

ALASKA LNG PROJECT	DOCKET NO. CP17-____-000 RESOURCE REPORT NO. 2 APPENDIX J – DRAFT STORMWATER POLLUTION PREVENTION PLAN (SWPPP)	Doc No: USAI-PE-SRREG-00- 000002-000 DATE: APRIL 14, 2017 REVISION: 0
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APPENDIX J DRAFT STORMWATER POLLUTION PREVENTION PLAN (SWPPP)



**STORMWATER POLLUTION PREVENTION
PLAN (SWPPP)**

USAI-P2-SPZZZ-00-000001-000



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- Attachment A: Notice of Intent (NOI) for the Project
- Attachment B: Qualified Persons – Description of Qualifications
- Attachment C: Stormwater Inspection Checklist and Reporting Forms
- Attachment D: Stormwater Monitoring Plan
- Attachment E: Typical Drawings

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1.0 INTRODUCTION

The purpose of the Stormwater Pollution Prevention Plan (SWPPP) is to:

- Identify all potential sources of pollution that may reasonably be expected to affect the quality of stormwater discharges from the Project during construction.
- Describe and ensure the implementation of practices that would be used to reduce the pollutants in stormwater discharges associated with the construction activity.
- Ensure compliance with the terms and conditions of the Alaska Construction General Permit (ACGP) through ongoing inspection and reporting.

This document is a template for a SWPPP and will be finalized once the Contractors are identified and the construction schedule for the Project updated.

1.1 REGULATORY FRAMEWORK

The Clean Water Act (CWA) and associated federal regulations (Title 40 of the Code of Federal Regulations (CFR) 123.25(a)(9), 122.26(a), 122.26(b)(14)(x) and 122.26(b)(15) require construction site operators engaged in clearing, grading, and excavating activities that disturb 1 acre or more, including smaller sites in a larger common plan development, to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) permit for their stormwater discharges. For oil and gas activities, the U.S. Environmental Protection Agency (EPA) has promulgated regulations in 122.26 to carry out the statutory requirements of 402(p) of the CWA for general construction permits that cover the Project. The state regulations are found in the Alaska Administrative Code (AAC), Chapter 83 “Alaska Pollutant Discharge Elimination System (APDES) Program” (18 AAC 83). The federal regulations are incorporated by reference into the state APDES regulations in 18 AAC 83.010.


The Alaska Department of Environmental Conservation (ADEC) administers the stormwater program through the APDES Program general permit (AKR 100000 Construction General Permit) that authorizes the discharge of pollutants in stormwater discharges under the ACGP. The ACGP requires construction site owners and operators to implement a range of erosion and sediment control measures and pollution prevention practices to control pollutants in discharges from construction sites. This SWPPP has been developed in accordance with the requirements of the ACGP.

The ACGP authorizes stormwater discharges from large and small construction activities that result in a total land disturbance equal to or greater than one acre, and where those discharges enter waters of the United States (U.S.) or a municipal separate storm sewer system discharging into waters of the U.S. The ACGP requires the preparation and implementation of a SWPPP for Project construction.

1.2 SCOPE

The purpose of a SWPPP is to identify all potential sources of pollutants that may reasonably be expected to affect the quality of stormwater discharges into waters of the United States from the Project during construction. This SWPPP covers the following aspects of the Project:

- Construction of the Liquefaction Facility (LNG Plant and Marine Terminal).
- Construction of the Mainline, aboveground facility sites, such as compressor stations, meter stations, heater stations, launching/receiving stations, mainline block valves, interconnection points and associated facilities.

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- Construction of the Gas Treatment Plant (GTP) and associated facilities.
- Construction of the Point Thomson Gas Transmission Line, Prudhoe Bay Gas Transmission Line, associated aboveground facilities, and associated facilities.

The initial Project Notice of Intent (NOI) and SWPPP would be prepared prior to the start of construction and would focus on projected new construction that would take place during the ensuing calendar year. During subsequent calendar years, separate NOIs and SWPPPs would be prepared to cover construction activities scheduled to take place during each corresponding calendar year. As sites are successfully restored and stabilized, an annual Notice of Termination (NOT) would be submitted. Early consultation with ADEC indicated that this would streamline its review and facilitate easier monitoring and compliance reporting. The NOT process is included in Section 7.0.

The NOI can be submitted in the following manner:

- Electronically at www.dec.alaska.gov/water/wnpspc/stormwater/APDESeNOI.html Please note that NOI submittal procedures are subject to change and the applicant should consult DEC at the time of submittal.
- Via paper copy (available at the above website) to:
Alaska Department of Environmental Conservation
Wastewater Discharge Authorization Program
Stormwater NOI
555 Cordova Street
Anchorage, AK 99501

An example NOI form provided in Attachment A. The General Permit Authorization Fee is due at the time of the NOI submission. Once the NOI is submitted and the fee received, ADEC would post the project on its website:


<http://dec.alaska.gov/Applications/Water/WaterPermitSearch/Search.aspx>.

Construction activities can commence upon receiving written authorization from the Department. Authorizations are expected to be issued no sooner than seven calendar days and up to 45 days after submitting an NOI, depending on the size and complexity of the project.

As required for APDES general permits for excavation dewatering and hydrostatic test discharges, appropriate documentation would be developed and submitted. Those discharges are not within the scope of this SWPPP, but would be handled through the Project's *Upland Erosion Control, Revegetation, and Maintenance Plan* and *Wetland and Waterbody Construction and Mitigation Procedures* (the Alaska LNG Project *Plan and Procedures* that are included as appendices to Resource Report Numbers 7 and 2, respectively), and through the required permitting for those activities.

1.2.1 Non-jurisdictional Facilities

The modifications and new construction activities proposed for the non-jurisdictional facilities, Point Thomson Unit, Prudhoe Bay Unit, and Kenai Spur Highway, would be handled by others (i.e., other Operators or the Alaska Department of Transportation and Public Facilities {ADOT&PF} and the Kenai Peninsula Borough) and are not covered by this SWPPP.

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2.0 ALASKA CONSTRUCTION GENERAL PERMIT (ACGP)

2.1 SOIL EROSION AND SEDIMENT CONTROL REQUIREMENTS

2.2 REQUIREMENTS

The SWPPP complies with the requirements of:

- APDES General Permit for Stormwater Discharges Associated with Construction Activity (AKR 100000).
- The *Plan* and *Procedures*.

The Contractor and Environmental Inspectors would maintain a complete copy of the current version of these documents on site at all times.

2.3 RESPONSIBILITIES

2.3.1 The Project Entity's Responsibilities

The Project entity is responsible for ensuring that all Contractors comply with the current ACGP and the current SWPPP at all times during construction of the Project including:

- Ensuring that up-to-date copies of the SWPPP, including amendments, are on site at Project sites.
- Conducting stormwater inspections of all construction sites for proper installation and maintenance of erosion control devices.
- Preparing SWPPP inspection reports during construction activities.


2.3.2 The Contractors' Responsibilities

The Contractor would have primary responsibility for compliance with the applicable requirements of the ACGP, including the implementation and maintenance of the SWPPP, and the preparation of any modifications of the SWPPP. The Contractor would be responsible for all notifications, reporting, and record keeping, as well as for all technical requirements related to the requirements listed above. The Contractor would be responsible for the installation and maintenance of all soil erosion and sediment control practices. When no longer required, the Contractor would be responsible for removing all debris and disposing of the material properly.

The Contractor would maintain the official working copies of the SWPPP at the site. The Contractor would provide copies of all inspection reports to the Project entity on a regular basis. The SWPPP would be made available to ADEC for review and copying as requested and during onsite inspections. In the event that the Project construction footprint overlaps with a non-Project entity project, such as an ADOT&PF road improvement project, with an open NOI, the contractor would be responsible for the implementation of best management practices (BMPs) within the Project construction footprint to ensure that discharges from the ADOT&PF project do not impact the Project.

2.3.3 ADEC Responsibilities

ADEC may review initial SWPPPs and provide recommendations at their discretion to supply compliance assistance to the permittee. ADEC may notify the Project entity that the SWPPP is

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not in compliance with the General Permit. This determination of SWPPP deficiency may be derived through site inspection or through a review of the SWPPP.

2.4 STORMWATER CONTACTS

Prior to construction, the Project entity would identify the qualified persons responsible for the following required positions:

- Stormwater Lead.
- SWPPP Preparer.
- Person(s) Conducting Inspections.
- Person(s) Conducting Monitoring (if applicable).
- Person(s) Operating Active Treatment System (if applicable).

The Project entity would also document that the named individuals are Qualified Persons as described in the ACGP and include documentation of qualifications in Attachment B of this SWPPP.

2.4.1 Project Entity

The preparer and holder of the overall ACGP is:

Contact:

Address: Street
 City, State, Zip Code

Telephone:

E-mail:


For each construction spread, the Construction Supervisor would be the responsible Project entity representative at the local level:

Contact: Supervisor Name

Address:

Telephone:

E-mail:

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For each construction spread, the Lead Environmental Inspector (LEI) would be responsible for conducting regular inspections on the implementation of the SWPPP, identifying any necessary corrective actions, and preparing SWPPP inspection reports in accordance with the requirements provided in Section 5.0.:

Contact: LEI Name

Address:

Telephone:

E-mail:

2.4.2 Contractors


Each Construction Contractor (Contractor) would designate a Stormwater Lead who would be responsible for implementing the Contractor's compliance with the SWPPP:

Contact: Stormwater Lead Name

Address:

Telephone:

E-mail:

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3.0 COMPLIANCE WITH STANDARDS AND LIMITS

3.1 RECEIVING WATERS

The Project would cross several rivers, streams, wetlands, and ditches. A table summarizing the waters that would be crossed by the Project is included in Appendix H of Resource Report No. 2.

3.2 DISCHARGE TO IMPAIRED WATERBODY

A Total Maximum Daily Load (TMDL) is a pollutant budget and includes a calculation of the maximum amount of a pollutant that can occur in a waterbody and allocates the necessary reductions to one or more pollutant sources. A TMDL serves as a planning tool and potential starting point for restoration or protection activities with the ultimate goal of attaining or maintaining water quality standards. Under section 303(d) of the CWA, states, territories and authorized tribes (included in the term State here) are required to submit lists of impaired waters. These are waters that are too polluted or otherwise degraded to meet water quality standards. The law requires that the states establish priority rankings for waters on the lists and develop TMDLs for these waters.

If the Project discharges stormwater into a waterbody with an EPA-established or approved TMDL, the Project entity would implement measures to ensure that the discharge of pollutants, if any, from the site is consistent with the assumptions and requirements of the EPA-established or approved TMDL, including ensuring that the discharge does not exceed specific waste load or load allocation that has been established that would apply to the discharge. The Project entity would also evaluate the recommendations in the Implementation Section of the TMDL and incorporate applicable measures into the operations.

3.3 PROTECTION OF ENDANGERED SPECIES

The Project entity would comply with the terms and conditions of any biological opinions issued by the National Marine Fisheries Service and U.S. Fish and Wildlife Service in connection with the Project. Discharges and discharge-related activities associated with the proposed construction activities and their impacts to endangered species is currently under evaluation, and will be determined in the Biological Assessment.

3.4 POTENTIAL POLLUTANT SOURCES


The following primary pollutant sources are anticipated to be encountered on the Project. The Project entity would implement BMPs to avoid or control these potential pollutants in stormwater runoff.

3.4.1 Sediment Sources

Potential sources of sediment to stormwater runoff include:

- Any disturbed soil that may be susceptible to sheet and rill erosion.
- Disturbed slopes adjacent to wetlands and waterbodies.
- Access roads.
- Trench dewatering.

Temporary and permanent erosion and sediment control measures, or BMPs, would be installed and maintained in accordance with the Alaska LNG Project *Plan* and *Procedures*.


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3.4.2 Other Pollutants

Potential pollutants and sources, other than sediment, to stormwater runoff include:

- Petroleum, oils, and lubricants that are transported, stored, and used during construction.
- Oil, fuel, hydraulic fluid, and coolant leaks from construction equipment.
- Pipeline coating materials and specialty chemicals used for pipeline construction.
- Cleaning supplies, pesticides and herbicides used at construction camps.

Measures to prevent spills or releases of potential contaminants during construction are specified in the Project entity's *Spill Prevention, Control, and Countermeasure (SPCC) Plan*.

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4.0 STORMWATER POLLUTION PREVENTION MEASURES


4.1 BEST MANAGEMENT PRACTICES (BMPs)

BMPs are actions incorporated into the permitted activity to reduce soil erosion, manage runoff, and prevent the introduction of sediment and other substances into a wetland or waterbody. The BMP installations would consider climate, geology and soils, vegetative cover, and topography at each construction location. At each Project location, the Environmental Inspector, except where noted below, would be the lead authority to determine the adequacy of BMP applications for compliance with the ACGP. ADEC guidelines require identification of the global categories of BMPs that would be used on the Project. The Project documents cited above cover a broad array of various types of BMPs that would be utilized to avoid stormwater pollution. These include the following:

- Minimize disturbed area (phase construction activities).
- Maintain natural buffer areas.
- Control stormwater discharges and flow rates.
- Protect steep slopes (20 percent or greater angle over a 30-foot horizontal difference) from erosion (BMP adequacy to be determined by a Geotechnical Engineer).
- Storm drain inlet protection measures.
- Waterbody protection measures.
- Down-slope sediment controls.
- Stabilized construction vehicle access and exit points.
- Minimize dust generation and track-out from vehicles.
- Soil stockpiles.
- Sediment basins.
- Dewatering through filter devices.
- Soil stabilization during and after construction (BMP adequacy to be determined by a Geotechnical Engineer).
- Treatment chemicals/Active treatment systems.
- Good housekeeping measures.

Owing to the diverse nature of terrain, precipitation regime, and construction operations associated with Project construction, it is not practical to attempt to identify which particular BMP category is suited for any particular Project location. Instead, the Project documents identify various structural and procedural methods to avoid stormwater pollution runoff from construction sites (see typical drawings in Appendix E). The Project entity's Environmental Inspectors would possess the appropriate experience and training to properly identify BMPs appropriate to each location.

Conditions of the ADEC Certificate of Reasonable Assurance issued under Section 401 of the CWA and in accordance with the Alaska Water Quality Standards would also be adopted for activities associated with the placement of fill material in waters of the United States.

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4.1.1 Liquefaction Facility

The proposed Liquefaction Facility would be cleared and graded to the extent necessary to install the facility and provide a level platform and sufficient space to execute the work safely, as well as provide for site drainage. Construction methods and associated typical mitigation actions and restoration are presented in the Alaska LNG Project *Plan* and *Procedures* that are included as Appendix O of Resource Report No. 2, Appendix D of Resource Report No. 7, and Appendix P of Resource Report No. 3, respectively. A detailed description of the construction of the Liquefaction Facility is provided in Resource Report No. 1.

4.1.2 Pipelines

Construction methods and associated typical mitigation actions and restoration are presented in the Alaska LNG Project *Plan* and *Procedures* that are included as Appendix O of Resource Report No. 2, Appendix D of Resource Report No. 7, and Appendix P of Resource Report No. 3, respectively. Refer to Resource Report No. 1 for more detailed descriptions of the various pipeline construction operations.

4.1.2.1 Wetland and Waterbody Crossings

Typical drawings and descriptions of the wetland and stream installation techniques that would be used on the Project are included in Appendix I and J of Resource Report No. 2, respectively. For most of the flowing streams and rivers, an open-cut method would be used to install the pipeline in an expedient manner. The Contractor would clear the minimum amount of vegetation necessary to safely complete the work. Construction methods and associated typical mitigation actions and restoration are presented in the Alaska LNG Project *Plan* and *Procedures* that are included as Appendix O of Resource Report No. 2, Appendix D of Resource Report No. 7, and Appendix P of Resource Report No. 3, respectively.

4.1.3 Gas Treatment Plant (GTP)

The GTP and associated facilities would be constructed on new granular pads. A detailed description of the construction of the GTP is provided in Resource Report No. 1.


Owing to the prevalence of wetlands and waterbodies in the GTP work areas, most of the civil and site preparation activities (i.e., installation of work pads and road construction) would be completed during the winter season to reduce tundra disturbance and also avoid extensive work area stabilization measures. Construction activities that would take place during summer months would mostly be confined to permanent roads and granular pads.

4.2 ABOVEGROUND FACILITY CONSTRUCTION PROCEDURES

The following sections briefly describe construction procedures for other aboveground facilities associated with Project construction, such as compressor stations, meter stations, heater stations, launching/receiving stations, mainline block valves, and interconnection points. At all locations, the Alaska LNG Project *Plan* and *Procedures* and this SWPPP will be followed for stormwater pollution prevention.

4.2.1 Access Roads

Refer to Resource Report No. 1 for more-detailed descriptions of the access roads.

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4.2.2 Helipads

Where required, helipad sites would be constructed within the footprint of construction camps, contractor yards, and compressor station facilities. Granular pads would be constructed for the helipads for stability, where required. In some cases, the site may be sufficiently stable to allow helicopter operations without the use of a granular pad.

4.2.3 Construction Camps, Storage Areas, and Contractor Yards

Construction camps, storage areas, and contractor yards would be established at previously disturbed sites to the extent practical or on the proposed GTP or compressor station sites. Where new sites are established or existing sites would be expanded, the sites, with the exception of those in areas of permafrost, would be cleared of vegetation and then leveled and stabilized, as necessary, prior to installation of the site facilities. All of these facilities would need a granular pad of varying thickness.

4.2.4 Material Sites

New material sites would be cleared, and an access road into the site would be constructed, if necessary. Existing material sites may be expanded and/or improved to facilitate use for the Project in accordance with landowner agreements and any permit amendments. Additional details are provided in the Project's *Gravel Sourcing Plan and Site Reclamation Measures*, which is included as an Appendix to Resource Report No. 6.

4.2.5 Aboveground Facilities (Compressor Stations, Valve Sites)


Detailed construction methods and associated typical mitigation actions are presented in Resource Report No. 1. In general, aboveground facility sites would be built on granular pads. In some locations, the facilities will be supported on pilings when sited in permafrost or discontinuous permafrost.

4.2.6 Maintenance

All erosion and sediment control measures and other protective measures identified in this Section 4.0 would be maintained in effective operating condition. The Contractors would provide, inspect, and maintain all soil erosion and sediment control measures through the construction phase of the project. In general, all erosion and sediment control measures would be checked weekly and after each significant rainfall. If site inspections required by Section 5.0 identify BMPs that are not operating effectively, maintenance would be performed before the next anticipated storm event, or as necessary to maintain the continued effectiveness of stormwater controls. If maintenance prior to the next anticipated storm event is impracticable, maintenance would be scheduled and accomplished as soon as practicable.


Inspection and maintenance practices for erosion/sediment controls include the following:

- The Contractors would install, maintain, and repair erosion and sediment controls as necessary to ensure that they are functional.
- Disturbed areas (not granular pads) would be inspected by the Environmental Inspector at least once each 14 calendar days and following any storm event producing 0.5 inch or more of precipitation until the construction area is permanently stabilized.
- Access points from public roads would be inspected for sediment tracking and additional granular would be applied if needed.

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- Disturbed areas and areas used for storage of material that are exposed to precipitation would be inspected for evidence of, or the potential for, sediment/pollutants entering a drainage system.

Discharge locations, if accessible, would be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

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5.0 INSPECTIONS, MONITORING, AND RECORD KEEPING

5.1 INSPECTIONS

The Project entity would be responsible for conducting SWPPP inspections in accordance with the following ADEC requirements. On each construction spread, the LEI would be accountable for conducting the inspections and preparing the required inspection checklists and reports. The LEI may delegate these tasks to one of the Environmental Inspectors working under his or her direction.

5.1.1 Stormwater Inspector Qualifications

Stormwater Inspectors must:

- Be knowledgeable in the principles and practice of erosion and sediment controls.
- Possess the skills necessary to assess conditions at the construction site that could impact stormwater quality.
- Possess the skills necessary to assess the effectiveness of any erosion and sediment control measures selected to control the quality of stormwater discharges from the construction activity.
- Be familiar with ADEC requirements as a means to ensure compliance with the General Construction Permit.
- Possess Alaska Certified Erosion and Sediment Control Lead (AK-CESCL) certification.

The Stormwater Inspector is the person:

- Who is familiar with the Project-specific inspection forms and how to fill them out.
- Responsible for conducting and signing inspection reports.
- Responsible for reporting the need for follow-up corrective action to the Stormwater Lead or Construction Supervisor.
- Possess AK-CESCL certification.


5.1.2 Inspection Frequency

SWPPP inspections would be completed in accordance with one of the three schedules listed below after the start of construction activities covered by each NOI. Each construction year, this SWPPP would be modified as appropriate based on location and ambient precipitation.

- Once every 7 calendar days, or once every 14 calendar days and within 24 hours of the end of a storm event that resulted in a discharge from the site.
- For areas of the state where the mean annual precipitation is 40 inches or greater, or relatively continuous precipitation or sequential storm events, inspect at least once every seven 7 calendar days.

The inspection frequency could be reduced for the following situations:

- If the stabilization has been achieved for the site, a permittee may reduce the frequency of inspections to at least once every month and within two business days of the end of a storm event at actively staffed sites that resulted in a discharge from the site.
- If portions of the site have achieved final stabilization but construction activity remains on other portions of the site, inspections may be suspended for those portions that have achieved final stabilization; however, subsequent inspections must be conducted within two business days of

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the end of a storm event that results in a discharge from that portion of the site previously considered finally stabilized.

- If the Project is undergoing winter shutdown, inspections may be suspended 14 calendar days after the anticipated fall freeze-up and must resume inspections at least 21 calendar days prior to the anticipated spring thaw.
- If the entire site has achieved final stabilization and a NOT has been submitted, no further inspection requirements apply to the site.

5.1.3 Location of Inspections

During a site inspection, the Stormwater Inspector must, at a minimum, inspect the following areas of the site:


- Areas of the site disturbed by construction activity (e.g., areas cleared, graded, or excavated).
- Areas used for storage of materials that are exposed to precipitation.
- Areas where temporary or permanent control measures are installed and maintained at the site.
- Areas where sediment and other pollutants have accumulated or been deposited and may have the potential for or are entering the stormwater conveyance system.
- Locations where vehicles enter or exit the site.
- Areas where stormwater typically flows, including the stormwater conveyance system.
- Points of discharge from the site. Where such discharge locations are inaccessible, the nearest downstream location must be inspected to the extent that such inspections are practicable.
- Portions of the site where temporary or permanent stabilization measures have been initiated.

5.1.4 Scope of Inspections

At a minimum, the scope of the site inspection shall include the following:

- Check whether all control measures are installed and operating as intended and determine if any control measures need to be replaced, repaired or maintained.
- Check for the presence of accumulated sediment along the Project right-of-way (ROW) and near the Project construction area boundaries that has a potential for being washed outside of the Project area on locations such as roadways or parking lots, stormwater conveyance systems, storm drain inlets, and discharge points.
- Check for the evidence of, or the potential for spills, leaks, or other accumulations of pollutants on the site entering the stormwater conveyance system or waters of the United States.
- Describe visible areas where erosion has occurred near the Project area boundary that have a potential for being washed outside of the Project boundary.
- Identify any locations where new or modified control measures are necessary to meet the requirements of the SWPPP.
- Identify all points where there is a discharge from the site and describe the conditions that are contributing to that discharge (e.g., recent storm event with ineffective control measure).
- Document any incidents of noncompliance observed and corrective actions taken.

Project construction activities (congestion), flooding, and slippery or impassable roads or ROW conditions may limit the access of inspection personnel to the areas described above. Also, inspection of these areas could require that vehicles used to conduct inspections may compromise temporarily or even

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permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion.

In these circumstances, control measures must be inspected on the same frequencies as specified above, however *Representative Inspections* (as defined by ADEC) may be performed. For representative inspections, the Environmental Inspector must inspect control measures along the site 0.25-mile above and below each access point where a roadway, undisturbed ROW, or other similar feature intersects the site and allows access to the areas described above.


The conditions of the control measures along each inspected 0.25-mile segment may be considered as representative of the condition of control measures along that reach extending from the end of the 0.25-mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the Project, whichever occurs first. If treatment chemicals are used, inspections must be conducted of all areas using the treatment chemicals.

5.1.5 Inspection Reports

For each inspection, the Stormwater Inspector must complete an inspection report that includes the following minimum requirements:

- The inspection date, a brief description of site conditions; a brief assessment of BMP efficacy, and photo documentation.
- Names, titles, and qualifications of personnel conducting the inspection.
- Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection), including a general estimate of the beginning day of each storm event, duration of each storm event, and whether any discharges occurred (information from the nearest National Weather Service Station may be adequate).
- Weather information and a description of any discharges occurring at the time of the inspection.
- Location(s) of discharges of sediment or other pollutants from the site.
- Location(s) of control measures that need to be maintained.
- Location(s) of control measures that failed to operate as designed or proved inadequate for a particular location.
- Location(s) where additional control measures are needed that did not exist at the time of inspection.
- Corrective action required, if any, including complete-by dates.

The inspection report must be signed by the preparer in accordance with ADEC requirements. Examples of a Stormwater Inspection Checklist and Report Form are included in Attachment C.


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6.0 STORMWATER RUNOFF MONITORING

As required, the Project entity would develop a written Project-specific Stormwater Monitoring Plan that includes all the requirements of the ACGP and follows the applicable ADEC Quality Assurance Guidance for Water Quality Monitoring Plans, as can be found at the ADEC website at http://dec.alaska.gov/water/wqapp/wqapp_index.htm).

The Stormwater Monitoring Plan would be included as a part of this SWPPP, as shown in Attachment D. The Stormwater Monitoring Plan would be updated, as necessary, during Project construction to account for changes in site conditions, and annual renewal of the ACGP. The Project-specific Stormwater Monitoring Plan would address the following minimum requirements:

- Discharge water quality sampling and analysis.
- Rainfall monitoring.
- Visual monitoring.
- Corrective actions.
- Record keeping.
- Reporting.

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7.0 TERMINATION OF COVERAGE

Performance standards have been identified in the *Restoration Plan* in Appendix P of Resource Report No. 3. Once the identified standards have been met, the Project entity would submit a complete and accurate NOT to ADEC that certifies that one or more of the conditions in the ACGP have been met to terminate permit coverage. The Project entity would comply with permits until an NOT is submitted.

It is anticipated that the Project entity would submit NOTs following each calendar year to close out construction locations where work has been completed during the previous year. For those areas where stabilization and revegetation is in process or granular material has been left in place, ADEC would be contacted to determine if the locations should be included within the NOT or if portions of the NOI would be left open.

7.1 WHEN TO SUBMIT A NOTICE OF TERMINATION

The Project entity would submit an NOT within 30 calendar days after one or more of the following conditions have been met:


- Final stabilization has been achieved on all portions of the Project covered under the NOI, in accordance with the ACGP, for which the Project entity is responsible and all ground disturbing construction activity or use of support activities has been completed.
- The Project entity has transferred control over all areas of the site that have not been finally stabilized to another operator.
- Coverage under an individual permit or alternative APDES general permit has been obtained by the Project entity, unless ADEC has required that the Project entity obtains individual permit coverage, in which case coverage under ACGP permit would automatically terminate.
- The planned construction activity identified on the original NOI was never initiated (e.g., no grading or earthwork was ever started) and plans for the construction have been permanently abandoned or indefinitely postponed.

7.2 SUBMITTING A NOTICE OF TERMINATION


Following annual construction, the Project entity would submit an NOT to terminate coverage under this permit. The complete and accurate NOT can be submitted in the following manner:

- Electronically at <http://www.dec.alaska.gov/water/wnpspc/stormwater/APDESeNOI.html> . NOI and NOT submittal procedures are subject to change and the applicant should consult DEC at the time of submittal. .
- Via paper copy (available at the above Web site) to:
Alaska Department of Environmental Conservation
Wastewater Discharge Authorization Program
Stormwater NOI
555 Cordova Street
Anchorage, AK 99501

The Project entity's authorization to discharge under the ACGP terminates at midnight of the day that the NOT is signed. If the Project entity submits a NOT without meeting one or more of the conditions


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identified in the ACGP, then the NOT is invalid and the Project entity remains responsible for meeting the requirements of this permit until authorization is terminated. The Project entity would consult with ADEC to determine the appropriate conditions for annual NOT submittal.

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8.0 ACRONYMS AND TERMS

Term	Definition
AAC	Alaska Administrative Code
ACGP	Alaska Construction General Permit
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
AK-CESCL	Alaska Certified Erosion and Sediment Control Lead
APDES	Alaska Pollutant Discharge Elimination System
BMP	best management practice
CFR	Code of Federal Regulations
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
GTP	Gas Treatment Plant
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
Project	Alaska LNG Project
ROW	right-of-way
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load


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9.0 REFERENCES

ADEC Div. of Water, 2015, Stormwater Program,
<https://dec.alaska.gov/Water/wnpspc/stormwater/index.htm>

ADEC Div. of Water, Frequently Asked Questions,
<https://dec.alaska.gov/water/npdes/APDESFAQs.htm>

ADEC Div. of Water, Construction General Permit,
https://dec.alaska.gov/water/wnpspc/stormwater/sw_construction.htm

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Attachment A: Notice of Intent (NOI) Form



Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity under an APDES Construction General Permit

Submission of this Notice of Intent (NOI) constitutes notice that the party identified in Section II of this form requests authorization to discharge pursuant to the APDES Construction General Permit (CGP, ACR100000). Submission of this NOI also constitutes notice that the party identified in Section II of this form meets the eligibility requirements of the CGP for the project identified in Section IV of this form. Permit authorization is required prior to commencement of construction activity until you are eligible to terminate coverage as detailed in the CGP. To obtain authorization, you must submit a complete and accurate NOI form. Refer to the instructions at the end of this form.

I. Single/Multiple NOI Project					
Is this NOI for a project with a single NOI?					<input type="checkbox"/> Yes <input type="checkbox"/> No
If "No," then your project has multiple NOIs, will the fee be paid with this NOI?					<input type="checkbox"/> Yes <input type="checkbox"/> No
If "No," then enter the name of the operator paying the fee:					
II. Operator Information					
Organization:		Name:		Title:	
Phone:		Fax (optional):		Email:	
Mailing Address:		Street (PO Box):			
		City:		State:	
				Zip:	
III. Billing Contact Information					
Organization:		Name:		Title:	
Phone:		Fax (optional):		Email:	
Mailing Address: <input type="checkbox"/> Check if same as Operator Information		Street (PO Box):			
		City:		State:	
				Zip:	
IV. Project / Site Information					
Project Name:			Estimated Start Date:		Estimated End Date:
Brief Description of Project:			Estimated Area to be Disturbed (nearest tenth acre):		
Is your project / site less than one-acre, but part of a common plan of development?					<input type="checkbox"/> Yes <input type="checkbox"/> No
If "Yes", provide the Permit Authorization Number and name of the common plan of development:			Number: Name:		
Have storm water discharges from your project / site been authorized previously by a DEC permit?					<input type="checkbox"/> Yes <input type="checkbox"/> No
If "Yes," provide the Permit Authorization Number for the previous DEC permit?					
If "Yes," have you updated your SWPPP according to the most recently issued CGP?					<input type="checkbox"/> Yes <input type="checkbox"/> No
Location Address:	Street:		Borough or similar government subdivision:		
	City:		State: Alaska		Zip:
	Latitude (decimal degree, 5 places):	Longitude (decimal degree, 5 places):	Determined By: <input type="checkbox"/> GPS <input type="checkbox"/> Web, Source:		
			<input type="checkbox"/> USGS Topographic Map, scale:		
		<input type="checkbox"/> Other:			

V. SWPPP (Storm Water Pollution Prevention Plan)

Has the SWPPP been prepared in advance of filing this NOI? <input type="checkbox"/> Yes <input type="checkbox"/> No			
For projects with 5 or more acres of disturbance, has a SWPPP been submitted to DEC? <input type="checkbox"/> Yes <input type="checkbox"/> No, ≤ 5 acres			
Location of SWPPP for Viewing: <input type="checkbox"/> Address in Section II <input type="checkbox"/> Address in Section IV <input type="checkbox"/> Other			
If other:	Street:		
	City:	State:	Zip:

SWPPP Contact Information (if different than that in Section II):

Organization:		Name:		Title:	
Phone:		Fax (optional):		Email:	
Mailing Address: <input type="checkbox"/> Check if same as Operator Information		Street (PO Box):			
		City:		State:	
				Zip:	

VI. Permanent Storm Water Controls

Will you construct a permanent storm water management control measure at the project site (Part 4.11)? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If "Yes", indicate the type of measure to be installed:	
<input type="checkbox"/> Pond	<input type="checkbox"/> Oil/Water/Grit Separator
<input type="checkbox"/> Other:	<input type="checkbox"/> Proprietary Storm Water Sedimentation Device

VII. Discharge Information

Does your project discharge into a Municipal Separate Storm Sewer System (MS4)? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, name of the MS4 Operator:	

Receiving Water and Wetlands Information: (if additional space is needed for this question, attach separate sheet or annotate in Section XI.)

a. Identify the name(s) of waterbodies or wetlands to which you discharge.	Impaired waters/303d Listed waters: (see http://dec.alaska.gov/water/wqsar/Docs/impairedwaters.pdf or http://dec.alaska.gov/water/wqsar/map.html , and http://dec.alaska.gov/water/tmdl/tmdl_index.htm .																
	b. Are any of your discharges directly into any segment of a 303d Listed Water, i.e. "Impaired" Water?		c. If you answered YES to question b, then answer the following three questions:														
			i. What pollutant(s) are causing the impairment?		ii. Are the pollutant(s) causing the impairment present in your discharge?		iii. Is the discharge consistent with the assumptions and requirements of applicable EPA approved or established Total Maximum Daily Load (TMDL(s))?										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Yes</th> <th style="width: 50%;">No</th> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>		Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Yes</th> <th style="width: 50%;">No</th> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>		Yes	No	<input type="checkbox"/>	<input type="checkbox"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Yes</th> <th style="width: 50%;">No</th> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>		Yes	No	<input type="checkbox"/>
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	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>										
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>										

VIII. Treatment Chemicals

Will you use control measures such as polymers, flocculants or other treatment chemicals at your construction site? <input type="checkbox"/> Yes <input type="checkbox"/> No	
NOTE: If you are unsure at the filing of the NOI, check "No" and then if you use treatment chemicals file an NOI Modification form indicating "Yes."	
If "Yes", indicate the following polymers, flocculants, or other treatment chemicals that will be used at your construction site:	<input type="checkbox"/> Alum <input type="checkbox"/> Gypsum <input type="checkbox"/> Polyacrylamide (PAM) <input type="checkbox"/> Polyaluminum Chloride <input type="checkbox"/> Other:

IX. Certification Information

An Alaska Pollutant Discharge Elimination System (APDES) permit application or report must be signed by an individual with the appropriate authority per 18 AAC 83.385. For additional information, please refer to 18 AAC 83.385 at the following link: <http://www.legis.state.ak.us/basis/aac.asp#18.83.385>.

Corporate Executive Officer 18 AAC 83.385 (a)(1)(A)	For a corporation, a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation.
Corporate Operations Manager 18 AAC 83.385 (a)(1)(B)	For a corporation, the manager of one or more manufacturing, production, or operating facilities, if (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations; (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
Sole Proprietor or General Partner 18 AAC 83.385 (a)(2)	For a partnership or sole proprietorship, the general partner or the proprietor respectively.
Public Agency, Chief Executive Officer 18 AAC 83.385 (a)(3)(A)	For a municipality, state, or other public agency, the chief executive officer of the agency.
Public Agency, Senior Executive Officer 18 AAC 83.385 (a)(3)(B)	For a municipality, state, or other public agency, a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.
<p><i>*For Delegated Authority: the delegation must be made in writing and submitted to the DEC.</i> <i>An Example of written authorization delegating authority can be found on the Division of Water website:</i> http://dec.alaska.gov/Water/OASysHelp/attachments/Delegation_Authorization_Form.pdf</p>	
Operations Manager (Delegated Authority)* 18 AAC 83.385 (b)(2)(A)	For a duly authorized representative, an individual or a position having responsibility for the overall operation of the regulated facility or activity, including the position of plant manager, operator of a well or a well field, superintendent or position of equivalent responsibility.
Environmental Manager (Delegated Authority)* 18 AAC 83.385 (b)(2)(B)	For a duly authorized representative, an individual or position having overall responsibility for environmental matters for the company.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:
Mailing Address: <input type="checkbox"/> Check if same as Operator Information	Street (PO Box):	
	City:	State: Zip:
<div style="display: flex; justify-content: space-between;"> <div>_____ Signature</div> <div>_____ Date</div> </div>		

X. NOI Preparer (Complete if NOI was prepared by someone other than the certifier.)

Organization:	Name:	Title:
Phone:	Fax (optional):	Email:
Mailing Address: <input type="checkbox"/> Check if same as Operator Information	Street (PO Box):	
	City:	State: Zip:

XI. Document Attachments and Supplemental Information

Documents attached with this application: <input type="checkbox"/> Copy of SWPPP if ≥ 5 acres of disturbance. <input type="checkbox"/> Delegation of Signatory Authority.	<input type="checkbox"/> Other:
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Instructions for Completing a Notice of Intent (NOI) Form for Storm Water Discharges Associated with Construction Activity under an APDES Construction General Permit

Who Must File an NOI Form:

Operators of construction sites where one or more acres are disturbed, smaller sites that are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, or any other site specifically designated by the Director, must submit an NOI to obtain coverage under an APDES construction general permit. Each person, firm, public organization, or any other entity that meets either of the following criteria must file this form: (1) they have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) they have day-to-day operational control of those activities at the project necessary to ensure compliance with SWPPP requirements or other permit conditions.

Completing the Form:

Obtain and read a copy of the APDES Construction General Permit. Type or print, in the appropriate areas only. "NA" can be entered in areas that are not applicable. If you have any questions about how or when to use this form, contact the DEC Storm Water Program at (907) 269-6285 or online at <http://www.dec.state.ak.us/water/wnpssp/stormwater>.

Section I. Single/Multiple NOI Project:

Indicate whether or not this is a single NOI project. If not, indicate if the fee will be paid with this NOI or another associated with this project. Provide the name of the operator that will be paying the fee.

Section II. Operator Information:

Provide the name of the contact person, title, and the legal name of the firm, public organization, or any other entity that operates the project described in this application. (An operator of a project is a legal entity that controls at least a portion of site operations and is not necessarily the site manager.) Also provide the operator's mailing address, telephone number, fax number (optional) and e-mail address (to be notified via e-mail of NOI approval when available). Correspondence for the NOI will be sent to this address.

Section III. Billing Contact Information

Provide the name of the contact person, title, and the legal name of the firm, public organization, or any other entity that is responsible for accounts payable for this project. Also provide the billing contact's mailing address, telephone number, fax number (optional), and email address. Correspondence for billing purposes will be sent to this address. If the billing contact is that same as the operator, check the box.

Section IV. Project/Site Information:

Enter the official or legal name, a brief description of the project or site, and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g.,

Intersection of State Highways 61 and 34). Complete site information must be provided for permit authorization to be granted.

Provide the latitude and longitude of the facility in decimal degrees format with up to 5 digit accuracy. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, Google Earth, Bing Maps, and EPA's web-based siting tools, among others. For consistency, DEC requests that measurements be taken from the approximate center of the construction site. Applicants must specify which method they used to determine latitude and longitude. If a U.S.G.S. topographic map is used, applicants are required to specify the scale of the map used. Enter the estimated construction start and completion dates using four digits for the year (i.e., 05/27/2016).

Enter the estimated area (acres) to be disturbed including but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest tenth of an acre. Note: 1 acre = 43,560 sq. ft.

Indicate whether or not the project/site has been previously covered by an EPA or DEC permit. If "Yes" provide the permit authorization number that the project/site was covered under. If this is a project that was covered under a previous DEC construction general permit indicate whether or not the SWPPP has been updated in accordance with the most recently issued Alaska Construction General Permit.

If the project or site is less than one-acre, but part of a common plan of development, provide the permit authorization number and name of the common plan of development.

Section V. SWPPP (Storm Water Pollution Prevention Plan) Information:

Indicate whether or not the SWPPP was prepared in advance of filing the NOI form. For projects with 5 acres or more of disturbance, has a SWPPP been submitted to DEC (Part 2.1.3)? Check the appropriate box for the location where the SWPPP may be viewed. Provide the name, fax number (optional), and e-mail address of the contact person if different than that listed in Section II of the NOI form.

Section VI. Permanent Storm Water Controls

A permittee must comply with applicable APDES MS4 permit requirements, local requirements, and the applicable requirements under 18 AAC 72.600 (i.e., Nondomestic Wastewater System Plan Review) regarding the design and installation of permanent storm water management controls. Annotate the type of measure to be installed, and see Permit Part 4.11 for additional requirements regarding plan submittal deadlines.

Section VII. Discharge Information:

Identify the receiving water bodies or wetlands to which the project's storm water will discharge. These should be the first

bodies of water that the discharge will reach. (Note: If you discharge to more than one water body, please indicate all such waters in the space provided and attach a separate sheet if necessary.) For example, if the discharge leaves your site and travels through a roadside swale or a storm sewer and then enters a stream that flows to a river, the stream would be the receiving water body. Waters of the U.S. include lakes, streams, creeks, rivers, wetlands, impoundments, estuaries, bays, oceans, and other surface bodies of water within the confines of the U.S. and U.S. coastal waters. (Waters of the U.S. do not include man-made structures created solely for the purpose of wastewater treatment.) U.S.G.S. topographical maps may be used to make this determination. If the map does not provide a name, use a format such as “unnamed tributary to Cross Creek”. If you discharge into a municipal separate storm sewer system (MS4), you must identify the water body into which that portion of the storm sewer discharges. That information should be readily available from the operator of the MS4.

Indicate if any of your storm water discharges from construction activities will be reach a 303d listed water (i.e., impaired water body)?

For a listing of impaired waters and an interactive map, see <http://dec.alaska.gov/water/wqsar/Docs/impairedwaters.pdf> or <http://dec.alaska.gov/water/wqsar/map.html>.

Indicate whether your storm water discharges from construction activities will be consistent with the assumptions and requirements of applicable EPA approved or established total maximum daily load(s)(TMDL(s)). To answer this question, refer to http://dec.alaska.gov/water/tmdl/tmdl_index.htm for specific TMDL information related to the construction general permit. You may also have to contact DEC. If there are no applicable TMDLs or no related requirements, please check the “yes” box in the NOI form.

Section VIII. Treatment Chemicals:

Indicate whether or not polymers, flocculants, or other treatment chemicals will be used. If you are unsure at the filing of the NOI, check “No” and then if you use them file an NOI Modification form indicating “Yes.”

Check the box next to any treatment chemical that will be used. If “Other” is checked, list the treatment chemicals.

Section IX. Certification Information:

The NOI must be signed as follows:

- (1) For a corporation, a responsible corporate officer shall sign the NOI, a responsible corporate officer means:
 - (A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy - or decision-making functions for the corporation; or
 - (B) the manager of one or more manufacturing, production, or operating facilities, if
 - (i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long

term environmental compliance with environmental statutes and regulations;

- (ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and
 - (iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- (2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or
- (3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means
 - (A) the chief executive officer of the agency; or
 - (B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.
- (4) Include the name, title, organization, address, telephone number, and email address of the person signing the form and the date of signing. An unsigned or undated NOI form will not be considered valid application for permit coverage.

Section X. NOI Preparer Information.

If the NOI was prepared by someone other than the certifier (for example, if the NOI was prepared by the project SWPPP contact or a consultant for the certifier’s signature), include the name, title, organization, address, telephone number, and email address of the NOI preparer.


Section XI. Document Attachments and Supplemental Information

Include a copy of the SWPPP if ≥ 5 acres of disturbance. Indicate documents attached and supplemental information.

Where to File NOI form


Select one of three options:

- 1) **Preferred Option:** DEC encourages you to complete the NOI form electronically via DEC’s Online Application System (OASys):
<https://myalaska.state.ak.us/dec/water/OASys/Login.aspx>.
Filing electronically is the fastest way to obtain permit coverage and help ensure that your NOI is complete.
- 2) If you file by mail please submit the original form with a signature in ink. Remember to retain a copy for your records.
NOIs sent by mail:
Alaska Dept. of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
Phone: (907) 269-6285
- 3) Submit all pages of scanned original form via Email:
DEC.WQPermit@alaska.gov. (Note, 20MB limit).

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Attachment B: Qualified Persons – Description of Qualifications

To be provided once all qualified persons are determined.


