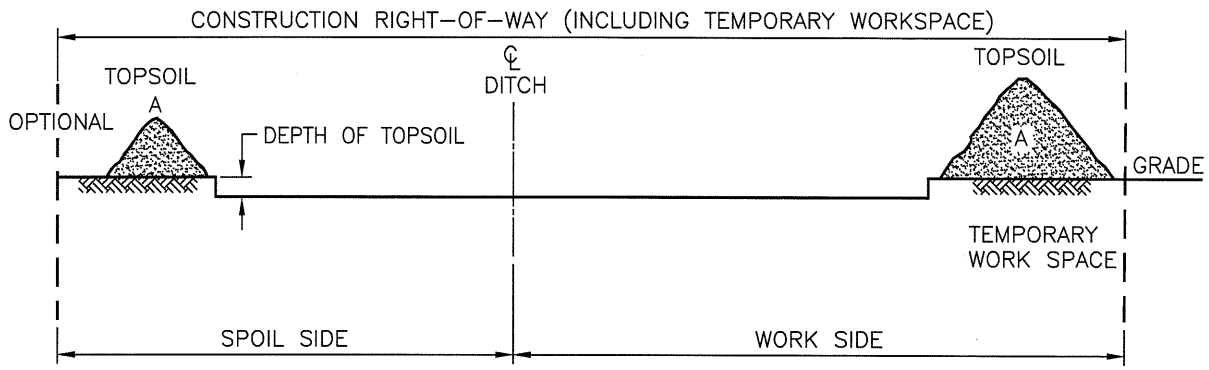
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: SOIL HANDLING FOR RAMPED LINE CROSSING (SHEET 2 OF 2)

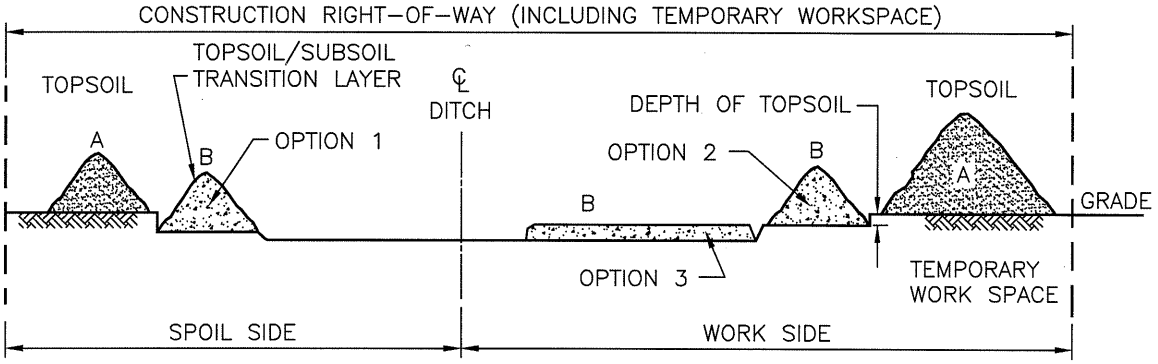
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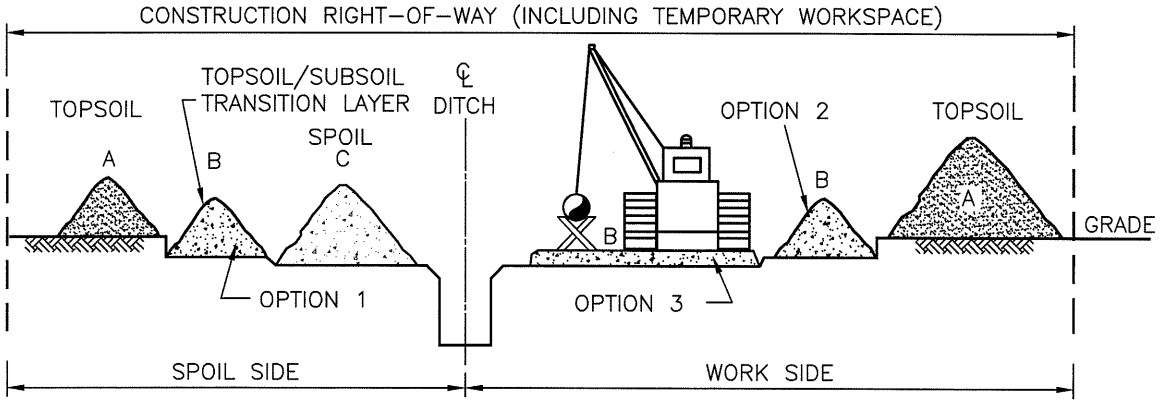
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1. STRIP TOPSOIL FROM SPOIL AND WORK SIDE AREAS. PLACE TOPSOIL IN WINDROWS ON OUTSIDE EDGE OF RIGHT–OF–WAY AND STORED IN TEMPORARY WORK SPACE. IN AREAS OF THICKER TOPSOILS, TOPSOIL MAY BE SPLIT TO BOTH SIDES OF THE RIGHT OF WAY WHERE APPROVED. APPLY TOPSOIL STABILIZERS TO TOPSOIL PILE, AS REQUIRED.



2. STRIP 'B' HORIZON FROM TRENCH AND SPOILSIDE AREAS OR FULL RIGHT–OF–WAY, AND PLACE ON STRIPPED AREA, EITHER AT SPOILSIDE OR WORKSIDE BOUNDARY OR TEMP W/S (IF APPROVED). (SEE OPTION 1 OR 2). IN OPTION 3, THE HORIZON (B) CAN BE FLATTENED AND DRIVEN ON WHERE APPROVED.



3. EXCAVATE TRENCH. THE TOE OF THE B AND C PILES CAN OVERLAP SLIGHTLY AND VISUAL DISTINCTION OF EACH PILE SHALL BE POSSIBLE AT ALL TIMES. STOCKPILING SHALL ALLOW FOR REPLACEMENT OF THE SOIL HORIZONS BACK TO THEIR ORIGINAL SEQUENCE.

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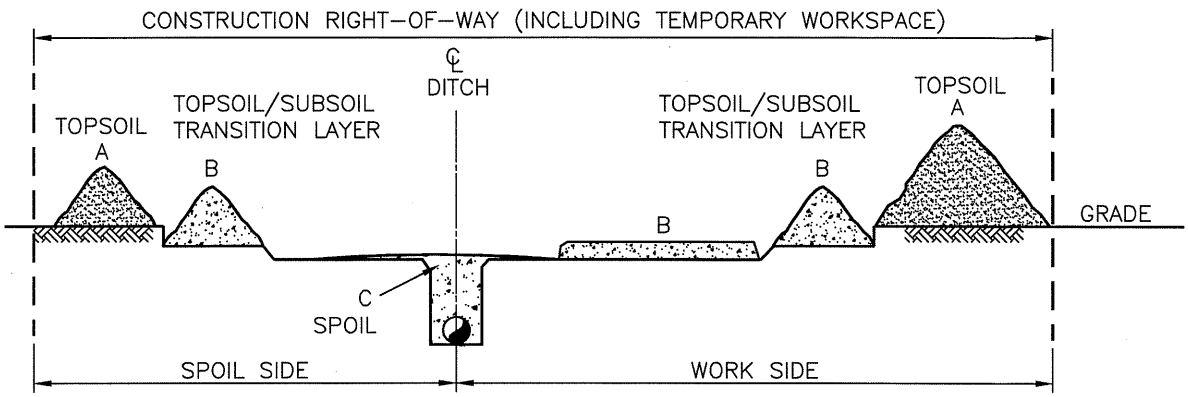
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TOPSOIL CONSERVATION
FULL–WIDTH STRIPPING 3 LIFT
(SHEET 1 OF 2)

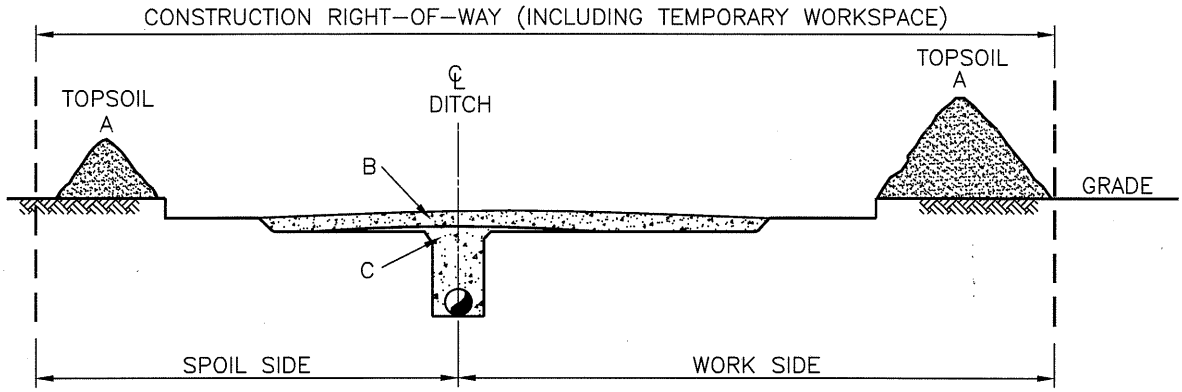
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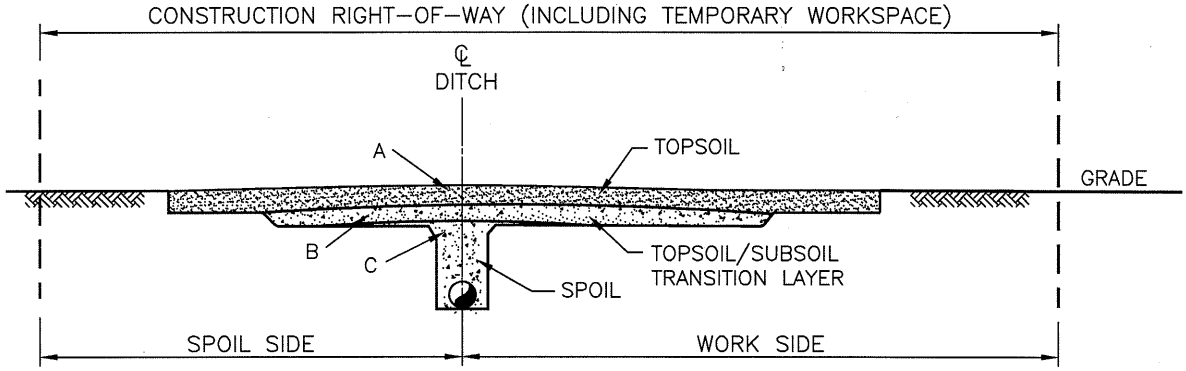
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4. BACKFILL AND COMPACT TRENCH (C) PER APPROVED PROCEDURE.



5. RELIEVE AREAS OF COMPACTION ACROSS ROW, LEVEL AND SMOOTH SOIL MATERIAL AND FEATHER (B) MATERIAL EVENLY OVER STRIPPED AREA.



6. REPLACE TOPSOIL/SUBSOIL TRANSITION LAYER UNIFORMLY, FOLLOWED BY REPLACEMENT OF THE TOPSOIL PILE EVENLY OVER STRIPPED AREA, AND PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

NOTE:

FOLLOWING TRENCH COMPACTION, FEATHER THE REMAINING SPOIL DISPLACED BY THE PIPE OVER THE APPLICABLE STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DOES NOT EXCEED 10cm.

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

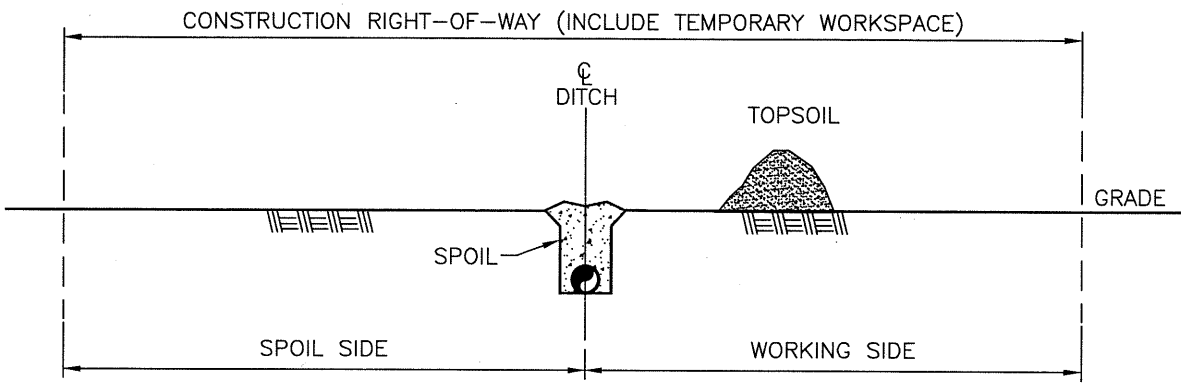
TITLE: TOPSOIL CONSERVATION
FULL–WIDTH STRIPPING 3 LIFT
(SHEET 2 OF 2)

SCALE N.T.S.	DWG No STDS–03–ML–05–426	REV 00

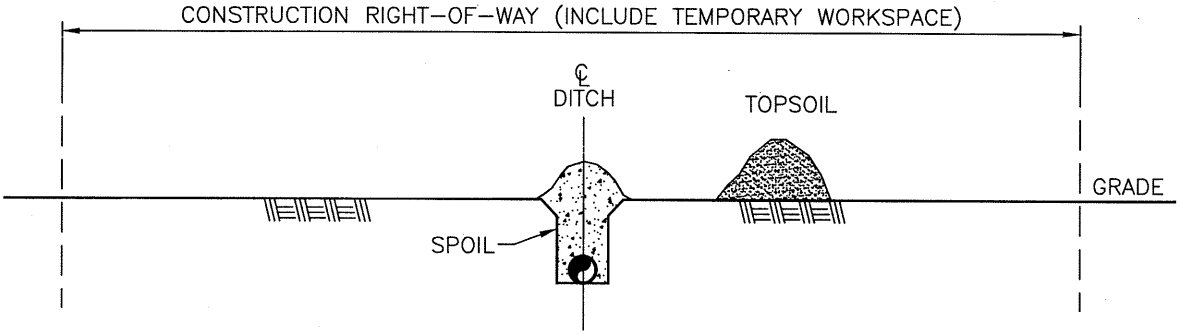
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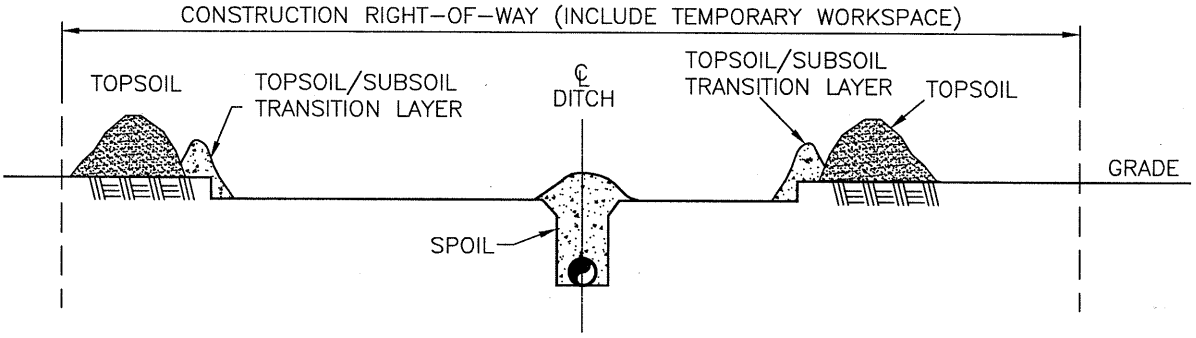
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1. SPRING CONFIGURATION FOLLOWING THAW OR OTHER SCENARIOS REQUIRING SECONDARY STRIPPING. TOPSOIL MAY ALSO BE STORED ALONG ROW BOUNDARIES.



2. BLADE SPOIL INTO PILE.



3. STRIP SPOIL AND WORK SIDE AREA WIDE ENOUGH TO ACCOMMODATE SPREADING AND DRYING OF SPOIL REMOVED FROM THE TRENCH AREA. UTILIZE A DISC TO FACILITATE DRYING OF TRENCH SPOIL.

REVISIONS | 00 | STANDARD ISSUE, SUPERCEDES SK-1590 (1) | 01 | GENERAL ISSUE – REVIEWED FOR 2015 SPEC

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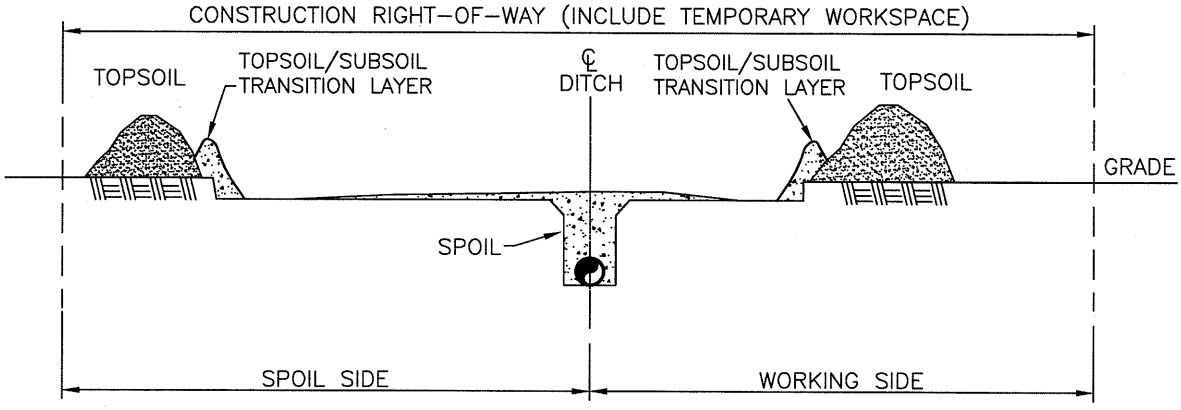
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: SECONDARY STRIPPING FOR SPOIL DISPLACEMENT (SHEET 1 OF 2)

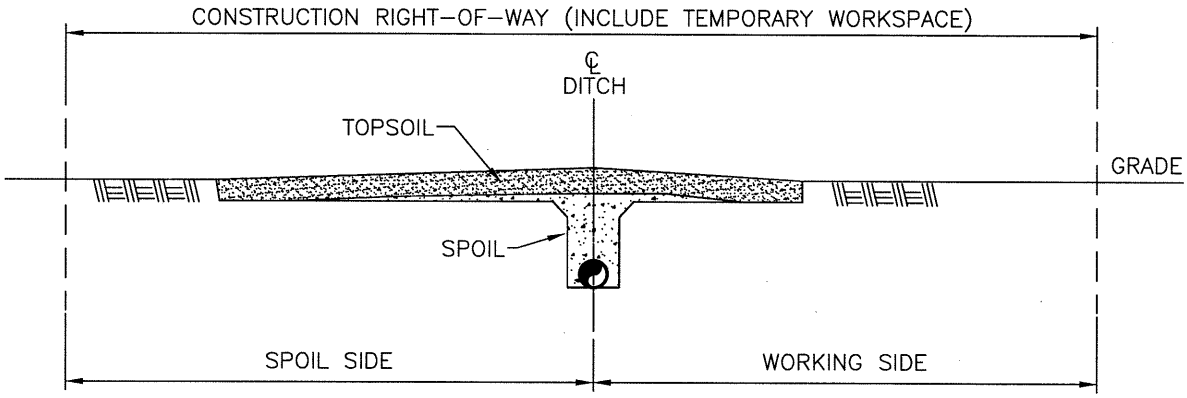
SCALE N.T.S.	DWG No STDS–03–ML–05–431	REV 01

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4. BACKFILL AND COMPACT TRENCH PER APPROVED PROCEDURE. RELIEVE AREAS OF COMPACTION.



5. REPLACE TOPSOIL/SUBSOIL TRANSITION LAYER UNIFORMLY FIRST, FOLLOWED BY REPLACEMENT OF THE TOPSOIL PILE EVENLY OVER THE STRIPPED AREA AND PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

APPLICATION:

SUMMER CLEANUP OF WINTER CONSTRUCTION OR OTHER AREAS AS DIRECTED BY THE COMPANY.

NOTE:

FOLLOWING TRENCH COMPACTION, FEATHER THE REMAINING SPOIL DISPLACED BY THE PIPE OVER THE APPLICABLE STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DOES NOT EXCEED 10cm.

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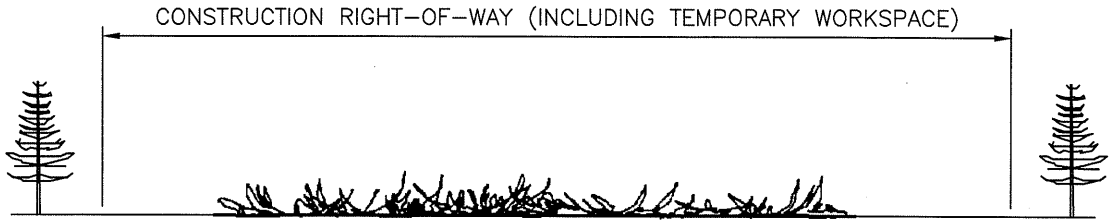
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: SECONDARY STRIPPING FOR SPOIL DISPLACEMENT (SHEET 2 OF 2)

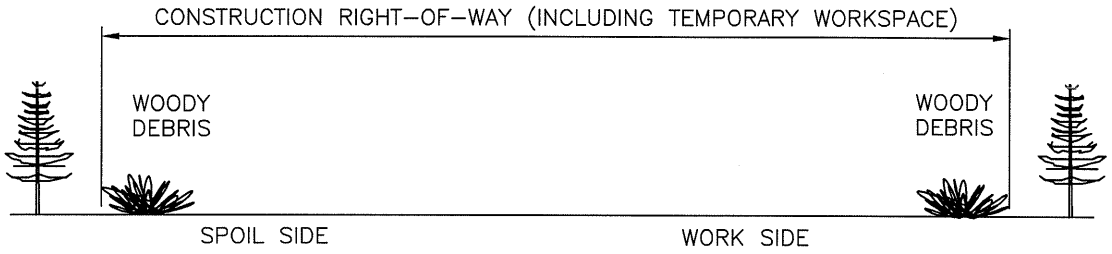
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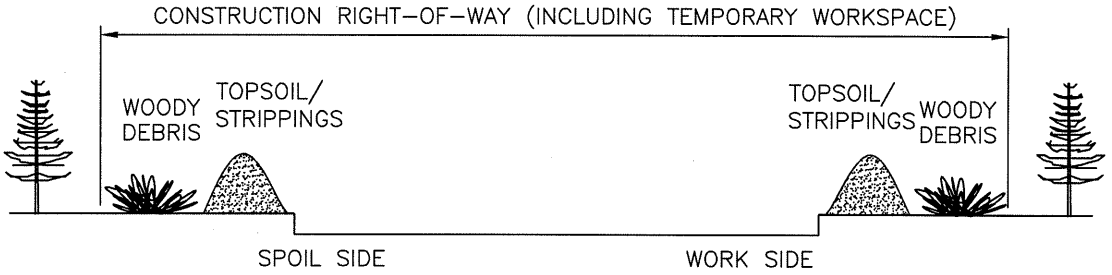
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1. CLEAR MERCHANTABLE TIMBER FROM RIGHT–OF–WAY FOR DECKING AND HAULING TO END USER. WHERE APPROVED, PILE WOODY DEBRIS ALONG RIGHT–OF–WAY BOUNDARIES. CLEAR NON MERCHANTABLE WOODY MATERIAL FOR BURNING.



2. GRUB ENTIRE RIGHT–OF–WAY DISPOSING OF STUMPS AND ROOTS. PLACE WOODY DEBRIS IN APPROVED WORKSPACES. MINIMIZE ROOT DAMAGE WITHIN 2 METRES OF STANDING TREES. SPLIT TO BOTH SIDES WHERE REQUIRED.



3. SALVAGE TOPSOIL/STRIPPINGS FULL WIDTH OR OTHER AS APPROVED, TO DEPTHS SPECIFIED ON ALIGNMENT SHEETS. TOPSOIL MUST BE KEPT SEPARATE FROM WOODY DEBRIS. SPLIT TO BOTH SIDES WHERE REQUIRED. MINIMIZE ROOT DAMAGE WITHIN 2 METRES OF STANDING TREES.

* APPLIES TO FREEHOLD (PRIVATE), AND DESIGNATED CROWN AGRICULTURAL LANDS.

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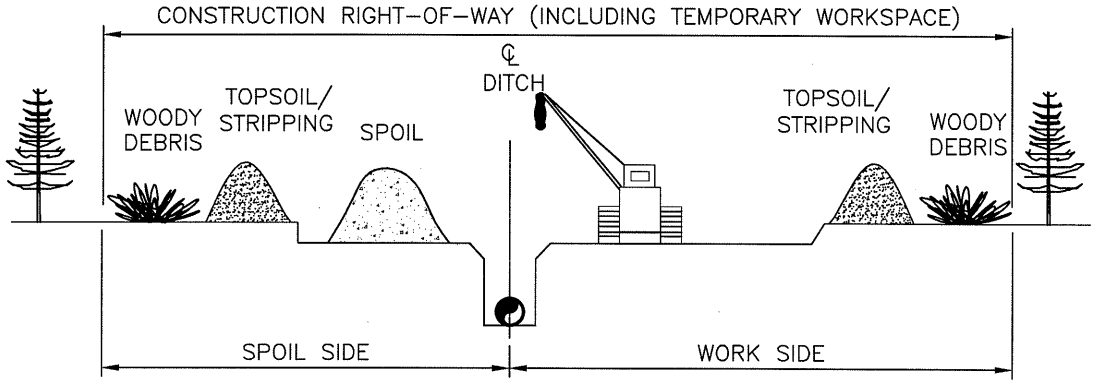
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: GRUBBING AND TOPSOIL CONSERVATION FOR TREED LAND (SHEET 1 OF 2)

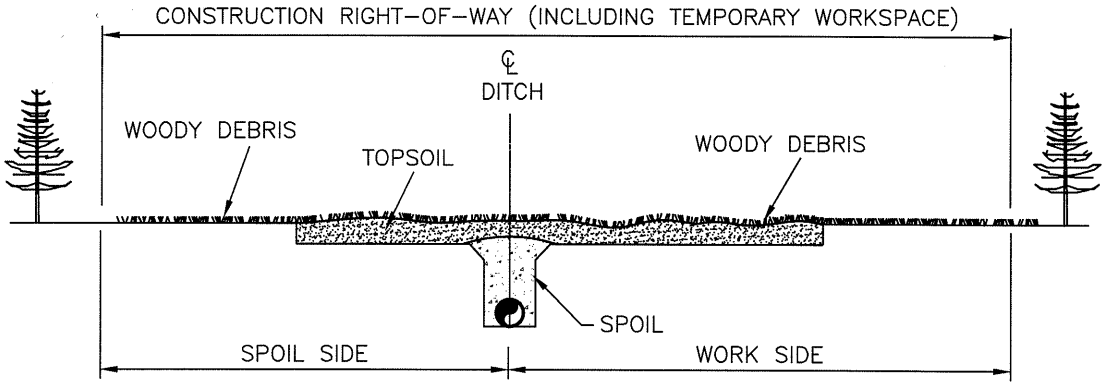
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4. EXCAVATE DITCH, LOWER–IN AND BACKFILL



5. BACKFILL AND COMPACT TRENCH AS PER APPROVED PROCEDURE AND REPLACE TOPSOIL/STRIPPINGS UNIFORMLY ACROSS STRIPPED AREA. REMOVE ROOTS AS REQUESTED BY LANDOWNER, AND ENSURE CONSISTENCY WITH EXISTING OR ADJACENT LAND USE. PREPARE SURFACE FOR RECLAMATION AS DIRECTED BY THE COMPANY.

* APPLIES TO FREEHOLD (PRIVATE), AND DESIGNATED CROWN AGRICULTURAL LANDS.

NOTE:

FOLLOWING TRENCH COMPACTION, FEATHER THE REMAINING SPOIL DISPLACED BY THE PIPE OVER THE APPLICABLE STRIPPED AREA TO ENSURE FINAL CROWN HEIGHT OVER THE TRENCH DOES NOT EXCEED 10cm.

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DESIGNER: Daughtry NAME June 15, 2015 DATE

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DESIGN STANDARD

FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: GRUBBING AND TOPSOIL CONSERVATION FOR TREED LAND (SHEET 2 OF 2)

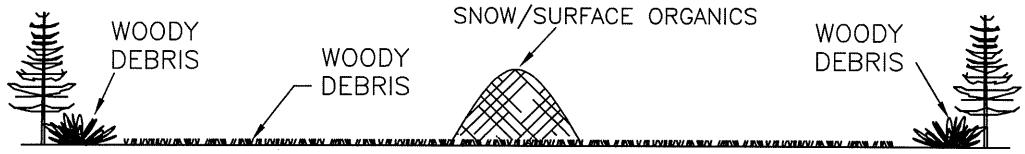
SCALE N.T.S.	DWG No STDS–03–ML–05–443	REV 01

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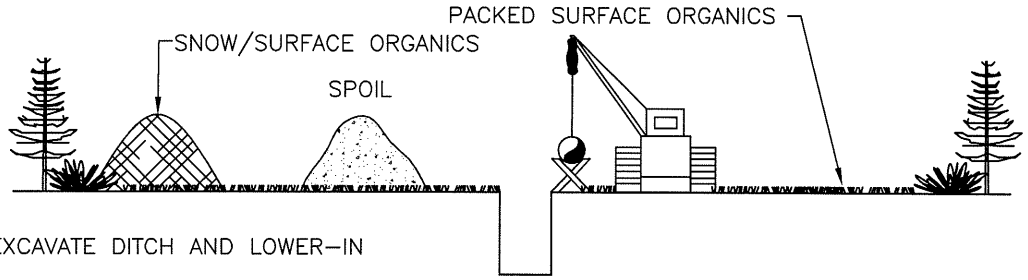
1. CLEAR MERCHANTABLE TIMBER FROM RIGHT–OF–WAY FOR DECKING AND HAULING TO END USER. WHERE APPROVED, PILE WOODY DEBRIS ALONG RIGHT–OF–WAY BOUNDARIES AND CLEAR NON MERCHANTABLE WOODY MATERIAL FOR BURNING DURING CLEANUP.



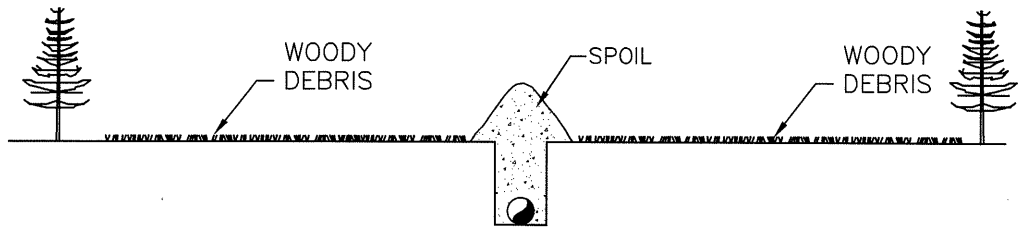
2. USE SUITABLE EQUIPMENT (e.g. MULCHER) TO MULCH NON MERCANTABLE TIMBER STUMPS AND ROOTS LEVEL WITH THE SURFACE TO MINIMIZE GROUND DISTURBANCE. THE DEPTH OF WOODY DEBRIS FOLLOWING MULCHING SHALL NOT EXCEED 5cm.

3. LEVEL THE REMAINING SURFACE MATERIAL TO CREATE A WORKING SURFACE. SNOW/SURFACE ORGANIC MATERIAL MIXTURE MAY BE USED TO CONSTRUCT A SNOW ROACH OVER THE PROPOSED DITCH TO PREVENT FREEZING OF THE DITCHLINE.

4. WHERE GRADING IS REQUIRED, STRIP SURFACE ORGANIC MATERIAL AND STORE IN TEMPORARY WORKSPACE OR OTHER APPROVED LOCATIONS FOR REPLACEMENT



5. EXCAVATE DITCH AND LOWER–IN



6. BACKFILL AND ROACH THE DITCHLINE WITH DITCH MATERIAL.

7. REPLACE SNOW/SURFACE ORGANICS EVENLY OVER THE AREAS WHERE IT WAS REMOVED DURING RIGHT–OF–WAY PREPARATION. REPLACE WOODY DEBRIS ACROSS THE RIGHT–OF–WAY, WHERE APPROVED.

NOTE: APPLIES TO CROWN, AND/OR NON–AGRICULTURAL DESIGNATED AREAS. UNLESS GRADING IS REQUIRED, STRIPPING OF SURFACE MATERIALS SHOULD NOT BE CONDUCTED WHEN USING THE MINIMAL SURFACE DISTURBANCE PROCEDURE.

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FIA # STDS | CHAINAGE: | DISCIPLINE # 03

TITLE: FROZEN FORESTED LANDS RIGHT–OF–WAY PREPARATION (MINIMAL SURFACE DISTURBANCE)

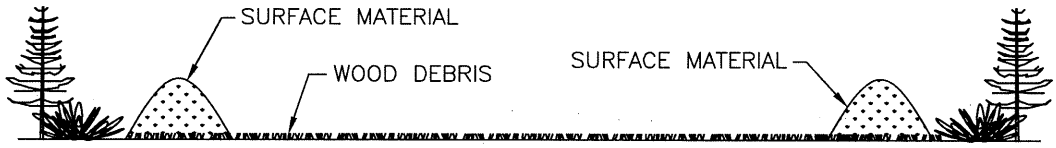
SCALE N.T.S. | DWG No STDS–03–ML–05–445 | REV 00

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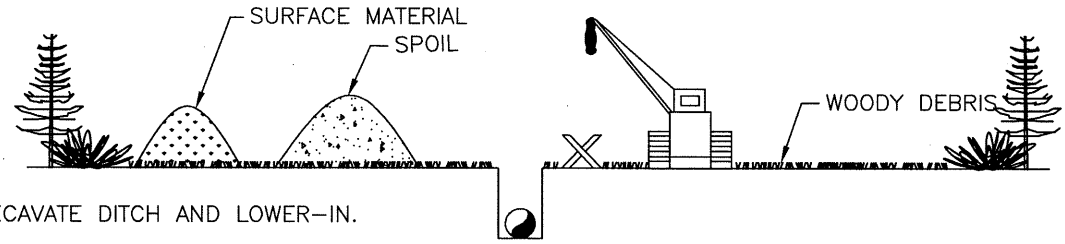
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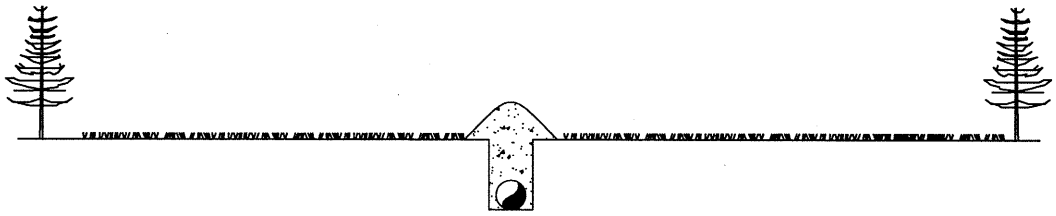
1. CLEAR MERCHANTABLE TIMBER FROM RIGHT–OF–WAY FOR DECKING AND HAULING TO END USER. WHERE APPROVED, PILE WOODY DEBRIS ALONG RIGHT–OF–WAY BOUNDARIES. CLEAR NON MERCHANTABLE WOODY MATERIAL FOR BURNING DURING CLEANUP.



2. USE SUITABLE EQUIPMENT (e.g. HOE WITH THUMB) TO REMOVE STUMPS AND ROOTS
3. SALVAGE STRIPPINGS AND STORE IN TEMPORARY WORKSPACE OR OTHER APPROVED LOCATIONS FOR REPLACEMENT DURING CLEANUP.



4. EXCAVATE DITCH AND LOWER–IN.



5. BACKFILL AND ROACH THE DITCHLINE WITH DITCH MATERIAL.

6. REPLACE STRIPPINGS EVENLY OVER THE AREAS WHERE IT WAS REMOVED DURING RIGHT–OF–WAY PREPARATION. REPLACE WOODY DEBRIS ACROSS THE RIGHT–OF–WAY, WHERE APPROVED.

NOTE:

APPLIES TO CROWN, AND/OR NON–AGRICULTURAL DESIGNATED AREAS.

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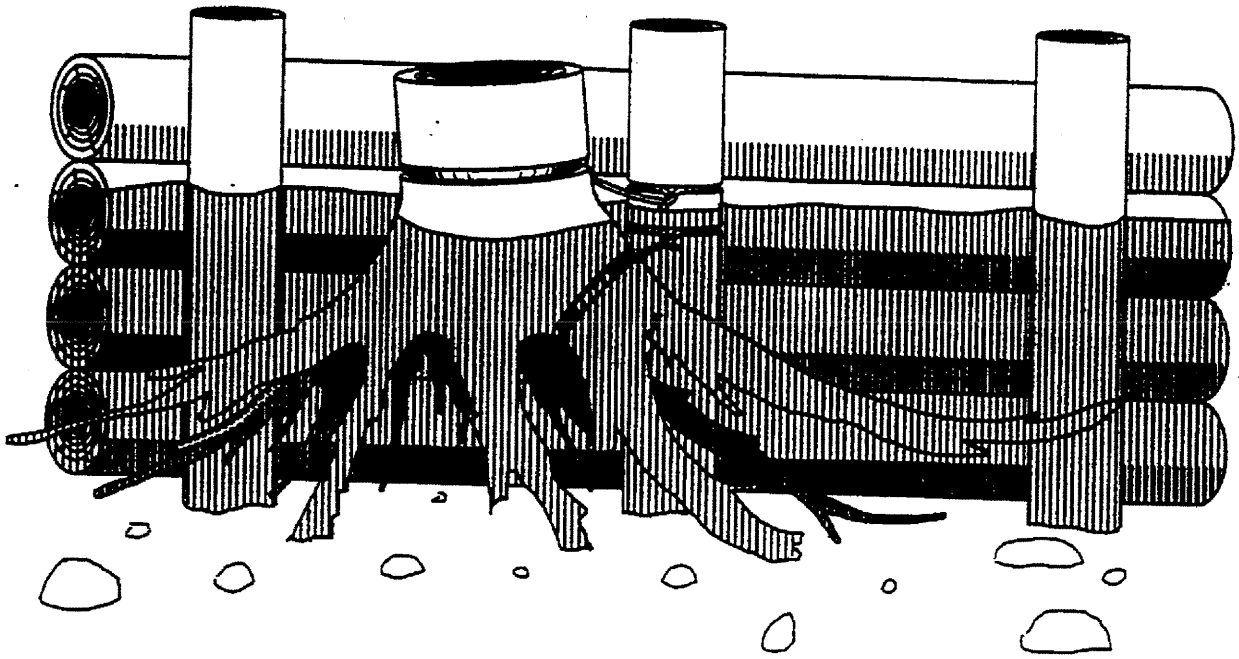
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: NON–FROZEN FORESTED LANDS
SURFACE MATERIALS/STRIPPING CONSERVATION

SCALE N.T.S.	DWG No STDS–03–ML–05–446	REV 00

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NOTE:

ROOTWAD PLACEMENT SHOWN FOR ILLUSTRATION PURPOSES ONLY. ROOTWADS CAN BE INCORPORATED AS PART OF VARIOUS BANK PROTECTION AND/OR HABITAT ENCHANCEMENT MEASURES TO SUIT PROJECT REQUIREMENTS, AND WHERE APPROVED BY THE COMPANY.

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

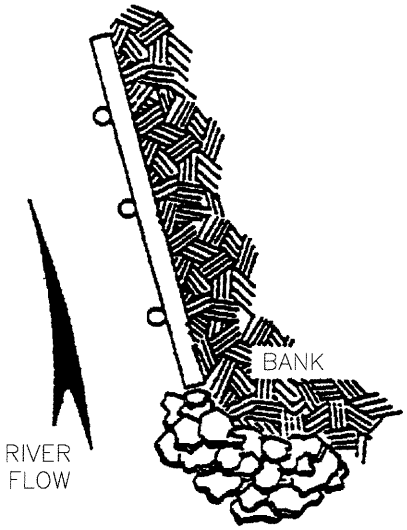
TITLE

STREAMBANK RECLAMATION – ROOTWAD

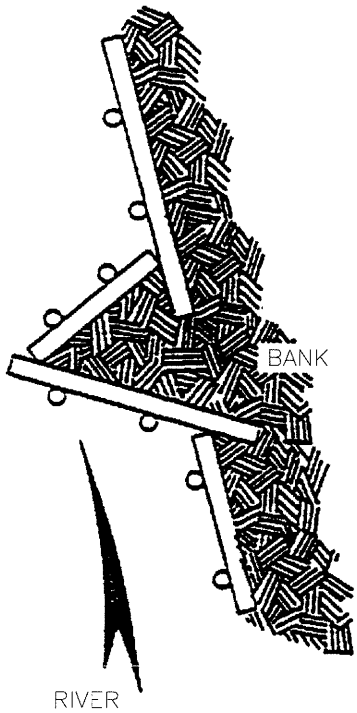
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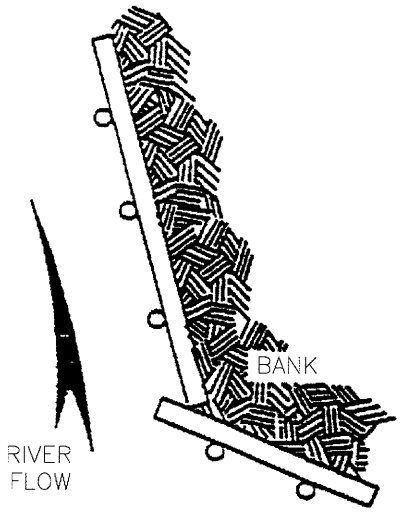
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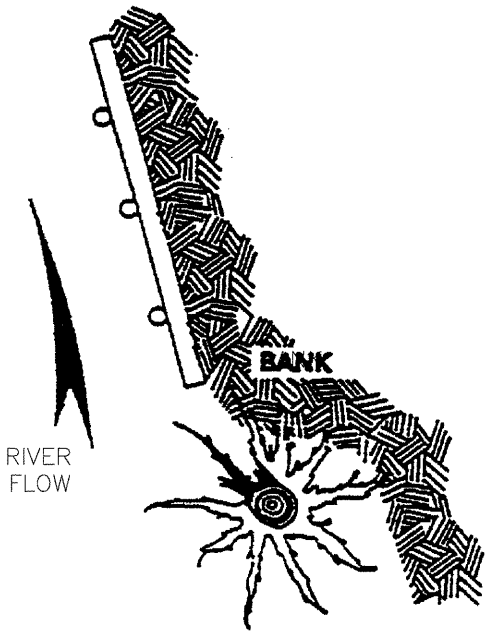
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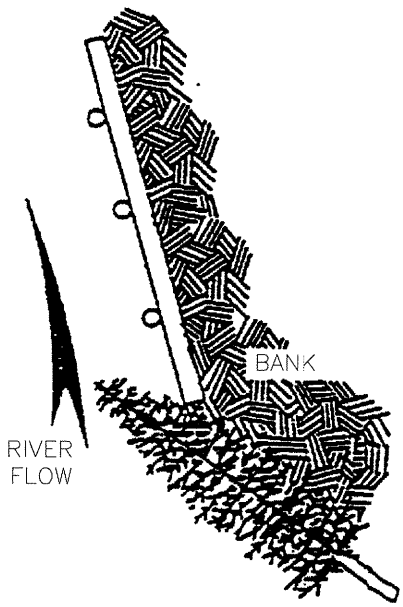
WING DEFLECTOR
DESCRIPTION



LOGWALL
DESCRIPTION



ROOTWAD
DESCRIPTION



TREE REVETMENT
DESCRIPTION

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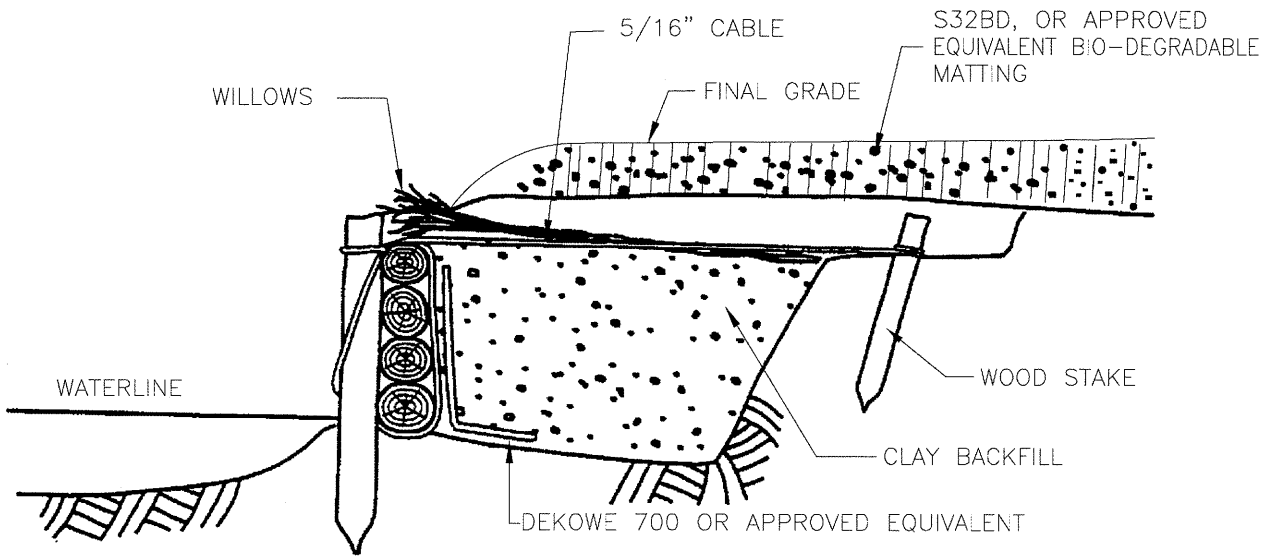
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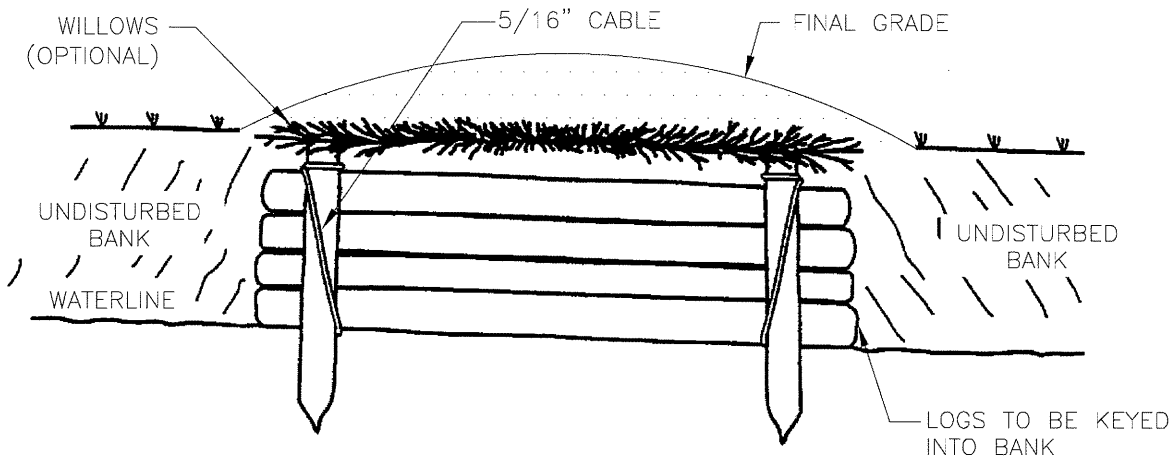
SCALE N.T.S.	DWG No STDS-03-ML-05-602	REV 01

TC_A4_EE.DWG 210X280

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NOTES:

1. LOG WALLS TO BE CONSTRUCTED USING CONIFEROUS MATERIAL.
2. UNFROZEN BACKFILL OR LOOSE GRADE MATERIAL SHOULD BE USED AS FILL MATERIAL.
3. ANCHOR PILINGS OR DEADMAN ANCHORS TO BE USED TO SECURE CABLE IN BANK.
4. REFER TO STDS-03-ML-05-606 FOR DETAIL ON WILLOWS INSTALLATION.

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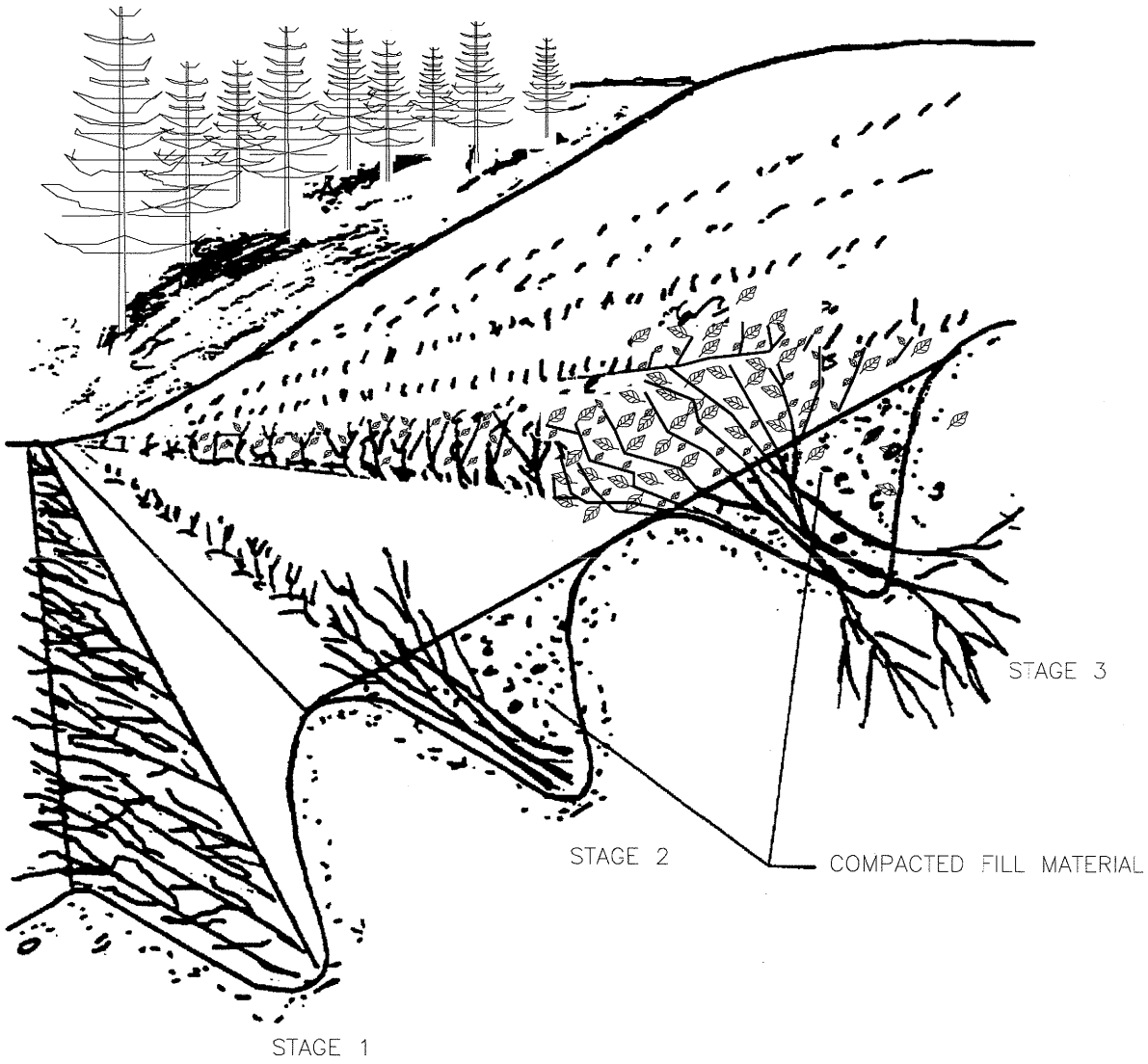
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TITLE: STREAMBANK RECLAMATION LOG WALL

SCALE N.T.S.	DWG No STDS-03-ML-05-603	REV 01

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STAGE 1. CUT TRENCH ACROSS SLOPE. FILL WITH DORMANT WOODY PLANT MATERIAL.

STAGE 2. FILL IS PLACED ON TOP OF BRANCH AND COMPACTED LAYER.

STAGE 3. POTENTIAL GROWTH AFTER 2 – 3 GROWING SEASONS.

REFER TO STDS–03–ML–05–606 FOR DETAIL ON WILLOWS INSTALLATION.

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

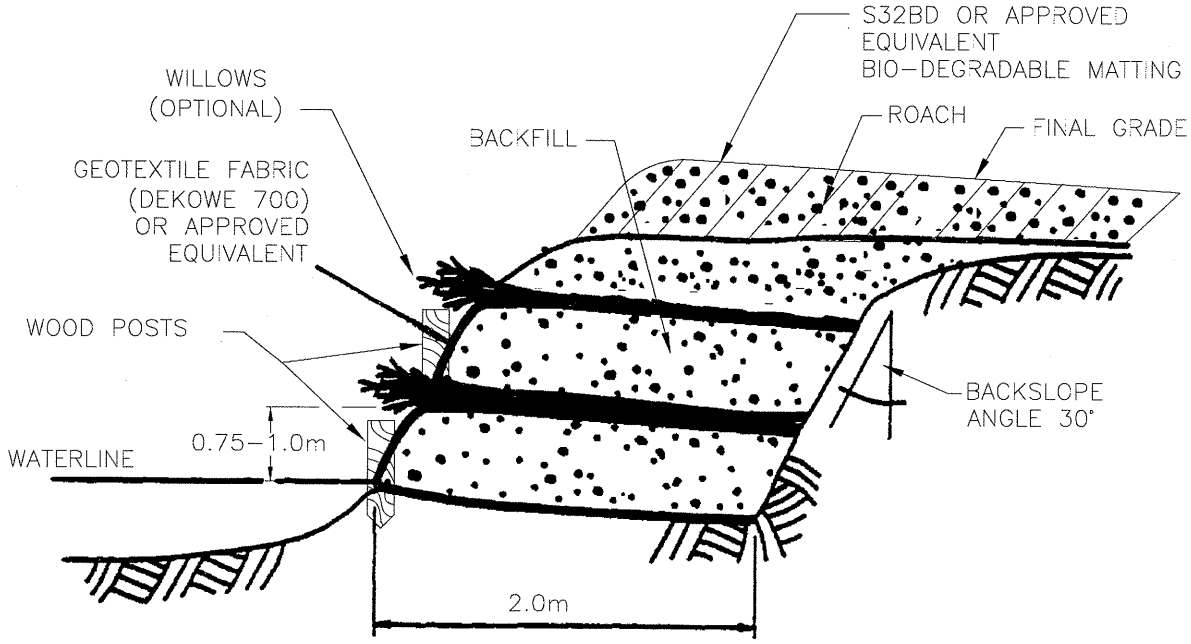
TITLE: STREAMBANK RECLAMATION – BRUSH LAYER IN CROSS CUT SLOPE

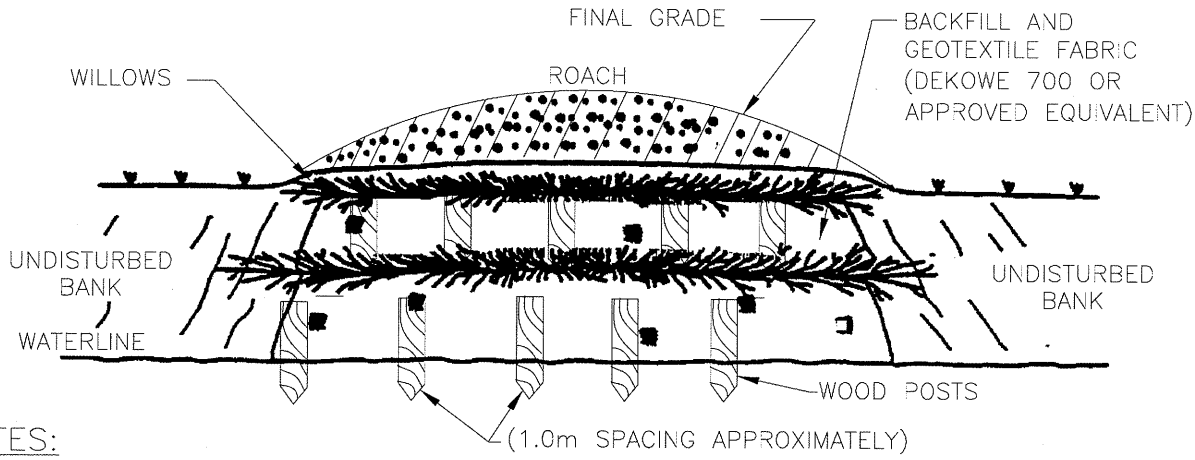
SCALE N.T.S.	DWG No STDS–03–ML–05–604	REV 01

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NOTES:

1. DURING WINTER CONSTRUCTION, VEGETATED GEOGRIDS MUST BE INSTALLED IN CONJUNCTION WITH DITCH BACKFILLING AND BANK RECONSTRUCTION.
2. UNFROZEN BACKFILL (OR LOOSE GRADE MATERIAL) SHOULD BE USED TO MINIMIZE AIR SPACES. THIS ALLOWS PROPER SOIL FABRIC CONTACT, WHICH MINIMIZES SCOURING DURING RUNOFF AND INCREASES SURVIVAL OF THE WILLOW CUTTINGS.
3. PLYWOOD FORMS (8x2 FEET) AND WOOD POSTS ARE REQUIRED TO HELP RECONSTRUCT VERTICAL BANKS. GRID LAYERS SHOULD NOT EXCEED 1.0m IN HEIGHT (0.75m OPTIONAL) WITH A MINIMUM OF 2.0m SET IN BANK.
4. WILLOWS SHOULD BE HARVESTED AS CLOSE TO INSTALLATION AS POSSIBLE, PREFERABLY THE PREVIOUS DAY BUT NO MORE THAN 2 DAYS EARLY.
   WILLOWS SHOULD BE 1.5cm TO 2.5cm IN DIAMETER AND 2.0m TO 3.0m LONG WITH NO MORE THAN 25cm LEFT EXPOSED.
5. PLANTING RATE SHOULD BE APPROXIMATELY 1 STEM PER 15.0cm.