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Attachment C: Stormwater Inspection Checklist and Reporting Form

Attachment 1: Inspection Checklist Form


Attachment 2: Inspection Reporting Form

To be developed following consultations with ADEC

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Attachment D: Stormwater Monitoring Plan

IFC Date TBD in Consultation with ADEC for each calendar year of construction.

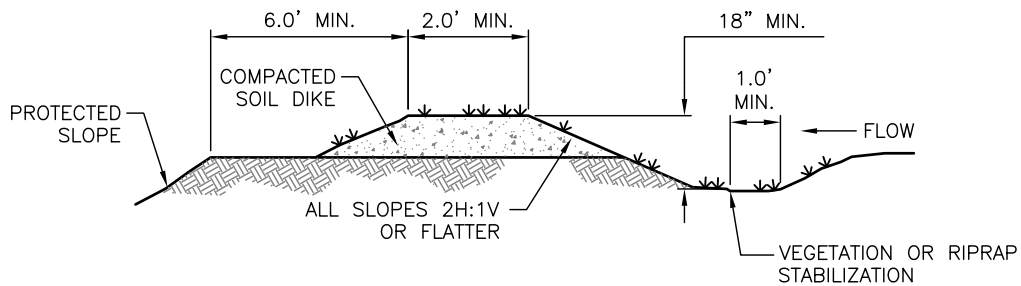
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Attachment E: Typical Drawings

TYPICAL DRAWING NUMBER	REV.	DRAWING CATEGORY	DRAWING DESCRIPTION
ESC-01-A	0	Erosion Controls	Interception, Diversion Ditch
ESC-01-B	0	Erosion Controls	Interception, Diversion Ditch
ESC-02	0	Erosion Controls	Slope Drain
ESC-03	0	Erosion Controls	Ground Water Control
ESC-03-B	0	Erosion Controls	Ground Water Control Sub-Drain
ESC-04	0	Erosion Controls	Rock Flume
ESC-05-A	0	Erosion Controls	Outlet Protection
ESC-05-B	0	Erosion Controls	Outlet Protection
ESC-06-A	0	Erosion Controls	Inlet Protection
ESC-06-B	0	Erosion Controls	Inlet Protection
ESC-06-C	0	Erosion Controls	Inlet Protection of Existing Catch Basin
ESC-06-D	0	Erosion Controls	Inlet Protection
ESC-06-E	0	Erosion Controls	Inlet Protection of Existing Catch Basin
ESC-06-F	0	Erosion Controls	Inlet Protection of Existing Catch Basin
ESC-06-H	0	Erosion Controls	Inlet Protection
ESC-06-I	0	Erosion Controls	Inlet Protection
ESC-07.1	0	Erosion Controls	Check Dam, Rock Dam
ESC-07.2	0	Erosion Controls	Check Dam, Sandbag Dam
ESC-07.3	0	Erosion Controls	Check Dam, Log Dam
ESC-07.4	0	Erosion Controls	Check Dam, Plank Dam
ESC-07.5-A	0	Erosion Controls	Check Dams, "Single Gabion" Basket Dam
ESC-07.5-B	0	Erosion Controls	Check Dam, Gabion Basket Dam
ESC-07.5-C	0	Erosion Controls	Check Dams, "Double Gabion" Basket Dam
ESC-07.5-D	0	Erosion Controls	Check Dams, "Double Gabion" Basket Dam
ESC-07.6	0	Erosion Controls	Check Dam, Earthen Fill Dam
ESC-07.7	0	Erosion Controls	Check Dams, Bio Roll Check Dam
ESC-07.8	0	Erosion Controls	Check Dam, Straw Bale Check Dam
ESC-09.3	0	Erosion Controls	Revegetation Topsoiling
ESC-09.4	0	Erosion Controls	Revegetation Sodding
ESC-09.5	0	Erosion Controls	Revegetation Live Staking
ESC-09.6	0	Erosion Controls	Revegetation Brush Layering
ESC-09.8	0	Erosion Controls	Revegetation Vegetative Plugs
ESC-10-A	0	Erosion Controls	Surface Roughening and Terracing
ESC-10-B	0	Erosion Controls	Surface Roughening and Terracing, Stepped or Terraced Slope
ESC-10-C	0	Erosion Controls	Surface Roughening and Terracing, Grooved or Serrated Slope
ESC-11.1	0	Erosion Controls	Rolled Erosion Control Products, Channel Installation
ESC-11.2	0	Erosion Controls	Rolled Erosion Control Products, Slope Installation
ESC-11.3	0	Erosion Controls	Rolled Erosion Control Products, Straw Rolls
ESC-11.4	0	Erosion Controls	Rolled Erosion Control Products, Wattle
ESC-12.1/12.2	0	Erosion Controls	Sediment Containment Systems Section C-C

TYPICAL DRAWING NUMBER	REV.	DRAWING CATEGORY	DRAWING DESCRIPTION
ESC-12.1-A	0	Erosion Controls	Sediment Containment Systems, Sediment Basin-Riser Outlet Option
ESC-12.1-B	0	Erosion Controls	Sediment Containment Systems, Sediment Basin-Permeable Rock Berm Outlet Option
ESC-12.2A	0	Erosion Controls	Sediment Containment Systems, Sediment Trap
ESC-12.2-B	0	Erosion Controls	Sediment Containment Systems, Sediment Trap
ESC-13	0	Erosion Controls	Vegetative Buffer Strip
ESC-14-A	0	Erosion Controls	Silt Fence, Trench Method Option
ESC-14-B	0	Erosion Controls	Silt Fence, Trench Method Option
ESC-14-C	0	Erosion Controls	Silt Fence, Trench Method Construction Sequence
ESC-14-D	0	Erosion Controls	Silt Fence, Mechanical Method Option
ESC-14-E	0	Erosion Controls	Silt Fence, Configuration Plan
ESC-14-F	0	Erosion Controls	Silt Fence, Conditions that Limit Silt Fence Effectiveness
ESC-15.1	0	Erosion Controls	Barriers/Berms, Straw Bale Barrier
ESC-15.2	0	Erosion Controls	Barriers/Berms, Sandbag Barrier
ESC-15.3	0	Erosion Controls	Barriers/Berms, Brush Barrier
ESC-15.4	0	Erosion Controls	Barriers/Berms, Rock Barrier
ESC-15.5	0	Erosion Controls	Barriers/Berms, Earth Dike Barrier
ESC-15.6	0	Erosion Controls	Barriers/Berms, Earth Filled Geotextile Barrier
ESC-15.7	0	Erosion Controls	Barriers/Berms, Synthetic Permeable Barrier
ESC-15.8-A	0	Erosion Controls	Diversion Berm Configuration
ESC-15.8-B	0	Erosion Controls	Diversion Berm and Cross Ditch
ESC-16	0	Erosion Controls	Vehicle Tracking Entrance/Exit
ESC-17.1/17.2	0	Erosion Controls	Rip Rap Armor Specification
ESC-17.1	0	Erosion Controls	Rip Rap Armor, Channel Installation
ESC-17.2	0	Erosion Controls	Rip Rap Armor, Slope Installation
ESC-18	0	Erosion Controls	Cellular Confinement Systems
ESC-19.2	0	Erosion Controls	Blankets and Covers, Manufactured Blankets
ESC-19.3	0	Erosion Controls	Blankets and Covers, Geotextile and Stabilization Matting
ESC-19.4	0	Erosion Controls	Blankets and Covers, Gabion Mattress
ESC-20-A	0	Erosion Controls	Energy Dissipator
ESC-20-B	0	Erosion Controls	Energy Dissipator
ESC-22	0	Erosion Controls	Sediment Control Systems, Pumped Silt Control System
ESC-23.1	0	Erosion Controls	Work Pads – Granular Pad
ESC-23.2	0	Erosion Controls	Work Pads – Snow/Ice Pad
ESC-24-A	0	Erosion Controls	Thermosyphons, Thermoprobe Option
ESC-24-B	0	Erosion Controls	Thermosyphons, Thermopile Option
ESC-27	0	Erosion Controls	Granular Cover, Plus Board Insulation
ESC-28.1-A	0	Erosion Controls	Dust Control, Wind Break
ESC-28.1-B	0	Erosion Controls	Dust Control – Stock Pile Installation
ESC-28.2	0	Erosion Controls	Dust Control, Wind Screen
ESC-33	0	Erosion Controls	Culverts

TYPICAL DRAWING NUMBER	REV.	DRAWING CATEGORY	DRAWING DESCRIPTION
ESC-34	0	Erosion Controls	Pipe Ditch Plug
ESC-35.1	0	Erosion Controls	Silt Containment – Turbidity Curtains
ESC-35.2-A	0	Erosion Controls	Silt Containment – Bladder Dam
ESC-35.2-B	0	Erosion Controls	Silt Containment – Bladder Dam
ESC-36.1	0	Erosion Controls	Temporary Bridge Structure, Ice/Snow Bridge
ESC-36.2-A	0	Erosion Controls	Temporary Bridge Structure, Timber/Steel Bridge
ESC-36.2-B	0	Erosion Controls	Temporary Bridge Structure, Timber/Steel Bridge
ESC-36.3	0	Erosion Controls	Timber/Steel Bridge, Gravel/Rip Rap Bridge
ESC-37	0	Erosion Controls	Low Water Crossing
ESC-38.1	0	Erosion Controls	Bank Reclamation – Fabric Wrap
ESC-38.2-A	0	Erosion Controls	Bank Reclamation – Log/Crib Wall
ESC-38.2-B	0	Erosion Controls	Bank Reclamation – Log/Crib Wall
ESC-38.2-C	0	Erosion Controls	Bank Reclamation – Log/Crib Wall
ESC-38.3	0	Erosion Controls	Bank Reclamation, Brush Mat
ESC-38.4	0	Erosion Controls	Bank Reclamation, Vegetative Cribbing
ESC-38.5-A	0	Erosion Controls	Bank Reclamation, Root Wads
ESC-38.5-B	0	Erosion Controls	Bank Reclamation, Root Wads
ESC-38.6-A	0	Erosion Controls	Bank Reclamation, Gabion Basket
ESC-38.6-B	0	Erosion Controls	Bank Reclamation, Gabion Basket
ESC-38.7	0	Erosion Controls	Bank Reclamation, Tree Revetment
ESC-38.8	0	Erosion Controls	Bank Reclamation, Rock Revetment
ESC-39.1	0	Erosion Controls	Waterbody Diversion, Temporary Diversion Berm
ESC-39.2	0	Erosion Controls	Waterbody Diversion, Pump Around
ESC-39.3	0	Erosion Controls	Waterbody Diversion, Flume
ESC-40.1	0	Erosion Controls	Waterbody Diversion, Riffle Structure
ESC-40.2	0	Erosion Controls	Waterbody Diversion, Let Down Structure
ESC-40.3-A	0	Erosion Controls	Waterbody Diversion, Grade Control Sill
ESC-40.3-B	0	Erosion Controls	Waterbody Diversion, Grade Control Sill



TYPICAL DIVERSION DITCH

NOTES:

1. THE CHANNEL BEHIND THE DIKE SHALL HAVE POSITIVE GRADE TO A STABILIZED OUTLET.
2. THE DIKE SHALL BE ADEQUATELY COMPACTED TO PREVENT FAILURE.
3. THE DIKE SHALL BE STABILIZED WITH TEMPORARY OR PERMANENT SEEDING OR RIPRAP.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

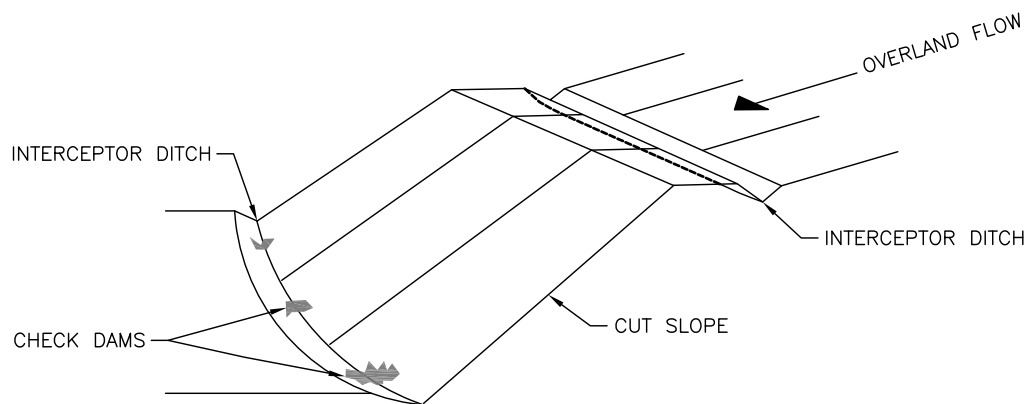
NOT FOR CONSTRUCTION

Modified From: Alaska Highway Drainage Manual. 2004

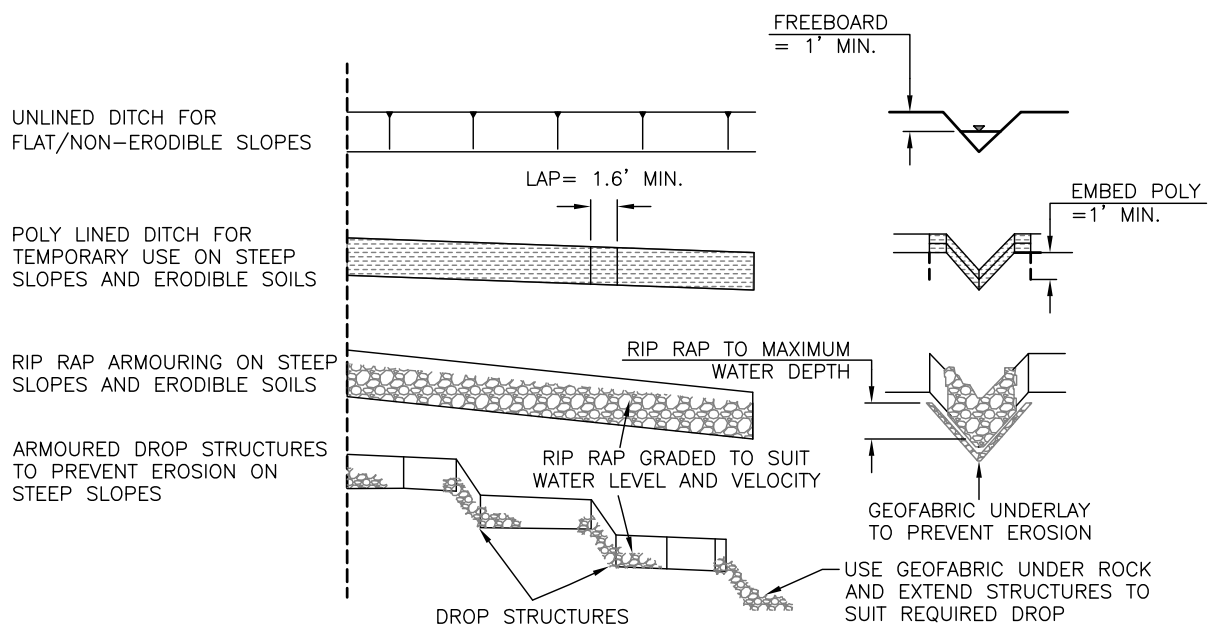
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ALASKA LNG PIPELINE PROJECT
INTERCEPTION, DIVERSION DITCH

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INTERCEPTOR DITCH APPLICATION



EXAMPLES OF DITCH LININGS

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

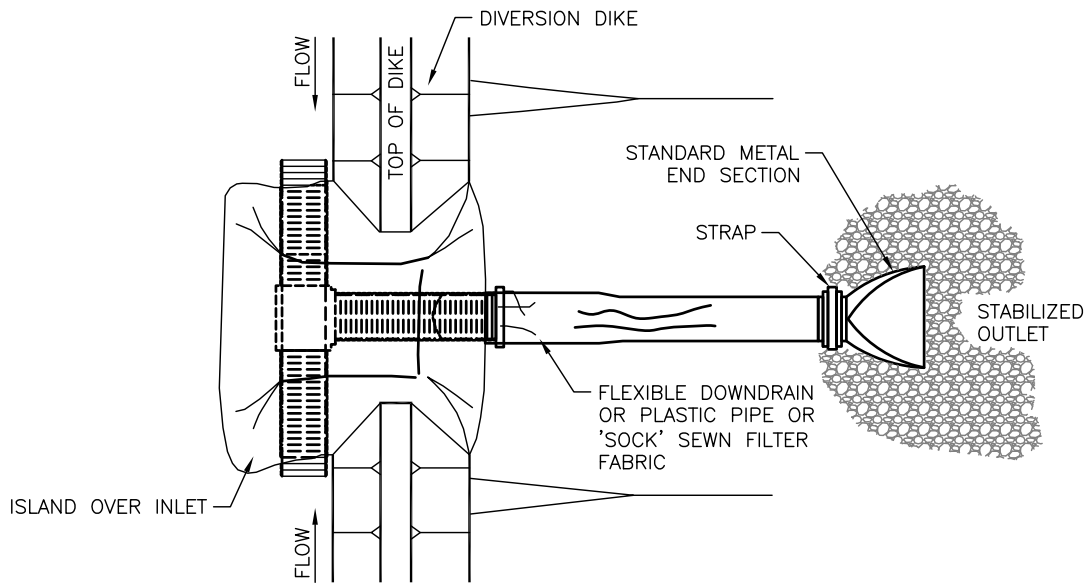
NOT FOR CONSTRUCTION

Adopted From: Government of Canada. Land Development Guidelines for the Protection of Aquatic Habitat. 1993

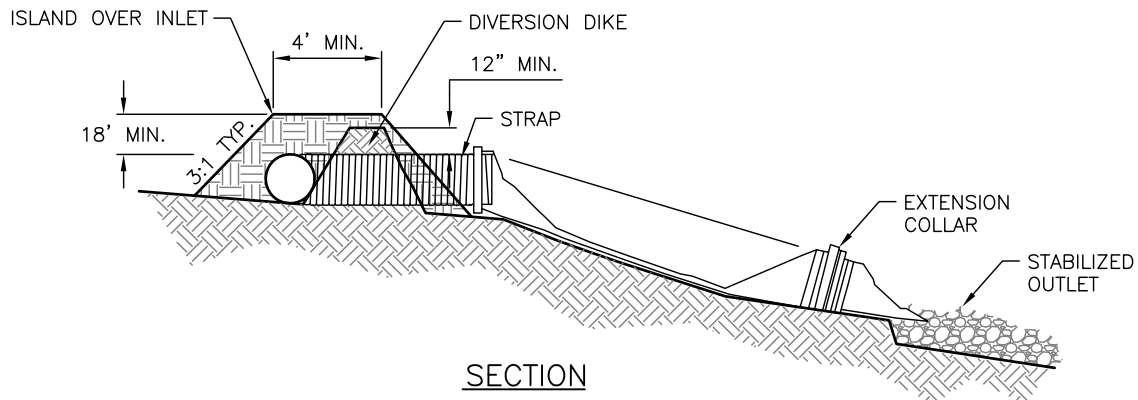
ALASKA LNG

ESC-01-B
ALASKA LNG PIPELINE PROJECT
INTERCEPTION, DIVERSION DITCH

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PLAN VIEW



SECTION

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

MAXIMUM DRAINAGE AREA (AC)	PIPE DIAMETER (IN)
0.5	12
1.5	18
2.5	21
3.5	24
5.0	30

SLOPE DRAIN SIZE

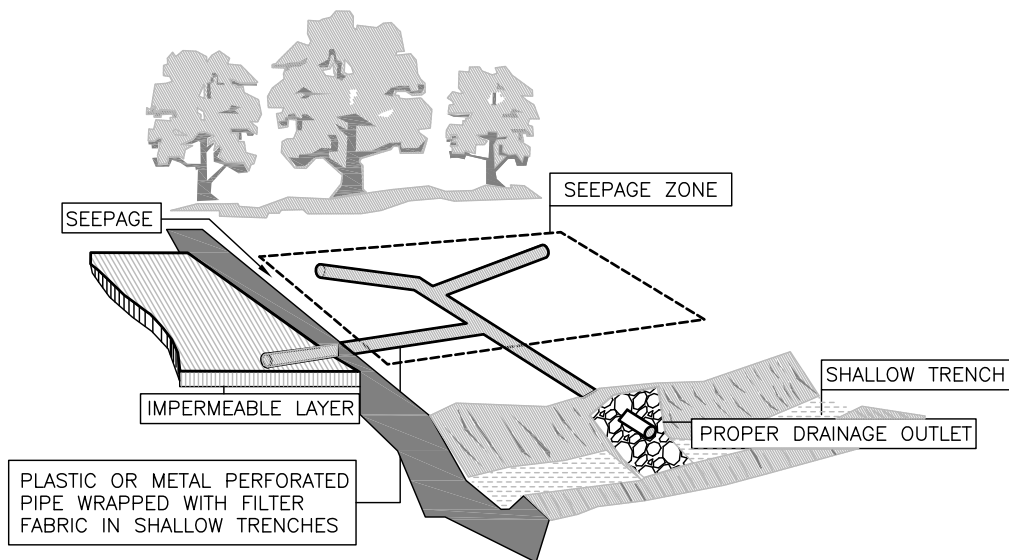
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

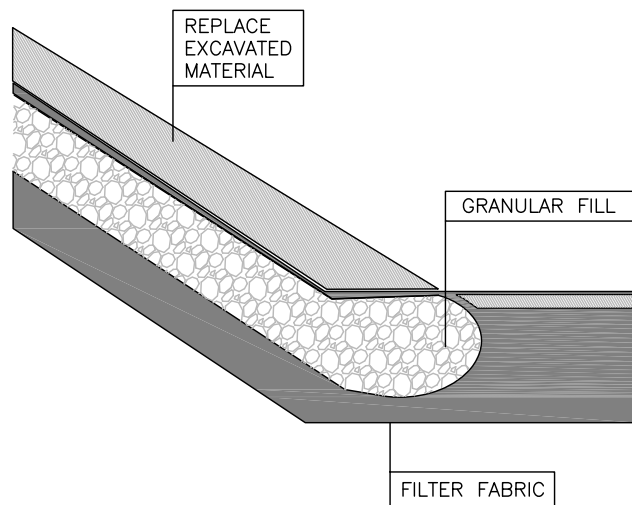
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ALASKA LNG PIPELINE PROJECT
SLOPE DRAIN

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SEEPAGE AREA DRAIN OPTION



SEEPAGE LAYER DRAIN OPTION

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

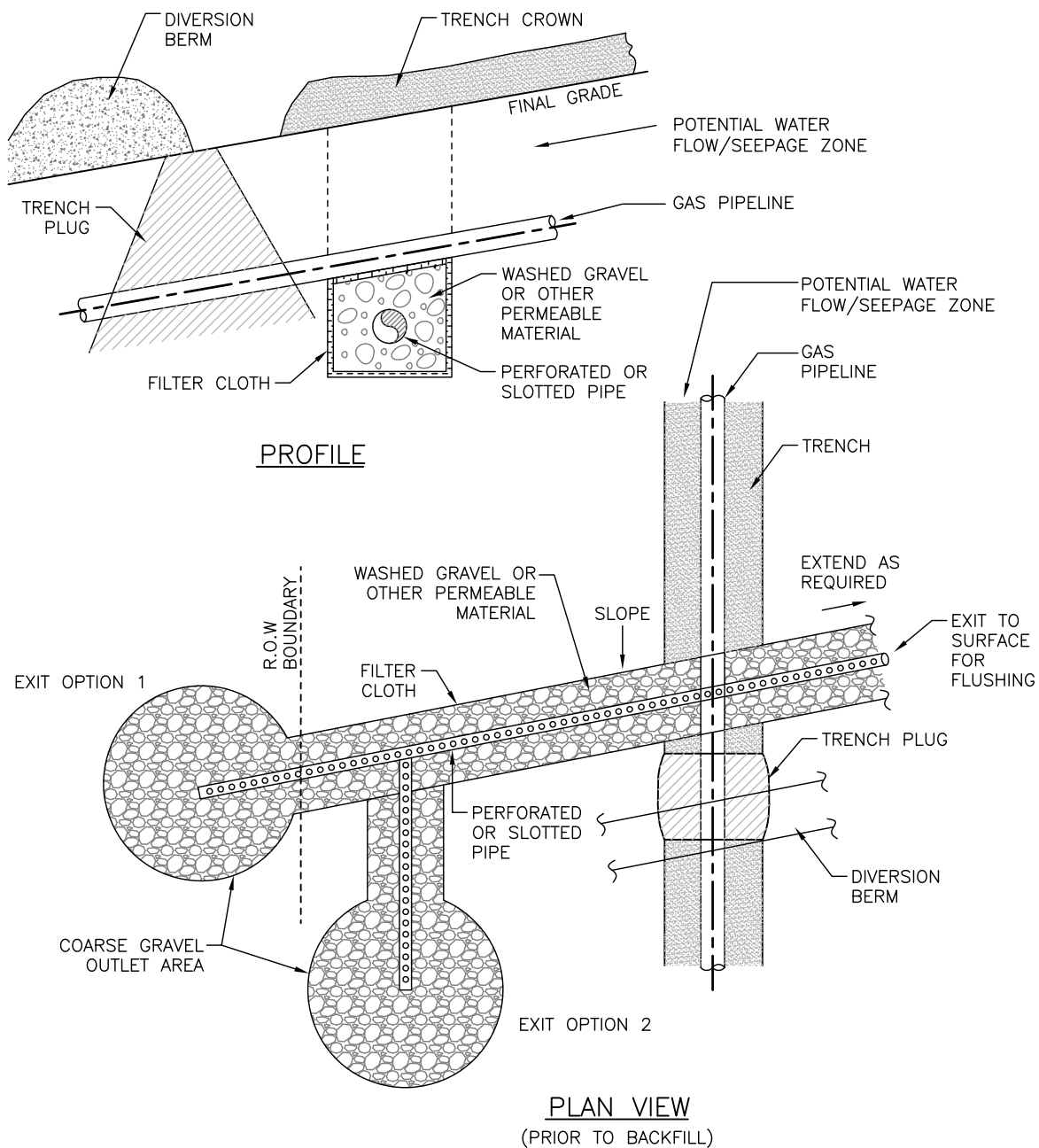
NOT FOR CONSTRUCTION

Adopted From:
Nova Scotia Erosion and Sediment Handbook for Construction Sites, 1988

ALASKA LNG

ESC-03
ALASKA LNG PIPELINE PROJECT
GROUND WATER CONTROL

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NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

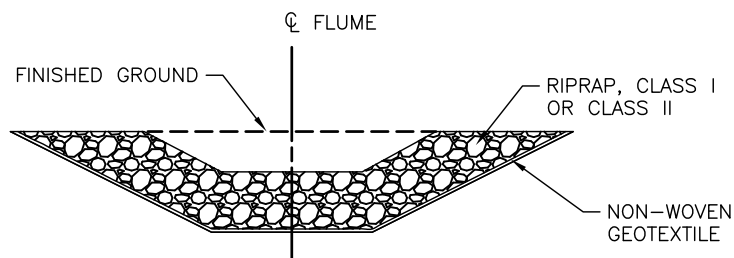
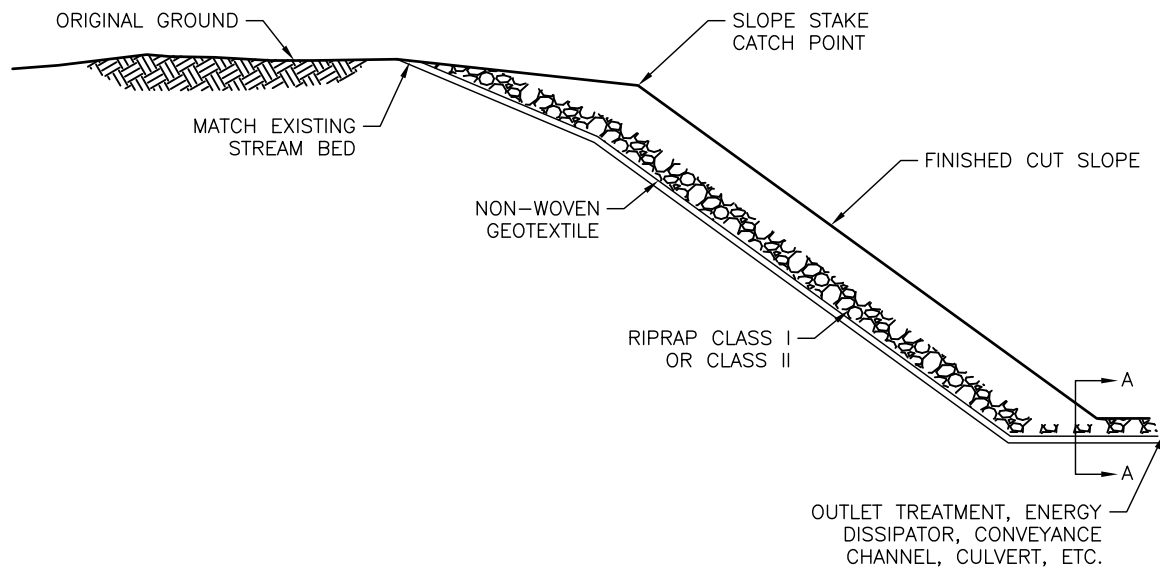
NOT FOR CONSTRUCTION

Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

ALASKA LNG

ESC-03-B
ALASKA LNG PIPELINE PROJECT
GROUND WATER CONTROL SUB-DRAIN

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SECTION A-A
ROCK FLUME DETAIL

NOTES:

1. IF ROCK IS ENCOUNTERED DURING FLUME CONSTRUCTION, ROCK SHALL BE EXCAVATED TO FINISHED FLUME LEVEL AND NO RIPRAP OR RIPRAP LINER SHALL BE REQUIRED.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

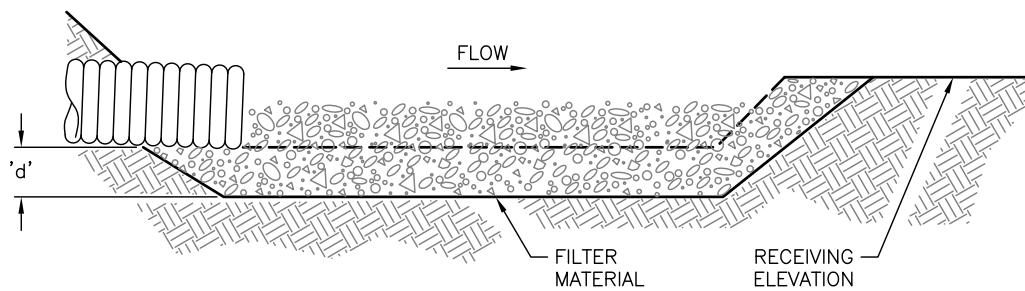
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

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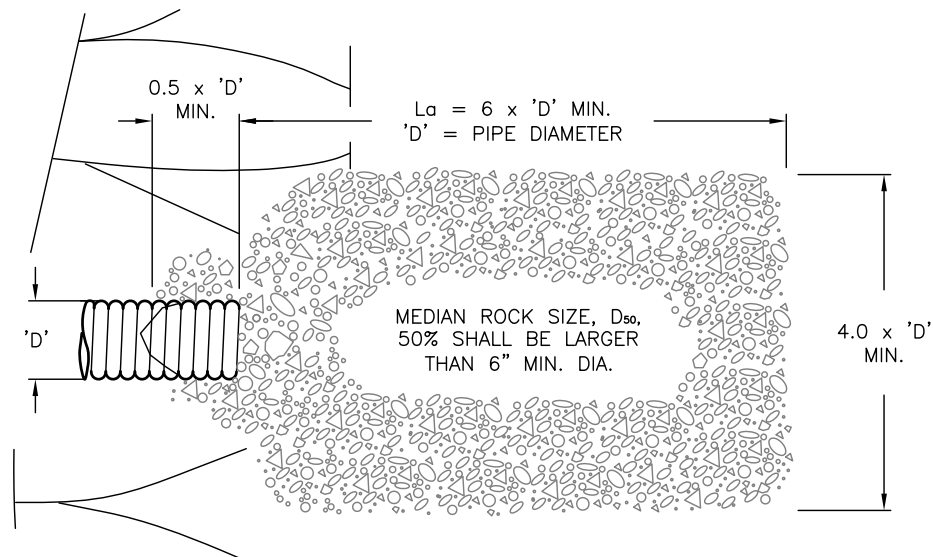
ESC-04
ALASKA LNG PIPELINE PROJECT
ROCK FLUME

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('d') MINIMUM THICKNESS = 6" (i.e. $1.5 \times D_{50}$) FOR $D_{50} = 4"$

SECTION



PLAN

NOTES:

1. 'La' = LENGTH OF APRON. DISTANCE 'La' SHALL BE OF SUFFICIENT LENGTH TO PROTECT OUTLET.
2. FILTER MATERIAL SHALL BE FILTER FABRIC OR 6" THICK MINIMUM GRADED GRAVEL LAYER.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

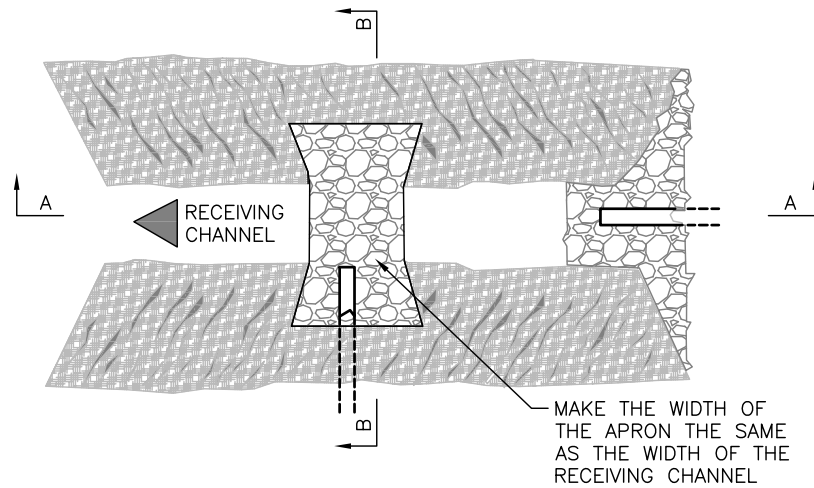
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

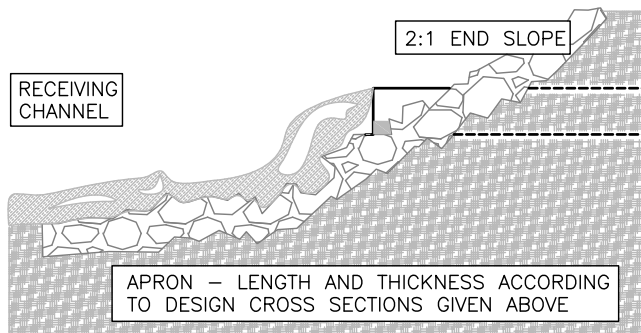
ALASKA LNG

ESC-05-A
ALASKA LNG PIPELINE PROJECT
OUTLET PROTECTION

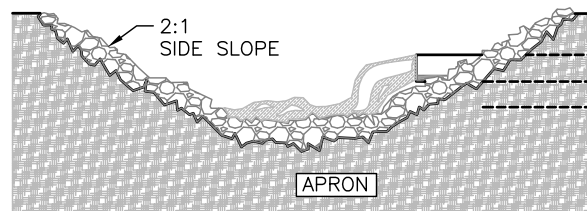
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TOP VIEW



SECTION A - A



SECTION B - B

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

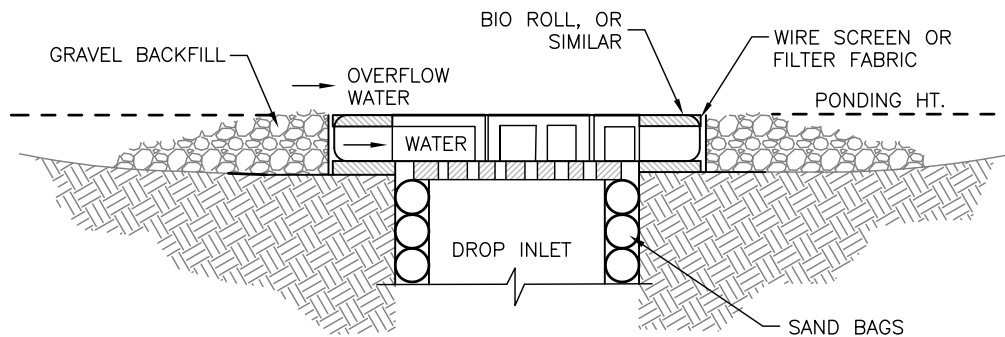
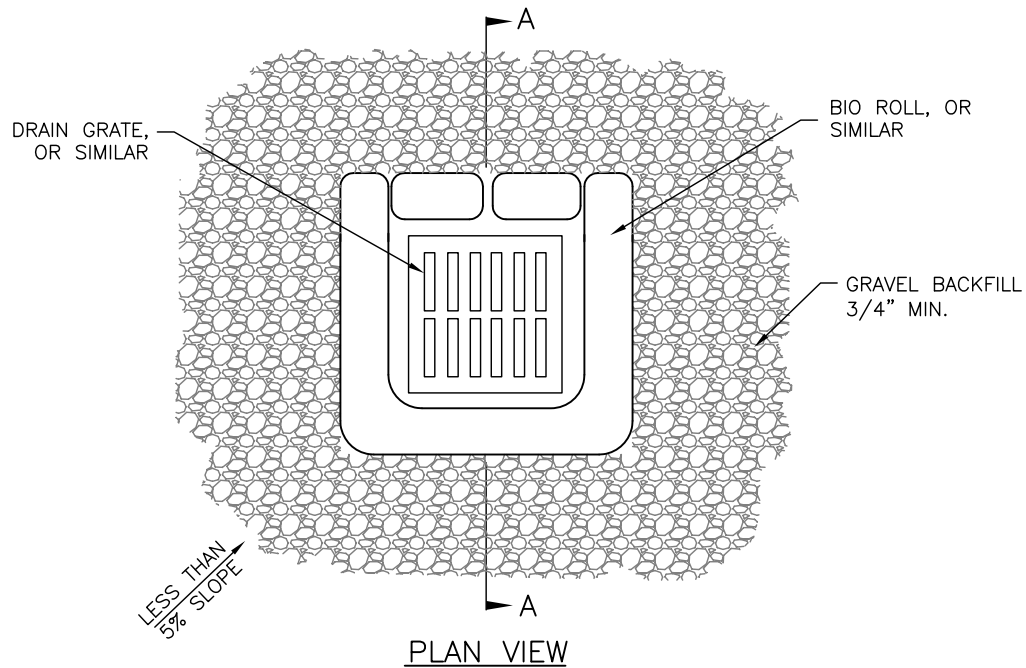
NOT FOR CONSTRUCTION

Adopted From:
Nova Scotia Erosion and Sediment Handbook for Construction Sites, 1988

ALASKA LNG

ESC-05-B
ALASKA LNG PIPELINE PROJECT
OUTLET PROTECTION

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SECTION A-A

NOTES:

1. DROP INLET SEDIMENT BARRIERS ARE TO BE USED FOR SMALL, NEARLY LEVEL DRAINAGE AREAS (LESS THAN 5% SLOPE).
2. EXCAVATE A BASIN OF SUFFICIENT SIZE ADJACENT TO THE DROP INLET.
3. THE TOP OF THE STRUCTURE (PONDING HEIGHT) MUST BE WELL BELOW THE GROUND ELEVATION DOWNSLOPE TO PREVENT RUNOFF FROM BYPASSING THE INLET. A TEMPORARY DIKE MAY BE NECESSARY ON THE DOWNSLOPE SIDE OF THE STRUCTURE.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

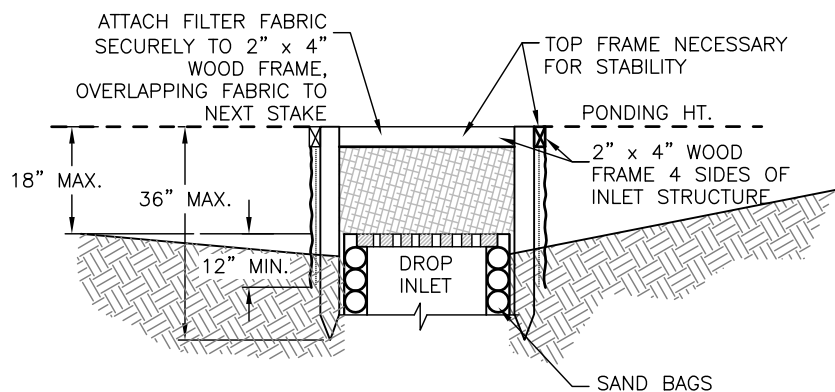
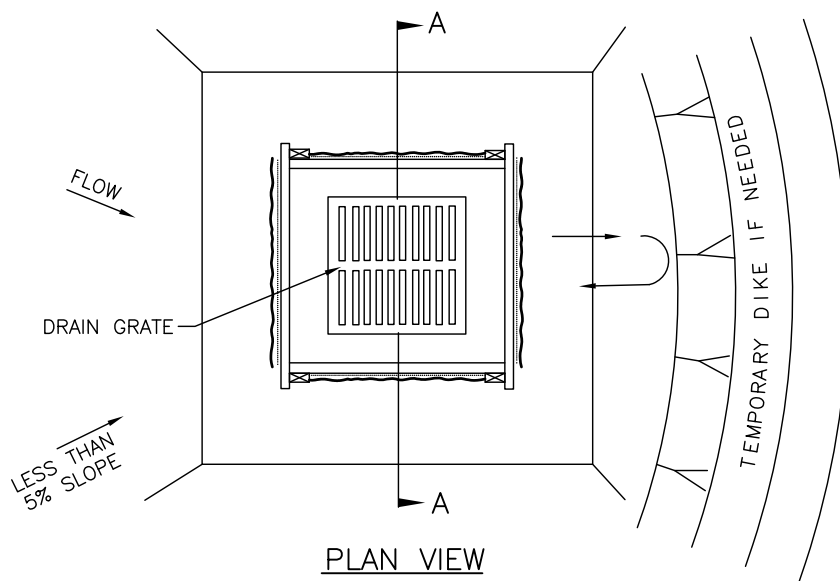
NOT FOR CONSTRUCTION

Modified From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-06-A
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION

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NOTES:

1. DROP INLET SEDIMENT BARRIERS ARE TO BE USED FOR SMALL, NEARLY LEVEL DRAINAGE AREAS (LESS THAN 5% SLOPE).
2. USE 2" x 4" WOOD OR EQUIVALENT METAL STAKES, 3' MINIMUM LENGTH.
3. INSTALL 2" x 4" WOOD TOP FRAME TO INSURE STABILITY.
4. THE TOP OF THE FRAME (PONDING HEIGHT) MUST BE WELL BELOW THE GROUND ELEVATION DOWNSLOPE TO PREVENT RUNOFF FROM BYPASSING THE INLET. A TEMPORARY DIKE MAY BE NECESSARY ON THE DOWNSLOPE SIDE OF THE STRUCTURE.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