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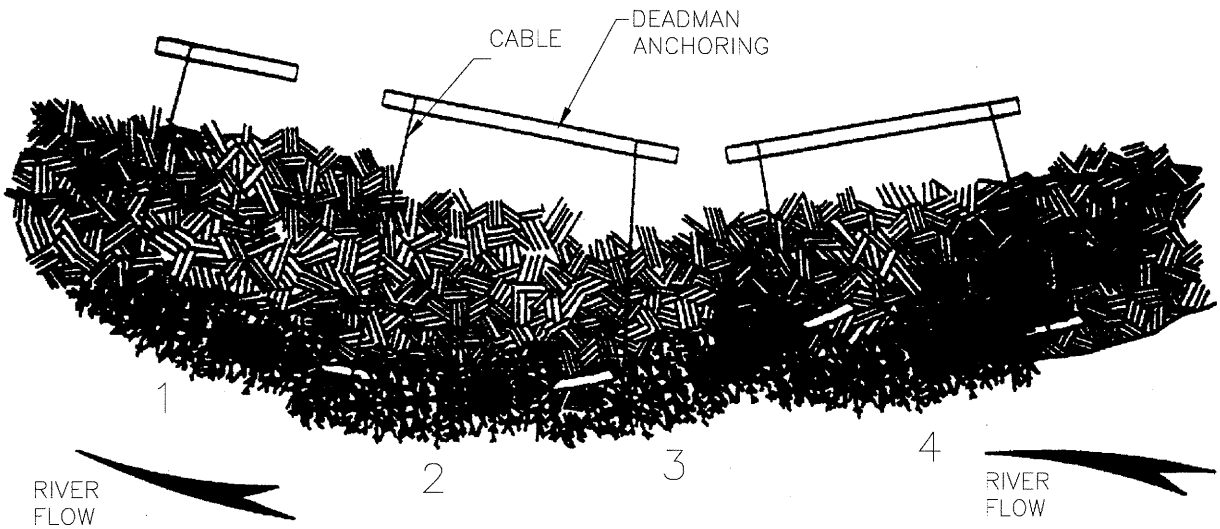
FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: STREAMBANK RECLAMATION VEGETATED GEOTEXTILE INSTALATION

SCALE N.T.S.	DWG No STDS-03-ML-05-606	REV 01

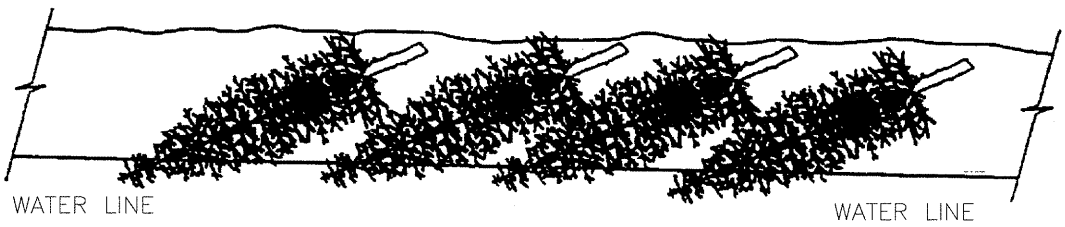
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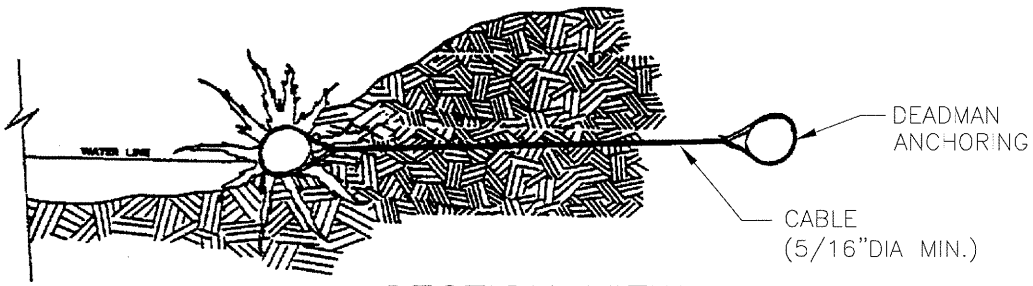


PLAN VIEW

NOTE:
-REVETMENT CONSTRUCTION ORDER. 1, THEN 2...4
-TIP OF TREE 4 TO OVERLAP ON OUTSIDE (WATERSIDE) OF TREE 3



ELEVATION VIEW



SECTION VIEW

NOTE:
TREE TO BE PARTIALLY BURIED IN NEW BANK

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: STREAMBANK RECLAMATION- TREE REVETMENT

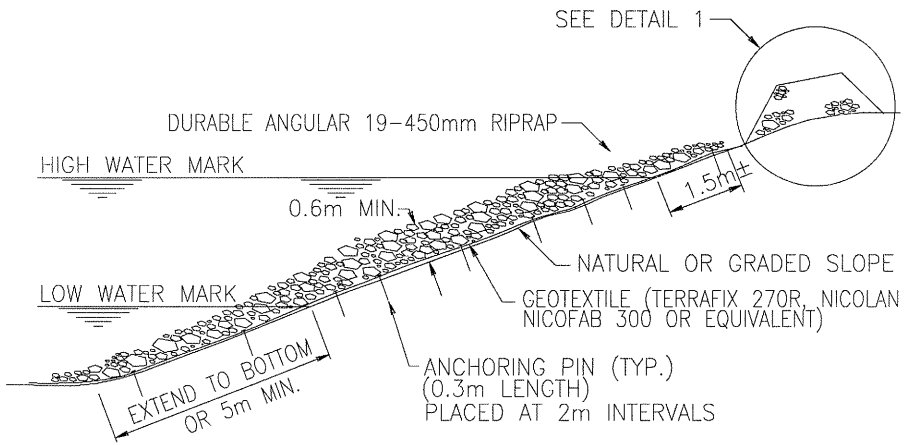
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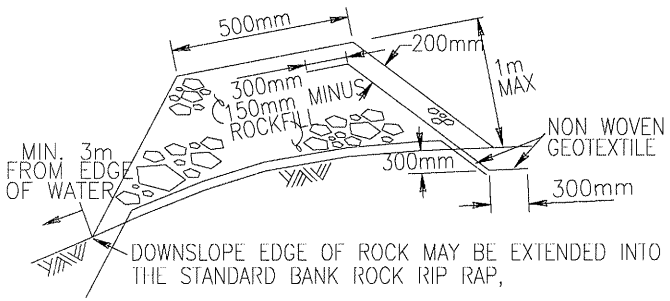
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NOTES:

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

DETAIL1 FILTER BERM



NOTES:

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

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DATE June 3, 2015

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TITLE

WATERCROSSING BANK EROSION PROTECTION

FIA # STDS

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DISCIPLINE # 03

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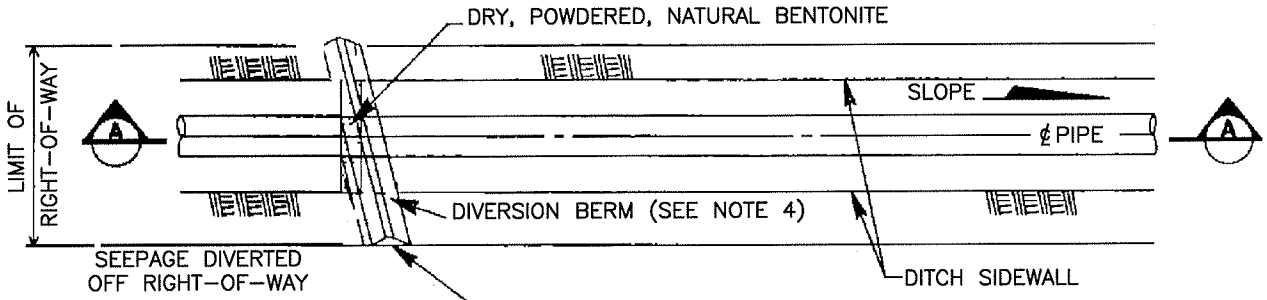
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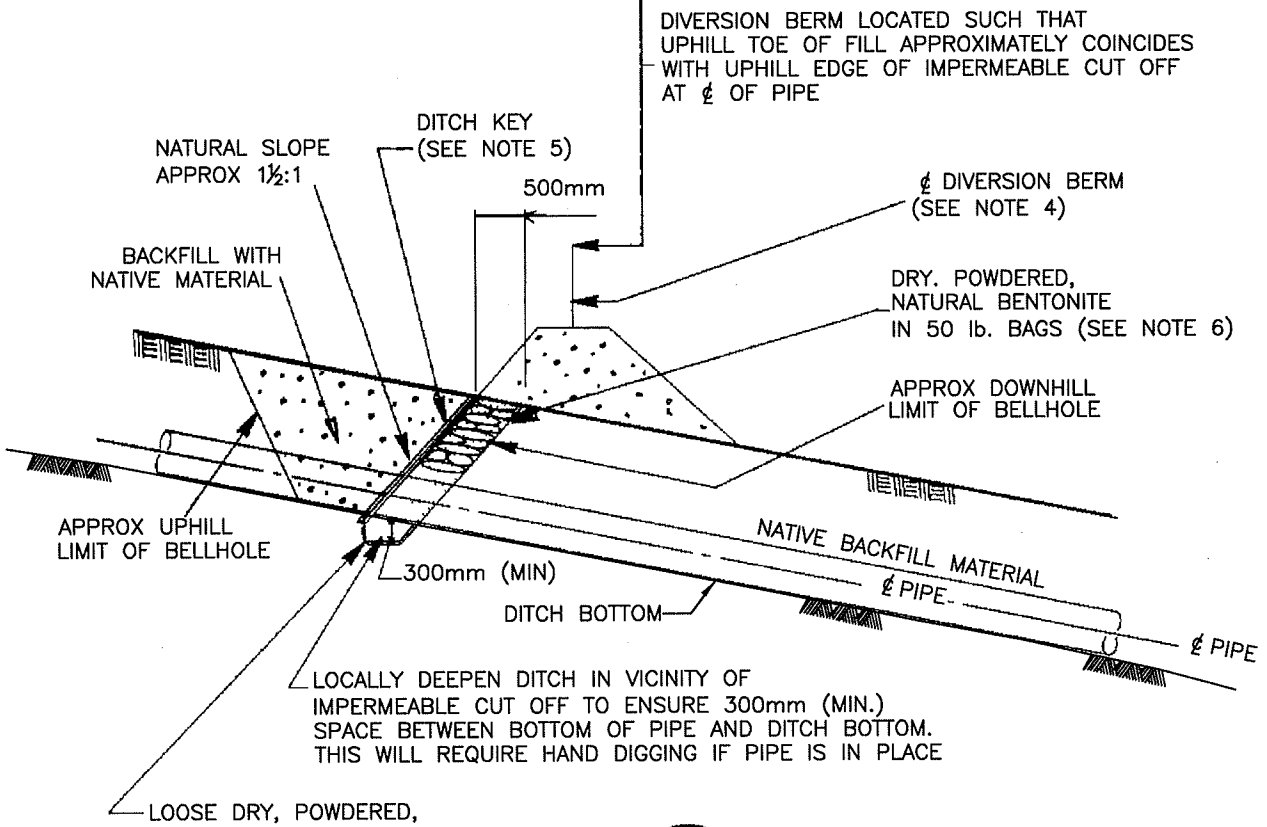
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PLAN
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SECTION A
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PROFESSIONAL ENGINEER OF ALBERTA
YIXIN LIU

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE

TYPICAL BENTONITE DITCH PLUG

SCALE N.T.S.	DWG No STDS-03-ML-12-202 SHT 01 OF 02	REV 01

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NOTES

1. DITCH PLUGS, WHERE REQUIRED, WILL TYPICALLY BE SPECIFIED ON THE DRAWINGS. HOWEVER, THE FREQUENCY AND FINAL LOCATION OF DITCH PLUGS ARE THE RESPONSIBILITY OF THE COMPANY REPRESENTATIVE AND ARE LOCATED ON THE BASIS OF FIELD OBSERVATIONS, LOCAL TOPOGRAPHY, AND DRAINAGE PATTERNS.

2. DITCH PLUGS ARE TO BE INSTALLED AT LOCATIONS WHERE THERE IS A POSSIBILITY OF GROUNDWATER SEEPAGE FLOWING EITHER WITHIN OR ALONG THE BACKFILLED PIPE DITCH. DITCH PLUGS SHOULD BE LOCATED IMMEDIATELY DOWNSLOPE OF AREAS OF SIGNIFICANT GROUNDWATER SEEPAGE OR AREAS OF CONCENTRATED CROSS SLOPE DRAINAGE. DITCH PLUGS ARE BEST LOCATED AT THE CREST OF STEEPER SLOPES TO ASSIST IN REMOVING WATER FROM THE PIPE DITCH BEFORE IT FLOWS ON A STEEPER GRADIENT. DITCH PLUGS ARE NOT TO BE PLACED IN GRADE CUT, UNLESS INDICATED ON SPECIFIC DESIGN DRAWING.

3. DITCH PLUGS SHOULD BE LOCATED PRIOR TO PIPE LOWER-IN AND BACKFILLING. SUFFICIENT OPEN DITCH MUST BE MAINTAINED TO INSTALL DITCH PLUG (APPROXIMATELY 5 METRES AT DITCH BOTTOM). DITCH PLUGS SHOULD BE CONSTRUCTED AS SOON AS PRACTICABLE AFTER PIPE INSTALLATION AND GENERAL BACKFILLING TO MINIMIZE DITCH WALL SLUMPING, WATER INFILTRATION, OR FROST PENETRATION INTO DITCH WALLS DURING WINTER CONSTRUCTION.

4. SEE DRAWING No. STDS-03-ML-12-221 AND STDS-03-ML-12-222 FOR DESIGN OF DIVERSION BERMS.

5. DITCH PLUG SHALL BE KEYED INTO THE DITCH SIDES AND BOTTOM TO A DEPTH AND WIDTH OF 0.3m.

6. FOLLOWING PLACEMENT, EACH BENTONITE BAG SHALL BE PERFORATED ONCE IN PLACE TO ALLOW FOR THE INFILTRATION OF WATER, THEREBY PERMITTING THE EXPANSION OF BENTONITE.

7. LOOSE BENTONITE SHALL BE PLACED BENEATH AND UP THE SIDES OF THE PIPE TO ENSURE ALL VOIDS ARE FILLED.

8. BAGS ORIENTATION SHOULD ALTERNATE.

9. REFER TO PROJECT SPECIFICATIONS WHERE PIPE PROTECTION MATERIALS (SAND PADDING, PILLOWS, ROCK SHIELD, ETC) ARE REQUIRED.

MATERIAL REQUIRED

DRY POWDERED NATURAL BENTONITE IN 50lb BAGS
FILTER CLOTH : NILEX NC 24 NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.

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FIA # STDS	CHAINAGE:	DISCIPLINE # 03

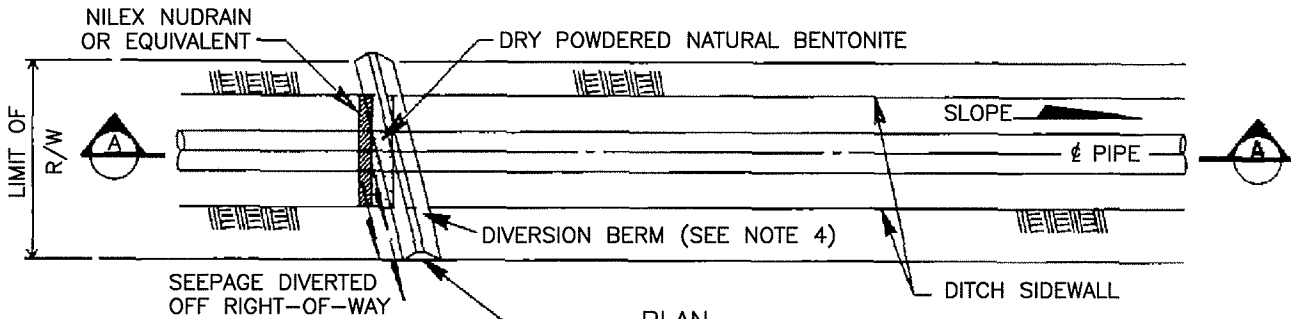
TITLE

TYPICAL BENTONITE DITCH PLUG

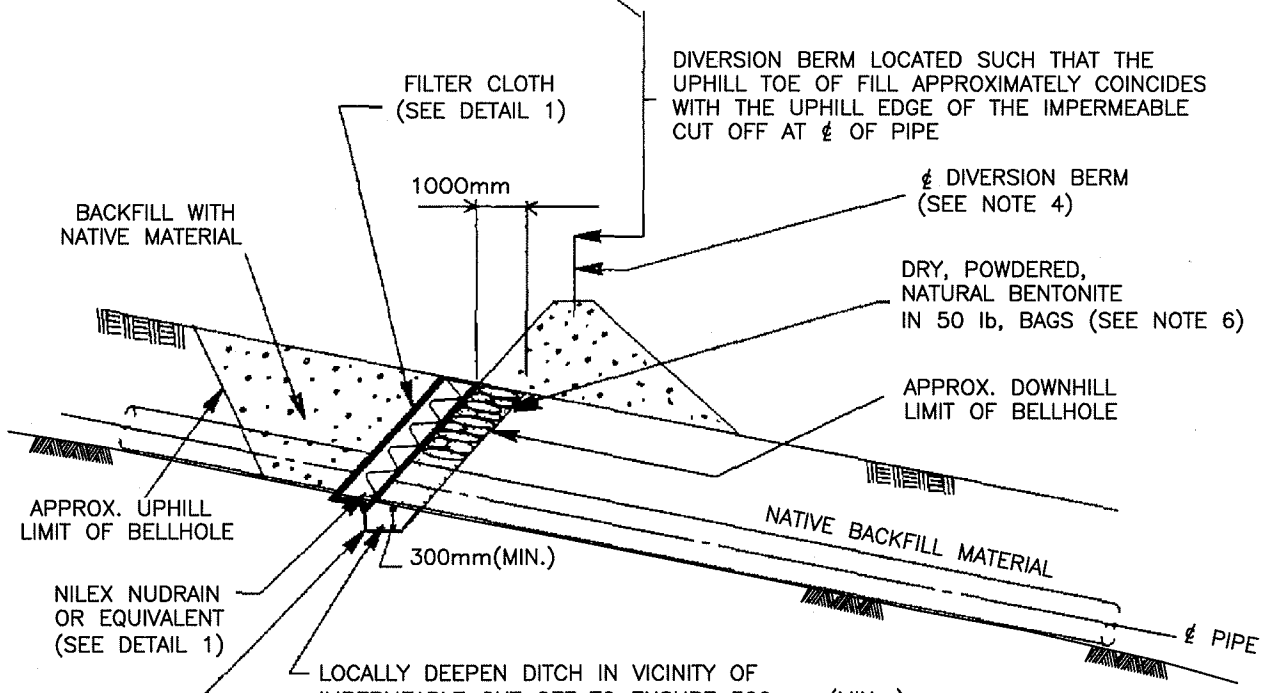
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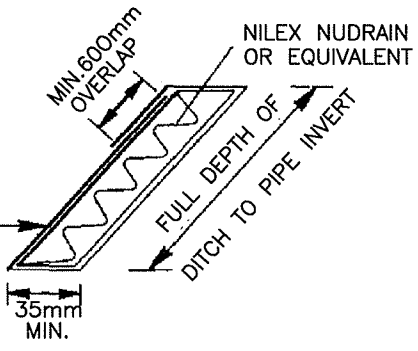


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SECTION A
NTS

DETAIL 1



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TITLE

TYPICAL BENTONITE DITCH PLUG USING NUDRAIN OR EQUIVALENT

SCALE N.T.S. | DWG No STDS-03-ML-12-203 SHT 01 OF 02 | REV 01

TC_A4_BR.DWG 210X280

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NOTES

1. DITCH PLUGS, WHERE REQUIRED, WILL TYPICALLY BE SPECIFIED ON THE DRAWINGS. HOWEVER, THE FREQUENCY AND FINAL LOCATION OF DITCH PLUGS ARE THE RESPONSIBILITY OF THE COMPANY'S AUTHORIZED REPRESENTATIVE AND ARE LOCATED ON THE BASIS OF FIELD OBSERVATIONS, LOCAL TOPOGRAPHY, AND DRAINAGE PATTERNS.

2. DITCH PLUGS ARE TO BE INSTALLED AT LOCATIONS WHERE THERE IS A POSSIBILITY OF GROUNDWATER SEEPAGE FLOWING EITHER WITHIN OR ALONG THE BACKFILLED PIPE DITCH. DITCH PLUGS SHOULD BE LOCATED IMMEDIATELY DOWNSLOPE OF AREAS OF SIGNIFICANT GROUNDWATER SEEPAGE OR AREAS OF CONCENTRATED CROSS SLOPE DRAINAGE. DITCH PLUGS ARE BEST LOCATED AT THE CREST OF STEEPER SLOPES TO ASSIST IN REMOVING WATER FROM THE PIPE DITCH BEFORE IT FLOWS ON A STEEPER GRADIENT.

3. DITCH PLUGS SHOULD BE LOCATED PRIOR TO PIPE LOWER-IN AND DITCH BACKFILLING. SUFFICIENT OPEN DITCH MUST BE MAINTAINED TO INSTALL DITCH PLUG (APPROXIMATELY 3 METRES AT DITCH BOTTOM). DITCH PLUGS SHOULD BE CONSTRUCTED AS SOON AS PRACTICABLE AFTER PIPE INSTALLATION AND GENERAL BACKFILLING TO MINIMIZE DITCH WALL SLUMPING, WATER INFILTRATION OR FROST PENETRATION INTO DITCH WALLS DURING WINTER CONSTRUCTION.

4. SEE DRAWING STDS-03-ML-12-221 AND STDS-03-ML-12-222 FOR DESIGN OF DIVERSION BERMS.

5. FILTER CLOTH TO BE WRAPPED TO TOTALLY ENCLOSE SUBDRAIN IN THE ZONE ILLUSTRATED IN DETAIL 1. A MINIMUM OVERLAP OF 600mm IS REQUIRED.

6. EACH BENTONITE BAG SHALL BE PERFORATED ONCE IN PLACE, TO ALLOW FOR THE INFILTRATION OF WATER THEREBY PERMITTING THE EXPANSION OF BENTONITE.

7. LOOSE BENTONITE SHALL BE PLACED BENEATH AND UP THE SIDES OF THE PIPE TO ENSURE ALL VOIDS ARE FILLED.

MATERIAL REQUIRED

DRY POWDERED NATURAL BENTONITE IN 50 lb. BAGS
FILTER CLOTH : NILEX C-24 NON-WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.
SUBRAIN : NILEX NUDRAIN OR EQUIVALENT

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		DISCIPLINE # 03	

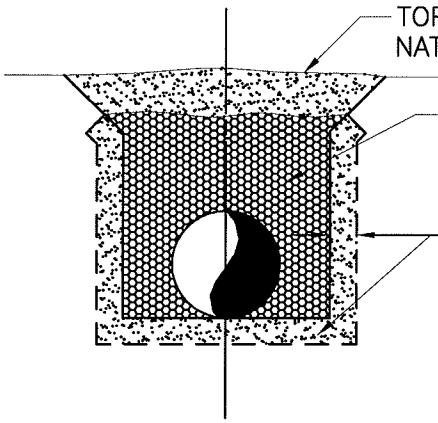
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TYPICAL BENTONITE DITCH
PLUG USING NUDRAIN OR EQUIVALENT

SCALE N.T.S. | DWG No STDS-03-ML-12-203 SHT 02 OF 02 | REV 01

TC_A4_BR.DWG 210X280

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SECTION A

APPROXIMATE BREAKER SPACING

$$S = \frac{h}{\sin \Theta}$$

NOTES

1. POLYURETHANE FOAM SHALL CONFORM TO ALL ENVIRONMENT REGULATIONS CONCERNING CHEMICAL COMPOSITION.
2. FOAM WITH 32kg/m³ (2LB/FT³) DENSITY AND 0.207 MPA (30 psi) MINIMUM COMPRESSIVE STRENGTH OR EQUAL SHALL BE USED.
3. IF FORMING REQUIRED, STYROFOAM BOARD CAN BE USED.
4. IN VALLEYS, DRAINAGE AREAS OR AREAS WHERE WATER MAY FLOW ALONG TRENCH AND REMOVE PADDING OR BACKFILL FROM AROUND THE PIPE. ADJUST SPACING OR BREAKERS SO TOP OF BREAKER IS AT APPROXIMATELY THE SAME ELEVATION AS BOTTOM OF UPHILL BREAKER.
5. BREAKER SPACING AND CONFIGURATION MAY BE CHANGED AS DIRECTED BY COMPANY. DEPTH OF DITCH VARIES WITH SITE CONDITIONS.
6. REFER TO PROJECT SPECIFICATIONS WHERE PIPE PROTECTION MATERIALS (SAND PADDING, PILLOWS, ROCK SHIELD, ETC.) ARE REQUIRED.

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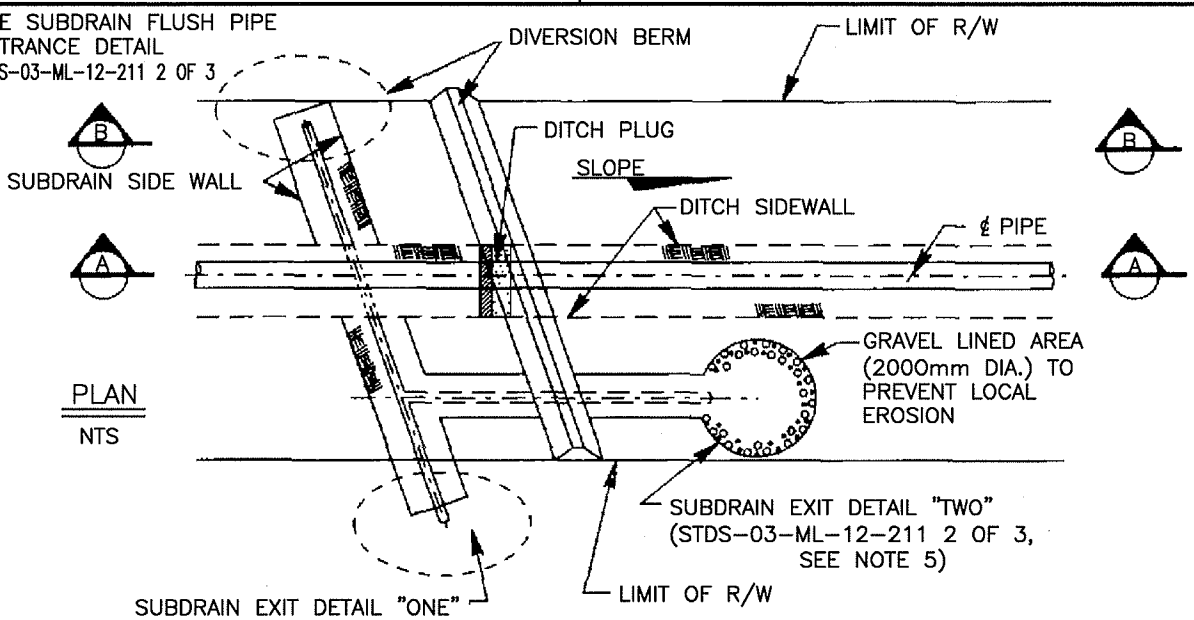
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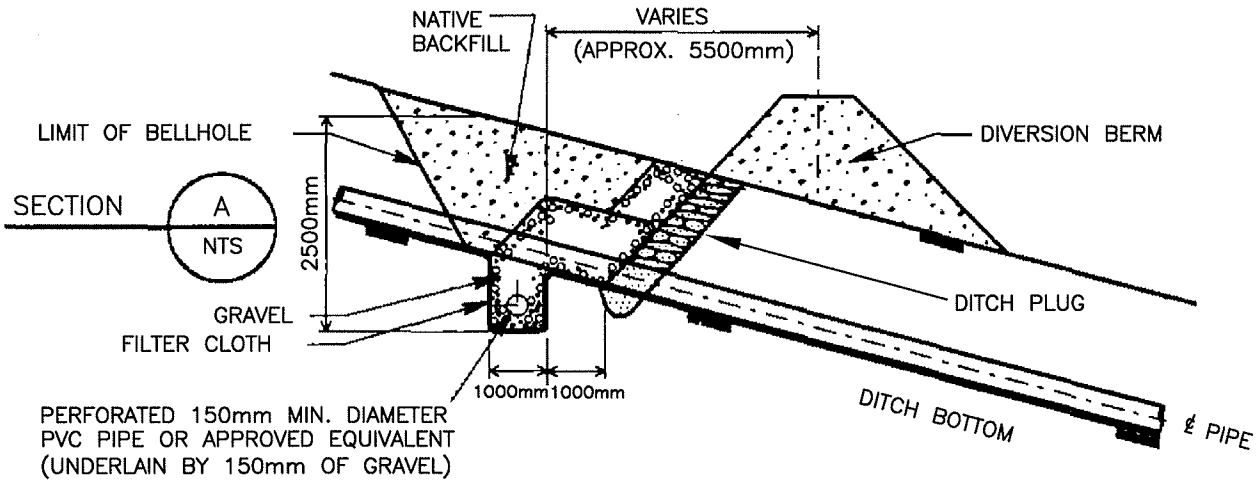
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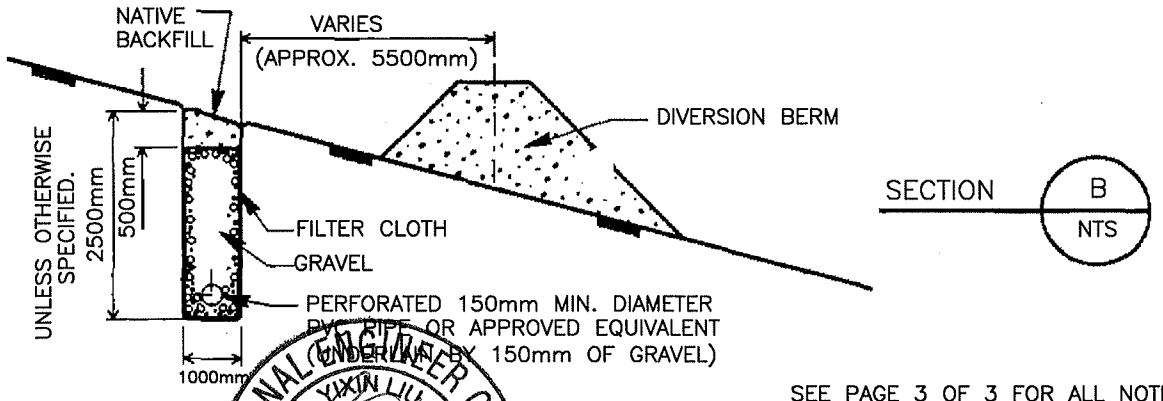
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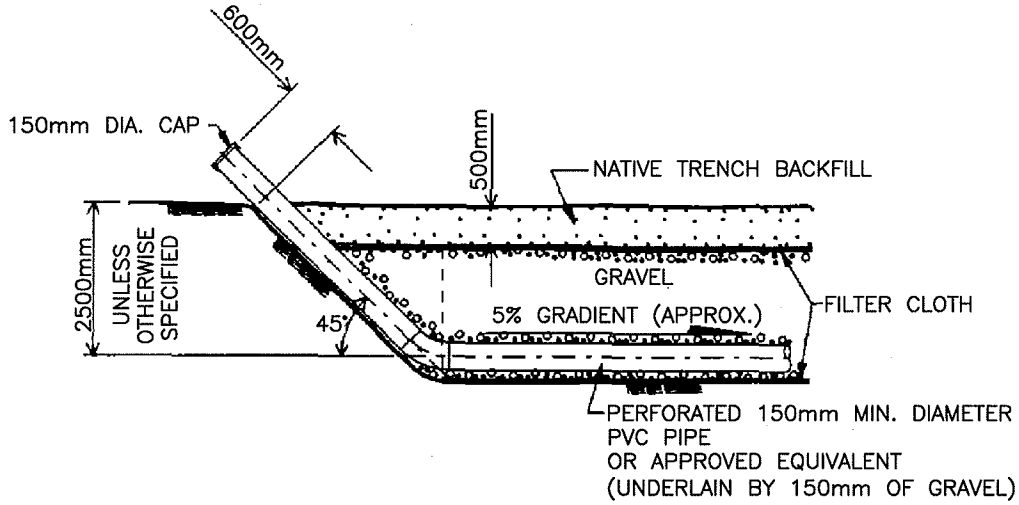
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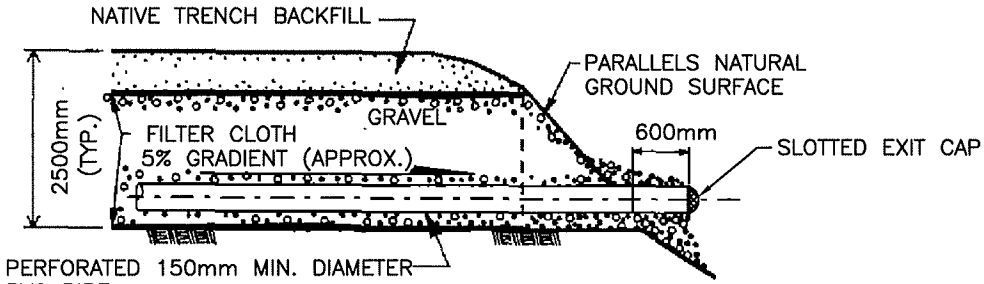
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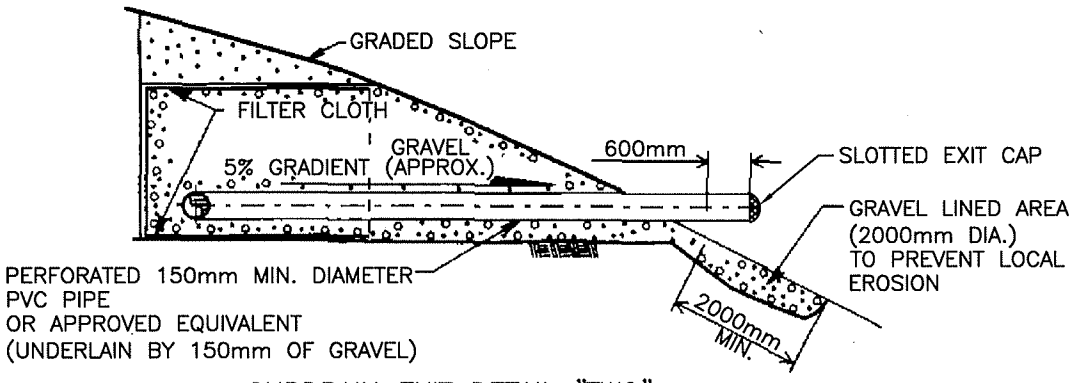
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SUBDRAIN FLUSH PIPE ENTRANCE DETAIL



SUBDRAIN EXIT DETAIL "ONE"



SUBDRAIN EXIT DETAIL "TWO"

SEE PAGE 3 OF 3 FOR ALL NOTES.

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TITLE: TYPICAL SUBDRAIN USING GRAVEL (SHT. 02 OF 03)

SCALE N.T.S.	DWG No STDS-03-ML-12-211	REV 01

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NOTES

1. SUBDRAINS ARE TYPICALLY USED TO LOWER A HIGH GROUNDWATER TABLE WITHIN THE PIPELINE RIGHT–OF–WAY. THEY ARE GENERALLY LOCATED AT THE CREST OF SLOPES OR IMMEDIATELY DOWNSLOPE OF AREAS EXHIBITING SIGNIFICANT GROUNDWATER EXIT.

2. SUBDRAINS WHERE REQUIRED, WILL BE SPECIFIED ON THE DRAWINGS. HOWEVER, THE THE LOCATIONS SHOWN ARE APPROXIMATE AND FINAL POSITIONING OF THE SUBDRAIN IS THE RESPONSIBILITY OF THE COMPANY'S AUTHORIZED REPRESENTATIVE. LOCAL TOPOGRAPHY, DRAINAGE PATTERNS, AND OBSERVED GROUNDWATER CONDITIONS – PARTICULARLY AFTER DITCH EXCAVATION – WILL GOVERN THE FINAL SUBDRAIN LOCATION.

3. APPROXIMATE SLOPE OF SUBDRAIN TO BE 5%.

4. FILTER CLOTH FOR SUBDRAINS TO BE LAID IN OPEN TRENCH FOLLOWED BY 150mm OF GRAVEL. PERFORATED PIPE SHOULD BE PLACED WITH THE PERFORATIONS AT A MINIMUM BEING ON THE UNDERSIDE AT 4 AND 8 O'CLOCK POSITIONS. REMAINDER OF TRENCH SHOULD BE BACKFILLED WITH CLEAN, WELL GRADED GRAVEL TO WITHIN 500mm OF GRADE AND THE FILTER CLOTH OVERLAPPED TO TOTALLY ENCLOSE GRAVEL. COMPLETE BACKFILLING WITH NATIVE MATERIAL TO PREVENT SURFACE WATER FROM ENTERING SUBDRAIN.

5. SUBDRAIN EXIT DETAIL "ONE" USED WHERE SUBDRAIN EXITS SLOPE WITHIN A REASONABLE DISTANCE AND NATURAL CONTOURS DIRECT WATER OFF RIGHT–OF–WAY. WHERE SUBDRAIN IS REQUIRED IN THROUGHOUT AREA OR WHERE A "DETAIL ONE" EXIT POINT WOULD BE LOCATED GREATER THAN 10 METRES OUTSIDE THE RIGHT–OF–WAY LIMITS THEN THE DIRECTION OF SUBDRAIN IS DIRECTED SO THAT IT EXITS ALONG THE EDGE OF THE RIGHT–OF–WAY. (SEE EXIT DETAIL "TWO")

6. WHERE SUBDRAIN EXIT IS LOCATED BEYOND THE RIGHT–OF–WAY LIMITS, LAND APPROVALS ARE REQUIRED.

MATERIALS REQUIRED

–GRAVEL: WELL GRADED. LESS THAN 5% PASSING No.200 SIEVE
–FILTER CLOTH: NILEX C–24 NON–WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.
–PERFORATED PIPE: 150mm MININIMUM DIAMETER, PERFORATED, PVC OR APPROVED EQUIVALENT
–END CAPS FOR DRAIN EXIT AND ENTRY. EXIT CAPS SHALL BE SLOTTED.

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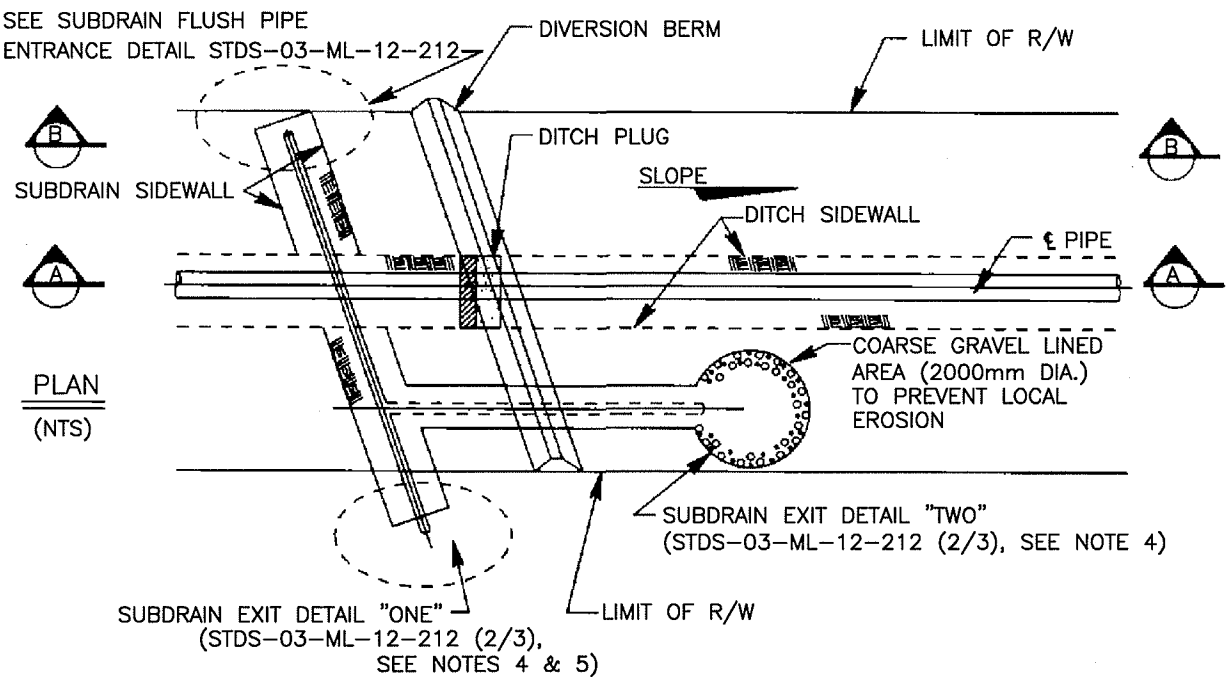
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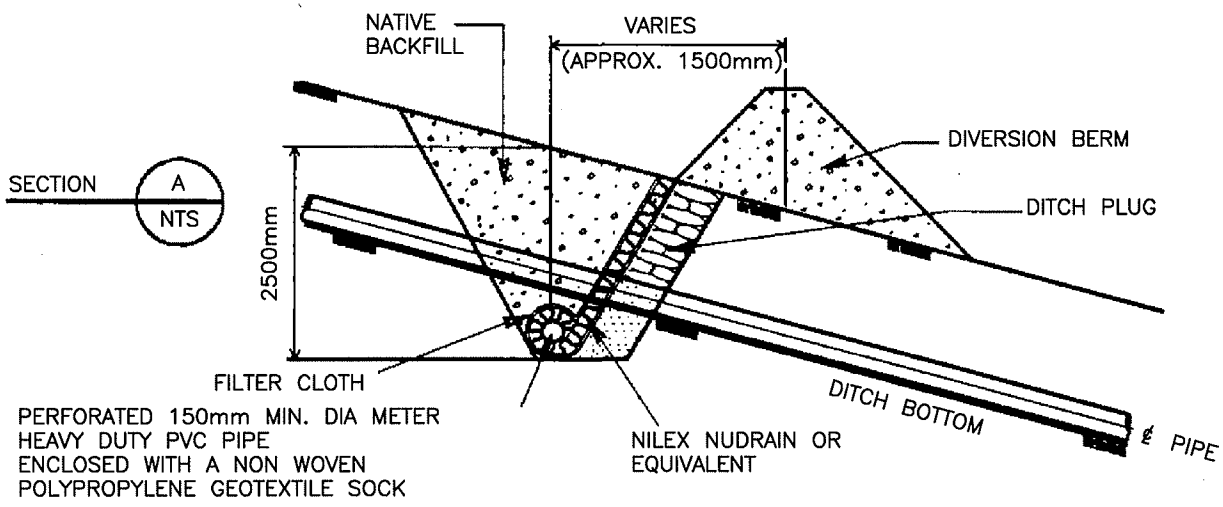
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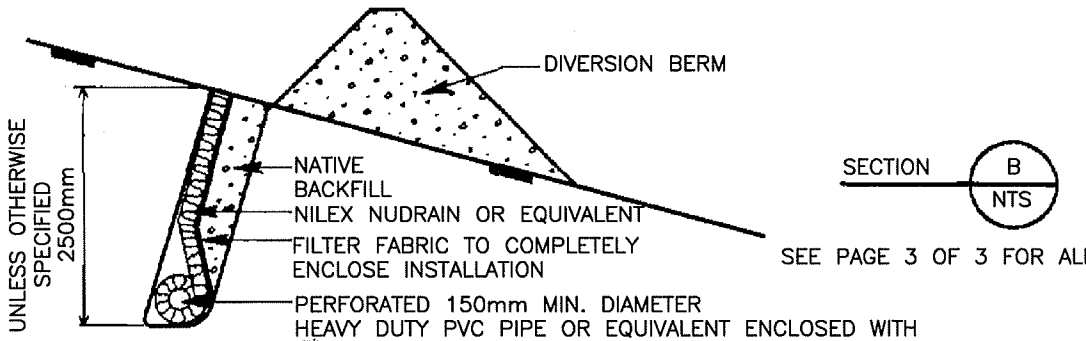
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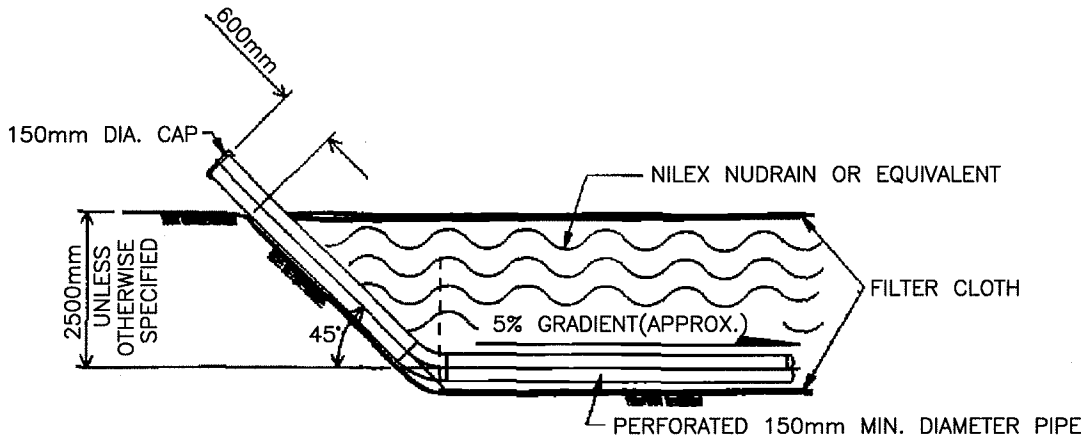
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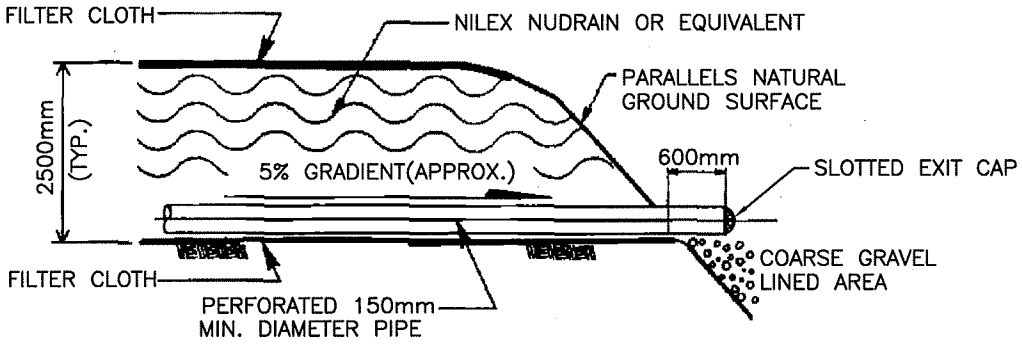
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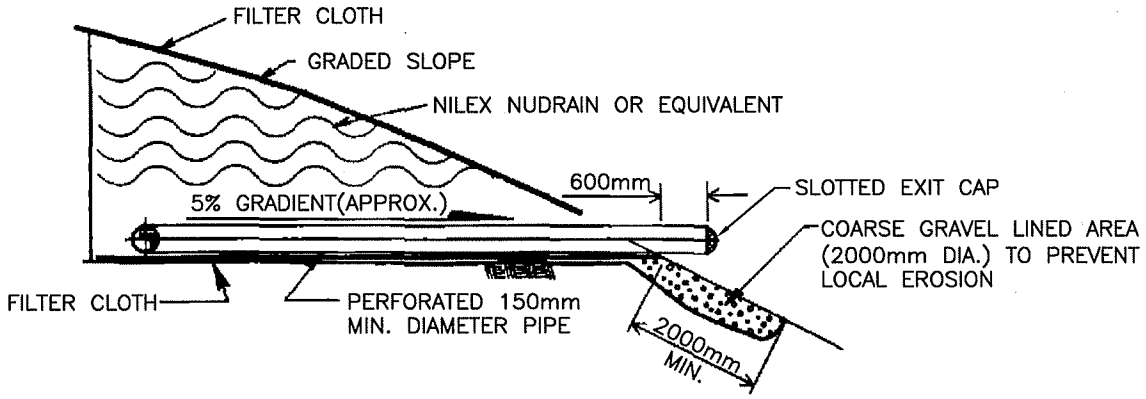
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SUBDRAIN FLUSH PIPE ENTRANCE DETAIL



SUBDRAIN EXIT DETAIL "ONE"



SUBDRAIN EXIT DETAIL "TWO"

SEE PAGE 3 OF 3 FOR ALL NOTES.

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TYPICAL SUBDRAIN
(SHT. 02 OF 03)

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NOTES

1. SUBDRAINS ARE TYPICALLY USED TO LOWER A HIGH GROUNDWATER TABLE WITHIN THE PIPELINE RIGHT–OF–WAY. THEY ARE GENERALLY LOCATED AT THE CREST OF SLOPES OR IMMEDIATELY DOWNSLOPE OF AREAS EXHIBITING SIGNIFICANT GROUNDWATER EXIT.

2. SUBDRAINS WILL BE SPECIFIED ON THE DRAWINGS WHERE REQUIRED. HOWEVER, THE LOCATIONS SHOWN ARE APPROXIMATE AND FINAL POSITIONING OF THE SUBDRAIN IS THE RESPONSIBILITY OF THE COMPANY'S AUTHORIZED REPRESENTATIVE. LOCAL TOPOGRAPHY, DRAINAGE PATTERNS AND OBSERVED GROUNDWATER CONDITIONS, PARTICULARLY AFTER DITCH EXCAVATION, WILL GOVERN THE FINAL SUBDRAIN LOCATION.

3. APPROXIMATE SLOPE OF SUBDRAIN TO BE 5%.

4. SUBDRAIN EXIT DETAIL "ONE" USED WHERE SUBDRAIN EXITS SLOPE WITHIN A REASONABLE DISTANCE AND NATURAL CONTOURS DIRECT WATER OFF RIGHT–OF–WAY. WHERE SUBDRAIN IS REQUIRED IN THROUGHCUT AREA, OR WHERE A "DETAIL ONE" EXIT POINT WOULD BE LOCATED GREATER THAN 10 METRES OUTSIDE THE RIGHT–OF–WAY LIMITS THEN THE DIRECTION OF SUBDRAIN IS DIRECTED SO THAT IT EXITS ALONG THE EDGE OF THE RIGHT–OF–WAY. (SEE EXIT DETAIL "TWO")

5. WHERE SUBDRAIN EXIT IS LOCATED BEYOND THE RIGHT–OF–WAY LIMITS, LAND APPROVAL IS REQUIRED.

MATERIALS REQUIRED

–NILEX NUDRAIN OR EQUIVALENT
–FILTER CLOTH: NILEX C–24 NON–WOVEN GEOTEXTILE OR APPROVED EQUIVALENT.
–PERFORATED PIPE: 150mm MININIMUM DIAMETER, PERFORATED, PVC OR APPROVED EQUIVALENT
–SOCK : NILEX SOCK – NON WOVEN POLYPROPYLENE GEOTEXTILE FOR 150mm DIAMETER PIPE
–COARSE GRAVEL : CLEAN, UNIFORM GRADED ROCK BETWEEN 10mm AND 100mm SIZE.
–END CAPS FOR DRAIN EXIT AND ENTRY. EXIT CAPS SHALL BE SLOTTED.