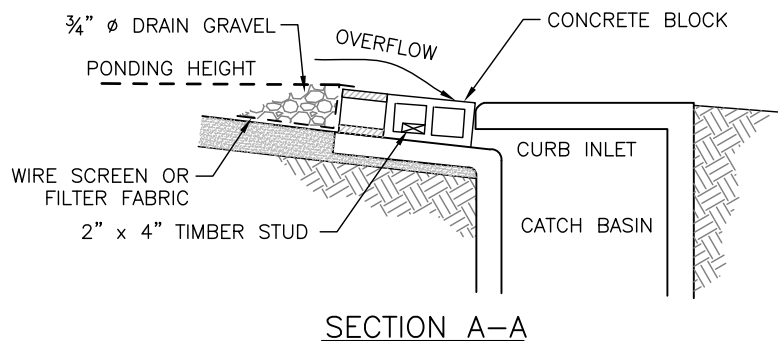
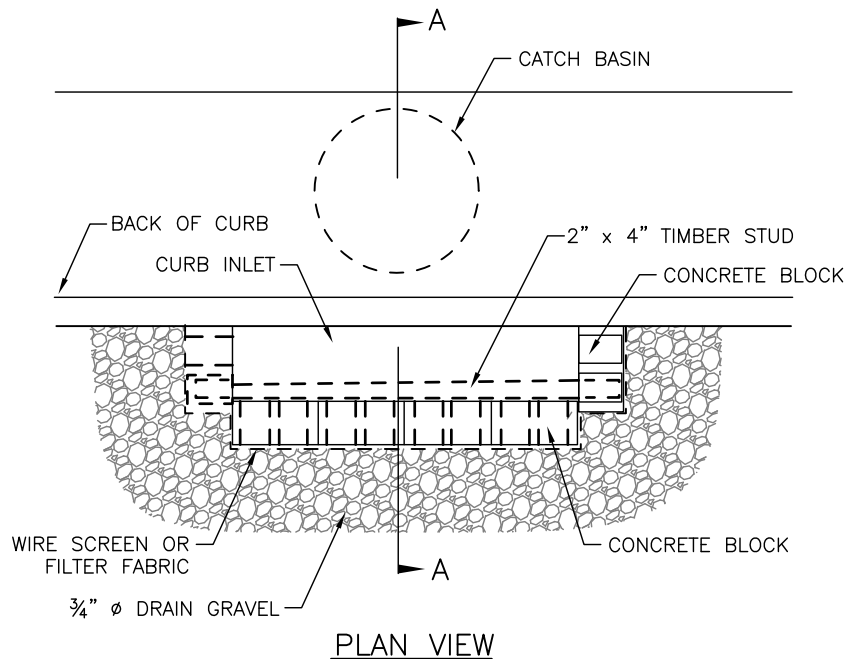
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Modified From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-06-B
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION

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NOTES:

1. USE BLOCK AND GRAVEL TYPE SEDIMENT BARRIER WHEN CURB INLET IS LOCATED IN GENTLY SLOPING SEGMENT, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. BARRIER SHALL ALLOW FOR OVERFLOW FROM SEVERE STORM EVENT.
3. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

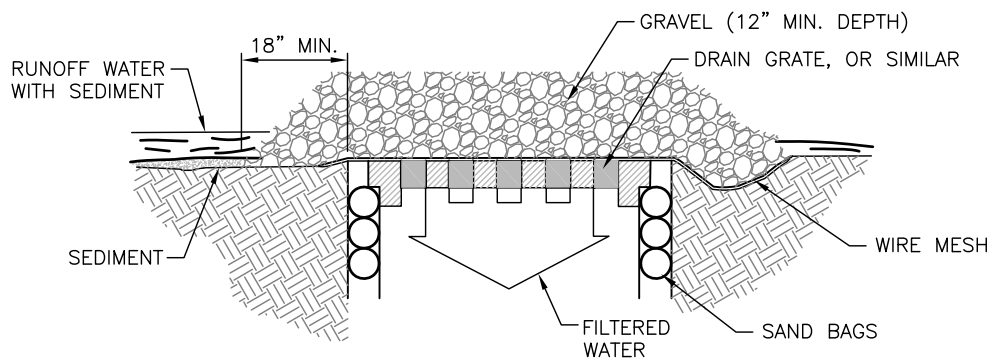
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Modified From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-06-C
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION OF EXISTING CATCH BASIN

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CROSS – SECTION

NOTES:

1. THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE HEAVY CONCENTRATED FLOWS ARE EXPECTED BUT NOT WHERE PONDING AROUND THE STRUCTURE MIGHT CAUSE EXCESSIVE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED AREAS.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

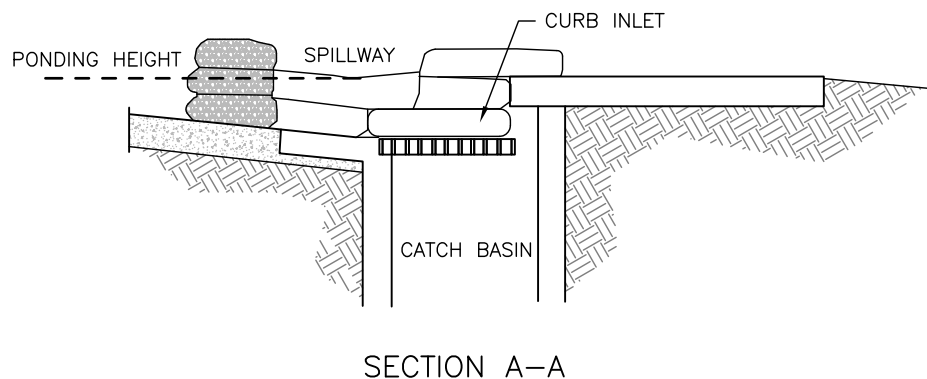
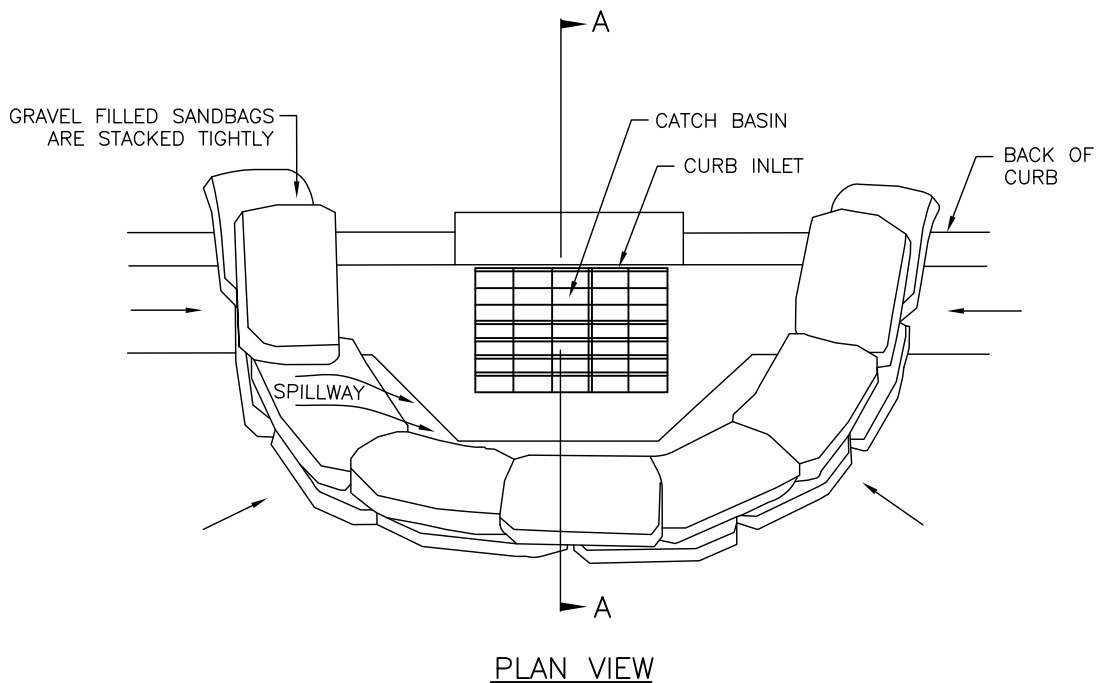
NOT FOR CONSTRUCTION

Modified From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-06-D
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION

Rev.
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NOTES:

1. PLACE CURB TYPE SEDIMENT BARRIERS ON GENTLY SLOPING STREET SEGMENTS WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. SANDBAGS, WOVEN GEOTEXTILE FABRIC, ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.
3. LEAVE ONE SANDBAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY FOR OVERFLOW.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

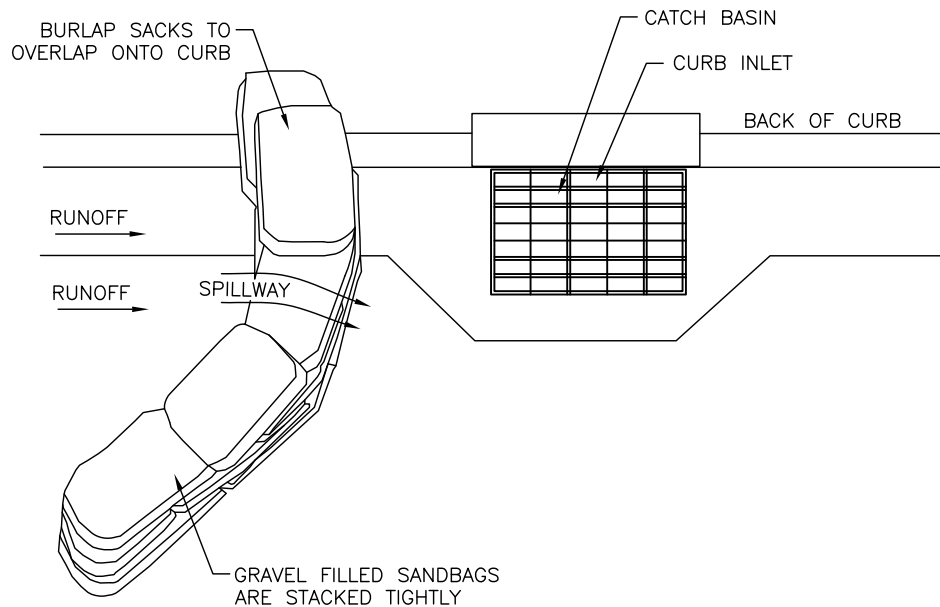
NOT FOR CONSTRUCTION

Modified From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC-06-E
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION OF EXISTING CATCH BASIN

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PLAN VIEW

NOTES:

1. PLACE CURB TYPE SEDIMENT BARRIERS ON GENTLY SLOPING STREET SEGMENTS, WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.
2. SANDBAGS, WOVEN 'GEOTEXTILE' FABRIC, ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.
3. LEAVE A ONE SANDBAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY FOR OVERFLOW.
4. INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.
5. DESIGN CENTRE SPILLWAY LOWER THAN OUTSIDE EDGE TO MINIMIZE FLOW OUTFLANKING.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

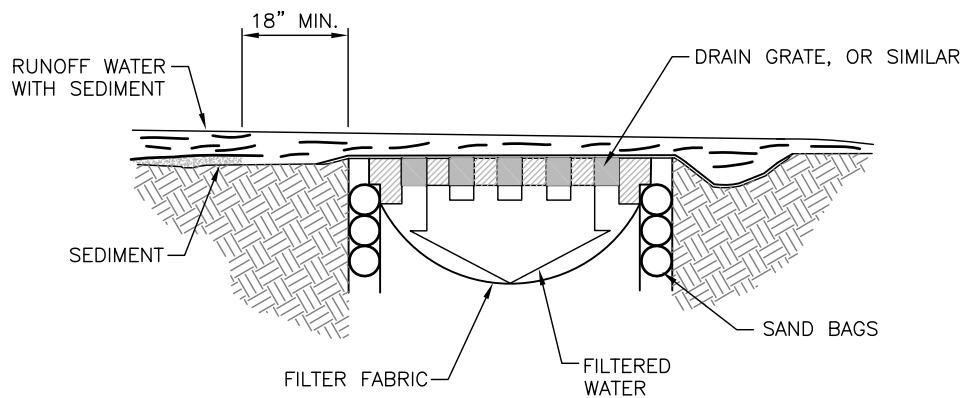
NOT FOR CONSTRUCTION

Modified From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC-06-F
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION OF EXISTING CATCH BASIN

Rev.
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CROSS – SECTION

NOTES:

1. THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE HEAVY CONCENTRATED FLOWS ARE EXPECTED BUT NOT WHERE PONDING AROUND THE STRUCTURE MIGHT CAUSE EXCESSIVE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED AREAS.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

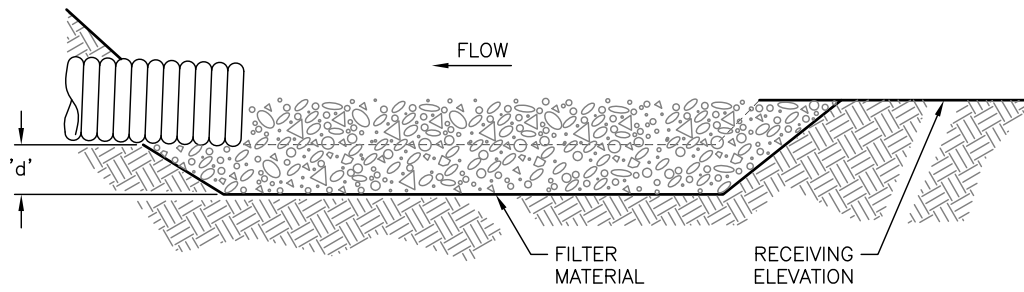
NOT FOR CONSTRUCTION

Modified From: Alaska Highway Drainage Manual. 2004

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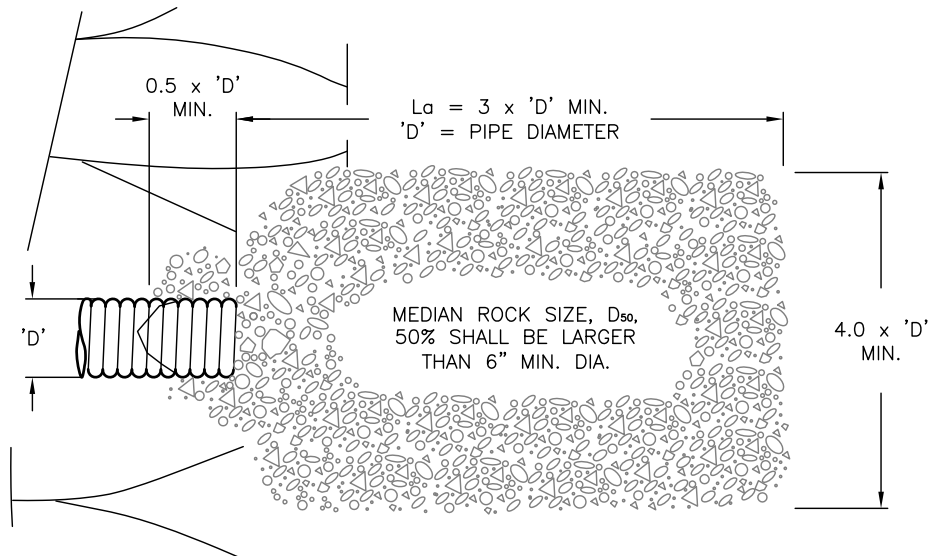
ESC-06-H
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION

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('d') MINIMUM THICKNESS = 6" (i.e. $1.5 \times D_{50}$) FOR $D_{50} = 4"$

SECTION



PLAN

NOTES:

1. 'La' = LENGTH OF APRON. DISTANCE 'La' SHALL BE OF SUFFICIENT LENGTH TO PROTECT INLET.
2. FILTER MATERIAL SHALL BE FILTER FABRIC OR 6" THICK MINIMUM GRADED GRAVEL LAYER.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

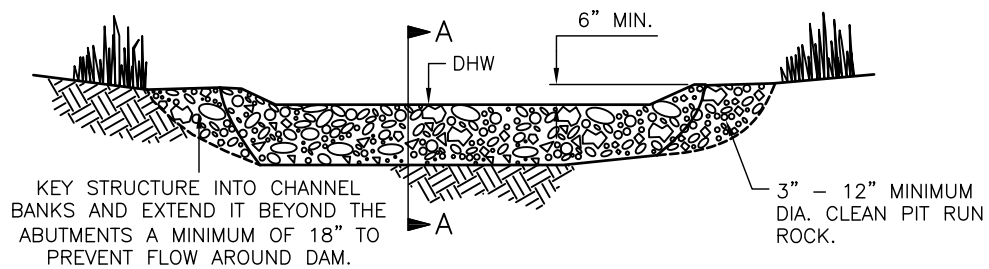
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

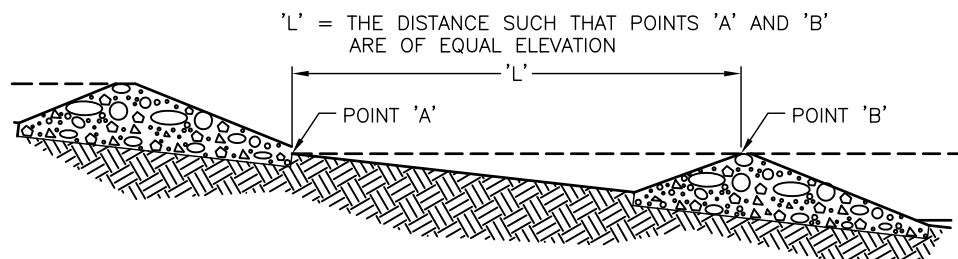
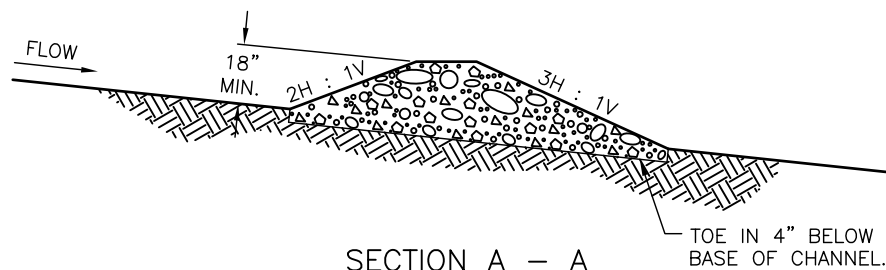
ALASKA LNG

ESC-06-I
ALASKA LNG PIPELINE PROJECT
INLET PROTECTION

Rev.
0



VIEW LOOKING UPSTREAM



SPACING BETWEEN CHECK DAMS

NOTES:

1. SUITABLE FOR FLOW VELOCITY ≤ 1.5 m/s.
2. SUITABLE FOR DRAINAGE AREA ≤ 4 ha.
3. SUITABLE FOR GRADES FROM 5% TO 8%.
4. ROCK SIZE (D_{50}) TO BE DETERMINED BY ENGINEER BASED ON HYDRAULIC CONDITIONS.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

CHANNEL SLOPE (%)				
2	3	4	5	6
SPACING (ft)				
100	67	50	40	33

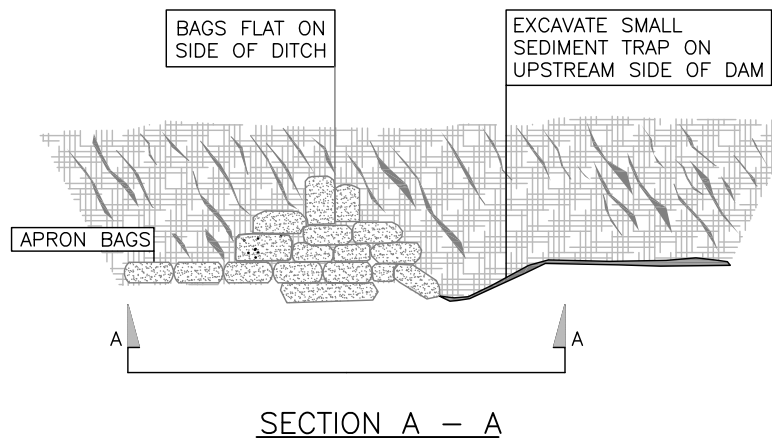
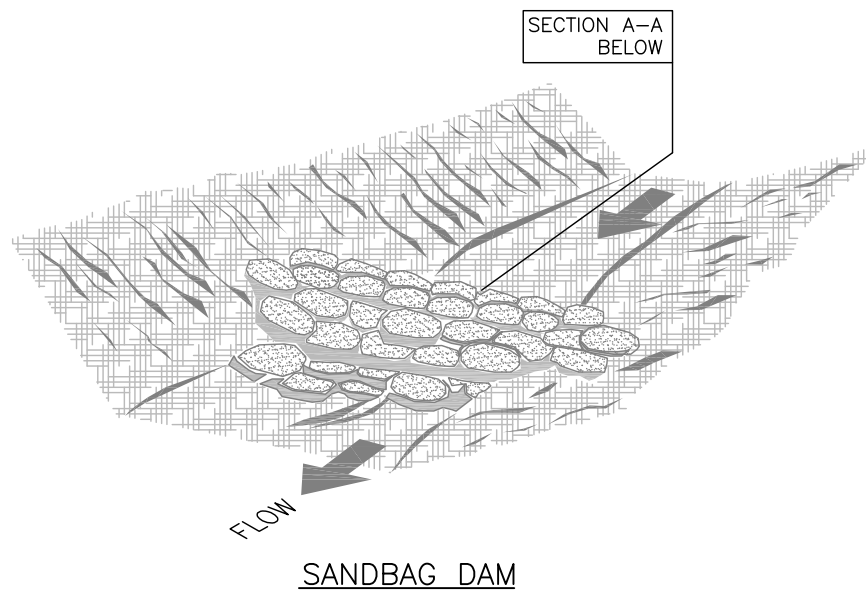
NOT FOR CONSTRUCTION

Modified From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-07.1
ALASKA LNG PIPELINE PROJECT
CHECK DAM, ROCK DAM

Rev.
0



NOTES:

1. SPACING TO BE DETERMINED BY DESIGNER/ENGINEER.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

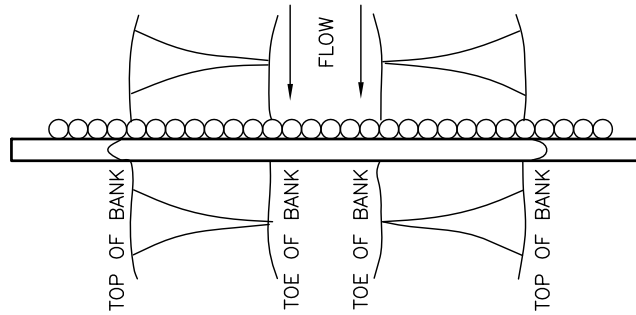
NOT FOR CONSTRUCTION

Adopted From:
Nova Scotia Erosion and Sediment Handbook for Construction Sites, 1988

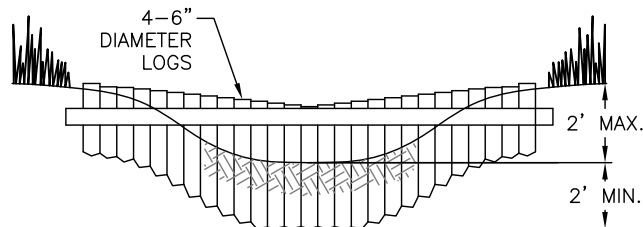
ALASKA LNG

ESC-07.2
ALASKA LNG PIPELINE PROJECT
CHECK DAM, SANDBAG DAM

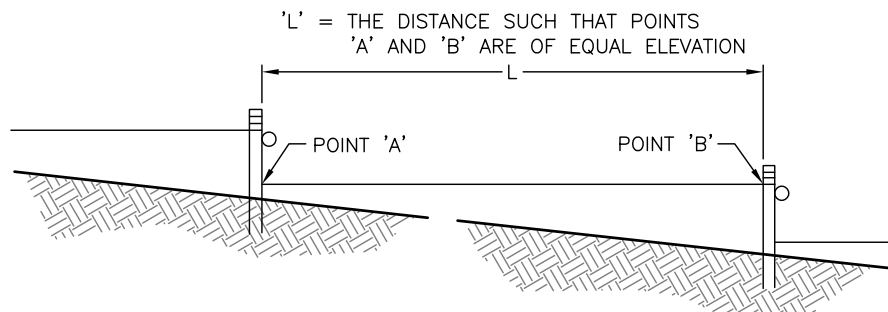
Rev.
0



PLAN VIEW



VIEW LOOKING UPSTREAM



SPACING BETWEEN CHECK DAMS

NOTES:

1. KEY THE ENDS OF THE CHECK DAM INTO THE CHANNEL BANK. LOGS SHALL CONSIST OF TREATED TIMBERS THAT COMPLIES WITH AGENCY REQUIREMENTS IF GRADE STABILIZATION STRUCTURE IS INTENDED TO BE PERMANENT.
2. LOGS MAY CONSIST OF TREATED OR UNTREATED TIMBER AS REQUIRED BY DESIGNER/ENGINEER. TYPE OF TIMBER TREATMENT SHOULD BE IN ACCORDANCE WITH LOCAL ENVIRONMENTAL GUIDELINES AND REQUIREMENTS.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

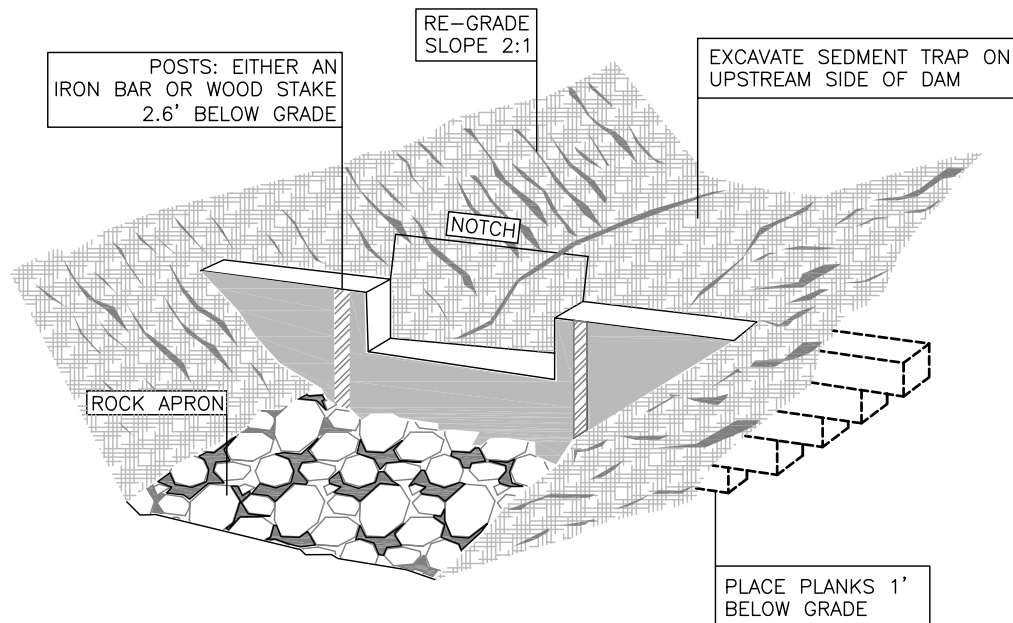
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

ESC-07.3
ALASKA LNG PIPELINE PROJECT
CHECK DAM, LOG DAM

Rev.
0



PLANK DAM

NOTE:

1. PLANKS SHOULD CONSIST OF AVAILABLE TREATED TIMBER THAT COMPLIES WITH AGENCY REQUIREMENTS.
2. PLANK DIMENSIONS AND SPACING TO BE DETERMINED BY DESIGNER/ENGINEER. HOWEVER, MINIMUM PLANK DIMENSIONS OF 4 INCHES BY 4 INCHES SHOULD BE USED.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

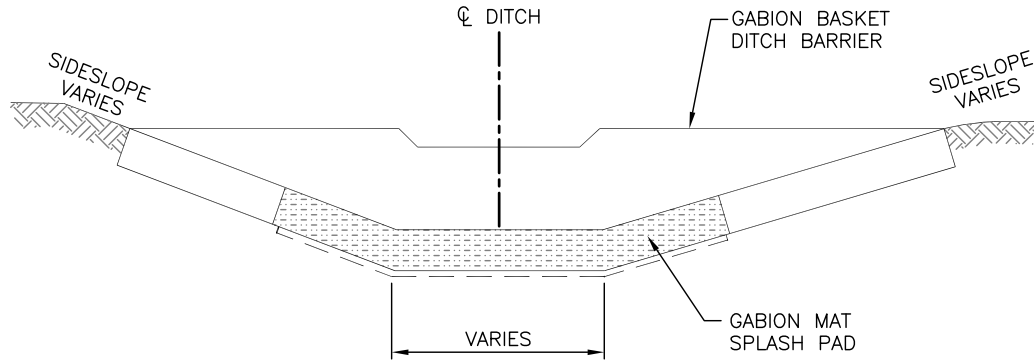
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Adopted From:
Nova Scotia Erosion and Sediment Handbook for Construction Sites, 1988

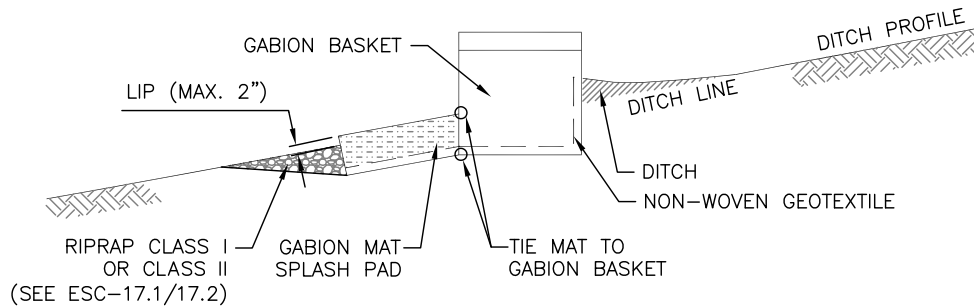
ALASKA LNG

ESC-07.4
ALASKA LNG PIPELINE PROJECT
CHECK DAM, PLANK DAM

Rev.
0



DOWNSTREAM TYPICAL DITCH CROSS-SECTION
GABION BASKET DITCH BARRIER
FRONT VIEW



"SINGLE GABION" BASKET DITCH BARRIER
AND GABION MAT SPLASH PAD
CROSS-SECTION VIEW

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN.
 A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

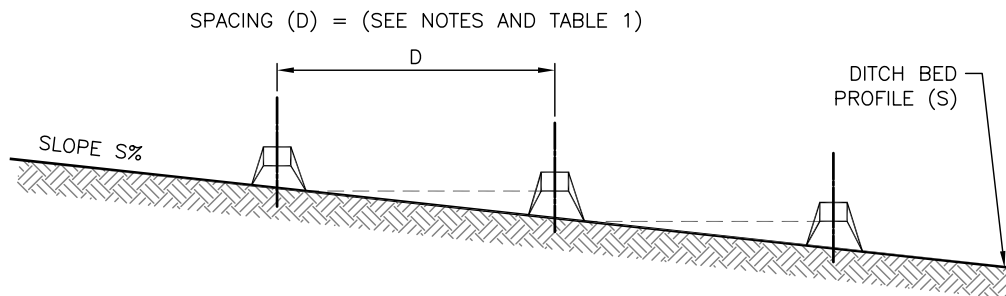
NOT FOR CONSTRUCTION

Modified From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

ESC-07.5-A
 ALASKA LNG PIPELINE PROJECT
 CHECK DAMS, "SINGLE GABION" BASKET DAM

Rev.
 0



TYPICAL BARRIER SPACING

SUGGESTED SPACING (D)		REMARKS
S (%)	(ft)	
5–7	100	OPTION TO INSTALL A GRADE BREAK (S.A. WEAVE BARRIER) BETWEEN STRUCTURES.
7–8	80	A DOUBLE GABION FOLLOWS EVERY 2 SINGLE GABIONS.
>8%	≤ 50	DESIGN BY ENGINEER REQUIRED.

TABLE 1

NOTES:

1. SUITABLE FOR MEDIUM TO STEEP GRADES AND CHANNELS LEADING TO WATER COURSE
4% < S < 10%.
2. SPACING TO BE DETERMINED BY ENGINEER BASED ON HYDRAULIC CONDITIONS.
USE IN CONJUNCTION WITH DOUBLE GABIONS OR OTHER BARRIER STRUCTURES.
3. SOIL COVERING BETWEEN STRUCTURES SUGGESTED FOR STEEP GRADE SOIL DITCH.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN.
A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

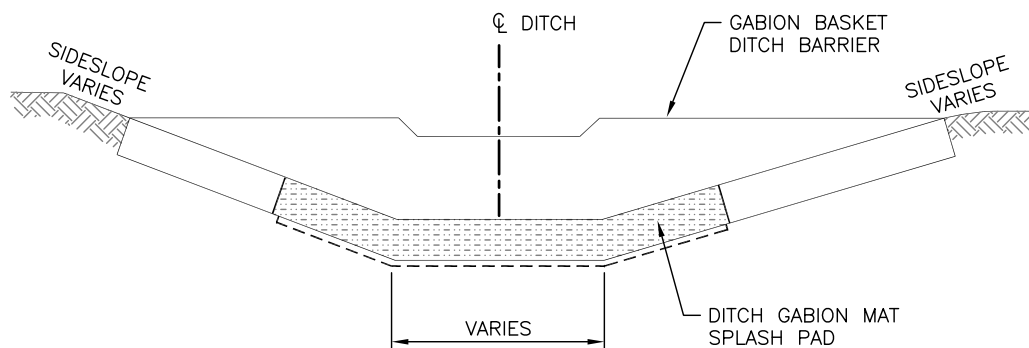
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

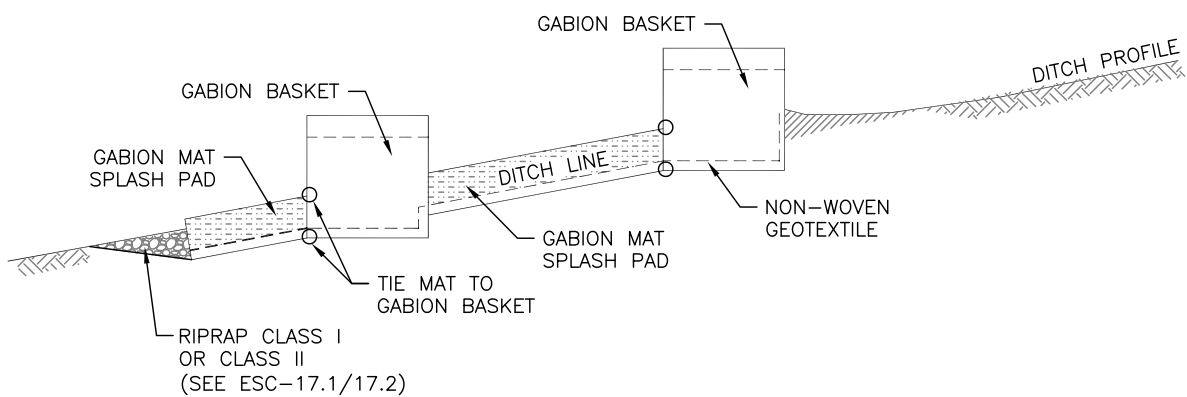
ALASKA LNG

ESC-07.5-B
ALASKA LNG PIPELINE PROJECT
CHECK DAM, GABION BASKET DAM

Rev.
0



DOWNSTREAM TYPICAL DITCH CROSS-SECTION
GABION BASKET DITCH BARRIER
FRONT VIEW



"DOUBLE GABION" ENERGY DISSIPATION GABION STRUCTURE
(TWO SINGLE GABIONS COMBINED)
CROSS-SECTION VIEW

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN.
A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

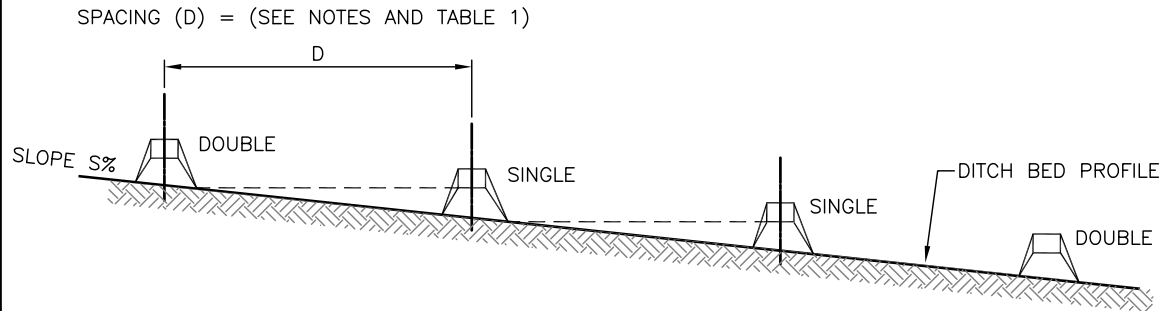
NOT FOR CONSTRUCTION

Modified From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

ESC-07.5-C
ALASKA LNG PIPELINE PROJECT
CHECK DAMS, "DOUBLE GABION" BASKET DAM

Rev.
0



TYPICAL BARRIER SPACING

SUGGESTED SPACING (D)		REMARKS
S (%)	(ft)	
6–8	80	INTER-SPACED WITH 2 SINGLE GABIONS BETWEEN STRUCTURES
	115*	*SEE NOTES
>8%	≤ 50	DESIGN BY ENGINEER REQUIRED.

TABLE 1

NOTES:

1. SUITABLE FOR STEEP GRADES ($6\% < S < 12\%$) AND CHANNELS LEADING TO WATER COURSE.
2. SPACING (D) TO BE DETERMINED BY ENGINEER BASED ON HYDRAULIC CONDITIONS.
USE IN CONJUNCTION WITH SINGLE GABION AND/OR OTHER GRADE BREAK STRUCTURES.
3. SUGGESTED TWO SINGLE GABIONS AT INTERVAL BETWEEN DOUBLE GABIONS.
4. SOIL COVERING BETWEEN STRUCTURES SUGGESTED FOR STEEP GRADE SOIL DITCH.
5. IF $D^* = 115\text{ft}$ AT 7% TO 8% GRADE
 - GRADE BREAK (S.A. PERMEABLE WEAVE BARRIER) SHOULD BE PLACED BETWEEN STRUCTURES.
 - LONG SPACING ALLOWABLE WHEN HYDRAULIC CONDITIONS NOT SEVERE.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

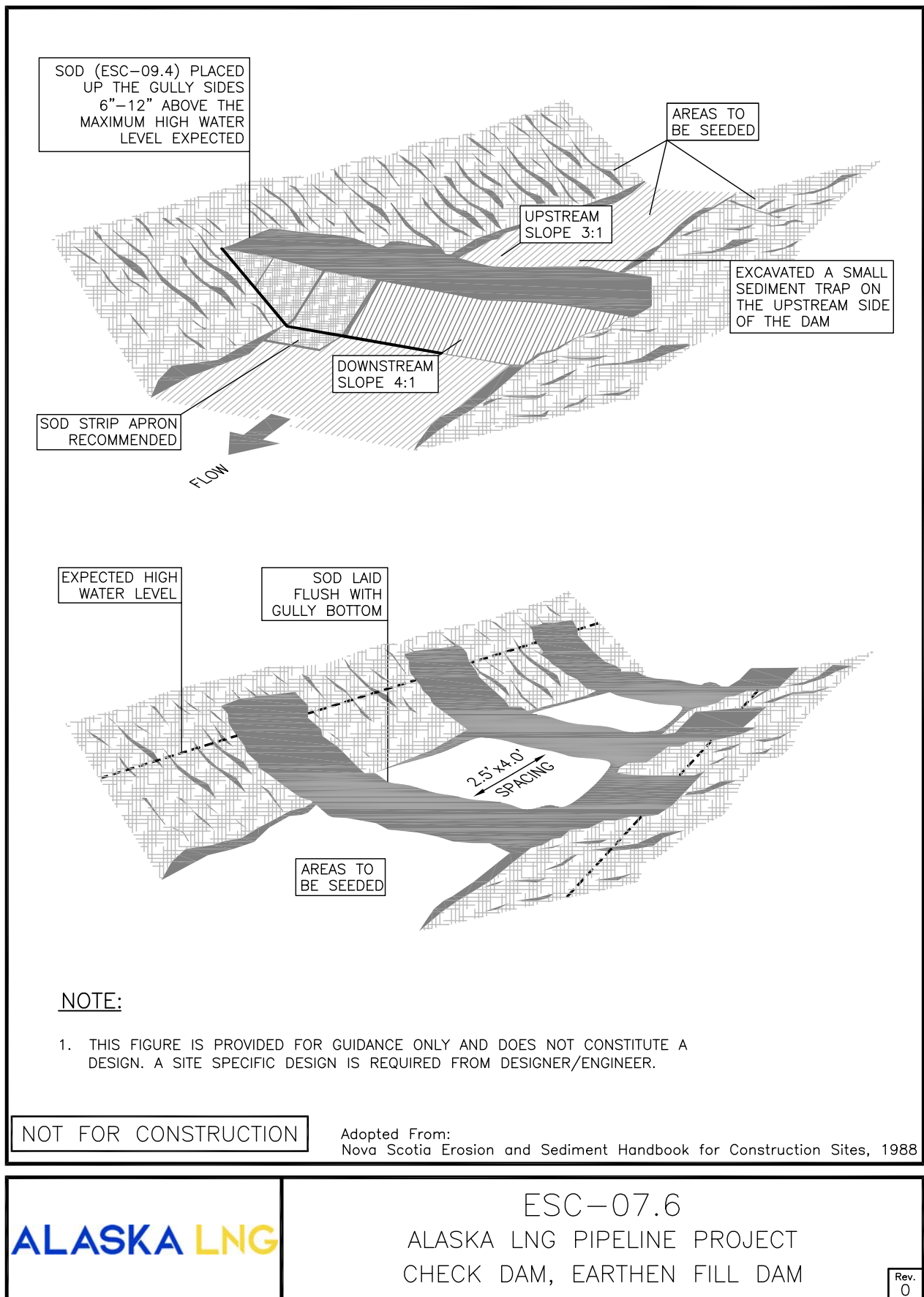
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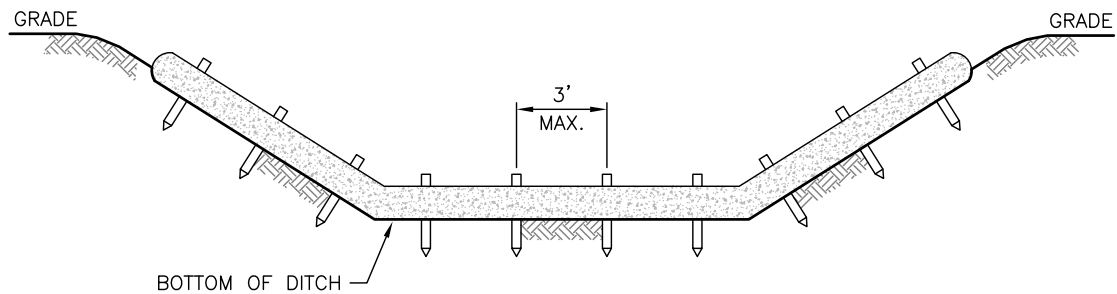
Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

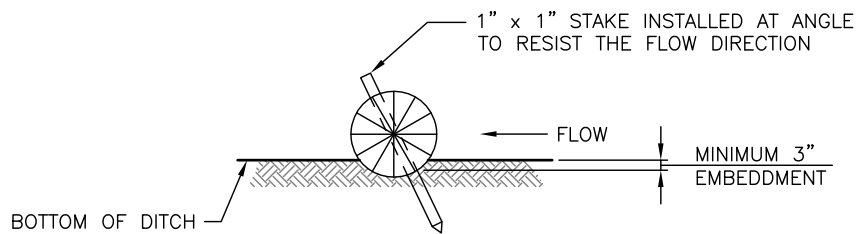
ESC-07.5-D
ALASKA LNG PIPELINE PROJECT
CHECK DAMS, "DOUBLE GABION" BASKET DAM

Rev.
0

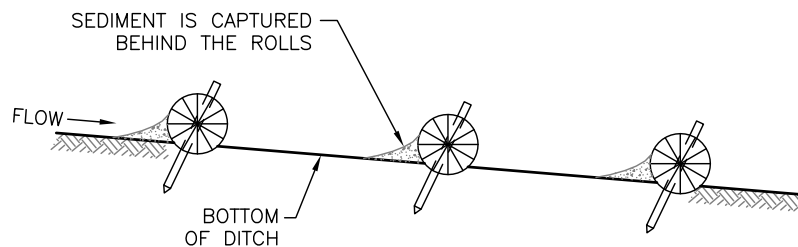




PROFILE VIEW



DETAIL



SECTION

NOTES:

1. BIO ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL AGAINST THE DIRECTION OF FLOW.
2. BIO ROLL SPACING ALONG LENGTH OF DITCH DEPENDS ON SOIL TYPE, DITCH GRADE AND DRAINAGE VOLUME.
3. STAKE MAY CONSIST OF 1" x 1" MANUFACTURE WOOD STAKE OR ALTERNATIVELY LIVE STAKE.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

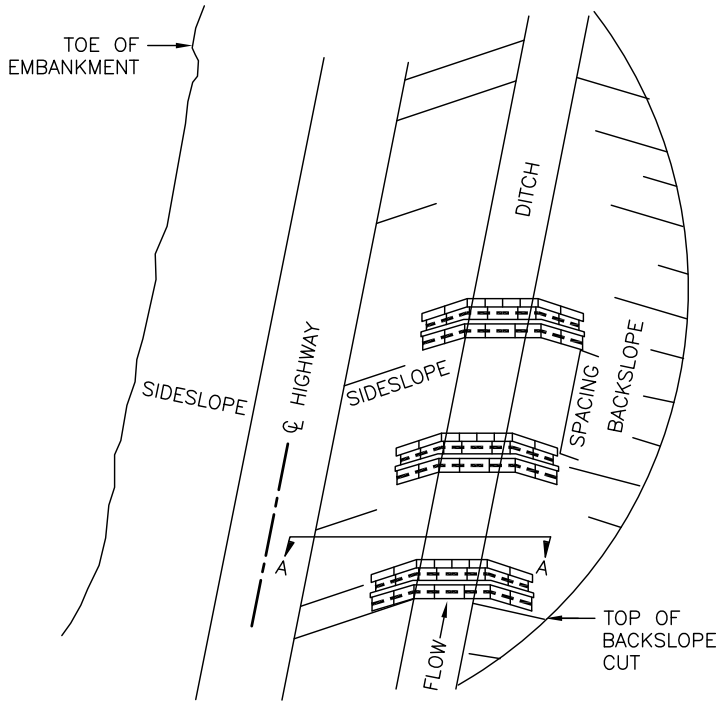
NOT FOR CONSTRUCTION

Modified From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC-07.7
ALASKA LNG PIPELINE PROJECT
CHECK DAMS, BIO ROLL CHECK DAM

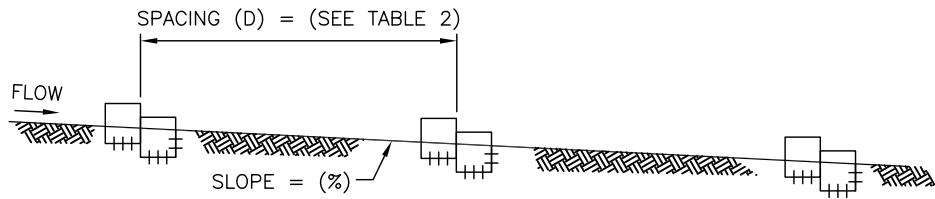
Rev.
0



DITCH BARRIER

TABLE 1	
MINIMUM INSTALLATION LENGTH UP SLOPES	
SLOPE (ft)	LENGTH L (ft)
6.5	3.5
8.0	4.0
10.0	5.0
11.5	5.5
13.0	6.0
16.5	7.5
20.0	9.0

TABLE 2	
SUGGESTED SPACING (D)	
S (%)	D (ft)
3	130
4	115
5	80



TYPICAL DITCH BARRIER SPACING

NOTES:

1. SUITABLE FOR $S < 5\%$ AND HYDRAULIC CONDITIONS NOT SEVERE FOR $S > 5\%$, THE ENGINEER MUST ASSESS USE OF THIS STRUCTURE VERSUS OTHER OPTIONS.
2. EMBED BALES 4" TO 6" INTO THE SOIL AND "KEY BALES INTO THE CHANNEL BANKS.
3. PLACE BALES PERPENDICULAR TO THE FLOW WITH ENDS TIGHTLY ABUTTING.
4. BALE HEIGHT SHALL NOT EXCEED 1.6'.
5. INSPECT AFTER EACH SIGNIFICANT STORM, MAINTAIN AND REPAIR PROMPTLY.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

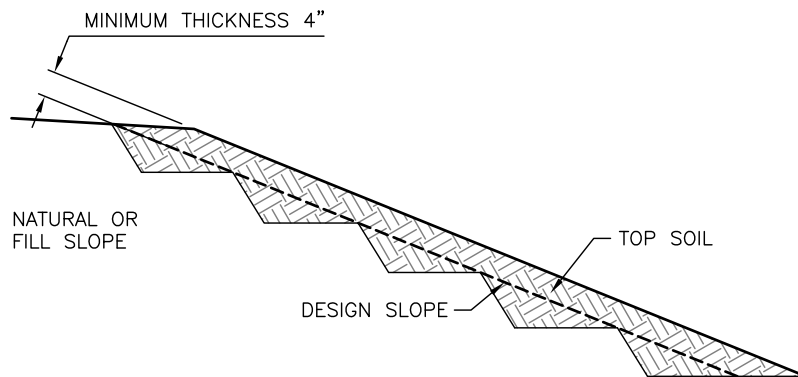
NOT FOR CONSTRUCTION

Adopted From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC-07.8
ALASKA LNG PIPELINE PROJECT
CHECK DAM, STRAW BALE CHECK DAM

Rev.
0



TOPSOILING ON SLOPES GREATER THAN 2H:1V

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

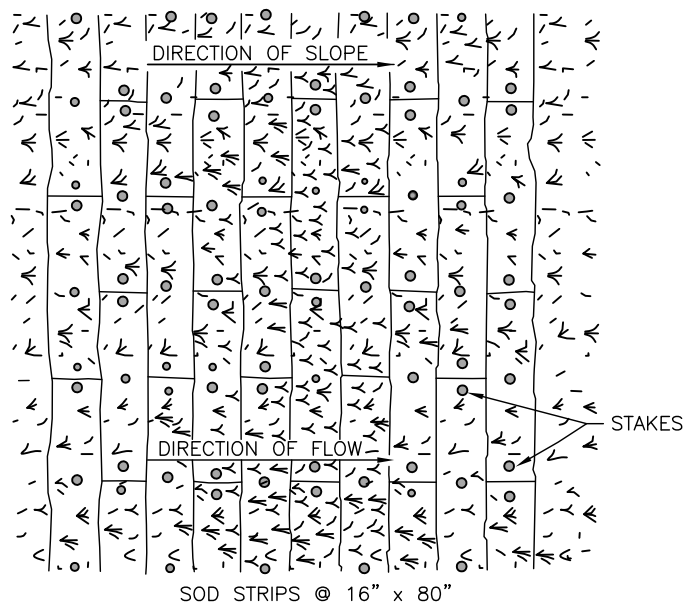
NOT FOR CONSTRUCTION

Adopted From:
British Columbia Manual for Control of Erosion and Shallow Slope Movement. 1997

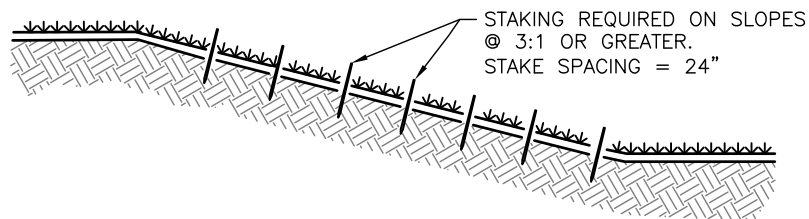
ALASKA LNG

ESC-09.3
ALASKA LNG PIPELINE PROJECT
REVEGETATION TOPSOILING

Rev.
0



SODDING



TIME	NUTRIENT RATE (kg/10 m ²)		
	NITROGEN	PHOSPHOROUS	POTASSIUM
EARLY SPRING	0.5	0.25	0.25
EARLY SUMMER	0.5	—	—
MID SUMMER	0.5	—	—
EARLY FALL	0.5	0.25	0.25

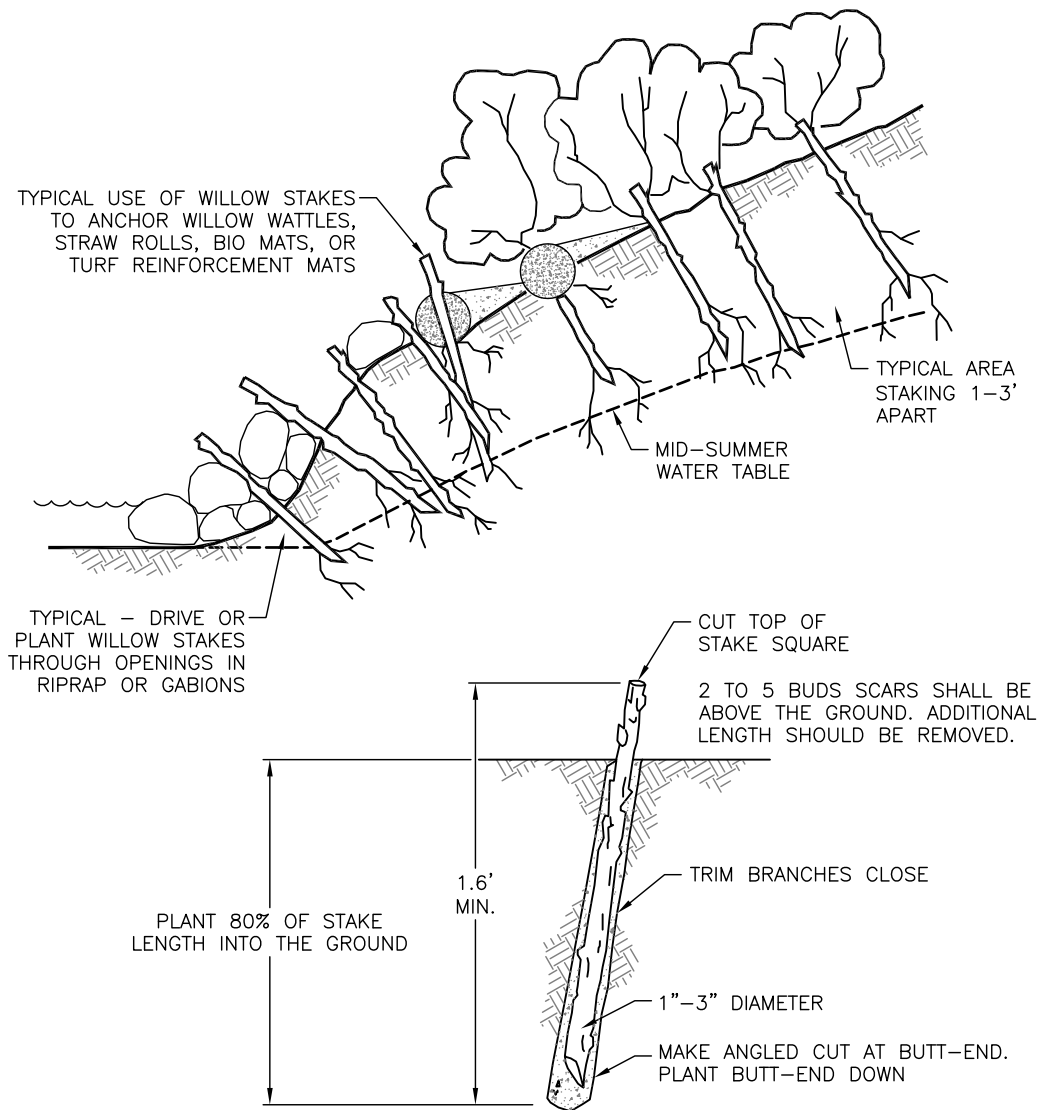
NOT FOR CONSTRUCTION

Adopted From: City of Calgary Guideline for Erosion and Sediment Control, 2011

ALASKA LNG

ESC-09.4
ALASKA LNG PIPELINE PROJECT
REVEGETATION SODDING

Rev.
0



LIVE STAKING

NOTES:

1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON.
2. USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION, USE A PILOT BAR IN FIRM SOILS.
4. SOAK CUTTINGS FOR 24 HOURS (MIN.) PRIOR TO INSTALLATION.
5. TAMP THE SOIL AROUND THE STAKE.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

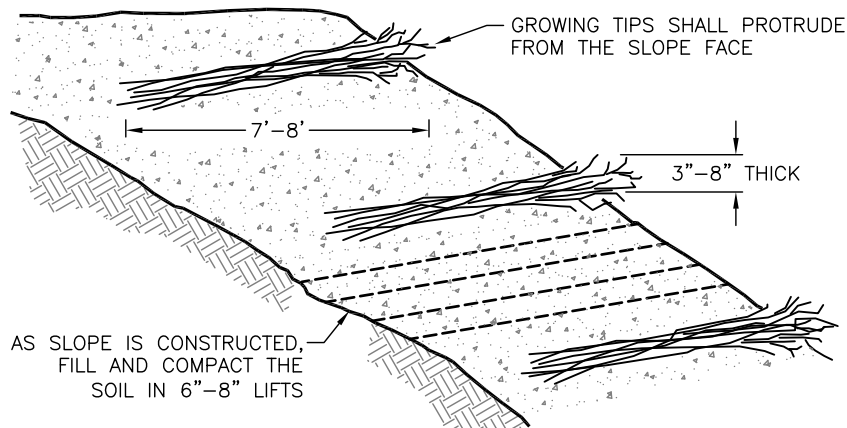
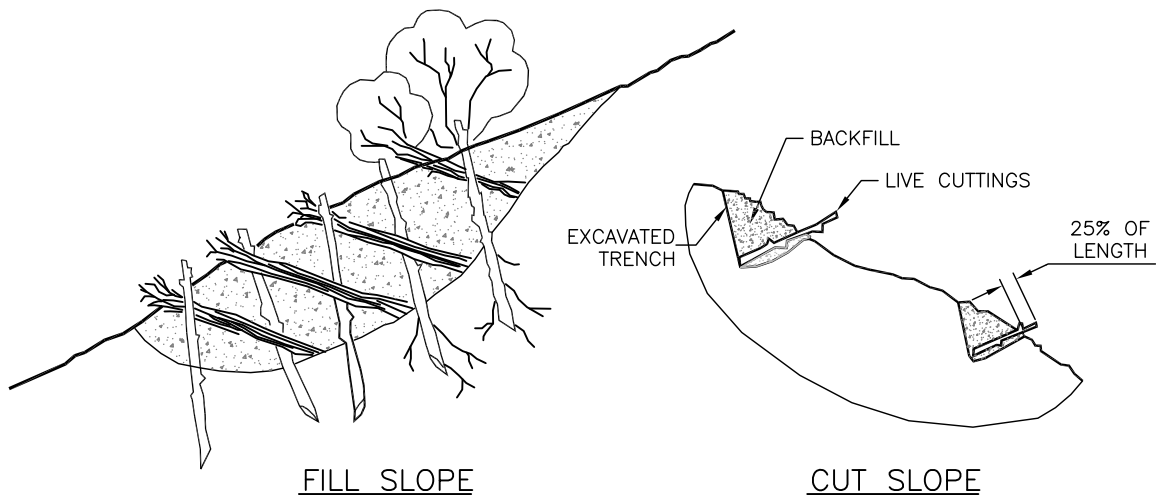
NOT FOR CONSTRUCTION

Adopted From: Alberta Field Guide for Erosion and Sediment Control. 2011

ALASKA LNG

ESC-09.5
ALASKA LNG PIPELINE PROJECT
REVEGETATION LIVE STAKING

Rev.
0



TYPICAL BRUSHLAYERING WITH SLOPE CONSTRUCTION

NOTES:

1. ROOTED, LEAFED CONDITION OF THE LIVING PLANT MATERIAL IS NOT REPRESENTATIVE OF THE TIME OF INSTALLATION.
2. COVER BRUSHLAYER IMMEDIATELY WITH 6" OF FILL SOIL, WATER AND COMPACT ACCORDING TO SPECIFICATIONS.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

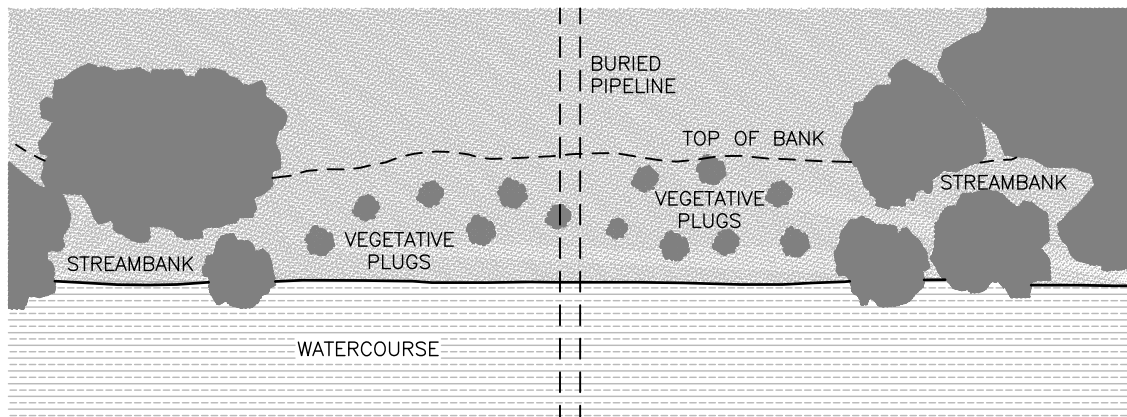
NOT FOR CONSTRUCTION

Modified From: Alberta Field Guide for Erosion and Sediment Control. 2011

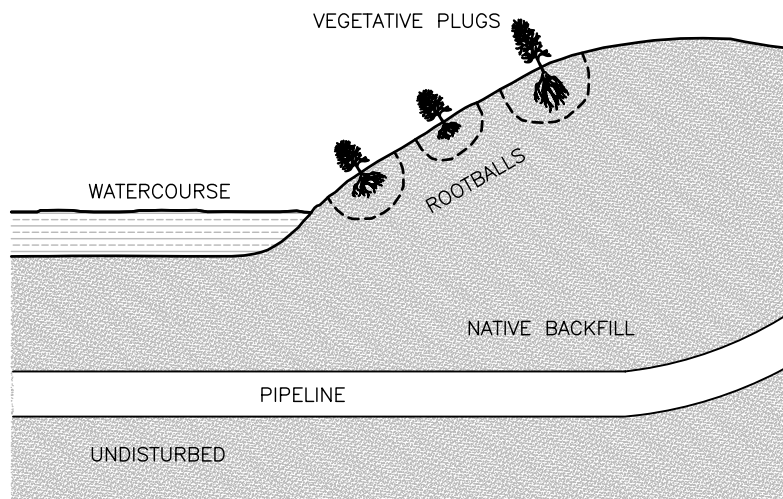
ALASKA LNG

ESC-09.6
ALASKA LNG PIPELINE PROJECT
REVEGETATION BRUSH LAYERING

Rev.
0



PLAN VIEW



PROFILE VIEW

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

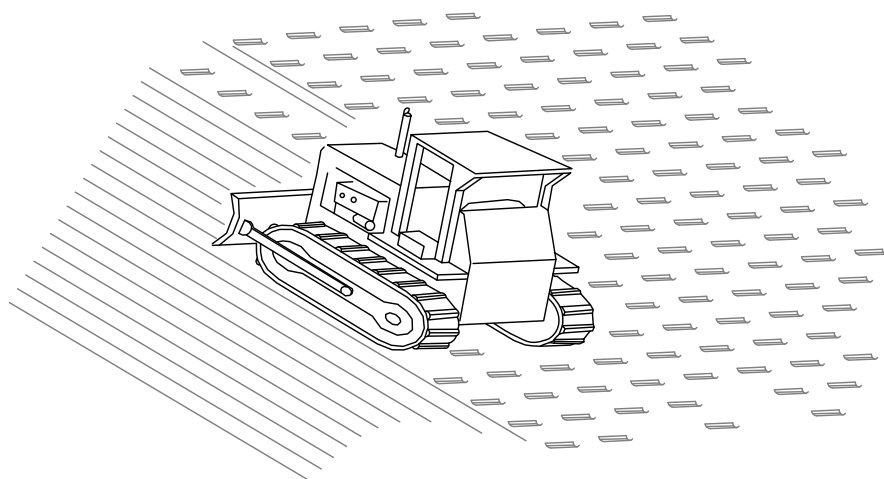
NOT FOR CONSTRUCTION

Modified From: Steambank Re-vegetation and Protection, A guide for Alaska. 2005

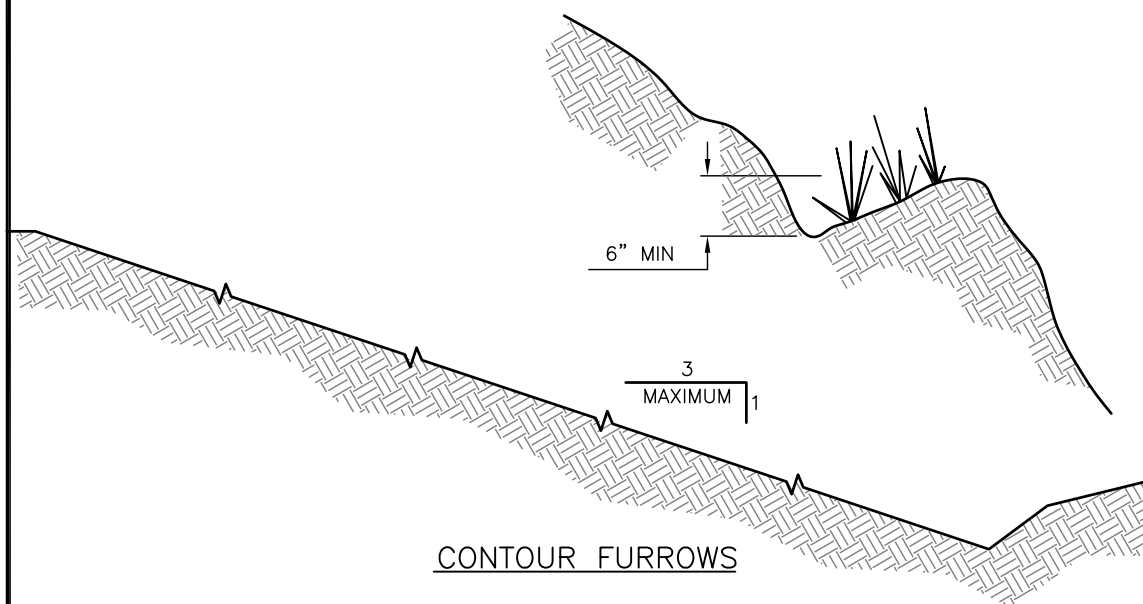
ALASKA LNG

ESC-09.8
ALASKA LNG PIPELINE PROJECT
REVEGETATION VEGETATIVE PLUGS

Rev.
0



TRACKING



CONTOUR FURROWS

NOTES:

1. 'TRACKING' WITH MACHINERY UP AND DOWN THE SLOPE PROVIDES GROOVES THAT WILL CATCH SEED, RAINFALL AND REDUCE RUNOFF.
2. GROOVES WILL CATCH SEED, FERTILIZER, MULCH, RAINFALL AND DECREASE RUNOFF.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

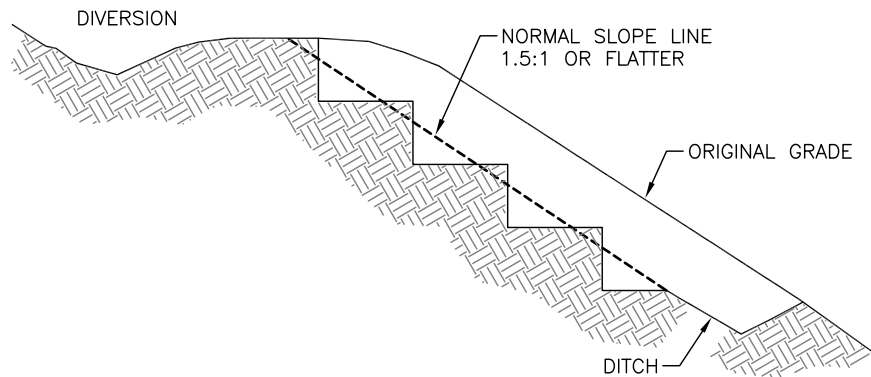
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

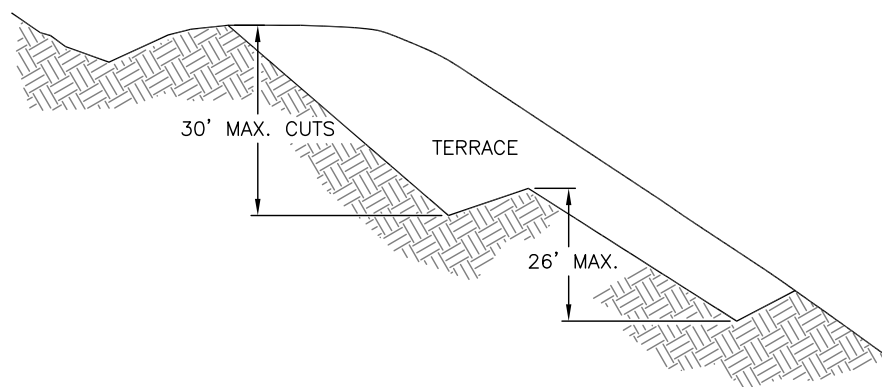
ALASKA LNG

ESC-10-A
ALASKA LNG PIPELINE PROJECT
SURFACE ROUGHENING AND TERRACING

Rev.
0



STEPPED SLOPE



TERRACED SLOPE

NOTES:

1. VERTICAL CUT DISTANCE SHALL BE LESS THAN HORIZONTAL DISTANCE.
2. VERTICAL CUT SHALL NOT EXCEED 2' IN SOFT MATERIAL AND 3' IN ROCKY MATERIAL.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

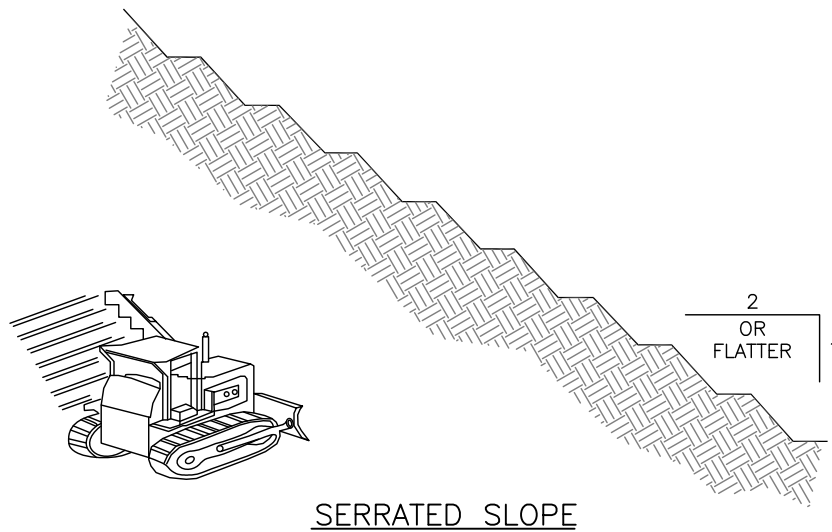
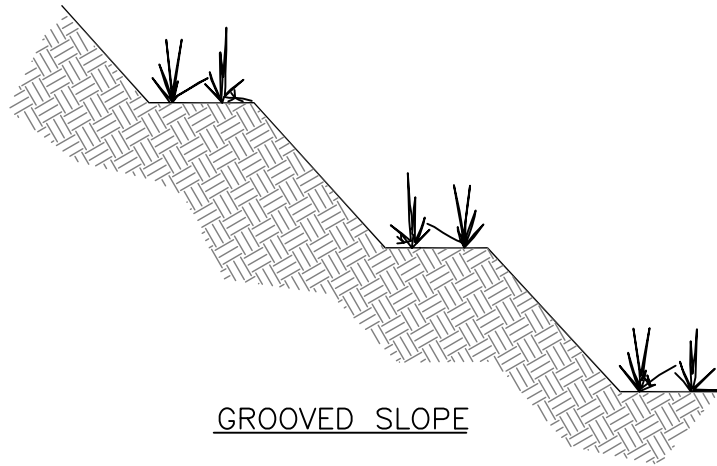
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-10-B
ALASKA LNG PIPELINE PROJECT
SURFACE ROUGHENING AND TERRACING, STEPPED OR TERRACED SLOPE

Rev.
0



NOTES:

1. GROOVE BY CUTTING SERRATIONS ALONG THE CONTOUR. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER, SEED, MULCH AND FERTILIZER.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

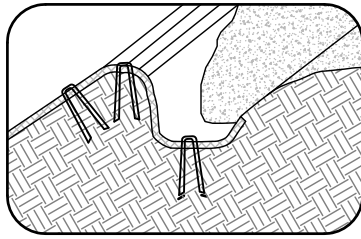
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

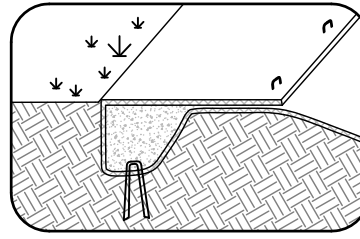
ALASKA LNG

ESC-10-C
ALASKA LNG PIPELINE PROJECT
SURFACE ROUGHENING AND TERRACING, GROOVED OR SERRATED SLOPE

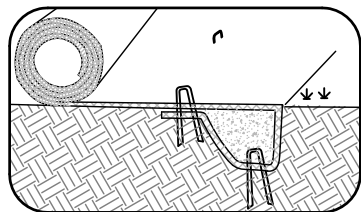
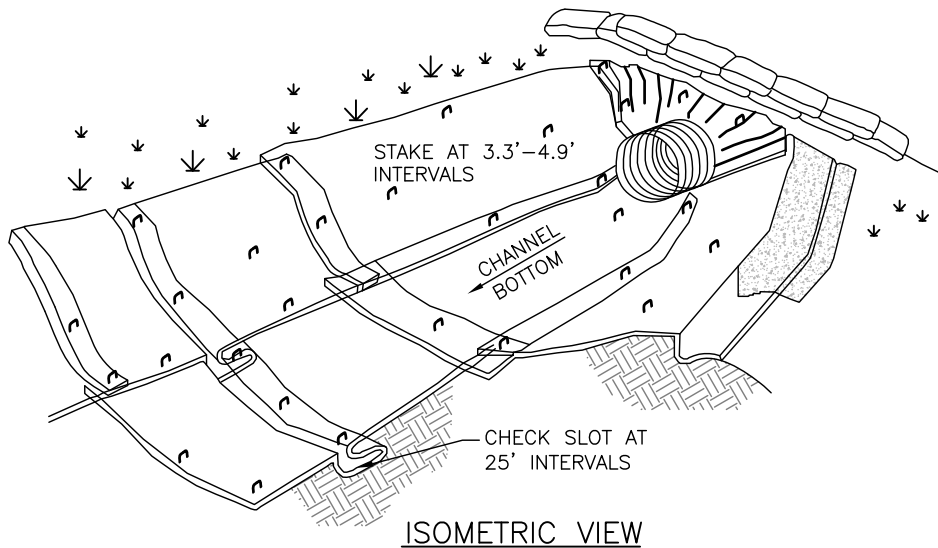
Rev.
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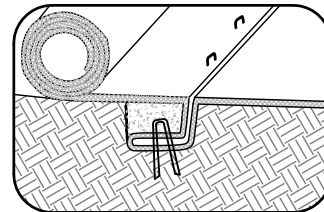
LONGITUDINAL ANCHOR TRENCH



TERMINAL SLOPE AND CHANNEL
ANCHOR TRENCH



INITIAL CHANNEL ANCHOR TRENCH



INTERMITTENT CHECK SLOT

NOTES:

1. CHECK SLOTS TO BE CONSTRUCTED PER MANUFACTURERS SPECIFICATIONS.
2. STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

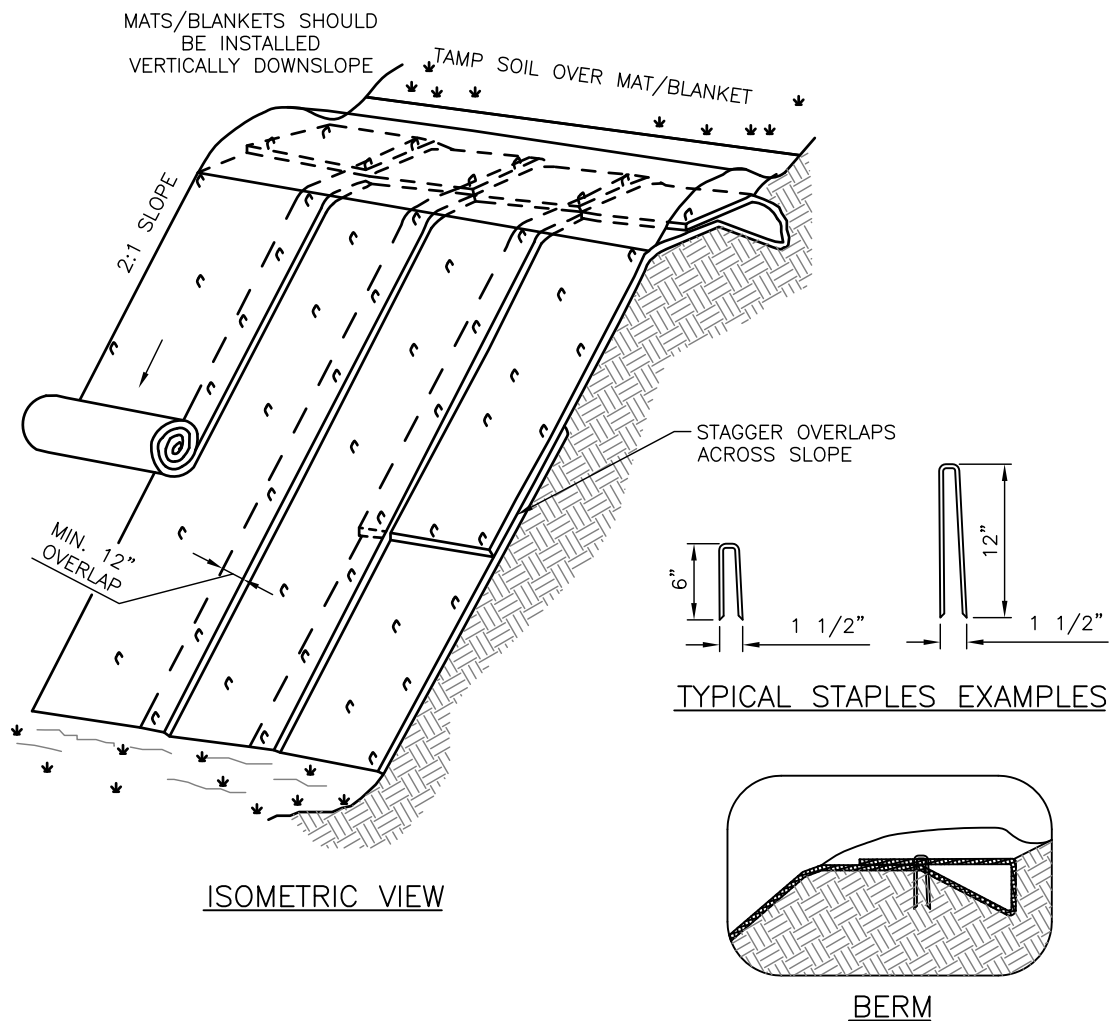
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

ESC-11.1
ALASKA LNG PIPELINE PROJECT
ROLLED EROSION CONTROL PRODUCTS, CHANNEL INSTALLATION

Rev.
0



NOTES:

1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH. CONSULT MANUFACTURE FOR STAPLE SPECIFICATIONS TO SUIT SITE CONDITIONS.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

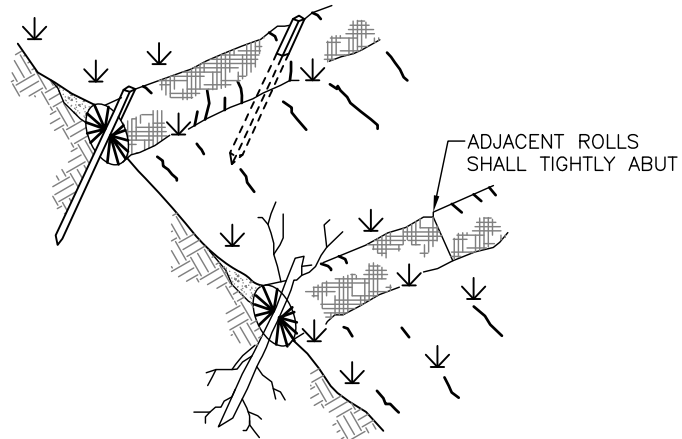
Adopted From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-11.2
ALASKA LNG PIPELINE PROJECT
ROLLED EROSION CONTROL PRODUCTS, SLOPE INSTALLATION

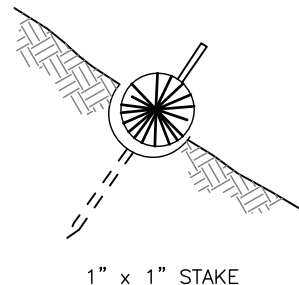
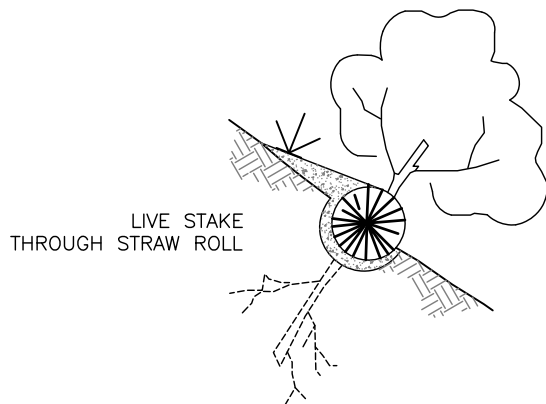
Rev.
0

STRAW ROLLS MUST BE PLACED
ALONG SLOPE CONTOURS



SPACING DEPENDS ON SOIL
TYPE AND SLOPE STEEPNESS

SEDIMENT, ORGANIC MATTER, AND
NATIVE SEEDS ARE CAPTURED
BEHIND THE ROLLS.



NOTES:

1. STRAW ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3"–5" DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

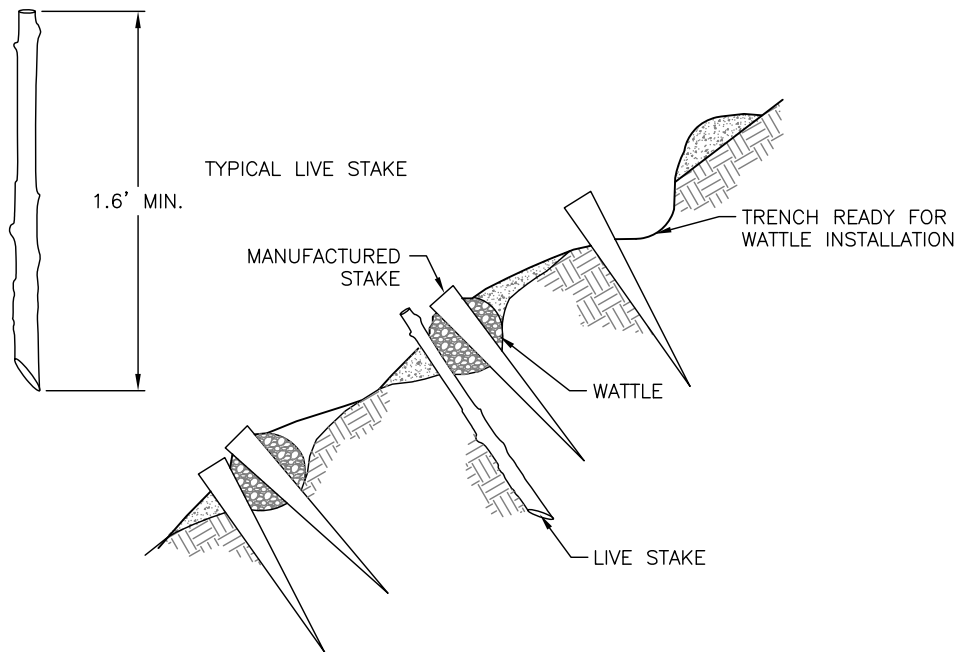
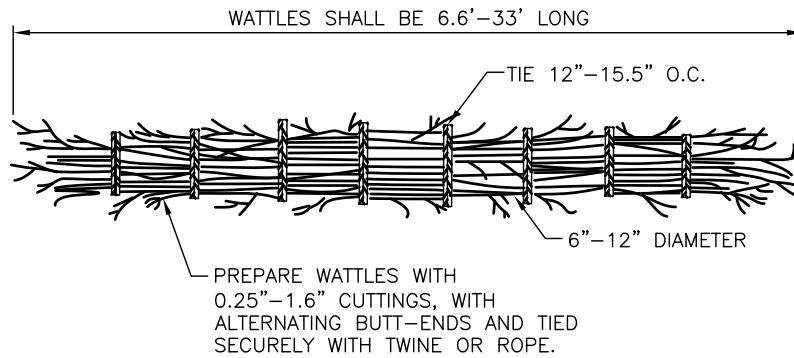
NOT FOR CONSTRUCTION

Adopted From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC–11.3
ALASKA LNG PIPELINE PROJECT
ROLLED EROSION CONTROL PRODUCTS, STRAW ROLLS

Rev.
0



NOTES:

1. HARVEST AND INSTALL WATTLES DURING DORMANT SEASON.
2. INSTALL WATTLES ON SLOPE CONTOURS.
3. ALL WORK PROCEEDS FROM THE BOTTOM OF THE SLOPE TO THE TOP.
4. FILL OR PARTIALLY COVER WATTLE WITH SOIL FROM SLOPE OR TRENCH ABOVE.
5. COMPACT AND WORK SOIL INTO COMPLETED WATTLES.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

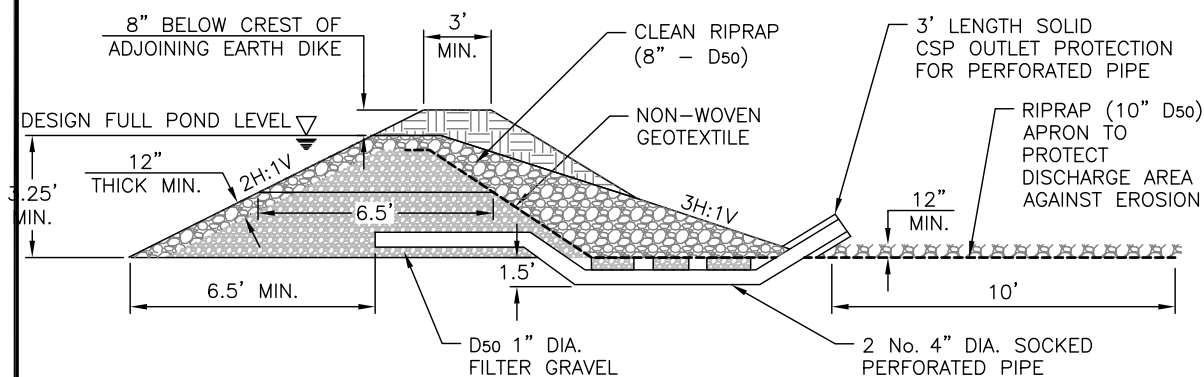
NOT FOR CONSTRUCTION

Adopted From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

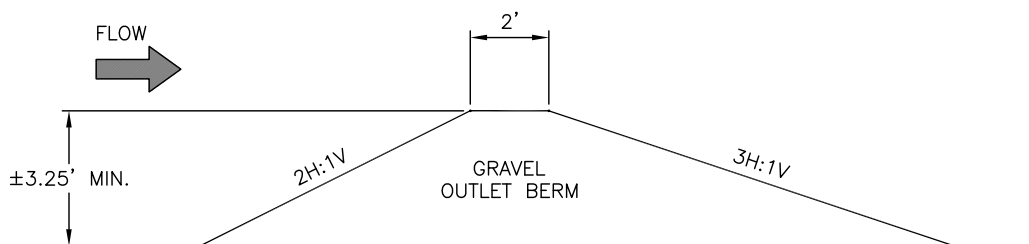
ALASKA LNG

ESC-11.4
ALASKA LNG PIPELINE PROJECT
ROLLED EROSION CONTROL PRODUCTS, WATTLE

Rev.
0



SECTION C - C' (DETAILED)



SECTION C - C' (SIMPLIFIED)

NOTES:

1. DESIGNER/ENGINEER TO DETERMINE WHETHER DETAILED OR SIMPLIFIED SECTION IS REQUIRED.
2. DEACTIVATE OR IMPLEMENT REGULAR MAINTENANCE WITHIN 3 YEARS AFTER SATISFACTORY FULL REVEGETATION OF THE DISTURBED AREA OF POTENTIAL EROSION SOURCES UPSTREAM.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