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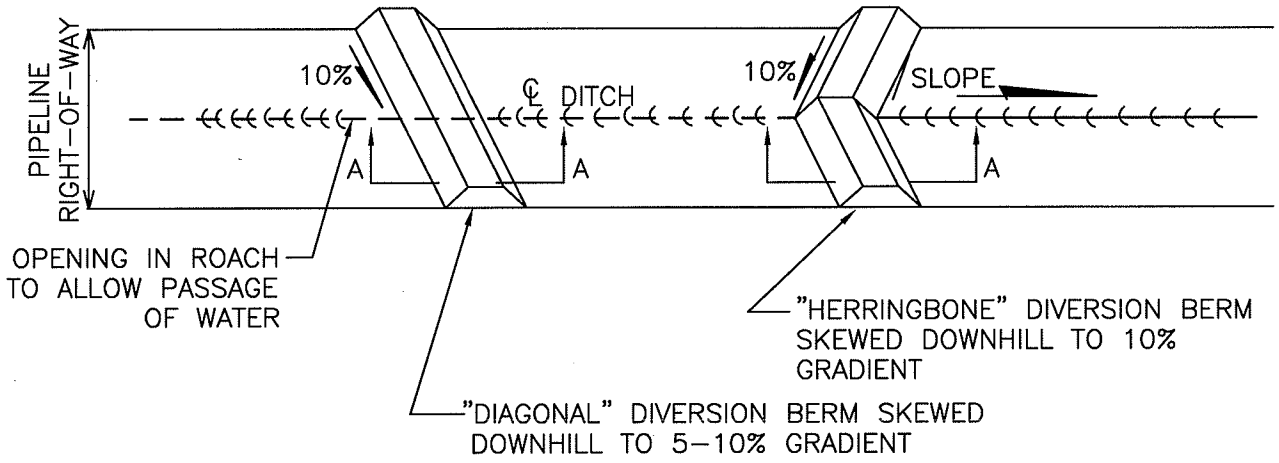
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TYPICAL SUBDRAIN
(SHT. 03 OF 03)

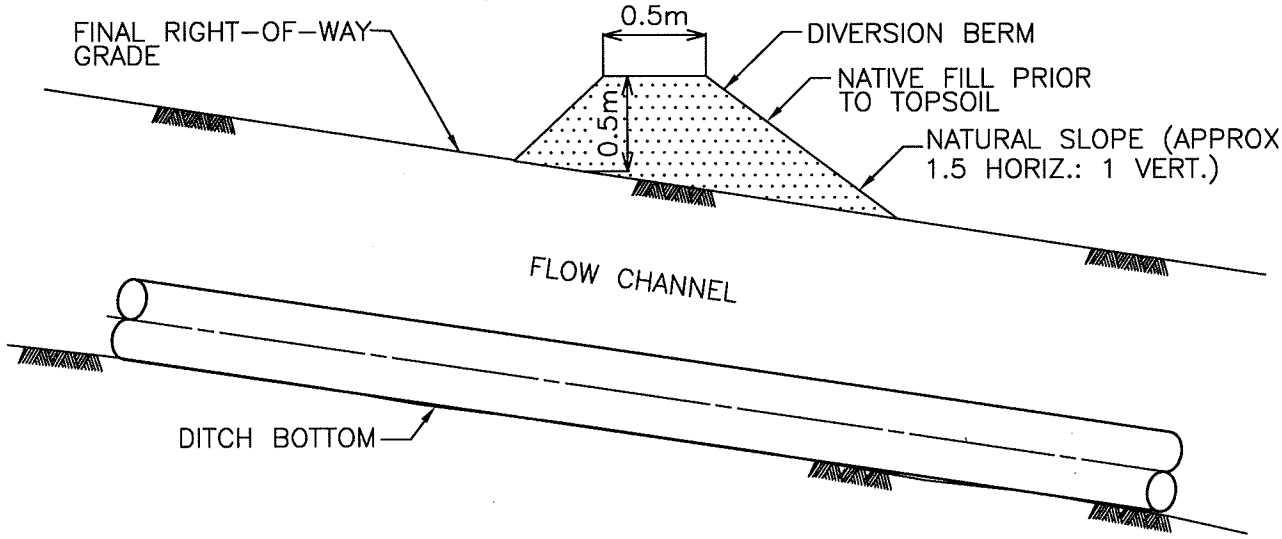
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FIA # STDS	CHAINAGE:	DISCIPLINE # 03
TITLE: TYPICAL DIVERSION BERMS (SHT. 01 OF 02)		
SCALE N.T.S.	DWG No STDS-03-ML-12-221	REV 01

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NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. "DIAGONAL" DIVERSION BERMS ARE USED:
   –WHERE THE EXISTING TOPOGRAPHY AND SLOPE DRAINAGE SUGGEST A PREFERRED DIRECTION OF SURFACE WATER MOVEMENT.
3. "HERRINGBONE" DIVERSION BERMS ARE TO BE USED:
   –WHERE THERE IS NO APPARENT PREFERRED DIRECTION OF SURFACE WATER MOVEMENT OR WHERE THE BERM IS LOCATED ACROSS A SLOPE WITH SIDE CUTS ON BOTH SIDES OF THE RIGHT–OF–WAY.
4. ALL BERMS SHALL BE CONSTRUCTED OF SUBSOIL NOMINALLY COMPACTED IN LIFTS. NO ORGANICS, TOPSOIL, SNOW, ICE OR OTHER DELETERIOUS MATERIAL SHALL BE INCORPORATED IN THE BERM FILL.
5. THE LENGTH OF THE BERMS SHALL EXTEND ACROSS THE FULL WIDTH OF THE DISTURBED RIGHT–OF–WAY OR TO THE TOE OF THE CUT SLOPE. BERMS MAY BE EXTENDED BEYOND THE RIGH–OF–WAY BOUNDARIES IF THE LAND APPROVALS HAVE BEEN OBTAINED.
6. TOPSOIL SHALL BE APPLIED TO THE BERMS AFTER COMPACTION OF SUBSOIL.
7. FOLLOWING TOPSOIL REQUIREMENT, THE BERMS SHALL BE SEEDED WITH THE APPROVED MIX, FOLLOWED BY PLACEMENT OF THE BIO–DEGRADEABLE EROSION CONTROL FABRIC (BIO4 OR EQUIVALENT). CHECK DAMS AND SILT FENCE MAY BE REQUIRED AFTER PLACEMENT OF THE EROSION CONTROL LINER, AS DETERMINED BY COMPANY'S AUTHORIZED REPRESENTATIVE. THE LINER SHALL BE KEYED–IN. OTHER BIO–DEGRADEABLE STAKES/ANCHORS CAN BE USED IN THE PLACE OF WOOD STAKES.
8. THE FINAL LOCATION, SPACING, AND DIRECTION OF THE BERMS ARE TO BE DETERMINED DURING CONSTRUCTION BY THE COMPANY'S AUTHORIZED REPRESENTATIVE BASED ON THE LOCAL TOPOGRAPHY AND DRAINAGE PATTERN.
9. THE FINAL HEIGHT OF THE BERM SHALL BE 0.5m HIGHER ACROSS THE PIPELINE TRENCH IN FROZEN CONDITIONS UNLESS SPECIFIED BY THE COMPANY.
10. SPACING OF DITCH PLUGS SHALL BE EVERY SECOND DIVERSION BERM UNLESS OTHERWISE APPROVED BY THE COMPANIES AUTHORIZED REPRESENTATIVE.

TYPICAL DIVERSION BERM SPACING

SLOPE	SOIL EROSION POTENTIAL		
	HIGH (FINE SANDS AND SILTS)	MODERATE (CLAY AND COURSE SANDS)	LOW (GRAVEL AND EXPOSED BEDROCK)
GENTLE (UNDER 5%)	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE
MODERATE (5%–10%)	30m	60m	90m
STEEP (OVER 10%)	$\frac{305}{\%\ \text{GRADE}} = ____\text{m}$	$\frac{305 \times 2}{\%\ \text{GRADE}} = ____\text{m}$	$\frac{305 \times 3}{\%\ \text{GRADE}} = ____\text{m}$

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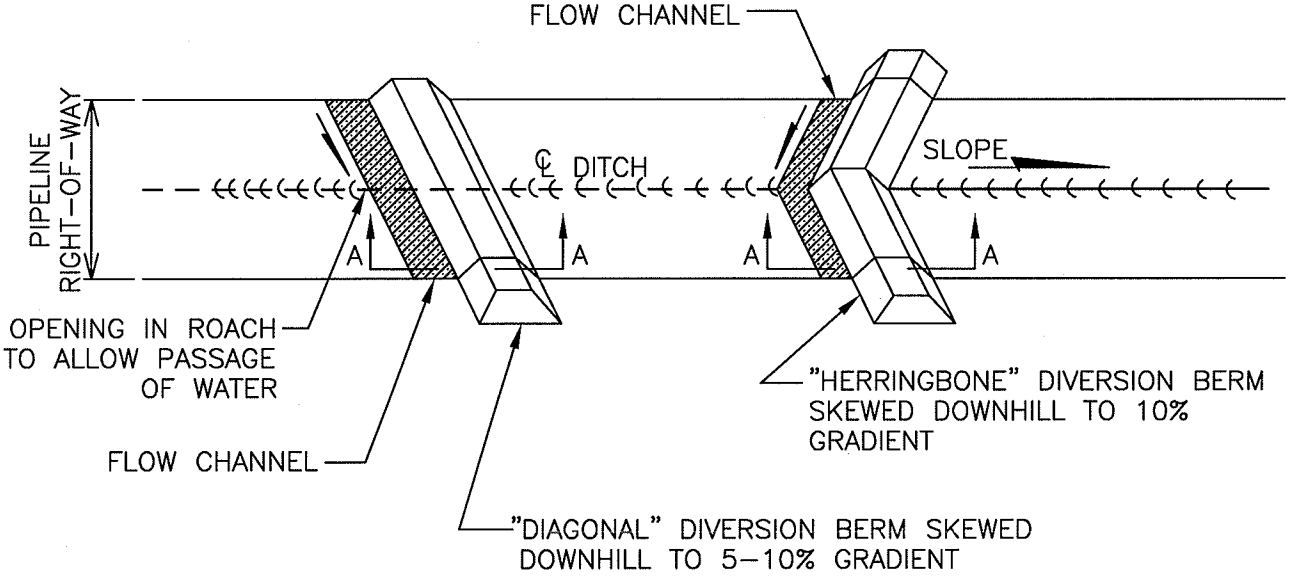
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TITLE: TYPICAL DIVERSION BERMS (SHT. 02 OF 02)

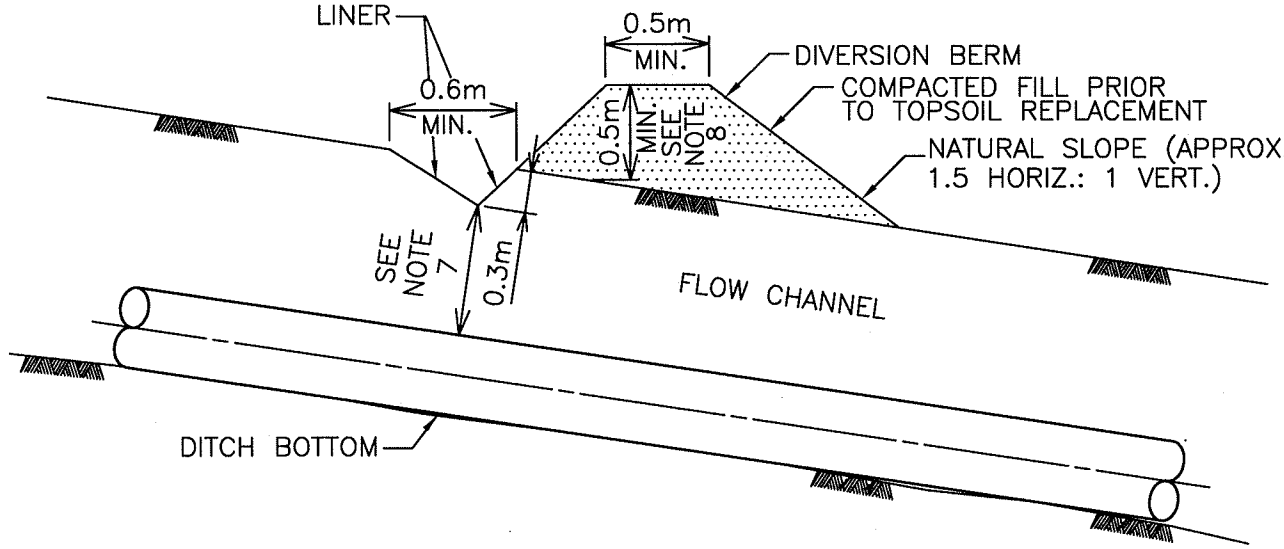
SCALE N.T.S.	DWG No STDS–03–ML–12–221	REV 01

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PLAN



SECTION A-A

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PROFESSIONAL ENGINEER OF ALBERTA

DESIGN STANDARD

FIA # STDS	CHAINAGE:	DISCIPLINE # 03

TITLE: TYPICAL DIVERSION BERMS WITH FLOW CHANNEL (SHT. 01 OF 02)

SCALE N.T.S.	DWG No STDS-03-ML-12-222	REV 01

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NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
2. "DIVERSION BERMS WITH FLOW CHANNELS ARE APPROPRIATE TO USE ON STEEP SLOPES. THE LINER SHALL CONSIST OF A BIO-DEGRADEABLE EROSION CONTROL FABRIC (MIN. BIO4 OR EQUIVALENT).
3. "DIAGONAL" DIVERSION BERMS ARE USED WHERE THE EXISTING TOPOGRAPHY AND SLOPE DRAINAGE SUGGEST A PREFERRED DIRECTION OF SURFACE WATER MOVEMENT.
4. "HERRINGBONE" DIVERSION BERMS ARE USED WHERE THERE IS NO APPARENT PREFERRED DIRECTION OF SURFACE WATER MOVEMENT ACROSS A SLOPE WITH SIDE CUTS ON BOTH SIDES OF THE RIGHT-OF-WAY.
5. ALL BERMS SHALL BE CONSTRUCTED OF SUBSOIL NOMINALLY COMPACTED IN LIFTS. NO ORGANICS, TOPSOIL, SNOW, ICE OR OTHER DELETERIOUS MATERIAL SHALL BE INCORPORATED IN THE BERM.
6. BERMS SHALL EXTEND ACROSS THE FULL WIDTH OF THE DISTURBED RIGHT-OF-WAY OR TO THE TOE OF THE CUT SLOPE. TO PREVENT WATER FROM FLOWING BACK ONTO THE RIGHT-OF-WAY, THE BERMS SHALL BE EXTENDED A SUITABLE DISTANCE BEYONG THE EDGE OF THE RIGHT-OF-WAY, PROVIDED NECESSARY LAND APPROVALS HAVE BEEN OBTAINED.
7. A FLOW CHANNEL SHALL BE EXCAVATED ALONG THE BASE OF THE UPHILL FACE OF THE DIVERSION BERMS ONLY IF MINIMUM COVER EXIST PRIOR TO EXCAVATION. TYPICAL DIVERSION BERM STDS-03-ML-12-221, INCLUDING THE LINER (KEYED AND SECURED) ON THE UPHILL FACE CAN ALSO BE UTILIZED AS DETERMINED BY THE COMPANY'S AUTHORIZED REPRESENTATIVE. THE LINER SHALL BE SECURED WITH WOOD STAKES OR OTHER BIO-DEGRADEABLE STAKES/ANCHORS AT MAXIMUM 1m INTERVALS BETWEEN.
8. TOPSOIL SHALL BE APPLIED TO THE BERMS AFTER COMPACTION OF SUBSOIL.
9. FOLLOWING TOPSOIL REPLACEMENT, THE BERMS SHALL BE SEEDED WITH THE APPROVED MIX, FOLLOWED BY PLACEMENT OF THE BIO-DEGRADEABLE EROSION CONTROL LINER (BIO4 OR EQUIVALENT, SECURED AT MAXIMUM 1m INTERVALS). CHECK DAMS AND SILT FENCE MAY BE REQUIRED AFTER PLACEMENT OF THE EROSION CONTROL LINER, AS DETERMINED BY COMPANY'S AUTHORIZED REPRESENTATIVE. THE LINER SHALL BE KEYED-IN.
10. THE FINAL LOCATION, SPACING, AND DIRECTION OF THE BERMS ARE TO BE DETERMINED DURING CONSTRUCTION BY THE COMPANY'S AUTHORIZED REPRESENTATIVE BASED ON THE LOCAL TOPOGRAPHY AND DRAINAGE PATTERN.
11. THE FINAL HEIGHT OF THE BERM SHALL BE 0.5m HIGHER ACROSS THE PIPELINE TRENCH IN FROZEN CONDITIONS UNLESS SPECIFIED BY THE COMPANY.
12. SPACING OF DITCH PLUGS SHALL BE EVERY SECOND DIVERSION BERM UNLESS OTHERWISE APPROVED BY THE COMPANIES AUTHORIZED REPRESENTATIVE.

TYPICAL DIVERSION BERM SPACING

SLOPE	SOIL EROSION POTENTIAL		
	HIGH (FINE SANDS AND SILTS)	MODERATE (CLAY AND COURSE SANDS)	LOW (GRAVEL AND EXPOSED BEDROCK)
GENTLE (UNDER 5%)	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE	AS DETERMINED BY COMPANIES AUTHORIZED REPRESENTATIVE
MODERATE (5%-10%)	30m	60m	90m
STEEP (OVER 10%)	$\frac{305}{\%\ \text{GRADE}}$ = ___m	$\frac{305 \times 2}{\%\ \text{GRADE}}$ = ___m	$\frac{305 \times 3}{\%\ \text{GRADE}}$ = ___m

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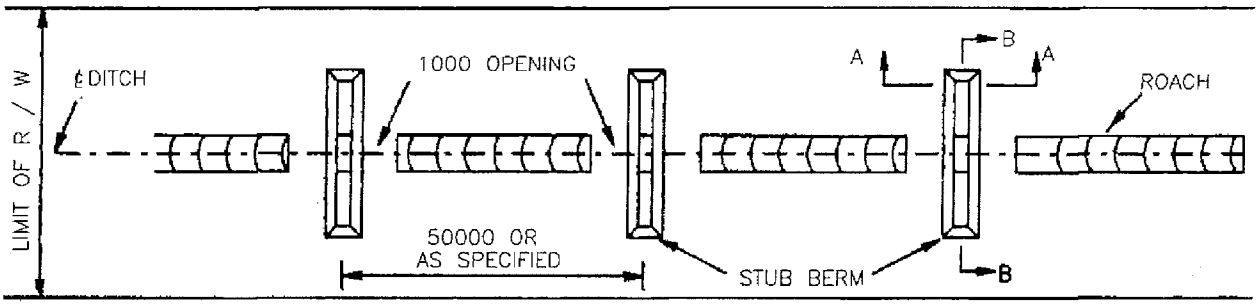
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TITLE: TYPICAL DIVERSION BERMS WITH FLOW CHANNEL (SHT. 02 OF 02)

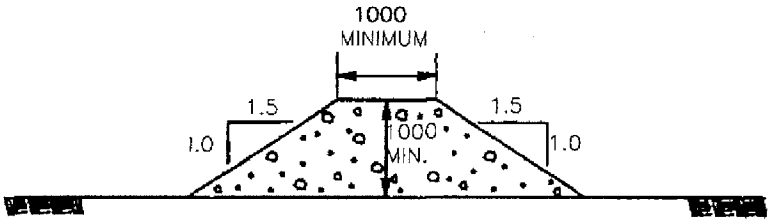
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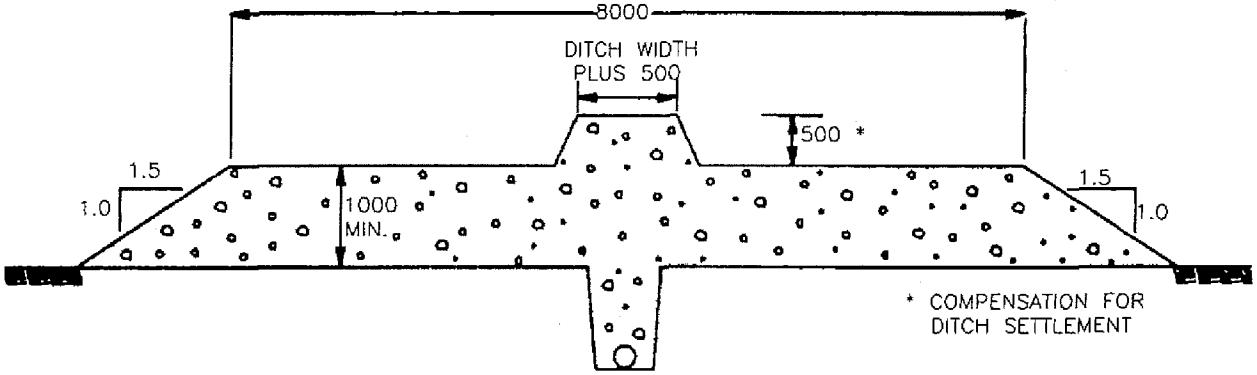
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PLAN (NTS)



SECTION A NTS



SECTION B NTS

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. STUB BERMS SHALL CONSIST OF NATIVE MINERAL SOIL NOMINALLY COMPACTED IN 300mm LIFTS USING HEAVY CONSTRUCTION EQUIPMENT. ORGANICS, SNOW, ICE, OR OTHER DELETERIOUS MATERIAL SHALL NOT BE INCORPORATED IN THE BERM FILL.
3. STUB BERMS SHALL BE PLACED PERPENDICULAR TO THE PIPE CENTERLINE.
4. AREAS OF APPLICATION FOR STUB BRMS: STUB BERMS ARE USED FOR THE CONTROL OF SURFACE FLOWS ALONG PIPELINE RIGHT-OF-WAY IN LOW LAYING SWAMPY TERRAIN.
5. THE FINAL LOCATION AND SPACING OF THE STUB BERMS WILL BE DETERMINED AT THE TIME OF CONSTRUCTION BY THE COMPANY'S AUTHORIZED REPRESENTATIVE.
6. SYNTHETIC COILS MAY BE USED IN PLACE OF STUB BERMS.

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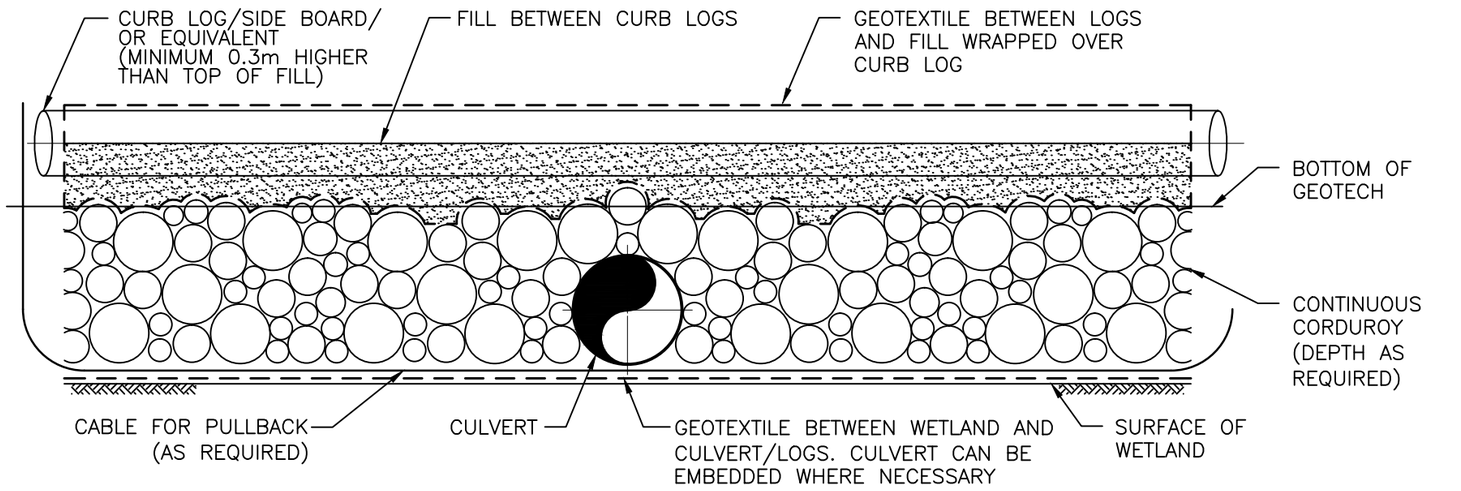
PROFESSIONAL ENGINEER OF ALBERTA

DESIGN STANDARD		
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TITLE: TYPICAL STUB BERM		
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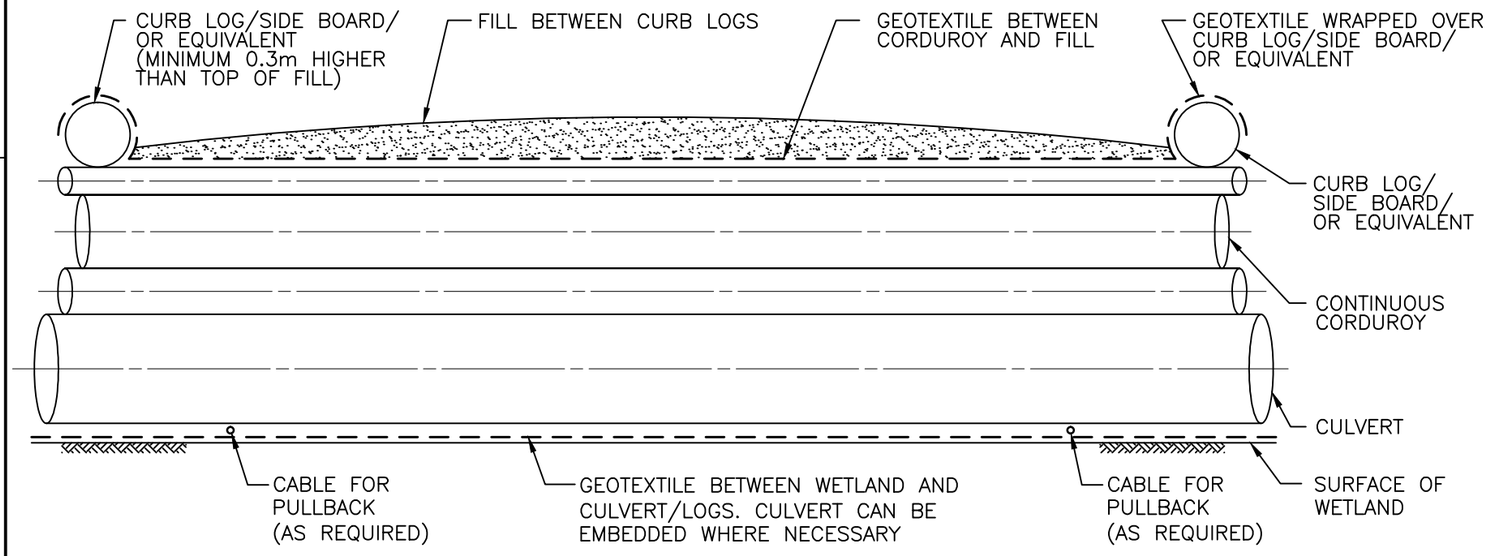
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PROFILE



SECTION

CONSTRUCTION NOTES:

1. CORDUROY (MINIMUM LOG DIAMETER OF 15cm) OR ACCESS MATS CAN BE USED ALONE, OR IN COMBINATION; LAYER CORDUROY AND ACCESS MATS AS REQUIRED VERTICALLY. ALTERNATING SECTIONS OF CORDUROY AND ACCESS MATS CAN BE USED AS REQUIRED AS WETLAND CONDITIONS AND TYPES CHANGE. CORDUROY MUST BE TRIMMED OF ALL LIMBS, TOPS AND STUMPS PRIOR TO PLACEMENT.
2. WHERE CULVERTS ARE REQUIRED, SIZE TO SUIT WETLAND HYDROLOGY (150–800 MM) AND ANTICIPATED FLOWS FOR DURATION CROSSING WILL BE IN PLACE. SPACE CULVERTS AMONGST CORDUROY, OR UNDER ACCESS MATS, AT EQUAL INTERVALS, AND/OR AT LOCATIONS WHERE FLOW IS ANTICIPATED/OBSERVED.
3. GEOTEXTILE FABRIC (ENVIRO–PRO EP–1050 OR EQUIVALENT, UNLESS OTHERWISE APPROVED BY THE COMPANY) WILL BE PLACED ON THE WETLAND SURFACE PRIOR TO CORDUROY OR ACCESS MAT PLACEMENT TO INCREASE STABILITY AND ASSIST IN REMOVAL. ENSURE GEOTEXTILE IS SLIGHTLY WIDER THAN CORDUROY/ACCESS MATS.
4. IF FILL MATERIAL IS TO BE PLACED ON TOP OF CORDUROY/ACCESS MATS USE A CURB LOG, OR EQUIVALENT, TO CONTAIN FILL MATERIAL. GEOTEXTILE FABRIC (ENVIRO–PRO EP–1050, OR EQUIVALENT) WILL BE PLACED BETWEEN THE CORDUROY/ACCESS MATS AND ANY FILL MATERIAL. IN ADDITION TO THE LOG CURB, GEOTEXTILE SHALL BE EXTENDED AND SECURED VERTICALLY TO CREATE A SILT FENCE A MINIMUM OF 0.3m HIGHER THAN THE TOP OF FILL. EXTEND GEOTEXTILE TO COVER ENDS OF CORDUROY AND A MINIMUM OF 1m BEYOND WIDTH OF FILL. IF A CURB LOG, OR EQUIVALENT IS REQUIRED, GEOTEXTILE WILL BE WRAPPED OVER CURB LOG.
5. CROSSING WILL REMAIN IN PLACE AS REQUIRED; CROSSING MATERIAL SHALL BE MAINTAINED, REPAIRED AS NECESSARY AND IN GOOD CONDITION TO ENSURE THEY ARE WORKING AS INTENDED UNTIL COMPLETION AND REMOVAL. UPON COMPLETION ALL MATERIALS WILL BE REMOVED TO THE EXTENT PRACTICABLE.
6. WHERE NECESSARY, CABLES MAY BE PLACED UNDER LOGS TO ASSIST WITH REMOVAL (E.G. AT LOCATIONS WHERE SEASONAL HIGH FLOWS MAY REQUIRE PULLBACK OF SOME LOGS TO ACCOMMODATED FLOWS).
7. APPLICATION OF CORDUROY AND/OR MATTING WILL BE APPROVED BY THE COMPANY.

REFERENCE DRAWINGS	
DRAWING No	TITLE
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REV No	DATE	REVISION	PROJECT CODE	DRAFT BY	DRAFT CHK	DESIGN BY	DESIGN CHK	PROJ MGR
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01	2021–02–09	ISSUED FOR USE	M.000955	AK	DS JJ	DS CL	DS DK	

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PROFESSIONAL ENGINEER/RPT	PERMIT/ ENG. APPROVAL
	DATE

REV. NO.	DATE	PERMIT NUMBER:

TC Energy — Coastal GasLink

GENERAL INFORMATION – COASTAL GASLINK PIPELINE PROJECT

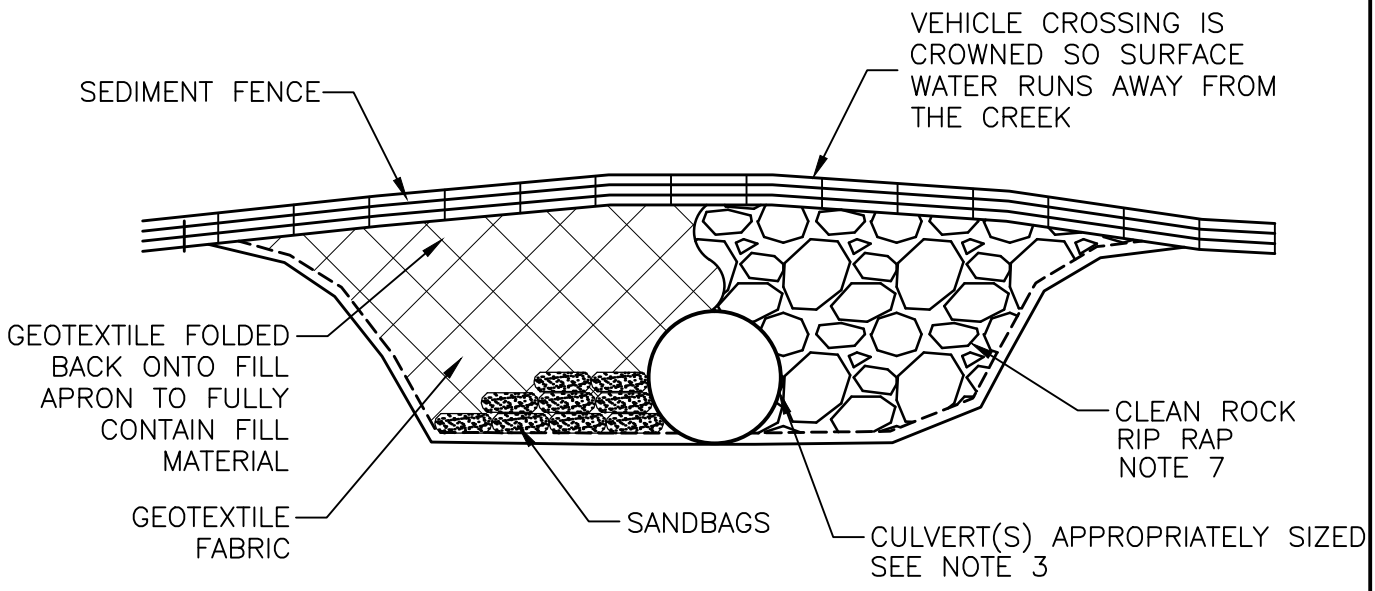
FACILITY # 4703	ENG STN:	DISC # 09

TYPICAL CORDUROY WETLAND ROAD CROSSING

SCALE N.T.S.	DRAWING # 4703–09–ML–SK–001	REV 01

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NOTES:

1. SEE APPLICABLE WATERCOURSE CROSSING TABLE AND/OR EPP FOR ALL LOCATIONS WHERE THIS TECHNIQUE CAN BE APPLIED.
2. NATIVE FILL IS FROM RIGHT–OF–WAY OR APPROVED MATERIAL AND SOURCE, BUT NOT FROM WATERCOURSE BED OR BANKS.
3. CULVERT SIZING WILL BE IN ACCORDANCE WITH PERMIT REQUIREMENTS OR THE OIL AND GAS ROAD REGULATION, AS APPLICABLE.
4. SEDIMENT FENCE TO BE INSTALLED AS PER MANUFACTURERS DIRECTIONS AND SPAN WIDTH OF WATERCOURSE PLUS 10m EACH SIDE OF WATERCOURSE ON BOTH SIDES OF VEHICLE ACCESS,
5. MONITORING AND MAINTENANCE OF SEDIMENT FENCE AND GEOTEXTILE IS REQUIRED.
6. SANDBAGS MAY BE REQUIRED TO ANCHOR GEOTEXTILE AND TO SEAL AROUND THE CULVERTS ON THE UPSTREAM AND DOWNSTREAM SIDES OF THE FILL APRON.
7. WHERE CLEAN ROCK IS USED FOR FILL MATERIAL, THE GEOTEXTILE AND SANDBAGS ARE NOT REQUIRED.

REVISIONS | A | ISSUED FOR REVIEW

TC Energy

Coastal GasLink

DESIGNER: DocuSigned by: Craig Lasos NAME E44BDB445C4248F... April 5, 2021 DATE

CHECKED BY: DS JJ

DESIGN CHECKER: DS DR

COASTAL GASLINK PIPELINE (2016) NPS 48

FACILITY # 16442	ENG STN:	DISC # 09

TITLE: PIPELINE VEHICLE CROSSING – CULVERT WITH NATIVE FILL MATERIAL CROSS SECTION

SCALE N.T.S.	DWG # 16442-09-ML-04-005	REV 00

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Environmental Management Plan

Appendix C Contingency Plans

Appendix C.1	Spill Contingency Plan
Appendix C.2	Adverse Weather Contingency Plan
Appendix C.3	Flood and Excessive Flow Contingency Plan
Appendix C.4	Wet Soils Contingency Plan
Appendix C.5	Fire Suppression Contingency Plan
Appendix C.6	Soil Handling Contingency Plan
Appendix C.7	Soil Erosion Contingency Plan
Appendix C.8	Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan
Appendix C.9	Ecological Community and Species of Concern Discovery Contingency Plan
Appendix C.10	Wildlife Species of Concern Discovery Contingency Plan
Appendix C.11	Heritage Resource Discovery Contingency Plan
Appendix C.12	Traditional Land Use Sites Discovery Contingency Plan
Appendix C.13	Acid Rock Construction Response Plan

C.1 SPILL CONTINGENCY PLAN

C.1.1 Introduction

Depending upon the location, substance and quantity of the release, the incident may be reportable to applicable federal and/or provincial authorities. It will be the responsibility of the Environmental Inspector(s) to determine if an incident is externally reportable and follow the appropriate regulatory reporting requirements. Therefore, it is the policy of Coastal GasLink that all releases are reported internally to the Environmental Inspector(s), regardless of the location, quantity or substance released.

The Construction Manager or Environmental Inspector(s) will immediately notify the appropriate regulatory agency when a reportable event occurs. If this is not practical, notification will be made as soon as practical upon detection of the spill. If a Contractor-specific Spill Response Plan is in place, the plan will be reviewed to ensure that the Contractor Spill Response Plan meets the criteria contained in Coastal GasLink's Spill Contingency Plan. Where inconsistencies exist, the more stringent requirement will apply.

C.1.2 General Measures

The following are standard measures to be adhered to during construction.

- Appropriate spill equipment will be maintained at all work sites, in accordance with the Chemical and Waste Management Plan (Appendix D.1). The risk for site-specific spills will be used to determine the appropriate type of response equipment and suitable location for storage.
- Specific instructions regarding applicable contacts and appropriate response actions to be taken in the event of a spill will be posted at the field construction offices.

C.1.3 Initial Response

The following actions will be taken upon detection of a spill.

- In the event of a spill of hazardous material, the first person on the scene will follow the actions presented in this Spill Contingency Plan.
- When notified of a spill, the Contractor will immediately ensure that action is taken to control danger to human life including the appointment of an Onsite Safety Supervisor; the necessary equipment is mobilized, and measures are being implemented to control and contain the spill; and that all resources are available to contain and cleanup a spill.

- When notified of a spill, the Environmental Inspector(s) will immediately ensure that the appropriate regulatory agencies are notified (e.g., BC EAO, BC OGC).
- The criteria for reportable spills are found in the *BC Environmental Management Act* Spill Reporting Regulation (2008), BC OGC's Incident Reporting Instruction and Guidelines (2014), Part 8 of the TDG Regulations (2015) and *Workers Compensation Act*, Section 172.
- Other notifications include the Project Engineer, Coastal GasLink Environmental Advisor and if warranted, the RCMP.

C.1.4 General Spill Containment Procedures

The successful containment of a spill on land or water depends on a variety of factors including ground cover, topography, hydrogeology, solubility of the material, viscosity of the liquid, water currents, soil permeability, and climatic conditions.

The following general guidelines will be followed for containment of spilled materials.

- The first person on the scene will follow the actions listed in the Contractor's Spill Response Procedures or the Spill Response Procedure.
- Assess the safety hazards of the situation.
- Remove sources of ignition, if safe to do so.
- Identify the product, stop source, and physically contain spill as soon as safe to do so.
- Avoid use of water or fire extinguishing chemicals on nonpetroleum product spills unless it is necessary to control a fire or prevent an explosion, since many chemicals react violently with water and chemical extinguishing agents may release toxic fumes. In addition, chemicals may be soluble in water and dispersal makes containment and cleanup more difficult.
- Reduce traffic on contaminated soils.
- Use natural depressions or berms constructed with materials and equipment in proximity to the site to physically contain a spill on land. Deployment of booms may be necessary on water.

Cleanup guidelines for specific accidents are outlined below.

C.1.5 Transportation by Truck

At a minimum, the following general guidelines will be followed for containment and cleanup of most hazardous materials if spilled from a truck.

- Contain spilled product.

- Pump the source of the leak dry, if applicable.
- Remove source from site.
- Recover spilled product.
- Cleanup contaminated area.
- Dispose of sorbent pads, heavily contaminated soil, and vegetation at an approved facility. Where in situ remediation is appropriate, add amendments, repeat as required, sample soil and seed as determined by the Environmental Inspector(s) in consultation with a Qualified Professional.

C.1.6 Spills Adjacent to or into a Waterbody

At a minimum, the following general guidelines will be followed for containment and cleanup of most hazardous materials if spilled adjacent to, or into, a waterbody.

- Construct berms, sumps and/or trenches where it is necessary to contain and/or prevent spilled product from entering a waterbody.
- Deploy booms, skimmers, sorbents, etc., if practical, to contain and recover spilled material from waterbody.
- Recover spilled product to the extent practical.
- Cleanup contaminated areas.
- Dispose of heavily contaminated soil and vegetation in accordance with the Chemical and Waste Management Plan (Appendix D.1). Where in situ remediation is appropriate, the site will be remediated in a suitable manner, as determined by Coastal GasLink who will consult a qualified remediation specialist.

C.1.7 Spot Spills

Since effects from small spot spills can generally be reduced if appropriate actions are implemented, all small spills of fuels or noxious materials must be reported immediately to the Environmental Inspector(s).

At a minimum, the following general guidelines will be followed while cleaning up spot spills of fuel or other hazardous materials.

- Modify construction activity in the immediate vicinity of the spot spill such that the affected area is not disturbed.
- The Environmental Inspector(s) will determine appropriate methods to remove contaminated soil or vegetation to an approved facility or reclaim contaminated soils and vegetation in a suitable manner.

Spill Reporting Authorities	
Regulatory Agency	Notes
Emergency Management BC (EMBC) 1-800-663-3456 Fisheries and Oceans Canada (DFO) 1-800-465-4336 BC Oil and Gas Commission (BC OGC)	Any spill, release or emergency that might cause, is causing, or has caused an adverse effect on the environment.
WorkSafe BC Emergency numbers Monday – Friday 8:30 – 4:30 1-888-621-7233 1-604-276-3100 After hours 1-866-922-4357	Immediately notify of any major release of a hazardous substance, as defined in Guidelines *Workers Compensation Act* Part 3 Division 10 - Accident Reporting and Investigation

SPILL SCENE CHECKLIST

The following activities should be taken by the first person on the scene of a hazardous material spill or release.

(a)	If practical, without further assistance, assess the safety hazards of the situation, control danger to human life and identify the composition of the spilled material.	_____
(b)	If practical and safe to do so, remove any sources of ignition, cut off the source of the spill and initiate a release response plan (i.e., control, contain and cleanup).	_____
(c)	Once the source has been cut off, attempt to contain the spilled area.	_____
(d)	Notify the Construction Manager and Environmental Inspector(s).	_____
(e)	Take notice of dangers to the environment (e.g., proximity of watercourses) and cleanup actions that might be necessary.	_____
(f)	If any of the above tasks are beyond the capabilities at hand, ask for qualified assistance.	_____

Note: The Environmental Inspector(s) is responsible for contacting Emergency Management BC. Any follow-up that may be required is coordinated regulatory agencies. Coastal GasLink's Environmental Advisor is responsible for follow-up reporting that may be required by regulations/guidelines. through Coastal GasLink's regulatory team. Relevant information regarding the spill must be collected as soon as practical. Information may be recorded in the CGL Spill Report Form or the OGC Notification form however other types of information recording are also acceptable provided all required information is collected.

C.2 ADVERSE WEATHER CONTINGENCY PLAN

The Environmental Inspector(s) is responsible for monitoring and implementing all procedures and will liaise with the appropriate regulatory agencies, when required. If necessary, a meeting will be held in the field to ensure that all involved parties mutually understand concerns.

Where adverse weather conditions and activities have the potential to cause adverse environmental effects, the Environmental Inspector(s) will suspend that phase of operations until weather conditions abate, or effective mitigation procedures have been implemented. The following represents mitigation that may be applied. Specific environmental mitigation is subjective and dependent upon specific right-of-way (ROW) conditions and the Project schedule.

The following table outlines mitigation that allows for the continuation of activities and reduce potential adverse environmental effects.

Mitigation for the Construction Manager, in consultation with the Environmental Inspector(s), to consider	
WIND EROSION	
Mitigation to Consider	
1	Uniformly apply mulch or tackifier to topsoil/surface material piles and/or other areas affected by wind erosion.
2	Water or apply tackifiers to identified areas when activities or sufficient winds have created the potential for topsoil/surface material erosion. Do not use tackifiers on wetland substrates.
3	Apply weed-free straw sourced from Alberta or British Columbia to surface material and/or other areas where winds have created the potential for soil erosion. Straw sources must be approved by the Environmental Inspector(s) and are subject to landowner approval on private land or regulatory approval where there is a statutory requirement Other erosion control measures may be used as per the Coastal GasLink Erosion and Sediment Control Plan.
WATER EROSION	
Temporary Berms/Silt Fence	
1	Temporary berms, silt fence and/or other appropriate mitigation (e.g., wattles, erosion control matting) will be implemented along the trench crown, surface material piles, and/or other areas where the potential for water erosion has been identified.
2	To prevent ponding and/or erosion, cross ROW drainage will be maintained. Appropriate measures (e.g., sumps, pumping excess water) to prevent deleterious material from entering a watercourse will be implemented, when and where required.
3	Use cross berms and chevrons where appropriate to redirect water from the ROW into a vegetated area.
ROW Maintenance/Stabilization	
1	During adverse weather conditions, Coastal GasLink will direct the Contractor to reduce unnecessary traffic and the number of vehicles on the ROW. Better planning of activities will be required by the Contractor to either tighten up or spread out the work crews as warranted (e.g., close proximity of ditching, lower in, and backfill operations). To reduce effects, a one trip in, one trip out philosophy will be implemented for all ROW access.
2	Traffic will be restricted to the ROW. The appropriate regulatory agency will need to approve any off-ROW activities.
3	The traffic pattern on the ROW will be changed to avoid repeated driving in the same areas.
4	Under adverse weather conditions, the Contractor will be required to back-blade the ROW during and at the end of the day. Back-blading of the ROW fills in tire tracks, thereby assisting in the prevention of water erosion and re-establishing a firm working ROW surface.
5	Under adverse weather conditions, topsoil/surface material and/or subsoil may be stripped and placed at the edge of the ROW if approved by the Environmental Inspector(s). Topsoil, surface material and/or subsoil will be redistributed evenly across the ROW during cleanup.
6	Under non-frozen conditions and/or where identified by Coastal GasLink, and in consultation with the appropriate Regulatory Representatives, vehicle watercourse crossing techniques may be modified and/or replaced with other appropriate crossing techniques.
7	When available and practical, tracked equipment may be required for specific activities.
8	Work in highly sensitive areas may be stopped and shifted to less sensitive areas.
9	If mitigation is not effective, Project activities may be suspended until adverse weather conditions abate as determined by the Construction Manager in consultation with the Environmental Inspector(s) or designate(s). Recommencement of work must be authorized by the Construction Manager, in consultation with the Environmental Inspector(s) prior to restart.

C.3 FLOOD AND EXCESSIVE FLOW CONTINGENCY PLAN

The weather conditions will be monitored by the Environmental Inspector(s) on a daily basis. The Contractors' Erosion and Sediment Control (ESC) Plans describe inspection protocols when a major storm is predicted or occurs to determine whether any corrective actions need to be implemented. Inspection protocols shall include in progress and completed watercourse crossings until stability has been documented.

The appropriate regulatory agencies will be notified when required, as soon as practical, by the Environmental Inspector(s) or Construction Manager, that contingency measures have been implemented.

At watercourses where an isolated crossing method is recommended, the proposed isolation crossing techniques may not be practical during periods of excessive flow or unusually wet seasons.

The following contingency measures will be implemented progressively or individually, as warranted, if excessive flow or flood conditions are anticipated prior to commencing watercourse crossing construction.

- Assess the capability to handle the expected flow rate with the proposed crossing method. If use of the proposed crossing method is determined to be practical by Coastal GasLink, the crossing will proceed.
- Defer water crossing construction to a later time when flows have subsided, if it is determined by Coastal GasLink that the proposed crossing method is not practical.
- Alternatively, where the expected flow rates and window limitations combine to preclude the proposed crossing method, request approval from the appropriate regulatory agencies to use an alternate crossing method.

The following contingency measures will be implemented progressively or individually, as warranted, if excessive flow or flood conditions should occur during watercourse crossing construction.

- Assess the capability to handle the anticipated flow rate with the proposed crossing method. If use of the proposed crossing method is determined to be practical by Coastal GasLink, the crossing will proceed.
- Increase the quantity of materials to perform the crossing as needed. Reinforce or replace the isolation and/or bypass structure(s) if necessary.
- Withdraw all equipment or tanks containing fuel, oil, or other hazardous materials from potential flood areas.
- Remove all stationary and mobile equipment deployed at the crossing site to a safe area above the anticipated high water level.

- Remove any instream flume or dam equipment that may impede streamflow, as safe work conditions allow.
- Relocate all topsoil/surface material piles at the direction of the Environmental Inspector(s).
- Relocate spoil piles, to the extent practical, to a position above the anticipated high water level.
- Evaluate vehicle crossing structure to determine whether adequate free-board is present on bridges and adequate capacity is available in culverts. Take corrective measures as appropriate to avoid flooding of adjacent lands.
- Import sandbags and place strategically to help stabilize and add height to banks to prevent flooding of nearby areas, especially where vegetation has been removed.

C.4 WET SOILS CONTINGENCY PLAN

Coastal GasLink will assign Environmental Inspector(s) with sufficient training and soils-related experience to be able to identify soils that are too wet for a particular activity and when the soils are sufficiently dry or frozen to allow the activity to resume. The decision to continue or suspend particular pipeline construction activities on lands with excessively wet soils will be made by the Construction Manager in consultation with the Environmental Inspector(s).

Soils are considered to be excessively wet when the planned activity could cause unacceptable damage to soils either due to rutting by traffic through the surface layer into the subsoil; soil structure damage during soil handling; or compaction and associated pulverization of surface material due to heavy traffic.

In order to reduce terrain disturbance and soil structure damage through rutting or compaction due to wet soil conditions, construction alternatives will be employed, as necessary, in the event of excessively wet soils. The contingency measures listed below will be implemented individually or in combination, as necessary, based on site-specific conditions.

C.4.1 Wet Soil Contingency Measures

The following contingency measures will be implemented as warranted as determined by the Construction Manager in consultation with the Environmental Inspector(s).

- Restrict construction traffic, where practical, to equipment with low-ground-pressure tires or wide pad tracks.
- Postpone construction until evening or early morning when the ground is frozen.
- Install biodegradable geotextile, swamp mats, rig mats, access mats, or corduroy if approved by the applicable regulatory agency, or equivalent, in problem areas.
- Under frozen conditions, employ frost inducement measures such as snow packing or plowing to increase the load-bearing capacity of thawed ground.
- Suspend timber skidding operations or implement other measures (e.g., use tarps or plastic sheeting) if the potential exists for salvageable timber to be damaged through contact with wet soils.
- Suspend construction until soils dry out or freeze.
- Backblade ruts at the end of the day or when leaving an area of concern.

C.5 FIRE SUPPRESSION CONTINGENCY PLAN

Prior to commencement of construction, the Contractor will designate one of his staff as Fire Boss. The Fire Boss will be familiar with fire-fighting techniques and equipment. A Fire Boss should have some degree of fireline certification and fire experience, or knowledge of fire weather and fire behaviour.

C.5.1 Fire Suppression Supplies

Necessary firefighting equipment will be on site in accordance with the BC Wildfire Regulations. Firefighting hand tools may include shovels, axes, pulaskis, hand tank pumps and fire extinguishers. A fire suppression system is a system for suppressing fire by delivering water, a suppressant, a surfactant or any combination of those substances. The system may include a water delivery system. In addition, all motorized equipment must carry a fully charged fire extinguisher. The Fire Boss will ensure that fire extinguishers are present and fully charged and all fireline equipment is present and in working order. The fire equipment and water supply on site should be increased as the fire hazard increases.

C.5.2 In the Event of a Fire

The following mitigation will be implemented in the event of a fire.

- Commence fire suppression measures immediately upon detection of fire provided that fire conditions allow personnel to safely proceed under the direction of the Fire Boss.
- Personnel working on the Project must report the location of fire as well as size of fire and wind direction, to Fire Boss immediately.
- Fire Boss or Coastal GasLink designate, will report wild fires and relevant information to Coastal GasLink's Environmental Advisor, Construction Manager, BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (BC MFLNRORD) Wildfire Management Branch, municipal By-Law officers and applicable local fire departments. Reporting to provincial authorities must be completed immediately. Refer to the Fire Report Form for guidance when reporting fires to regulatory agencies.
- Fire Boss will deploy fire-fighting equipment and crew to clear fire breaks or extinguish the fire directly if practical. All equipment and personnel shall be made available to control the fire. Effort of fire control will be limited, if warranted, due to safety issues and will take into consideration fire conditions, safety, fitness of personnel and equipment availability.
- Fire Boss will inspect the fire site as soon as practical and take charge of directing suppression measures until relieved of this duty by the applicable provincial authority or until conditions become unsafe.

- Fire Boss will deploy additional crew and machinery as needed and Coastal GasLink will request assistance of the BC MFLNRORD Wildfire Management Branch, local fire department and applicable municipal government if Contractor resources are inadequate (see contact list and phone numbers below). Fire suppression measures shall continue until the fire is extinguished or until otherwise notified by applicable regulatory agency.
- Moveable material, particularly explosive or flammable materials, vehicles, etc. will be promptly moved to a safe location whenever there is a possibility of being endangered by fire.
- Fire Boss will ensure that all burning embers are extinguished and will monitor burn area for smouldering material. Employ infrared scanning equipment to detect any hot spots.

C.5.3 Fire Report Form

General

Date and Time of Fire or Discovery: _____

Source (if known): _____

Location of Fire

LSD _____ of section _____ Township _____ Range _____ W _____ Mer.

Easting _____; Northing _____ UTM Zone ____; KP _____

Other description of location:

_____

_____

_____

Site Information

Fire is burning in the:

ground _____

bush (timber type) _____

agricultural land _____

Other _____

Rate of spread is:

not moving _____

moderate (less than a normal walk?)_____

fast (more than a normal walk?)_____

Any people at the fire? Yes _____ No _____ Don't know _____

Is property threatened? Yes _____ No _____ Don't know _____

Is road access available? Yes _____ No _____ Don't know _____

Is water readily available? Yes _____ No _____ Don't know _____

Any other observations? _____

(e.g., lightning, recreation, vehicles)

Smoke Information

When unable to see fire, only smoke visible:

Colour:	light grey _____	Column:	intermittent _____
	medium grey _____		scattered _____
	dark grey _____		light _____
	black _____		heavy _____

C.6 SOIL HANDLING CONTINGENCY PLAN

While soils handling criteria presented in the EMP address the key soils handling questions that could occur during pipeline construction, the following minor problems may arise during construction that may result in loss of soil capability if not addressed. Mitigation is provided to lessen the potential effects associated with construction.

Condition/Concern	Mitigation
Little or no topsoil on cultivated, pasture or hay lands	• Follow direction provided in the Soil Survey as provided on the Environmental Worksheets.
Poor colour separation between topsoil/strippings and subsoils	• Identify subsoil by texture and structure for any site-specific adjustments to depth. • Use topsoil/surface material depths indicated in the soil assessment and the Environmental Worksheets as a guide.
Stony subsoils or topsoil/strippings	• Attempt to use conventional equipment to strip topsoil/surface material. • Employ backhoe, if above measures are ineffective. • Pick rocks after backfilling and after grade reclamation. • Pick rocks after replacement of topsoil/surface material.
Shallow bedrock	• Ripping is preferred over blasting where rock trenching is encountered. • Bedrock is not to be backfilled into the upper 0.5 m of the trench on agricultural lands. • Excess bedrock will be disposed of at locations approved by the landowner for private land or the appropriate government agency for Crown land. • Import additional or replacement backfill if warranted from locations approved by the landowner or appropriate government representative.
Alternate soil handling measure or no topsoil/upper surface material stripping	• Discuss benefits of proposed soil handling with landowner. • If the landowner maintains the request following discussions, conduct topsoil/surface material handling operations in compliance with the landowner's request.
Uneven boundary between topsoil/strippings and subsoil	• Utilize equipment capable of fine depth adjustments when salvaging topsoil/surface material.
Soil pulverization	• Reduce traffic on ROW.
High winds	• Temporarily suspend soil salvage operations when there is a threat of wind erosion. • Implement adequate erosion control measures such as wind barriers or tackifiers as required wherever soils are exposed. • Spray water or tackifiers or implement 'walk down' procedures on soil windrows as required and as instructed by the environmental inspector. • Initiate revegetation as soon as practical after machine cleanup.

C.7 SOIL EROSION CONTINGENCY PLAN

If wind or water erosion is evident during the construction phase of the Project, all necessary Contractor equipment and personnel will be made available to control the erosion. During the construction phase, the Environmental Inspector(s) in consultation with Coastal GasLink's Environmental Advisor will determine appropriate procedures to be implemented to control soil erosion and other soil handling problems encountered.

This table provides a list of control options to be implemented as appropriate. Similar procedures should be followed during the operations phase.

Concern	Mitigation

Water Erosion	• Implement one or a combination of the following mitigation:
	  • install silt fences near the base of slopes
	  • regrade furrows and gullies
	  • construct cross ditches and berms decreasing the spacing on steeper slopes or on more erodible soils
	  • construct temporary berms of subsoil, sandbags, wattles, bio-degradable geotextiles, or geo-ridge during construction activities
	  • armour the upslope face of berms with geotextile, rock, logs, or sandbags
	  • import small diameter slash then roll back and walk down
	  • reseed an annual cover crop as soon as practical after construction
	  • transplant native shrubs, plant willow stakes or use other bioengineering techniques
	  • install slope indicators at locations where the risk of slope failure, or creep exists; consult a geotechnical engineer
	  • shut-down construction until the risk of erosion has been reduced or the conditions improve

Wind Erosion	• Shut-down or relocate construction activities until winds dissipate and conditions improve.
	• Consider using the following techniques if wind erosion of the topsoil/surface material windrow is of concern:
	  • apply water to the topsoil/surface material windrow
	  • windrow snow (if available) over the topsoil/surface material windrow
	  • tackify (at rate recommended by the distributor) the topsoil/surface material windrow
	  • pack the topsoil/surface material windrow with a sheepsfoot packer or other suitable equipment
	• Consider using the following techniques if wind erosion is of concern after/surface material replacement:
	  • seed cereal or sterile hybrid cover crop
	  • employ straw crimping at 2-2.5 tonnes/ha using weed-free straw sourced from Alberta or British Columbia. Straw sources must be approved by the Environmental Inspector(s) and are subject to landowner approval on private land or regulatory approval where there is a statutory requirement. Other erosion control measures may be used as per the Coastal GasLink Erosion and Sediment Control Plan
	  • apply hydromulch or tackifier
	  • import small diameter slash for use as rollback - walk down slash
	  • add locally available manure and cultivate
	  • install wind fences

Concern	Mitigation

Erosion or Failure of Streambanks	• Implement one or a combination of the following mitigation:
	  • install vegetated geogrid
	  • install coir logs
	  • install log cribwall bank protection
	  • install biodegradable erosion control matting
	  • plant willow stakes in the spring
	  • transplant willow clumps, install willow wattles, or brush layering
	  • install tree revetments
	  • install rock gabions or line the banks with riprap (subject to DFO approval)

C.8 DIRECTIONAL DRILLING PROCEDURES AND INSTREAM DRILLING MUD RELEASE CONTINGENCY PLAN

During trenchless installation methods, an accidental release of drilling mud adjacent to or into a watercourse could adversely affect the environment. The following contingency plan has been developed to ensure that appropriate measures are in place to reduce the risk of adverse effects during directional drilling.