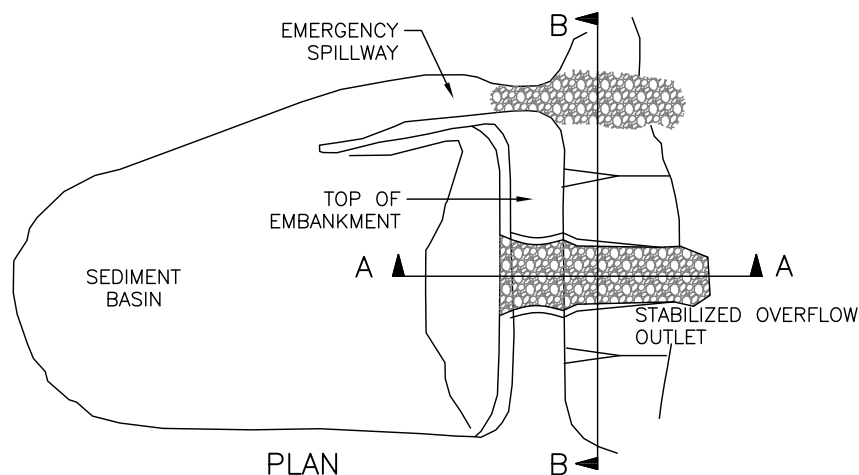
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

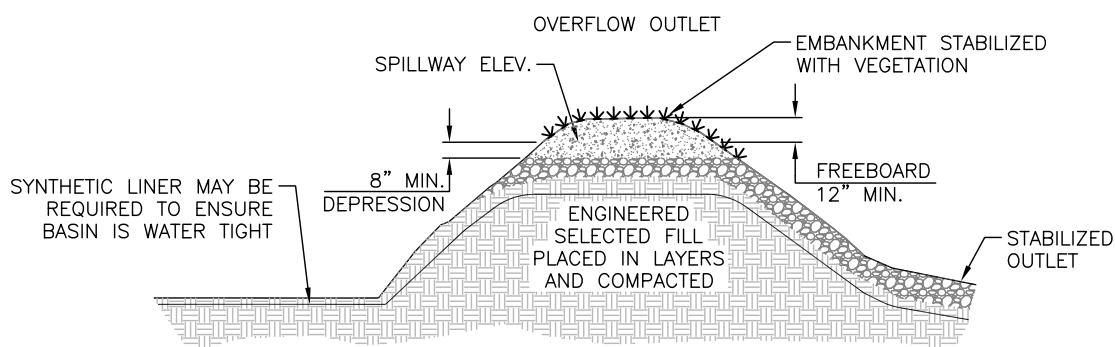
ALASKA LNG

ESC-12.1/12.2
ALASKA LNG PIPELINE PROJECT
SEDIMENT CONTAINMENT SYSTEMS SECTION C-C

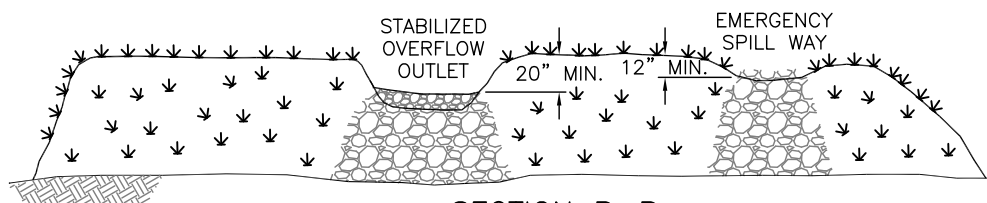
Rev.
0



PLAN



SECTION A-A



SECTION B-B

NOTES:

1. THE TEMPORARY SEDIMENT BASIN, DESIGNED BY A QUALIFIED PROFESSIONAL, IS GENERALLY REQUIRED FOR DISTURBED AREAS GREATER THAN 5 ACRES WITH A DRAINAGE AREA LESS THAN 100 ACRES.
2. THE SEDIMENT BASIN MAY BE REMOVED WITHIN 3 YEARS.
3. FOR CONFIGURATION AND FLOW CHAMBER DESIGN REFER TO DESIGN ENGINEER.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

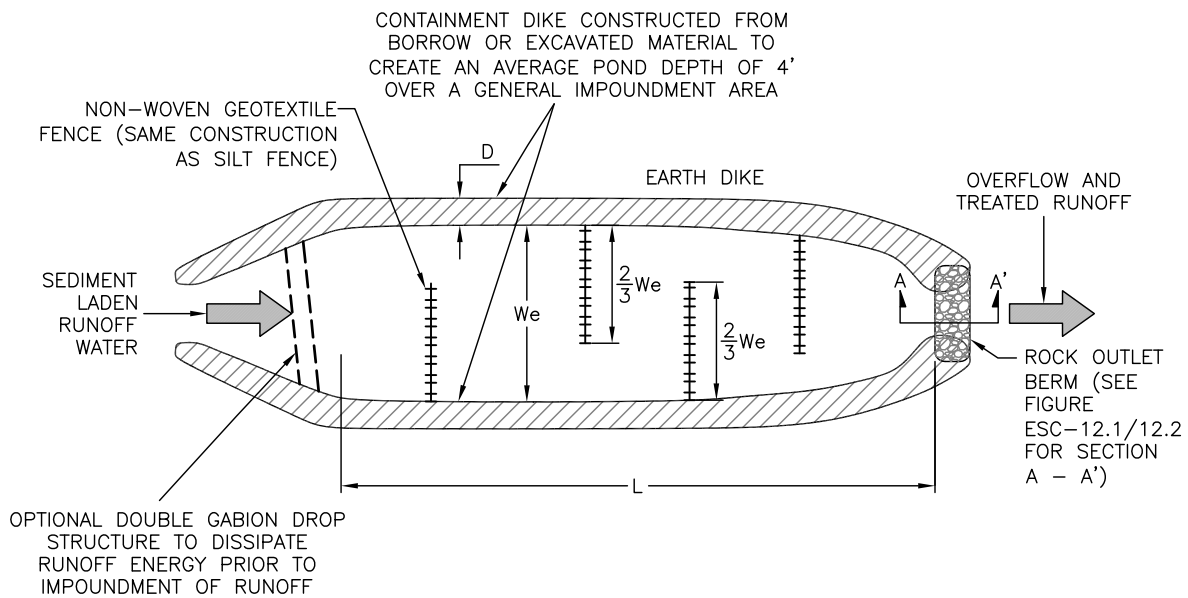
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

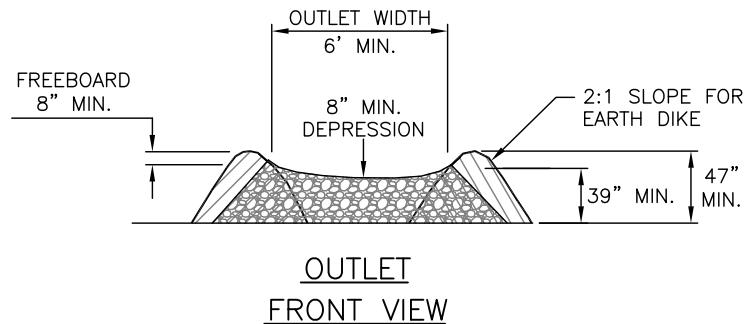
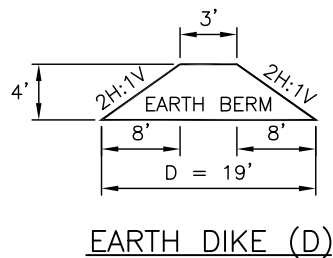
ALASKA LNG

ESC-12.1-A
ALASKA LNG PIPELINE PROJECT
SEDIMENT CONTAINMENT SYSTEMS, SEDIMENT BASIN-RISER OUTLET OPTION

Rev.
0



TYPICAL ABOVE GRADE SEDIMENT TRAP
PLAN VIEW



NOTES:

1. CONTRIBUTING RUNOFF AREA SHOULD BE OR SMALLER THAN 5.0ac.
2. EFFECTIVENESS APPROPRIATE FOR REMOVING MEDIUM TO COARSE SILT PARTICLES SUSPENDED IN RUNOFF.
3. L/We RATIO 3:1 CAN BE APPROPRIATE.
4. We = X' MINIMUM BOTTOM WIDTH.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

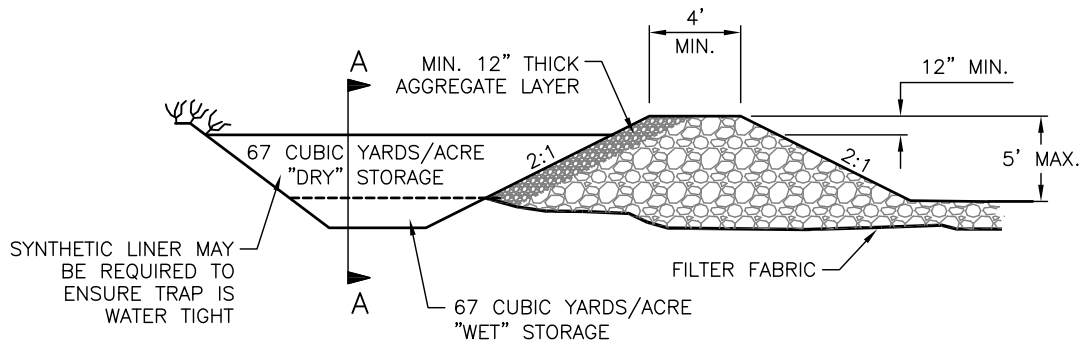
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

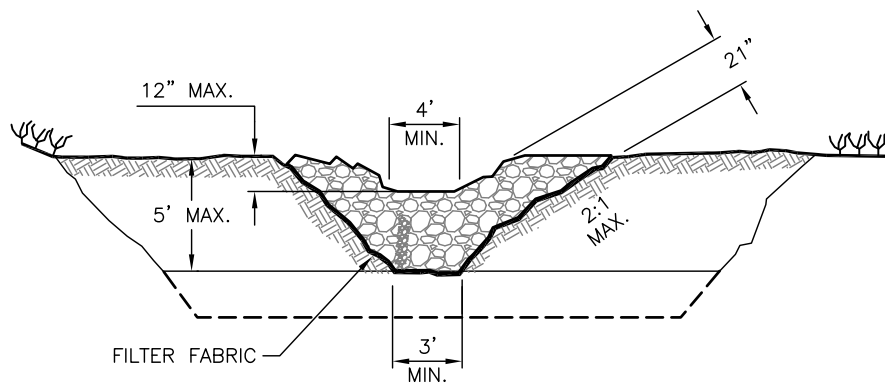
ALASKA LNG

ESC-12.2-A
ALASKA LNG PIPELINE PROJECT
SEDIMENT CONTAINMENT SYSTEMS, SEDIMENT TRAP

Rev.
0



TYPICAL BELOW GRADE CROSS SECTION



SECTION A-A

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

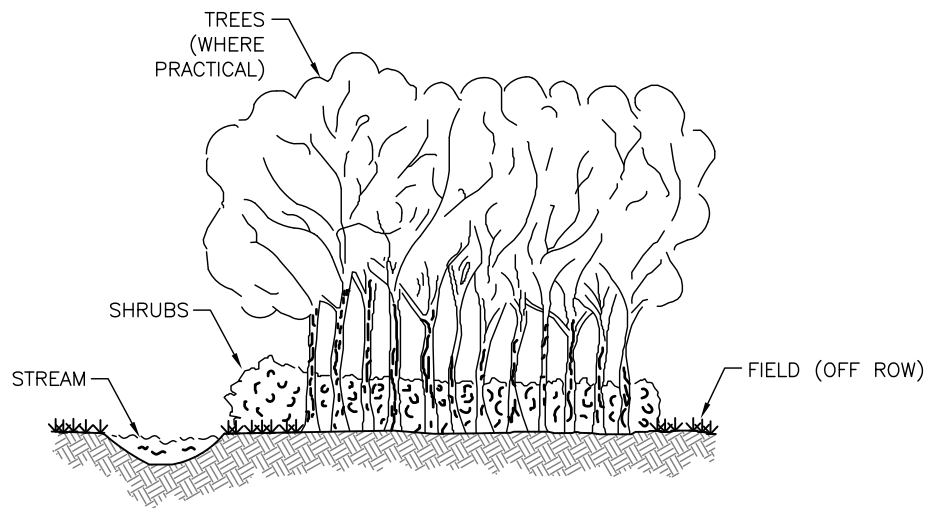
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-12.2-B
ALASKA LNG PIPELINE PROJECT
SEDIMENT CONTAINMENT SYSTEMS, SEDIMENT TRAP

Rev.
0



MINIMUM WIDTH OF TREED BUFFER STRIP TO
BE EQUAL TO MAXIMUM MATURE TREE HEIGHT
MINIMUM WIDTH OF GRASS BUFFER STRIP = 18' TO 60' (NOT SHOWN)
DEPENDENT ON SITE CONDITIONS

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

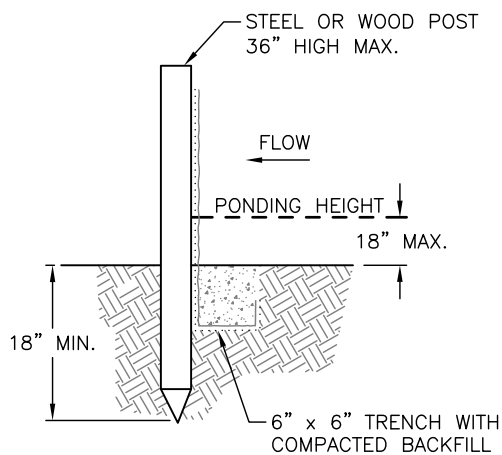
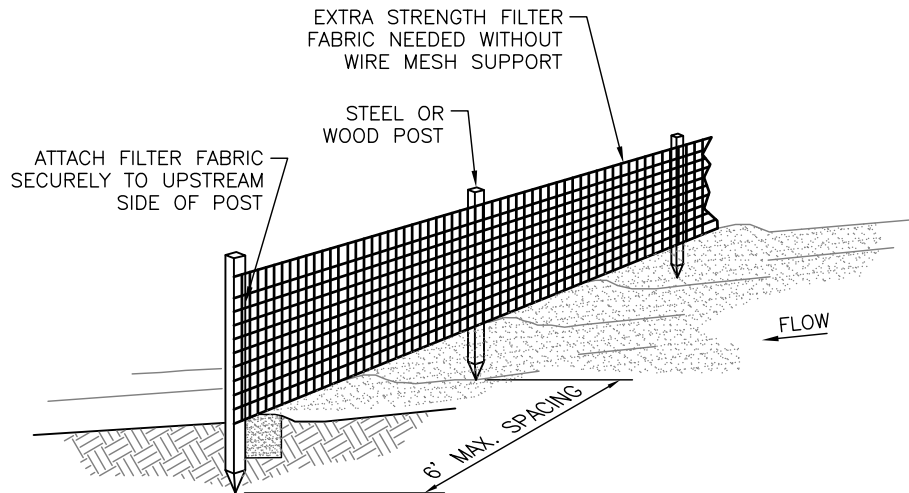
NOT FOR CONSTRUCTION

Modified From: Alaska Storm Water Guide. 2009

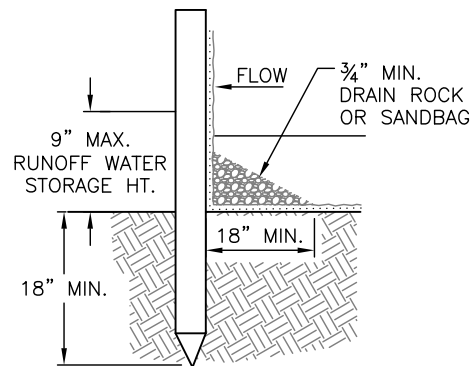
ALASKA LNG

ESC-13
ALASKA LNG PIPELINE PROJECT
VEGETATIVE BUFFER STRIP

Rev.
0



TRENCH DETAIL



INSTALLATION WITHOUT TRENCHING

NOTES:

1. SILT FENCE FOLLOWS SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT ACCUMULATION.
3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT AND CAN BE PERMANENTLY STABILIZED.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

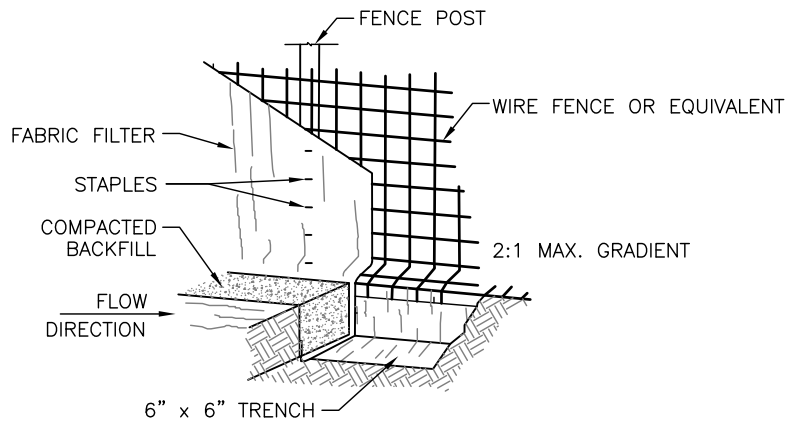
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-14-A
ALASKA LNG PIPELINE PROJECT
SILT FENCE, TRENCH METHOD OPTION

Rev.
0



SILT FENCE

SLOPE (%)	18 in. FENCE HEIGHT (ft.)	30 in. FENCE HEIGHT (ft.)
2 (OR LESS)	250	500
5	100	250
10	50	150
15	35	100
20	25	70
25	20	55
30	15	45
35	15	40
40	15	35
45	10	30

MAXIMUM SPACING OF SILT FENCE

NOTES:

1. SILT FENCE FOLLOWS SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT ACCUMULATION.
3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT AND CAN BE PERMANENTLY STABILIZED.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

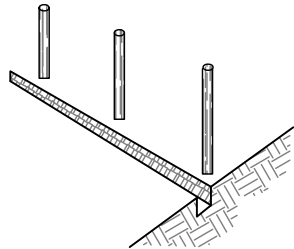
Adopted From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

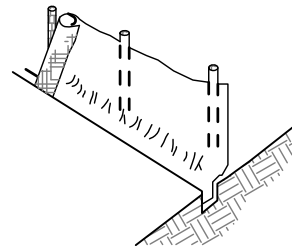
ESC-14-B
ALASKA LNG PIPELINE PROJECT
SILT FENCE, TRENCH METHOD OPTION

Rev.
0

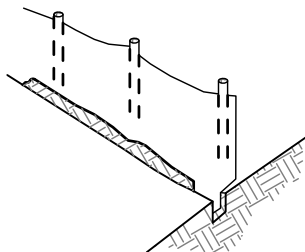
1. SET POSTS AND EXCAVATE A SHALLOW TRENCH UP SLOPE FROM AND ALONG THE LINE OF POSTS



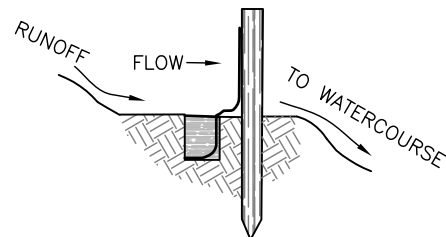
2. ATTACH THE GEOTEXTILE AND WIRE MESH REINFORCEMENT TO THE POSTS AND EXTEND INTO THE TRENCH



3. BACKFILL AND COMPACT THE EXCAVATED SOIL



4. CROSS SECTIONAL VIEW OF INSTALLED SILT FENCE



NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

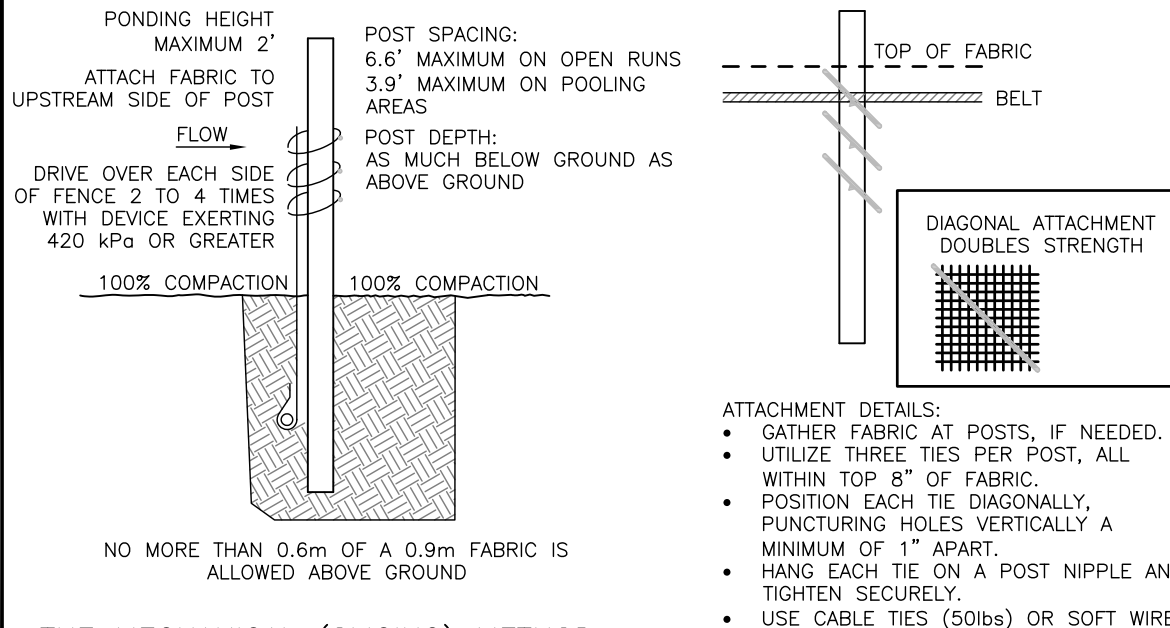
NOT FOR CONSTRUCTION

Adopted From:
City of Moncton Erosion and Sediment Control at Construction Sites. 2011

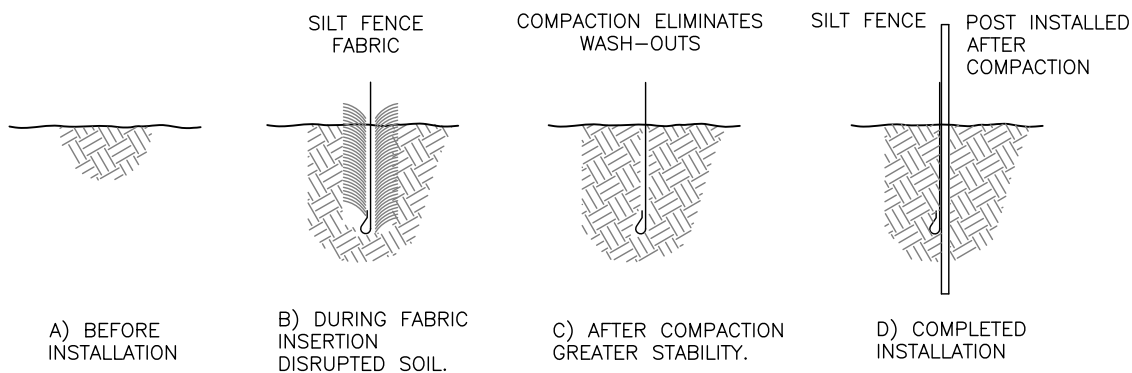
ALASKA LNG

ESC-14-C
ALASKA LNG PIPELINE PROJECT
SILT FENCE, TRENCH METHOD CONSTRUCTION SEQUENCE

Rev.
0



THE MECHANICAL (SLICING) METHOD



THE MECHANICAL (SLICING) METHOD INSTALLATION SEQUENCE

NOTES:

1. INSTALLATION MACHINE MUST ALLOW CONTINUOUS SLICING AND EMBEDMENT OF GEOTEXTILE INTO GROUND WITH MINOR GROUND DISTURBANCE.
2. INSTALLATION MACHINE TYPES WILL VARY WITH MANUFACTURER.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

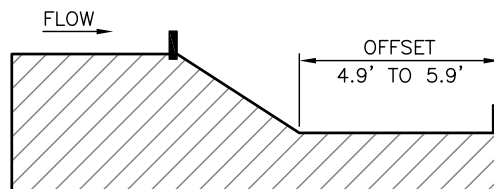
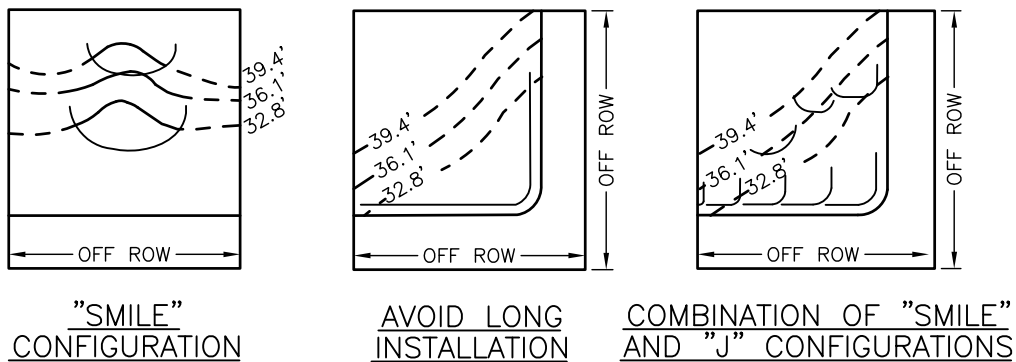
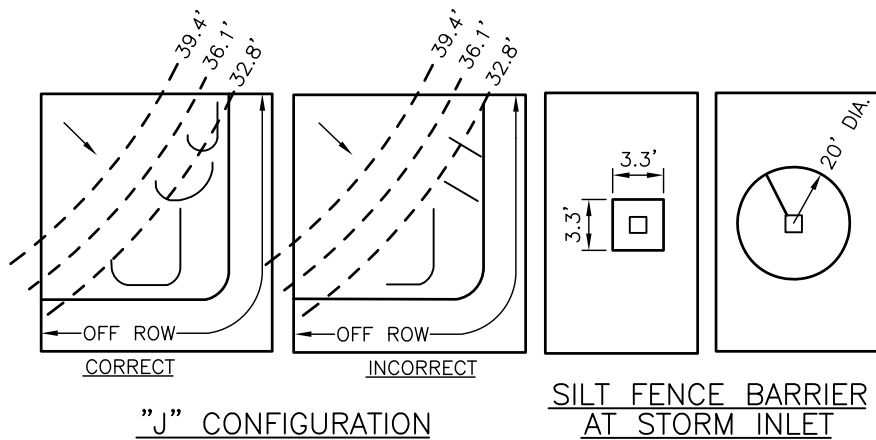
NOT FOR CONSTRUCTION

Adopted From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC-14-D
ALASKA LNG PIPELINE PROJECT
SILT FENCE, MECHANICAL METHOD OPTION

Rev.
0



LOCATION AT TOP AND BOTTOM OF SLOPE

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.


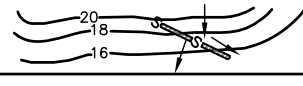
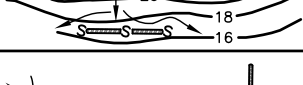
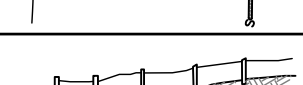






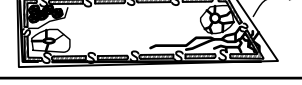

NOT FOR CONSTRUCTION

Adopted From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC-14-E
ALASKA LNG PIPELINE PROJECT
SILT FENCE, CONFIGURATION PLAN

Rev.
0

1		SLOPE AND/OR LENGTH OF SLOPE FOR 18" FENCE HEIGHT 5% TO 10%: NO MORE THAN 50 FEET 10% TO 20%: NO MORE THAN 25 FEET MORE THAN 20%: NO MORE THAN 10 FEET
2		SILT FENCE IS NOT ALIGNED PARALLEL TO SLOPE CONTOURS
3		EDGES OF THE SILT FENCE ARE NOT CURVED UPHILL, ALLOWING FLOW TO BYPASS THE FENCE
4		CONTRIBUTING LENGTH TO FENCE IS GREATER THAN 100 FEET
5		FABRIC IS NOT ENTRENCHED DEEPLY ENOUGH TO PREVENT UNDERCUTTING
6		SPACING BETWEEN POSTS IS GREATER THAN MAXIMUM ALLOWABLE SPACING
7		FENCE RECEIVES CONCENTRATED FLOW WITHOUT REINFORCEMENT
8		INSTALLED BELOW AN OUTLET PIPE OR WEIR
9		SILT FENCE IS UPSLOPE OF THE EXPOSED AREA
10		SILT FENCE ALIGNMENT DOES NOT CONSIDER CONSTRUCTION TRAFFIC
11		SEDIMENT DEPOSITS BEHIND SILT FENCE REDUCE CAPACITY AND INCREASE BREACH POTENTIAL
12		ALIGNMENT OF SILT FENCE MIRRORS THE PROPERTY LINE OR LIMITS OF DISTURBANCE, BUT DOES NOT REFLECT ESC NEEDS

NOTE:

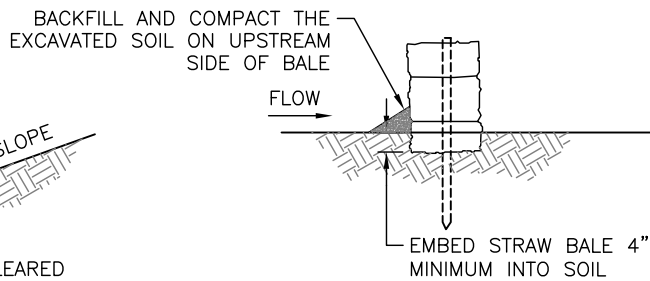
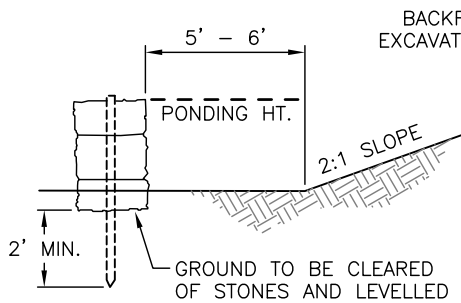
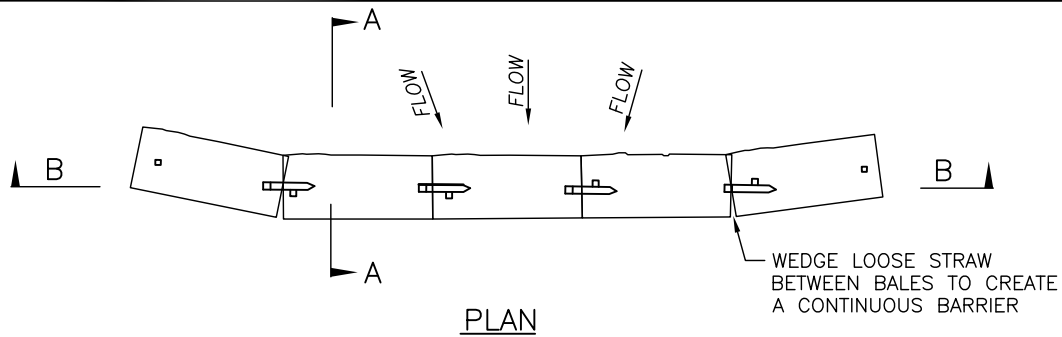
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

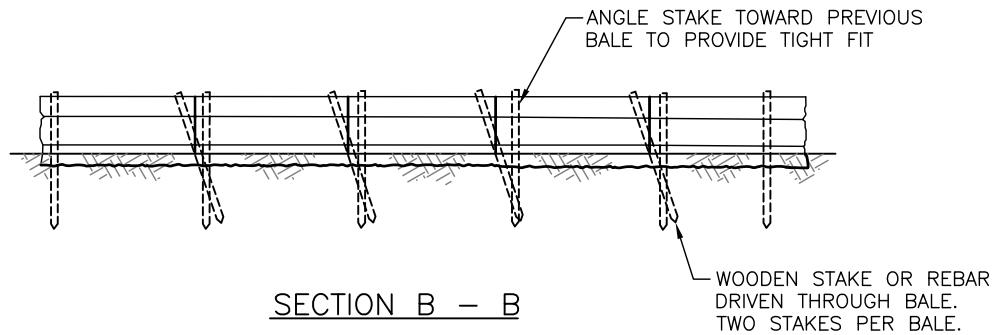
ALASKA LNG

ESC-14-F
ALASKA LNG PIPELINE PROJECT
SILT FENCE, CONDITIONS THAT LIMIT SILT FENCE EFFECTIVENESS

Rev.
0



SECTION A - A



NOTES:

1. THE STRAW BALES SHALL BE PLACED ON SLOPE CONTOUR.
2. BALES TO BE PLACED IN A ROW WITH THE ENDS TIGHTLY ABUTTING.
3. KEY IN BALES TO PREVENT EROSION OR FLOW UNDER BALES.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

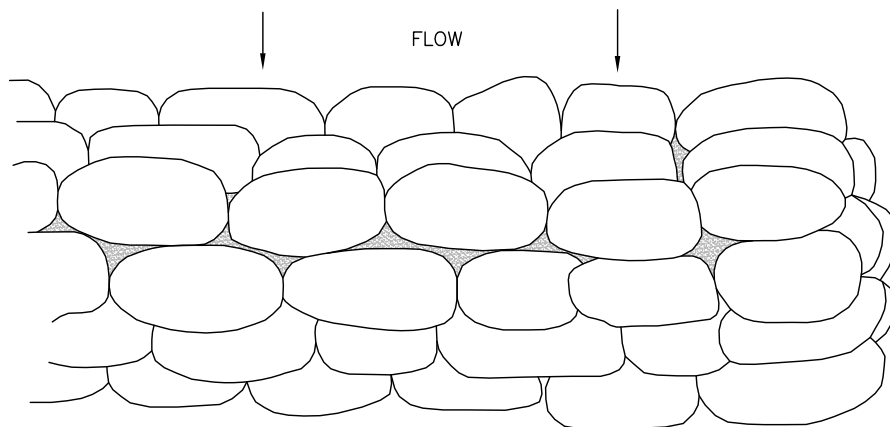
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

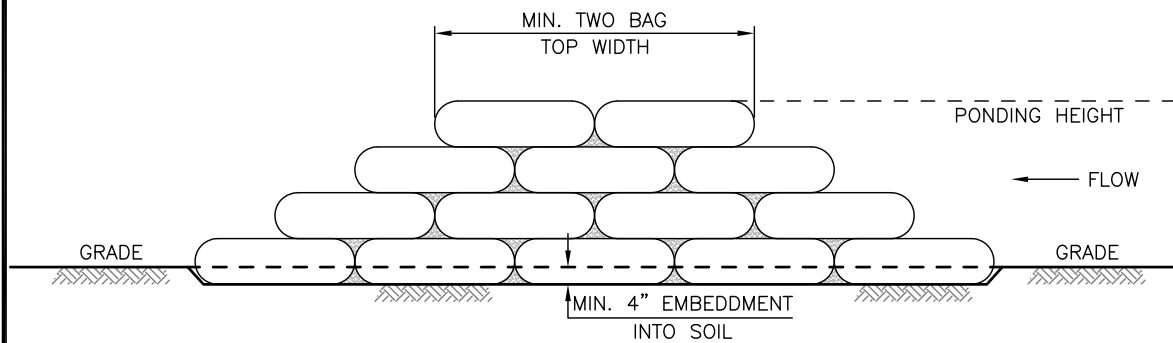
ALASKA LNG

ESC-15.1
ALASKA LNG PIPELINE PROJECT
BARRIERS/BERMS, STRAW BALE BARRIER

Rev.
0



PLAN



PROFILE VIEW

NOTES:

1. SANDBAGS TO BE PLACED IN A ROW WITH THE ENDS TIGHTLY ABUTTING.
2. KEY IN SANDBAGS TO PREVENT EROSION OR FLOW UNDER SANDBAGS.

NOT FOR CONSTRUCTION

Modified From: California Stormwater Best Management Practice Handbook Portal: Construction, 2009

ALASKA LNG

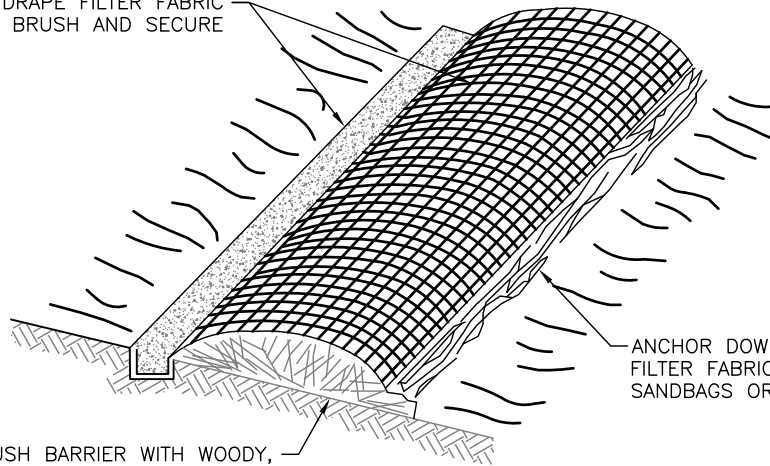
ESC-15.2
ALASKA LNG PIPELINE PROJECT
BARRIERS/BERMS, SANDBAG BARRIER

Rev.
0

IF REQUIRED DRAPE FILTER FABRIC
OVER BRUSH AND SECURE

BRUSH BARRIER WITH WOODY,
ALTERNATIVELY TOPSOIL STRIPPING
MAY BE USED TO FORM BARRIER

ANCHOR DOWNHILL EDGE OF
FILTER FABRIC WITH STAKES,
SANDBAGS OR EQUIVALENT



NOTES:

1. EXCAVATE 4" x 4" TRENCH ALONG UPSTREAM SIDE OF BRUSH FILTER BERM.
2. DRAPE FILTER FABRIC OVER BRUSH FILTER BERM ENSURING UPSTREAM SIDE IS IN TRENCH.
3. BACKFILL AND COMPACT SOIL OVER FILTER FABRIC IN EXCAVATED TRENCH.
4. SECURE FILTER FABRIC OVER BRUSH FILTER BERM BY STAKING ON DOWNSTREAM SIDE OF BERM.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

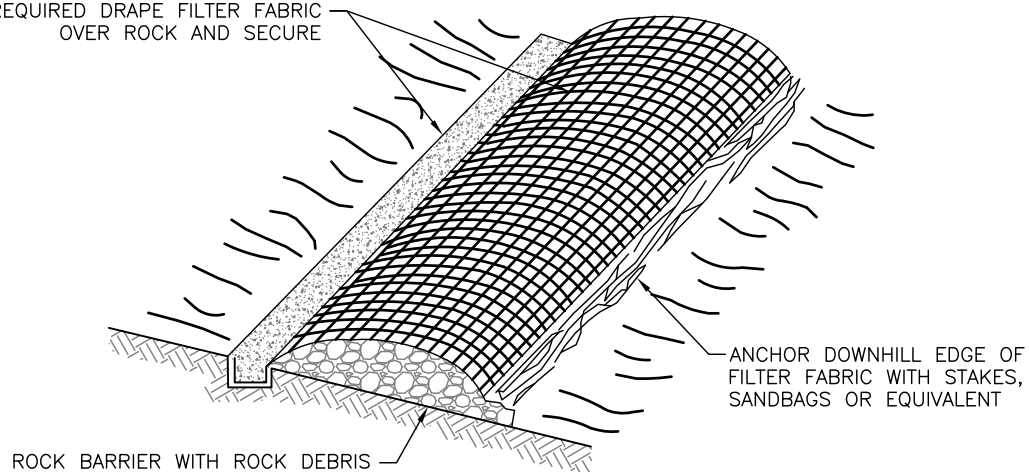
Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

ESC-15.3
ALASKA LNG PIPELINE PROJECT
BARRIERS/BERMS, BRUSH BARRIER

Rev.
0

IF REQUIRED DRAPE FILTER FABRIC
OVER ROCK AND SECURE



NOTES:

1. EXCAVATE 4" x 4" TRENCH ALONG UPSTREAM SIDE OF ROCK FILTER BERM.
2. DRAPE FILTER FABRIC OVER ROCK FILTER BERM ENSURING UPSTREAM SIDE IS IN TRENCH.
3. BACKFILL AND COMPACT SOIL OVER FILTER FABRIC IN EXCAVATED TRENCH.
4. SECURE FILTER FABRIC OVER ROCK FILTER BERM BY STAKING ON DOWNSTREAM SIDE OF BERM.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

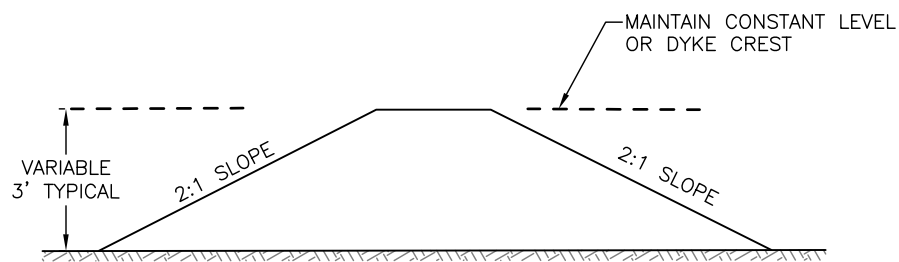
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

ESC-15.4
ALASKA LNG PIPELINE PROJECT
BARRIERS/BERMS, ROCK BARRIER

Rev.
0



TYPICAL SECTION

NOTES:

1. SILT ACCUMULATION TO BE REMOVED WHEN HALF EARTH DYKE HEIGHT COVERED.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

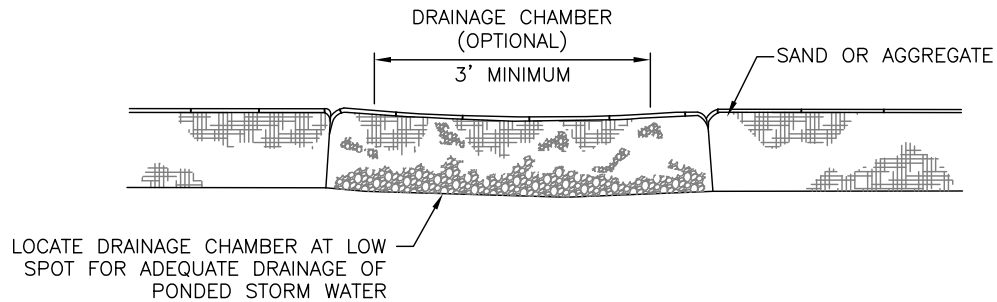
NOT FOR CONSTRUCTION

Modified From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

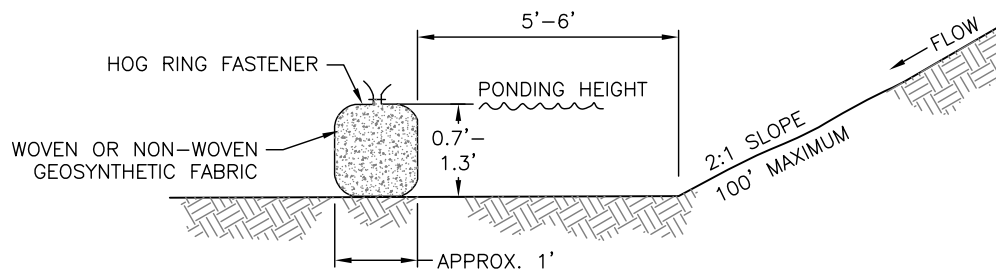
ALASKA LNG

ESC-15.5
ALASKA LNG PIPELINE PROJECT
BARRIERS/BERMS, EARTH DIKE BARRIER

Rev.
0



FRONT VIEW



SIDE VIEW

NOTES:

1. USE OF WOVEN GEOTEXTILE IS PREFERRED FOR CONTINUOUS BERM.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

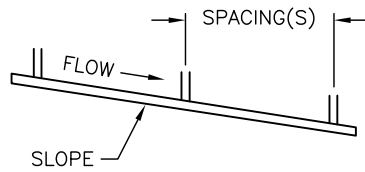
NOT FOR CONSTRUCTION

Modified From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

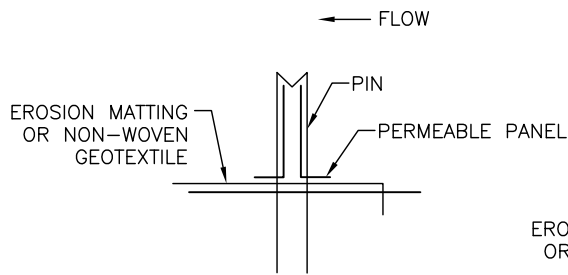
ALASKA LNG

ESC-15.6
ALASKA LNG PIPELINE PROJECT
BARRIERS/BERMS, EARTH FILLED GEOTEXTILE BARRIER

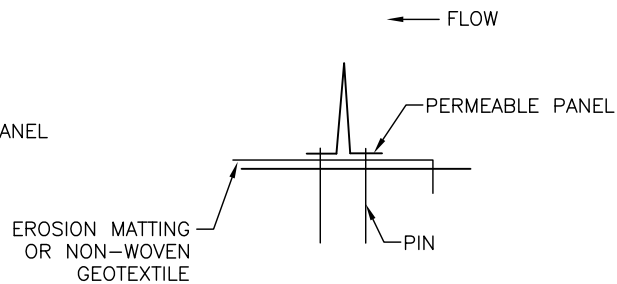
Rev.
0



MINIMUM INSTALLATION LENGTH UP SLOPES	
SLOPE	LENGTH: L (ft.)
2:1	1.75
2.5:1	3.5
3:1	3.5
3.5:1	3.5
4:1	3.5
5:1	4.25
6:1	5.0



DOUBLE PANEL SIDE VIEW



TRIANGLE PANEL SIDE VIEW

NOTES:

1. FOR USE MAINLY AS A GRADE BREAK STRUCTURE FUNCTIONING AS A FLOW ENERGY DISSIPATOR AND VELOCITY RETARDER.
2. FOR SECONDARY USE AS SEDIMENT BARRIER.
3. REQUIRES NON-WOVEN GEOTEXTILE FABRIC OR BIODEGRADABLE (COCONUT FIBRE PREFERABLE) EROSION BLANKET MAT AT BASE AND KEY-IN TO SOIL AT UPSTREAM END.
4. MAY BE INSTALLED AS GRADE BREAK AT GRADE TRANSITION AREAS TO CREATE DISSIPATION OF FLOW ENERGY AND A MORE LAMINAR FLOW REGIME DOWNSTREAM OF STRUCTURE.
5. DITCH BARRER SPACINGS ARE TO BE DESIGNED BY ENGINEER.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

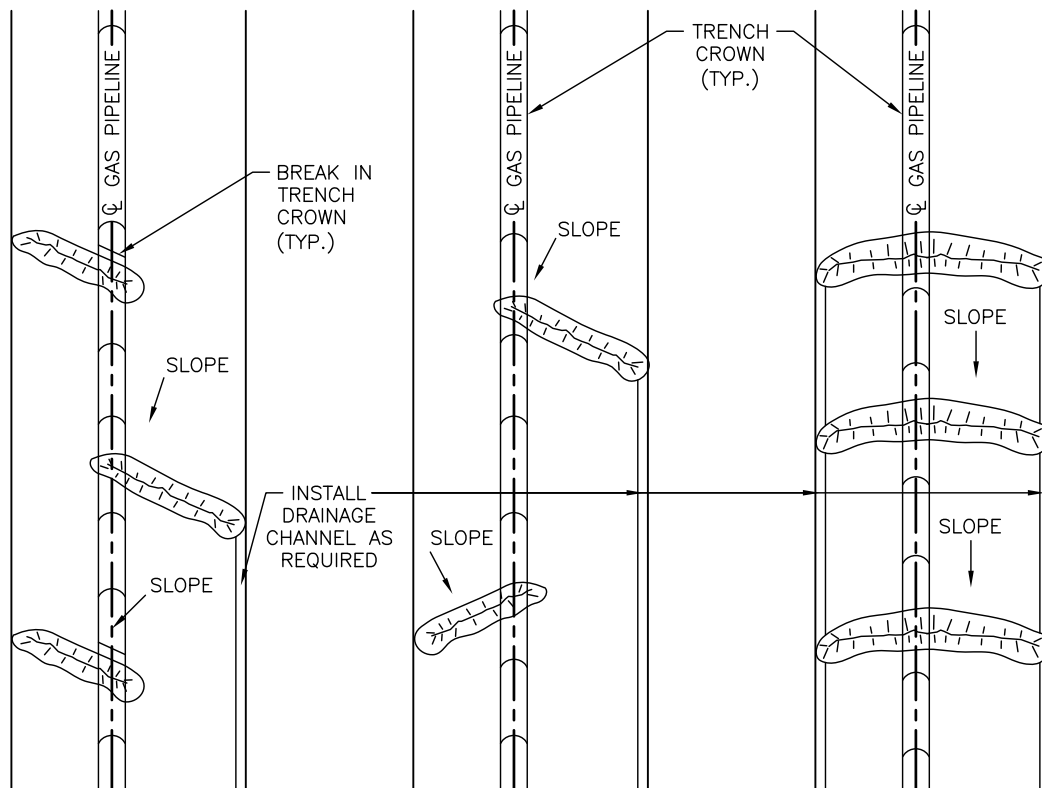
NOT FOR CONSTRUCTION

Adopted From: Alberta Field Guide for Erosion and Sediment Control. 2011

ALASKA LNG

ESC-15.7
ALASKA LNG PIPELINE PROJECT
BARRIERS/BERMS, SYNTHETIC PERMEABLE BARRIER

Rev.
0



DIAGONAL BERMS ONE-WAY
SURFACE FLOW

DIAGONAL BERMS TWO-WAY
SURFACE FLOW

HERRINGBONE BERMS
ONE-WAY SURFACE FLOW

PLAN VIEW

NOTES:

1. DIAGONAL DIVERSION BERMS SHOULD BE USED TO DIRECT SURFACE WATER AWAY FROM TRENCHLINE ON SIDE SLOPES.
2. HERRINGBONE BERMS SHOULD BE USED ON PERPENDICULAR SLOPES TO DIVERT SURFACE WATER AWAY FROM TRENCHLINE.
3. DETERMINE LOCATION AND CONFIGURATION OF BERM(S) BASED ON LOCAL TOPOGRAPHY AND DRAINAGE PATTERNS. SKEW BERM DOWNSLOPE TO ACHIEVE APPROXIMATELY 4% GRADIENT.
4. LEAVE BREAK IN TRENCH CROWN IMMEDIATELY UPSLOPE OF DIAGONAL BERMS. NOT APPLICABLE FOR HERRINGBONE BERMS.
5. SPACING IS DEPENDENT ON SLOPE ANGLE AND SOILS.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

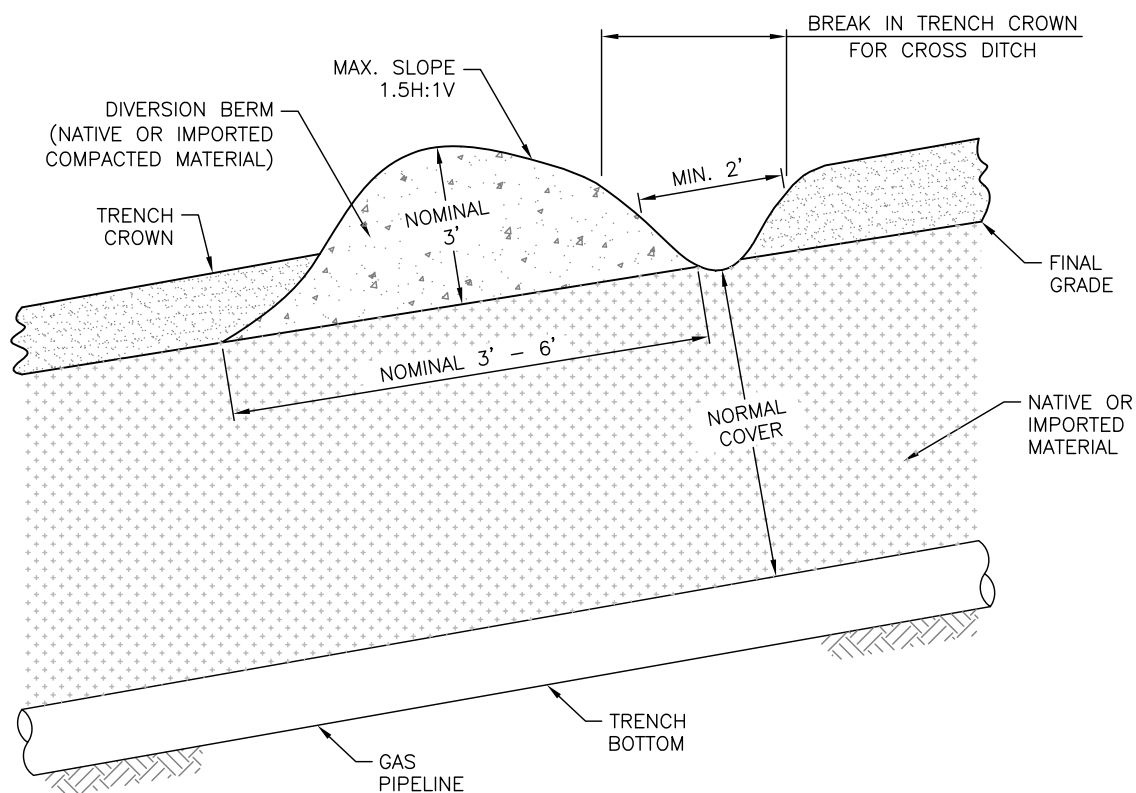
NOT FOR CONSTRUCTION

Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

ALASKA LNG

ESC-15.8-A
ALASKA LNG PIPELINE PROJECT
DIVERSION BERM CONFIGURATION

Rev.
0



PROFILE

NOTES:

1. CONSTRUCT DIVERSION BERM(S) AND CROSS DITCH(ES) ON SLOPES TO REDIRECT SURFACE RUN-OFF AWAY FROM TRENCHLINE.
2. DIVERSION BERMS HEIGHT AND WIDTH SHOULD BE STRUCTURALLY STABLE BASED ON SLOPE TOPOGRAPHY.
3. LEAVE A BREAK IN TRENCH CROWN IMMEDIATELY UPSLOPE OF DIVERSION BERMS.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

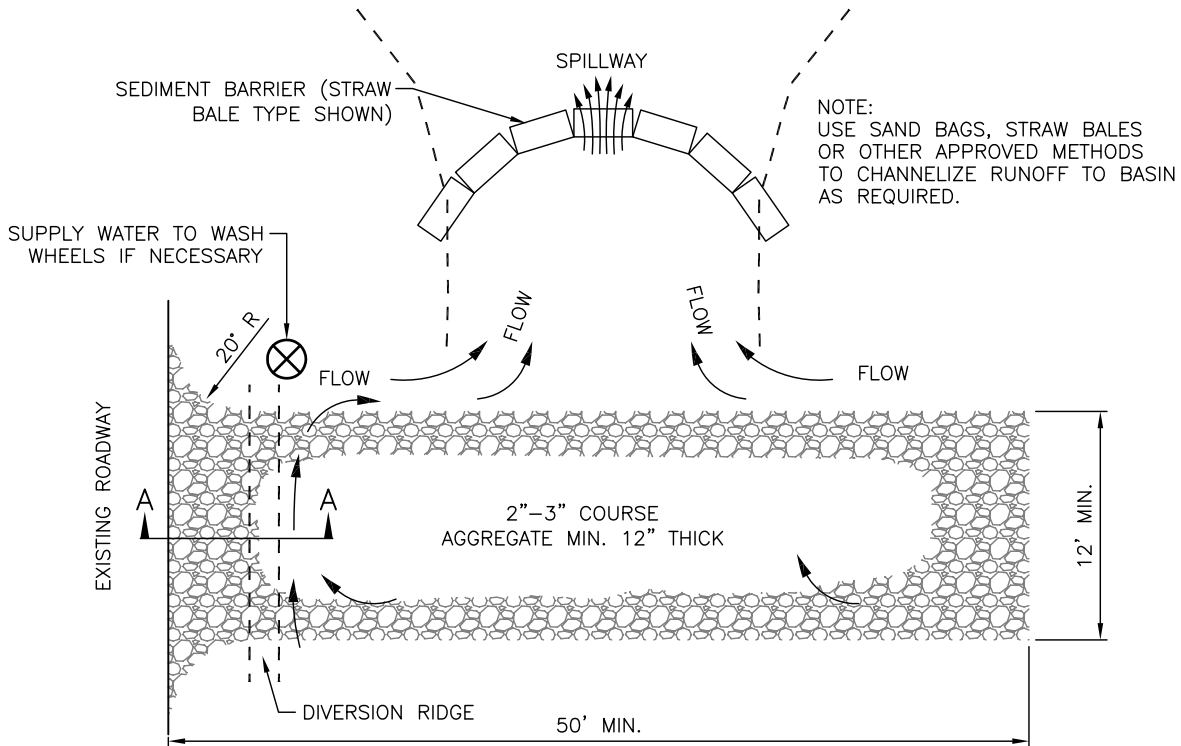
NOT FOR CONSTRUCTION

Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

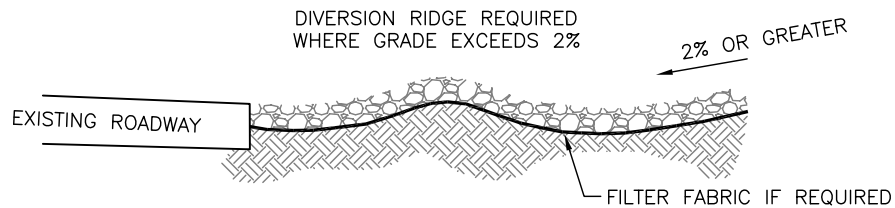
ALASKA LNG

ESC-15.8-B
ALASKA LNG PIPELINE PROJECT
DIVERSION BERM AND CROSS DITCH

Rev.
0



PLAN



SECTION A - A

NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

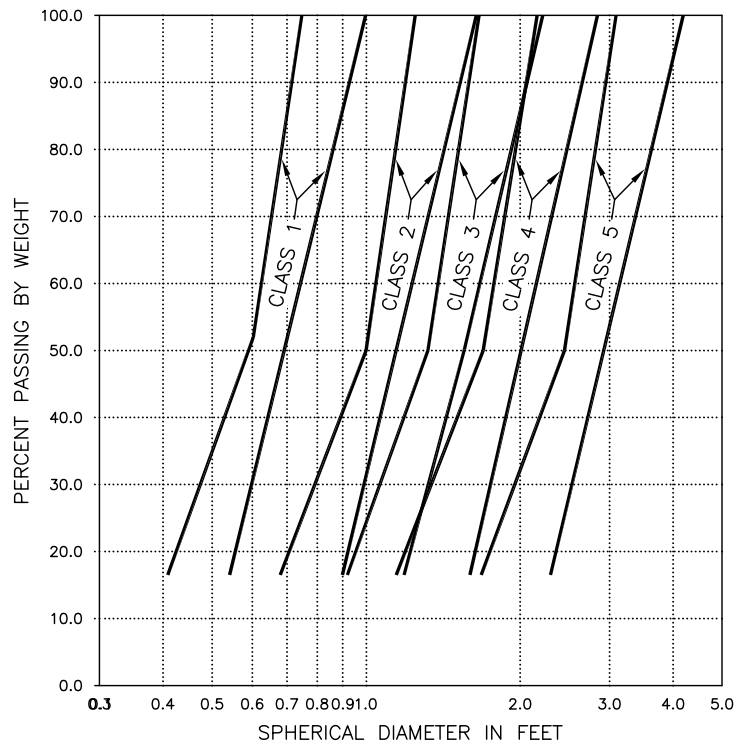
Adopted From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-16
ALASKA LNG PIPELINE PROJECT
VEHICLE TRACKING ENTRANCE/EXIT

Rev.
0

RIP RAP SIZE CURVES



NON-WOVEN GEOTEXTILE FILTER FABRIC SPECIFICATIONS AND PHYSICAL PROPERTIES

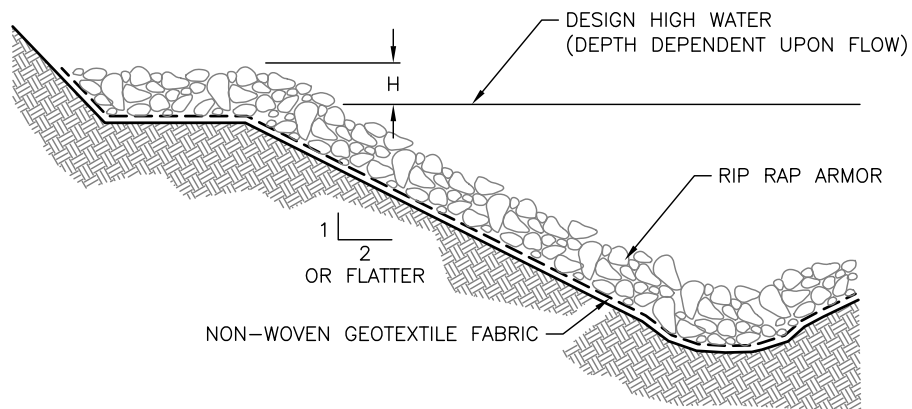
	CLASS 1	CLASS 2	CLASS 3	CLASS 4 & 5
TENSILE STRENGTH	100 lb	100 lb	100 lb	200 lb
ELONGATION (FAILURE)	15%	15%	15%	15%
PUNCTURE STRENGTH	40 lb	40 lb	40 lb	80 lb
TEAR STRENGTH	25 lb	30 lb	30 lb	30 lb
ABRASION STRENGTH	NOT REQUIRED	25 lb	55 lb	55 lb
MINIMUM FABRIC OVERLAP TO BE 1.0'				

NOT FOR CONSTRUCTION

ALASKA LNG

ESC-17.1/17.2
ALASKA LNG PIPELINE PROJECT
RIP RAP ARMOR SPECIFICATION

Rev.
0



TYPICAL SECTION

NOTES:

1. DESIGN HEIGHT (H), WIDTH AND RIP RAP SIZE SHALL BE DETERMINED BY THE ENGINEER.
2. RIPRAP GRADATION AND THICKNESS SHALL BE DETERMINED BY THE ENGINEER IN ACCORDANCE WITH HYDRAULIC CONDITIONS.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

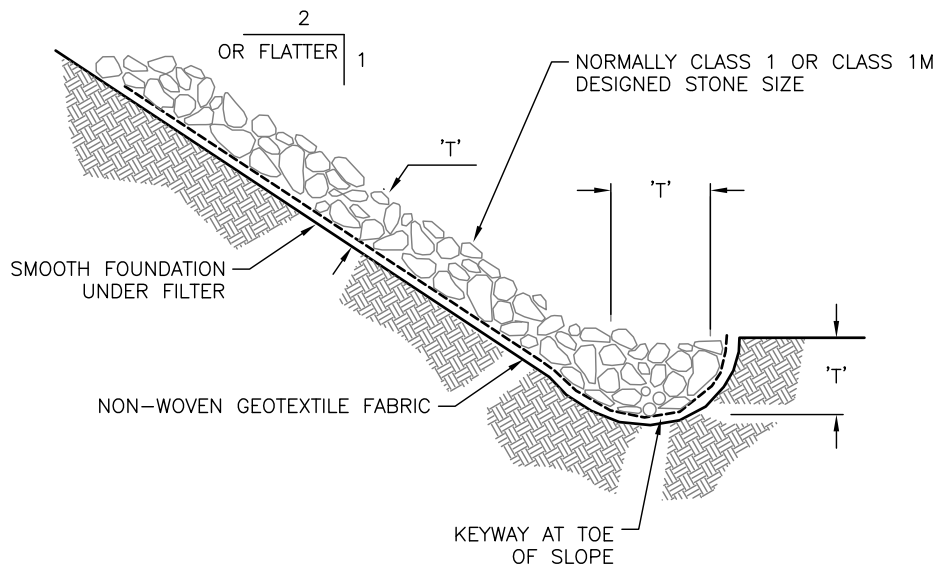
NOT FOR CONSTRUCTION

Adopted From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-17.1
ALASKA LNG PIPELINE PROJECT
RIP RAP ARMOR, CHANNEL INSTALLATION

Rev.
0



TYPICAL SECTION

NOTES:

1. 'T' = THICKNESS: THICKNESS SHALL BE DETERMINED BY THE ENGINEER. MINIMUM THICKNESS = 12". (i.e. $1.5 \times D_{50}$) FOR $D_{50} = 8"$.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

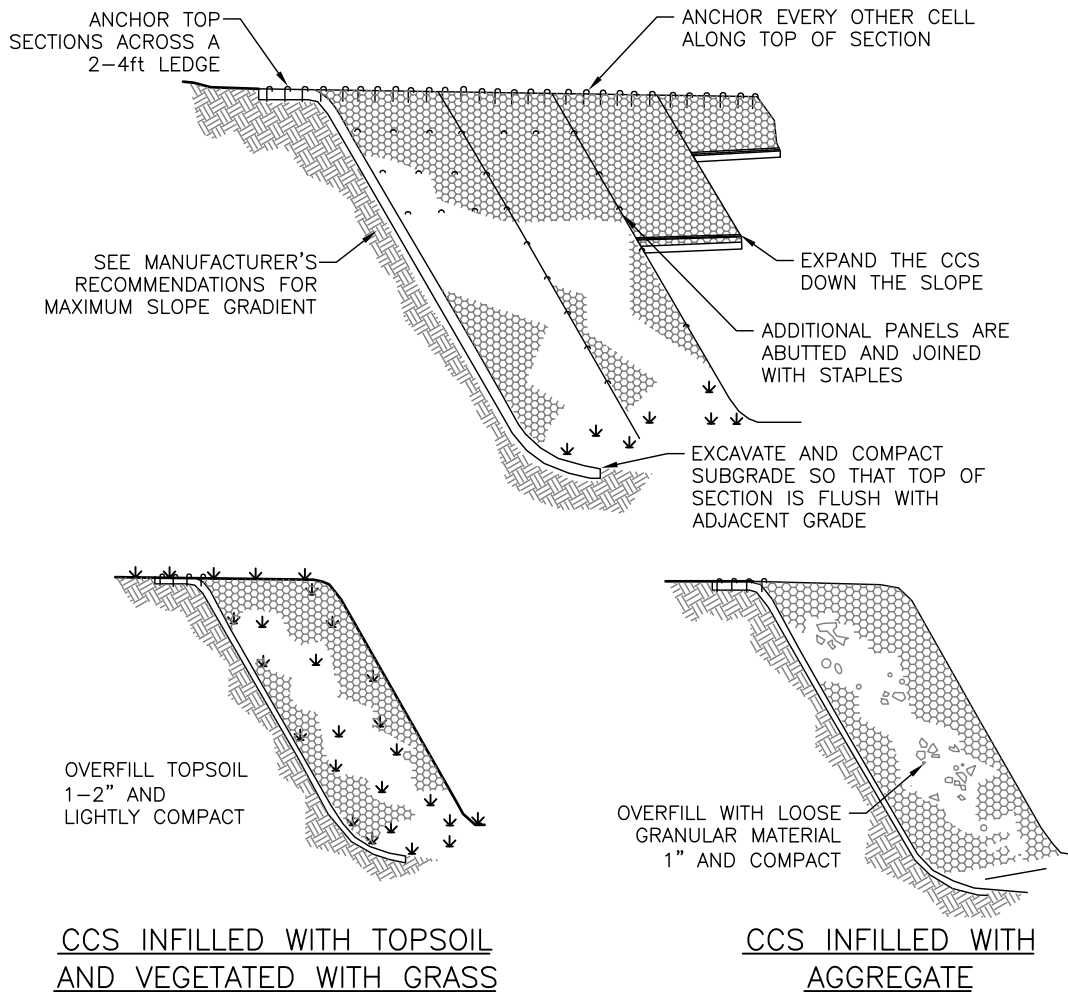
NOT FOR CONSTRUCTION

Adopted From: Alberta Field Guide for Erosion and Sediment Control. 2011

ALASKA LNG

ESC-17.2
ALASKA LNG PIPELINE PROJECT
RIP RAP ARMOR, SLOPE INSTALLATION

Rev.
0



NOTES:

1. SURFACE OF SLOPE SHALL BE LEVELED WITH GULLIES FILLED AND WELL COMPACTED.
2. SHAPE AND COMPACT SUBGRADE SURFACES TO DESIGN ELEVATIONS AND GRADES.
3. THE CELLS SHALL BE ANCHORED SECURELY TO PREVENT DISPLACEMENT AND DEFORMATION OF PANELS WHEN BACKFILLING.
4. INFILL FROM CREST OF THE SLOPE TO TOE TO PREVENT DISPLACEMENT. LIMIT DROP HEIGHT TO 3ft.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

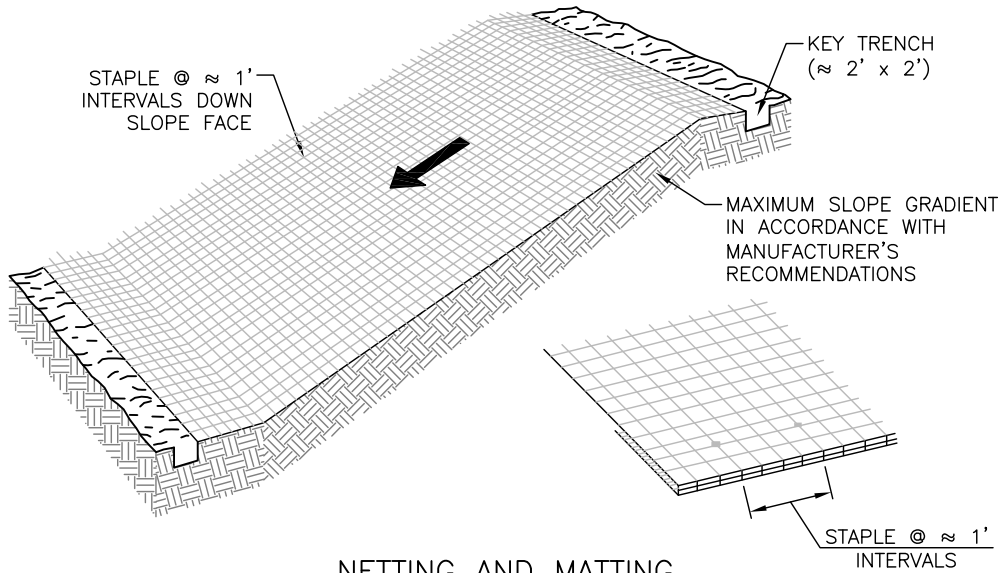
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

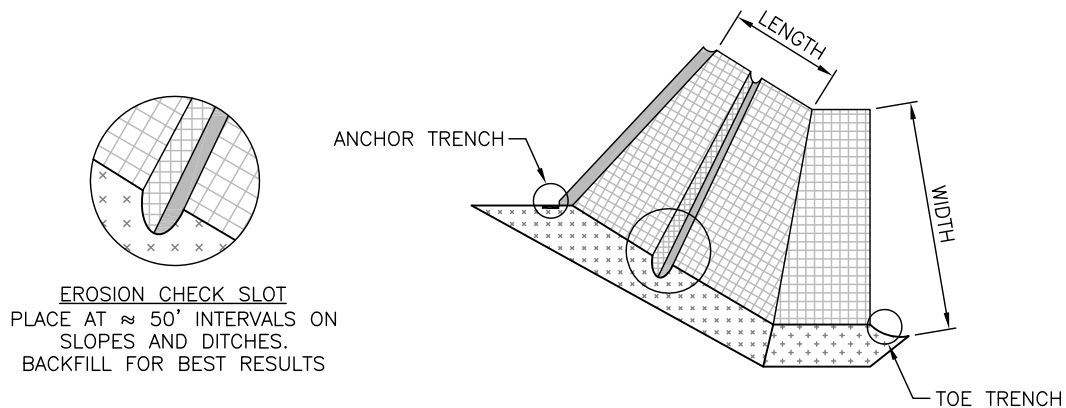
ALASKA LNG

ESC-18
ALASKA LNG PIPELINE PROJECT
CELLULAR CONFINEMENT SYSTEMS

Rev.
0



NETTING AND MATTING



TYPICAL SLOPE INSTALLATION

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

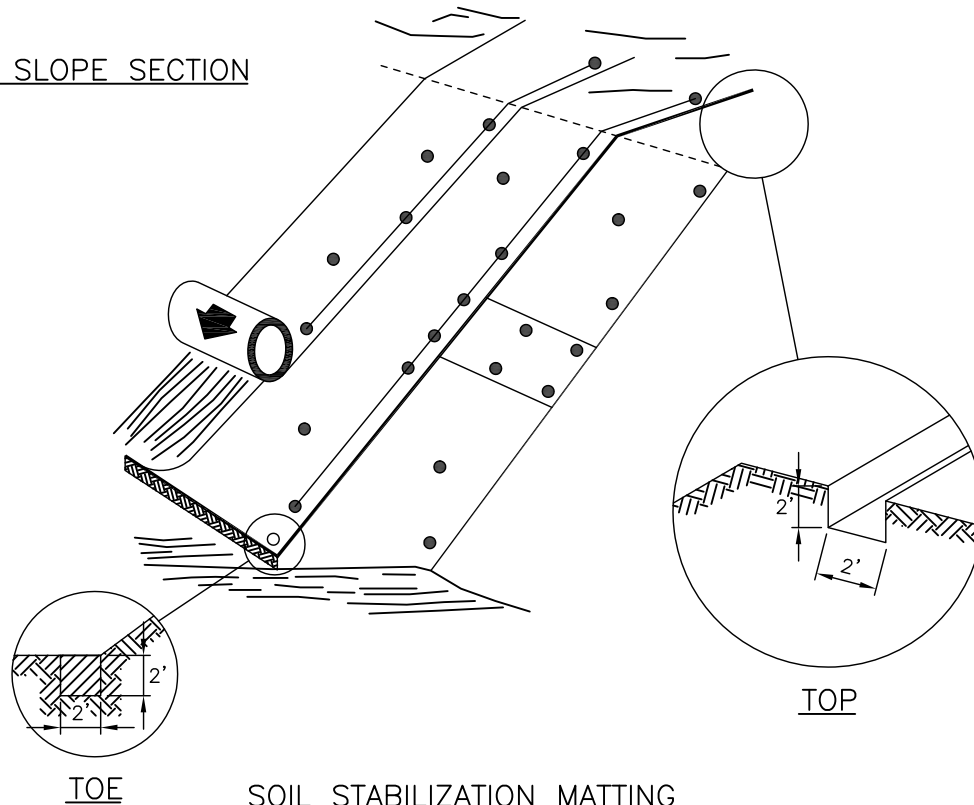
Modified From:
City of Moncton Erosion and Sediment Control at Construction Sites. 2011

ALASKA LNG

ESC-19.2
ALASKA LNG PIPELINE PROJECT
BLANKETS AND COVERS, MANUFACTURED BLANKETS

Rev.
0

FILL SLOPE SECTION



SOIL STABILIZATION MATTING
SLOPE INSTALLATION

NOTES:

1. MATTING MUST BE KEYED IN AT TOP AND TOE OF SLOPE AS SHOWN ABOVE AND BACKFILLED WITH FINE NATIVE SOIL.
2. MATTING SECTIONS MUST BE PLACED PANELLED TO THE SLOPE DIRECTION AND MUST OVERLAP A MINIMUM OF 1'.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

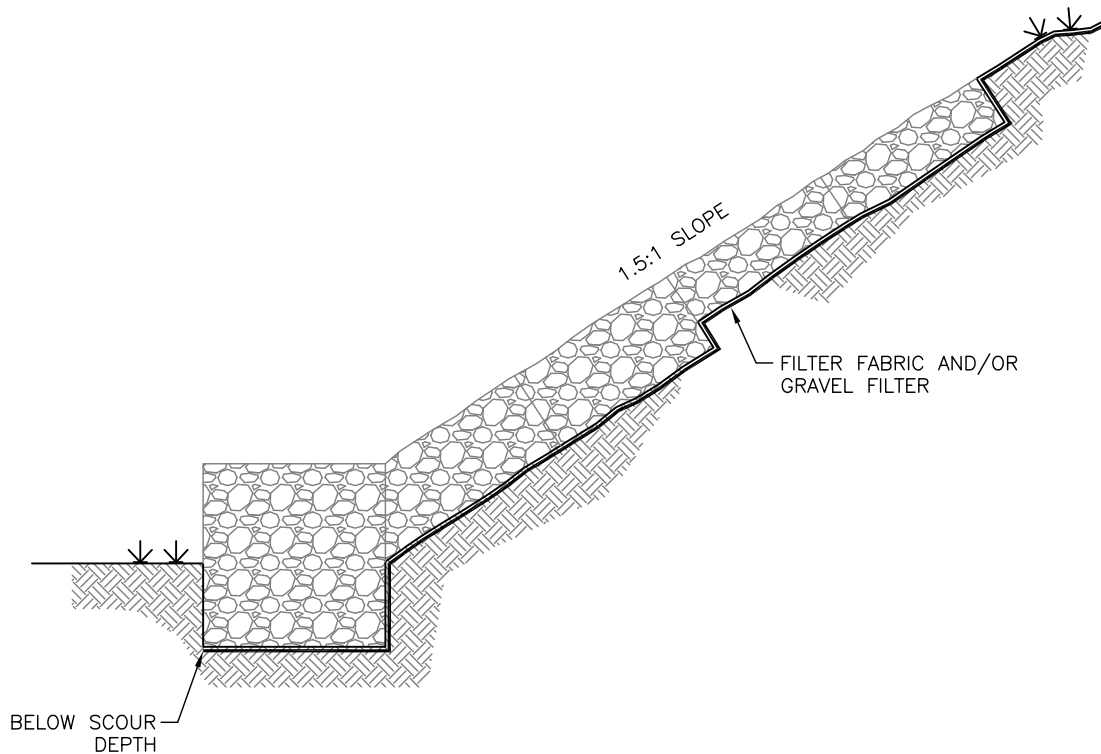
NOT FOR CONSTRUCTION

Modified From: Alaska Storm Water Guide. 2009

ALASKA LNG

ESC-19.3
ALASKA LNG PIPELINE PROJECT
BLANKETS AND COVERS, GEOTEXTILE AND STABILIZATION MATTING

Rev.
0



TYPICAL GABION AND GABION MATTRESS
(SLOPE AND BANK)

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

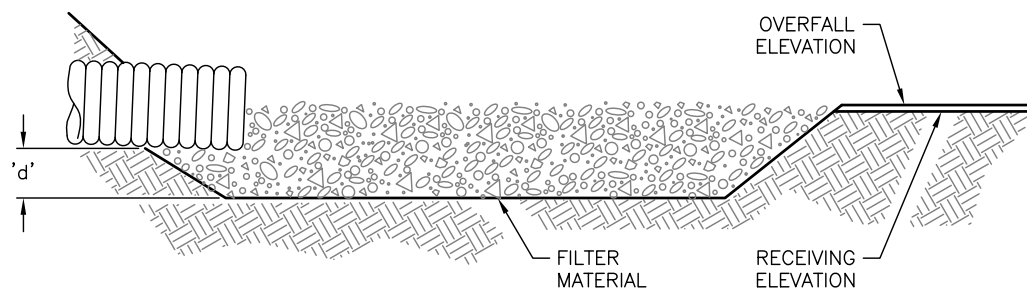
NOT FOR CONSTRUCTION

Modified From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

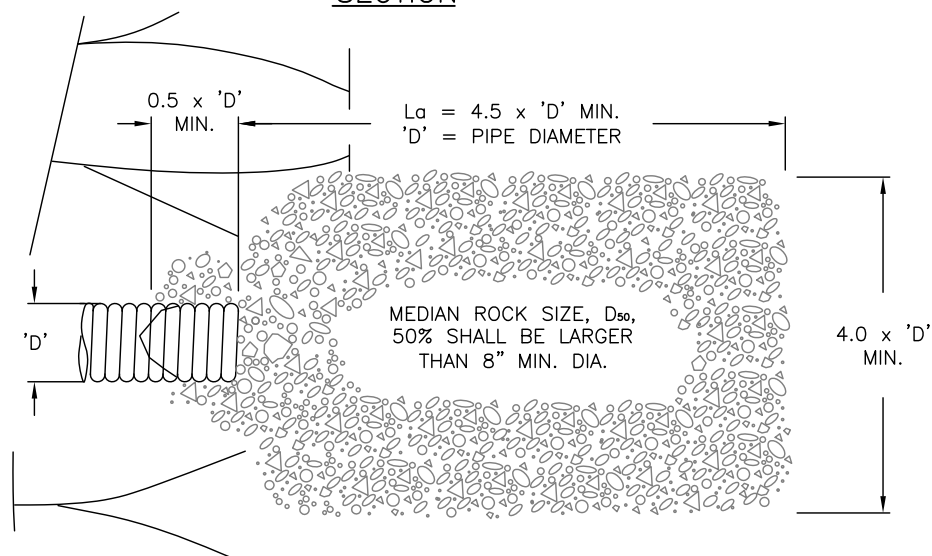
ESC-19.4
ALASKA LNG PIPELINE PROJECT
BLANKETS AND COVERS, GABION MATTRESS

Rev.
0



('d') MINIMUM THICKNESS = 12". (i.e. $1.5 \times D_{50}$) FOR $D_{50} = 8"$.

SECTION



PLAN

NOTES:

1. 'La' = LENGTH OF APRON. DISTANCE 'La' SHALL BE OF SUFFICIENT LENGTH TO DISSIPATE ENERGY.
2. APRON SHALL BE SET AT A ZERO GRADE AND ALIGNED STRAIGHT.
3. FILTER MATERIAL SHALL BE FILTER FABRIC OR 6" THICK MINIMUM GRADED GRAVEL LAYER.
4. FOR PIPE DIAMETER > 24", DESIGN BY ENGINEER IS REQUIRED.
5. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

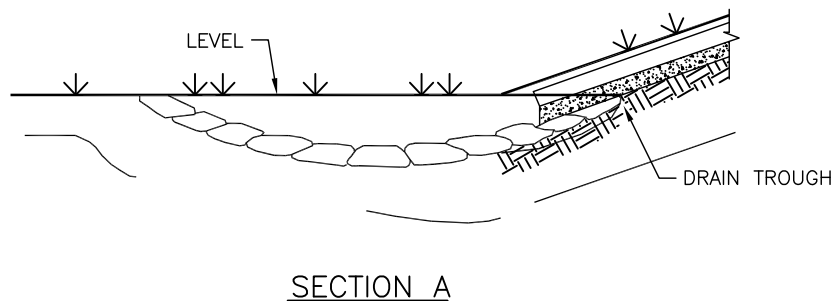
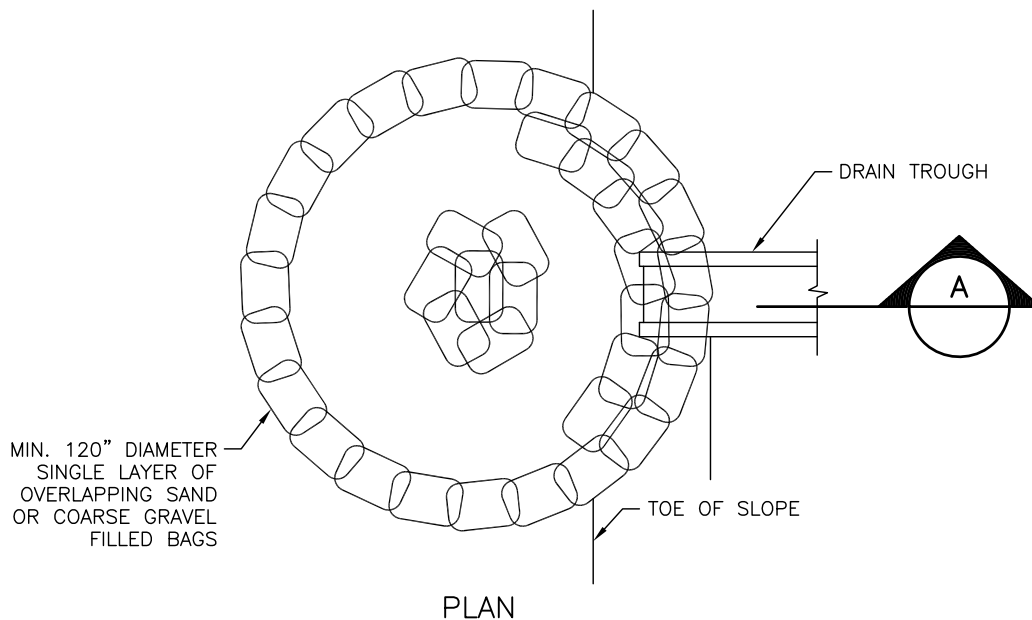
NOT FOR CONSTRUCTION

Modified From: Alaska Highway Drainage Manual. 2004

ALASKA LNG

ESC-20-A
ALASKA LNG PIPELINE PROJECT
ENERGY DISSIPATOR

Rev.
0



NOTES:

1. PLACING OF BAGGED CONCRETE RIPRAP SHALL START AT THE BOTTOM CENTRE OF THE DISHED AREA AND SHALL PROCEED IN A CONTINUOUS SPIRAL FASHION OUTWARD UNTIL THE ENTIRE DISH IS COVERED. EACH CONCRETE FILLED BAG SHALL LAP OVER THE EDGES OF THE PREVIOUSLY PLACED BAGS.
2. MINIMUM DIAMETER OF ENERGY DISSIPATOR SHOULD BE DETERMINED BASED ON SITE SPECIFIC HYDRAULIC DESIGN.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

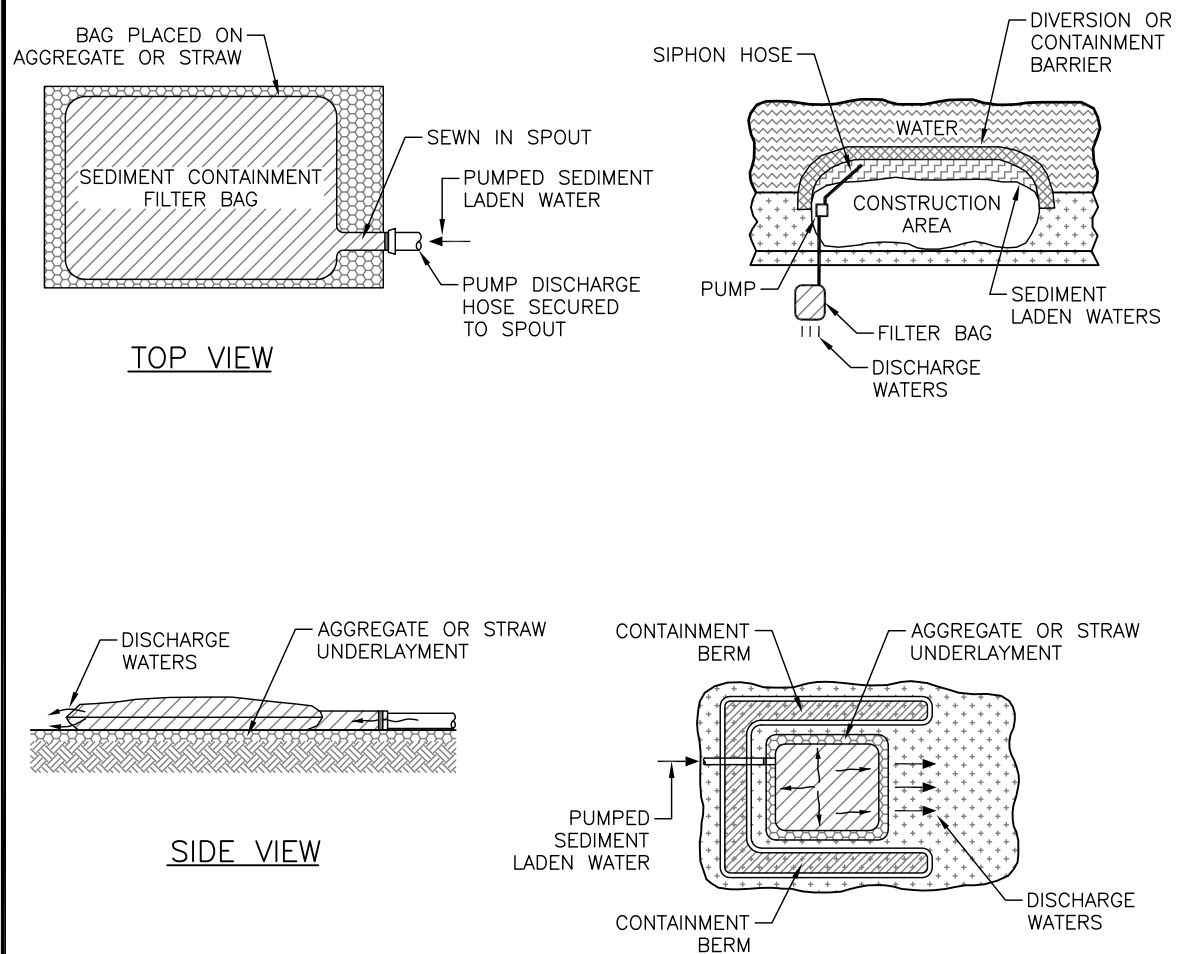
NOT FOR CONSTRUCTION

Adopted From:
Alberta Design Guidelines for Erosion and Sediment Control for Highways. 2003

ALASKA LNG

ESC-20-B
ALASKA LNG PIPELINE PROJECT
ENERGY DISSIPATOR

Rev.
0



NOTES:

1. DISCHARGE WATER ONTO A LINED SWALE, FIELD, OR ONTO A SECONDARY SEDIMENT CONTAINMENT SYSTEM.
2. DISCHARGE WATER MUST FLOW AWAY FROM THE CONSTRUCTION AREA.
3. SEDIMENT CAPTURED BY THE FILTER BAG MUST BE REMOVED AND STABILIZED.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

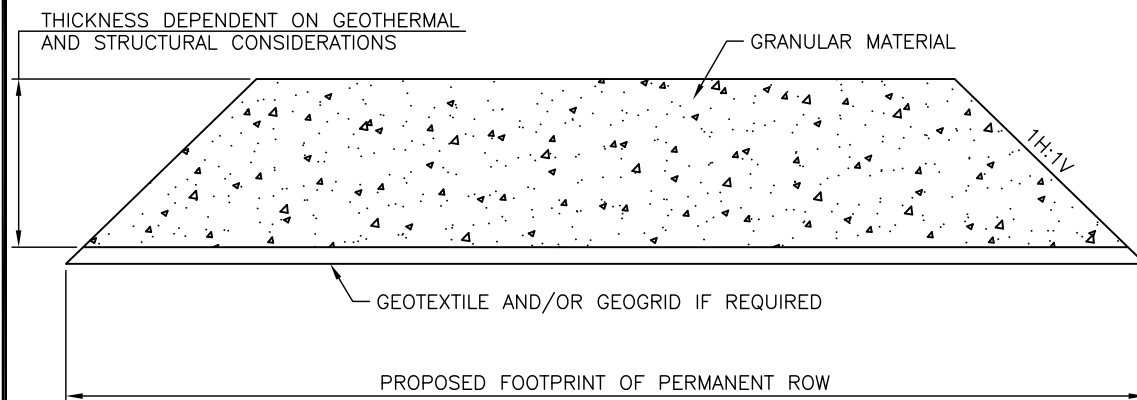
NOT FOR CONSTRUCTION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.