Both the Contractor and Coastal GasLink must be diligent during all aspects of directional drilling to ensure that the potential for an instream drilling mud release is reduced; or if it does occur, that environmental effects are reduced.

Should the Contractor have an instream drilling mud release contingency plan in place, both plans will be reviewed by Coastal GasLink with the Contractor to ensure that the most stringent conditions of both plans apply.

C.8.1 General Measures

The following general measures will be implemented.

- Ensure that supervisory personnel are aware of this contingency plan prior to commencement of drilling activity.
- Arrange for access beyond the boundaries of the Project's surface rights agreement along the drill path to monitor, contain and cleanup potential frac-out releases.
- Install surface casing at the entry point to a depth that extends beyond the coarsest material, if warranted.
- Ensure that drilling mud composition is limited to bentonite-based systems (e.g., bentonite, water, and industry standard additives). All bentonite-based systems shall meet applicable regulatory requirements and shall be limited to those that in its composition and concentration, should an interaction with the environment occur, do not result in a significant adverse effect to the environment. At the Company's request, the contractor shall provide all product Material Safety Data Sheets (MSDS) for approval.
- Construct a sump at the entry point and a subsoil berm downslope of the proposed exit point with a capacity adequate to capture anticipated volumes of drilling mud that could be released during pullback and other drilling operations. Construct a sump with the above-noted capacity, at the exit point after the pilot hole has been completed (see Dwg. STDS-03-ML-05-131 in Appendix B).
- Install surface casing at the exit point if coarse-textured near surface deposits could interfere with drilling mud circulation.

- Develop a cleanup plan prior to drilling. The plan will be prepared by the drilling contractor in consultation with Coastal GasLink inspection staff. Acquire the appropriate approvals to access the release area if off ROW and for mud pump-off.
- Reclaim entry and exit sumps that contained drilling mud immediately after completion of drilling and remediate to meet the applicable requirements of the BC *Environmental Management Act* Oil and Gas Waste Regulation, Emergency Response Equipment.
- Maintain the following equipment onsite in sufficient quantities during drilling operations to contain any inadvertent drilling mud releases:
  - sandbags
  - filter cloth (e.g., silt fence)
  - T-bar posts
  - post pounders
  - light towers, flashlights or headlamps
  - shovels
  - 6 mm polyethylene
  - 2 trash pumps with sufficient lengths of leak-free hose and suction heads
- Maintain vacuum truck(s) onsite during pullback operations.
- Maintain the appropriate water quality sampling equipment onsite during drilling operations to ensure that accurate water quality samples can be taken. Onsite equipment to be provided by Coastal GasLink or their Contractor may include:
  - turbidity meter
  - sampling pole
  - chest waders
  - water sample bottles (approximately 30 - 500 ml bottles)
  - boat
  - coolers
- Implement the Water Quality Management Plan as required during drilling activities.
- Ensure that a minimum of three sets of walkie-talkies with spare batteries are onsite and available for use during monitoring operations.

C.8.2 Monitoring

The following measures will be implemented.

- Implement the Water Quality Monitoring Plan to monitor for sediment events during drilling activities. Water quality monitoring will be used to avoid exceedance of the CCME (2001) guidelines and provincial limits for TSS and as early warning signs of potential problems during construction.
- Supervisory personnel will be onsite at all times during drilling, reaming and pullback operations to ensure that emergency response measures will be implemented immediately and effectively. Coastal GasLink will also assign inspection personnel to the site during all phases of drilling of the watercourse.
- Monitor and record annular pressures throughout drilling.
- Monitor and record the amount of fluid return to the mud tank/pit and the amount of make-up drilling fluid required in the mixing tanks during drilling of the pilot hole and hole opening (reaming). Maintain a detailed log of all drilling activities in order to correlate drilling status with potential frac-out events.
- Monitor both onshore and instream portions of the drill path and surrounding area for signs of drilling mud release. All water quality monitoring must be done consistent with the Water Quality Monitoring Plan.
- Ensure that a minimum of three sets of walkie-talkies with spare batteries are onsite and available for use during monitoring operations.
- Supervisory personnel will be onsite at all times during drilling, reaming and pullback operations to ensure that emergency response measures will be implemented immediately and effectively. Coastal GasLink will also assign inspection personnel to the site during all phases of drilling of the watercourse.

C.8.3 Emergency Response

The loss of drilling mud into seams of coarse material, fissures, etc. routinely occurs during drilling operations. Since drilling fluid does not always flow to the surface, a loss does not necessarily indicate that the drilling mud has been released onto near shore areas or into the watercourse. Nevertheless, a release of drilling mud into a watercourse can adversely affect fish and fish habitat.

- Monitor and record the amount of fluid return to the mud tank/pit and the amount of make-up drilling fluid required in the mixing tanks during drilling of the pilot hole and hole opening (reaming). Maintain a detailed log of all drilling activities in order to correlate drilling status with potential frac-out events.
- Monitor both onshore and instream portions of the drill path and surrounding area for signs of drilling mud release. All water quality monitoring must be done consistent with the Water Quality Monitoring Plan. The size of the area to be

monitored will be determined by evaluating geotechnical conditions (i.e., amount of fracturing, type and depth of substrate) and drilling conditions (i.e., depth of drill path, distance between watercourse and entry and exit points). Monitoring will be on a continuous basis during drilling operations and will continue for at least eight hours after shut-down. Personnel equipped with walkie-talkies shall be positioned at the most advantageous locations to observe any sign of a release of drilling mud to the surface or in the watercourse.

- If the amount of mud released is not great enough to allow practical collection, the mud release will be allowed to dry and dissipate naturally.
- If the drilling mud release enters a watercourse, the Construction Manager will immediately notify Coastal GasLink's engineering staff as well as the Environmental Inspector(s). The Environmental Inspector(s) or Environmental Advisor will immediately notify the applicable provincial and DFO fisheries biologists, and the appropriate land authority (i.e., BC OGC). Any drilling mud release that enters waters or that may cause or is causing an adverse effect is reportable to BC OGC.

Contain and further prevent drilling mud from entering the watercourse from near shore areas by installing a berm of subsoil, sandbags or other material approved by the Environmental Inspector(s).

Conduct water quality sampling as directed by the Environmental Inspector(s). Instream and near shore containment/cleanup objectives include the following.

Instream

The following measures will be implemented.

- Divert streamflow around the mud release to the extent practical.
- Install silt fencing around the exit point(s), if practical.
- Remove mud from the watercourse by pumping, shovels or with a hoe.
- Dispose of mud in accordance with provincial requirements.

Consider the following options for diverting streamflow from the mud release area.

- Construct a dam and pump set-up on smaller watercourses.
- Install a flume to divert water past the release area.
- Install coffer dams made of sandbags or sheet metal.
- Attempt to contain the release point within an area isolated with aquadams or sheet metal, etc.

- If access is practical, consider covering the mud at the source point on stream bottom with a layer of poly and sand bags to prevent scouring of mud.

Consider the following options for removal of mud from instream.

- Use trash pumps or hydrovac truck. If trash pumps are used, ensure that the pump-off area does not drain directly into watercourse or construct a holding area. If a hydrovac truck is used, ensure that all activities comply with appropriate guidelines and industry practices.
- In consultation with provincial and DFO fisheries biologists, leave mud in place if current streamflow levels inhibit removal operations or removal will result in unacceptable terrain or instream damage.

Onshore

The following measures will be implemented.

- Contain the mud release immediately to limit the area affected and prevent the mud from entering the watercourse.
- Dispose of mud.

For onshore mud release, consider the following options for immediate containment.

- If accessible by heavy equipment, immediately construct berms or excavate a sump for containment.
- If not accessible by heavy equipment, construct weirs using logs, silt fence, rolls of matting, shovel trenches, and/or filter cloth and a containment area where appropriate.

Before allowing filtered water to enter the watercourse, ensure that the TSS level is within 10 mg/L of the background TSS levels.

Coastal GasLink's inspection staff will prepare a report summarizing the events leading up to the release as well as measures taken following the release to reduce effects on the environment. The report will be submitted to the Director of Regional Water Management within seven days of the mud release. Report the details of the spill to Emergency Management BC (EMBC) at 1-800-663-3456. The regional office with jurisdiction will review the report and request additional information accordingly.

Plans for Potential Continuance of Drilling

In the event of a release of drilling mud to water, drilling will only be allowed to resume if the potential for significant adverse effects on the environment is low, as determined by Coastal GasLink in consultation with DFO. The decision to resume

drilling may include consultation with the Environmental Advisor, project management, inspection staff, aquatic specialists, drilling or geotechnical consultant.

Implement measures to prevent the further release of drilling mud into the watercourse. Appropriate measures will vary depending on the lessons learned during the previous drill attempt.

Progressively implement the following measures to prevent the further release of drilling mud into the watercourse.

- Ensure that appropriate structures, materials, equipment, and personnel are in place and available in the event of a subsequent release of drilling mud.
- Reduce drilling mud pressures if practical.
- Plug fissures/fracture with nontoxic sealers or plugging agents pumped into the drill hole and left undisturbed for an appropriate period of time whereupon drilling will be resumed. If the sealing agents are not successful, drilling will be suspended, and the plan reviewed and revised.
- Employ downhole cementing to either seal off the problem zone for redrilling or seal off a large portion of the existing drill hole to a point where a new drill path (generally at a lower elevation) can be attempted. If these measures are unsuccessful, then drilling will be suspended, and the plan reviewed and revised.
- Move the drill and attempt to redrill from a new location employing the same protection measures implemented on the initial drill if conditions indicate that a second drill will be successful. If the contractor plans on discharging filtered water that will re-enter the watercourse, the TSS level will be within 10 mg/L of background TSS levels. Turbidity will be used as a proxy in this instance, with the relationship between the parameters determined before discharge of the water. Refer to Section 4.1 of the Water Quality Monitoring Plan for additional detail.

Alternative Crossing Method

Prior to construction, a detailed watercourse crossing and contingency plan for each proposed trenchless installation methods site will be prepared to address the possibility that the trenchless installations methods are unsuccessful. The plan will identify methods, measures and activity schedules to:

- Reduce effects on fish and fish habitat.
- Limit the risk of soil erosion and promote revegetation with suitable plant species.
- Reduce the disturbance of native vegetation (in particular rare plants and ecological communities) and wildlife and their habitats.
- Reduce disturbance of archaeological resources.

- Avoid navigational risks and reduce disruption to boaters.

The plans will be prepared by the project team with input from several resource specialists (wildlife, vegetation, fish and fish habitat, historical resource and reclamation specialists), engineering and construction personnel, contractors, and the results of consultation with the applicable regulatory agencies.

The following information will be considered within the plans:

- A summary of issues requiring mitigation.
- Schedules for the river crossing and onshore construction, and reclamation.
- Access routes and traffic control measures.
- Equipment and temporary workspace requirements.
- Site-specific plans to avoid, salvage or reduce effects on local features.
- A grade plan that identifies workspace requirements.
- Temporary and permanent erosion control measures including the identification of specific materials such as silt fencing, erosion control matting, etc.
- Revegetation procedures and seed mixes.
- Other information requested by regulatory agencies.
- Detailed drawings to support the above-noted information.
- Inspection and monitoring plans.

C.9 ECOLOGICAL COMMUNITY AND SPECIES OF CONCERN DISCOVERY CONTINGENCY PLAN

In the event that rare ecological communities or rare plants are discovered during vegetation studies along the Project Footprint or during construction of the Project or related facilities, the ecological community or plant population will be thoroughly documented and appropriate mitigation will be determined by the Vegetation Resource Specialist prior to the commencement of any pipeline, facility, or ancillary site construction, or before additional construction activities are allowed. Appropriate mitigation will be determined following an assessment of the ecological community or plant population of concern, which will take into account the following site-specific conditions and sensitivity criteria:

- The location of the ecological community or plant population relative to the construction ROW, facility site or ancillary sites.
- Construction activity timing.
- The relative rarity of the ecological community or plant species (regionally, nationally, etc.).
- The growth habits and propagation strategies of the community components or plant species.
- The habitat preferences of the ecological community or plant species.
- Community or population size and abundance in the local area.
- The proximity of available habitat.
- Expected or known sensitivity or resilience to disturbance of the community or plant species.
- Expected or known community or population viability/sustainability (both construction preparation and post-construction).
- Past mitigation success of the same or similar communities or species.
- Requirements or recommendations based on consultation with regulators.

Mitigation (i.e., staged mitigation) to avoid or reduce effects on the site that may be implemented includes the following:

- Avoid the site by realigning the route, relocating workspace or adjusting the equipment layout or location of the footprint.
- Avoid or reduce effects on the site by:
    - extending road or watercourse bores and provide alternative measures for equipment to travel past the area of concern (e.g., protection matting, or snow under frozen conditions; drive around)

- narrowing the ROW or workspace or re-orienting the proposed area of disturbance and clearly mark and protect the site using fencing and signage
- restricting access at the site and clearly mark with flagging and signage to inform all users of the restrictions
- reducing topsoil stripping, grading, or grubbing to the extent practical to protect plant root systems
- conducting careful topsoil salvage at the site, storing topsoil separately and ensuring it is returned to the exact location from where it was stripped
- leaving gaps in the spoil pile to avoid plants or plant populations
- temporarily covering the site (e.g., geotextile pads, flex net, snow, rig/swamp mats, plywood) to reduce physical disturbance of the vegetation/soil surface
- creating a raised ramp (e.g., bridge, rig/swamp mats) for traffic to travel on, to reduce compaction of the vegetation/soil surface
- carefully recontouring the site to match pre-disturbance site conditions so that drainage is not altered
- constructing under frozen conditions and there is full snow cover, if practical
- consult with the vegetation resource specialists regarding:
    - propagating specific components of ecological communities of concern or plants of risk via vegetative means (i.e., harvest seed from the ROW or adjacent area, sow onto ROW following cleanup), or reproductive means (i.e., collect seed or cuttings, grow in greenhouse, and plant onto ROW following cleanup)
    - salvaging and transplanting individual plants, portions of sod containing the plants of risk and the surrounding vegetation, or the feature that houses the plants (e.g., log or rock) to an appropriate off ROW receiving site
- fencing/flagging community components or populations that are outside the footprint to prevent incidental damage

- Reduce impact from compaction by freezing in the ground surface prior to vehicle access.
- Collect more information about the community or population by revisiting the area to confirm population abundance/extent in the area off of the ROW.
- Conduct post-construction monitoring to assess mitigation success (e.g., for five years starting in the first full growing season following cleanup).
- Alternative mitigation deemed appropriate by the Vegetation Specialist, Environmental Inspector(s) and Coastal GasLink.

C.10 WILDLIFE SPECIES OF CONCERN DISCOVERY CONTINGENCY PLAN

C.10.1 Wildlife Species of Concern Discovery Prior to Construction

In the event that wildlife species of concern or their site-specific habitat is discovered during future wildlife studies, the discovery will be assessed, and appropriate mitigation will be determined. The wildlife or habitat will be assessed by wildlife specialists based on the following criteria:

- The location of the wildlife or habitat feature with respect to the proposed area of development.
- The presence of topographic features or vegetation to effectively screen the wildlife or habitat from construction activities.
- The timing of construction versus the critical timing constraints for the species.
- The potential for an alteration of construction activities to reduce or avoid sensory disturbance.

Mitigation that may be implemented includes the following:

- Abide by seasonal timing constraints within the recommended set back distances.
- Abide by daily timing restrictions on construction activities.
- Narrow down the proposed disturbance area and protect the site using snow fencing and signage.
- Alter or delay construction activities to avoid sensory disturbance (e.g., no burning).
- Extend road or watercourse bores to avoid or reduce effects on the site.
- Inform all users of access restrictions in the vicinity of fenced sites.
- Realign the workspace to avoid the site.
- Install nest boxes or platforms or otherwise replace or enhance habitat during reclamation or reclamation.
- Relocate nests or other habitat features or individuals if practical and monitor post-construction response.

C.10.2 Wildlife Species of Concern Discovery During Pipeline Construction

Wildlife sighted by construction personnel will be recorded on Wildlife Sighting Cards and provided to the Environmental Inspector.

In the event that wildlife species of concern or their site-specific habitat are discovered during construction of the pipeline, the discovery will be assessed by a

Qualified Professional based on the criteria provided above and appropriate mitigation will be implemented from the list outlined below:

- Suspend work immediately in the vicinity of any unanticipated discovery of wildlife species of concern or habitat feature. Work at that location will not resume until the appropriate mitigation is implemented.
- Notify the Environmental Inspector(s) who will notify the Construction Manager of the unanticipated discovery.
- The Environmental Inspector(s) will assess the discovery and implement appropriate mitigation as described in the EMP and Wildlife and Wildlife Habitat Management Plan. Following mitigation implementation, construction will resume. If the mitigation cannot be implemented, or if alternative mitigation is needed, the Environmental Inspector will:
    - consult with a Resource Specialist/Qualified Professional for advice on alternative mitigation
    - discuss the alternative mitigation with the appropriate regulatory agency
- The Qualified Professional may deem it necessary to visit the site to develop an appropriate mitigation plan in consultation with the Environmental Inspector. The mitigation available includes that listed in Section 3.2.
- In the event a discovery is made during construction preparation, wildlife surveys or construction, the appropriate mitigation will be implemented and the Environmental Worksheets will be updated to incorporate these measures.

C.11 HERITAGE RESOURCE DISCOVERY CONTINGENCY PLAN

In the event that archaeological, historical or palaeontological resources are discovered during construction of the Project, the sites will be assessed by Coastal GasLink's Heritage Resource Specialist or appropriate resource specialist regarding palaeontological discoveries, and appropriate mitigation will be determined. The site will be assessed based on the following criteria:

- The significance of the site.
- The location of the site with respect to the Project Footprint.
- The feasibility of construction footprint refinement to avoid the resource.
- The decision of the appropriate regulatory agency (e.g., BC OGC or BC MFLNRORD).

In the event that heritage resources are discovered during construction, follow the measures outlined below.

- Suspend work immediately in the vicinity of any newly discovered archaeological or historical site (i.e., up to 100 m) and any newly discovered palaeontological site (i.e., within 30 m).
- Notify the Environmental Inspector(s) who will notify the Coastal GasLink Construction Manager and Coastal GasLink's Heritage Resource Specialist.
- Coastal GasLink's Heritage Resource Specialist will provide an initial assessment review of potential archaeological, palaeontological and historical remains and will advise the Environmental Inspector to allow construction to resume or, in the event of a confirmed or potential discovery, Coastal GasLink will proceed by notifying applicable regulatory agencies (e.g., BC OGC or BC MFLNRORD), as required.
- Arrange for emergency archaeological, historical (including architectural sites) or palaeontological resource excavation of previously unidentified sites endangered by the Project during construction, wherever such sites warrant attention and can be excavated safely. When, for practical reasons, the sites cannot be investigated, map and flag these sites for protection and later investigation.
- Coastal GasLink's Heritage Resource Specialist may deem it necessary to visit the site and will, regardless of whether a site visit is required, develop an appropriate mitigation plan in consultation with Coastal GasLink's Environmental Advisor and the relevant regulatory agency, as appropriate.
- Coastal GasLink will notify affected Indigenous groups of heritage resource discoveries within their Traditional Territory.

C.12 TRADITIONAL LAND USE SITES DISCOVERY CONTINGENCY PLAN

In the event that a TLU site is discovered during construction of the Project, the following measures will be implemented.

- Suspend work immediately in the vicinity of any newly discovered sacred sites. Work at that location may not resume until the measures below are implemented:
  - notify the Environmental Inspectors, who will notify the Coastal GasLink Construction Manager and the Coastal GasLink Heritage Resource Specialist
  - the Coastal GasLink Heritage Resource Specialist will assess the site and develop an appropriate mitigation plan using the information listed above
  - any potentially affected Indigenous community will be informed of the discovery and the mitigation to be implemented

C.13 ACID ROCK CONSTRUCTION RESPONSE PLAN

Please see *Acid Rock Construction Response Plan (Rev 4)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 5

Environmental Management Plan

Appendix D Management Plans

Appendix D.1 Chemical and Waste Management Plan
Appendix D.2 Traffic Control Management Plan
Appendix D.3 Access Control Management Plan
Appendix D.4 Hydrovac Cuttings Handling Plan
Appendix D.5 Contaminated Soils Management Plan
Appendix D.6 Caribou Mitigation and Monitoring Plan
Appendix D.7 Forest Pest Management Plan
Appendix D.8 Grizzly Bear Mitigation and Monitoring Plan
Appendix D.9 Human-Wildlife Conflict Management Plan
Appendix D.10 Invasive Plant Management Plan
Appendix D.11 Visual Quality Management Plan
Appendix D.12 Wetlands Management Plan
Appendix D.13 Wildlife and Wildlife Habitat Management Plan
Appendix D.14 Erosion and Sediment Control Plan

D.1 CHEMICAL AND WASTE MANAGEMENT PLAN

D.1.1 Purpose

The Chemical and Waste Management Plan has been prepared to provide guidelines for dealing with the generation of project waste, and to provide guidelines for dealing with the procurement, storing, and handling of hazardous materials required for the Project.

This plan outlines specific measures to be followed by all Coastal GasLink employees and contractors involved with the construction of the Project. The plan is designed to ensure that chemicals and wastes are procured, handled, stored, and disposed of in an environmentally responsible manner, thereby maintaining ecological and cultural integrity. This plan will reduce the likelihood of an accidental release of potentially hazardous waste products into the environment during construction.

This plan applies to all employees, contractors and consultants who conduct work on behalf of the Coastal GasLink during construction of the Project. All employees, contractors and consultants will abide by all federal, provincial, and local requirements for the storage, handling, transport, disposal and spill reporting requirements of all products and waste materials that are potentially hazardous to human health and the environment.

The Environmental Inspector(s) is responsible for assuring compliance with Coastal GasLink's Environmental Guidelines and all applicable codes, regulations and industry standards for waste management and handling chemicals. Where a discrepancy occurs, the most stringent requirements apply. In the event of a spill, the Spill Contingency Plan (see Appendix C.1) will be implemented. The Spill Contingency Plan sets forth the lines of communication and procedures to follow in order to facilitate containment and clean-up should a spill occur.

D.1.2 Applicable Regulations, Guidelines and Codes of Practice

Federal

- *Hazardous Products Act*, Hazardous Products Regulations (Workplace Hazardous Materials Information System [WHMIS] legislation)
- Canada Labour Code, Oil and Gas Occupational Safety and Health Regulation, Part XI Hazardous Substances
- *Transportation of Dangerous Goods* (TDG) *Act* and Regulation

Provincial

- Environmental Assessment Certificate
- *Environmental Management Act*

- Hazardous Waste Regulation
- *Oil and Gas Activities Act*
- *Workers Compensation Act* (Revised Statues of British Columbia [RSBC 1996]), Chapter 492
- OHS Regulation and Guideline
- Occupational Health and Safety Regulation
- *Public Health Act*
- BC *Fire Services Act* and BC Fire Code
- BC Oil and Gas Handbook Drilling Waste Management Chapter

D.1.3 Guiding Principles

Coastal GasLink is committed to performing its activities in an environmentally responsible manner. The following general guiding principles have been incorporated into this plan:

- Reasonable preventative measures will be taken to avoid the release of wastes and hazardous materials into the environment.
- All waste and hazardous material spills will be reported to the Environmental Inspector and to the appropriate authorities, in accordance with applicable provincial and federal legislation.
- All waste and hazardous material spills will be cleaned up promptly and thoroughly.
- Waste and hazardous materials will, to the extent practical, be recycled, disposed of or moved to an approved area as required.

Application

This Chemical and Waste Management Plan applies to the pipeline ROW, other construction areas, all staging areas, construction yards and public roadways being used in association with the Project. Awareness of these requirements will be integrated as appropriate into preconstruction training and orientations.

Description of Wastes and Chemicals

Potential Project related wastes have been divided into two categories for discussion of storage, handling and disposal procedures.

Solid Nonhazardous Wastes – include garbage and debris generated through the activities of personnel during pipeline construction and ROW reclamation. These wastes are nontoxic in nature and include, but are not necessarily limited to:

- food wastes
- pipe tape and coating
- spent welding rods
- grinder pads
- styrofoam and plastics
- wood
- wire
- survey stakes/flagging tape
- used geotextile
- metal strapping

Industrial Wastes - include wastes and products generated or utilized during pipeline construction. These materials may contain quantities of potentially toxic substances in the form of residues and include, but are not necessarily limited to:

- used oils (engine oil, transmission/drive train oil, hydraulic/lube oil, gear oils, lubricating greases)
- used lube filters
- spent grease cartridges
- used antifreeze (containers and cans of ethylene glycol, propylene glycol)
- contaminated soil, vegetation and/or absorbents that may contain hydraulic fluid, gasoline, diesel, or lube oil
- used solvents
- used batteries (automotive/equipment)
- film processing waste liquids
- spent cleaning products and associated materials rags

Potential Project-related chemicals that are likely to be found on the construction sites include, but are not necessarily limited to:

- batteries
- cleaning products
- fuels (gasoline, diesel, propane)
- lubricants (engine oil, transmission/drive train oil, hydraulic oil, gear oil, lubricating grease)
- coolants (ethylene glycol, propylene glycol)
- paints and solvents
- film processing chemicals
- glues (including epoxy and urethane coating products) and cements

D.1.4 Mitigation

All employees, contractors and consultants of Coastal GasLink will be required to comply with applicable regulations for the containment, handling, storage, use and disposal of wastes and chemicals.

General Measures

- Construction yards and staging areas that are designated as an industrial waste or chemical storage area will be selected and designed to:
  - avoid wetlands, watercourses, sensitive vegetation, highly permeable soils, steep slopes, areas within 100 m of any land subject to slope failure, and water supply wells
  - prevent vehicle incidents by providing unobstructed access (for delivery, disposal and emergency vehicles)
  - provide safe storage areas, including secondary containment, for all chemical liquids and hazardous wastes in accordance with applicable regulatory requirements
  - provide unobstructed access/egress to/from emergency response materials and equipment
- Areas designated for hazardous waste storage will meet the siting standards cited in Section 3 of the Hazardous Waste Regulation, unless otherwise authorized by the relevant regulatory authority.
- All Project staff with waste management and hazardous materials responsibilities will be educated in accordance with regulatory requirements specific to the

Project. All personnel shall understand their responsibilities for proper handling, identification, documentation and storage of wastes and hazardous materials.

- An appropriate number of portable toilets shall be made available to ensure each crew has ready access to washroom facilities. The facilities will be serviced and cleaned regularly and will be adequately secured. All site personnel are to use portable toilets as provided.
- The Contractor shall register with the appropriate provincial government department with respect to hazardous materials (to obtain a hazardous waste generator number or equivalent) and shall, at that time, provide detailed manifest information regarding the location of the staging areas, the types of waste that will be produced, the transport vehicle and the licenced hazardous waste transportation company that will be collecting the waste for disposal.

Prevention of Release into the Environment

- The Contractors' equipment will be clean and in good operating condition.
- Contractors will be supplied with a list of required stand-by equipment and required spill response container supplies to respond to large volume spills. The stand-by equipment will be stationed in the field construction yards. Appropriate measures will be taken immediately to limit the spread of the contamination, in accordance with the Spill Contingency Plan (see Appendix C.1 of the EMP).
- Prior to construction kick-off, the Contractor will ensure that all spill response equipment and materials are onsite or readily available.
- Fuel/service vehicles will carry:
  - fire extinguishers
  - shovels
  - an impermeable barrier for placing under vehicles to be serviced
  - hydrocarbon spill kits complete with a minimum of 10 kg of sorbent material for clean-up of small spills
- Sorbents, barrier materials (e.g., impermeable liners, etc.), shovels, a water boom, and 210 l storage drums will be stockpiled at the contractor yards/staging areas to respond to small spills.

Waste and Chemical Handling

- Personnel who will be handling waste materials will possess valid WHMIS training.
- All fuel truck drivers, and drivers transporting waste or chemicals will have current TDG certification.

- During waste and chemical handling activities, employees and contractors will use appropriate personal protective equipment to prevent any contact with material.
- Procedures for safe loading and unloading of products will be followed:
  - service vehicles will be equipped with automatic shut-off valves
  - brakes will be set
  - the vehicle will be grounded if the product is flammable
  - the operator will observe loading and unloading activities at all times
  - when complete, the operator will examine all outlets for leaks and take corrective action if leaks are identified

Waste and Chemical Storage

- An appropriate number of waste and recycling receptacles will be made available during the Project.
- Designated industrial waste storage areas at a facility shall be designed to meet all applicable federal and provincial regulations.
- Hazardous materials will be stored in designated storage area(s). Short term hazardous material storage on the ROW may be designated at the discretion of the Environmental Inspector, if necessary, for specific tasks.
- Hazardous materials and industrial wastes will be stored greater than 100 m from a wetland, watercourse, or waterbody.
- Designated storage areas will be clearly identified and secured. Waste stored in any containers must be clearly labelled to comply with TDG Act and WHMIS regulations.
- Hazardous wastes will be separated by type.
- Secondary containment may be required depending on the location, type, volume and duration of the waste or chemical being stored. Secondary containment will be in accordance with applicable federal, provincial and municipal requirements.
- Containment devices will be constructed from suitable metallic or non-metallic materials capable of containing the stored product.
- Secondary containment areas not protected from the elements will be monitored regularly to ensure that ice, snow, or rainwater have not decreased the volumetric capacity for storage of a spill to be less than 125% of the aggregate storage volume of the containment area. Water accumulated within a secondary containment structure may be removed if authorized by the Environmental Inspector. If there is visible hydrocarbon sheen, the water will be collected for proper storage and disposal.

- Where hazardous waste is not hydrocarbon based and water accumulates within the secondary containment structure, the water will be sampled before removal. If there is evidence of contamination, the water will be collected for proper storage and transported to an appropriate facility for treatment and disposal.
- Containers and tanks will be closed when not in use. Drain valves will be locked to prevent accidental or unauthorized releases.
- Secured non-hazardous materials (i.e., skids, geotextiles, survey stakes, etc.) that pose no threat to the surrounding ecosystem will be neatly stockpiled in locations along the ROW for disposal. The disposal frequency is dependent upon the type of material stockpiled and will be determined by the Environmental Inspector.
- The Contractor will visually inspect designated hazardous material storage areas and aboveground tanks on a regular basis as well as when the tank is refilled. The Contractor shall maintain inspection records in accordance with applicable federal, provincial and local requirements. Identified problems or deficiencies shall be corrected in a timely manner.
- The Contractor will remove all secondary containment structures at the end of the construction phase and return the impoundment area to its original contours and appearance, including establishing appropriate drainage patterns and vegetation cover.

Waste Disposal

- All waste materials will be disposed of in accordance with federal and provincial legislation and municipal/regional regulations as required.
- Each construction site will be equipped with adequate garbage receptacles for solid non-hazardous wastes and debris. These materials will be collected as required and disposed of at approved locations. Food wastes will be stored in animal proof (bear-proof) containers and transported to an appropriate landfill site.
- Receptacles for industrial wastes and hazardous wastes generated during construction will be provided in order to keep them segregated from non-hazardous waste. Used oil and oil filters will be placed in sealed containers and delivered for disposal by a qualified service contractor.
- Receptacles for recycling various products (e.g., paper and tin) will be available at Project construction yards and workforce accommodations and will be hauled to appropriate recycling depots.
- Naturally occurring radioactive materials (NORMs) will be transferred to approved locations by a qualified contractor for final disposal.
- Polychlorinated biphenyl (PCB) treatment or disposal facilities must be pre-approved by Coastal GasLink. This includes third party waste brokers,

consultants, and contractors. PCB concentration must be thoroughly characterized prior to special treatment or disposal.

Documentation and Record Keeping

- Material Safety Data Sheets (MSDSs) or Safety Data Sheets will be available for each product stored at a particular construction yard or staging area.
- The contractor will maintain a record of the routine inspections performed on the industrial waste storage area(s).The Contractor will furnish Coastal GasLink construction office with any and all inspection reports monthly.
- Provincial manifest records will be reviewed by an authorized Coastal GasLink representative with current TDG certification when waste is transferred from a temporary storage facility for transport to a final disposal location.
- The Environmental Inspector(s) will be provided with copies of waste manifests. Provincial manifest records must be reconciled within six weeks of initial shipment date. Until notification that the waste has been received at its final disposal location, the waste is the responsibility of Coastal GasLink.
- Copies of manifest records must be kept in a central location for a minimum of two years after the waste has arrived at its final disposal location.

D.2 TRAFFIC CONTROL MANAGEMENT PLAN

This plan deals with the management and control of pipeline construction traffic along the pipeline route and temporary access routes. It covers activities during preconstruction, construction and post-construction phases of the Project.

D.2.1 Purpose

The Traffic Control Management Plan provides guidelines for vehicular use on the ROW and associated access roads. The intent is to reduce disturbance resulting from pipeline construction on these lands, particularly in riparian areas and in areas of high erosion hazard. All vehicle and equipment operators will adhere to the contingency measures for wet/thawed conditions outlined in the Wet Soils Contingency Plan (see Appendix C.4).

The plan objectives will be accomplished by reducing the development of access routes, selecting appropriate access routes that cause the least disturbance, managing traffic on these routes and determining appropriate as-left treatment at the completion of the Project.

D.2.2 Construction Preparation

The relevant regulatory authorities will be notified of all access road upgrading requirements and Coastal GasLink will accommodate continued public access during pipeline construction whenever practical.

Prior to construction activities, Coastal GasLink will place notices in local and regional newspapers where appropriate to announce the Project initiation and the construction schedule. Information regarding labour, equipment, and activity schedules will be provided to applicable municipal and provincial authorities prior to the commencement of work.

The Project will adhere to the following principles.

- All motorized vehicle traffic, including ATV, ARGO and snowmobile traffic, will be confined to the approved route, access roads or trails except where specifically authorized by the relevant regulatory authority.
- ATVs and ARGOs may be used during preconstruction activities if minimal terrain effect is anticipated. Vehicle travel across wetlands and riparian areas will be reduced to the extent practical.
- Prior to commencement of construction activities, features of concern flagged during biophysical surveys or indicated on the Environmental Worksheets, Table 1 or Table 2 will be clearly marked. Following clearing, snow fencing will be installed to delineate the sensitive resources.

The development and maintenance of access roads required prior to, or during construction, will adhere to the relevant requirements set out in the EMP.

D.2.3 Construction

During construction:

- All Project personnel and other visitors to the ROW will participate in the Contractor orientation program.
- All access points to the ROW will be flagged and signed to discourage public use.
- All vehicular traffic will be restricted to the approved and staked pipeline route, workspace and access roads.
- Construction and inspection personnel and visitors to the ROW and other work sites will receive instruction on locations suitable for parking vehicles and equipment.
- Snow fencing and signage will be erected to protect features of concern as specified in the EMP. The boundaries of shooflies and trails will be clearly staked.
- Coastal GasLink, Contractor and all subcontractor personnel will avoid areas that are fenced or staked and abide by any restrictions on in/out privileges that are implemented in areas requiring special protection.
- Coastal GasLink, Contractor and all subcontractor personnel will limit travel up and down the ROW during the course of the work. General touring trips on the ROW will be reduced.
- Special measures such as limiting of construction traffic, and/or the installation of swamp mats or matting may be warranted in areas with poorly-drained and organic soils (see the Wet Soils Contingency Plan in Appendix C.4 of the EMP).
- Construction personnel will be transported between construction yards, construction workforce accommodations and the construction site by multi-passenger vehicles to the extent practical, in order to reduce vehicle traffic.
- Control measures may be put in place to ensure traffic adheres to special restrictions that are in effect (e.g., narrowing of workspace to limit effect on a species of concern).
- Obey ROW speed limits. Coastal GasLink will set the speed limit on the ROW. Speed limits may be lowered under specific conditions such as areas with poor visibility, steep terrain or areas where specific wildlife concerns have been identified.
- Post winter speed limits of 80 km/hr on high grade roads and 60 km/hr on secondary roads in UWRs (BC OGC 2013), unless otherwise directed by an

applicable transportation authority (i.e., adhere to the posted speed limit for a road if it is less than these speeds).

- Generally, post winter speed limits of 80 km/hr on high grade roads and 60 km/hr on secondary roads in UWRs (BC OGC 2013), unless otherwise directed by an applicable transportation authority (i.e., adhere to the posted speed limit for a road if it is less than these speeds).
- All Project-related vehicles will follow applicable traffic, road-use and safety laws.
- All vehicle traffic will avoid unnecessary wheel spin.
- During nonfrozen conditions, equipment travel, particularly that of heavy and/or tracked equipment, will make use of the stripped and graded areas for travel and passing.
- Vehicles will be limited to travel on the access roads and ROW for which they are designed. Most vehicles are able to turn around within the width of the construction ROW. Stringing trucks require extra turning radius. Consequently, approaches to the pipeline ROW or existing public roads will need to be wider when used for stringing trucks. Where turnarounds are required on the ROW, extra space will be required on the travel side of the ROW. Previously disturbed areas will be used for this purpose, when practical.

D.2.4 Post-Construction

After construction is complete, reclamation efforts will be initiated, and traffic will adhere to the following principles to ensure there is as little disturbance as practical.

- Deactivate and reclaim all temporary construction access roads and shooflies, as identified in applicable agreements or regulatory requirements. Block newly created access points unless otherwise directed by Coastal GasLink or the appropriate regulatory agency.
- Vehicle traffic will be reduced on newly seeded areas until ground cover is re-established.
- Routine access to the ROW for operations, maintenance and monitoring activities will be by way of pre-existing roads and trails wherever practical. Where travel along the ROW in the vicinity of sensitive vegetation (e.g., ecological communities of concern or species of concern, vegetation that is re-establishing) is required (e.g., during reclamation monitoring) foot travel will be used whenever practical. ATV/ARGOs will be used if necessary.
- Implement Section 4.5, Post Construction, of the Access Control Management Plan.

D.3 ACCESS CONTROL MANAGEMENT PLAN

Please see *Access Control Management Plan (Rev 5)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 15

D.4 HYDROVAC CUTTINGS HANDLING PLAN

In order to ensure the disposal of Hydrovac slurry complies with all applicable provincial and/or federal Guidelines and reclamation objectives, Coastal GasLink will implement a number of measures during construction of the Project.

- The contractor will ensure that the Coastal GasLink has reviewed and approved an onsite disposal site prior to starting Hydrovac operations, where onsite disposal will be used.
- Ensure road weight restrictions are adhered to.
- The hydrovac contractor is to ensure that all tanks are clean and free of contaminants prior to arriving onsite.
- Salvage topsoil/surface material prior to hydrovac use. Topsoil salvage is not required for holes less than 1 m in diameter if soil will be removed using a hydrovac during frozen soil conditions or where the area to be exposed will be subsequently subject to topsoil/surface material salvage as part of ROW preparation activities.
- As hydro-vac slurry from new disturbances is generally of mineral soil content and is not likely to be contaminated, onsite disposal is the preferred method if subsidence is not a concern. The disposal area must be in a location that has had the surface materials removed. If a dike is required to contain slurry, dike material shall be of subsoil or an alternative material approved by the Environmental Inspector capable of containing the slurry.
- Non-contaminated slurry may be released into the hydrovac excavation if future subsidence of the site is not a concern and the area is fenced until the tailings are dry.
- If temporary onsite storage is to be constructed (e.g., sump or bermed area) the surface materials must be removed from the area. The area constructed must be able to contain slurry and prevent any off site migration.
- Hydrovac contractor may temporarily store slurry in their trucks or at a site that is designed to safely store slurry. Use clean oilfield storage tank or metal slop bin for temporary storage if other more practical storage options (i.e., temporary pits) are not desirable for the site.
- Wet hydrovac slurry cannot be sent to a landfill even if it is not contaminated with hazardous substances. Wet hydrovac slurry can be disposed of by the hydrovac contractor to a licensed treatment or disposal facility where accepted. Appropriate documentation must be provided to Coastal GasLink to verify that hydrovac slurry disposal is in accordance with regulatory requirements and to the satisfaction of Coastal GasLink.
- Do not mix contaminated slurry with uncontaminated slurry.

- Contaminated and potentially contaminated slurry needs special handling storage and disposal requirements.
- If contaminants are suspected, do not remove the hydrovac slurry from the site. Arrangements should be made to temporarily contain the slurry onsite pending analysis and final disposal arrangements.
- All hydrovac holes shall be adequately back filled with mineral soil, or other materials as directed by the owner of the facilities, to ensure settling of material does not pose a hazard for wildlife, livestock or the general public.

D.5 CONTAMINATED SOILS MANAGEMENT PLAN

Soil excavation is required for the installation of the pipeline and associated facilities. During these activities, soil (and accompanying water) suspected of contamination from known or unknown sources might be encountered.

D.5.1 Goals

The contingency plan outlined below has been developed and will be employed to:

- reduce adverse effects to an acceptable level (see CCME 1999)
- ensure appropriate federal and provincial reporting
- maintain a safe working environment on the Project area
- employ environmentally and economically responsible construction practices at all times and in accordance with applicable industry standards

Coastal GasLink, its Contractor(s), and subcontractor(s) are responsible for implementing and maintaining all mitigation and remediation measures unless otherwise specified.

D.5.2 Known Contaminated Sites

There are three known contaminated sites associated with the Project (Inventory of Potentially Contaminated Sites TDR (Appendix B of the Social Technical Report). The BC Site Registry search found three results, two near KP 391.7 and one located near the endpoint of the proposed route at KP 664.7_R3. Of these three results, two are still considered Active – Under Remediation and one site is Inactive – No Further Action. The Project Area does no cross any contaminated sites listed on the Federal Contaminated Sites Inventory. If Coastal GasLink becomes aware of contaminated soils before construction, they will be excavated and stored onsite in approved locations for disposal subject to the below.

The pipeline route and associated permanent facilities do not traverse any contaminated sites listed on the Federal Contaminated Sites Inventory or by the British Columbia Crown Land Restoration Branch. If Coastal GasLink becomes aware of contaminated soils before construction, they will be excavated and stored onsite in approved locations for disposal subject to the below.

- Contaminated soils will be manifested and disposed of in accordance with the Chemical and Waste Management Plan (Appendix D.1 of the EMP), the CCME, BC *Environmental Management Act* and BC Contaminated Sites and Hazardous Waste Regulations as applicable.

- If conditions dictate an environmental risk to adjacent properties, Coastal GasLink will direct the Contractor(s) to install additional measures such as an impervious berm around the work area; lined sediment ponds; and additional soil and water testing to monitor the potential for offsite product migration and contamination.

D.5.3 Unknown Contaminated Sites

In the event a suspected contaminated area is encountered, the procedure will be as follows:

1. Coastal GasLink's Contractor will suspend all work in the immediate area.
2. Coastal GasLink's Contractor will immediately notify the Construction Manager and Environmental Inspector of the situation.
3. Coastal GasLink will conduct a preliminary site assessment to determine whether the soil in question is potentially contaminated. Potential contamination will be defined as "the presence of a substance of concern, or a condition, in concentrations above appropriate pre-established criteria in soil, surface water, groundwater, air or structures" (CSA 2001).
4. Coastal GasLink will assess whether the soil in question could potentially be contaminated based on:
    - the specific location of the suspect/contaminated soil
    - adjacent land uses
    - how it was encountered (excavated, oozing, flowing, solid, etc.)
    - quantity of contaminant (volume of soil/liquids)
5. Based on the site indicators, including olfactory and visual indicators, Coastal GasLink may consult an appropriate third party consultant to determine if the site is contaminated, including the necessity for boreholes or test pits to sample and test soils.
6. Coastal GasLink's Contractor will secure the area and any suspect excavated soil, and any unnecessary contact/disturbance of the soil will be avoided. Potential securing methods include:
    - placing the excavated soil on a impervious liner
    - covering the excavated soil with an impervious membrane to isolate it from weather events
    - storing the excavated soil away from any watercourses, wetlands, or crops
    - placing impermeable berms around the excavated material to isolate and contain the soil

If it is determined that the soil is contaminated with a hazardous waste, as defined by the Hazardous Waste Regulation, storage requirements defined in the Hazardous Waste Regulation will be followed.

7. If an excavation can be safely left open, the area will be secured until further direction can be obtained. If the excavation cannot be safely left open, it will be backfilled with its own excavated materials.
8. Work will be suspended if:
    - continuing to excavate in a suspect/contaminated site could pose a threat to the health and safety of the worker(s) (see CCME 1999. Canadian soil quality guidelines for the protection of environmental and human health)
    - issues of non-compliance with environmental legislation might result from continuing to work in areas of contaminated soils
9. Resolution of the management of contaminated materials will include the following points:
    - completion of the work
    - ensuring compliance concerns are addressed
    - ensuring health and safety concerns are addressed (see CCME 1999. Canadian soil quality guidelines for the protection of environmental and human health)
    - ensuring proper manifesting, removal, treatment, and disposal of any soil and/or waters where Coastal GasLink has responsibility (see Appendix C.1, Spill Contingency Plan)
10. Contaminated soils will be excavated, stockpiled, manifested, and disposed of at an approved facility. Based on olfactory and visual indicators, specialists will be deployed to the area to direct cleanup and disposal of contaminated materials.
11. If existing contamination is encountered and remediated, notifications of independent remediation and completion will be sent to the BC Ministry of Environment and Climate Change Strategy (BC MECCS) as required in Section 54 of the BC *Environmental Management Act* and Section 57 of the BC Contaminated Sites Regulation. A copy of the notifications will also be sent to BC OGC along with an BC OGC Site Classification Report.

D.6 CARIBOU MITIGATION AND MONITORING PLAN

Please see *Caribou Mitigation and Monitoring Plan (Rev 5)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 10

D.7 FOREST PEST MANAGEMENT PLAN

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1.0 INTRODUCTION

The Forest Pest Management Strategy provides the framework for the pest management plan; the strategy may vary from region to region depending on stated forest health strategies and priorities. The Forest Pest Management Strategy was designed by incorporating the established Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) Forest Health Strategies for all Natural Resource Districts intersected by the Project. This plan will provide strategic and operational guidance to mitigate the occurrence and spread of forest pests under the Environmental Protection and Management Regulation (BC. Reg. 200/2010, June 25, 2010) pursuant to the *Oil and Gas Activities Act* (SBC 2008 CHAPTER 36, January 14, 2014). In addition, the plans will provide strategies to mitigate impacts on forest health from any damage agent (including forest pests, pathogens and abiotic agents) during Coastal GasLink Pipeline Ltd. (Coastal GasLink) operations on the Coastal GasLink Pipeline Project (Project) footprint.

The Provincial Forest Health Strategy implements three key strategic forest health objectives:

- Protect forest resources from pest damage by direct actions when operationally possible and justified.
- Implement stand establishment activities to minimize the expected impact of known forest pests.
- Assess pest impacts on forest values to improve estimates of timber yield from British Columbia's (BC) forests and prioritize management interventions.

2.0 PROVINCIAL FOREST HEALTH PROGRAM

The following statements are from the BC Provincial Forest Health Program (2013-2016):

Vision Statement: The Provincial Forest Health Program minimizes the negative impacts of forest health agents on the forests of British Columbia.

Mission Statement: Provide science-based, economically rationalized best management practices and implement treatment programs that prevent or mitigate the impacts of forest health agents.

2.1 FOREST HEALTH OBJECTIVES

According to the provincial Forest Health Program (2013-2016), the government's three key strategic forest health objectives are to:

- Protect forest resources from pest damage by direct actions when operationally practical and justified.
- Implement stand establishment activities to minimize the expected impact of known forest pests.
- Assess pest impacts on forest values to improve estimates of timber yield from British Columbia's forests and prioritize management activities.

2.2 STRATEGIC GOALS

According to the provincial Forest Health Strategy (2013-2016), the government's three forest health strategic goals are:

- Pest impacts are monitored and assessed.
    - The evaluation of pest impacts on forest resource values is supported by forest health monitoring and assessment.
- Practices are adapted to accommodate known forest health risk.
    - Forest practices are modified to minimize the impacts of forest health factors based on the best available information.
- Resources are protected.
    - Forest resources are protected from pest damage through appropriate applied direct management actions.

3.0 PROVINCIAL BARK BEETLE MANAGEMENT

The province actively manages for bark beetles, defoliators and invasive forest pests. As bark beetles are the leading damaging agents of forested lands in BC (Westfall & Ebata, 2014), they require a separate management program. There are several bark beetle species in BC; however, only four currently pose significant management concerns (see Table 3-1).

Table 3-1: Bark Beetle Descriptions of Significant Concern

Bark Beetle Species	Host Tree	Timing	Life Cycle
Mountain pine beetles	Lodgepole pine, ponderosa pine, white pine	Mid July to mid-August	One-year
Spruce beetles	Engelmann spruce, white spruce, Sitka spruce	Late May to early July	Two-year
Douglas-fir beetles	Douglas fir	Late April to June	One-year
Western balsam bark beetles	Mature true firs (primarily subalpine fir)	Late May or June	Two-year

3.1 PROVINCIAL BARK BEETLE MANAGEMENT OBJECTIVES

According to the provincial Forest Health Strategy (2013-2016), the following are specific bark beetle management objectives:

- Focus on bark beetle management investments in areas that maximize benefits.
- Implement policies that encourage industry participation in efficient and effective beetle management.

3.2 PROVINCIAL BARK BEETLE MANAGMENT STRATEGIES

According to the provincial Forest Health Strategy (2013-2016), the following are specific bark beetle management strategies:

- Phase out the Emergency Bark Beetle Management Area map and replace it with guidelines and processes that allow effective use of existing legislation and policy at the local level.
- Work with the appropriate policy branches to ensure a seamless transition during the Emergency Bark Beetle Management Area phase-out process.
- Continue to apply suppression tactics to high-priority beetle management units, as determined by the provincial beetle management ranking system, to protect current and mid-term timber supply and other resource values.

- Aggressively monitor and manage Douglas-fir and spruce beetles, particularly in timber supply areas heavily affected by mountain pine beetle, to mitigate impacts on both timber and non-timber resource values.

4.0 DISTRICT AND REGIONAL FOREST HEALTH STRATEGIES

4.1 NADINA NATURAL RESOURCE DISTRICT (2016-2017)

The Nadina District Forest Health Strategy falls within the Skeena Region, and incorporates the Morice and Lakes Timber Supply Areas (TSA). The Forest Health Strategy has several objectives that must be met to successfully achieve set goals:

- Maintain detection and reporting programs.
- Produce incidence maps as a tool for assessing current impacts at stand and landscape levels.
- Identify new pest risks to resource values in the context of climate change.
- Implement strategies and tactics according to scientifically sound practices.
- Continue to improve management practices.

4.2 OMINECA REGION (2017-2018)

The Omineca Region Forest Health Strategy incorporates the Prince George TSA (Fort St. James, Vanderhoof and Prince George Districts), Mackenzie TSA and the Robson Valley TSA. The Omineca Region Forest Health Strategy provides a framework to coordinate and guide forest health activities within the TSAs of the Omineca Region while ensuring consistency with the existing legislative objectives and the provincial forest health strategies and guidelines. The strategy aims to:

- Incorporate the principles of Integrated Forest Health Management (IFHM) to effectively mitigate the risks and impacts of priority pests and pathogens on resource objectives.
- Provide guidance in the form of best practices for managing priority pests and pathogens.
- Summarize the current knowledge regarding the impact of forest health factors on timber supply.
- Provide ecologically sound, scientific techniques for the protection and enhancement of resource values.

4.3 NORTHEAST REGION (2017-2018)

The Northeast Forest Health Strategy incorporates the Fort Nelson, Fort St. John and Dawson Creek TSAs. The Forest Health Strategy provides a framework to coordinate and guide forest health activities within the TSAs of the Northeast Region while ensuring consistency with the existing legislative objectives, the provincial forest health strategies and guidelines, and the Omineca Forest Health Strategy. The strategy aims to:

- Incorporate the principles of Integrated Forest Health Management to effectively mitigate the risks and impacts of priority pests and pathogens on resource objectives.
- Provide guidance in the form of best practices for managing priority pests and pathogens.
- Summarize the current knowledge regarding the impact of forest health factors on timber supply; and provide ecologically sound, scientific techniques for the protection and enhancement of resource values.

5.0 PROJECT-SPECIFIC FOREST HEALTH FACTORS

5.1 FOREST PESTS THAT MAY BE MOVED OR WORSENED BY PROJECT ACTIVITIES

The Project crosses multiple natural resource districts as it traverses the interior of BC and terminates on the west coast. Because of the Project's extensive footprint, there is potential for interaction with many forest health and forest pest concerns. However, most of these concerns are not at risk of being moved or worsened by the Project.

The province of BC is facing mid-term timber supply issues across many forest districts in the interior. Because of this fact, it is important to ensure that forest health, or forest pests that impact younger stands, are monitored closely. At this time, four forest health/forest pest concerns have been identified as high risk. The decision to rank these pests as high risk was based on their status in the forest district, the potential for the Project to worsen the forest health or forest pest concern, and the potential for areas adjacent to the Project to be impacted. The high-risk forest health concerns are as follows:

- Spruce beetle
- Douglas fir beetle
- White pine blister rust
- Annosus root disease

Table 5-1 summarizes the forest health and forest pest concerns that have been identified in the Project area; as well as, their risk rating for the Project. In this case, the risk rating refers solely to the potential for the concern to be moved or worsened by the Project and is not the overall risk of the concern at a landscape level, and not necessarily the risk identified in the applicable district forest health strategy.

Table 5-1: Forest Health and Forest Pest Risk Ranking

Concern	Natural Resource District(s)*	Risk Ranking	Rational
Spruce beetle	DPC, DPG, DND	Very High	Potential to spread via logging debris.
Annosus root disease	DCM	High	Potential to spread via mechanical damage.
White pine blister rust	DCM	High	Whitebark pine will be adversely impacted by any increase in white pine blister rust infestations.
Douglas fir beetle	DPG, DVA	Medium	Potential to spread via logging debris.
Western gall rust	DPG, DVA, DND	Medium	Potential to impact adjacent stands.

Table 5-1: Forest Health and Forest Pest Risk Ranking (cont'd)

Concern	Natural Resource District(s)*	Risk Ranking	Rational
Commandra blister rust	DPG, DVA, DND, DVA	Medium	Potential to impact adjacent stands.
Concern	Natural Resource District(s)*	Risk Ranking	Rational
Stalactiform blister rust	DPG, DVA, DND	Medium	Potential to impact adjacent stands.
Wind	DCM	Medium	Potential to impact adjacent stands.
Mountain Pine Beetle	DPC, DPG, DVA, DND, DCM	Low	Infestation levels are already very high.
Western Balsam Bark Beetle	DPC	Low	Very low anticipated risk of this pest to be moved or worsened by Project activities.
Lodgepole Pine Beetle	DPC	Low	Very low anticipated risk of this pest to be moved or worsened by Project activities.
Ips Bark Beetle	DPC	Low	Very low anticipated risk of this pest to be moved or worsened by Project activities.
Warren's root collar	DCM	Low	Very low anticipated risk of this pest to be moved or worsened by Project activities.
Dothistroma needle blight	DCM	Low	Very low anticipated risk of this pest to be moved or worsened by Project activities.
Spruce Weevil	DCM	Low	Very low anticipated risk of this pest to be moved or worsened by Project activities.
Hemlock dwarf mistletoe	DCM	Low	Very low anticipated risk of this pest to be moved or worsened by Project activities.

Notes:
Peace Natural Resource District (DPC)
Prince George Natural Resource District (DPG)
Vanderhoof Natural Resource District (DVA)
Nadina Natural Resource District (DND)
Coast Mountain Natural Resource District (DCM)

5.2 PEACE NATURAL RESOURCE DISTRICT – KP 0+000 TO 139+476

The Peace Natural Resource District (NRD) is situated in the northeastern section of BC, and includes several parks, protected areas, ecological reserves, private land and various leases (BC MOF, 2016). The Peace NRD incorporates the Dawson Creek TSA, the Fort St. John TSA, TSA 41, TSA 40; as well as, Tree Farm License (TFL) 48 (belonging to Canadian Forest Products Ltd) (BC MOF, 2016).