ALASKA LNG

ESC-22
ALASKA LNG PIPELINE PROJECT
SEDIMENT CONTROL SYSTEMS, PUMPED SILT CONTROL SYSTEM

Rev.
0

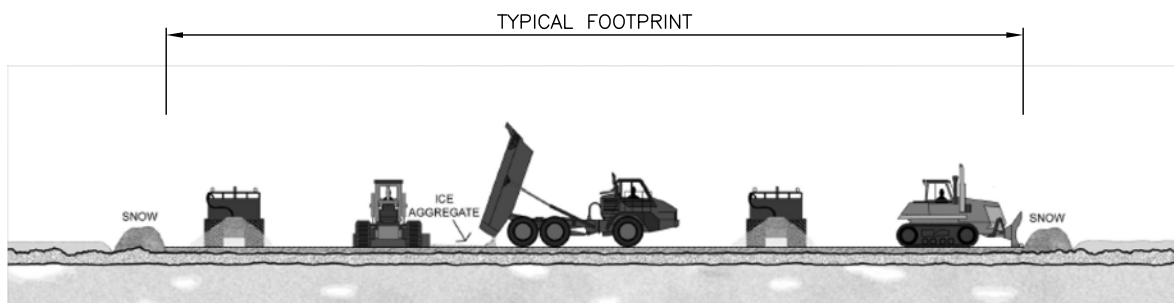


GRANULAR PAD

NOTES:

1. THICKNESS OF GRANULAR MATERIAL WILL VARY BASED ON NATIVE SOIL CONDITIONS AS WELL AS GEOTHERMAL AND STRUCTURAL REQUIREMENTS.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

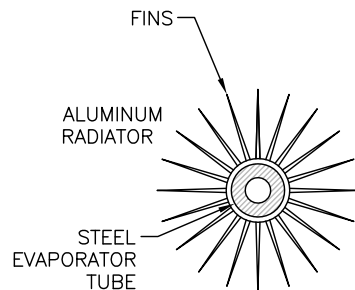
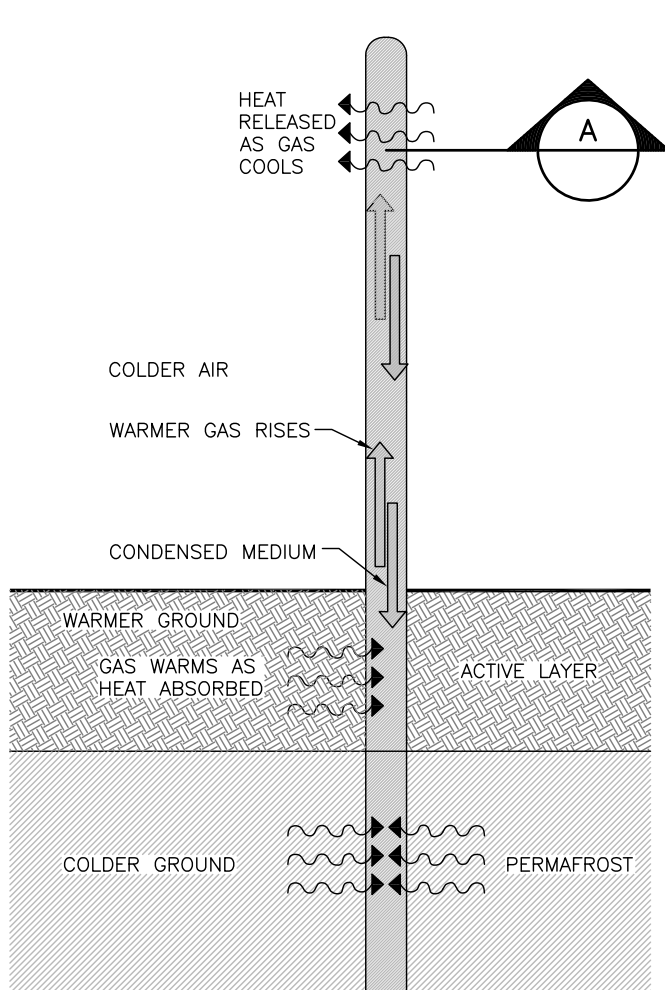


SNOW/ICE PAD

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION



RADIATOR SECTION A - A

TYPICAL THERMOPROBE OPTION

NOTES:

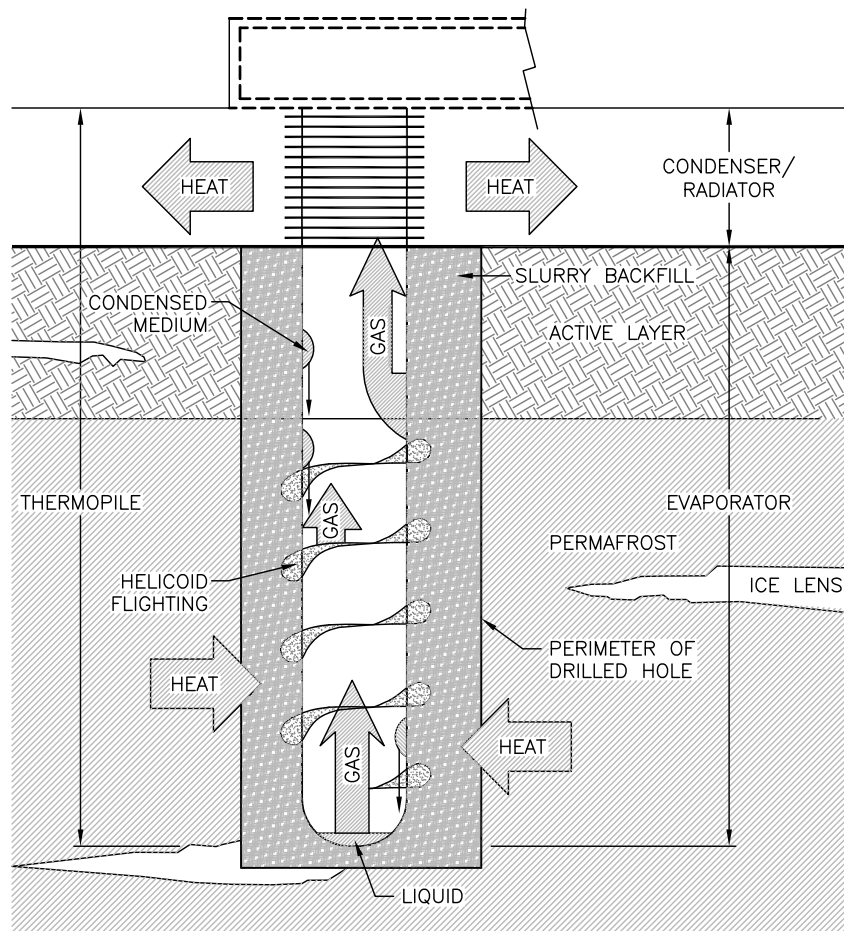
1. APPLICATION OF THERMOPROBES ARE OFTEN SUPPLEMENTED WITH AN INSULATION LAYER BENEATH A THIN GRAVEL PAD IN AREAS OF WARM PERMAFROST TO ENSURE EFFECTIVENESS DURING NON-OPERATIONAL SUMMER PERIOD.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER IN WHICH TYPE AND CONFIGURATION MAY DIFFER FROM THAT SHOWN.

NOT FOR CONSTRUCTION

ALASKA LNG

ESC-24-A
ALASKA LNG PIPELINE PROJECT
THERMOSYPHONS, THERMOPROBE OPTION

Rev.
0

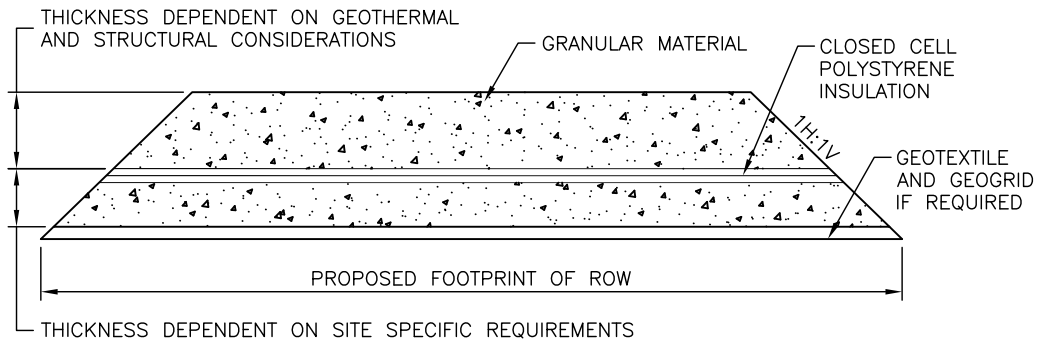


TYPICAL THERMOPILE OPTION

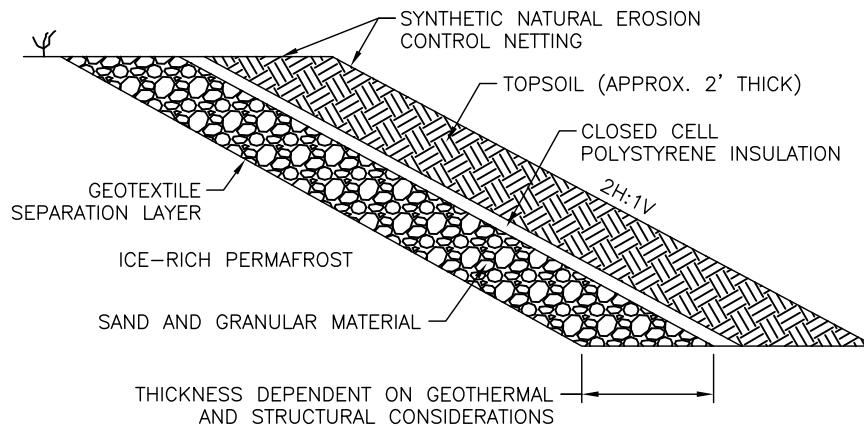
NOTES:

1. APPLICATION OF THERMOPROBES ARE OFTEN SUPPLEMENTED WITH AN INSULATION LAYER BENEATH A THIN GRAVEL PAD IN AREAS OF WARM PERMAFROST TO ENSURE EFFECTIVENESS DURING NON-OPERATIONAL SUMMER PERIOD.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER IN WHICH TYPE AND CONFIGURATION MAY DIFFER FROM THAT SHOWN.

NOT FOR CONSTRUCTION



GRANULAR COVER WITH INSULATION – R.O.W. OPTION



GRANULAR COVER WITH INSULATION – SLOPE OPTION

NOTES:

1. THICKNESS OF GRANULAR MATERIAL AND POLYSTYRENE INSULATION WILL VARY BASED ON NATIVE SOIL CONDITIONS, AS WELL AS GEOTHERMAL AND STRUCTURAL REQUIREMENTS.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

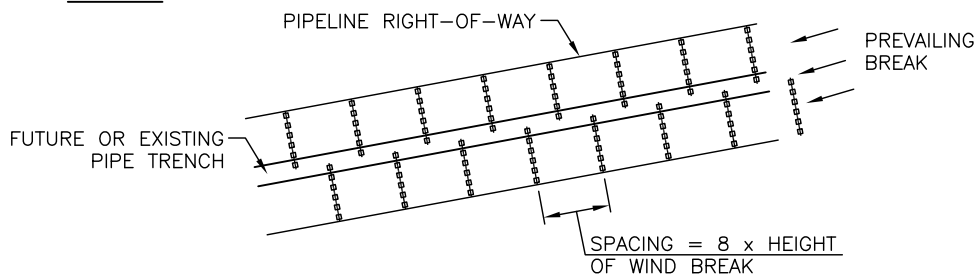
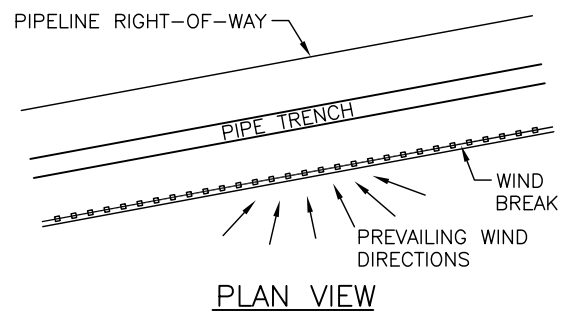
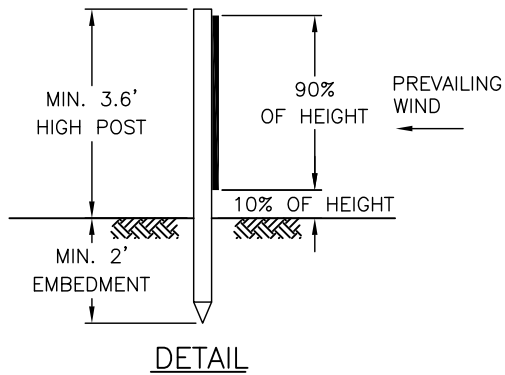
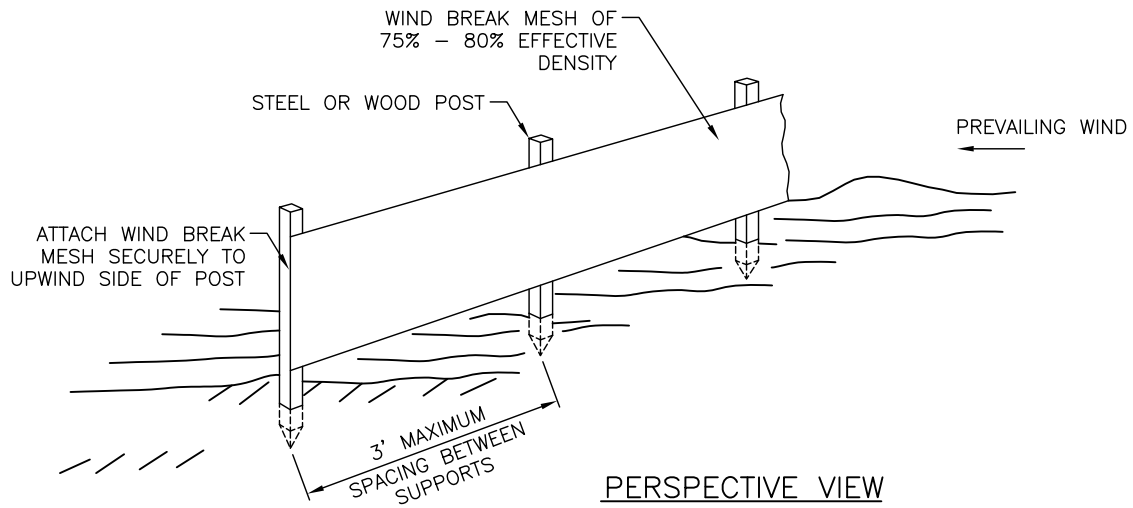
NOT FOR CONSTRUCTION

Modified From: Documenting Best Management Practices for Cut Slopes in Ice Rich Permafrost. 2009

ALASKA LNG

ESC-27
ALASKA LNG PIPELINE PROJECT
GRANULAR COVER, PLUS BOARD INSULATION

Rev.
0



NOTE:

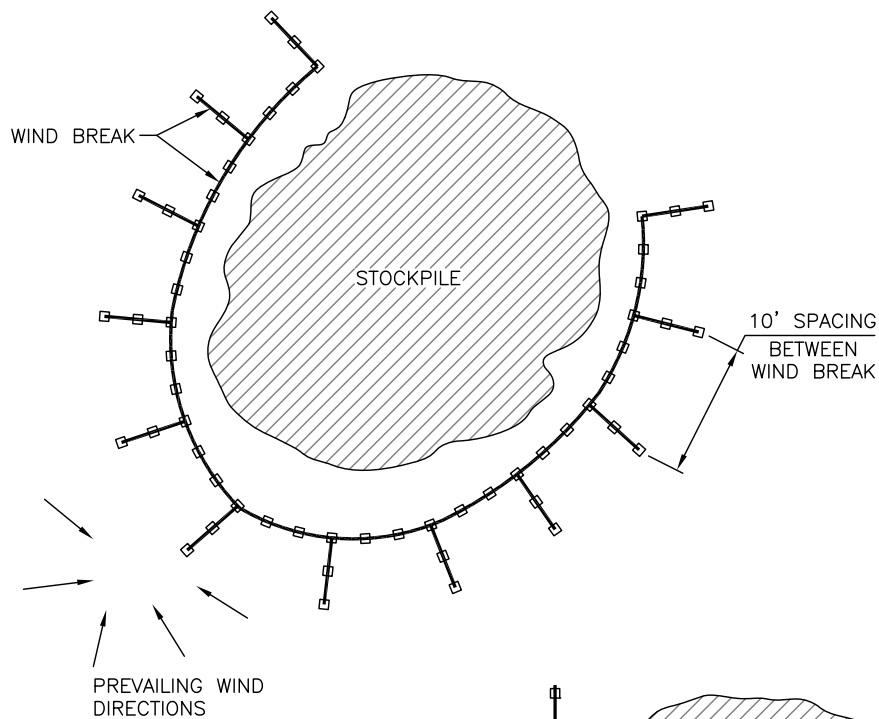
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

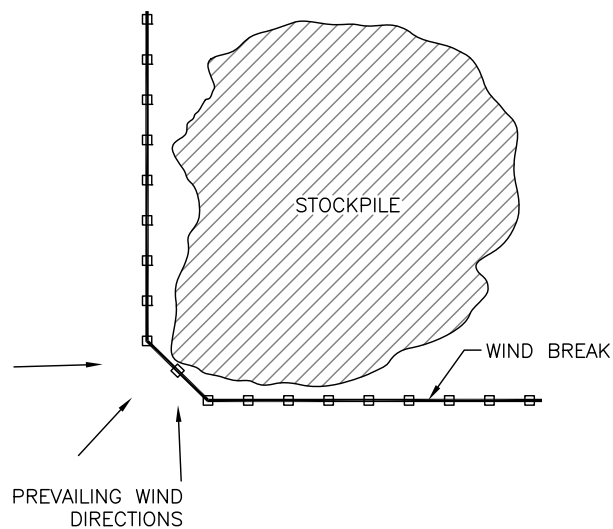
ALASKA LNG

ESC-28.1-A
ALASKA LNG PIPELINE PROJECT
DUST CONTROL, WIND BREAK

Rev.
0



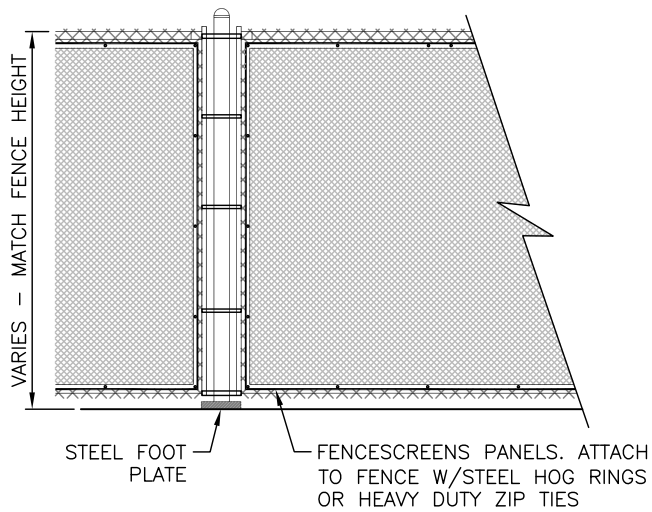
STOCKPILE INSTALLATION



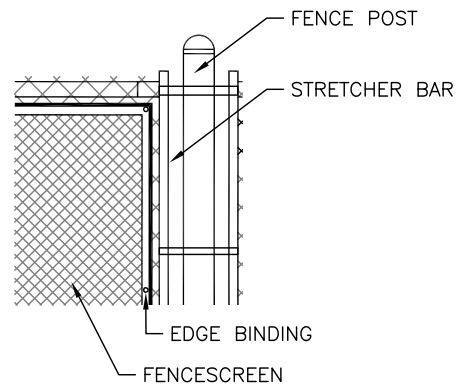
NOTES:

1. FENCE HEIGHT DEPENDENT ON MANUFACTURER'S SPECIFICATIONS.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

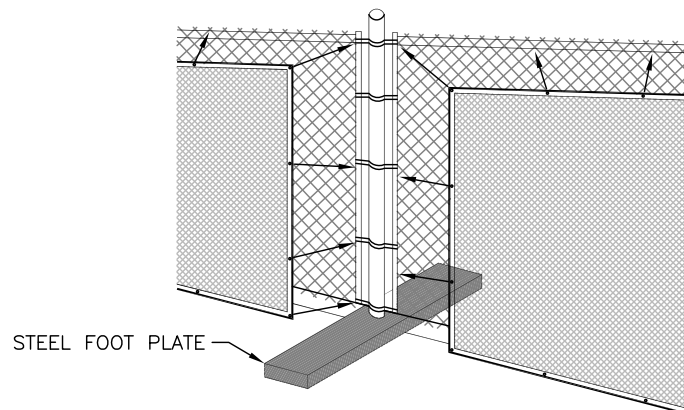
NOT FOR CONSTRUCTION



ELEVATION VIEW



ATTACHMENT ENLARGEMENT

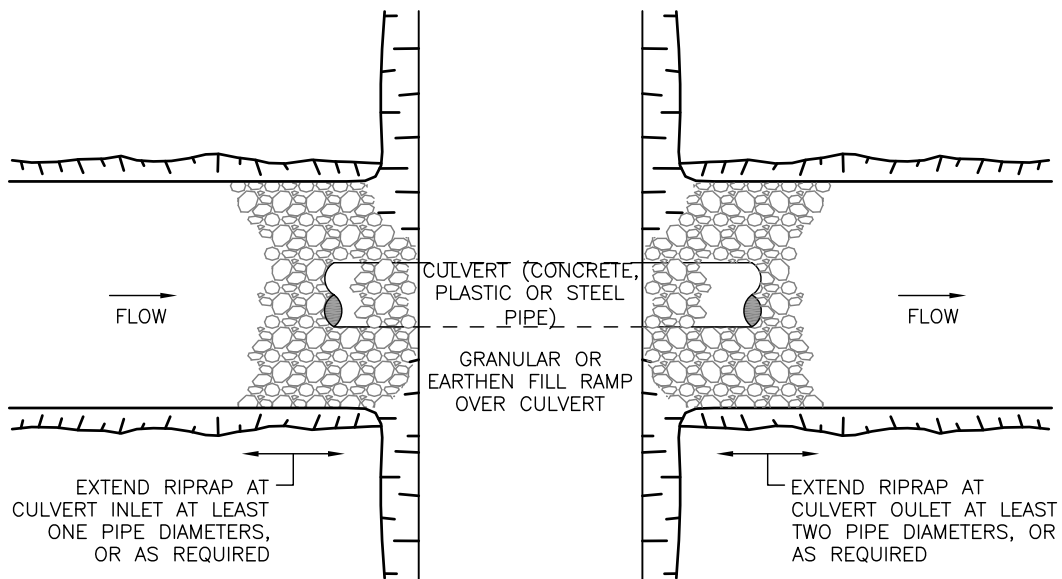


ATTACHMENT DETAIL 3-D

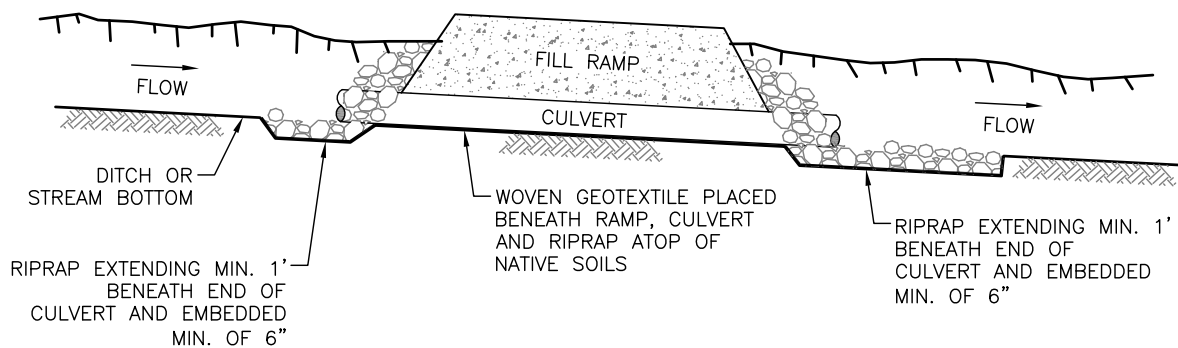
NOTES:

1. INSTALL PER FENCESCREEN MANUFACTURER RECOMMENDATIONS.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION



PLAN VIEW



PROFILE VIEW

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

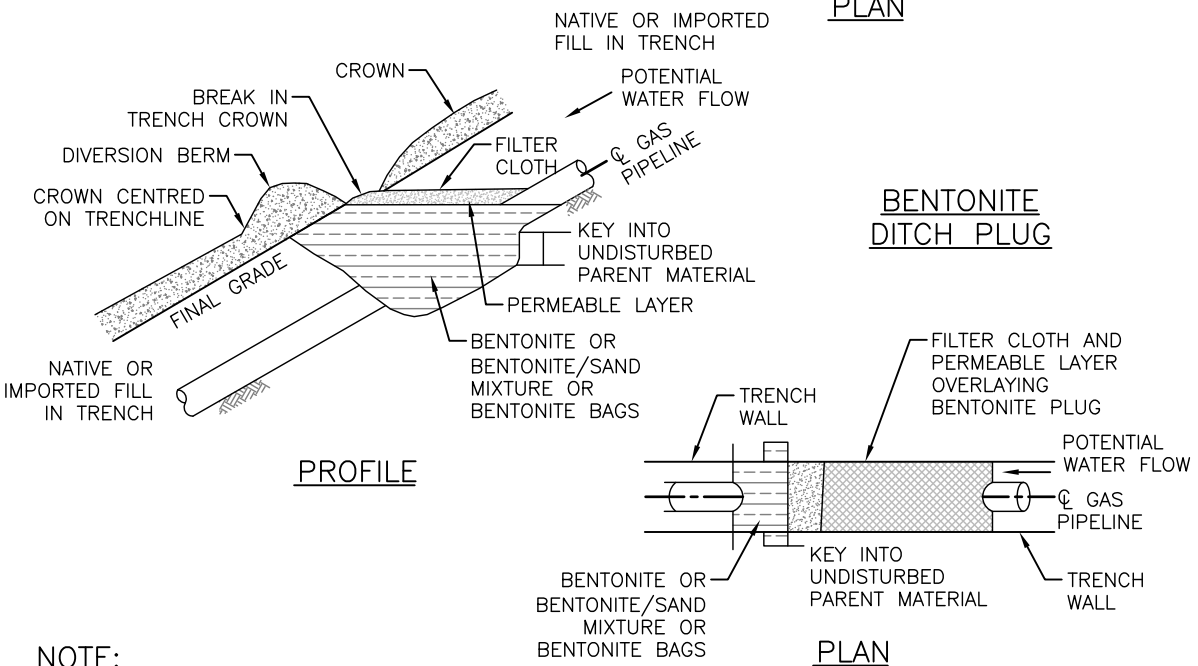
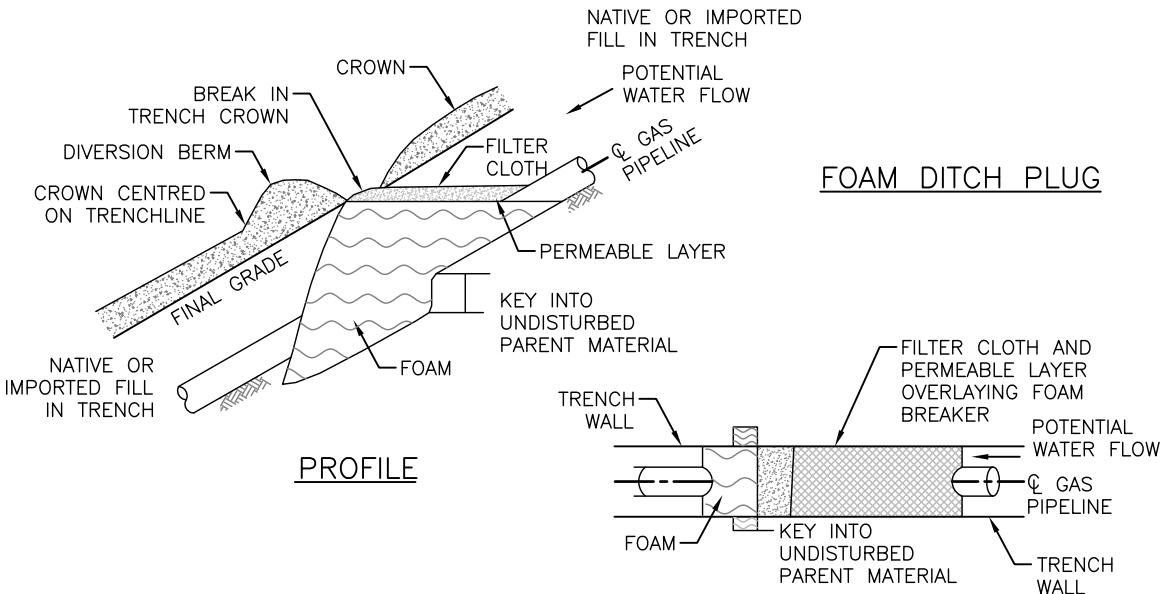
NOT FOR CONSTRUCTION

Modified From: CAPP Pipeline Associated Watercourse Crossings. 2012

ALASKA LNG

ESC-33
ALASKA LNG PIPELINE PROJECT
CULVERTS

Rev.
0



NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

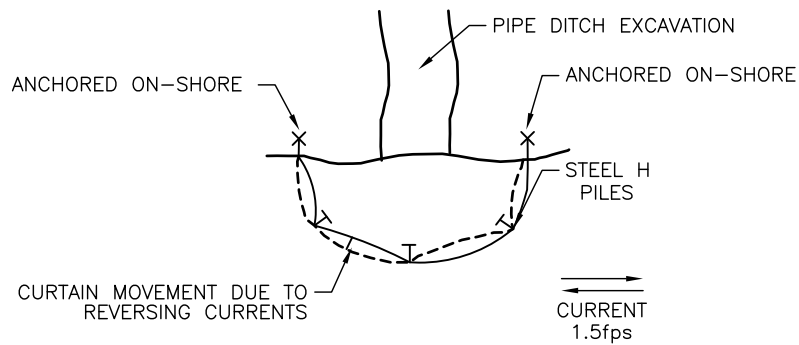
NOT FOR CONSTRUCTION

Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

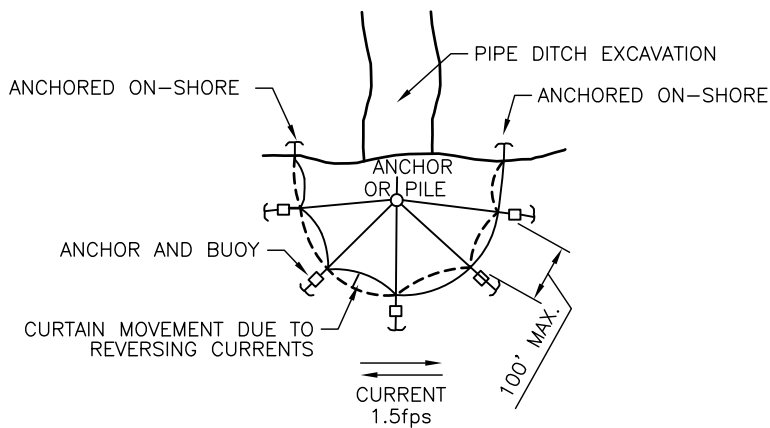
ALASKA LNG

ESC-34
ALASKA LNG PIPELINE PROJECT
PIPE DITCH PLUG

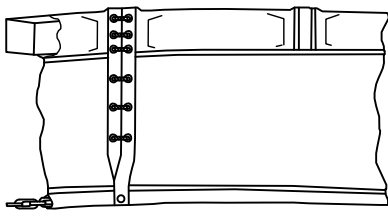
Rev.
0



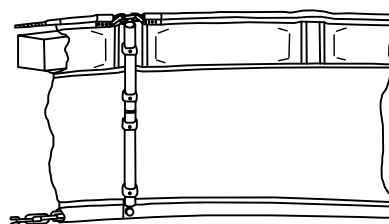
(A) PLAN VIEW WITH PILES



(B) PLAN VIEW WITH MARINE ANCHORS



LIGHTWEIGHT TURBIDITY CURTAIN
PROFILE



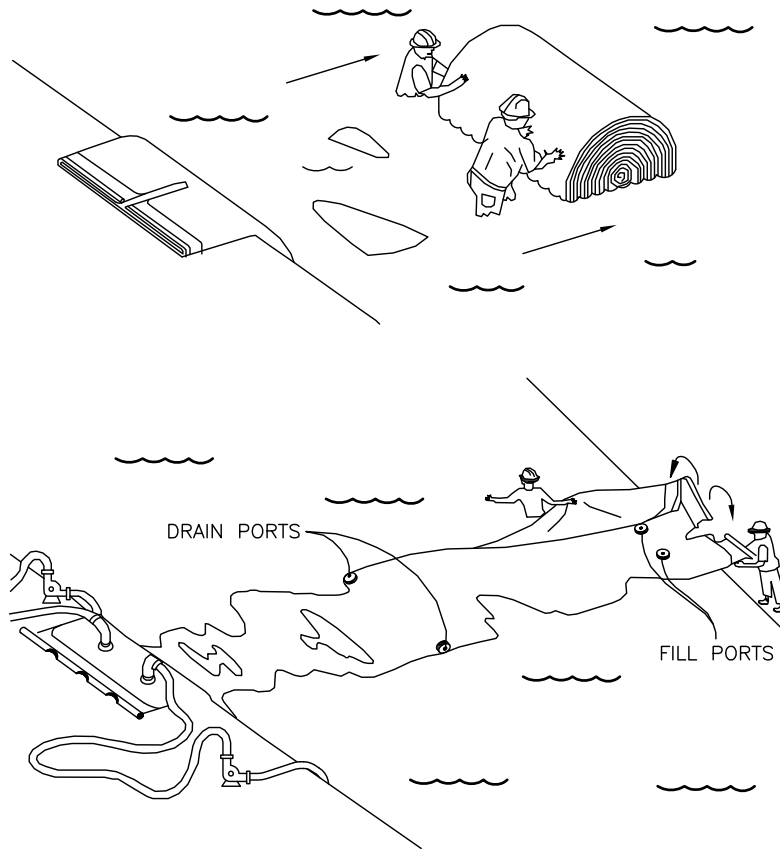
MIDDLEWEIGHT TURBIDITY CURTAIN
PROFILE

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

Modified From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.



MANUAL DEPLOYMENT

NOTE:

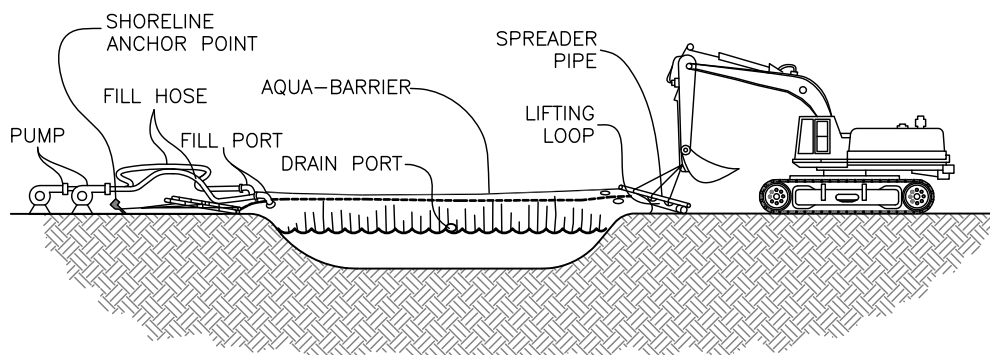
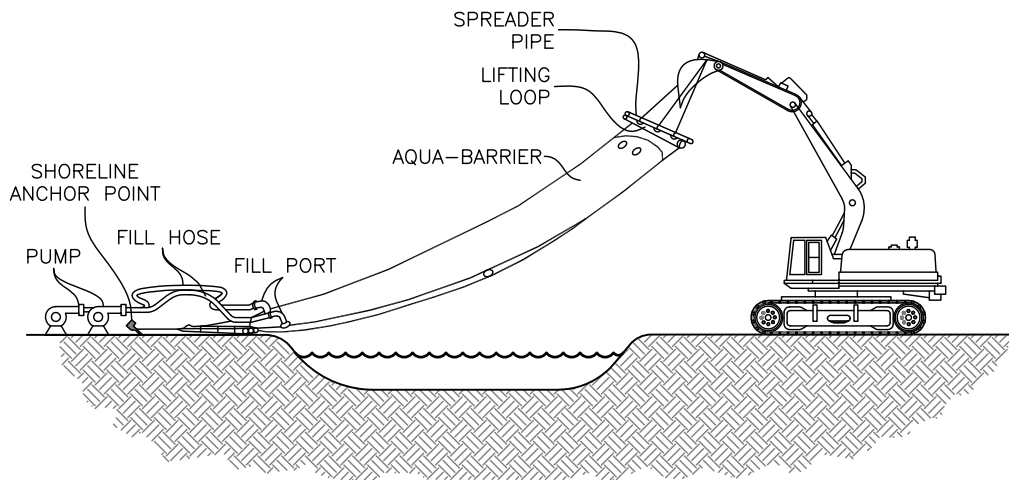
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

ALASKA LNG

ESC-35.2-A
ALASKA LNG PIPELINE PROJECT
SILT CONTAINMENT – BLADDER DAM

Rev.
0



MECHANICAL DEPLOYMENT

NOTE:

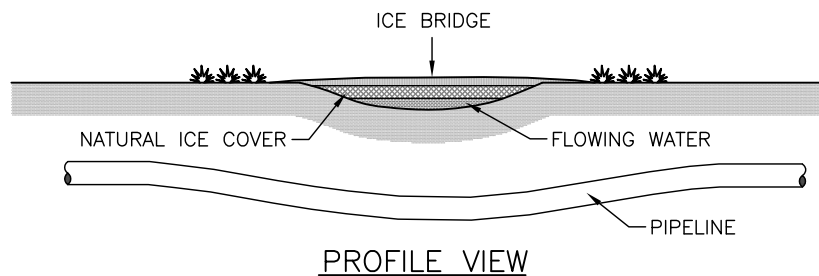
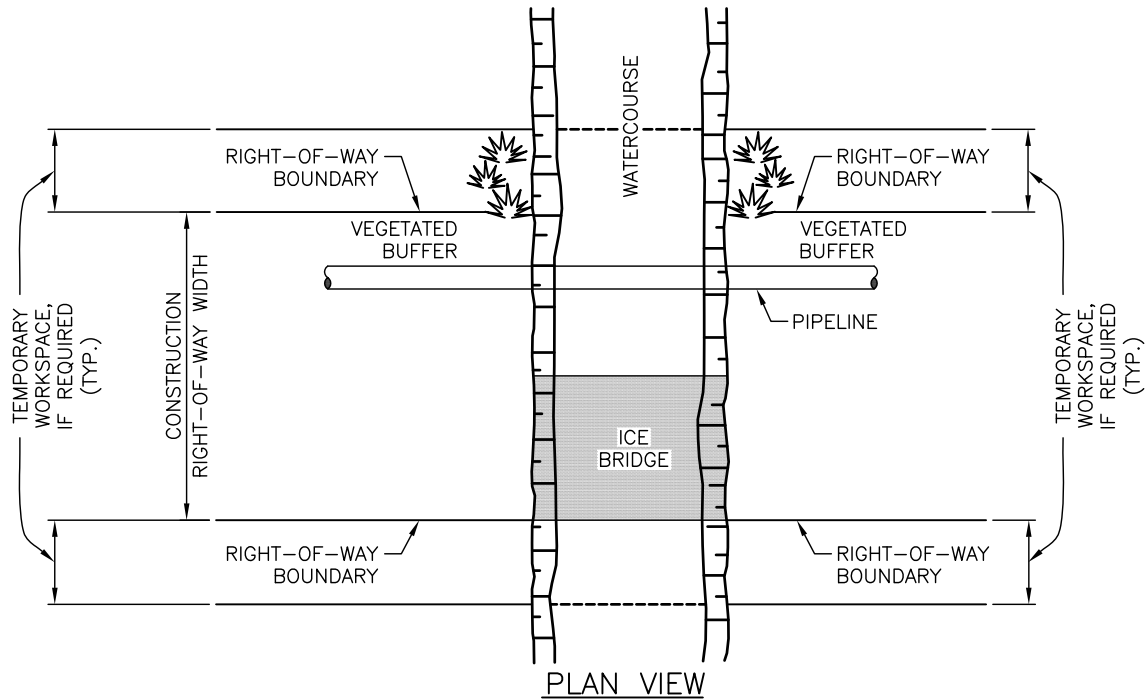
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

ALASKA LNG

ESC-35.2-B
ALASKA LNG PIPELINE PROJECT
SILT CONTAINMENT, BLADDER DAM

Rev.
0



NOTES:

1. INSTALL ICE BRIDGES ON WINTER PROJECTS WHEN A SAFE ICE THICKNESS CAN BE MAINTAINED.
2. LOCATE ICE 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 FROM THE WATERBODY (OR HAULED TO SITE IF NECESSARY) WATER AND COVER WITH SNOW TO INCREASE LOAD BEARING CAPACITY. LOGS MAY BE USED AS A BASE TO STRENGTHEN THE BRIDGE. THE ICE BRIDGE SHOULD NOT IMPEDE FLOW.
4. MAINTAIN ICE REGULARLY AND REMOVE ALL DEBRIS FROM THE ICE SURFACE.
5. BREACH ICE BRIDGE BY PHYSICAL MEANS PRIOR TO SPRING BREAK-UP.
6. RECLAIM AND STABILIZE BANKS AND APPROACHES PRIOR TO SPRING BREAK-UP.
7. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