The top five forest health factors are as follows for the Peace Natural Resource District (BC MOF, 2016) (BC MOF, 2017-2018):

- Mountain Pine Beetle (Moderate)
- Spruce Beetle (Moderate)
- Western Balsam Bark Beetle (No ranking)
- Lodgepole Pine Beetle (No ranking)
- Ips Bark Beetle (No ranking)

5.3 OMINECA REGION – KP 139+117 TO KP 400+302 (PRINCE GEORGE NRD AND VANDERHOOF NRD)

The Omineca Region contains three of the 38 administrative timber management 4units: Prince George TSA, Mackenzie TSA and Robson Valley TSA (BC MOF, 2017). The Project intersects the Prince George TSA, which encompasses three forest districts: Fort St. James, Vanderhoof and Prince George. The Prince George TSA extends from the Alberta border in the southeast, to the Spatsizi Plateau Wilderness Park in the northwest and Tweedsmuir Provincial Park in the southwest and covers approximately 7.97 million hectares (BC MOF, 2017). The Project transects both the Prince George and Vanderhoof NRDs, thus they will be the focus of this section.

The top forest health factors are as follows for the Prince George NRD (BC MOF 2017):

- Spruce Beetle (high)
- Mountain Pine Beetle (moderate)
- Comandra Blister Rust (moderate)
- Stalactiform Blister Rust (moderate)
- Western Gall Rust (moderate)
- Douglas-fir beetle (monitor) *although this pest is of low importance in the Omineca, there is potential for an increase of spread within the next year or two, thus the population should be carefully monitored.*

5.4 NADINA NATURAL RESOURCE DISTRICT – KP 400+302 TO 592+182_R2 AND 602+970_R2 TO 614+764_R1

The Nadina NRD is located on roughly 2.6 million ha in north central BC (BC MOF, 2016). The district extends from Tweedsmuir Park in the south to the Babine mountains in the north, and from Hungry Hill in the east to the Endako River in the east (FLNRO, 2014). The Nadina NRD contains two timber supply areas, the Lakes TSA and the Morice TSA. The Nadina NRD implemented a monosodium methanearsonate (MSMA) treatment program for bark beetle management, which ceased in 2004; for further information on MSMA refer to Appendix B.

The top forest health factors are as follows for the Nadina NRD (BC MOF, 2016):

- Mountain Pine Beetle (very high)
- Spruce Beetle (very high)
- Commandra Blister Rust (high)
- Western Gall Rust (high)
- Stalactiform Blister Rust (high)
- Warren's root collar weevil (moderate)

5.5 COAST MOUNTAIN NATURAL RESOURCE DISTRICT – KP 592+182_R2 TO KP 602+970+R2 AND KP 614+764_R1 TO 667+392_R0

The Coast Mountain NRD is located in northwestern BC (BC MOF, 2007). The Coast Mountain Natural Resource District contains a diversity of Biogeoclimatic zones, dominated by Coastal Western Hemlock, and the Interior Cedar Hemlock (BC MOF, 2007). The Coast Mountain Natural Resource District includes the Kalum and Nass TSAs as well as TFL 1 and TFL 41.

The top forest health factors are as follows for the Coast Mountain NRD (BC MOF, 2007):

- Dothistroma needle blight (high)
- Spruce Weevil (high)
- Wind (high)
- Annosus root disease (moderate)
- Commandra blister rust (moderate)
- Hemlock dwarf mistletoe (moderate)
- Mountain pine beetle (moderate)

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Appendices Contents

Appendix A Mitigation
Appendix B MSMA Treated Trees

Appendix A Mitigation

Table A-1: Mountain Pine Beetle Mitigation

Forest Pest	Mountain Pine Beetle (*Dendroctonus ponderosae*)
Host Species	• Intermediate to Mature or over mature lodgepole pine, whitebark pine and ponderosa pine.
Mitigation	• Avoid transportation of logs during beetle flight windows if possible (July 15th to August 31st). Unless no transportation windows are in effect by either District or Regional Forest Health Staff. • If infested trees are required to be decked for extended periods of time high piling should be implemented. This will lower the overall temperature of the log deck and delay beetle emergence. • If infested trees are required to be decked for extended periods of time log butts should be oriented to the north to create shade on the end of the logs that are most likely to contain beetles. • If tree planting will be implemented as a reclamation measure, a mix of species should be planted and if resistant stock is available it should be used.
Anticipated Presence on the Project Footprint	• Any areas that contain lodgepole pine will be impacted by the mountain pine beetle. This forest pest may be present in the Peace NRD, the Prince George NRD, the Vanderhoof NRD, the Nadina NRD, and the Coast Mountain NRD.
Reporting	• No regulatory reporting is required to harvest mountain pine beetle infected trees.
Implementation and Monitoring	• Monitoring of adjacent stands that are not already infested with the mountain pine beetle may be required if infested timber is decked during beetle emergence windows. Monitoring should take place after the first flight window post clearing.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-2: Spruce Beetle Mitigation

Forest Pest	Spruce Beetle (*Dendroctonus rufipennis*)
Host Species	• Larger diameter white spruce, Engelmann, sitka, and rarely black spruce. Typically, beetles will attack blowdown or logging debris.
Mitigation	• Avoid leaving decked timber in log decks or log storage sites from late May to early July. • Avoid transportation of infested logs during beetle flight windows if possible. (Late May to early June). Unless no transportation windows are in effect by either District or Regional Forest Health Staff. • Dispose of all logging debris as soon as possible after clearing. Disposal may consist of burning or mulching. • Do not store timber in any areas that have been identified to contain higher than normal levels of spruce beetle infestations (e.g., blowdown areas). • If hauling is permitted at the beginning and end of the spruce beetle flight, there must be a stipulation that the logs be milled within 24 hours.

Table A-2: Spruce Beetle Mitigation (cont'd)

Forest Pest	Spruce Beetle (*Dendroctonus rufipennis*)
Mitigation (cont'd)	• If hauling is to occur during the main flight in June, areas with susceptible timber should only be removed if the daytime temperature is forecasted to be less than 16°C. • If infested trees are required to be decked for extended periods of time high piling should be implemented. This will lower the overall temperature of the log deck and delay beetle emergence. • If infested trees are required to be decked for extended periods of time, log butts should be oriented to the north to create shade on the end of the logs that are most likely to contain beetles.
Anticipated Presence on the Project Footprint	• The spruce beetle may be present in any areas that contain larger diameter spruce or significant levels of spruce blowdown. This forest pest has a rating of high or very high in the Peace NRD, the Prince George NRD, the Nadina NRD, and the Coast Mountain NRD.
Reporting	• Any areas of spruce beetle infestations will be reported the Forest Health Officer for that NRD.
Implementation and Monitoring	• Monitoring of spruce beetle impact levels will be required during clearing and throughout the reclamation stage. Anywhere spruce trees have been decked for transportation off site or for use as roll back will be monitored to ensure that spruce beetle impact levels are not increased in adjacent stands. Monitoring should take place after the first flight window post clearing. • If any new infestations are identified during monitoring, adaptive management of the infested area should be implemented. • Any spruce fiber retained for onsite use such as rollback or any other use will be monitored to ensure that it does not create an environment that may worsen the current infestation.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-3: Western Balsam Bark Beetle Mitigation

Forest Pest	Western balsam bark Beetle (*Dryocoetes confuses*)
Host Species	• Primarily mature sub-alpine fir, occasionally mature amabilis fir. Records show there have been attacks of white spruce and Engelmann spruce.
Mitigation	• No site-specific mitigation required.
Anticipated Presence on the Project Footprint	• Western balsam bark beetle may be present in any location that contains mature sub alpine fir or mature amabilis fir. This forest pest is listed as a species of concern in the Peace NRD, and the Coast Mountain NRD.
Reporting	• Any areas of western balsam bark beetle infestations will be reported the Forest Health Officer for that forest district.
Monitoring	• No onsite monitoring of this forest pest is required.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-4: Lodgepole Pine Beetle Mitigation

Forest Pest	Lodgepole pine beetle (***Dendroctonus murryanae***)
Host Species	• Stressed or damaged lodgepole pine trees
Mitigation	• Remove infested trees from site. • Do not leave lodgepole pine trees standing within the Project footprint. • Do not create any type of mechanical damage to adjacent stands of timber.
Anticipated Presence on the Project Footprint	• This forest pest may be present in any areas that contain mature lodgepole pine trees. Areas adjacent to existing disturbances such as cutblocks, roads, or fire disturbed stands may contain higher levels of lodgepole pine beetle infestation. However, since many of the mature lodgepole pine trees are already significantly impacted by the mountain pine beetle this forest pest is only listed as a concern in the Peace NRD.
Reporting	• Any areas of western balsam bark Beetle infestations will be reported the Forest Health Officer for that NRD.
Monitoring	• No onsite monitoring of this forest pest is required.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-5: *Ips* Beetle Mitigation

Forest Pest	Ips Beetle (***Ips spp***)
Host Species	• Dead dying or damaged lodgepole pine
Mitigation	• Avoid leaving decked timber in log decks or log storage sites from mid- May to early July. • Dispose of all logging debris as soon as possible after clearing. Disposal may consist of burning or mulching. • Do not store timber in any areas that have been identified to contain higher than normal levels of Ips beetle infestations (e.g. blowdown areas).
Anticipated Presence on the Project Footprint	• Ips beetle may be encountered anywhere lodgepole pine trees are present on the Project. Specifically, lodgepole pine trees that have been attacked by the mountain pine beetle, as Ips beetles are often the secondary beetle to attack trees that are already under attack from the mountain pine beetle.
Reporting	• Any areas of Ips beetle infestations will be reported the Forest Health Officer for that NRD.
Monitoring	• No onsite monitoring of this forest pest is required.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-6: Douglas Fir Beetle Mitigation

Forest Pest	Douglas fir beetle (*Dendroctonus pseudotsugae*)
Host Species	• Larger diameter mature Douglas fir. Down, damaged or stressed trees are targeted.
Mitigation	• Priority given to over mature and decadent stands, where Douglas-Fir beetle is active. • Remove and utilize all infested logs before beetle emergence. Those felled during May-July should be removed before April of the following year. • Slash and culls over 20cm in diameter should be kept minimal, if infested, they should be treated via burning or peeling of bark for the prevention of broods emerging (May-July). • Tops of logs should be kept under 20cm in diameter and stumps kept as short as possible. If stumps are infested, beetles can be treated via burning or removing bark. • If possible, stands adjacent to new roads should be carefully examined in late summer of the year of road construction and infested trees should be removed.
Anticipated Presence on the Project Footprint	• Douglas fir beetle may be encountered in any area of the Project where larger mature Douglas fir trees are present. Specifically, areas adjacent to cutblocks, blowdown areas, or areas of logging debris. The Douglas fir beetle has been identified as a forest health priority in the Prince George NRD.
Reporting	• Any areas of Douglas fir beetle infestations will be reported the Forest Health Officer for that NRD.
Monitoring	• Monitoring of Douglas fir beetle infestation levels will be required during clearing and throughout the reclamation stage. Specifically, any areas where timber has been decked for an extended period, or any areas where debris piles have been left for an extended period. Monitoring should take place after the first flight window post clearing.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-7: Western Gall Rust Mitigation

Forest Pest	Western gall rust (*Endocronartium Harknessii*)
Host Species	• Immature lodgepole pine trees (<3 meters).
Mitigation	• Dispose of any infected trees via burning or mulching to prevent spore dispersal to adjacent stands. • If tree planting will be implemented as a reclamation measure, a mix of species should be planted and if resistant stock is available it should be used. • If tree planting will be implemented as a reclamation measure, consider planting to a high density to account for increased seedling mortality.
Anticipated Presence on the Project Footprint	• Western gall rust may be encountered in any area of the Project where young lodgepole pine trees are present. The most common location will be recent cutblocks that have been planted with lodgepole pine within the last 10 years. Western gall rust may be present on older lodgepole pine trees, but it does not spread its spores after approximately 10 years of age. Western gall rust is identified as a concern in the Prince George NRD, the Vanderhoof NRD, and the Nadina NRD.

Table A-7: Western Gall Rust Mitigation (cont'd)

Forest Pest	Western gall rust (*Endocronartium Harknessii*)
Reporting	• Any areas of unusually high concentrations will be reported to the district Forest Health Officer.
Monitoring	• Monitoring of adjacent stands may be required. Specifically, any recent cutblocks. Monitoring should take place within 2 years of clearing. • If high risk areas are identified a forest health survey should be completed no more than 2 years after clearing. • If trees are planted as a reclamation measures they should be monitored as per the applicable Establishment to Free Growing Guidebook.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-8: Commandra Blister Rust Mitigation

Forest Pest	Commandra blister Rust (*Cronartium comandree*)
Host Species	• The primary host tree is young lodgepole pine, while the alternative host is primarily bastard toadflax.
Mitigation	• Dispose of any infected trees via burning or mulching to prevent spore dispersal to adjacent stands. • If tree planting will be implemented as a reclamation measure, a mix of species should be planted and if resistant stock is available it should be used. • If tree planting will be implemented as a reclamation measure, consider planting to a high density to account for increased seedling mortality.
Anticipated Presence on the Project Footprint	• Commandra blister rust may be encountered in any area of the Project where young lodgepole pine trees are present. Commandra blister rust has been identified as a concern in the Prince George NRD, the Vanderhoof NRD, the Nadina NRD, and the Kalum NRD.
Reporting	• Any areas of unusually high concentrations will be reported to the district Forest Health Officer.
Monitoring	• Monitoring of adjacent stands may be required. Specifically, any recent cutblocks. Monitoring should take place within 2 years of clearing. • If high risk areas are identified a forest health survey should be completed no more than 2 years after clearing. • If trees are planted as a reclamation measures they should be monitored as per the applicable Establishment to Free Growing Guidebook.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-9: Stalactiform Blister Rust Mitigation

Forest Pest	Stalactiform blister rust (*Cronartium coleosporioides*)
Host Species	• The primary host species is young or slow growing lodgepole pine and the alternative host species include, Indian paintbrush, as well as, other figwort family species.
Mitigation	• Dispose of any infected trees via burning or mulching to prevent spore dispersal to adjacent stands. • If tree planting will be implemented as a reclamation measure, a mix of species should be planted and if resistant stock is available it should be used. • If tree planting will be implemented as a reclamation measure, consider planting to a high density to account for increased seedling mortality.
Anticipated Presence on the Project Footprint	• Stalactiform blister rust may be encountered anywhere that lodgepole pine are present on the Project footprint. Infestations may be more prevalent in young and intermediate cutblocks. Stalactiform blister rust has been identified as a concern in the Prince George NRD, the Vanderhoof NRD, and the Nadina Forest NRD.
Reporting	• Any areas of unusually high concentrations will be reported to the district Forest Health Officer.
Monitoring	• Monitoring of adjacent stands may be required. Specifically, any recent cutblocks. Monitoring should take place within 2 years of clearing. • If high risk areas are identified a forest health survey should be completed no more than 2 years after clearing. • If trees are planted as a reclamation measures they should be monitored as per the applicable Establishment to Free Growing Guidebook.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-10: Warren's Root Collar Weevil Mitigation

Forest Pest	Warrens root collar weevil (*Hylobius warreni*)
Host Species	• Young lodgepole pine
Mitigation	• Dispose of all infected trees via burning or mulching. • If tree planting will be implemented as a reclamation measure, a mix of species should be planted and if resistant stock is available it should be used. • If tree planting will be implemented as a reclamation measure, consider planting to a high density to account for increased seedling mortality.
Anticipated Presence on the Project Footprint	• Warrens root collar weevil may be encountered in young lodgepole pine plantations. This forest pest has been identified as a concern in the Nadina NRD.
Reporting	• No reporting is required.
Monitoring	• If trees are planted as a reclamation measures they should be monitored as per the applicable Establishment to Free Growing Guidebook.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-11: Dothistroma Needle Blight Mitigation

Forest Pest	Dothistroma needle blight (*Mycosphaerella pini*)
Host Species	• All ages of lodgepole pine
Mitigation	• Dispose of all infected trees via burning or mulching. • If possible restrict clearing activities to cold winter months or dry summer months; this will reduce the change of spore dispersal.
Anticipated Presence on the Project Footprint	• Dothistroma needle blight is only identified as a concern in the Coast Mountain NRD. This forest pest may be encountered anywhere lodgepole pine are present in the Coast Mountain NRD.
Reporting	• Any areas of unusually high concentrations will be reported to the district Forest Health Officer.
Monitoring	• No on-site monitoring of this forest pest will be required.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-12: Annosus Root Disease Mitigation

Forest Pest	Annosus root disease (*Heterobasidion annosum*)
Host Species	• Spruce trees are highly susceptible, lodgepole pine, western hemlock, sitka spruce, Douglas fir, and sub-alpine fir are moderately susceptible.
Mitigation	• If areas of potential concern are identified, all stumps must be piled and burnt. • Do not create any type of mechanical damage to adjacent stands of timber. This disease spreads more rapidly through freshly damaged trees.
Anticipated Presence on the Project Footprint	• Annosus root disease may be encountered anywhere there is a large component of conifer blowdown, specifically spruce blowdown. Annosus root disease is identified as a concern in the Coast Mountain NRD.
Reporting	• Any areas of unusually high concentrations will be reported to the district Forest Health Officer.
Monitoring	• Adjacent susceptible forest stands should be monitored post clearing. Monitoring should take place no more than 2 years from clearing. • If high risk areas are identified a forest health survey should be completed no more than 2 years after clearing.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-13: Spruce Weevil Mitigation

Forest Pest	Spruce weevil (***Pissodes Strobi***)
Host Species	• White spruce, Engelmann spruce, and sitka spruce.
Mitigation	• Dispose of all infected trees via burning or mulching. • If tree planting will be implemented as a reclamation measure, a mix of species should be planted and if resistant stock is available it should be used.
Anticipated Presence on the Project Footprint	• Spruce weevil may be encountered anywhere spruce trees that are 1.5 meters to 10 meters tall are present. This forest pest has only been identified as a concern in the Coast Mountain NRD.
Reporting	• No reporting is required.
Monitoring	• If trees are planted as a reclamation measures they should be monitored as per the applicable Establishment to Free Growing Guidebook.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-14: Wind

Forest Pest	Wind
Host Species	• All tree species
Mitigation	• If areas of high wind are identified, immediately adjacent trees may be able to be topped or de-limbed to reduce the chance of blowing over.
Anticipated Presence on the Project Footprint	• Unnatural disturbance boundaries such as, roads and cutblock edges will be the most susceptible to wind damage. Wind is only identified as a concern in the Coast Mountain NRD.
Reporting	• No reporting is required
Monitoring	• Project boundaries that are immediately adjacent to mature conifer timber should be monitored at regular intervals post clearing. In the event that significant blowdown is created further monitoring may be required to ensure that down trees do not become infected with other forest pests (such as the spruce beetle).
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-15: White Pine Blister Rust Mitigation

Forest Pest	White Pine Blister Rust (*Cronartium ribicola*)
Host Species	• The primary host is whitebark pine; the alternative host includes most currant and gooseberry plants.
Mitigation	• Dispose of all infected trees via burning or mulching. • If tree planting will be implemented as a reclamation measure, a mix of species should be planted and if resistant stock is available it should be used. • If tree planting will be implemented as a reclamation measure, consider planting to a high density to account for increased seedling mortality. • Conduct a pre-clearing forest health survey to assess the level of white pine blister rust infestation on the Project footprint. This pre-clearing survey can be completed in conjunction with the whitebark pine density analysis.
Anticipated Presence on the Project Footprint	• White pine bister rust may be encountered in any of the project areas that contain whitebark pine. This forest pest has been identified as a concern in the Coast Mountain NRD.
Reporting	• All occurrences of white pine blister rust will be reported to the district forest health officer.
Monitoring	• Adjacent whitebark pine trees should be monitored post clearing to ensure that infestation levels do not increase. Monitoring should take place no more than 2 years after clearing. • If high risk areas are identified a forest health survey should be completed no more than 2 years after clearing. • If whitebark pine is planted as reclamation measure it should be monitored to ensure that white pine blister rust levels are not increased.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Table A-16: Hemlock Dwarf Mistletoe Mitigation

Forest Pest	Hemlock dwarf mistletoe (*Arceuthobium tsugense*)
Host Species	• Western hemlock is most susceptible. Secondary hosts may be mountain hemlock, amabilis fir, sub-alpine fir, and sitka spruce.
Mitigation	• Dispose of any infected trees onsite via burning to prevent spread to adjacent stands.
Anticipated Presence on the Project Footprint	• Hemlock dwarf mistletoe may be encountered in any areas of the Project that western hemlock is present. This forest pest is only listed as a concern in the Coast Mountain NRD.
Reporting	• Any areas of unusually high concentrations will be reported to the district Forest Health Officer.
Monitoring	• Adjacent susceptible forest stands should be monitored post clearing. Monitoring should take place no more than 2 years from clearing.
Roles and Responsibilities	• The Project forest professional will be responsible for implementation and monitoring of any of the mitigation measures and reporting of any infestations. Specifically recording the location on the Project where the damage occurred and what mitigation measure was applied.

Appendix B MSMA Treated Trees

In the mid-1980s to 2004, monosodium methanearsonate (MSMA) was used for bark beetle management in various locations in the interior of British Columbia (BC) (BC MFLNRO, 2013). However, since 2005 the product's registration has expired and, therefore, it is no longer used within BC (BC MFLNRO, 2013).

In BC, MSMA was used to create lethal trap trees in an effort to control the bark beetle infestation (BC MFR, 1995). MSMA and several other similar arsenical pesticides are formed in nature. However, the MSMA used in the attempt to suppress bark beetle infestations was produced synthetically (BC MFR, 1995). The application method was to select a small percentage of trees in a strand and treat them with MSMA, administering it directly to the tree stem by making shallow cuts through the bark at the base of the trees (BC MFR, 1995).

MSMA has been found to pose no risk to the surrounding soil, vegetation, mammal (including human; although harvesting of foodstuffs within two meters of treated trees should be avoided (BC MFLNRO, 2013)) health However, it is still no longer used as an attempt to control infestations of mountain pine beetle (BC MFR, 2009). In 2007, the BC Ministry of Forests and Range (BC MFR) implemented the Management of MSMA-treated Trees in British Columbia. The policy states that MSMA treated trees that are encountered shall not be harvested, removed, milled and/or burned (BC MFR, 2009). In various operational harvesting situations, MSMA trees can be incorporated into a wildlife tree patches (BC MFLNRO, 2013).

However, the policy declares that stands with a high proportion of MSMA-treated trees are not suitable for wildlife tree patches and efforts should be pursued to compensate for any consequent habitat loss in these areas (BC MFR, 2009).

MSMA Identification & Reporting

At the time of treatment, all MSMA trees were clearly marked with paint, flagging tape, and/or waterproof tags (BC MFLNRO, 2013). Presently the MSMA injection site ("axe frill") at the base of the tree is the best field indicator of a MSMA treated tree (BC MFLNRO, 2013). Any MSMA trees discovered in the field need to be reported to the local forest district manager (BC MFLNRO, 2013). The BC MFLNRO MSMA Trees and Forest Management Operations Brochure states that the following information needs to be gathered and reported using the MSMA Tree Reporting Form.

- A GPS reference point, of the approximate central point of the treatment area.
- A record of the approximate treatment area
- The approximate date of the treatment
- An approximate number of treated trees on site

- A description of the treated tree species
- The date the information was collected; and by whom.

MSMA Trees encountered by the Project

Information of known locations of MSMA-treated trees provided by the BC MFR, indicated that there are several locations where an area treated with MSMA intersects, or falls within close proximity of the Coastal GasLink pipeline ROW. The MSMA encountered areas fell within construction sections 5, 6, and 7, within the Vanderhoof and Nadina Forest Districts. Proper precautions and procedures outlined by the BC MFLNRO policy for the management of MSMA-treated trees in BC need to be adhere to in all areas where MSMA-treated trees may be encountered.

D.8 GRIZZLY BEAR MITIGATION AND MONITORING PLAN

Please see *Grizzly Bear Mitigation and Monitoring Plan (Rev 5)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 7

D.9 HUMAN-WILDLIFE CONFLICT MANAGEMENT PLAN

Please see *Human-Wildlife Conflict Management Plan (Rev 5)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 9

D.10 INVASIVE PLANT MANAGEMENT PLAN

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1.0 INTRODUCTION

The Invasive Plant Management Plan (IPMP) outlines methods and management procedures to identify, prevent, control and monitor the introduction or spread of noxious and invasive plant species to a level equivalent to adjacent lands.

The IPMP will be implemented using industry standards and best management practices and communication with Indigenous groups, landowners, relevant regulatory authorities and the two regional invasive plant management council areas within the Coastal GasLink Pipeline Project (the Project) footprint.

The IPMP will be implemented in conjunction with the Environmental Management Plan during construction, and the Reclamation Program and Post-Construction Monitoring Program after construction. Invasive plant management will continue throughout the operations phase of the Project.

2.0 GOALS AND OBJECTIVES

The primary objectives of the IPMP are to prevent the introduction of provincially and regionally noxious and invasive plant species (weeds) to the Project sites, and to effectively manage any identified weeds found on the Project site to a level equivalent to that observed in adjacent lands. Specific objectives of the IPMP for construction and operation phases of the work include:

- complying with TC Energy's policies, standards and guidelines pertaining to vegetation management
- complying with applicable provincial and federal invasive plant management statutes, regulations and regional management plans
- protecting public health, environmental resources and ecologically sensitive areas
- maintaining facility integrity, security and landscape aesthetics
- implementing preventive measures (e.g., ensuring equipment is clean before starting work)
- preventing the establishment of new weed species through early detection and rapid response
- completing and regularly updating weed surveys
- controlling the spread and density of weed populations through a variety of measures (e.g., mechanical, chemical, bio-control)
- working in co-operation with municipal, provincial and federal representatives to use effective weed management strategies
- incorporating the most effective and efficient weed management procedures as determined through the use of integrated vegetation management principles
- minimizing long-term Project costs
- monitoring and evaluating management measures

Coastal GasLink intends to manage weeds in and around pipeline rights-of-way (ROWs), facilities and infrastructure using a sustainable and environmentally responsible integrated vegetation management (IVM) approach that incorporates current knowledge, practices and actions to achieve management objectives and goals.

3.0 WEED LEGISLATION, REGULATIONS AND MANAGEMENT STRATEGIES

The legislative and policy framework for noxious weeds and invasive plant species in the Project area includes:

- *BC Weed Control Act* (1996)
- *Weed Control Regulations* (2011)
- Community Charter (2003)
- *Forest and Range Practices Act* (FRPA) (2002)
- *Oil and Gas Activities Act* (OGAA) (2008)
- *Integrated Pest Management Act* (IPMA) (2003)
- *Integrated Pest Management* (IPM) *Regulation* (2008)

Land managers work with regional invasive species organizations to jointly establish priorities for treatment and improve coordination and collaboration on management actions, and in some regions of the province, pool resources to deliver management activities across jurisdictions.

The BC *Weed Control Act* requires all occupiers or owners of land and premises to control noxious weeds growing or located on their land and premises. The *Weed Control Act* is enabling legislation that local governments may choose to adopt through the appointment of a weed inspector and notification to the Minister. The Weed Control Regulation limits the movement of noxious weeds, contains the provincial and regional noxious weed lists, and provides structure for weed notices and level of control action weed inspectors may require land owners or occupiers to complete. The Community Charter gives municipalities the authority to control or eradicate weeds within their jurisdiction. The Charter includes a list of target weed species in the Community Charter Environment and Wildlife Regulation (BC Reg 144/2004).

The FRPA requires provincial forest land users to "prevent the introduction or spread of prescribed species of weeds". A list of the prescribed weeds is included in the FRPA Invasive Plants Regulation (BC Reg 18/2004). The *Oil and Gas Activities Act* gives the Lieutenant Governor in Council the authority to make regulations regarding weeds, which must be followed by permit holders and persons conducting oil and gas activities. The designation of weed species and actions required by oil and gas permit holders are specified in the Environmental Protection and Management Regulation (BC Reg 200/2010). The Regulation requires persons carrying out oil and gas activities to:

- make responsible efforts to ensure that invasive plant seed, plant parts or propagules are not transported into oil and gas development areas

- prevent invasive plants from establishing in development areas by revegetating with ecologically suitable species as soon as practical after disturbance
- ensure invasive plants do not establish on facility sites

The IPMA and IPM Regulation (BC Reg 427/2008) controls the sale and use of pesticides on BC Crown land and requires the use of integrated pest management of pests on public land, private forestry land, transportation and public utilities, and pipelines.

The Coastal GasLink project footprint includes two invasive plant management regions, the Invasive Plant Committee of the Peace River Regional District (IPCPRRD) and the Northwest Invasive Plant Council (NWIPC). The regional groups identify weeds of regional concern and oversee weed management within areas crossed by the pipeline route. The committees include representatives from provincial and regional government agencies, utility companies, industry and private landowners. Invasive plant management on BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (BC MFLNRORD) and BC Ministry of Transportation and Infrastructure (BC MOTI) Crown lands in the PRRD is completed under provincial government contract. Project treatment activities on these lands would be coordinated with the BC MFLNRORD Invasive Plant Program. Weed management within the region is coordinated so treatments are more effective and cost efficient. Coastal GasLink will comply with all applicable regulatory requirements.

Regional species include provincial species as listed by the BC *Weed Control Act* and Weed Control Regulation. The priority weed species and recommended management techniques for the regions are outlined in annual strategic plans, the PRRD Strategic Plan and Profile of Invasive Plants and Noxious Weeds (PRRD 2015) and the NWIPC Strategic Plan (NWIPC 2015).

4.0 WEED SPECIES IN THE COASTAL GASLINK PROJECT AREA

In BC, the provincial *Weed Control Act* and associated Weed Control Regulation list provincial and regional noxious weeds. The BC Inter-Ministry Invasive Species Working Group (IMISWG) has established a proposed prohibited noxious weed list as candidates for the BC Early Detection Rapid Response (EDRR) Program (BC IMISWG 2016).

4.1 PROVINCIALLY LISTED WEEDS

As of 2013, BC provincially listed weeds include 10 species on the EDRR list and 39 species on the provincial noxious weed list. Coastal GasLink has been advised by BC MFLNRORD that the lists of provincial and regional noxious weeds are updated annually.

4.1.1 Provincial EDRR Weeds

The purpose of the EDRR system is to prevent new invasive species from entering and becoming established in BC (BC IMISWG 2015). The EDRR species are described as posing a significant threat to the BC environment, economy or human health. Currently, no EDRR species are known to occur in the Project area.

The BC EDRR plan provides specific direction on the process that must be followed if an EDRR species is found in BC. The EDRR plan applies to all land management agencies in BC, including private industry (BC IMISWG 2012). If a new species is found, industry should complete Step 1 of the six-step EDRR process. The remaining steps are completed by government agencies.

EDRR Process

Step 1: *Observing and reporting species believed to be new in BC*. Species should be immediately reported to the local regional invasive species committee or regional office of a provincial government agency, including BC MECCS; BC MLFNRORD; BC MOTI; Ministries of Agriculture (MOA);;of Energy, Mines and Petroleum Resources; or the BC Inter-Ministry Invasive Species Working Group. Reporting can be accomplished through the Report-A-Weed smartphone app, online at www.ReportInvasives.ca, or by phoning or emailing the Invasive Plant Specialist and submitting photographs. Information regarding the location of the species should be included with the report.

Step 2: *Verifying species identification.* Voucher specimens should be collected and provided to the ministry or organization that receives the notification.

Steps 3 through 6 are completed by the provincial government and include:

- alert screening
- risk assessment
- rapid response
- monitor and reassess

Species that are on the provincial EDRR list are included in Table 4-1.

Table 4-1: Provincial EDRR Weed Species

Common Name	Scientific Name	Common Name	Scientific Name
African-rue	*Peganum harmala*	Kudzu	*Pueraria montana var. lobata*
Black henbane	*Hyoscyamus niger*	Meadow clary	*Salvia pratensis*
Brazilian Elodea / Waterweed	*Egeria densa*	Medusahead	*Taeniatherum caput-medusae*
Camel thorn	*Alhagi maurorum*	Nightshade, silverleaf	*Solanum elaeagnifolium*
Common crupina	*Crupina vulgaris*	North Africa grass	*Ventenata dubia*
Common Reed, European	*Phragmites australis subsp. Australis*	Nutsedge, purple	*Cyperus rotundus*
Cordgrass, Dense-flower	*Spartina patens*	Pepperweed, perennial	*Lepidium latifolium*
Cordgrass, Salt Meadow	*Spartina patens*	Red bartsia	*Odontites serotina*
Cordgrass, Smooth	*Spartina anglica*	Reed, giant	*Arundo donax*
Cordgrass, Common	*Spartina anglica*	Sage, clary	*Salvia sclarea*
Dyer's wood	*Isatis tinctoria*	Sage, Mediterranean	*Salvia aethiopis*
Eggleaf spurge	*Euphorbia oblongata*	Spring milletgrass	*Milium vernale*
False-brome, Slender	*Brachypodium sylvaticum*	Spurge flax	*Thymelaea passerina*
Foxtail, slender/meadow	*Alopecurus myosuroides*	Starthistle, Iberian	*Centaurea iberica*
Goatsrue	*Galega officinalis*	Starthistle, purple	*Centaurea calcitrapa*
Halogeton / saltover	*Halogeton glomeratus*	Starthistle, yellow	*Centaurea solstitialis*
Hawkweed, mouse-ear	*Hieracium pilosella*	Syrian bean-caper	*Zygophyllum fabago*
Hyacinth, water	*Eichhornia crassipes*	Texas blueweed	*Helianthus ciliaris*
Hydrilla	*Hydrilla verticillata*	Thistle, Italian	*Carduus pycnocephalus*
Johnsongrass	*Sorghum halepense*	Thistle, slenderflower	*Carduus tenuiflorus*
Jointed goatgrass	*Aegilops cylindrica*	Water soldier	*Stratiotes aloides*
Knapweed, squarrose	*Centaurea virgata ssp. Squarrosa*		
SOURCE: EDRR Program (BC IMISWG 2016)			

4.1.2 Provincial Noxious Weeds

Noxious weeds are non-native plants with aggressive growth that have been introduced to BC and may be competitive, destructive and difficult to control. Table 4-2 lists weeds classified as noxious in all regions of BC.

Table 4-2: Provincial Noxious Weeds

Common Name	Scientific Name	Common Name	Scientific Name
Annual Sow-thistle	*Sonchus oleraceus*	Hound's-tongue	*Cynoglossum officinale*
Bohemian Knotweed	*Fallopia x bohemica*	Japanese Knotweed	*Fallopia japonica*
Bur Chervil	*Anthriscus caucalis*	Jointed Goatgrass	*Aegilops cylindrica*
Canada Thistle	*Cirsium arvense*	Leafy Spurge	*Euphorbia esula*
Common Reed	*Phragmites australis subsp. australis*	Milk Thistle	*Silybum marianum*
Crupina	*Crupina vulgaris*	North Africa Grass	*Ventenata dubia*
Common Toadflax	*Linaria vulgaris*	Perennial Sow-thistle	*Sonchus arvensis*
Dalmatian Toadflax	*Linaria dalmatica*	Purple Loosestrife	*Lythrum salicaria*
Dense-flowered Cordgrass	*Spartina densiflora*	Purple Nutsedge	*Cyperus rotundus*
Diffuse Knapweed	*Centaurea diffusa*	Rush Skeletonweed	*Chondrilla juncea*
Dodder	*Cuscuta spp*	Saltmeadow Cordgrass	*Spartina patens*
English Cordgrass	*Spartina anglica*	Scentless Chamomile	*Matricaria maritima*
Flowering Rush	*Butomus umbellatus*	Smooth Cordgrass	*Spartina alterniflora*
Garlic Mustard	*Alliaria petiolata*	Spotted Knapweed	*Centaurea maculosa*
Giant Hogweed	*Heracleum mantegazzianum*	Tansy Ragwort	*Senecio jacobaea*
Giant Knotweed	*Fallopia sachalinensis*	Velvetleaf	*Abutilon theophrasti*
Giant Mannagrass / Reed Sweetgrass	*Glyceria maxima*	Wild Oats	*Avena fatua*
Gorse	*Ulex europaeus*	Yellow Flag Iris	*Iris pseudacorus*
Himilayan Knotweed	*Polygonum polystachyum*	Yellow Nutsedge	*Cyperus esculentus*
		Yellow Starthistle	*Centaurea solstitialis*
SOURCE: Schedule A, Part I Weed Control Regulations (Government of BC 2011)			

4.2 REGIONAL NOXIOUS WEED SPECIES

Coastal GasLink crosses four regional districts, including Peace River, Fraser-Fort George, Bulkley-Nechako, and Kitimat-Stikine. Regional noxious weeds are only considered noxious in the specified regional district (Table 4-3).

Table 4-3: Regional Noxious Weeds in the Coastal GasLink Project Area

Common Name	Scientific Name	Regional Districts
Burdock	*Arctium sp.*	Peace River, Fraser-Fort George, Bulkley-Nechako, Kitimat-Stikine
Cleavers	*Galium aparine*	Peace River
Common tansy	*Tanacetum vulgare*	Bulkley-Nechako
Field scabious	*Knautia arvensis*	Bulkley-Nechako
Green Foxtail	*Setaria viridis*	Peace River
Kochia	*Kochia scoparia*	Peace River
Marsh plume thistle	*Cirsium palustre*	Fraser-Fort George, Bulkley-Nechako
Night-flowering catchfly	*Silene noctiflora*	Peace River
Orange hawkweed	*Hieracium aurantiacum*	Bulkley-Nechako
Oxeye daisy	*Chrysanthemum leucanthemum*	Peace River
Quackgrass	*Agropyron repens*	Peace River
Russian thistle	*Salsola kali*	Peace River
Tartary buckwheat	*Fagopyrum tataricum*	Peace River
White cockle	*Lychnis alba*	Peace River
Wild mustard	*Sinapsis arvensis*	Peace River
SOURCE: Schedule A, Part II Weed Control Regulations (Government of BC 2011)		

4.3 REGIONAL INVASIVE PLANT COMMITTEE WEEDS OF CONCERN

Regional invasive plant committees develop regional weed lists based on ease of establishment and spread of the species in the region, and risk to primary land uses, such as agricultural land or forest land.

4.3.1 Weeds of Management Interest to the Invasive Plant Committee of the Peace River Regional District

The Invasive Plant Committee of the Peace River Regional District (IPCPRRD) has developed a Strategic Plan and Profile of Weeds and Noxious Weeds, which details the current status, priority for control and control methods of weeds that are of concern in northeast BC (IPCPRRD 2014). The IPCPRRD weed list also includes regional EDRR species, which occur on a limited number of sites.

The IPCPPRD classifies weeds in the Peace Regional District as high, medium or low priority for control and eradication. The regional weeds of concern are included in Table 4-4. EDRR species are included in the eradication category.

Table 4-4: IPCPRRD List of Regionally Important Weeds

High Priority [1]		Medium Priority [2]		Low Priority [3]		Eradication [4]	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**
Burdock	*Arctium* spp.	Common toadflax	*Linaria vulgaris*	American Dragonhead	*Dracocephalum parviflorum*	Dames's Rocket	*Hesperis Matronalis*
Comfrey	*Symphytum spp*	Canada Thistle	*Cirsium Arvense*	Arrow Grass	*Triglochin martime*	*Oxeye Daisy*	*Chrysanthemum Leucanthemum*
Common tansy	*Tanacetum vulgar*	Goat's beard	Tragopogon spp	Bladder aboriginalion	*Silene cucubalus*	*Russian Thistle*	*Salsola Kali*
Cypress spurge	*Euphorbia cyparissias*	Kochia	*Kochia scoparia*	Bluebur, western	*Lappula echinata*	Annual bluegrass*	Poa Annua
Dalmatian toadflax	*Linaria dalmatica*	Night-flowering catchfly	*Silene noctiflora*	Buckwheat, wild	*Polygonum convolvulus*	Baby's Breath*	*Gysophilia Paniculata*
Dame's Rocket	*Hesperis matronalis*	Oxeye daisy	*Chrysanthemum leucanthemum*	Bull thistle	*Cirsium vulgare*	Big headed Knapweed	*Centaurea macrocephala*
Diffuse knapweed	*Centaurea diffusa*	Scentless Chamomile	*Matricaria perforata*	Chickweed, mouse eared	*Cerastium* spp.	Blueweed*	*Echium Vulgare*
Field scabious, blue button	*Knautia arvensis*	Sow thistles	*Sonchus* spp.	Cleavers	*Galium aparine*	Brown knapweed *	*Centaurea jacea*
Green foxtail	*Sertaria viridis*	White cockle	*Lychnis alba*	Corn spurry	*Spergula arvensis*	Cheat grass*	*Bromus tectorum*
Marsh thistle	*Cirsium palustre*	Wild caraway	*Carvi commun*	Curled dock	*Rumex* spp.	Chicory*	*Cichorium intybus*
Mountain bluet	*Centaurea Montana*	Wild mustard	*Sinapsis arvensis*	Flixweed	*Descurainia sophia*	Creeping Bell Flower*	*Campunanaula rapunculiodes*
Orange hawkweed	*Heiracium aurantiacum*			Foxtail barley	*Hordeum jubatum*	Himalayan Balsam*	*Impatiens glandulifera*
Russian thistle	*Salsola kali*			Groundsel, common	*Senecio vulgaris*	Hoary Alyssum*	*Bereroa incana*
Shasta Daisy	Leucantheunum x superbum			Hawksbeard, narrowleaf	*Crepis tectorum*	Hoary cress*	*Cardiarai draba*
Spotted knapweed	*Centaurea biebersteinii*			Hemp nettle	*Galeopsis tetrahit*	Hound's tongue*	*Cynglissum officinale*
Tall (Meadow) buttercup	*Ranunculus acris*			Lamb's-quarters	*Chenopodium* spp.	Jointed goatgrass*	*Aegilops cynlindrical*
Yellow clematis	*Clematis tangutica*			Mallow	*Malva neglecta*	Knotweed Species*	*Fallopia spp and Polygonum spp*

Table 4-4: IPCPRRD List of Regionally Important Weeds (cont'd)

High Priority [1]		Medium Priority [2]		Low Priority [3]		Eradication [4]	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**
Yellow hawkweed	*Heiracium pratense*			Mullein	*Verbascum thapsus*	Leafy Spurge*	*Euphorbia esula*
				Mustards	*Sisymbrium* spp.	Mustard, dog*	*Eruscastrum gallicum*
				Pineapple weed	*Matricaria matricarioides*	Nodding thistle*	*Carduss nutans*
				Prickly lettuce	*Lactuca serriola*	Perennial pepperweed*	*Lepidium latifolium L*
				Quackgrass	*Agropyron repens*	Plumeless thistle*	*Carduus acathoides*
				Nodding thistle	*Carduus nutans*	Purple loosestrife*	*Lythrum spp*
				Sea buckthorn	*Hippophae rhamniodes*	Rush skeletonweed*	*Chondrilla juncea*
				Sheep sorrel	*Rumex acetosella*	Scotch Broom*	*Cytisus scoparius*
				Smartweed	*Polygonum* spp.	St. John's Wort or goatweed*	*Hypericum perforatum*
				Stinkweed	*Thlaspi arvense*	Stinking mayweed, dog*	*Anthemis cotula*
				Stork's bill	*Erodium* spp.	Sulphur cinquefoil*	*Potentilla recta*
				Tarweed (native)	*Madia glomerata*	Tansy ragwort*	*Senecio Jacobeae*
				Wild Oats	*Avena fatua*	Tartary buckwheat*	*Fagopyrum tataricum*
				Yarrow (native)	*Achillea millefolium*	Velvetlead*	*Abutilon theophrasti*
						Wild parsnip*	*Pastinaca sativa*
						Wormwood or absinthium*	*Artemisia absinthium*

NOTES:

[1] **High Priority for Eradication and Containment** plants are highly competitive with an ability to spread rapidly.

[2] **Medium Priority for Eradication and Containment** plants have the ability to spread rapidly but are not as aggressive as prohibited weeds. Provincially Prohibited species are weed species that do not occur in BC or the species are present but extremely limited in extent and pose a significant threat to BC's environment, economy or human health. BC Prohibited species are included in the provincial EDRR species list.

[3] **Low Priority for Containment and Control** plants can spread easily but the requirement to contain them is usually site specific. They are sometimes also under successful biological control. As well, this category can contain some native plants that behave in a weedy like fashion.

[4] **Eradication category** plants are of special note because they can be easily controlled and have relatively short-lived seed banks. These plants can be eradicated through persistent treatments over time.

***** Regional EDRR species

Source: 2015 IPCPRRD Strategic Plan and Profile (IPCPRRD 2015)

4.3.2 Weeds of Management Interest to the Northwest Invasive Plant Council

The Fraser-Fort George, Bulkley-Nechako, and Kitimat-Stikine Regional Districts fall within the management boundaries of the NWIPC.

The NWIPC has developed a Strategic Plan and Plant Profile report that details the current status, priority for control and control methods of weeds that are of concern in the northwest regions (NWIPC 2015). The NWIPC classifies weeds in the Fraser-Fort George, Bulkley-Nechako, and Kitimat-Stikine Regional Districts as extremely invasive, very invasive, invasive, and aggressive or under biological control (refer to Table 4-5). Weed species in the eradication category are on the regional EDRR list.

Table 4-5: NWIPC List of Regionally Important Weeds

Extremely Invasive		Very Invasive		Invasive		Aggressive or Under Bio-control		Eradication	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**
Broom, scotch	*Cytisus scoparius*	Bluet, mountain	*Centaurea montana*	Baby's-breath	*Gypsophila paniculata*	Blue buttons	*Centaurea cyanus*	Black knapweed	*Centaurea nigra*
Gorse	*Ulex europaeus*	Blueweed	*Echium vulgare*	Catchfly, night-flowering	*Silene noctiflora*	Bluebur, western	*Lappula echinata*	Blueweed	*Echium vulgare*
Hawkweeds	*Heiracium spp.*	Burdock, common	*Arcticum minus*	Comfrey	*Symphytum officinale L.*	Buckwhat, wild	*Polygonum convolvulus*	Brown knapweed	*Centaurea jacea*
Hoary alyssum	*Berteroa incana*	Carrot, wild	*Daucus carota*	Foxglove, purple	*Digitalis purpurea*	Bugloss, small	*Lycopsis arvensis*	Chicory	*Cichorium intybus*
Himalayan blackberry	*Rubuis discolor*	Chamomile, scentless	*Matricaria maritima*	Goat's-beard	*Tragopogon spp.*	Campion, bladder	*Silene cucubalus*	Comfrey	*Symphytum officinale L.*
Yellow flag Iris	*Iris pseudacorus*	Chicory	*Cichorium intybus*	Thistle, bull	*Cirsium vulgare*	Cockle, white	*Silene latifolia ssp. Alba*	Common hops	*Humulus lupulus*
Ivy, English	*Hedera helix*	Daisy, oxeye	*Chrysanthemum leucanthemum*	Thistle, Russian	*Salsola kali*	Dock, curled	*Rumex crispus*	English Holly	*Ilex aquifolium*
Knapweed, black, brown & greater	*Centaurea nigra, jacea & scabiosa*	Eyebright	*Euphrasia nemorosa*	Thistle, perennial sow	*Sonchus spp.*	Groundsel, common	*Senecio vulgaris*	English ivy	*Hedera helix*
Knapweed, spotted	*Centaurea* stoebe, *(syn. C. maculosa & C. biebersteinii*	Hairy bittercrest	*Cardamine hirsuta*	Toadflax, yellow	*Linaria vulgaris*	Hawk's beard, narrowleaf	*Crepis tectorum*	Giant Hogweed	*Heracleum mantegazzianum*
Knotweeds	*Fallopia & Polygonum sp.*	Hops, common	*Humulus lupulus*	Wormwood or absinthium	*Artemisia absinthium*	Hemp-nettle	*Galeopsis tetrahit*	Gorse	*Ulex europaeus*

Table 4-5: NWIPC List of Regionally Important Weeds (cont'd)

Extremely Invasive		Very Invasive		Invasive		Aggressive or Under Bio-control		Eradication	
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**	**Common Name**	**Scientific Name**
Policeman's helmet or Himalayan balsam	*Impatiens glandulifera*	Hound's tongue	*Cynglossum officinale*			Hop-clover	*Trifolium aureum*	Greater knapweed	*Centaurea scabiosa*
Scabious, field or blue button	*Knautia arvensis*	Knapweed, diffuse	*Centaurea diffusa*			Lamb's-quarter	*Chenopodium spp.*	Hairy bittercress	*Cardamine hirsuta*
Leafy spurge	*Euphorbia esula*	Loosestrife	*Lythrum spp.*			Medic, black	*Medicago lupulina*	Himalayan balsam	*Impatiens gladulifera*
Sulphur cinquefoil	*Potentilla recta*	Mossy stone crop	*Sedum acre*			Mullein	*Varbascum Thapsus*	Himalayan blackberry	*Rubus discolor*
Tansy, common	*Tanacetum Vulgare*	Ragwort, tansy	*Sencio jacobaea*			Mustard, dog	*Erucastrum gallicum*	Hoary alyssum	*Berteroa incana*
Thistle, marsh plume	*Cirsium palustre*	Thistle, Canada	*Cirsium arvense*			Mustard hedge	*Sissymbirum officinale*	Hound's-tongue	*Cynoglossum officinale*
		Thistle, plumeless	*Carduus acanthoides*			Mustard, tumble	*Sisymbrium spp.*	Knotweed	*Fallopia & Polygonum spp.*
		Toadflax, Dalmatian	*Lunaria dalmatica*			Mustard, wild	*Sinapsis arvensis*	Mossy stone crop	*Sedum acre*
		Yellow archangel	*Lamium galeobdolon*			Pineapple weed	*Matricaria matricarioides*	Purple loosestrife	*Lythrum salicaria*
						Primrose, evening	*Oenothera biennis*	Spurge	*Euphoria ssp.*
						St. John's-wort	*Hypericum perforatum*	Sulphur cinquefoil	*Potentilla recta*
						stinkweed or pennycress	*Thlapsi arvense*	Tansy ragwort	*Senecio jacobaea*
						Tarweed	*Carduus nutans*	Wild carrot	*Daucus carota*
						Thistle, nodding	*Carduus nutans*	Yellow archangel	*Lamium galeobdolon*
						Vetch, tufted	*Vicia cracca*	Yellow flag iris	*Iris pseudacorus*
Source: NWIPC 2015 Target Species List									

1

5.0 COMPONENTS OF THE INVASIVE PLANT MANAGEMENT PLAN

The IPMP focuses on five key elements: identification, prevention, control and management strategies, monitoring and evaluation.

5.1 IDENTIFICATION

A reconnaissance weed survey was conducted as part of the Coastal GasLink vegetation studies in 2013. This work identified noxious weeds and invasive plant species on or near the ROW and planned associated facilities in selected locations. Survey information will be used as baseline field data to identify the locations along the ROW where there is a higher potential for weeds to exist or spread, and develop mitigation.

Species identification and areas of infestation will be an ongoing consideration during and construction and operations. Coastal GasLink will continue to record the location and extent of weed infestations at facilities and along the pipeline ROW during inspection, maintenance and monitoring activities during the operations phase of the Project.

The Invasive Plant Monitoring Form (Appendix A) will be used to document infestations and provide direction for weed control contractor activities. Completed forms will contain details on the infestation location, size, density and species. Site flagging may be used to delineate infested areas.

5.2 PREVENTION

Prevention is the most effective way to minimize the spread of noxious and invasive weeds. Preventing the establishment or spread of weeds will rely on educating Project personnel about the importance of managing weeds and ensuring there are personnel who can identify weed species, treat existing weed populations and implement mitigation that prevents weed seeds or other plant parts from becoming established.

The Coastal GasLink Environmental Management Plan (EMP) includes the following mitigation to prevent the spread of invasive plant species (Table 5-1).

Table 5-1: Mitigation to Prevent Weed Establishment

Reference	Project Activity	Mitigation
EMP Section 6.3	Staking	• Flag areas identified as having noxious weed infestations before starting construction.
Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan and Reclamation Program	Grasslands	• Seed grasslands as soon as practical after final cleanup or after machine clean up in areas of construction, in frozen conditions. Re-seed with Certified No.1 seed mix or native species in accordance with the Reclamation Program. Where the grassland occurs in an area with invasive plants, seed an aggressive short-lived cover crop that will provide a quick cover. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority.
	Noxious Weed Infestations	If noxious weed infestations are identified before construction, implement the following: • For noxious weed infestations: treat infestation before mats are placed (i.e., construction mats or swamp mats) over the infested areas. Where mats are used, ensure they are free of soil, vegetation and debris before removing from the site. • Avoid the placement of vehicles, equipment and construction material in areas infested with noxious weeds.
	Weeds	• All equipment must arrive at the Project site clean and free of soil or vegetative debris. Equipment will be inspected by the Environmental Inspector(s) or designate, and if deemed to be in appropriate condition, will be identified with a suitable marker or tag. • Any equipment that arrives in a dirty condition will not be allowed on the ROW until it has been cleaned. • Post signs at areas identified as having noxious weed infestations before starting construction. • Conduct basic shovel and sweep or compressed-air cleaning before moving equipment from any locations identified as having a noxious weed infestation. • Reduce the amount of construction equipment used and limit the number of passes the equipment makes through weed-infested areas, to the extent practical. • Strip topsoil and surface materials from the full ROW on lands where localized weed infestations are encountered. Store soil piles containing noxious weeds to prevent mixing with the surrounding soil during regrading and final cleanup. • Monitor topsoil and surface material piles for weed growth during construction and implement corrective measures (e.g., spraying, mowing, hand pulling) to avoid infestation, when warranted. • Record locations of equipment weed cleaning sites and monitor during the following growing season. • Additional mitigation to reduce weed growth and spread may be warranted if grade/surface material replacement is delayed because of construction scheduling.
EMP Section 7.1.3	Invasive Plants	• Implement the Invasive Plant Management Plan during the Project clearing activities.

Table 5-1: Mitigation to Prevent Weed Establishment (cont'd)

EMP Section No.	Project Activity	Mitigation
Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan	Red-listed Ecological Communities at Risk	• In the few Red-listed ecological community areas along the route, retain a forested or shrub buffer between the Red-listed ecological community at risk and adjacent early seral plant communities by reducing the extra work space, where practical, when the Project footprint enters and exits the feature. The buffer is expected to reduce the potential adverse effect of windthrow, help preserve the natural environmental conditions of the community and limit the movement of invasive plant seed and plant parts along the open corridor. Flag the area to narrow in the field before clearing.
Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan and Reclamation Program	Alpine/Subalpine Areas	• Manage the alpine/subalpine habitats as invasive plant free zones with strict guidelines on vehicle and equipment access.
EMP Table 7-1 Resource-Specific Mitigation Table	Agricultural Land Reserve	• Follow a Soil Erosion Contingency Plan and Invasive Plant Management Plan to reduce the introduction and spread of noxious weeds during Project construction activity.
EMP Section 8.8.3	Straw Crimping	• To prevent the introduction or spread of noxious weeds, use certified weed-free straw sourced from within BC or Alberta. If certified straw is not available, source straw from the immediate local area provided it is from fields where weed management is practiced.

5.3 INVASIVE PLANT CONTROL AND MANAGEMENT STRATEGIES

Coastal GasLink will use an integrated vegetation management approach that includes mechanical, cultural and chemical methods to control and minimize the spread of invasive plant infestations. The cultural or chemical treatment methods will vary with the life-form and mode of reproduction of the species targeted, and the location and extent of the infestation. Mechanical treatments may include hand-pulling, cultivation, mowing and mulching. Cultural weed treatments may include the promotion of active revegetation of native plant communities through native grass, forb or woody plant installations. Condition 16 of Schedule B to of the Environmental Assessment Certificate (EAC) states:

> The Holder must use alternative methods of vegetation control, as specified in the Holder's Invasive Plant Management Plan, in the asserted territories of Aboriginal Groups that have requested that pesticides or herbicides not be used, and tracked in the *Working Group Issue-Response Tracking Table (including First Nations) for the Coastal GasLink Pipeline Project*, provided those alternative methods are consistent with the *Integrated Pest Management Act*.

If herbicides are deemed necessary to control the spread of weeds, Coastal GasLink will contract qualified herbicide application specialists. The specialists will work in conjunction with the regional invasive plant councils to minimize herbicide use and maximize efficiency. Herbicide applications will be conducted in accordance with all applicable regulatory requirements. Pesticides that are harmful to wildlife will not be used.

Coastal GasLink will work with the regional invasive plant councils to identify species or specific locations that warrant treatment. Coastal GasLink will also manage the following species when it is likely that Project activities will result in the species establishment or spread to high risk sites, such as environmentally sensitive areas and adjacent areas that do not already contain the invasive plant species:

- provincially listed noxious and EDRR species (Table 4-1 and Table 4-2) (Coastal GasLink has been advised by BC MFLNRORD that regional priority invasive plant lists are updated annually.)
- regionally listed noxious species (Table 4-3)
- species listed as ‘Eradicate’ and ‘High Priority’ in the Peace Region (Table 4-4)
- species listed as ‘Eradicate’, ‘Extremely Invasive’ and ‘Very Invasive’ in the NWIPC regions (Table 4-5)

Specific control measures will be developed for species with defined containment boundaries in communication with the appropriate regional invasive plant councils. There are four species with provincially defined containment boundaries (BC MFLNRORD 2015). These include:

- marsh (plume) thistle
- field scabious (blue buttons)
- common tansy
- blueweed

The objective of containment boundaries is to prevent the weed infestation from expanding into surrounding areas. The species will be treated aggressively outside the containment area and treatments within the boundary will be conducted as resources allow (BC MFLNRORD 2015). Linear projects that cross defined containment boundaries must ensure project activities do not spread the species outside the containment zone. The Project crosses through the common tansy containment boundary. In addition, temporary Project infrastructure (access road) crosses a containment zone for field scabious.

As specified in the EMP, construction mitigation to control the establishment of weeds is listed in Table 5-2.

Table 5-2: Mitigation to Control Weed Establishment

Reference	Project Activity	Mitigation
EMP Section 7.1.3	Use of Herbicides	Restrict the general application of herbicide near sensitive resources during all phases of the Project. Spot spraying, wicking, mowing or hand-picking are acceptable measures for weed control in these areas. Prohibit the use of herbicides in proximity to waterbodies, unless the herbicide application is conducted by ground application equipment, or otherwise approved by the relevant regulatory agency. Use of herbicides will adhere to the BC *Integrated Pest Management Act* and regulation.
	Weeds	• Monitor topsoil and surface material piles for weed growth during construction and implement corrective measures (e.g., spraying, mowing, hand pulling) to avoid infestation, when warranted. • Record locations of equipment weed cleaning sites and monitor during the following growing season. Longer term monitoring may be required for slow germinating species. • Additional mitigation to reduce weed growth and spread may be warranted if grade/surface material replacement is delayed because of construction scheduling.
EMP Table 7-1 Resource-Specific Mitigation Table	Agricultural Land Reserve	• Follow a Soil Erosion Contingency Plan and Invasive Plant Management Plan to reduce the introduction and spread of noxious weeds and invasive plants during Project construction activity.

EMP Table 7-1 Resource Specific Mitigation Table	Agricultural Land Reserve	• The following requirements must be met within 24 months of applying the seed mixture or introducing vegetation:
		  • seed mixtures must not increase the frequency or distribution of any weed species of the surface lease or on adjacent undisturbed ground;
		  • seed certificates of analysis will be obtained and all seed used will be Certified No. 1 seed mix or native species in accordance with the Reclamation Program. Seed mixtures used will have a weed certificate. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority.

EMP Section 8.8.3	Weed Control	• Implement Post-Construction Monitoring (PCM) and treat weed infestation on the ROW and facility sites, as needed.

5.4 MONITORING

Coastal GasLink's weed monitoring will be done during regular ground inspections and over-flights to determine the areal extent of weed problems on the ROW and at facilities, in accordance with BC Oil and Gas Commission permit conditions. Where potential problems are identified, action plans will be developed to determine the best treatment options. Refer to the Post-Construction Monitoring Program for monitoring protocols. The Post-Construction Monitoring Program continues for five years after construction. TC Energy will implement its operations and maintenance programs, which include right-of-way surveillance. If warranted, detailed vegetation assessments will be completed at sites where reclamation problems are identified.

5.5 EVALUATION

Efficacy of treatments and the effectiveness of the invasive plant management program will be assessed annually. Records of invasive plant surveys, treatments and monitoring results conducted for the Project will be retained by Coastal GasLink. Coastal GasLink will work with regional groups (i.e., the IPCPRRD and the NWIPC) for information about survey, treatment and monitoring data in the Invasive Alien Plant Program (IAPP) database (http://apps.nrs.gov.bc.ca/ext/iapp).

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Appendices – Contents

Appendix A Invasive Plant Monitoring Form

Appendix A

Invasive Plant Monitoring Form

Coastal GasLink Invasive Plant Monitoring Form
Page 1 – Site Assessment

Date:_____ Daily: _____ Page: _____ Name: _____

Location: _____ **Type**: ROW / Facility / Access Road **Land Use**: NP / THP / C / RD Photos: _____

Preconstruction Invasive Plant Survey / Post Construction Invasive Plant Control

Species Observed (Corresponds to site sketch)	Location	Growth Stage (S / J / M)	Height (cm)	Density Code (1-13)	Designation (R / Nox / Nus)	Plant Category (1 - 4)
1.	On site					
	Adjacent[1]					
2.	On site					
	Adjacent[1]					
3.	On site					
	Adjacent[1]					
4.	On site					
	Adjacent[1]					
5.	On site					
	Adjacent[1]					
6.	On site					
	Adjacent[1]					
7.	On site					
	Adjacent[1]					
8.	On site					
	Adjacent[1]					
9.	On site					
	Adjacent[1]					
10.	On site					
	Adjacent[1]					

Sketch of Site – Show Distribution of Invasive Plants	Additional Comments

[1]Adjacent: the area within 20 m of the Project footprint

A. – PRECONSTRUCTION INVASIVE PLANT CONTROL – ROW, Facility Site or Access Road

- If prohibited or Noxious weeds are present, recommend control method for immediate suppression
- If agronomic invasives are present, recommend either:
  1. No treatment, if not invasive where found, or
  2. Control method (see Treatment Options, below), or
  3. Topsoil management during construction (See EPP), or
  4. Both 2 & 3

B. POST CONSTRUCITON MONITORING – ROW, Facility Site or Access Road

Course of Action Key:

1. Are prohibited or Noxious weeds present?
2. If Yes, are weeds more abundant on site than off?
3. If Yes, determine Treatment Priority

Treatment Threshold			
Plant Category	Site Risk Level		
	High	Mod	Low
1	P1	P1	P1
2	P2	P3	P4
3	P2	P3	P4
4	P3	P4	P5

Plant Category	Treatment Priority
1 - Extremely Invasive, dominant	P1 - As soon as possible, immediate suppression treatment
2 - Very Invasive, dense patches	P2 - As soon as conditions are optimal for treatment
3 - Somewhat Invasive, not dominant	P3 - When conditions are optimal, treat once P2 sites treated
4 - Aggressive, relatively easy to control	P4 - Assess again next year and treat to prevent spread
(For plant rating, see table 2-1, WMP)	P5 - Assess again next year, treat once P4 sites treated

Site Risk Level – Purpose/Intent of Treatment (See also Table 2-4, WMP)

High - To stop the spread of invasive plants currently threatening non-infested or highly susceptible sites (cultivated, hay and pasture lands)

Moderate - To stop the enlargement of sites in less susceptible areas

Low - To stop the enlargement/contain sites on and adjacent to industrial lands

Environmental Protection

Water source/waterbody within 30 m	☐ Yes	☐ No	Comments
Waterbody/Riparian area within 30 m	☐ Yes	☐ No	Comments
Site requiring protection	☐ Yes	☐ No	Comments
Environmental features within 10 m (*e.g.* wildlife habitat)	☐ Yes	☐ No	Comments
Native/rare plants present	☐ Yes	☐ No	Comments
Accessibility (circle)	good / fair / poor		Comments

Other: _____

Treatment Options

Control Method (circle) seeding / mechanical / chemical / biological

Rationale/Comments: _____

Treatment Decision

Recommendations reviewed by: _____

Approved course of action: _____

Rationale for approved course of action: _____

D.11 VISUAL QUALITY MANAGEMENT PLAN

Please see *Visual Quality Management Plan (Rev 5)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 19

D.12 WETLANDS MANAGEMENT PLAN

Please see *Wetland Management Plan (Rev 5)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 6

D.13 WILDLIFE AND WILDLIFE HABITAT MANAGEMENT PLAN

Please see *Wildlife and Wildlife Habitat Management Plan* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 14

D.14 EROSION AND SEDIMENT CONTROL PLAN

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Coastal GasLink
Pipeline Project

Erosion and Sediment Control Plan

CGL4703-EFR-ENV-PLN-0001

April 13, 2020

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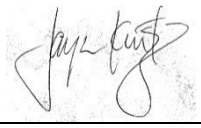
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Revision Log

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LIST OF ABBREVIATION AND ACRONYMS

BC	British Columbia
BC-CESCL	British Columbia Certified Erosion Sediment Control Lead
BC WQG	British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture
BMP	Best Management Practice
CISEC	Certified Inspector of Sediment and Erosion Control
CPESC	Certified Professional in Erosion and Sediment Control
EA	Environmental Assessment
EAC	Environmental Assessment Certificate
ESC	Erosion and Sediment Control
EI	Environmental Inspector
EM	Environmental Monitor
EMP	Environmental Management Plan
LNG	liquefied natural gas (LNG)
km	Kilometer
mg/L	Milligram per litre
NTU	Nephelometric Turbidity Unit
OGC	British Columbia Oil and Gas Commission
PLA	Permits, licenses, and/or authorizations
QP	Qualified Professional
TSS	Total Suspended Solids
WQ	Water Quality

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1.0 FOREWARD

This erosion and sediment control (ESC) plan has been developed for the Coastal GasLink (Coastal GasLink) Pipeline Project (the Project). The intent of this high-level planning document is to outline in one document the general approach and expectations for erosion and sediment control across the entire Project consistent with regulatory requirements. This plan has been prepared following the Project's Environmental Management Plan (EMP[1]) commitments and Environmental Assessment Certificate (EAC) conditions, permit conditions, other regulatory requirements, best management practices (BMPs), and the authors' ESC experience. The ESC practices and guidance contained herein are intended to support and complement Contractors' planning and implementation of ESC measures to minimize uncontrolled surface water runoff and sediment transport on the Project.

2.0 INTRODUCTION

2.1 EROSION AND SEDIMENT CONTROL CONTEXT

The Project footprint is characterized by a wide range of biogeoclimatic conditions; temperature, precipitation, terrain, soils, streams, and fisheries and aquatic values vary across the footprint. When combined with other factors like construction sequencing and timing, biogeoclimatic diversity will present various erosion and sediment control challenges unique to each work package. For example, ESC measures for winter construction along the Fraser Plateau ecoregion near Burns Lake will have to consider different risks and employ different measures than near Chetwynd, where soils are highly erodible, or near Kitimat, where steep terrain, high-value fisheries resources, and abundant year-round precipitation prevail.

Based on experience in early construction of the Project, Initial ESC results and Contractor feedback reinforce the importance of ESC planning, including sharing information and lessons learned. To facilitate ESC adaptive management, Coastal GasLink has established regular Project-wide meetings where Contractors and Coastal GasLink can discuss ESC challenges and successes. This collaborative forum is not a requirement of the EA or permit conditions and may not be required on an ongoing basis; however, it is an important component of the Project's approach to enhancing ESC based on experience in early construction.

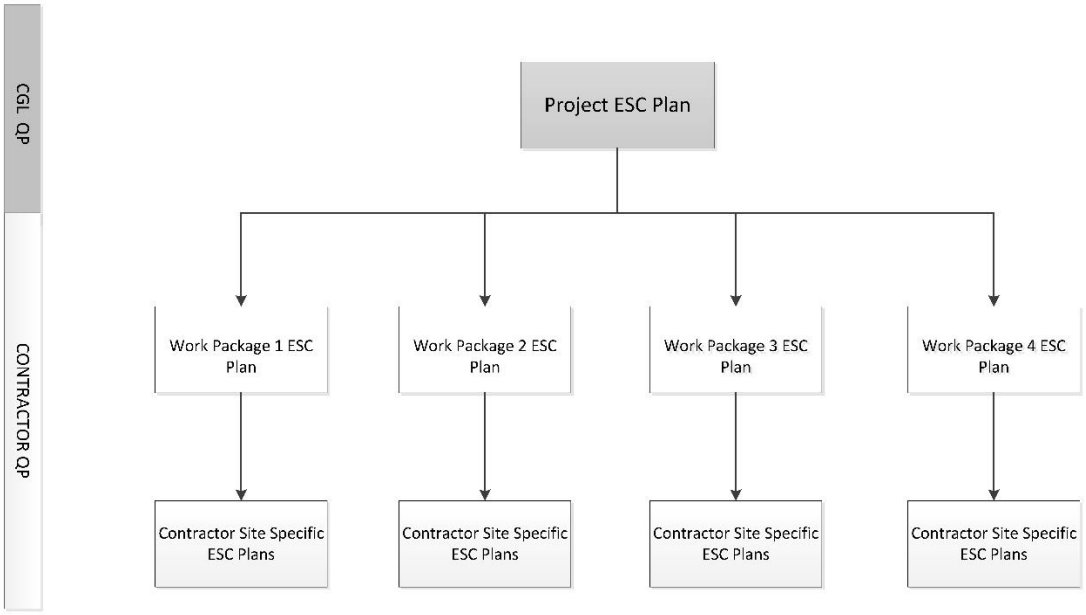
The overall strategy for ESC planning relies on Qualified Professionals (QPs) planning, designing, and overseeing ESC mitigation in a three-fold approach (Figure 1): Coastal

[1] Throughout this document, any reference to the "EMP" includes all associated management, monitoring and contingency plans.

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GasLink's overall plan across the entire Project; Contractor-specific plans; and, site-specific plans (as determined by the Contractors' QP). This document is the Project's plan.

Figure 1. Three-Fold Approach to ESC Planning



2.2 PURPOSE AND SCOPE

This ESC Plan has been developed to address two main objectives:

- To provide a high-level, Project-wide plan that demonstrates the overall approach to ESC. This standalone ESC Plan aims to enhance ESC by consolidating the existing EMP requirements relating to ESC and providing additional information in an overarching ESC Plan.
- To directly support Contractors' ESC planning and implementation responsibilities (see Section 2.3).

Specifically, this ESC Plan will:

- Provide a framework to guide the Project toward successful ESC planning and implementation.
- Demonstrate appropriate ESC planning and oversight.
- Consolidate existing ESC information, including regulatory and contractual requirements, plans, and supporting documents.

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- Outline roles and responsibilities.
- Support Contractors' responsibilities, including requirements to develop construction-ready plans and to implement ESC measures.
- Identify best management approaches and practices.
- Outline existing ESC specifications where appropriate (e.g., water quality criteria) and factors the Contractors' QPs should consider.

The Project-wide ESC Plan will not:

- Replace Contractor site-specific ESC planning and implementation requirements.
- Provide detailed ESC measures or prescriptions.

2.3 CONTRACTOR SPECIFIC PLANS

Contractors are required to develop comprehensive, construction-ready ESC plans specific to their work package. Each Contractor-specific plan shall, at minimum:

- Be prepared by a Certified Professional in Erosion and Sediment Control (CPESC) (see Section 5.0).
- Be consistent with this overall Project ESC Plan.
- Meet all EMP commitments, EAC conditions (Section 0), permits and other regulatory requirements (Section 0).
- Develop a process to assess ESC risk across the work package.
- Specifically identify high risk sites and receptor sensitivity.
- Specify appropriate mitigation measures, with contingencies, to manage ESC risk. This may include generic or pick-list style ESC mitigation measures for selection by qualified field professionals (See Section 5.0) but must include a process to guide selection as well as standards for design, materials specifications, installation directions, etc. High-risk sites and activities, as determined by the Contractors' QP, shall require a site-specific plan.
- Incorporate ESC components shown on construction alignment sheets.
- Consider factors specific to Contractor work package locations (e.g., biogeoclimatic conditions, seasonality or timing of construction).
- Incorporate site and activity winterization measures (e.g., prepare for freeze and thaw of surface water, soils, and equipment).

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- Identify how ESC measures shall be incorporated into grading and other construction plans.
- Incorporate biophysical components and relevant mitigation shown on environmental worksheets and construction drawings.
- Incorporate ESC measures and typical design drawings included in pipeline construction specifications and/or other contractual documents.
- Incorporate manufacturers' installation and design specifications for ESC materials.
- Identify Contractor resources required to implement ESC mitigation measures.
- Define monitoring, maintenance, and reporting processes to demonstrate effectiveness of ESC mitigation measures.

In addition to work-package ESC plans, Contractors shall be required to develop site-specific plans to address high risk sites and activities. Site-specific plans shall:

- Be prepared, or reviewed and approved, by a CPESC (See Section 5.0) for all high-risk ESC sites.
- Identify specific erosion and sediment risks, including receptor sensitivity.
- Identify specific mitigation approaches, including construction timing, mitigation measures and devices, site plan drawings, standards for design, materials specifications and installation directions, monitoring and maintenance schedules, etc.
- Incorporate ESC components shown on environmental worksheets and construction drawings.

3.0 REGULATORY CONTEXT

3.1 RELEVANT LEGISLATION, GUIDELINES AND STANDARDS

The Project is subject to several Provincial and Federal acts and regulations. The following legislation is specifically relevant to ESC planning and mitigation:

- Federal
  - *Fisheries Act*
  - *Species at Risk Act*

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- *Seeds Act*

- Provincial
  - *BC Environmental Assessment Act*
  - *BC Water Sustainability Act*
  - *BC Environmental Management Act*
  - *BC Oil and Gas Activities Act*
  - *BC Forest and Range Practices Act*
  - *BC Mines Act*

Government legislation is often supported by formal guidelines. The following guidelines are specifically relevant to ESC:

- British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (BC WQG).

Other legislation, acts, regulations and guidelines may apply.

3.2 PROJECT ENVIRONMENTAL ASSESSMENT COMMITMENTS

The Project received its EA Certificate in 2014 with an amendment to allow for an alternative route (SHAR). Condition 26 of the EA certificate requires implementation of Project commitments specified in the EMP and associated plans, including the Soil Erosion Contingency Plan. A list of commitments relevant to ESC in the Soil Erosion Contingency plan and other plans is provided in Appendix A.

However, consistent with section 4.4 of the EMP, commitments may be revised over the course of this Project. Commitment revisions relevant to ESC will be provided directly to Contractors and this Project-wide ESC Plan will be updated. Accordingly, should discrepancies arise between the commitments in this Project ESC Plan and the rest of the EMP, commitments and standards in this ESC Plan prevail.

3.3 PERMITS, LICENSES AND AUTHORIZATIONS

Numerous environmental permits, licenses, and authorizations (PLAs) are required for various aspects of Project construction. Many of these PLAs will have requirements that are relevant to ESC, particularly:

- *Fisheries Act* Authorizations.
- BC *Water Sustainability Act* Change Approvals and/or Notifications.
- BC Oil and Gas Commission (OGC) Permits.

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Individual permits will be obtained by Coastal GasLink and provided directly to Contractors (rather than included in this ESC Plan) as outlined in the contract. Contractors shall be responsible to incorporate permit conditions in ESC planning and implementation.

3.4 COMPLIANCE EXPECTATIONS

The project will be constructed in compliance with all applicable legislation, regulatory requirements, EA Certificate conditions and referenced commitments (e.g., EMP), and PLAs. Coastal GasLink expects Contractors to plan and implement ESC measures using appropriate QPs applying best practices for the activities and reasonably anticipated conditions in accordance with this Project-wide ESC Plan.

4.0 ROLES AND RESPONSIBILITIES

A critical component of all ESC planning and implementation is oversight by ESC QPs (Section 5.1). Under QP oversight, the roles and responsibilities of key environmental and construction personnel who are involved with planning, implementing and maintaining ESC are presented below in Table 1 and Table 2.

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Table 1. Owner and Contractor Overall ESC Roles and Responsibilities

Company	Position/Role	Responsibilities and Authorities
Coastal GasLink	Project Management	• Define standards and expectations for Contractors. • Overall project performance. • Support in construction planning. • Oversee implementation of the Project-wide ESC Plan. • Stop Work Authority.
	Environmental	• Ensure Coastal GasLink ESC planning and inspection is overseen by a QP. • Ensure Coastal GasLink ESC Environmental Inspectors have adequate ESC training and experience • General environmental support. • Environmental Inspection. • Adding items to Contractor's ESC tracking list. • Environmental incident support. • Spill and environmental incident reporting to agencies. • Compliance assurance. • Environmental field support. • Stop Work Authority.
Contractors	Construction Management	• Construction planning and implementation. • Provide sufficient resources and materials to implement ESC measures. • Support development of Contractor-specific, and site-specific ESC plans. • Implement the Project-wide, Contractor-specific, and site-specific ESC plans, including monitoring and maintaining mitigation measures. • Address environmental incidents. • Review ESC deficiency reports. • Stop Work Authority
	Environmental	• Ensure Contractor ESC planning, implementation, and monitoring is overseen by a QP. • Ensure all employees, Contractors and subcontractors have appropriate ESC training and experience. • Develop Contractor-specific, and site-specific ESC plans.

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Company	Position/Role	Responsibilities and Authorities
		• Advise construction team on planning, scheduling and other factors in advance of specific construction activities. • Implement the Project-wide, Contractor-specific, and site-specific ESC plans, including monitoring and maintaining mitigation measures. • Generate and maintain ESC tracking list. • Maintain inventory of ESC materials • Recommend mitigation measure modifications. • Monitor environmental effects. • Reporting. • Environmental incident support. • Confirm overall ESC compliance. • Address environmental incidents. • Stop Work Authority

Table 2. Owner and Contractor ESC Planning, Implementation and Monitoring Roles and Responsibilities

Company	Project-Wide ESC Plan	Contractor-Specific ESC Plan	Site-Specific ESC Plan and/or Prescriptions
Coastal GasLink	Develop Inspect	Accept Inspect	Accept Inspect
Contractor	Implement Monitor	Develop Implement Monitor Maintain	Develop Implement Monitor Maintain

4.1 EROSION AND SEDIMENT CONTROL LEAD QUALIFIED PROFESSIONAL

To provide the highest level of professional practice, each Contractor shall retain, at minimum, an ESC Lead QP with CPESC certification. The ESC Lead QP shall oversee the Contractors' overall framework of ESC design, planning, training, installation, inspection and maintenance as per the Contractor-specific ESC Plan. The ESC Lead QP will develop and provide professional oversight of the Contractor-specific ESC plan, including signoff for reports and plans. The ESC Lead QP must provide ESC construction personnel with the appropriate level of information and oversight (e.g. typical design drawings, installation instructions, specifications, materials required) to successfully implement the prescribed ESC

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measures. Any changes to the ESC Lead QP endorsed plans shall be overseen and approved by the ESC Lead QP or designate.

The ESC Lead QP shall determine additional QPs or other qualified staff required to conduct planning, installation, monitoring and maintenance activities. In the Contractor's specific ESC Plan, the ESC Lead QP shall describe qualifications and experience required for various responsibilities, including:

- Field fit and design adjustment
- Installation oversight
- Effectiveness monitoring
- Maintenance of ESC prescriptions

5.0 ESC TRAINING AND QUALIFICATIONS

A key element to successful ESC planning and mitigation is ensuring that both management and workers have appropriate knowledge, training and experience. This Project requires three categories of training to facilitate success: specific qualifications and experience for key team members; general awareness orientation for all appropriate personnel and site/activity-specific training.

5.1 ESC CERTIFICATIONS

In addition to training and experience, key ESC practitioners shall have certified credentials as part of their qualification, except as otherwise determined by the Contractors' QPs. There are two approaches to certification: Professional Associations recognized by government legislation, and third-party institutions. The BC *Professional Governance Act* regulates five professional disciplines through enforceable codes of ethics and practice standards: agrologists, biologists, applied science technologists and technicians, engineers and geoscientists, and forest professionals (i.e., P.Ag., R.P.Bio., A.Sc.T., P.Eng., P.Geo., R.P.F.). Although ESC is not a specific discipline recognized by legislation, many of these professionals have ESC expertise, and a range of professional expertise is often integral to effective ESC management.

Third-party ESC certifications are not recognized by legislation but ensure specific ESC qualifications through training, knowledge, experience and practice standards. Three third-party certifications are generally recognized in BC:

- Erosion and Sediment Control Association of British Columbia (Certified Erosion and Sediment Control Lead, BC-CESCL).

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- EnviroCert International Inc. (Certified Professional in Erosion and Sediment Control, CPESC).
- CISEC Inc. (Certified Inspector of Sediment and Erosion Control, CISEC).

At minimum the Contractor shall:

- Hire personnel with appropriate training and experience for each role or provide required training.
- Ensure an ESC Lead QP (CPESC) signs off on the Contractor Specific ESC plan and reporting.
- Ensure a QP (as determined by the ESC Lead QP) oversees the implementation, monitoring and maintenance of all ESC measures, including identifying what tasks may be delegated to other QPs and other qualified individuals[2].

5.2 ORIENTATION

The Contractor shall provide adequate ESC training to appropriate personnel (management, employees, and subcontractors). This training shall:

- Be created or approved by the Contractors' ESC Lead QP.
- Clearly communicate the requirements to manage erosion and to control offsite sediment transport.
- Provide an overview of ESC best practices.
- Be recorded on personnel training records.

5.3 SITE AND ACTIVITY SPECIFIC TRAINING

Site and activity-specific training shall be required as determined by the Contractors' ESC Lead QP. This may include:

- ESC refresher/discussion of commitments and risk during daily tailboards.

[2] There may be situations where a suitably experienced and knowledgeable ESC practitioner is not a legislated professional and does not have a recognized third-party certification and/or recommended qualifications. The ESC Lead QP who must be a CPESC can designate such individuals as QPs with appropriate and documented justification.

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- Topic-specific presentations to construction teams, such as how to avoid or minimize ESC risk.
- Specific instructions for ESC teams, such as installation of ESC devices or monitoring of mitigation measures.

6.0 EROSION AND SEDIMENT CONTROL BEST PRACTICES

Except as otherwise noted, the following sections and best practices are not prescriptions; rather, they are general information and recommendations for consideration in ESC planning and implementation.

6.1 GENERAL APPROACH

Erosion is the removal and transportation of surface material, mainly because of wind or water, while sedimentation is the deposition of the suspended material removed by erosive forces. Implementation of mitigation and protection measures is based on extensive research and scientific evidence that the reduction in mobilization of soils reduces the effects of sediments on aquatic organisms.

Erosion prevention should be prioritized over sediment control and treatment. Preventing soil erosion and sediment mobilization by maintaining soil and slope integrity is important in preventing soil loss and water quality degradation. Erosion prevention is typically more cost effective and requires less maintenance or repair than sediment control, which often requires water treatment measures.

6.2 IDENTIFICATION AND MITIGATION OF EROSION RISK

Contractors shall develop and adopt a pre-planning approach to identify areas of risk and an understanding of required ESC mitigation measures to reduce risk. The Contractor has a multitude of methods available to determine the erosion and sedimentation risk to the Project along the route including desktop evaluation (e.g. aerial and/or satellite imagery, elevation/contour data), historical climatic data, onsite evaluation and site surveying, pre-construction inspections, and geotechnical reports. The Contractor shall determine appropriate methods during ESC planning to evaluate site specific erosion risks, reduce erosion risk and protect water quality during all construction phases.

6.3 WATER QUALITY PROTECTION CRITERIA

Water quality standards for the Project are specified in the EMP and requirements are detailed in the British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (BC MoE 2019). All surface water leaving the Project footprint that has contacted areas disturbed by Project construction must meet these standards if discharged into downstream waterbodies. However, these water quality guidelines are ambient rather

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than absolute; they specify allowable exceedances over background and account for naturally elevated conditions. Requirements for monitoring and reporting ESC-related water quality are provided in the EMP Appendix E2: Water Quality Monitoring Plan.

BC WQG relevant to ESC are summarized in Table 3.

Additional water quality standards for pH, temperature, dissolved oxygen and other parameters may also be relevant for specific ESC mitigations (such as flocculants or other active treatment options).

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Table 3. BC Water Quality Guidelines Directly Relevant to Erosion and Sediment Control.

Parameter	Measurement(s)	Criteria
Turbidity	Nephelometric Turbidity Unity (NTU)	If the following water quality changes are detected, mitigation measures must be implemented: • Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters; • Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters; • Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters; or • Change from background of 10% when background is >50 NTU at any time during high flows or in turbid waters.
Total Suspended Solids (TSS)	Milligrams per litre (mg/L)	• Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters; • Change from background of 5 mg/L at any one time for a duration of 30 d in all waters during clear flows or in clear waters; • Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters; • Change from background of 10% when background is >100 mg/L at any time during high flows or in turbid waters.

6.4 TIMING AND WORK SCHEDULING

Timing and work scheduling are preferred mitigation approaches that shall be considered in ESC planning and implementation. Factors to consider include climate (e.g., seasonal rain or snow melt), sensitive receptor periods (e.g., critical periods of fish life cycles such as spawning and egg incubation), and work staging (e.g., delaying high risk work until needed, shortening the duration of exposed soils). For example, clearing tall vegetation in advance of grading is standard practice, but avoiding grubbing until grading is imminent is a best practice. Another example is thoughtful winterization; minimizing exposed soils that will be subject to spring melt and installing ESC measures such as surface water drainage proactively before freeze-up.

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6.5 DESIGN FACTORS

The Contractor shall consider, at a minimum, the following site-specific factors when planning ESC design and implementation for each work package:

- Site-specific soils, slopes, watercourse and drainage considerations.
- Climate and weather (precipitation, temperature, design rainfall event), including the need to adapt measures in frozen conditions.

The Contractor shall consider the biogeoclimatic zone of the work location when designing the ESC measures to be implemented for a work site, including any special adaptations or modifications to BMPs necessary to ensure successful ESC.

Soils and slopes may be at risk of destabilization during construction activities in wet weather or during spring freeze-thaw cycles. To mitigate this risk, the Contractor shall use appropriate techniques to design slope protection appropriate for the location and climate type. This may include laboratory material testing and predictive modelling. The Revised Universal Soil Loss Equation (RUSLE2) (USDA 2019) is recommended for estimates rates of rill and slope soil erosion caused by rainfall and overland flow.

Some ESC mitigation measures, such as design of sediment ponds or surface water diversions, may require input from other registered professionals for geotechnical hazard assessment, engineered designs, etc.

6.6 WATER MANAGEMENT

Water management in areas with large areas of exposed slopes or soils is important in preventing erosion and transport of sediment. Drainage ditching may be used to direct clean water around exposed areas and to prevent sediment laden/turbid waters from directly discharging into nearby streams. Diversion ditches and pumping of sediment laden water shall discharge into designed settling ponds or natural infiltration areas to avoid sediment laden water inputs to watercourses, according to conditions outlined in the EMP. Discharges shall have scour protection or an energy diffuser to minimize erosion of receiving sites. Water management planning shall be part of site-specific ESC planning.

Water management features shall be designed considering the factors described above in Section 6.5.

6.7 EROSION CONTROL MEASURES AND APPLICATIONS

The Contractor is required to implement applicable and effective ESC measures in all areas of the Project where there is the potential for erosion, sediment transport, and/or sediment

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laden waters deposition into off-site receiving waters. Anticipated site-specific erosion control measures that may be used as determined by the ESC Lead QP or other qualified individuals, and overseen by the ESC Lead QP may include:

- **Vegetation retention** – Vegetation clearing may be staged to maintain slope stability and to prevent soil loss. Specifically, delay grubbing and leave stumps and low vegetation on slopes until construction is imminent.
- **Soil handling and stockpile management** – Soils may be segregated, and stockpiles protected (e.g. covered or seeded) to prevent soil loss and sediment transport by rain or wind to conserve soils for use during reclamation.
- **Seeding/hydroseeding** - Seeding or hydroseeding may be used to stabilize slopes, and in areas where soils are expected to remain exposed for longer than a growing season. Contractors will provide specific prescriptions and guidelines for hydroseed/mulch application in their site-specific ESC plans. All seed mixes used for erosion prevention will meet standards to prevent the spread of invasive plants and be designed for the local area with native plant seed in accordance with Canada's *Seeds Act* and the Project EMP. Seed placement will be on properly prepared soils at the appropriate dispersal rate/density as designed in coordination with vegetation QP.
- **Mulch application** - Mulch may be seed-free straw, compost, wood chips, or an engineered fiber mulch. All mulches must be certified weed-free, and application rates must conform to designed/prescribed coverage.
- **Rolled erosion control products (RECP) / erosion matting** - RECP may be used as protective covering on slopes and soils to increase surface sheer strength and protect soils against rain splash, wind, and/or sheet flow erosion. Slopes and soils are prepared prior to installation of RECPs to ensure full contact with the surface is maintained.
- **Slope texturing** – Slope texturing may include track packing, punch templates, benching, and rough and loose method.
- **Water conveyance** – Water conveyance features (ditches etc.) include erosion protection and designed velocity checks may be used as required to prevent erosion of the conveyance feature itself.
- **Rock armoring** – Rock armouring may be used where bio-engineering is not feasible or appropriate. Rock must be sized appropriately to remain stable but also provide sufficient ground contact to protect soils.

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- **Diversion ditch/berm** - Temporary water diversion structures may be required during instream works to temporarily dewatering and isolate of work areas, or to temporary protect workspaces. All water management structures must be protected from erosion and hydrologic sheer stress and be installed in accordance with applicable permits.
- **Slope interception structures and slope drains** - Slope interception structures are effective protection measures to prevent rill formation on lengthy uninterrupted slopes. Slope drains may be used to convey flow downslope within non-erodible structures or materials with the goal of preventing rill and gully formations.
- **Impermeable protective sheeting** - Impermeable sheeting may be used as a temporary measure to protect soils from rain splash erosion or hydrologic shear stress by maintaining a barrier between the water and soil.
- **Silt or sediment fence** – Silt fencing may be used as a wind erosion protection structure but is generally not effective at controlling erosion from surface water. Silt fence is intended for use as a perimeter control to retain sediment within the boundary of a site and/or area.

6.8 SEDIMENT CONTROL MEASURES AND APPLICATIONS

Sediment control measures shall be used when space is available for treatment within the right-of-way or as a barrier to sensitive receiving environments. Anticipated site-specific sediment control measures that may be used, as determined by the ESC Lead QP or other qualified individuals and overseen by the Lead ESC QP, include:

- **Perimeter Controls** - Perimeter controls, including sediment fencing, may be used to retain potentially erodible materials at the base of slopes or at sensitive receptor boundaries. Perimeter controls allow water to slow down when encountering the barrier, depositing fine particles of soil behind it. Sediment fence or silt fence is not an effective filter and will impound water when installed correctly.
- **Check Dams** - Velocity check or check dams may be used within water conveyance structures to slow the flow of water and allow for deposition of suspended sediments. Check dams must not be used to contain water. The Contractor will engage the CPESC regarding proper installation of velocity checks and check dams.
- **Retention roll** - Retention roll (coir rolls) may be used as a slope interception structure to slow the flow of water travelling over slopes, depositing sediment on the upslope side of the retention structure.

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- **Water management** – Water management may include diversion channels, pumping, and Vac trucks.
- **Filter bags** – Filter bags may be attached to the end of discharge pipes and hoses to slow water flow at the outlet and capture larger sediments within the filter bag.
- **Storage and containment of site runoff** – Site runoff may be contained in sediment retention ponds or portable storage tanks to prevent sediment delivery to adjacent receptors.
- **Active Treatment** - Active treatment may include the use of flocculants, coagulants, pH adjustment, filters, or bioengineering.
- **Wheel Wash Stations** – Wheel wash stations may be located between construction sites and public roads to prevent tracking of sediments beyond the project footprint.
- **Street sweeping** – Street sweeping may be used in to recover sediments tracked onto public roads.

6.9 ESC SHUTDOWNS / ENVIRONMENTAL INCIDENTS

The Contractor must report all environmental incidents relating to ESC to the Construction Manager and Lead Environmental Inspector as soon as practicable. Corrective actions must be identified by the Contractor, including timelines.

In some cases, site or activity shutdowns may be required to address ESC. Two types of site or activity shutdowns may occur in relation to ESC: proactive shutdowns (to prevent an environmental incident) and reactive shutdowns (in response to some environmental incidents). ESC related shutdowns can be site or activity specific, or broader, and can be initiated by anyone with stop work authority in the Contractors' teams or Coastal GasLink (see EMP section 3.5). Refer to EMP section 4.3 regarding non-compliances and resolution for further information about the work modification, stop work and corrective action procedures in situations of non-compliance.

Proactive shutdowns may occur to prevent an environmental incident due to failure of installed ESC measures, or due to predicted weather events or site conditions. The Contractor ESC Lead QP should ensure there is a process in place within the construction/environmental team to monitor and assess weather forecasts and site conditions. The Adverse Weather Contingency Plan, Wet Soils Management Plan, and the Flood and Excessive Flow Contingency Plan provide additional requirements relating to pausing or re-scheduling work to address issues that can arise in ESC management.

7.0 INSPECTION AND MAINTENANCE

Inspections and maintenance of ESC measures are necessary to determine if the mitigation measures implemented for the Project are functioning appropriately and as designed.

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Regularly scheduled inspections determine whether maintenance, redesign or removal is required. Inspections and associated records allow for confirmation of the functionality of the measures and conformance with the Project-wide, Contractor-specific, and site-specific ESC Plans.

The Contractor is responsible for correct design, implementation, installation, monitoring, and maintenance of all ESC measures for their respective work package. The Contractor shall maintain a record of inspections, and maintenance log for all ESC activities, which shall include:

- Location.
- Date of ESC measure installation.
- Type of mitigations installed.
- Dates of inspections.
- Lists of deficiencies.
- Maintenance activities performed and dates.
- Recommendations for improving similar mitigation installations at other sites.

The Contractor responsibilities with respect to inspection and maintenance include:

- Determining the minimum frequency of inspections.
- Developing a monitoring schedule based on inspection frequency and that considers risk (rain vs dry conditions, sensitivity of receptors, etc.).
- Seeking Coastal GasLink approval of the proposed monitoring schedule to ensure regulatory requirements are met.
- Maintaining consistency in records of ESC measures and inspection results through the use of tracking tables and punch lists.
- Documenting removal and disposal of all temporary ESC products.

8.0 REPORTING

The Contractor shall be responsible for reporting on ESC related issues and developing appropriate templates and timelines for reports. Reporting requirements will be related to the timing of the works (season) and the works occurring. Coastal GasLink reserves the right to modify the requested frequency of reporting at any time during the Project and will provide notice to the Contractor to do so. In the case of extreme weather events, Coastal GasLink reserves the right to request additional monitoring with minimal notice.

- The Contractor shall be responsible for scheduling the delivery of reports at the required frequency and shall seek Coastal GasLink approval of the proposed schedule.

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Coastal GasLink may approve the proposed reporting schedule or require modifications to meet regulatory requirements.

- The Contractor shall provide timely reports suitable for the monitoring activity including the following types of reporting:
    - Routine updates.
    - Routine inspection reports.
    - Emergency or non-conformance reporting.
    - Environmental tracking list, including ESC, that will be actively maintained and available for submittal to Coastal GasLink according to a mutually agreed schedule.
    - Photos of the site and site conditions (as necessary).
- The Contractor shall outline the expected level of detail for each reporting type and submit report templates to Coastal GasLink for approval.

8.1 INCIDENT REPORTING

The Contractor shall report ESC-related environmental incidents to the Coastal GasLink EI as soon as practical but not exceeding 24-hours. (Other environmental incident reporting requirements are provided in the EMP and appendices, including the Water Quality Monitoring Plan).

Coastal GasLink will also report directly to provincial and federal regulatory authorities as required.

9.0 ADAPTIVE MANAGEMENT

Adaptive management involves a continuous improvement cycle and shall be implemented as part of ESC planning to ensure the appropriate mitigation measures are being employed. Adaptive management actions, such as modification or change to an ESC measure, may be the required as a result of inspection, maintenance, or changing conditions. Improvements to ESC measures will be made based on field observations of effectiveness, or in response to extreme weather events that require an increase level of ESC response. Adaptive management may also include the adoption of emerging technologies or innovative new approaches.

Erosion control products being used on site shall be installed and operated as per the manufacturers' instructions, or as per the CPESC's instructions, depending on site conditions. If installed ESC measures are not meeting expected standards, they shall be repaired or replaced, and if continual maintenance is required may be modified and reconsidered on subsequent sites and applications.

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Key issues to address when designing and reviewing ESC effectiveness are:

- Product Awareness (understanding of the purpose and capabilities of the product).
- Proper supervision during field installation (CPESC, BC CESCL, or other qualified individual as determined by the ESC Lead QP available at time of installation to ensure proper fit of measures or to provide guidance to equipment operators).
- Coastal GasLink, regulator, or Contractor feedback on the effectiveness of installed mitigation measures and BMPs.
- Understanding the mechanism of failure for BMPs (understanding how the BMP works and its weaknesses).

Personnel designated by the ESC Lead QP to conduct effectiveness monitoring shall provide regular feedback to the ESC Lead QP on the condition and functionality of the ESC measures and BMPs for their respective work package. This information shall be considered for ongoing ESC planning, including to modify and improve existing ESC measures, particularly when installed measures are proving ineffective or maintenance becomes impractical.

Seasonality of the work shall also be considered when evaluating or modifying any existing ESC measures. Since the Project is located in areas of high rainfall or snow accumulation and snow melt, the site-specific ESC plans and any modifications to the plans as a result of adaptive management shall be designed to adjust with the changes in the season.

10.0 CHANGE MANAGEMENT

The Project-wide ESC Plan is not a static document; amendments to EMP commitments, changes to construction plans, and ESC adaptive management may necessitate revisions to this ESC Plan consistent with section 4.4 of the EMP. The Contractor-specific ESC Plans will include a change management section to describe the process for revisions to those plans.

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11.0 REFERENCES

BC MOE (British Columbia Ministry of Environment). 2019. Approved Water Quality Guidelines. Available online at: https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines. Accessed on December 2019.

USDA (United States Department of Agriculture). 2019. Watershed Physical Processes Research: Oxford, MS: Revised Universal Soil Loss Equation 2 – Overview of RUSLE2. Available online at: https://www.ars.usda.gov/southeast-area/oxford-ms/national-sedimentation-laboratory/watershed-physical-processes-research/research/rusle2/revised-universal-soil-loss-equation-2-overview-of-rusle2/. Accessed on December 2019.

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Appendix A. Erosion and Sediment Control Commitments

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Commitment **(square brackets indicate text was added to provide context or clarity)**	**Source Document**
Before any blasting commences, a specific blasting procedure shall be developed for the site. Ensure location of potentially required erosion control such as trench plugs that may be required to key in are identified in the blasting procedure.	Environmental Management Plan - Section 6.0 Construction Preparation
Review blasting procedures, safety protocols and applicable erosion control measures with Contractor personnel prior to commencing blasting activities to ensure there is a full understanding of the procedures and mitigation to be implemented.	Environmental Management Plan - Section 6.0 Construction Preparation
If beaver dams must be removed, breach the beaver dam slowly to avoid the rapid release of water that could cause fish entrapment or erosion of the bed and banks resulting in subsequent siltation of downstream waters.	Environmental Management Plan - Section 7.1 Resource-Specific Protection Measures
Location: KP 0.0 to KP 15.2, KP 20.6 to KP 24.0, KP 25.2 to KP 27.1, KP 27.2 to KP 28.7, KP 28.9 to KP 38.8, KP 39.5 to KP 39.8, KP 62.3 to KP 64.0, KP 90.2 to KP 91.1, KP 409.7 to KP 414.6 Issues: Disturbance to ALR Mitigation: Apply water, snow, tackifier, or other suitable material to the salvaged topsoil or upper surface material as directed by the Environmental Inspector in order to prevent erosion.	Environmental Management Plan - Section 7.1 Resource-Specific Protection Measures - Table 7-1
Location: KP 0.0 to KP 15.2, KP 20.6 to KP 24.0, KP 25.2 to KP 27.1, KP 27.2 to KP 28.7, KP 28.9 to KP 38.8, KP 39.5 to KP 39.8, KP 62.3 to KP 64.0, KP 90.2 to KP 91.1, KP 409.7 to KP 414.6 Issues: Disturbance to ALR Mitigation: Monitor the effectiveness of the erosion control measures and implement remedial work where warranted.	Environmental Management Plan - Section 7.1 Resource-Specific Protection Measures - Table 7-1
Location: KP 0.0 to KP 15.2, KP 20.6 to KP 24.0, KP 25.2 to KP 27.1, KP 27.2 to KP 28.7, KP 28.9 to KP 38.8, KP 39.5 to KP 39.8, KP 62.3 to KP 64.0, KP 90.2 to KP 91.1, KP 409.7 to KP 414.6 Issues: Disturbance to ALR Mitigation: The frequency and extent of erosion features must be similar to adjacent undisturbed land.	Environmental Management Plan - Section 7.1 Resource-Specific Protection Measures - Table 7-1
Where segments of the ROW require rollback for access management or erosion control, ensure sufficient timber of appropriate size is available.	Environmental Management Plan - Section 8.2 Clearing
Reduce grading throughout the ROW, especially at watercourses, wetlands, and rare plant sites and on moderately steep slopes, if practical. Reduce the width of grading in order to limit the potential for erosion and subsoil compaction, where practical.	Environmental Management Plan - Section 8.2 Clearing
Install sediment control structures such as temporary berms on approach slopes to watercourses following grading, as required (Dwgs.STDS 03 ML 05-001, STDS 03 ML 05-608, STDS-03-ML-05-132, STDS-03-ML-12-221, STDS-03-ML-12-222, and STDS-03-ML-12-223). Inspect the temporary sediment control structures on a daily basis and, if repairs are required, complete before the end of each working day.	Environmental Management Plan - Section 8.2 Clearing

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Commitment **(square brackets indicate text was added to provide context or clarity)**	**Source Document**
Stabilize exposed surface material and subsoil where the potential for erosion exists. Refer to the Soil Erosion Contingency Plan (Appendix C.7) for additional information.	Environmental Management Plan - Section 8.3 Surface Material Removal, Salvage and Grading
Following an adverse weather event, the Contractor is responsible for confirming the efficiency of sediment and erosion control measures and whether corrective action is required. The Construction Manager, in consultation with the Environmental Inspector(s) will implement contingency measures as outlined in the Adverse Weather Contingency Plan (Appendix C.2).	Environmental Management Plan - Section 8.3 Surface Material Removal, Salvage and Grading
Following the salvage of the topsoil, if warranted, stabilize topsoil windrows and stockpiles using either water or a suitable tackifier as directed by the Environmental Inspector(s). Refer to the Soil Erosion Contingency Plan (Appendix C.7).	Environmental Management Plan - Section 8.3 Surface Material Removal, Salvage and Grading
Should construction traffic or other related construction activities disturb the topsoil piles and there is a potential for wind erosion, apply additional water or tackifier.	Environmental Management Plan - Section 8.3 Surface Material Removal, Salvage and Grading
Where practical, delay grading of the primary banks of watercourses until immediately before construction of the crossing. If warranted, install appropriate temporary erosion and sediment control structures at the discretion of the Environmental Inspector(s) upon initial disturbance of the vegetative mat and surface material.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Direct grading away from waterbodies. Do not place fill material in a waterbody during grading.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Install erosion and sediment control such as silt fences at all watercourses or waterbodies and on approach slopes to watercourses and waterbodies as directed by the Environmental Inspector(s). (Appendix B, Dwgs. STDS-03-ML-05-001, STDS-03-ML-05-131, STDS-03-ML-05-132, STDS-03-ML-05-137, STDS-03-ML-05-608).	Environmental Management Plan - Section 8.4 Watercourse Crossings
Where water erosion is evident and there is potential for runoff from the ROW to flow into a watercourse, refer to the Soil Erosion Contingency Plan (Appendix C.7).	Environmental Management Plan - Section 8.4 Watercourse Crossings
Construct or install temporary vehicle access across waterbodies, shorelines, and riverbanks in a manner that protects the banks from erosion and maintains the flows in the waterway and follows the BC Water Sustainability Act and Water Regulations as well as applicable DFO conditions.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Construct and install all watercourse vehicle crossings as outlined in the Fish and Fish Habitat Technical Data Report (Appendix 2-G of the EAC Application) and in accordance with the typical drawings (Appendix B, Dwgs. STDS 03-ML-05-101, STDS-03-ML-05-103, and STDS-03-ML-05-104).	Environmental Management Plan - Section 8.4 Watercourse Crossings
Construct all bridges (ice and snowfill or single-span) beyond the ends of the [watercourse] banks and with a minimum depth of 0.5 m of snowfill or fill material at each bank. Do not place fill within primary banks for bridge abutment construction, unless approved by the relevant regulatory authority.	Environmental Management Plan - Section 8.4 Watercourse Crossings

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If fill material is required during the construction of bridge abutments with wings [for watercourse crossings], place geotextile fabric between the fill material and the surface layer.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Install and remove any temporary vehicle [watercourse] crossings in a manner that protects the banks from erosion and maintains the flow in the waterway. These crossings will be returned to their construction preparation condition.	Environmental Management Plan - Section 8.4 Watercourse Crossings
During winter construction, where conditions permit, employ ice and snowfill bridges as temporary [watercourse] crossing structures. Install ice and snowfill bridges using water drawn from an approved source or clean snow ploughed in from surrounding areas or made. Design, construct and deconstruct ice bridge and snow fill vehicle crossing at waterbodies in a manner that prevents erosion, scouring and sedimentation during spring break-up.	Environmental Management Plan - Section 8.4 Watercourse Crossings
If beaver dams must be removed, breach the beaver dam slowly to avoid the rapid release of water that could cause fish entrapment and/or erosion of the bed and banks resulting in subsequent siltation of downstream waters.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Flow isolation crossings [for watercourse crossings] must be planned and conducted in accordance with the relevant detail in the Construction Section's Supplemental Stream Crossings Submission that has been submitted to the satisfaction of the BC OGC, and in accordance with the following requirements: a. crossings of fish-bearing streams may commence only after confirming that sufficient equipment and supplies are available to complete the crossing in an efficient and timely manner; b. instream activities, including the location and operation of any equipment must be isolated from water flowing in the stream; c. spawning gravels must not be disturbed when redds that contain eggs are present; d. activities must be suspended if high stream flows present an increased risk to effectively completing the intended crossing installation technique; e. welding, coating, weighting and, where applicable testing, of the pipe must be completed prior to commencement of trenching within fish-bearing water bodies; f. water from flumes, pump-arounds, diversions, or other methods must be released to downstream areas using dissipation structures to avoid causing erosion or sediment release; g. pump intakes must not disturb beds of streams or wetlands and must be screened with a maximum mesh size of 2.54 mm and approach velocity of 0.038 m/s; h. water flows downstream of in-stream construction sites must be maintained consistent with upstream flows; and i. hard ditch plugs must be installed at or near the banks of the crossing and left in place until the crossing has been initiated (see Dwgs. STDS-03-ML-12-202 and STDS-03-ML-12-203).	Environmental Management Plan - Section 8.4 Watercourse Crossings

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Construct and install all typical and non-typical pipeline [watercourse] crossings as outlined in the Fish and Fish Habitat Technical Data Report (Appendix 2-G of the Application) and in accordance with the typical drawings (Appendix B Dwgs. STDS-03-ML-05-105, STDS-03-ML-05-111, STDS-03-ML-05-112, and STDS-03-ML-05-113).	Environmental Management Plan - Section 8.4 Watercourse Crossings
Implement the Water Quality Monitoring Plan (Appendix E.2) to monitor water quality during instream construction activities. Exceedances of water quality parameters will be reported to the Environmental Inspector and corrective actions will be developed in consultation with the Resource Specialist, the construction management team and the BC OGC. If corrective actions are not successful, construction activities will be temporarily suspended until effective solutions are identified.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Pile all spoil on the banks [during pipeline installation at watercourse crossings], if practical. Construct a temporary storage area for spoil above the high watermark of the watercourse if spoil is likely to be highly saturated to prevent spoil or silty water from flowing back into the watercourse.	Environmental Management Plan - Section 8.4 Watercourse Crossings
If spoil is likely to be highly saturated [during pipeline installation at watercourse crossings], excavate a pit or construct berms of packed earth to prevent spoil from flowing back into the watercourse. Locate containment berms and spoil outside of the 10 m riparian area (Dwg. STDS-03-ML-05-131).	Environmental Management Plan - Section 8.4 Watercourse Crossings
Store excavation material outside the watercourse during the [typical] open-cut crossing, above the ordinary high water line, where spoil will not erode back into the watercourse, where practical.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Pile all spoil on the banks, if practical [for open-cut crossings of large flowing watercourses]. Construct a temporary storage area for spoil above the high watermark of the watercourse if spoil is likely to be highly saturated. Excavate a pit or construct berms of packed earth or swamp weights, if warranted, to prevent spoil or silty water from flowing back into the watercourse. Containment berms and spoil should be back from the streambank to avoid sloughing into the watercourse. Note: vegetative buffers are to be maintained and, consequently, spoil may require stockpiling an appropriate distance from the banks as determined by an Environmental Inspector.	Environmental Management Plan - Section 8.4 Watercourse Crossings
If earthen material must be used in construction of isolation dams [for isolated open-cut crossings of large flowing watercourses], ensure that the outside face of the dam is armoured with suitable-sized riprap to protect the dam from erosion.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Pump sediment-laden dewatering discharge into a vegetated area or settling basin to prevent sediment and other deleterious substances from entering any water body [for isolated open-cut crossings for dry or frozen to the bottom watercourses].	Environmental Management Plan - Section 8.4 Watercourse Crossings

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Ensure water from flumes, dam and pumps, diversion or other methods do not cause erosion or introduce sediment into the channel [for isolated open-cut crossings for not dry or frozen to the bottom watercourses]. Pump sediment-laden dewatering discharge into a vegetated area or settling basin to prevent sediment and other deleterious substances from entering any water body.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Remove accumulated sediment and excess spoil from the isolated area before removing dams [for isolated open-cut crossings for not dry or frozen to the bottom watercourses].	Environmental Management Plan - Section 8.4 Watercourse Crossings
Ensure that water from dewatering entry and exit sites [for trenchless watercourse crossings] with a high sediment load is not discharged or allowed to flow into any waterbody. Remove the sediment load (e.g., filtered or discharged into a vegetated area) before discharge water is allowed to enter any watercourse.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Where warranted, develop a water quality monitoring plan with input from an aquatics specialist that includes monitoring for total suspended solids (TSS) and turbidity if trenchless methods are used [for watercourse crossings].	Environmental Management Plan - Section 8.4 Watercourse Crossings
Develop an emergency response plan that will be implemented in the event of sediment releases or spills of deleterious substances during the construction of the trenchless [watercourse] crossings.	Environmental Management Plan - Section 8.4 Watercourse Crossings
In the event of sediment releases or spills of deleterious substances during the construction of the trenchless [watercourse] crossings, implement the Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan (Appendix C.9).	Environmental Management Plan - Section 8.4 Watercourse Crossings
Inspect all temporary sediment control structures [related to watercourse crossings] on a regular basis and following precipitation events and snowmelt. Where repairs are warranted, repair before the end of the working day.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Dewater the trench onto stable surfaces in a manner that does not cause erosion of soils or sedimentation of the watercourse [for isolated open-cut crossings for dry or frozen to the bottom watercourses and/or for not dry or frozen to the bottom watercourses]. Water returning to the watercourse should equal or exceed the background water quality of the watercourse.	Environmental Management Plan - Section 8.4 Watercourse Crossings
Where practical, grade the ROW to divert surface water away from the open trench.	Environmental Management Plan - Section 8.5
Inspect and install erosion control measures such as cross ditches and berms where required on long or moderately steep to steep slopes.	Environmental Management Plan - Section 8.5 Pipeline Activities
If water levels or flow rates in the trench could overwhelm existing trench water control measures (berms, take offs, etc.), thereby increasing the risk of sediment-laden water affecting wetlands or watercourses (e.g., if heavy rains are forecast), dewater and backfill the trench to create a soft plug, or maintain an existing hard plug.	Environmental Management Plan - Section 8.5 Pipeline Activities
Through wetland areas where sumps are required, pump water to an appropriate area so that erosion is not accelerated.	Environmental Management Plan - Section 8.5 Pipeline Activities

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If the trench requires dewatering, pump water onto stable, well-vegetated areas, tarpaulins, sheeting, rocks, sand bags, or into settling ponds, filter bags or other appropriate sediment filtering devices. Ensure dewatering is completed in a manner that does not cause erosion or allow sediment to re-enter a watercourse.	Environmental Management Plan - Section 8.5 Pipeline Activities
Ensure adequate erosion control crews are present to manage off ROW runoff on an ongoing basis, if necessary, throughout construction activities. If additional erosion control is necessary at the end of a work day, consider conducting rough ROW cleanup on daily spreads to ensure water is managed appropriately.	Environmental Management Plan - Section 8.5 Pipeline Activities
Ensure any leaks in the fill and discharge lines [related to hydrostatic testing] are controlled to prevent erosion.	Environmental Management Plan - Section 8.7 Pressure Testing
Preserve water quality, including preventing the introduction of foreign material (debris, sediment, etc.) into the receiving waterbody/watercourse. Do not dewater [hydrostatic test water] directly to watercourses or wetlands.	Environmental Management Plan - Section 8.7 Pressure Testing
Monitor the discharge area [of hydrostatic test water] for erosion.	Environmental Management Plan - Section 8.7 Pressure Testing
Complete machine cleanup immediately following construction, prior to spring break-up. If machine cleanup cannot be completed prior to spring break-up, ensure cross ROW drainage is re-established, and sedimentation and erosion controls are installed to protect the ROW and sensitive environmental features. Final cleanup and reclamation will generally occur during the following fall or winter, or as soon as conditions permit.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Re-establish surface drainage patterns following construction, install drainage and erosion control measures and complete the installation of sedimentation control measures at all watercourse crossings.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Postpone replacement of surface material during wet conditions [during cleanup and reclamation] to prevent erosion or damage to the soil structure.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Remove unnecessary silt fence or other temporary erosion control measures not required [during cleanup and reclamation], as specified by the Environmental Inspector(s) or designate.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Install sedimentation and erosion control measures [during cleanup and reclamation], where required, in accordance with Dwgs. STDS-03-ML-05-001, STDS-03-ML-05-132, STDS-03-ML-05-137, STDS-03-ML-05-604, STDS-03-ML-05-606, STDS-03-ML-05-607, and STDS-03-ML-05-608 in Appendix B unless otherwise approved by the Environmental Inspector(s) or designate to adjust for site conditions and suitability.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
The Environmental Inspector(s) or designate will determine the location of sedimentation and erosion control measures [druing cleanup and reclamation].	Environmental Management Plan - Section 8.8 Cleanup and Reclamation

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Install cross ditches and berms on moderately steep and steep slopes in order to prevent runoff along the ROW and subsequent erosion [during cleanup and reclamation]. Install berms immediately downslope of all trench breakers (Dwg. STDS-03-ML-12-221, STDS-03-ML-12-222, and STDS-03-ML-12-223).	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Use cover crops, where required, to prevent erosion of disturbed areas prior to final cleanup and reclamation.	Environmental Management Plan - Section 8.8
Seed riparian and erosion prone areas with an approved native cover crop and seed mix that has been approved by the relevant regulatory authority as soon as practical after construction prior to spring freshet, wherever practical.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Straw crimping may be used to prevent wind erosion and reduce evapotranspiration on pasture, cultivated lands, and erosion prone soils [during seeding and revegetation] as specified by the Environmental Inspector.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Rollback slash and small diameter, non-merchantable timber on erosion prone slopes when deemed necessary by the Environmental Inspector. Walk down erosion control rollback with a dozer (refer to Appendix B, Dwg. STDS-03-ML-05-313).	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Review areas where tackifier has been applied and other potential erosion areas to ensure soils stabilization is effective where topsoil and surface material, and piles and windrows are left in place through winter construction and spring thaw. Follow-up monitoring and applications will be conducted as required.	Environmental Management Plan - Section 8.8 Cleanup and Reclamation
Areas that are susceptible to erosion or difficult to revegetate (e.g., due to high salinity) will be identified, and records maintained of remedial measures implemented and the success of these measures. This information will be made available to construction Contractors and supervisors prior to and during operations and maintenance activities to allow implementation of adaptive mitigation strategies to reduce potential adverse effects on soil and soil productivity.	Environmental Management Plan - Section 9.0 Post-Construction Monitoring
The following table outlines mitigation that allows for the continuation of activities and reduce potential adverse environmental effects. Wind Erosion 1) Uniformly apply mulch or tackifier to topsoil/surface material piles and/or other areas affected by wind erosion. 2) Water or apply tackifiers to identified areas when activities or sufficient winds have created the potential for topsoil/surface material erosion. Do not use tackifiers on wetland substrates. 3) Apply straw to surface material and/or other areas where winds have created the potential for soil erosion. Straw sources are subject to landowner or regulatory approval, and must be approved by the Environmental Inspector(s). When clean straw is unavailable, seeding a clean, unpalatable annual crop at half the normal rate is acceptable.	Environmental Management Plan - Appendix C.2 Adverse Weather Contingency Plan

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The following table outlines mitigation that allows for the continuation of activities and reduce potential adverse environmental effects. Water Erosion Temporary Berms/Silt Fence 1) Temporary berms, silt fence and/or other appropriate mitigation (e.g., wattles, erosion control matting) will be implemented along the trench crown, surface material piles, and/or other areas where the potential for water erosion has been identified. 2) To prevent ponding and/or erosion, cross ROW drainage will be maintained. Appropriate measures (e.g., sumps, pumping excess water) to prevent deleterious material from entering a watercourse will be implemented, when and where required. 3) Use cross berms and chevrons where appropriate to redirect water from the ROW into a vegetated area.	Environmental Management Plan - Appendix C.2 Adverse Weather Contingency Plan

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The following table outlines mitigation that allows for the continuation of activities and reduce potential adverse environmental effects. Water Erosion ROW Maintenance/Stabilization 1) During adverse weather conditions, Coastal GasLink will direct the Contractor to reduce unnecessary traffic and the number of vehicles on the ROW. Better planning of activities will be required by the Contractor to either tighten up, or spread out the work crews as warranted (e.g., close proximity of ditching, lower in, and backfill operations). To reduce effects, a one trip in, one trip out philosophy will be implemented for all ROW access. 2) Traffic will be restricted to the ROW. The appropriate regulatory agency will need to approve any off ROW activities. 3) The traffic pattern on the ROW will be changed to avoid repeated driving in the same areas. 4) Under adverse weather conditions, the Contractor will be required to back-blade the ROW during and at the end of the day. Back-blading of the ROW fills in tire tracks, thereby assisting in the prevention of water erosion and re-establishing a firm working ROW surface. 5) Under adverse weather conditions, topsoil/surface material and/or subsoil may be stripped and placed at the edge of the ROW if approved by the Environmental Inspector(s). Topsoil, surface material and/or subsoil will be redistributed evenly across the ROW during cleanup. 6) Under spring thaw condition and/or where identified by Coastal GasLink, and in consultation with the appropriate Regulatory Representatives, vehicle watercourse crossing techniques may be modified and/or replaced with other appropriate crossing techniques. 7) When available and practical, tracked equipment may be required for specific activities. 8) Work in highly sensitive areas may be stopped and shifted to less sensitive areas. 9) If all mitigation fails, Project activities may be suspended until adverse weather conditions abate, thereby incurring a schedule delay. Project shut-down will be based upon discussions between the Construction Manager, Contractor, Environmental Advisor and the appropriate regulatory agencies. Recommencement of work must be authorized by the Construction Manager, in consultation with the Environmental Inspector(s) prior to restart.	Environmental Management Plan - Appendix C.2 Adverse Weather Contingency Plan

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Condition/Concern [with respect to minor problems that may arise during construction that may result in loss of soil capability if not addressed]: High Winds • Temporarily suspend soil salvage operations when there is a threat of wind erosion. • Implement adequate erosion control measures such as wind barriers or tackifiers as required wherever soils are exposed. • Spray water or tackifiers, or implement 'walk down' procedures on soil windrows as required and as instructed by the environmental inspector. • Initiate revegetation as soon as practical after machine cleanup.	Environmental Management Plan - Appendix C.6 Soil Handling Contingency Plan
If wind or water erosion is evident during the construction phase of the Project, all necessary Contractor equipment and personnel will be made available to control the erosion. During the construction phase, the Environmental Inspector(s) in consultation with Coastal GasLink's Environmental Advisor will determine appropriate procedures to be implemented to control soil erosion and other soil handling problems encountered.	Environmental Management Plan - Appendix C.7 Soil Erosion Contingency Plan
This table provides a list of control options to be implemented [during the construction phase, to control soil erosion and other soil handling problems] as appropriate. Similar procedures should be followed during the operations phase. Water Erosion Implement one or a combination of the following mitigation: • install silt fences near the base of slopes • regrade furrows and gullies • construct cross ditches and berms decreasing the spacing on steeper slopes or on more erodible soils • construct temporary berms of subsoil, sandbags, wattles, bio-degradable geotextiles or geo-ridge during construction activities • armour the upslope face of berms with geotextile, rock, logs or sandbags • import small diameter slash then roll back and walk down • reseed an annual cover crop as soon as practical after construction • transplant native shrubs, plant willow stakes or use other bioengineering techniques • install slope indicators at locations where the risk of slope failure, or creep exists; consult a geotechnical engineer • shut-down construction until the risk of erosion has been reduced or the conditions improve	Environmental Management Plan - Appendix C.7 Soil Erosion Contingency Plan

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This table provides a list of control options to be implemented [during the construction phase, to control soil erosion and other soil handling problems] as appropriate. Similar procedures should be followed during the operations phase. Wind Erosion • Shut-down or relocate construction activities until winds dissipate and conditions improve.	Environmental Management Plan - Appendix C.7 Soil Erosion Contingency Plan
This table provides a list of control options to be implemented [during the construction phase, to control soil erosion and other soil handling problems] as appropriate. Similar procedures should be followed during the operations phase. Wind Erosion Consider using the following techniques if wind erosion of the topsoil/surface material windrow is of concern: • apply water to the topsoil/surface material windrow • windrow snow (if available) over the topsoil/surface material windrow • tackify (at rate recommended by the distributor) the topsoil/surface material windrow • pack the topsoil/surface material windrow with a sheepsfoot packer or other suitable equipment	Environmental Management Plan - Appendix C.7 Soil Erosion Contingency Plan
This table provides a list of control options to be implemented [during the construction phase, to control soil erosion and other soil handling problems] as appropriate. Similar procedures should be followed during the operations phase. Wind Erosion Consider using the following techniques if wind erosion is of concern after/surface material replacement: • seed cereal or sterile hybrid cover crop • employ straw crimping at 2-2.5 tonnes/ha • apply hydromulch or tackifier • import small diameter slash for use as rollback - walk down slash • add locally available manure and cultivate • install wind fences	Environmental Management Plan - Appendix C.7 Soil Erosion Contingency Plan

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This table provides a list of control options to be implemented [during the construction phase, to control soil erosion and other soil handling problems] as appropriate. Similar procedures should be followed during the operations phase. Erosion or Failure of Streambanks Implement one or a combination of the following mitigation: • install vegetated geogrid • install coir logs • install log cribwall bank protection • install biodegradable erosion control matting • plant willow stakes in the spring • transplant willow clumps, install willow wattles, or brush layering • install tree revetments • install rock gabions or line the banks with riprap (subject to DFO approval)	Environmental Management Plan - Appendix C.7 Soil Erosion Contingency Plan
Emergency Response Instream The following measures will be implemented. • Divert streamflow around the mud release to the extent practical. • Install silt fencing around the exit point(s), if practical. • Remove mud from the watercourse by pumping, shovels or with a hoe. • Dispose of mud in accordance with provincial requirements.	Environmental Management Plan - Appendix C.8 Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan - Section 8.3 Emergency Response
Emergency Response Onshore For onshore mud release, consider the following options for immediate containment. • If accessible by heavy equipment, immediately construct berms or excavate a sump for containment. • If not accessible by heavy equipment, construct weirs using logs, silt fence, rolls of matting, shovel trenches, and/or filter cloth and a containment area where appropriate.	Environmental Management Plan - Appendix C.8 Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan - Section 8.3 Emergency Response

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Alternative Crossing Method Prior to construction, a detailed watercourse crossing and contingency plan for each proposed trenchless installation methods site will be prepared to address the possibility that the trenchless installations methods are unsuccessful. The plan will identify methods, measures and activity schedules to: • reduce effects on fish and fish habitat • limit the risk of soil erosion and promote revegetation with suitable plant species • reduce the disturbance of native vegetation (in particular rare plants and ecological communities) and wildlife and their habitats • reduce disturbance of archaeological resources • avoid navigational risks and reduce disruption to boaters The plans will be prepared by the project team with input from several resource specialists (wildlife, vegetation, fish and fish habitat, historical resource and reclamation specialists), engineering and construction personnel, contractors, and the results of consultation with the applicable regulatory agencies. The following information will be considered within the plans: • a summary of issues requiring mitigation • schedules for the river crossing and onshore construction, and reclamation • access routes and traffic control measures • equipment and temporary work space requirements • site-specific plans to avoid, salvage or reduce effects on local features • a grade plan that identifies workspace requirements • temporary and permanent erosion control measures including the identification of specific materials such as silt fencing, erosion control matting, etc. • revegetation procedures and seed mixes • other information requested by regulatory agencies • detailed drawings to support the above-noted information • inspection and monitoring plans	Environmental Management Plan - Appendix C.8 Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan - Section 8.3 Emergency Response

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Alternatively, a composite liner consisting of a geomembrane and a geosynthetic clay liner protected with earthen material achieving similar or lower permeability could be used [to protect grade containing high ML/ARD]. Also, erosion control measures derived from engineering geohazard assessment of the pipeline route will be implemented to prevent the degradation and alteration of the protective clay or till layers. These will include: revegetation, berms and interceptor dikes, slope protection, etc.	Environmental Management Plan - Appendix C.13 Acid Rock Construction Response Plan - Section 8.3 Waste Rock Management
The mitigation listed below [Section 8.3.5 of the ARCRP] is proposed and can be applied in situ at high ARD/ML locations. Although not recommended, crushing PAG rock may be required if PAG rock is used as backfill to protect the integrity of the pipe. Also, a suite of erosion control measures derived from engineering geohazard assessment of the pipeline route will be implemented to prevent the degradation and alteration of the protective clay or till layers. These will include: revegetation, berms and interceptor dikes, slope protection, etc.	Environmental Management Plan - Appendix C.13 Acid Rock Construction Response Plan - Section 8.3 Waste Rock Management
Shotcrete placed on cut slopes, till or clay covers on the grade and ditch, and backfilled ditches will be inspected for cracks, rebound, erosion and seepages, and corrective actions will be applied, where required [for ARD/ML prevention and mitigation].	Environmental Management Plan - Appendix C.13 Acid Rock Construction Response Plan - Section 8.5 Monitoring and Reporting
Depending on site conditions and construction methods, geotechnical issues may arise over time [in relation to ARD/ML monitoring where PAG rock was used]. These include slumping, settlement and cracking, and may affect the physical stability of the stockpiles, the integrity of shotcrete placed on cut slopes or till/clay covers placed on grade rock or the ditch. A monthly geotechnical monitoring program will be implemented during the first year and will include, but will not be limited to, the following: • visual observation of mitigation sites for unusual conditions or changes (e.g., cracks and slumps) • visual observation of stockpiles for slumps, movement along the face, cracks and erosion • measurement of movement and vertical settlement using common equipment, such as extensometers, inclinometers, settlement gauges and electronic distance measurement • on-site measurement of permeability, where required	Environmental Management Plan - Appendix C.13 Acid Rock Construction Response Plan - Section 8.5 Monitoring and Reporting

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New long-term, all-weather access roads (roads surfaced with gravel) will be required for the maintenance and operation of permanent infrastructure (e.g., compressor stations and meter stations) and will be established during construction of the Project. Long-term, all-weather roads are permitted under the Oil and Gas Activities Act and will be used where there is no existing access or where existing access is limited. At the end of the Project's life, long-term, all-weather roads will be deactivated in a manner consistent with BC OGC requirements at that time, unless otherwise directed by the relevant regulatory authority. Construction of new long-term, all-weather access roads may include the following construction activities: • clearing vegetation and stripping topsoil and other surficial materials • salvaging and storing topsoil or surface material • cutting and filling in side slope areas • grading and surfacing • applying road surface material (e.g., gravel) of various sizes, where necessary • installing culverts, where warranted, in the road bar ditches • installing watercourse crossings, such as culverts and bridges, where necessary, using appropriate mitigation for watercourses (refer to the Section 8 of the EMP) • conducting cleanup and reclamation • applying erosion control measures to road surfaces, road shoulders and back slopes, where required	Environmental Management Plan - Appendix D.3 Access Control Management Plan - Section 3.3 Access
Mitigation for work planned to occur during critical timing windows for caribou during the construction phase: Retention of Timber/Woody Debris • Salvaged timber and coarse woody debris (slash) will be retained at locations identified for access control, line-of-sight barrier, erosion control, and to enhance seed germination and seedling survival. • Coarse woody debris will be spread at identified locations over the ROW to conserve moisture, moderate soil temperatures, provide nutrients, reduce soil erosion, provide a seed source, provide microsites for seed germination and protection for regenerating seedlings, and mitigate damage to regenerating vegetation from human use (e.g., off road access). • Existing disturbed areas will be used for log deck sites and woody debris storage, where practical. • Slash and non-merchantable timber will be piled along the centreline of the ROW or to a side of the ROW that has been previously cleared in a manner that does not drag soil into the pile. A brush rake attachment may be used on bulldozers to facilitate preservation of surface soils. • Remaining merchantable timber will be salvaged in accordance with the applicable permits and approvals. Decked wood will be removed from the ROW, as soon as practical, to facilitate pipeline construction.	Environmental Management Plan - Appendix D.6 Caribou Mitigation and Monitoring Plan - Section 6.2 Construction Phase - Table 6-2

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Mitigation for work planned to occur during critical timing windows for caribou during the construction phase: Soil and Slope Stability • Disturbed erosion-prone slopes or banks will be stabilized. Bioengineering techniques (e.g., soil wraps and shrub staking) will be implemented at appropriate locations to stabilize disturbed soils and facilitate regeneration of native vegetation. Willow and poplar will only be used in caribou range where these species were naturally occurring before construction (e.g., riparian areas). • Seed mixes will be used in caribou range to minimize soil erosion, where needed (e.g., slopes, riparian areas and watercourse banks). Seed mixes will be predominantly native species that are appropriate to site conditions (refer to Reclamation Program). Only certified no. 1 seed will be used.	Environmental Management Plan - Appendix D.6 Caribou Mitigation and Monitoring Plan - Section 6.2 Construction Phase - Table 6-2

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Mitigation tools for cleanup and reclamation: Woody debris and rollback • Feasibility of rollback may depend on approval from provincial authorities or forestry operators to retain and pile slash or timber onsite, and availability of material. • Where rollback is the preferred mitigation, woody material will be brought to access control sites, as required, and will be stored in existing temporary workspace until needed for placement. When moving woody material, the same tree species that are present at the access control site or other acceptable species will be used, and the volume of material and potential for pest transfer and fire risk will be considered. • In an effort to reduce the risk of fire and insect pests, only larger-diameter logs should be used, and where alternative species are available, "green" spruce and Douglas-fir will be avoided for use in some Forest Districts. Pest management guidelines are included in the Forest Pest Management Plan. • Longer segments (100 to 400 m) are expected to be more effective. • Rollback logs arranged in non-random fashion, and applied in combination with large rocks and stumps, are expected to be more effective, and particularly with regard to access by snowmobiles. • Rollback can also conserve soil moisture, moderate soil temperatures and provide nutrients as debris decomposes, prevent soil erosion, provide a source of seed for natural revegetation, provide microsites for seed germination and protection for introduced tree seedlings, and protect seedlings from wildlife trampling and browsing. Rollback is effective immediately after implementation provided adequate material is available and properly applied. At the specified location, debris should be spread evenly across the entire footprint width at a coverage/density that will not restrict ability to plant seedlings or limit planted or natural seedling growth. Where sufficient material is available, the target woody debris coverage at selected locations is 100 m^3/ha, to both mimic natural processes and control access (Vinge and Pyper 2012). Higher volumes may be more effective at precluding access and may be considered (up to 150 m^3/ha); the amount and placement of wood needs to consider reducing ladder fuels from a forest fire perspective (Pyper and Vinge 2012). Locations where slash rollback is considered effective include the following: ° on each side of an intersection with a linear feature that is not an all-season road ° for 100 to 400 m on each side of roads and permanent watercourses crossed by the ROW, depending on site suitability ° on segments of the ROW that deviate from paralleling existing linear features (i.e., new cut) to discourage new access trails from developing ° on slopes > 10% ° on temporary access (i.e., shooflies) and false rights-of-way (e.g., pull-back sections)	Environmental Management Plan - Appendix D.6 Caribou Mitigation and Monitoring Plan - Section 6.2 Construction Phase - Table 6-3

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Rollback: slash/woody debris: • Rollback of large woody debris provides an effective barrier to humans travelling on off-road vehicles during the snow-free months (CRRP 2005). • Woody material will be retained at access control locations or brought to access control locations from another portion of the Project footprint, as required, and will be stored in existing temporary workspace until needed for placement. Longer segments are expected to be more effective at controlling human access because ATV users are likely to be less inclined to try to ride through the debris or traverse around it in adjacent forest stands. However, rollback is most effective at blocking human access when applied properly (i.e., dense, consisting of stripping, stumps, slash and large lumps of debris, and covering at least 100 m of the length of the ROW) (e.g., CLMA and FPAC 2007). • Rollback can also conserve soil moisture, moderate soil temperatures and provide nutrients as debris decomposes, prevent soil erosion, provide a source of seed for natural re-vegetation, provide microsites for seed germination and protection, and protect seedlings from wildlife trampling and browsing. • Rollback is effective immediately after implementation provided that it is properly applied. Debris should be spread evenly across the entire footprint width at a coverage/density that will not restrict seedling planting or natural seedling growth. The target woody debris coverage at selected locations is 100 m^3/ha to both mimic natural processes and control access (Vinge and Pyper 2012). Although higher volumes may be more effective at precluding access (up to 150 m^3/ha), the amount and placement of wood needs to consider the risk of forest fire (Pyper and Vinge 2012). • Use of heavy coarse woody debris (rollback) may create a barrier to human movement and is also recommended as part of native vegetation restoration. Heavy application of rollback will be deployed at high-priority access points. • Actual loading of coarse woody debris will be determined in consultation with BC MFLNRORD and BC OGC. Monitoring strategy: remote cameras and aerial monitoring.	Environmental Management Plan - Appendix D.8 Grizzly Bear Mitigation and Monitoring Plan - Section 5.4 Mitigation and Monitoring Guide - Table 5-1
Seed grasslands immediately after final cleanup or in areas of winter construction, after machine cleanup. Re-seed with an appropriate and Certified #1 native seed mix sourced from an appropriate area. Where the grassland occurs in an area with invasive plants, seed an aggressive short-lived cover crop that will provide a quick cover.	Environmental Management Plan - Appendix D.10 Invasive Plant Management Plan - Section 5.2 Prevention - Table 5-1
Stabilize exposed surface material and subsoil where the potential for erosion exists. Refer to the Soil Erosion Contingency Plan (Appendix C.7 of the EMP) for additional information.	Environmental Management Plan - Appendix D.12 Wetlands Management Plan - Section 3.0 Mitigation

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Install erosion and sediment control at all watercourses and waterbodies and on approach slopes to watercourses and waterbodies as directed by the Environmental Inspector(s).	Environmental Management Plan - Appendix D.12 Wetlands Management Plan - Section 3.0 Mitigation
Install structures, such as berms, cross ditches or silt fences, between wetlands (non-peat) and disturbed areas, when deemed necessary by the Environmental Inspector(s).	Environmental Management Plan - Appendix D.12 Wetlands Management Plan - Section 3.0 Mitigation
Open cut crossings of wetlands must be planned and conducted in accordance with the relevant detail in each construction section's supplemental stream crossings submission that has been submitted to the satisfaction of the BC OGC, and the following requirements: • where the wetland substrate consists of rocks, pebbles or coarse gravel overlaying finer material, this material must be removed and stockpiled separately above the high water mark of the stream for replacement during restoration • excavated materials must be contained using appropriate techniques, so that that sediment-laden water and spoil do not re-enter the wetland; and • any sediment-laden trench water must be pumped onto stable surfaces in a manner that does not cause erosion of soils or release of suspended sediments to watercourses	Environmental Management Plan - Appendix D.12 Wetlands Management Plan - Section 3.1 Oil and Gas Commission Section 25 Permit Conditions
The permit holder must implement the Water Quality Monitoring Programs developed as per conditions 37 and 38 and do each of the following: • provide records of documentation of all pre and post construction monitoring to the Commission; • immediately report to the Commission any exceedance of the BC Water Quality Guidelines for aquatic life or, where they exist, the Water Quality Objectives for a specific watercourse or wetland that persist for a period of 24 hours or greater, relative to the baseline; and • immediately take steps to address the factors producing any exceedance of the BC Water Quality Guidelines for aquatic life, relative to the baseline, should any exceedance persist for a period of 24 hours or greater, and where such steps do not result in addressing the turbidity exceedance, promptly suspend construction operations at the site of activities causing the exceedance until effective solutions, satisfactory to the Commission, have been developed and implemented.	Environmental Management Plan - Appendix D.12 Wetlands Management Plan - Section 3.1 Oil and Gas Commission Section 25 Permit Conditions

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As part of the post-construction monitoring program, the permit holder must, for all watercourse and wetland crossings: inspect and provide a report to the Commission that includes assessment of: • RMA stability • erosion risk to the watercourse • vegetation re-establishment within the RMA, including species composition, percent establishment and presence of invasive plant species • identify where contingency measures may be required to address the three items above Where contingency measures are required, the permit holder must develop and implement an appropriate plan to the satisfaction of the Commission.	Environmental Management Plan - Appendix D.12 Wetlands Management Plan - Section 3.1 Oil and Gas Commission Section 25 Permit Conditions
Coarse woody debris will be spread at identified locations over the ROW to conserve moisture, moderate soil temperatures, provide nutrients, reduce soil erosion, provide a seed source, provide microsites for seed germination and protection for regenerating seedlings, and mitigate damage to regenerating vegetation from human use (e.g., off-road access).	Environmental Management Plan - Appendix D.13 Wildlife and Wildlife Habitat Management Plan - Section 4.0 Wildlife and Wildlife Habitat Mitigation - Table 4-1
Salvaged timber and coarse woody debris (slash) will be retained at locations identified for access control, line-of-sight blocks, erosion control, and to enhance seed germination and seedling survival.	Environmental Management Plan - Appendix D.13 Wildlife and Wildlife Habitat Management Plan - Section 4.0 Wildlife and Wildlife Habitat Mitigation - Table 4-1
If amphibian breeding locations cannot be avoided, amphibian salvage and relocation will be conducted before heavy equipment activity. If amphibian salvage is required, the relevant regulatory agency will be contacted for permitting requirements. Conduct amphibian salvage before heavy equipment activity starts at known sensitive amphibian species breeding locations during the amphibian breeding season. In larger wetlands where all eggs/tadpoles/adults are not moved, isolate the work area (e.g., exclusion fencing) to prevent amphibians from adjacent parts of the wetland from moving into the construction site. Maintain silt fencing for a period following construction and remove after amphibians have dispersed from the wetland to avoid indirect mortality or potential adverse health effects from water siltation.	Environmental Management Plan - Appendix D.13 Wildlife and Wildlife Habitat Management Plan - Section 4.0 Wildlife and Wildlife Habitat Mitigation - Table 4-1

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Implement the following measures at trenched crossings of identified coastal tailed frog streams: • Use existing access to facilitate construction. If no existing access is available, limit instream crossings to one vehicular/equipment crossing to install an appropriate temporary crossing to facilitate construction. Remove crossings after construction. • Limit riparian disturbance as much as practical within 50 m of coastal tailed frog streams. Clear only the minimum workspace necessary to facilitate construction. • Where slopes exceed 60%, riparian avoidance buffers should extend beyond the top of the ravine. • Clearly mark or fence off riparian buffers before clearing and construction. • Install and maintain appropriate erosion control measures to prevent siltation during and after construction. • Maintain stream flows throughout construction.	Environmental Management Plan - Appendix D.13 Wildlife and Wildlife Habitat Management Plan - Section 4.0 Wildlife and Wildlife Habitat Mitigation - Table 4-1
Seed mixes will be used in caribou range to minimize soil erosion, where needed (e.g., slopes, riparian areas and watercourse banks). Seed mixes will be predominantly native species that are appropriate to site conditions (refer to Reclamation Program). Only certified no.1 seed will be used.	Environmental Management Plan - Appendix D.13 Wildlife and Wildlife Habitat Management Plan - Section 4.0 Wildlife and Wildlife Habitat Mitigation - Table 4-1
As described in EAC Condition #4 and BC OGC permit conditions, water quality monitoring will focus on turbidity, TSS and benthic sediments. Physiochemical parameters that are related to the introduction of sediments will be measured and monitored with portable instruments. These parameters include water temperature, turbidity, pH, EC and DO.	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 4.0 Methods
Water quality grab samples will be collected from crossing locations before the start of any construction activities. Additional samples will be collected if and when turbidity values exceed thresholds (refer to Table 3-1 [of the WQMP]) from control sites upstream and from the affected waters where the turbidity exceedance occurred. Grab samples will be collected according to the guidelines in the Ambient Freshwater and Effluent Sampling Manual (Part E of WLAP 2003). These samples will be submitted for laboratory analysis to determine the actual TSS readings. If no turbidity exceedances occur, then the baseline sample collected prior to construction will be deemed unnecessary and will be discarded. Bottles that have been opened and used to store water intended for TSS analysis will not be used to send samples of any other parameter.	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 4.1 Turbidity and TSS

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Turbidity can be used as a proxy for TSS if the relationship between these parameters is established before construction (Marquis 2010; CCME 2002). Establishing the relationship requires the collection of grab samples for TSS analysis at various concentrations, and simultaneously recording the turbidity. The least squares method of linear regression analysis is used to define the relationship between turbidity and TSS, and the relationship can be used to predict the TSS given a turbidity reading. The relationship is site specific, and therefore a relationship cannot be easily developed for use across the entire Project area. Because this method requires laboratory analysis of several samples, it is impractical to develop a TSS/turbidity curve for all crossings. TSS/turbidity curves could be developed for large watercourse crossings (S2 and larger), and smaller watercourse crossings where non-standard crossing techniques are proposed (i.e., those that do not comply with existing provincial BMP's).	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 4.1 Turbidity and TSS
Sediment traps could be used to monitor sediment deposition on any watercourse, of wadeable depth (typically <0.8 m deep), that provides actual or potential salmonid spawning sites within the ZOI. Gravel buckets are installed along transects, at equally spaced intervals across wetted width of channel, before construction activities both above and below crossing locations. The number and location of sampling transects downstream of crossing location will be dictated by the anticipated ZOI. Transects should be located in areas with similar water depths and velocities to reduce variability. Sealed 4 L buckets filled with washed angular gravel are dug into the substrate, ensuring that the cover of the bucket is flush with the stream bed. Once any further upstream bucket placement is completed and sediments have settled out, lids are removed working from farthest upstream site first before construction activities begin. Buckets should be retrieved immediately after construction to assess construction-related sediment deposition relative to upstream controls. Actively sampling (open) buckets should always be approached from downstream. Bucket lids are replaced and buckets are removed from the stream bed. Reference gravel is removed from site with a coarse screen and remaining sediment is sent to a laboratory to determine the quantity and particle size distribution of fine sediments. A detailed sampling protocol can be found in the Guidelines for Monitoring Fine Sediment Deposition in Streams (WLAP 2002).	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 4.2 Benthic Sediments

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At crossings where it is not practical to install sediment traps due to high flows or deep water depth, sediment samples can be collected using a grab sampler (e.g. Ekman or Ponar Grab). Sample collection may occur from accessible infrastructure such as a bridge, through ice cover in the winter, or from a boat. Collection of grab samples will follow protocols in the Lake and Stream Bottom Sediment Sampling Manual (Resources Inventory Committee 1997). Multiple grab samples will be collected from a pre-determined number of sites above and below crossing locations, before and after construction activities. Sampling trips will start at the most downstream site and work upstream so as to not disturb sediments before the deployment of the sampling device. Samples collected where the jaws of the grab sampler were not fully closed will be discarded and additional grabs will be completed until a sample has been successfully collected. Samples will be transferred from the grab sampler to an appropriately sized container and shipped to a laboratory for mechanical (particle size) analysis.	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 4.2 Benthic Sediments
Water used for hydrostatic pressure testing of the pipeline may be discharged to land, following the requirements under section 7(2)(e) of the Oil and Gas Waste Regulation: • Water must not be discharged directly to any natural surface waters or discharged in a location where it could reasonably enter surface waters. • The effluent must be discharged on a stable slope and not cause erosion, at a rate that does not cause it to accumulate on the ground surface. • Water quality parameters must not exceed the values presented in Table 3-3 [of the WQMP].	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 4.3 Hydrostatic Test Water
Where the WQMP indicates that exceedances occurred and negative effects on fish and fish habitat may have occurred (e.g., prolonged elevated levels of TSS, fine sediment deposition on potential fish spawning habitat, changes to pH level outside of thresholds), incident reports will be prepared and the proposed remedial action will be discussed with the BC OGC. The BC OGC will be notified of any exceedance that persists for a period of 24 hours or more.	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 5.0 Reporting

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If water quality parameters reach or exceed threshold values, the Environmental Inspector and Qualified Professional will be notified. The Environmental Inspector or Qualified Professional will alert the Construction Manager and work with the construction management team to develop corrective actions. If the Environmental Inspector or Qualified Professional is not immediately available, the Construction Manager will be notified. Corrective actions will be site-specific, but could include: • The installation of additional erosion and sediment control measures to limit sediment-laden runoff from entering watercourses. • Temporarily stopping activities that are contributing to the water quality exceedance until parameters return to near-background levels. • Consideration of re-scheduling works until conditions are more favourable (e.g., avoiding work during heavy precipitation or working in the early morning when the ground is frozen during freeze-thaw activity). Corrective actions [related to water quality exceedances] will be documented within 24 hours of implementation. An adaptive management approach will be used to implement corrective actions and monitor their effectiveness. If unsuccessful, alternative corrective actions will be developed and implemented in a timely manner (this may include ceasing on site construction activities). Where an exceedance persists for more than 24 hours and corrective actions are unsuccessful in addressing the exceedance, construction activities will be suspended at the crossing location until effective solutions have been developed and implemented. In such situations, the Construction Manager has the decision-making authority after considering input and recommendations from the Environmental Inspector or the Qualified Professional.	Environmental Management Plan - Appendix E.2 Water Quality Monitoring Plan - Section 6.0 Response to Exceedances
Mitigation specifically for red- and blue-listed ecological communities: Seed grasslands immediately after final cleanup, or in areas of winter construction, after machine cleanup. Re-seed with an appropriate and Certified No. 1 native seed mix. Where the grassland occurs in an area with invasive plants or in areas where sediment and erosion control is a concern, seed an aggressive short-lived cover crop that will provide a quick cover.	Environmental Management Plan - Appendix E.3 Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan - Section 3.2 Red- and Blue-Listed Communities Mitigation

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Timber can be used for many applications during the construction phase and reclamation work. Applications include, but are not limited to: • erosion control • reducing soil compaction • access control • soil nutrient addition • habitat reclamation • facilitating overland travel (e.g., corduroy)	Timber Salvage Strategy - Section 6.2 Onsite Timber Utilization
Rollback is a process in which full-length processed timber is strategically placed for erosion control and increased bank stability, access management, interruption to line of sight, promotion of natural vegetative recruitment, and provision of wildlife habitat (Golder Associates Ltd., 2012; Khan & Islam, 2013). Logs will be stored at decking sites and adjacent to the ROW until needed. Rollback must be stored so that it is easily accessible for cleanup and reclamation purposes. Generally, access control rollback requires larger diameter logs to maximize effectiveness. The timber used ranges from non-merchantable timber, to the largest diameter available, depending on the site-specific requirements. The use of rollback is considered "onsite" as defined in the OGC FUP Guideline (BC OGC, 2011).	Timber Salvage Strategy - Section 6.2 Onsite Timber Utilization
Rollback species selection will vary with the type of application, either access control or erosion control. In both cases, undesirable and defect timber should be targeted for use first. Erosion control rollback should be comprised of only coniferous species; however, if no coniferous species are available, deciduous species may be utilized, but only outside the riparian reserve zone. Access rollback may be comprised of both coniferous and deciduous fibre. Access control rollback may require the use of larger diameter logs.	Timber Salvage Strategy - Section 6.2 Onsite Timber Utilization

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Non-merchantable timber may be mulched or ground into chips and spread across the ROW. Mulching of mature timber may occur in cases where traditional methods of timber transport (skidding or hoe-forwarding) may cause excessive site disturbance. Mulching on site is advantageous as it eliminates transportation costs, reduces soil compaction and erosion, improves water penetration into soil, controls weeds, and improves growth of established plants by reducing competition, conserving soil moisture and stabilizing root zone soil temperature (Dreistadt, 2013). A bank stabilizing method may be required on steep slopes to limit the accumulation of mulch at the base of the slope as a result of gravity, precipitation and wind (TransCanada, 2012). The maximum depth of mulch is 5 cm or in accordance with the applicable provincial regulation, or as agreed to with the applicable authorities. Also, mulching of mature timber or logs should not be implemented in wetlands. Excess mulching of aspen is not recommended as it could create a concentrated point source of leachate with allelochemical properties (TransCanada, 2012). Mulching equipment should travel in straight lines avoiding sharp turns as this has been shown to cause micro site accumulations of mulched material.	Timber Salvage Strategy - Section 7.3 Mulch

Environmental Management Plan

Appendix E Mitigation and Monitoring Plans

Appendix E.1 Guide to the Preparation of a Nest Removal Management and Compensation Plan
Appendix E.2 Water Quality Monitoring Plan
Appendix E.3 Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan

E.1 GUIDE TO THE PREPARATION OF A NEST REMOVAL MANAGEMENT AND COMPENSATION PLAN

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1.0 INTRODUCTION

The Coastal GasLink Pipeline Project (the Project) has the potential to interact with raptor (e.g., bald eagle, osprey, golden eagle, peregrine falcon) and great blue heron nests, which are protected year-round under the British Columbia (BC) *Wildlife Act*. Most raptors and herons use stick nests, although peregrine falcons use bare ledges. Raptor and heron nests are generally located in trees or on cliffs, but can also be found on the ground and on artificial structures. Nests of these species are often reused in consecutive years. Unlike raptors, most great blue herons nest in colonies, and comparatively fewer nest solitarily (Gebauer and Moul 2001; COSEWIC 2008). Colony nest sites are usually comprised of several nest trees clustered in a relatively small area.

1.1 SCOPE

The scope of this guide is to provide Coastal GasLink with information and instruction on how to prepare a Nest Removal Management and Compensation Plan that would be required as part of a BC *Wildlife Act* Permit Authorization if the removal of a raptor or heron nest protected year-round under the BC *Wildlife Act* is necessary. This guide has been developed to address a mitigation commitment made in Table 26-B-1 of Coastal GasLink's Application for an Environmental Assessment Certificate (EAC) (EAC Application) (Table 1-1).

Table 1-1: Environmental Assessment Certificate Application Mitigation Commitment EAC Table 26-B-1

Mitigation Commitment
If construction activities require the removal of a raptor nest that is protected year-round under the BC Wildlife Act (i.e., eagle, peregrine falcon, gyrfalcon, osprey and burrowing owl), a Nest Removal Management and Compensation Plan is required as part of a BC Wildlife Act Permit Authorization application submission to the Province to obtain permission to remove the nest. A BC Wildlife Act Permit Authorization application is not required for the removal of a raptor nest that is not protected under the BC Wildlife Act (e.g., red-tailed hawk nests).

Therefore, raptor and heron nests described in this guide refer to species identified under Section 34(b) of the BC *Wildlife Act*, and not to all raptor species with the potential to overlap with the Project (refer to Section 2.0).

2.0 REGULATORY FRAMEWORK AND GUIDELINES FOR CONSERVATION

Under Section 34 (b) of the BC *Wildlife Act*, the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron, or burrowing owl is protected year-round, whether it is active or not. Nests of great blue heron are also protected under the federal *Migratory Birds Convention Act*, 1994, and the coastal subspecies (*Ardea herodias fannini*) is listed as being of Special Concern under Schedule 1 of the *Species at Risk Act*.

Bald eagle, golden eagle, peregrine falcon, osprey, and great blue heron nesting areas are expected to overlap with the Project footprint. Coastal GasLink does not expect gyrfalcon or burrowing owl nesting areas to overlap with the Project. Guidance for the restoration and enhancement of raptor habitat is provided in *Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia* (BC Ministry of Environment and Climate Change Strategy [MECCS] 2013), and relevant information has been incorporated into this guide.

Additionally, guidance in A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development [MFLNRORD] 2014) will be reviewed if a nest removal permit application is required.

3.0 DEVELOPING A NEST REMOVAL MANAGEMENT AND COMPENSATION PLAN

A Nest Removal Management and Compensation Plan will be developed if a raptor or heron nest is discovered as described in Section 2.0, which must be removed because it cannot be avoided through practical Project construction planning. The following sections describe how a raptor or heron nest might be discovered, and the process for applying for the required regulatory authorization to remove that nest if required.

3.1 DISCOVERING NESTS

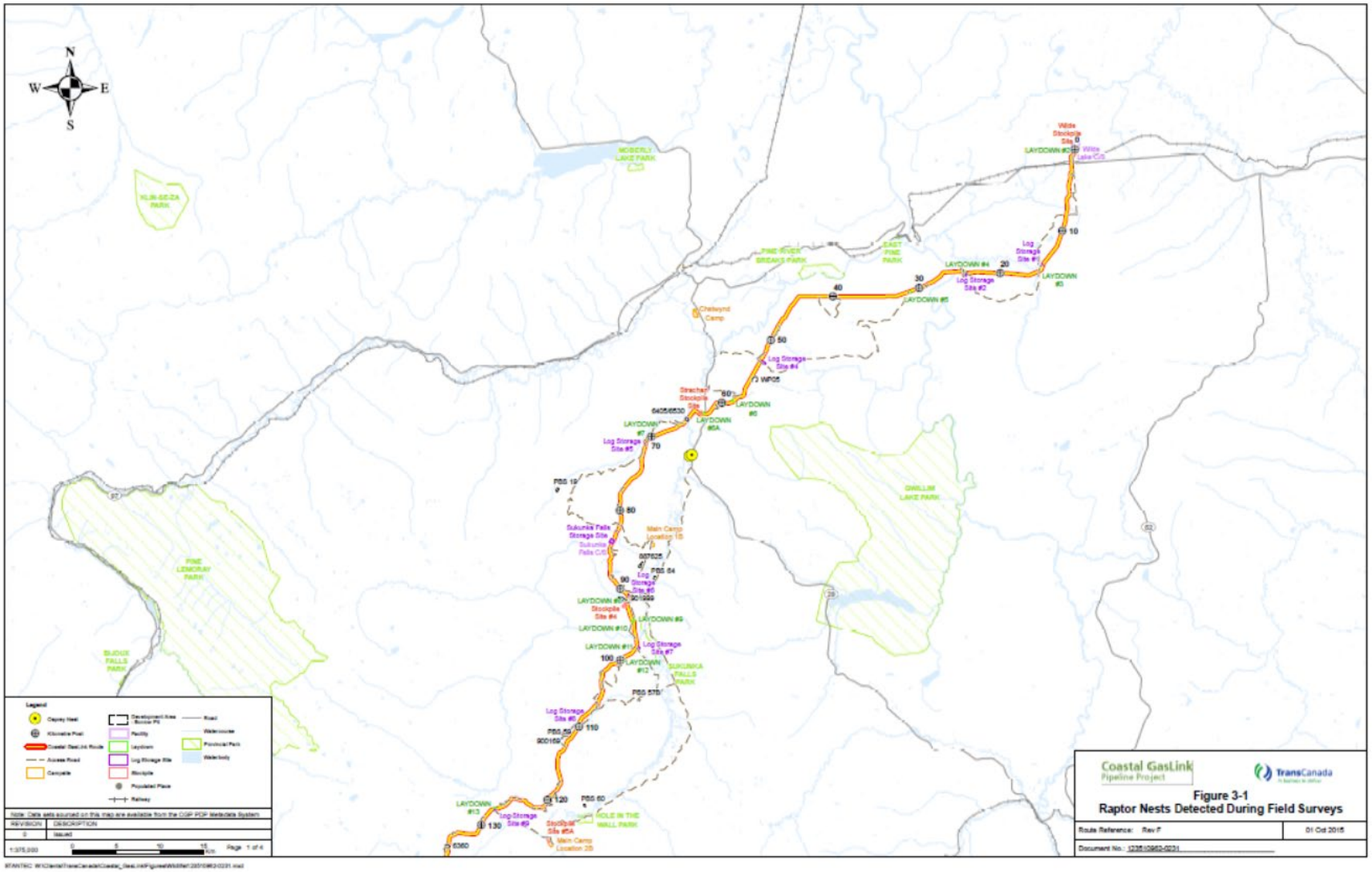
There are three ways in which a raptor or heron nest can be discovered: during baseline surveys, construction preparation surveys, or as an incidental observation during Project-related activities. Baseline surveys provide current information of known nest locations, and clearing preparation surveys will build on existing information and allow additional time for planning if any missed or newly created nests are identified as overlapping the Project footprint. Incidental nest detections will be documented and mitigated through the Wildlife Species of Concern Discovery Contingency Plan.

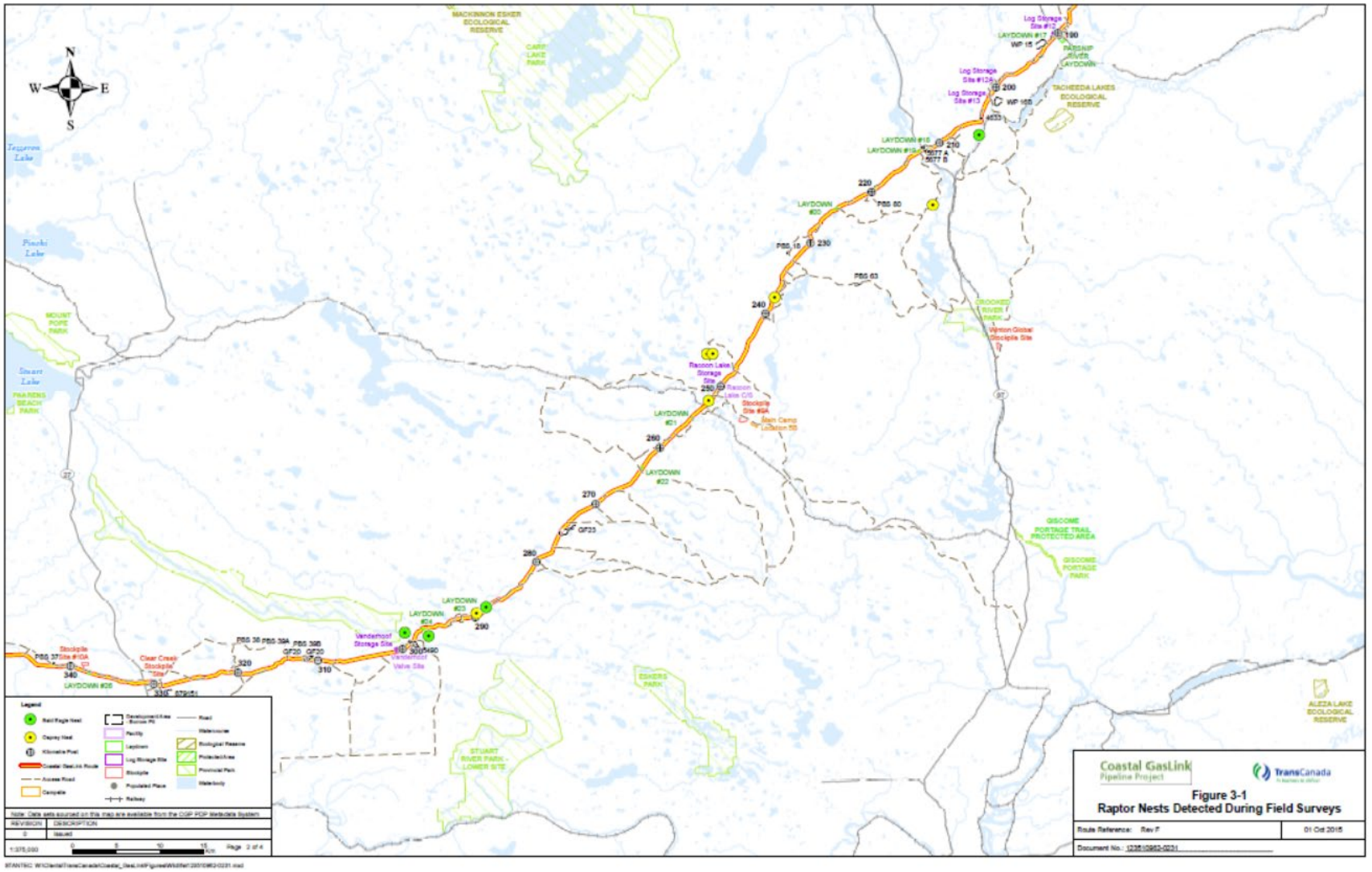
3.1.1 Summary of Baseline Data

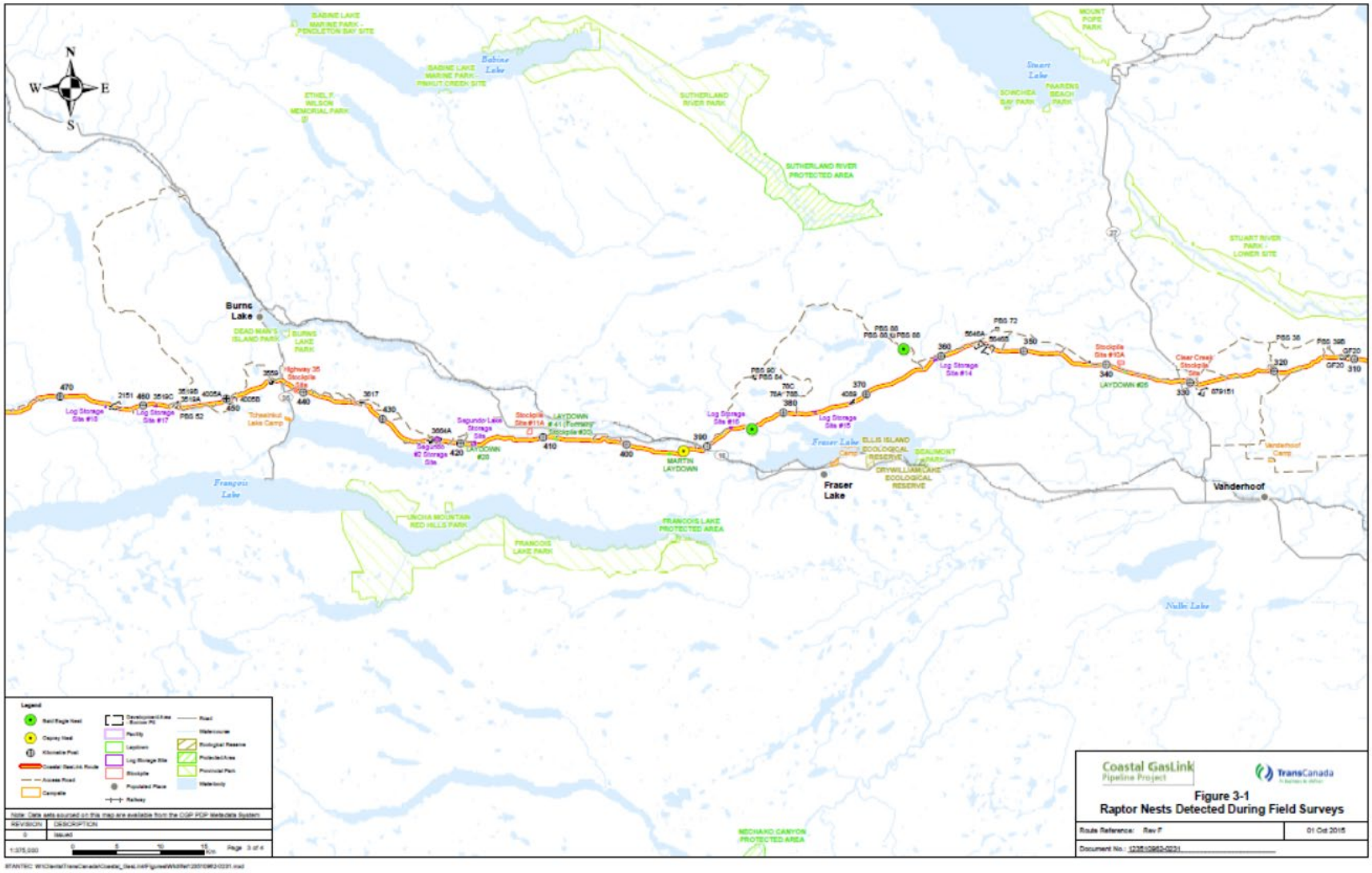
Coastal GasLink conducted field surveys in 2013, 2014 and 2015 to identify the locations of raptor and heron nests with the potential to interact with the Project (Coastal GasLink 2014). During those field surveys, 23 nests (11 osprey and 12 bald eagle) were identified, none of which were found to occur within the Project footprint (i.e., the areas to be cleared for construction of the pipeline ROW, access roads, and ancillary sites; Figure 3-1). One osprey nest was found to be close to an existing road; however, Coastal GasLink does not anticipate having to remove it (Table 3-1; Figure 3-1). The distance from each known nest to the nearest Project feature ranges from 5 m to 8,000 m (Table 3-1).

Table 3-1: Summary of Nests Found during Project-Specific Field Surveys

Species	Year Detected	Nest ID	Nearest KP	Distance to Project Feature (m)	Project Feature
Osprey	2013	W-002	67	1,318	Road
Osprey	2014	W-079	67	1,438	Road
Bald Eagle	2013	W-003	205	1,445	ROW
Bald Eagle	2013	W-016	205	1,401	ROW
Osprey	2013	W-041	215	5	Road
Osprey	2014	W-070	237	63	ROW
Osprey	2014	W-072	247	133	Road
Osprey	2014	W-071	248	323	Road
Osprey	2015	W-108	252	97	ROW
Bald Eagle	2015	W-110	288	132	ROW
Osprey	2015	W-109	289	196	Road
Bald Eagle	2013	W-015	296	754	ROW
Bald Eagle	2014	W-078	296	768	ROW
Bald Eagle	2014	W-073	298	1,054	Ancillary Site
Bald Eagle	2014	W-074	364	199	Ancillary Site
Bald Eagle	2014	W-075	364	136	Ancillary Site
Bald Eagle	2013	W-014	384	424	ROW
Bald Eagle	2014	W-076	308	308	ROW
Osprey	2013	W-004	393	197	ROW
Bald Eagle	2013	W-013	542	810	Road
Osprey	2014	W-104	586	295	ROW
Osprey	2013	W-012	586	515	ROW
Bald Eagle	2013	W-001	667	8,008	ROW


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Coastal GasLink
Pipeline Project
TransCanada
Figure 3-1
Raptor Nests Detected During Field Surveys


Coastal GasLink Pipeline Project
TransCanada
Figure 3-1
Raptor Nests Detected During Field Surveys
Route Reference: Rev F
01 Oct 2015


N
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Burns Lake
Fraser Lake
Vanderhoof
Babine Lake
Stuart Lake
Francois Lake
Nulki Lake
Legend
Figure 3-1
Raptor Nests Detected During Field Surveys

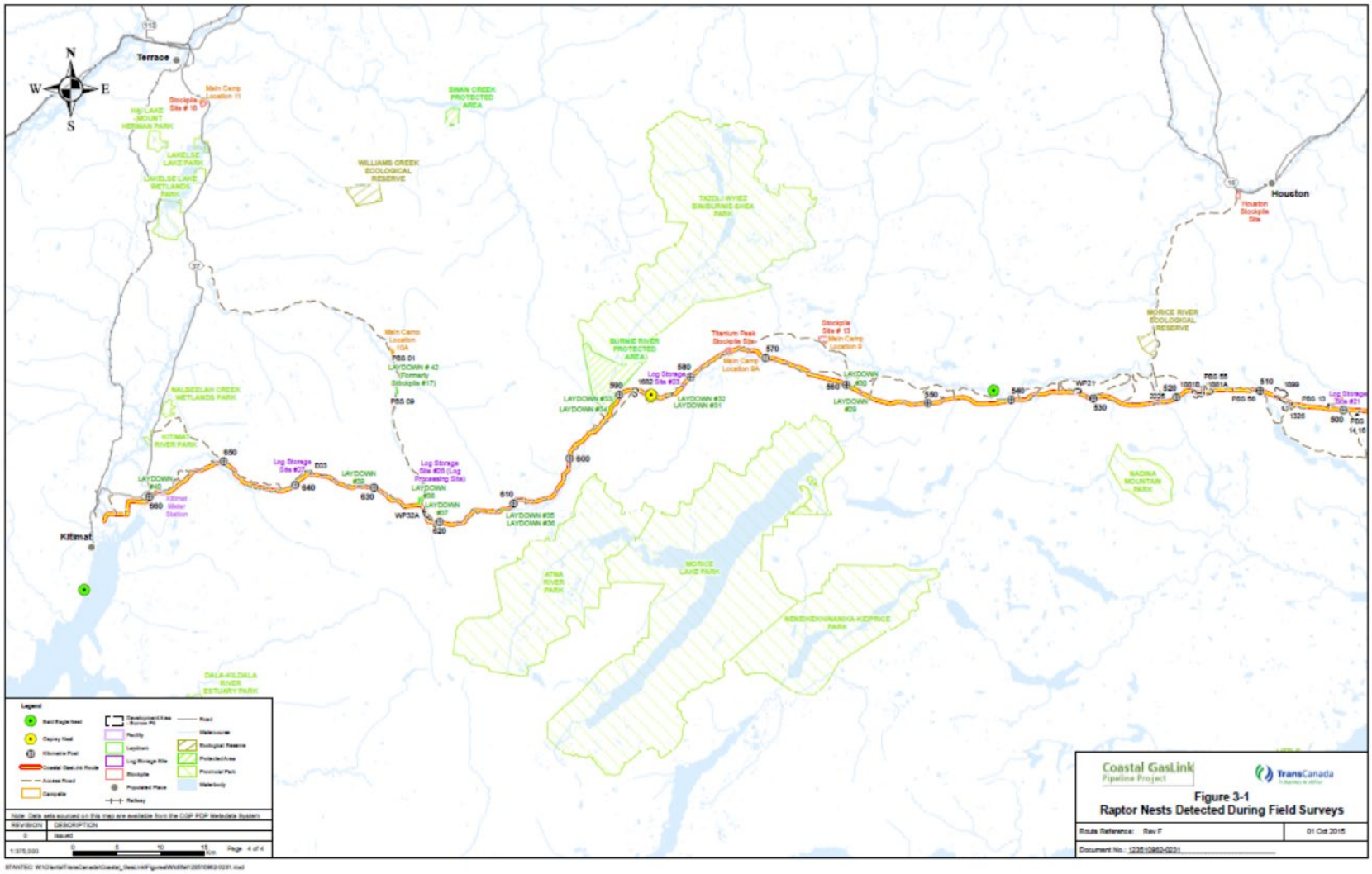


Figure 3-1: Raptor Nests Detected during Field Surveys

3.1.2 Construction Preparation Surveys

Construction preparation surveys along the route will target habitats with the potential to support raptor or heron nests. If a nest is detected in a location requiring clearing for the Project, a BC *Wildlife Act* permit authorization, including an accompanying Nest Removal Management Plan, will be developed (refer to Section 4.0) based on consultation with the relevant regulatory authority. If a nest is discovered as part of a construction preparation survey that is completed only a few days before construction is scheduled to begin, certain construction activities at that specific location may be delayed if the nest tree is located on the Project footprint. The length of the delay would depend on whether the nest is active and the time required to obtain a permit if nest tree removal is necessary.

If a nest is active, and Coastal GasLink cannot avoid the restricted activity window (i.e., the active nest period), Coastal GasLink will comply with applicable regulatory requirements and implement a minimum setback of 100 m consistent with the BC OGC permit conditions. If practical, Coastal GasLink will consider a larger setback consistent with BC MFLNRORD (2014) guidance, based on the construction activity and site conditions, if activity is planned for the restricted activity window.

If removal of a nest is required for construction, Coastal GasLink will proceed with a permit authorization application (refer to Section 4.0) and wait until the nest is not active before removing it.

3.1.3 Wildlife Species of Concern Discovery Contingency Plan

As part of its EAC Application, Coastal GasLink prepared a series of contingency plans to address unexpected circumstances. Appendix C.10 contains the Wildlife Species of Concern Discovery Contingency Plan, which describes measures to be taken for the discovery of a wildlife species of concern or their site-specific habitat. A raptor or heron nest is a site-specific habitat feature of a wildlife species of concern. Therefore, if a nest is discovered incidentally during construction, is identified as overlapping with the Project footprint, and is not avoidable, Coastal GasLink will implement the following steps in consideration of the contingency plan and the nest management removal and compensation plan:

- Immediately suspend work activities at the site.
- Notify the Environmental Inspector(s), who will notify the Construction Manager. Coastal GasLink will contact a wildlife resource specialist or Qualified Professional, if deemed necessary, for advice on the discovered nest and recommended interim mitigation.
    - If the nest is active (i.e., occupied by a raptor or heron), Coastal GasLink will comply with applicable regulatory requirements and implement a minimum

setback of 100 m consistent with the BC OGC permit conditions, and if practical, will consider a larger setback consistent with BC MFLNRORD (2014) guidance.

  - If the nest is not active (i.e., no signs of breeding activity), Coastal GasLink will maintain a 100 m undisturbed buffer around the nest tree where practical and will avoid cutting down the tree.

- Prepare a *BC Wildlife Act* permit authorization and accompanying Nest Removal Management and Compensation Plan (refer to Section 4.0).

4.0 BC WILDLIFE ACT PERMIT AUTHORIZATION

If a raptor or heron nest is identified as being in conflict with a Project activity, Coastal GasLink will consult with the relevant regulatory authority and, if required, a General Permit Application, type 3(1)(d)(i), (ii), or (iii), will be completed and submitted to the province of BC (BC MFLRNORD) through FrontCounter BC. Provision of a permit for the removal of a raptor or heron nest will be considered on a case by case basis. The permit application will include an accompanying Nest Removal Management and Compensation Plan, which will describe the following information:

- the location of the nest (UTM or legal description of the property)
- the species of bird occupying the nest to be removed
- the number of nests to be removed
- a detailed reasoning for nest removal, or an explanation of why the proposed activity is in the public interest
- the proposed timeline for nest removal and compensation (Table 4-1)
- a detailed description of the management and compensation to be implemented (refer to Section 5.0)
- submission of a project-completion report to the FrontCounter BC upon 30 days of nest removal

Table 4-1: Recommended Timeline for Proposed Nest Platform Installation and Nest Removal

Permit Phase	Time Frame	Task
Prepare and Submit Permit		
Permit application under the BC *Wildlife Act*	Anytime	Submit application to FrontCounter BC and negotiate permit commitments (between 30–90 days)
Permit Approved		
Artificial Nest Construction	Late September or October (prior to removal of the existing nest)	Install the artificial nesting pole(s) or platform(s)
Nest Removal	Late September to January (after the new nest platform(s) have been installed)	Commence activities, including removal of the old nest, and if appropriate, relocating the original nest to the new platform.
Post-nest Construction	Within 30 days of removing the existing nest	Electronically submit a project-completion report to FrontCounter BC.
	Subsequent breeding season (between February and August) and through Project construction	Monitor to determine whether new nest sites are active.

5.0 CONSULTATION

There is no requirement under the BC *Wildlife Act* to consult on the development of a Nest Removal Management and Compensation Plan, however, Coastal GasLink expects to consult with a relevant regulatory authority (i.e., BC MFLNRORD, or BC MECCS) if a raptor or heron nest requires removal. If a great blue heron nest must be removed, Coastal GasLink will also consult with Environment and Climate Change Canada (ECCC).

6.0 MANAGEMENT AND COMPENSATION CONSIDERATIONS

The recommended time frame for the removal and potential relocation of a raptor or heron nest is September 16 to January 14 (BC MECCS 2014a, b; BC MFLNRORD 2014)[1]. However, permit authorization may still be granted in the event that a nest is found outside of this timing window. The recommended timeline for activities associated with nest removal and relocation is provided in Table 2.

Dependent on permit authorization, Coastal GasLink will:

- Obtain a qualified biologist to guide management or compensation for the nest to be removed or relocated (BC MECCS 2013). Options may include:
    - Selectively pruning mature trees in a nearby suitable habitat (outside of the breeding season and under the guidance of a qualified biologist) to make the trees more attractive to raptors for perching and nesting.
    - Compensating for a removed raptor nest by replacing it with an artificial platform at a 1:1 ratio. The artificial nest platform will be placed in suitable nearby habitat during the least-risk timing window to encourage nesting in an alternate location (refer to Appendix A and B). This approach has primarily been successful for osprey, but could be applied for bald eagle nests (Bortolotti et al. 1988). Site selection for osprey should avoid proximity to nesting bald eagle.
- Coastal GasLink will apply adaptive management which may include the evaluation of practical corrective measures in consultation with a resource specialist if, within 5 years post-construction, a relocated or artificial nest is not used, or if a new natural nest has not been established within 1,000 m of the location where the nest was removed. Coastal GasLink will engage with the relevant regulatory authority to determine the most appropriate approach.

The ability for osprey to nest on a human-made structure is considered high (BC MECCS 2013), but is generally less so for bald eagle, and is non-existent for great blue heron, in British Columbia. Artificial nest platforms used by bald eagle in North America include power poles and communication towers (Bortolotti et al. 1988; Marion 1992), which are used when nest sites are limited or unavailable (Wildlife Habitat Council 2001). However, as nesting trees are generally not lacking in the Project area, selectively pruning mature trees to encourage the relocation of a nesting pair of bald eagles may be a reasonable option for the Project (BC MECCS 2013). There is a limited likelihood of a Project interaction with a golden eagle or peregrine falcon nest due to the lack of cliffs within the Project footprint.

[1] This date range reflects new information that was made available after filing the EAC Application, and supersedes the date range provided in Table 26-B-1 of Coastal GasLink's EAC Application.

Nest platforms for great blue heron have been constructed in Texas and Michigan, USA in areas where nesting vegetation was lacking (National Audubon Society 2009; Newstead et al. 2010). The construction of nest platforms in Michigan obtained positive results with the use of a series of tripod poles in areas once used by great blue heron (National Audubon Society 2009). However, for great blue heron nests in colonies, relocation would likely involve more than one nest and require careful planning based on input from a qualified biologist. Little information exists on the success of great blue heron nest relocation to an artificial nest structure, particularly in areas where heron are unhabituated to disturbance.

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Appendices – Contents

Appendix A Guidance for Osprey Nest Relocation
Appendix B Osprey Nest Platform Design

Appendix A

Guidance for Osprey Nest Relocation

Osprey have been found to relocate to new nesting platforms when they are provided in suitable habitat near the existing nest (Poole et al. 2002; Virginia Department of Game and Inland Fisheries 2010). The availability of human-made nesting platforms has been a significant factor in the recovery of osprey populations in some areas (Watts and Paxton 2007), and is expected to minimize Project impacts on osprey breeding success. Appendix B provides additional information on nest platform design.

The following guidance will be considered prior to the installation of new nest platforms (Land Owner Resource Centre 1999; BC MOECCS 2013; and BC MOECCS 2014a):

- Nest platforms should be constructed no more than 50 m from fish-bearing waterbodies (including wetlands, streams, and lakes). The sites should be at least 100 m from human activity and away from power lines and other potential sources of electrocution risk.
- Nest platforms should be in an open area without tree cover over the nest. This provides a preferred vantage point, sufficient space for flight, and the ability to detect predators.
- The platform σηουλδ be set higher than the original nest location.
- The support σηουλδ consist of a single pole (e.g., hydro or utility pole).
- The nest platform support should be strong enough to support a 90 kilogram nest (e.g., a 1.2 m x 1.2 m skid or pallet, a circular or oval convex, or a polygonal shape with more than three sides but with a minimum horizontal width of 1 m).
- The base of nest platform poles or trees should have aluminum flashing at least 1 m high to deter predators.
- If possible, the original nest should be relocated, intact, onto the new platform. If not feasible, sticks from the nest should be roughly arranged on the platform in the shape of a nest to attract further nest-building behavior.
- The original nest support or substrate should be modified or removed to δισχουραγε ospreys from rebuilding a nest at the same site (e.g., covered in chicken wire).

Appendix B

Osprey Nest Platform Design

The following is obtained from Land Owner Resource Centre (1999).

Single-poled platforms are better suited for use on land. This structure can be adapted for use in areas with deep soil as well as areas without soil. Old hydro poles are ideal for supporting nesting platforms.

Equipment:



- One pole, six to nine meters in length
- 1.2 m x 1.2 m skid or pallet with 10-inch high retaining fence
- Four wood or metal braces
- Power auger (for deep soil sites)
- Rock drill and mounting set (for rocky sites)
- Six-inch spikes
- Two-inch roofing nails
- Steel guy wire
- Four eye bolts (minimum two-inch thread)
- Cement
- Pliers, claw hammer and sledge hammer
- One piece of one-meter square sheet metal

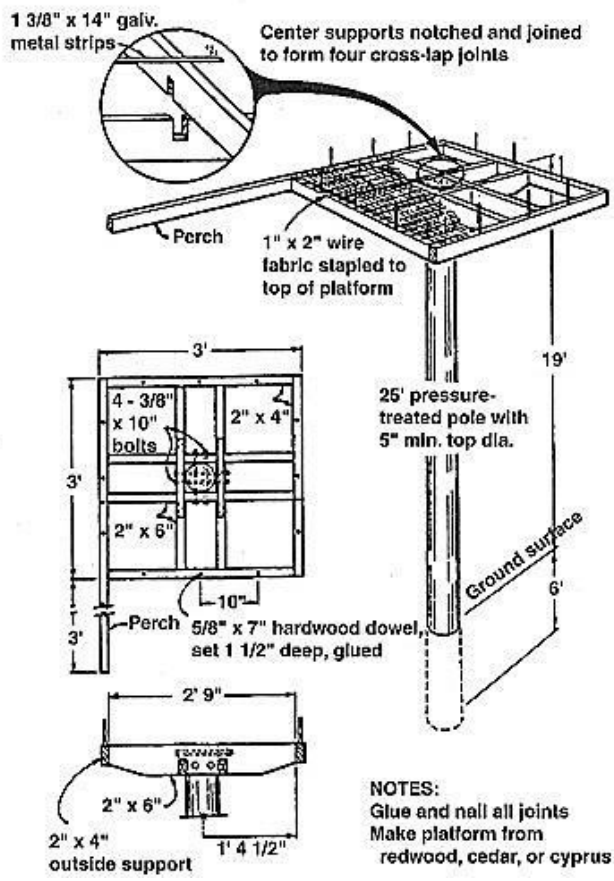
The following steps are recommended for installation in deep soil:

1. Attach the nesting platform (skid or pallet) to the pole. Wire a few "starter" nest sticks to the platform.
2. Use the power auger to drill a hole one to two meters deep.
3. Place the pole in the hole and secure it with cement, sand or rock.
4. If necessary, attach guy wires to add extra support.
5. Wrap the predator guards (sheet metal) around the base of the pole. Nail them in place with roofing nails, ensuring that they are pounded in flush so as to not provide toe-holds for predators.

The following steps are recommended for installation with no soil (e.g., rock):

Equipment: rock drill and mounting sets (as used by utility companies).

1. Attach the nesting platform (skid or pallet) to the pole. Wire a few starter sticks to the platform.
2. Use the rock drill to make the holes to accommodate the mounting set.
3. Set the bracket inside the holes. Pour in cement for additional support.
4. Raise and anchor the pole in place using the mounting set.
5. If necessary, attach guy wires prior to raising the pole to add extra support.
6. Wrap the predator guards (sheet metal) around the pole. Nail them in place with roofing nails, ensuring that they are pounded in flush and can't provide toe-holds for predators.



An additional 1 m-length of wood can be mounted as a perch.

E.2 WATER QUALITY MONITORING PLAN

Please see *Coastal GasLink Water Quality Monitoring Plan (Rev 5)* filed separately with the Environmental Assessment Office in response to Environmental Assessment Certificate #E14-03 Condition 4

E.3 RED- AND BLUE-LISTED PLANTS AND ECOLOGICAL COMMUNITIES SURVEY AND MITIGATION PLAN

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1.0 INTRODUCTION

The purpose of the Red- and Blue-Listed Plants and Ecological Communities Survey and Mitigation Plan (the Plan) is to satisfy Condition #17 of Schedule B to the Coastal GasLink Environmental Assessment Certificate (EAC) issued by the British Columbia (BC) Environmental Assessment Office (BC EAO) (2014), which states:

> The Holder must, prior to Construction, for any red- and blue-listed plants and ecological communities identified by the BC Conservation Data Centre, conduct site habitat assessment surveys for all locations within the Certified Pipeline Corridor, and propose mitigation to address adverse effects to those plants and ecological communities. The Holder must consult with EC, FLNR and OGC in the development of surveys and mitigation.
>
> The Holder must include the survey results and mitigation in relevant permit applications where available at the time of application or as soon as practicable thereafter.

The objectives of this Plan are to:

- summarize existing information about known occurrences of red- and blue-listed plants and ecological communities within the Certified Pipeline Corridor (CPC) and within new access roads
- describe methods for conducting construction preparation surveys to confirm the spatial extent and attributes of each occurrence
- provide guidelines for determining suitable mitigation from among the options presented in Coastal GasLink's EAC Application and the Environmental Management Plan (EMP)
- describe the reporting structure

As part of Coastal GasLink's EAC Application, Appendix 2-A includes an EMP presenting mitigation that will be implemented during construction. Project-specific mitigation is included in the EMP, including mitigation to be implemented to reduce or avoid adverse effects on Ecological Communities of Concern. The Red- and Blue-Listed Plant and Ecological Communities Survey and Mitigation Plan supplements the information found in the EMP and provides more detail regarding construction preparation surveys and identification of suitable mitigation specific to each finding.

Construction preparation surveys will be conducted in the CPC. The CPC is defined as the certified pipeline corridor set out in Appendix A of the Certified Project Description for an EAC for the Project. This area includes the pipeline route and temporary workspaces, but does not include access roads.

1.1 DEFINITIONS

Plants and plant communities in British Columbia (BC) are designated as being of conservation concern by the BC Conservation Data Centre (BC CDC). The BC CDC ranks the abundance and status of all ecological communities and plant species from S1 (most rare) to S5 (least rare) and lists them on Red, Blue and Yellow lists (Red being the most rare and Yellow being not at risk). This Plan focuses on those listed as red or blue.

The federal *Species at Risk Act* (SARA) tracks plant species at risk, but does not track ecological communities at risk. The only SARA-listed plant species observed during field surveys for the Project was whitebark pine (*Pinus albicaulis*). Refer to Section 7 of the EMP for information regarding mitigation for potential adverse effects on whitebark pine for the Project.

1.2 REGULATORY CONTEXT

1.2.1 Land and Resource Management Plans

The CPC crosses six Land and Resource Management Plan (LRMP) areas, including the Dawson Creek, Prince George, Vanderhoof, Lakes District, Morice and Kalum LRMPs. The LRMPs are produced as guidance for land and resource activities in each region. Three of the six LRMPs contain guidance specific to red- or blue-listed plants or ecological communities, and one contains more general guidance pertaining to rare plant species and plant associations. This guidance is summarized below.

The Dawson Creek LRMP contains a strategy to conserve biodiversity through mapping rare plant communities, rare ecosystems and rare habitat types. This information is intended to be incorporated into the landscape unit and operational plans within the region (Government of BC 1999).

The Morice LRMP contains a goal to avoid development of infrastructure, including roads, in red- and blue-listed ecosystems. It recommends ecological enhancement where ecosystem losses occur as a result of development (Government of BC 2007).

The Kalum LRMP contains a goal to maintain naturally occurring wildlife and vegetation species while protecting red- and blue-listed species. It notes that implementation of conservation measures may occur to protect listed species and communities (Government of BC 2002).

The Vanderhoof LRMP includes management direction pertaining to biodiversity to maintain or enhance rare plant species and plant associations by identifying them and developing appropriate management plans (Government of British Columbia 1997).

1.2.2 *Oil and Gas Activities Act*

The *Oil and Gas Activities Act* (OGAA) came into force on October 4, 2010. The BC Oil and Gas Commission (BC OGC) is the regulatory agency that oversees oil and gas operations in BC and administers the OGAA Environmental Protection and Management Regulation (EPMR). The BC OGC has published a guide (BC OGC 2018) that outlines strategies for the permit holder to utilize to comply with the regulations. The guide provides direction in the following areas, which are pertinent to vegetation and wetlands:

- waterbody classification with associated setbacks
- riparian management areas with associated best management practices
- wetland crossings
- old growth management areas
- natural range barriers
- integrated management of invasive plants

1.2.3 *Forest and Range Practices Act*

The *Forest and Range Practices Act* (FRPA) (2010) and regulations govern the activities of forest and range licensees in BC. The statute sets the requirements for forest land users related to planning, road building activities, logging, reforestation and old growth management areas. As a result, the identification and mapping of wetlands, riparian areas, old forest, plant species and ecosystems at risk are required.

1.2.4 *Species at Risk Act*

The *Species at Risk Act* (SARA) is a federal law that seeks to prevent endangered or threatened species from becoming extinct and secures the necessary actions for their recovery, and manages species of special concern to help prevent them from becoming endangered or threatened. The status of species is assessed and designated by the Committee on the Status of Endangered Wildlife Species in Canada (COSEWIC), which then recommends a designation for legal protection through listing under SARA. Both plant and animal species can be listed under SARA.

1.2.5 Federal Policy on Wetland Conservation

The Federal Policy on Wetland Conservation is described in detail and applied to red- and blue-listed ecological communities (and other wetland categories) within the Wetlands Management Plan for the Project.

1.3 CONSULTATION

This Plan has been developed in consultation with the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (BC MFLNRORD), Environment and Climate Change Canada (ECCC) and the BC OGC. Indigenous groups potentially affected by the Project were invited to comment on the Plan, and comments were considered in the development of the Plan.

1.4 POTENTIAL EFFECTS MECHANISMS

Effects on red- and blue-listed plants and ecological communities may occur as a result of construction, operations, and decommissioning and abandonment phases of the Project. The potential effects mechanisms include the alteration or loss of occurrences of red- or blue-listed plant species or communities in land areas that will be directly affected by Project construction activities, including associated physical works and activities. Pipeline and facility construction, operations, and decommissioning and abandonment have the potential to directly and indirectly affect vegetation along the route through the following three primary mechanisms:

- clearing and maintenance of an earlier seral stage
- introduction or spread of invasive plants
- introduction or spread of forest pests in forested communities

1.5 SUMMARY OF OCCURRENCES

Coastal GasLink's EAC Application indicated that two red-listed and 15 blue-listed plant species had the potential to be disturbed because of construction activities. Since the EAC Application was submitted, the conservation status of one plant species (dwarf clubrush; *Trichophorum pumilum*) has changed from blue-listed to yellow-listed. Subsequent fieldwork on footprint refinements within the CPC indicates that an additional two blue-listed plant species are present within the CPC.

Ecological communities were derived from the Terrestrial Ecosystem Mapping (TEM) product developed for the EAC Application. According to the EAC Application, 10 occurrences of red-listed ecological communities (15.1 ha) and 222 occurrences of blue-listed ecological communities (448.3 ha) have the potential to be disturbed because of construction activities (CGL 2014).

Before conducting field surveys, this summary of occurrences will be revised using the most up-to-date construction footprint to determine the number, location and spatial extent of occurrences of red- and blue-listed communities.

2.0 SITE HABITAT ASSESSMENT SURVEYS

Site habitat assessment surveys will be completed for each occurrence of red- and blue listed plants and communities within the CPC.

2.1 RED- AND BLUE-LISTED PLANT SPECIES

The objectives of the site habitat assessment surveys for red- and blue-listed plant species are to:

- confirm and delineate each occurrence of a red- or blue-listed plant species
- provide details on the plant population attributes of each occurrence (e.g., density, cover, phenology)
- select and recommend site-specific mitigation for each occurrence

Table 2-1 shows the red- and blue-listed plant species found in plots within the CPC during previous field surveys. This table includes details about habitat preferences, growth forms, propagation methods, state and global ranks, number of occurrences and the kilometre post (KP) for each occurrence. These data will assist Qualified Professionals in determining which mitigation may be appropriate for a given plant species.

Table 2-1: Red- and Blue-Listed Plants in the Certified Pipeline Corridor

Scientific Name	Common Name	Growth Form	Life History [1]	Habitat Type [2]	Propagation [3]	Provincial Status [4]	State/Global Conservation Rank [4, 5]	Number and Location of Occurrences (KP)
Red-Listed Plant Species								
Carex adusta	lesser brown sedge	graminoid	Perennial	dry coniferous forest	seed	Red	S1/G5	1 (251)
Sphagnum annulatum	sphagnum	moss	Perennial	Wetlands	spores	Red	S1S2/GNR	1 (279)
Blue-Listed Plant Species								
Carex crawei	Crawe's sedge	graminoid	Perennial	fen, meadow	rhizomes; seeds	Blue	S2S3/G5	1 (139)
Carex tenera	tender sedge	graminoid	Perennial	meadow, mesic coniferous forest	seeds	Blue	S2S3/G5	1 (282)
Draba glabella	smooth draba	forb	Perennial	stream, river, cliff, rock, sparsely vegetated rock, talus	seeds	Blue	S2S3/G5T5	1 (139)
Epilobium hornemannii ssp. *behringianum*	Hornemann's willowherb	forb	Perennial	bog, fen, swamp, marsh, riparian shrub, alpine/subalpine meadows	stolons; seeds	Blue	S2S3/G5T4	1 (81)
Epilobium oregonense	Oregon willowherb	forb	Perennial	bog, fen, marsh, swamp, riparian forest, riparian shrub	stolons; seeds	Blue	S2S3/G5	1 (570)

Table 2-1: Red- and Blue-Listed Plants in the Certified Pipeline Corridor (cont'd)

Scientific Name	Common Name	Growth Form	Life History [1]	Habitat Type [2]	Propagation [3]	Provincial Status [4]	State/Global Conservation Rank [4, 5]	Number and Location of Occurrences (KP)
Festuca minutiflora	little fescue	graminoid	Perennial	cliff, rock, sparsely vegetated rock	seeds	Blue	S2S3/G5	1 (139)
Galium labradoricum	northern bog bedstraw	forb	Perennial	fen, marsh, meadow, moist coniferous forest, wet coniferous forest	rhizome; seeds	Blue	S3/G5	1 (140) 2 (182) 2 (185) 2 (200)
Juncus stygius	bog rush	graminoid	Perennial	pond margins, peat bogs (e-flora)	seeds	Blue	S2S3/G5T5	1 (644) 1 (645)
Malaxis paludosa	bog adder's-mouth orchid	forb	Perennial	bog, swamp, moist coniferous forest, wet coniferous forest	corms; seeds	Blue	S2S3/G4	1 (645)
Meesia longiseta		moss	Perennial		spores	Blue	S3/G5	1 (357)
Melica spectabilis	purple oniongrass	graminoid	Perennial	meadow, alpine/subalpine meadow	rhizomes; bulbs; seeds	Blue	S2S3/G5	1 (536)
Pedicularis parviflora ssp. *parviflora*	small-flowered lousewort	forb	annual/biennial	bog, fen, swamp, marsh	seeds	Blue	S3/G4T4	1 (623)
Pinus albicaulis	whitebark pine	coniferous tree	Perennial	cliff, rock, sparsely vegetated rock, mesic coniferous forest, dry coniferous forest	seeds	Blue	S2S3/G3G4	*not discussed in this Plan
Scorpidium cossonii	intermediate hook-moss	moss	Perennial		spores	Blue	S2S4/GU	1 (81)

Table 2-1: Red- and Blue-Listed Plants in the Certified Pipeline Corridor (cont'd)

Scientific Name	Common Name	Growth Form	Life History [1]	Habitat Type [2]	Propagation [3]	Provincial Status [4]	State/Global Conservation Rank [4, 5]	Number and Location of Occurrences (KP)
Tomentypnum falcifolium		moss	Perennial		spores	Blue	S3/G3G5	1 (448) 2 (453) 1 (544)

Notes:

[1] E-flora. Available at http://ibis.geog.ubc.ca/biodiversity/eflora/. Accessed December 2018.

[2] BC CDC Species and Ecosystems Explorer. Available at http://www.env.gov.bc.ca/atrisk/toolintro.html. Accessed December 2018.

[3] Douglas et al. 1998-2002. Illustrated Flora of BC, Volumes 1 – 8. B.C. Min. Environ., Lands and Parks, and B.C. Min. For., Victoria, B.C.

[4] Provincial Status (SRank):

Provincial Status applies to a species' or ecological community's conservation status in British Columbia. The status ranks have the following meaning:

1 = critically imperiled

2 = imperiled

3 = special concern, vulnerable to extirpation or extinction

4 = apparently secure

[5] State/Global Conservation Rank (GRank):

A Global Rank applies to a species/ecological community across its entire range. The ranks have the following meaning:

3 = vulnerable to extirpation or extinction

4 = apparently secure

5 = demonstrably widespread, abundant, and secure.

U = unrankable

1

Survey Methods

Before starting construction preparation surveys, a rare plant field guide containing each targeted species will be developed to aid in species identification and survey timing based on suitable habitat.

Surveys will be conducted by qualified vegetation ecologists or botanists (refer to Section 4.0 for the schedule).

Field crews will navigate to the known location of each occurrence of red- or blue-listed plant species using up to date base maps and GPS units. Field crews will search the extent of contiguous suitable habitats along the route for target plant species using a meandering transect method (Stantec 2010, ANPC 2012, Penny and Klinkenberg 2010). Information contained in the BC CDC Field Survey Form (Appendix A) will be collected for each occurrence, including:

- plant species
- date
- GPS location
- habitat description
- slope
- elevation
- aspect
- soil moisture regime
- soil nutrient regime
- phenological development phase
- spatial extent of the population and/or density
- rank considerations
- landscape context
- photos
- any notes or comments

To determine if more than one population is present, the area around the known occurrence will be surveyed. This area will depend on the extent of continuous suitable habitat and connectivity of dispersal vectors (e.g., riparian corridors). The extent of suitable habitat will be informed by desktop mapping and Coastal GasLink's Terrestrial Ecosystem Mapping (TEM) product.

A voucher specimen will be collected for each species in accordance with ANPC (2006) collection guidelines for verification.

A handheld GPS will be used to delineate the spatial extent of each occurrence within the CPC to aid in mitigation planning. An updated spatial data file (e.g., shapefile) will be produced for each occurrence.

Appropriate mitigation will be selected and recommended for each occurrence in the field based on:

- the location of the occurrence relative to the CPC boundaries
- its population attributes
- the conservation ranking

Mitigation identified in the EAC Application and EMP will be provided to each crew and any site-specific mitigation opportunities for each site will be noted in the field.

Section 5.0 in this Plan describes how these survey results will be documented and incorporated into permit applications and appropriate construction documents (i.e., environmental worksheets). In addition, Coastal GasLink is required to conduct construction preparation surveys for SARA-listed and provincially–listed vascular and non-vascular plants, and submit the survey results and site-specific mitigation plans to the BC OGC before clearing (BC OGC 2015).

2.2 RED- AND BLUE-LISTED ECOLOGICAL COMMUNITIES

The objectives of the site habitat assessment surveys for red- and blue-listed ecological communities are to:

- confirm the presence and classification of red- or blue-listed ecological communities within the CPC
- delineate and record the confirmed boundary of red- or blue-listed ecological communities
- select and recommend mitigation that is appropriate for each site and occurrence

Table 2-2 shows the ecological communities identified as present in the CPC and their current conservation status.

Table 2-2: Red- and Blue-listed Ecological Communities in the Certified Pipeline Corridor

Name	Category	Global/State Rank [1]	Provincial Listing
amabilis fir - Sitka spruce/devil's club	Upland forest	S3/GNR	Blue
amabilis fir - western redcedar/oak fern	Upland forest	S3/GNR	Blue
(balsam poplar, black cottonwood) - spruces/red-osier dogwood	Floodplain: mid-bench	GNR	Red
balsam poplar - white spruce/mountain alder - red-osier dogwood	Floodplain: mid-bench	S3/GNR	Blue
Bebb's willow/bluejoint reedgrass	Wetland; swamp	GNR	Blue
black cottonwood - subalpine fir/devil's club	Floodplain: mid-bench	S2S3/GNR	Blue
black spruce/common horsetail/peat moss	Wetland; bog	GNR	Blue
black spruce/creeping-snowberry/sphagnum	Wetland; bog	GNR	Blue
black spruce/lingonberry/peat moss	Wetland; bog	GNR	Blue
Douglas-fir - hybrid white spruce/knight's plume	Upland forest	S3/G3	Blue
Douglas-fir - hybrid white spruce/thimbleberry	Upland forest	S3/GNR	Blue
Douglas-fir - lodgepole pine/cladonia	Upland forest	S3/GNR	Blue
Douglas-fir/soopolallie/feathermoss	Upland forest	GNR	Blue
Drummond's willow/bluejoint reedgrass	Floodplain: low-bench	S2S3/G3	Blue
hybrid white spruce/horsetails/leafy moss	Wetland; swamp	GNR	Blue
hybrid white spruce/pink spirea - prickly rose	Upland forest	S3/GNR	Blue
hybrid white spruce/pink spirea/oak fern	Upland forest	S3/GNR	Blue
Labrador tea/western bog-laurel/peat moss	Wetland; bog	GNR	Blue
lodgepole pine - black spruce/feathermoss	Upland forest	S3/G3	Blue
lodgepole pine/common juniper/rough-leaved ricegrass	Upland forest	S3/GNR	Blue
lodgepole pine/huckleberry - velvet-leaved blueberry	Upland forest	S3/GNR	Blue
lodgepole pine/huckleberry/cladonia	Upland forest	GNR	Blue
MacCalla's willow/beaked sedge	Wetland; swamp	GNR	Blue
mountain alder/common horsetail	Floodplain: low-bench	S3/G3	Blue
mountain alder/red-osier dogwood/lady fern	Floodplain: low-bench	S3/G3G4	Blue
narrow-leaved cotton-grass/shore sedge	Wetland; fen	GNR	Blue
Sandberg's bluegrass - slender wheatgrass	Grassland	GNR	Red
Saskatoon/slender wheatgrass	Grassland	S2/G2	Red
scheuchzeria/peat moss	Wetland; bog	GNR	Blue
scrub birch/water sedge	Wetland; fen	GNR	Blue

Table 2-2: Red- and Blue-listed Ecological Communities in the Certified Pipeline Corridor (cont'd)

Name	Category	Global/State Rank [1]	Provincial Listing
shore sedge - buckbean/hook-moss	Wetland; bog	GNR	Blue
Sitka sedge/peat moss	Wetland; fen	S2/G2	Red
Sitka spruce/salmonberry Very Wet Maritime	Floodplain	S2/G3	Red
Sitka spruce/salmonberry Wet Submaritime 2	Floodplain: high-bench	S3/G3	Blue
Sitka willow/Sitka sedge	Wetland; swamp	GNR	Blue
spruce - subalpine fir/skunk cabbage	Wetland; swamp	GNR	Blue
subalpine fir - mountain hemlock/cladonia	Upland forest	GNR	Blue
subalpine fir/alders/horsetails	Upland forest	GNR	Blue
sweet gale/Sitka sedge	Wetland; fen	S2/G3	Red
tamarack/water sedge/golden fuzzy fen moss	Wetland; fen	GNR	Blue
tufted clubrush/golden star-moss	Wetland; fen	GNR	Blue
western hemlock - amabilis fir/deer fern	Upland forest	GNR	Blue
western hemlock - western redcedar/salal Very Wet Maritime	Upland forest	GNR	Blue
western redcedar - Sitka spruce/skunk cabbage	Wetland; swamp	GNR	Blue
white spruce - lodgepole pine/soopolallie/showy aster	Upland forest	GNR	Blue
white spruce - subalpine fir/black huckleberry/red-stemmed feathermoss	Upland forest	GNR	Blue
white spruce/oak fern - sarsaparilla	Upland forest	GNR	Blue
white spruce/red swamp currant/horsetails	Upland forest	GNR	Blue
whitebark pine/cladonia lichens - curly heron's-bill	Upland forest	GNR	Blue

Notes:

[1] Global/State Conservation Rank

Global Rank (GRank) applies to a species/ecological community across its entire range. The ranks have the following meaning:

2 = imperiled

3 = vulnerable to extirpation or extinction

GNR = Global Rank not yet released

State (provincial) rank (SRank) applies to a species' or ecological community's conservation status in BC. The status ranks have the following meaning:

2 = imperiled

3 = special concern, vulnerable to extirpation or extinction

4 = apparently secure

Survey Methods

Each occurrence of a red- or blue-listed ecological community within the CPC will be visited during construction preparation surveys. Red- or blue-listed wetlands within the footprint will be surveyed in the course of the field program for the Wetlands Management Plan.

Before fieldwork, vegetation ecologists will review indicator species and community descriptions for the ecological communities present along the CPC and prepare a field guide and updated base maps with current community information from TEM to aid in community identification and delineation in the field.

Surveys will be conducted by qualified vegetation ecologists or botanists.

Field crews will navigate to the location of each occurrence of a red- or blue-listed community (according to the Project's TEM) using updated base maps and GPS units. Once field crews have arrived at the location of the red- or blue-listed community, a ground inspection site visit will be completed according to BC MFLNRORD and BC Ministry of Environment and Climate Change Strategy (MECCS) (2010), if there was not already one established during the baseline studies for the Project's Technical Data Report. Refer to Appendices A and B for an example of data forms that will be adapted to the Project's purposes. Information collected at each occurrence will include:

- date
- GPS location
- site series
- structural stage
- slope
- elevation
- aspect
- moisture regime
- spatial extent
- location
- rank considerations
- landscape context
- photos
- stand age

- successional status
- plant species assemblage
- any notes or comments

The purpose of the site identification and classification plot is to confirm the ecological community or site series and structural stage of each occurrence.

A handheld GPS will be used to delineate the spatial extent of each occurrence along the CPC to aid in mitigation planning. An updated spatial data file (i.e., shapefile) will be produced for each occurrence.

Appropriate mitigation will be selected and recommended for each occurrence in the field and office and will be based on the extent and location of the occurrence, relative to the CPC, and its conservation rank. Mitigation identified in the EAC Application and EMP will be provided to each crew and any site-specific mitigation opportunities for each site will be noted in the field.

Section 5.0 in this Plan describes how these survey results will be documented and incorporated into permit applications and guidance documents for construction (i.e., environmental worksheets).

3.0 MITIGATION

The list of mitigation presented in the EAC Application, EMP, and Ecological Community and Species of Concern Discovery Contingency Plan are presented below. General mitigation that is applicable to both listed plant species and listed communities is summarized in Section 3.0. Mitigation specific to listed plant species are presented in Section 3.1, while those specific to listed ecological communities are presented in Section 3.2.

Site-specific mitigation opportunities based on the options listed in the EAC Application and EMP will be identified and noted while crews are in the field.

Mitigation common to listed plant species, as well as listed communities, are presented below:

- Avoid the site by refining the construction footprint, relocating workspace, or adjusting the equipment layout or location of the footprint. If none of these options is practical, construction methods should be altered to provide the greatest protection to the community or population. Options for altering construction methods are described in Coastal GasLink's Ecological Community and Species of Concern Discovery Contingency Plan (Appendix C.9).
- Ensure a buffer of 20 m between timber decking sites and ecological communities of concern or plant populations of concern, wherever practical.
- For Species at Risk listed under Schedule I of SARA, confirm whether a permit pursuant to Section 73 of SARA is required before conducting any activity.
- Coastal GasLink will determine site-specific and appropriate mitigation according to the Ecological Communities and Species of Concern Discovery Contingency Plan (Appendix C.9 of the EMP), which lists the sensitivity criteria considered and presents a suite of mitigation options (i.e., staged mitigation).
- Mitigation of sensitive resources should be reviewed with contractor personnel before construction, to ensure personnel understand the procedures involved.
- Extend road or watercourse bores and provide alternative measures for equipment to travel past the area of concern (e.g., protection matting, or snow during the winter; drive around).
- Narrow the ROW or workspace, or re-orient the area of disturbance and clearly mark and protect the site using fencing and signage.
- Restrict access at the site and clearly mark with flagging and signage to inform all users of the restrictions.

- Propagate specific components of ecological communities or plants of concern on-site (e.g., harvest seed from the ROW or adjacent area and sow onto ROW following cleanup), or by other means (e.g., collect seed or cuttings, grow in greenhouse and plant onto ROW following cleanup).
- Temporarily cover the site (e.g., geotextile pads, flex net, snow, rig/swamp mats, plywood) to reduce physical disturbance of the vegetation and soil surface during construction.
- Create a raised ramp (e.g., bridge, rig) for traffic to travel on, to reduce compaction of the vegetation or soil surface.
- Carefully re-contour the site to match pre-disturbance site conditions so that drainage is not altered.
- Construct in winter when the ground is frozen and there is full snow cover, if practical.
- Reduce impact from compaction by allowing the ground surface to freeze before vehicle access.
- During construction, fence or flag community components or populations that are adjacent to the footprint to prevent incidental damage.
- Limit the size of the work area through alpine and subalpine areas by reducing workspace and extra workspace in these areas, where practical.
- Retain the natural range of alpine and subalpine plant community types and structure by implementing mitigation such as retaining diverse micro-habitats (i.e. “leave patches”).
- Manage the alpine and subalpine habitats as invasive plant-free zones with strict guidelines on vehicle and equipment access as outlined in the EMP.
- If previously unidentified ecological communities of concern or plant species of concern are found on the construction footprint before construction, implement the Ecological Community and Species of Concern Discovery Contingency Plan.
- At locations where the Ecological Community and Species of Concern Discovery Contingency Plan is implemented, conduct post-construction monitoring to assess mitigation success (e.g., for three years starting in the first full growing season following cleanup).
- Implement alternative mitigation deemed appropriate by the Environmental Inspector(s) in consultation with the vegetation resource specialist.

3.1 RED- AND BLUE-LISTED PLANT SPECIES MITIGATION

Species of concern will be flagged in the field before construction.

The list of mitigation specifically for red- or blue-listed plant species (excluding whitebark pine) includes:

- The Environmental Worksheets will include appropriate site-specific mitigation to be implemented at each site where a species of concern occurs within the CPC.
- Use natural recovery in areas of species of concern unless invasive species or noxious weeds are a concern, or unless otherwise specified by Coastal GasLink.
- Leave gaps in the spoil pile to avoid listed plants or listed plant populations.
- Salvage and transplant individual plants (or seed or other propagules), portions of sod containing the plants of risk and the surrounding vegetation, or the feature that houses the plants (e.g., log or rock) to an appropriate off ROW location.
- In alpine and subalpine areas, move select, floristically rich (i.e., moss, lichen and small herbs) rocks out of the work area and return to the work area following construction, where practical.
- The Environmental Worksheets will include appropriate site-specific mitigation to be implemented at each site where a listed plant species occurs within the Project footprint.

3.2 RED- AND BLUE-LISTED ECOLOGICAL COMMUNITIES MITIGATION

The list of mitigation specifically for red- and blue-listed ecological communities includes:

- The Environmental Worksheets will include appropriate site-specific mitigation to be implemented at each site where an ecological community of concern occurs within the Project footprint.
- Near ecological communities of concern and plant populations of concern, grading should be prohibited except where required to safely install pipe.
- Use natural recovery in areas of ecological communities of concern unless invasive species or noxious weeds are a concern, or unless otherwise specified by Coastal GasLink.
- Conduct careful duff layer and topsoil or surficial soil salvage at the site, storing topsoil or surficial soil separately and ensuring it is returned to the location from where it was stripped.
- Implement all applicable mitigation outlined in the EMP under the headings of: clearing, maintenance, invasive plants and forest pests.

- In the identified red-listed ecological community areas along the route, retain a forested or shrub buffer between the red-listed ecological community at risk and adjacent early seral plant communities by reducing the extra workspace, where practical, when the Project footprint enters and exits the feature. The buffer will reduce the potential adverse effect of windthrow, help preserve the natural environmental conditions of the community, and limit the movement of invasive plant seed and plant parts along the open corridor. Flag the area for potential narrowing in the field before clearing.
- Before clearing, assess forests along the route for the presence of forest pests that could be moved or worsened by Project activities. In alpine and subalpine areas, white-pine blister rust and mountain pine beetle are of particular concern. The assessment will be conducted by a Qualified Professional. Implement the Forest Pest Management Plan, as needed.
- Seed grasslands as soon as practical after final cleanup, or after machine cleanup in areas of construction in frozen conditions. Re-seed with Certified No. 1 seed mix or native species in accordance with the Reclamation Program. Where the grassland occurs in an area with invasive plants or in areas where sediment and erosion control is a concern, seed an aggressive short-lived cover crop that will provide a quick cover. If these measures are not feasible, Coastal GasLink will discuss alternative measures with the relevant regulatory authority.
- Reclaim micro-topography features to the extent practical, specific to grasslands immediately after construction.

4.0 SCHEDULE

The schedule of field surveys described in this Plan is subject to ecological and access constraints. Portions of the CPC are at high elevations and latitudes subject to late snowpack. Most listed plant species and communities can only be identified during the growing season, often with either flowers or fruits present. Portions of the CPC do not have road access.

Given the ecological and access constraints, surveys for red- and blue-listed plants should take place in mid to late June and August, depending on the species. Ecological community surveys should take place in mid to late July through the end of August.

5.0 REPORTING

A final report documenting the findings and mitigation for each occurrence of a red- or blue-listed plant or ecological community will be completed at the end of the field program.

The report will consist of a document outlining key findings during fieldwork accompanied by a map book detailing the location of each occurrence using the field-verified and collected spatial data. The report will include the population- or community-level details, location and mitigation for each occurrence.

Together with the mitigation, these results will inform Project Environmental Worksheets for construction and will support the information requirements for permit applications to regulatory agencies, such as the BC OGC or BC MFLNRORD.

6.0 REFERENCES

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Appendices Contents

Appendix A BC Conservation Data Centre Field Survey Form (Plants)
Appendix B Site Visit Inspection Form (FS1333)

Appendix A

BC Conservation Data Centre Field Survey Form (Plants)

B.C. Conservation Data Centre
FIELD SURVEY FORM (PLANTS)
Note: Complete only for Red- or Blue-Listed species. Please fill out as many fields as you can, but precise locality and population data are especially important pieces of information.

Project name: _____
New/Update
Update EO #___

Species: _____
Name of surveyor/Address/ phone #/Email:
_____
_____
Survey Date: (*Month/Day/year*): ____ ____ _____ **1st visit or repeat visit to this site:** _____
Revisit needed? ___yes ___no Why?: _____
Specimen Collection # & Herbarium: (*Please make a collection; in most cases, a collection is necessary to verify identification*) _____ **Was a photo taken?** _____

Location/Directions: (*Please be as precise as possible; include photocopies of 1:20,000 trim or 1:50,000 topographic maps (if possible, but any maps are welcome*)
_____
_____
_____
_____
_____
_____

Position:
UTM grid reference: (*from blue grid on 1:50,000 NTS map*): **MAP SHEET#** _____
(*North American Datum (NAD) designation is found below the contour interval scale on NTS map, 27 or 83; a GPS unit can be set to either NAD designation; We use NAD 83 data*).
ZONE ____ **EASTING** __ __ __ __ __ __ **NORTHING** __ __ __ __ __ __ __ **NAD** ____
LATITUDE ____ ____ ____ **LONGITUDE**____ ____ _____
Did you use a GPS unit to determine this value? Y / N Precision of point (+/- metres) ____

Habitat: *(Please include dominant plants and identify plant communities, a general description of area including land forms/use)*
_____
_____
_____
_____
_____
_____
_____

Topographic features: **Elevation:** _____ metres feet (*circle one*) **Slope:** _____ **Aspect:** _____
(Please note if elevation was derived from GPS unit)

Light:
___ open
___ partial
___ filtered
___ shade

Slope Position:
___ crest
___ upper slope
___ mid slope
___ lower slope
___ bottom

Moisture:
___ inundated
___ saturated (wet-mesic)
___ moist (mesic)
___ dry-mesic
___ dry (xeric)

Population Data:
Number of individuals: (estimate or exact count, if feasible; if plants are spreading vegetatively, indicate number of aerial stems): _____
Number of sub-populations & separation distances (if applicable):_____

Area and units covered by population: _____ ____ Length: _____ ____ Width:_____ ___
(Please also indicate direction for length & width and reference to any landscape features, shape of areas & how areas relates to any UTM's provided, ie the centrum): _____

_____

_____

Confidence Extent: ____Full extent of population known ___Full extent not known ___Uncertain full extent known

Phenology: (Indicate the number observed in each category (or check if numbers are unknown):
___ in leaf ___ in bud ___in flower ___immature fruit ___mature fruit ___seed dispersing
___dormant ___seedlings

Area for sketch:

_____

Rank Considerations:

Condition: *An integrated measure of the quality of biotic and abiotic factors, structures and processes* ***within the habitat the population occupies****, and how they reflect on how well this species is doing at this site.*

Please consider:

1) *reproduction and health*
2) *ecological processes*
3) *species composition and biological structure*
4) *habitat degradation, presence of exotic species and disturbance*
5) *physical/chemical factors that affect the element's ability to persist at the site.*

_____
_____
_____
_____
_____
_____

Landscape context: *Factors, structures and processes at work* ***over the landscape surrounding*** *the population.*

Please consider:

1) *the degree of fragmentation and connectivity of suitable habitat for this species*
2) *species composition*
3) *biological structure*
4) *ecological processes*
5) *abiotic factors*

_____
_____
_____
_____
_____

Notes: (*Land ownership, development plans, management activities, if any, or other comments*):

_____
_____A

private land owner **may request** that the exact location **not** be released to the public. The CDC will only release the location in response to an FOI request. Does the landowner want the exact location withheld from the public? YES ____ NO ___
Was the landowner contacted about the release of the exact location? YES ____ NO ___

LANDOWNER'S NAME:_____ PHONE: _____ E-MAIL:_____

Please return to: CDC, Ministry of Environment, Ecosystems Branch, P.O. Box 9358 Station Provincial Government, Victoria BC V8W 9M2 (fax: 250-387-2733) cdcdata@gov.bc.ca THANK YOU!

CONSERVATION EVALUATION FORM			
PROJECT IDENTIFICATION		**DATE:**	
PROJECT ID:		**PLOT #:**	
POLY #:	**SEI CLASS:SUBCLASS:**		
ECOLOGICAL COMMUNITY			
CONSERVATION INFORMATION			
OWNER/JURISDICTION:			
DISTURBANCE:		**KNOWN THREATS:**	
ADJACENT LAND USE:		**OTHER FACTORS:**	
ALIEN SPP.:			
SUCCESS. STATUS:		**EST. SIZE COMM:**	**(ha)**
FRAGMENTATION OF ECOLOGICAL COMMUNITY			
❒ < 5% FRAGMENTED ❒ 5 - 25 % FRAGMENTED ❒ > 25% FRAGMENTED			
EVALUATION SUMMARY			
LANDSCAPE CONTEXT:	EXCELLENT ❒ GOOD ❒ FAIR ❒ POOR ❒		
ECOLOGICAL INTEGRITY:	EXCELLENT ❒ GOOD ❒ FAIR ❒ POOR ❒		
CONDITION:	EXCELLENT ❒ GOOD ❒ FAIR ❒ POOR ❒		
NOTES(AT-RISK SPECIES, WILDLIFE OBSV., ACCURACY INFO, ETC)			
OBSERVER	NAME:		
ADDRESS:			
EMAIL:		PHONE/FAX:	
SUBMIT DATA			
CDC, Ministry of Environment, Ecosystems Branch, P.O. Box 9358 Station Provincial Government, Victoria BC V8W 9M2 (fax: 250-387-2733) THANK YOU! Include: FS882 or GIF or VENUS file ❒ air photos with polygon marked ❒ map product(s) ❒ ground photos ❒			

COMPLETING THE CONSERVATION EVALUATION FORM
This form is intended for ecologists familiar with the RISC[1] Standards For Describing Terrestrial Ecosystems In The Field (DTEIF[2]). Submit a ground inspection (GIF) or ecosystem field (FS882) form with copies of air photos and/or maps. This information is necessary to identify and assess the conservation status of at-risk ecological communities.
PROJECT IDENTIFICATION:
Enter the date and GIF or FS882 plot number. If this form is completed as part of an inventory project provide the project name, related polygon number and sensitive ecosystem category, if applicable.
ECOLOLOGICAL COMMUNITY
Enter the name of the ecological community as on the CDC tracking list
CONSERVATION INFORMATION
OWNER/JURISDICTION: Enter the land owner or land management jusridiction (i.e. Provincial park, TFL #, regional government)
ADJACENT LAND USE: Provide details of land use adjacent to the community (i.e. housing, logging, recreation, etc)
DISTURBANCE: Enter DTEIF site disturbance codes and comments.
KNOWN THREATS: Record any known threats to the ecological community such as fire suppression, invasiveness of alien species, etc.
OTHER FACTORS: Record any other information known about the site
ALIEN SPP.: Note the type and abundance of alien species associated with the ecological community or in the vicinity.
SUCCESS. STATUS: Enter DTEIF succesional status codes
EST.SIZE COMM: Enter the estimated size of the community in hectares.
FRAGMENTATION: Indicate the degree of fragmentation within the community
EVALUATION SUMMARY:
Complete this section only if familiar with these terms as defined by CDC. Refer to CDC website - element occurrence ranking factors
NOTES
Record any other information or comments.
OBSERVER
Enter your name and contact information. A CDC ecologist may contact you if additional information or clarity is required.
1. Resource Information Standards Committee 2. Field Manual For Describing Terrestrial Ecosystems, Land Management Handbook 25. 1998. Prov. Of BC., Victoria, BC.

Appendix B Site Visit Inspection Form (FS1333)

BRITISH COLUMBIA
The Best Place on Earth

Ministry of Forests and Range

SITE VISIT FORM

PROJECT ID

Plot No.	Plot Type: Grnd ☐ Visual ☐ Note ☐ Other ☐	Date YY - MM - DD
Surveyors	Map Polygon No.	Plot Photo

Plot Location

FS Region/ District	East	North	UTM Zone
NTS Map.	Lat.	Long.	Accur. (+/- m)

Plot Representing

BGC	SS	SMR	SNR	Map Label

Site Features	Elevation	Slope %	Aspect	Surface Shape	ST ☐	CC ☐	CV ☐

Crest ☐ Upper ☐ Mid ☐ Lower ☐ Toe ☐ Level ☐ Dep. ☐ Gully ☐ Flood Plain? ☐

Expose. Type ☐ insolation ☐ wind ☐ snow ☐ water spray ☐ misc.
☐ n/a ☐ frost ☐ cold air ☐ salt spray ☐ air toxicity _____

Site Disturb. ☐ fire ☐ site prep. ☐ terrain ☐ soil dist. _____
☐ n/a ☐ harvest ☐ planted ☐ biotic ☐ other _____

Stand Attributes | Stand Age _____ Est. ☐ Mea. ☐ | Stand Ht. _____ Est. ☐ Mea. ☐ | Canopy Composition

Struct. Stage: 1a ☐ 1b ☐ 2a ☐ 2b ☐ 2c ☐ 2d ☐ 3a ☐ 3b ☐ 4 ☐ 5 ☐ 6 ☐ 7a ☐ 7b ☐

Success Status: NV ☐ PS ☐ YS ☐ MS ☐ OS ☐ YC ☐ MC ☐ OC ☐ DC ☐

Terrain	Texture	Surficial Material	S. Expression	Geo. Process	Rock Types
1					1
2					2

Rooting Zone | Drainage ☐ X ☐ R ☐ W ☐ M ☐ I ☐ P ☐ V

Humus/Organic Form ☐ Mor ☐ Moder ☐ Mull ☐ Fibric ☐ Mesic ☐ Humic

Humus Thickness _____ cm	Ah? ☐ Ae? ☐ _____ cm	Estimated Soil Depth _____ cm
R.Z. Soil Texture _____	R.Z.Coarse Fragrament % _____	Estimated Rooting Depth _____ cm
Gleying or Mottling ☐ n/a _____ cm	Seepage ☐ n/a _____ cm	Restrict.Layer ☐ n/a _____ cm

Restrict. Type ☐ **C**ement ☐ **P**an ☐ **K**ompact ☐ **L**ithic ☐ **W**ater ☐ **X** Chem. ☐ **Z** Permafrost

SPP. LIST COMP. ☐ PART. ☐

% COVER BY LAYER TREE (A) ☐ SHRUB (B) ☐ HERB (C) ☐ MOSS / LICHEN (D) ☐

Associated Full Cruise Card ? ☐ No ☐ Yes

COL.	TREES & SHRUBS	A1	A2	A3	A	B1	B2	B

COL.	HERB LAYER (C)	%

COL.	MOSS / LICHEN / SEEDLING (D)	%

Notes/Diagram

Tree Mensuration

SPP.	dbh	Ht.	BH Age	Path. Y/N	Notes