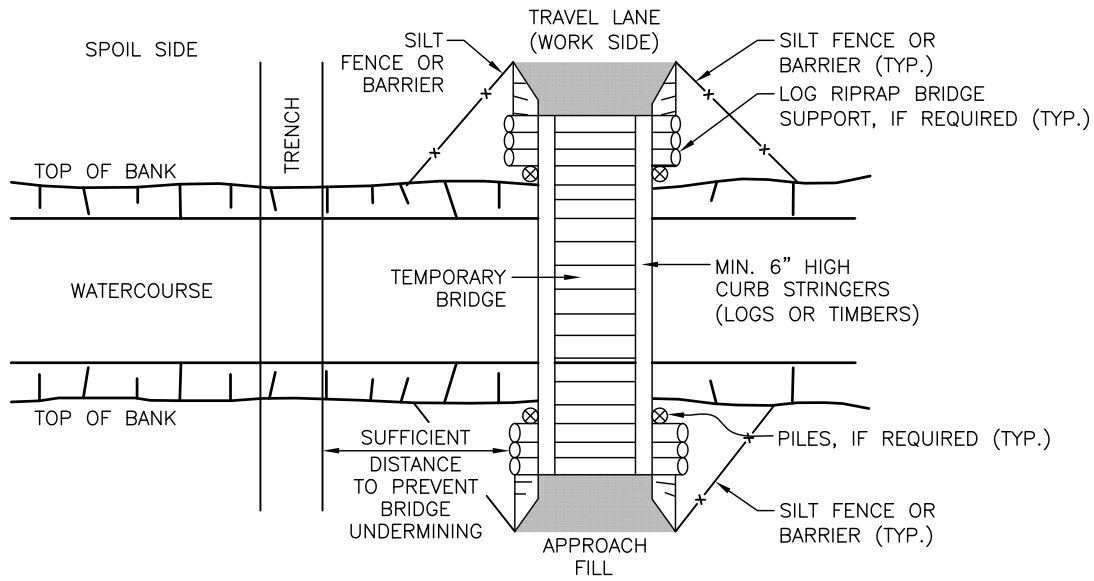
NOT FOR CONSTRUCTION

Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

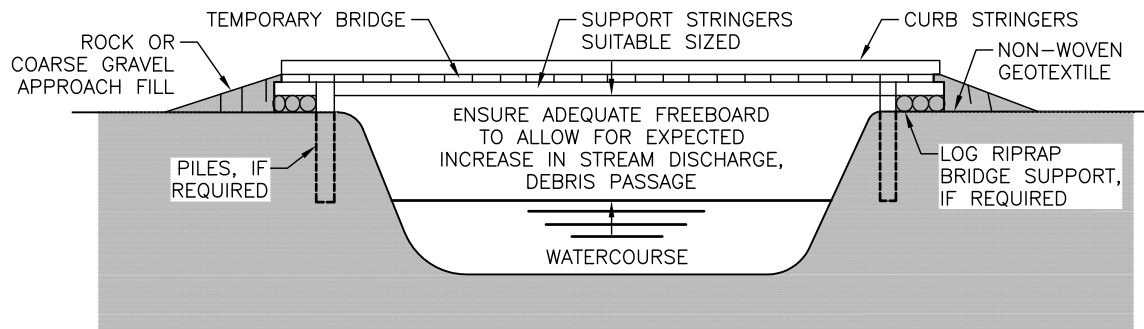
ALASKA LNG

ESC-36.1
ALASKA LNG PIPELINE PROJECT
TEMPORARY BRIDGE STRUCTURE, ICE/SNOW BRIDGE

Rev.
0



PLAN VIEW – TYPICAL TEMPORARY TIMBER BRIDGE



PROFILE VIEW – TYPICAL TEMPORARY TIMBER BRIDGE

NOTES:

1. UTILIZE APPROACH FILLS RATHER THAN CUTS IN BANKS TO MINIMIZE EROSION POTENTIAL. DO NOT CONSTRICT FLOW WITH APPROACH FILL OR SUPPORT STRUCTURES. ENSURE ADEQUATE FREE-BOARD TO HANDLE ANTICIPATED STREAMFLOWS OR ICE PASSAGE.
2. REMOVE BRIDGE IMMEDIATELY AFTER USE. IF BRIDGE IS TO REMAIN IN PLACE THROUGH SPRING BREAK-UP, IT MUST BE DESIGNED FOR SPRING FLOODS AND ICE JAMS. REMOVE SUPPORT STRUCTURES AND APPROACH FILLS. RESTORE AND STABILIZE BANKS.
3. INSTALL CURB STRINGERS OF LOGS OR PLYWOOD TO ENSURE THAT FILL MATERIAL DOES NOT SPILL INTO THE WATERCOURSE, WHERE REQUIRED.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

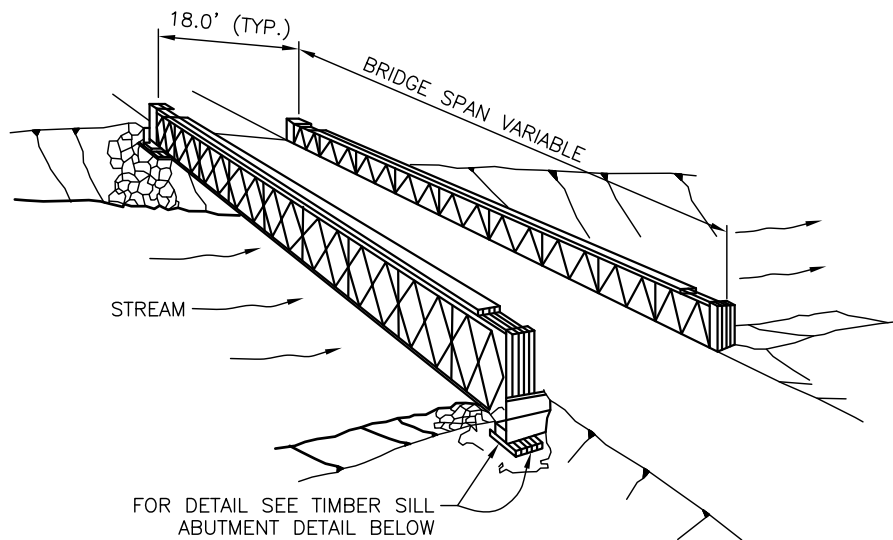
NOT FOR CONSTRUCTION

Modified From: CAPP Pipeline Associated Watercourse Crossings. 2012

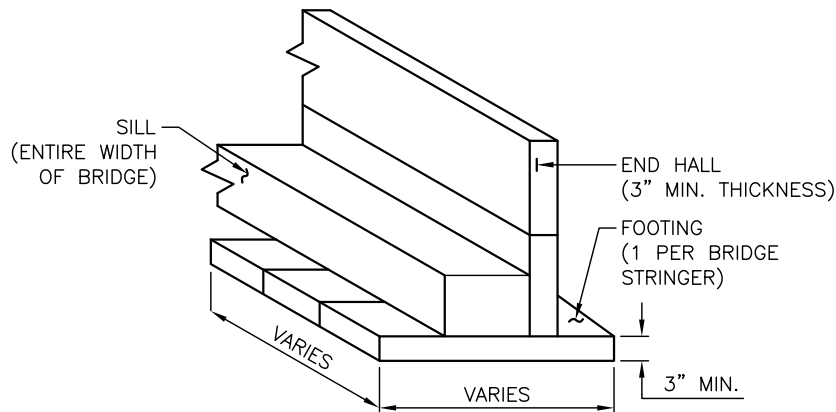
ALASKA LNG

ESC-36.2-A
ALASKA LNG PIPELINE PROJECT
TEMPORARY BRIDGE STRUCTURE, TIMBER/STEEL BRIDGE

Rev.
0



TYPICAL TEMPORARY STEEL BRIDGE



TYPICAL TIMBER SILL ABUTMENT DETAIL

NOTES:

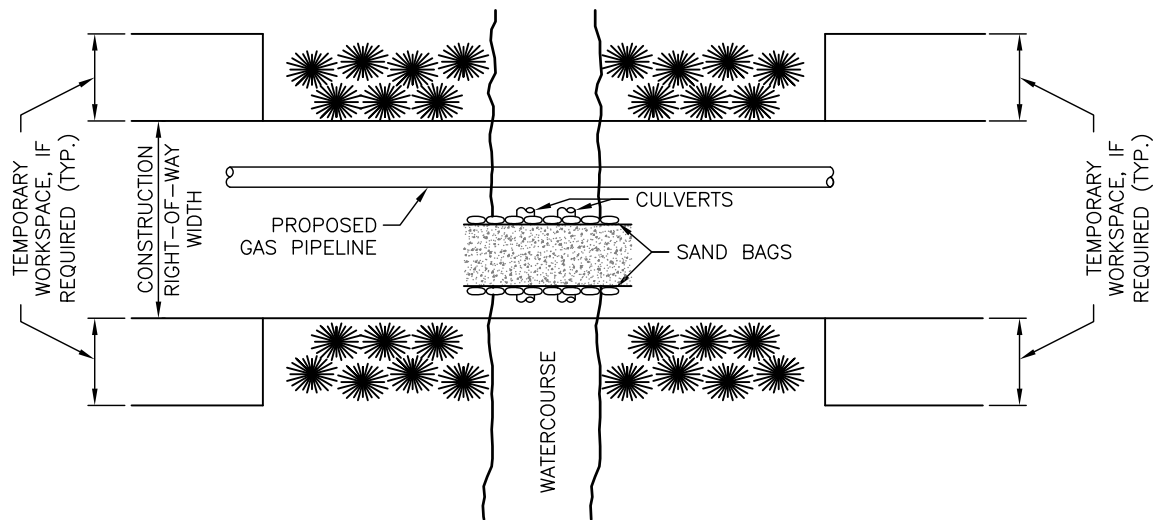
1. UTILIZE APPROACH FILLS RATHER THAN CUTS IN BANKS TO MINIMIZE EROSION POTENTIAL. DO NOT CONSTRICT FLOW WITH APPROACH FILL OR SUPPORT STRUCTURES. ENSURE ADEQUATE FREE-BOARD TO HANDLE ANTICIPATED STREAMFLOWS.
2. REMOVE BRIDGE IMMEDIATELY AFTER USE. IF BRIDGE IS TO REMAIN IN PLACE THROUGH SPRING BREAK-UP, IT MUST BE DESIGNED FOR SPRING FLOODS AND ICE JAMS. REMOVE SUPPORT STRUCTURES AND APPROACH FILLS. RESTORE AND STABILIZE BANKS.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

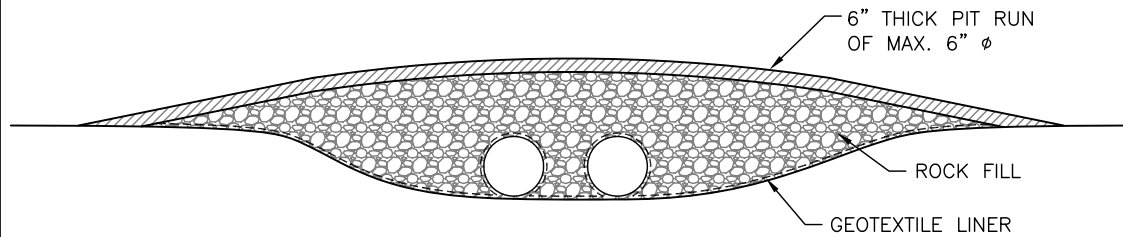
ALASKA LNG

ESC-36.2-B
ALASKA LNG PIPELINE PROJECT
TEMPORARY BRIDGE STRUCTURE, TIMBER/STEEL BRIDGE

Rev.
0



PLAN VIEW



PROFILE VIEW

NOTES:

1. TO PROTECT THE STREAM BED, A GEOTEXTILE LINER SHALL BE LAID DOWN ON THE BED AND BANKS AFTER INSTALLING THE CULVERT BUT BEFORE PLACING ANY RAMP MATERIAL. GEOTEXTILE SHALL BE WIDE ENOUGH TO FOLD BACK INTO THE EDGE OF THE RAMP AT THE UPSTREAM AND DOWNSTREAM ENDS OF THE RAMP AND PREVENT ANY FILL FROM FALLING INTO THE STREAM. THE SIDES OF THE RAMP SHALL BE ARMoured TO PROTECT IT FROM EROSION DURING ANTICIPATED STREAMFLOWS AND ICE.
2. CULVERTS SHALL BE OF SUFFICIENT SIZE AND NUMBER TO HANDLE A ONE IN TEN YEAR STREAM FLOW. CULVERTS SHALL ALSO BE OF SUFFICIENT WALL THICKNESS AND GRADE TO HANDLE HEAVY LOADS.
3. RAMPS SHALL BE OF SUFFICIENT DEPTH TO PREVENT COLLAPSE OF THE CULVERT.
4. RAMPS SHALL BE CONSTRUCTED FROM APPROVED LOCAL ROCK FILL FREE OF ORGANICS OR OTHER DELETERIOUS MATERIAL.
5. TOP COURSE OF 1" ROAD CRUSH MAY BE ADDED.
6. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

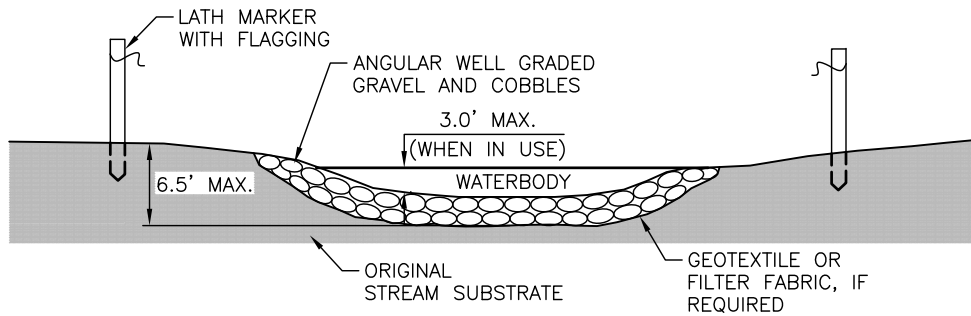
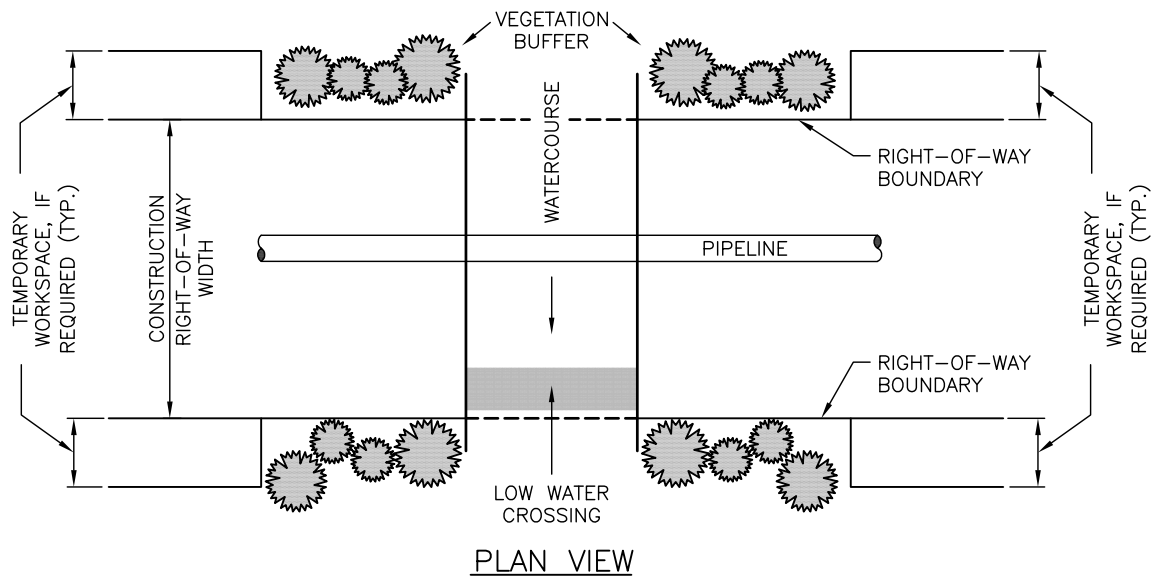
NOT FOR CONSTRUCTION

Modified From: California Stormwater Best Management
Practise Handbook Portal: Construction, 2009

ALASKA LNG

ESC-36.3
ALASKA LNG PIPELINE PROJECT
TEMPORARY BRIDGE STRUCTURE, GRAVEL/RIP RAP BRIDGE

Rev.
0



NOTES:

1. DO NOT USE LOW WATER CROSSING DURING FISH SPAWNING, INCUBATION OR MIGRATION PERIODS.
2. MINIMIZE USE OF LOW WATER CROSSINGS.
3. MARK BOUNDARIES OF LOW WATER CROSSING ON BOTH SIDES OF CROSSING TO CONFINE ALL VEHICLE TRAFFIC TO THE LOW WATER CROSSING.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

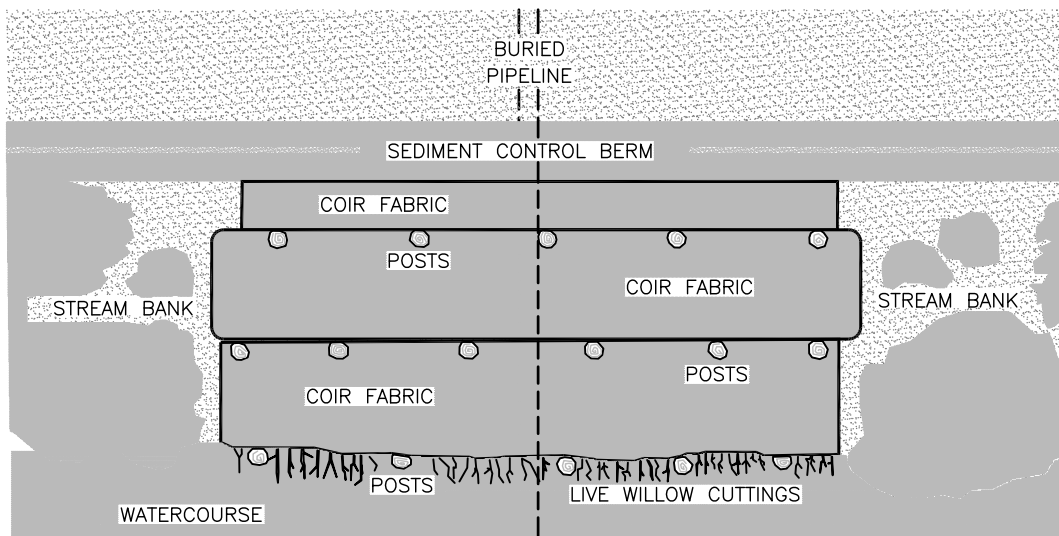
NOT FOR CONSTRUCTION

Modified From: CAPP Pipeline Associated Watercourse Crossings. 2012

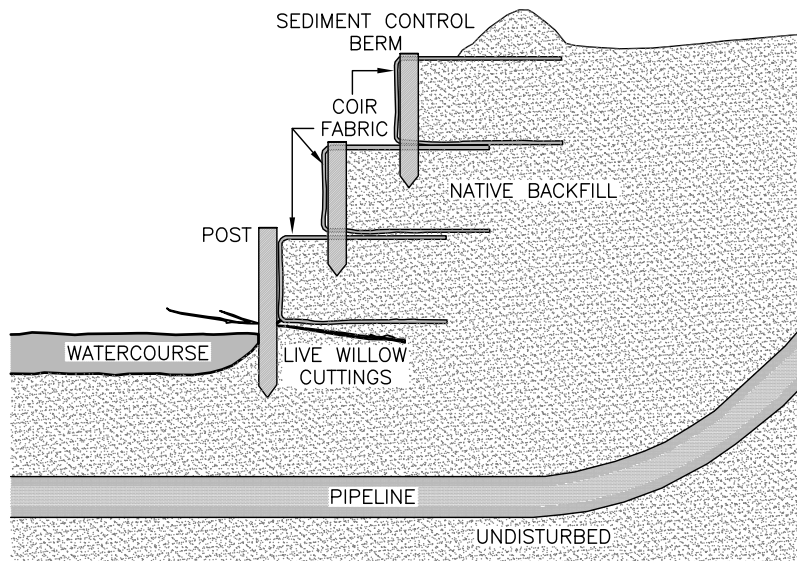
ALASKA LNG

ESC-37
ALASKA LNG PIPELINE PROJECT
LOW WATER CROSSING

Rev.
0



PLAN VIEW



PROFILE VIEW

TYPICAL TIERS OF FABRIC WRAPS, WITH BRUSH LAYER
USED TO RECONSTRUCT STREAMBANK

NOTE:

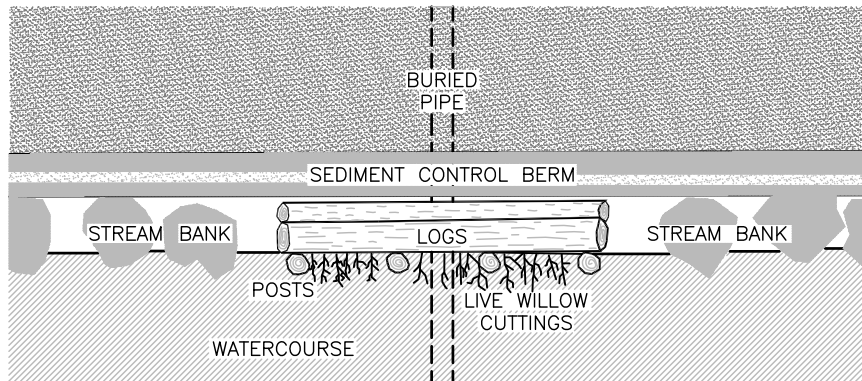
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

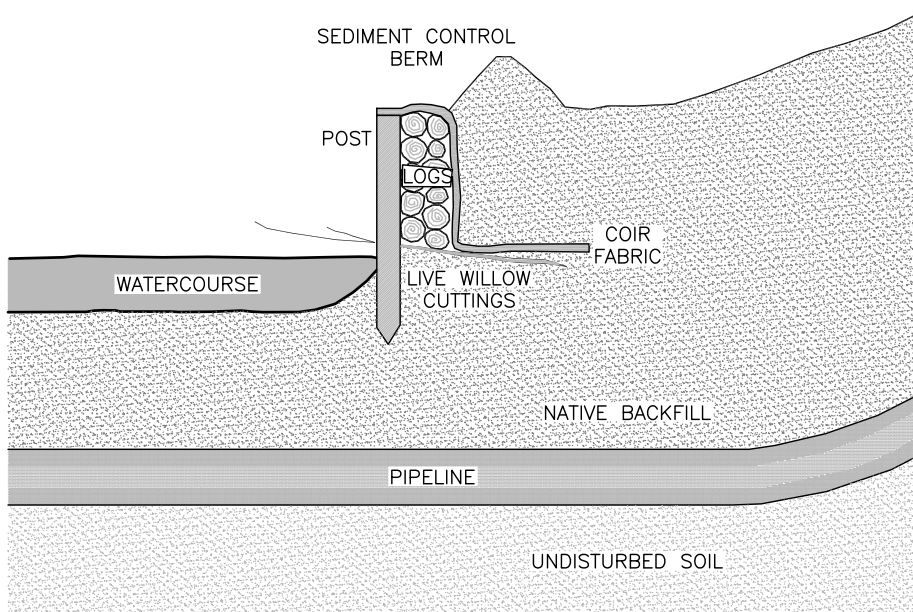
ALASKA LNG

ESC-38.1
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION – FABRIC WRAP

Rev.
0



PLAN VIEW



PROFILE VIEW

TYPICAL ROWS OF LOGS AND LIVE WILLOW CUTTINGS
USED TO CONSTRUCT LOG WALL

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

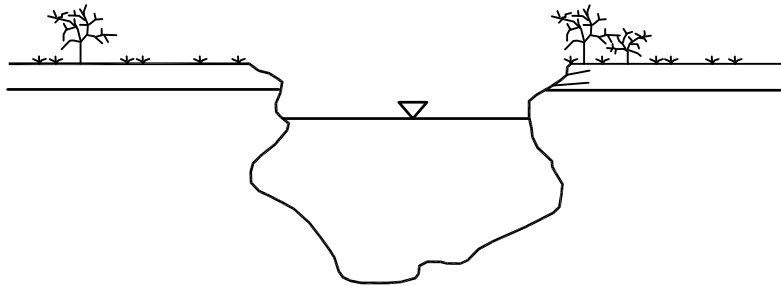
Modified From: CAPP Pipeline Associated Watercourse Crossings. 2012

ALASKA LNG

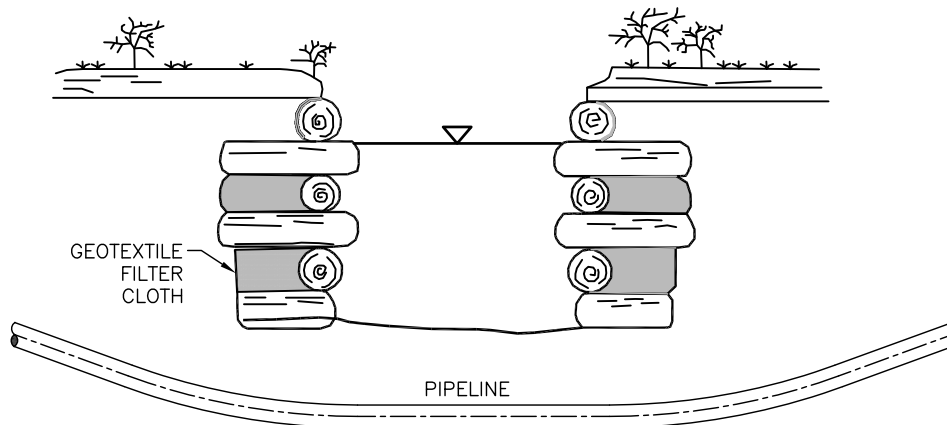
ESC-38.2-A
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, LOG/CRIB WALL

Rev.
0

BEFORE CONSTRUCTION



AFTER CONSTRUCTION AND RECLAMATION



PROFILE VIEW

OVERHANGING BANKS – CRIB WALL

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

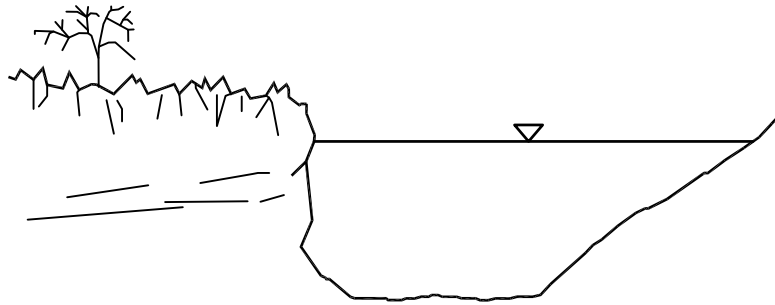
Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

ALASKA LNG

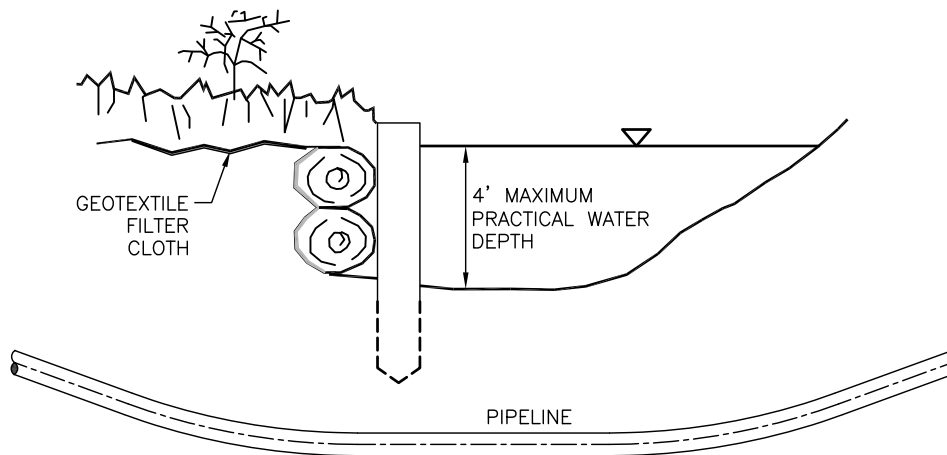
ESC-38.2-B
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, LOG/CRIB WALL

Rev.
0

BEFORE CONSTRUCTION



AFTER CONSTRUCTION AND RECLAMATION



PROFILE VIEW
VERTICAL BANKS – LOG WALL

NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

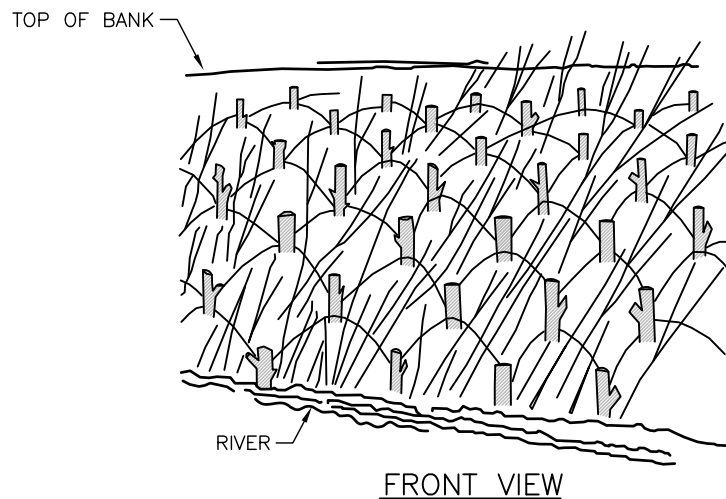
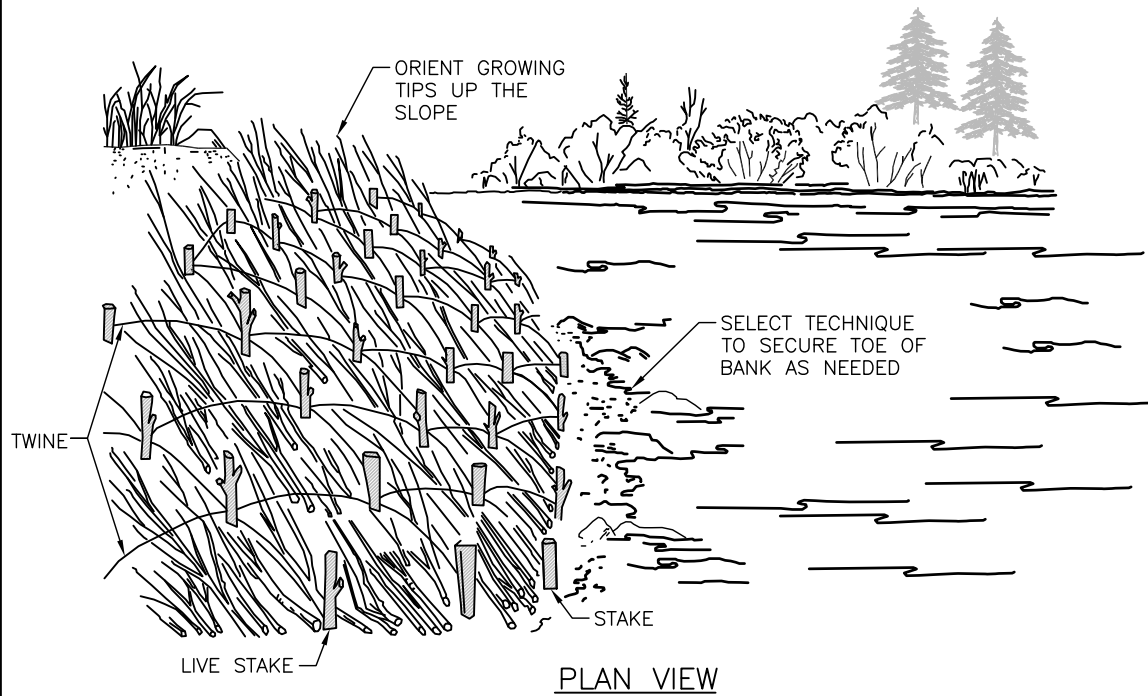
NOT FOR CONSTRUCTION

Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

ALASKA LNG

ESC-38.2-C
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, LOG/CRIB WALL

Rev.
0



NOTES:

1. A COMBINATION OF LIVE AND WOODEN STAKES CAN BE USED.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

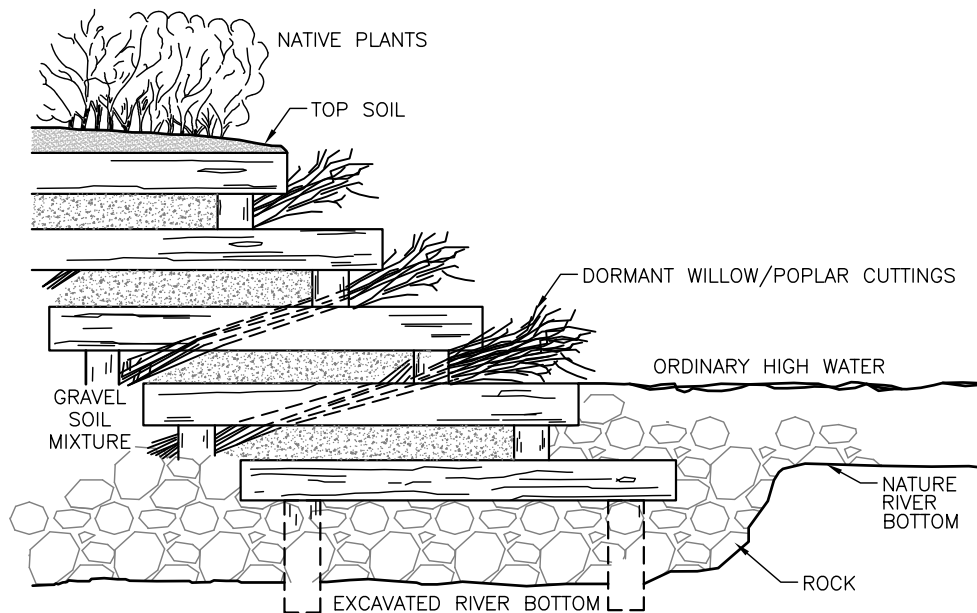
NOT FOR CONSTRUCTION

Adopted From: Steambank Re-vegetation and Protection, A guide for Alaska. 2005

ALASKA LNG

ESC-38.3
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, BRUSH MAT

Rev.
0



NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

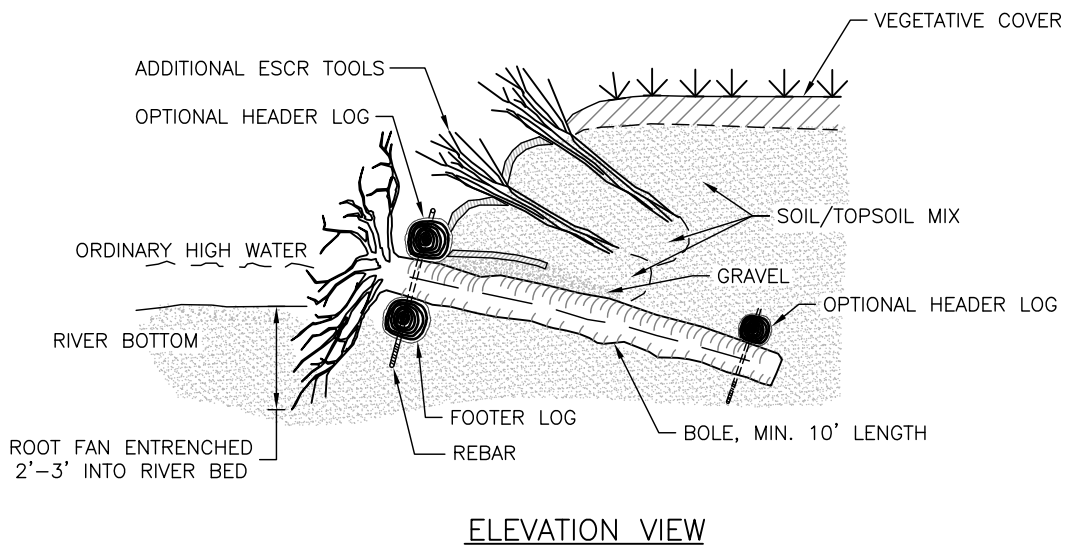
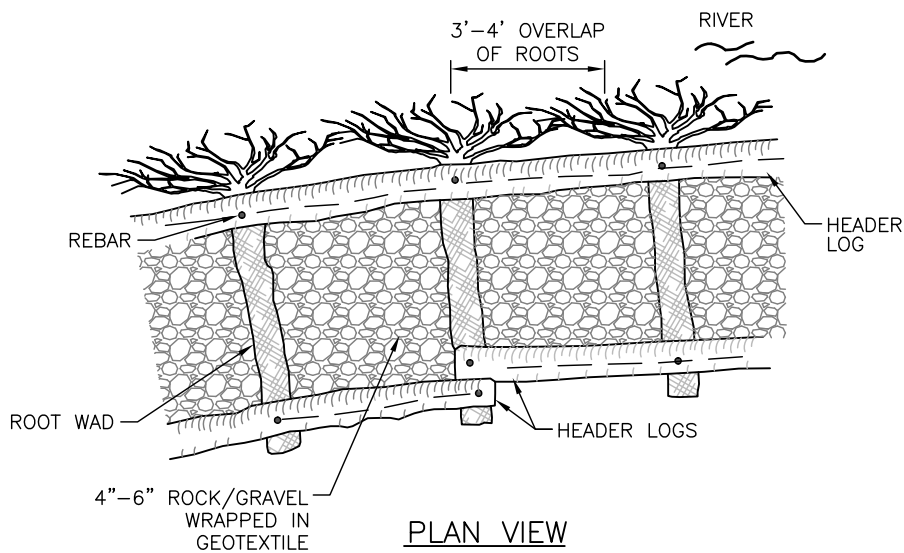
NOT FOR CONSTRUCTION

Adopted From: Steambank Re-vegetation and Protection, A guide for Alaska. 2005

ALASKA LNG

ESC-38.4
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, VEGETATIVE CRIBBING

Rev.
0



NOTE:

1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

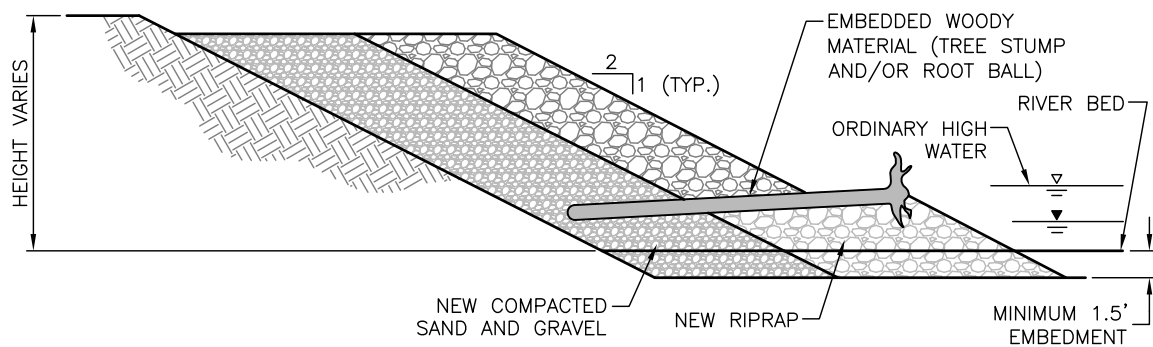
NOT FOR CONSTRUCTION

Adopted From: Steambank Re-vegetation and Protection, A guide for Alaska. 2005

ALASKA LNG

ESC-38.5-A
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, ROOT WADS

Rev.
0



ROOT WADS USED IN CONJUNCTION WITH ROCK REVETMENT
AS BANK RECLAMATION

NOTE:

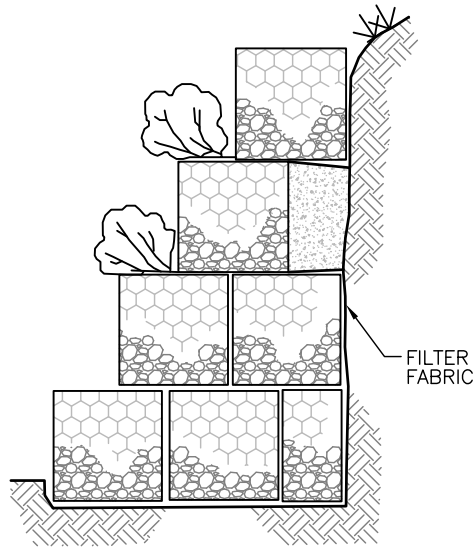
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

ALASKA LNG

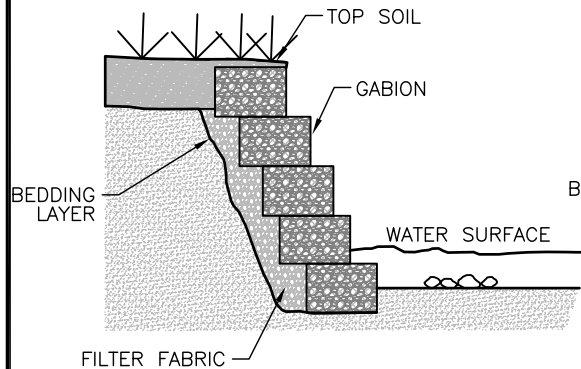
ESC-38.5-B
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, ROOT WADS

Rev.
0



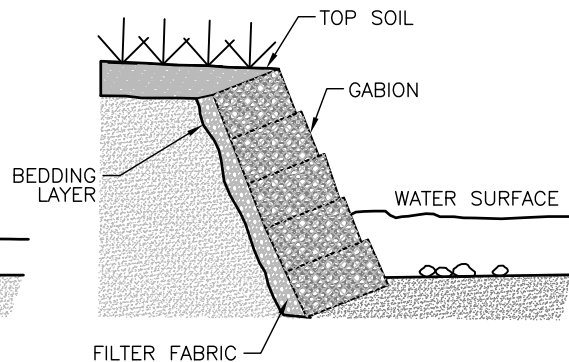
TYPICAL VEGETATED ROCK GABION

Adopted From: Ontario Environmental Guide for Erosion and Sediment Control During the Construction of Highway Projects, 2015.



GABIONS OFFSET TO MAINTAIN BANK SLOPE

Adopted From: Pipeline Associated Watercourse Crossings. 2012



GABIONS INSTALLED FLAT AGAINST STREAMBANK

NOTES:

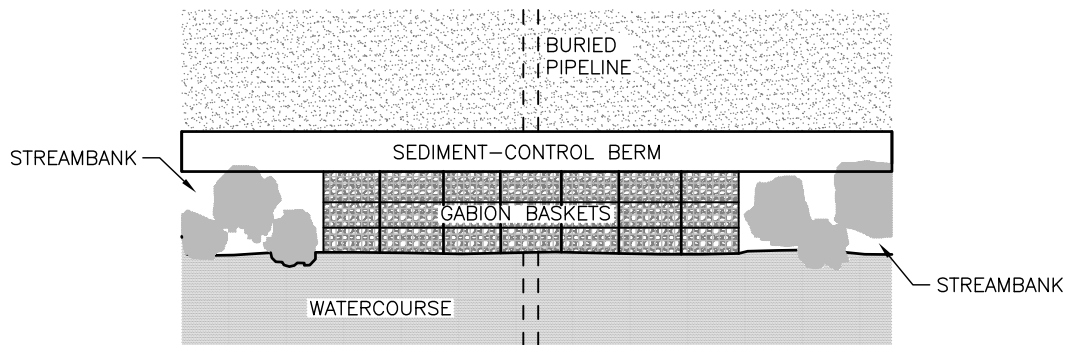
1. PROPER PLACEMENT AND DESIGN IS CRITICAL AND QUALIFIED SPECIALISTS SHOULD BE INVOLVED.
2. GABIONS CAN BE INSTALLED ON SLOPES THAT EXCEED 1.5:1. INSTALLATION FLAT TO SLOPE IS PREFERRED ON HIGH BANKS.
3. GABIONS SHOULD BE TIED TOGETHER WITH HEAVY GAUGE WIRE AND ANCHORED INTO THE BANKS AT THE UP AND DOWNSTREAM ENDS.
4. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

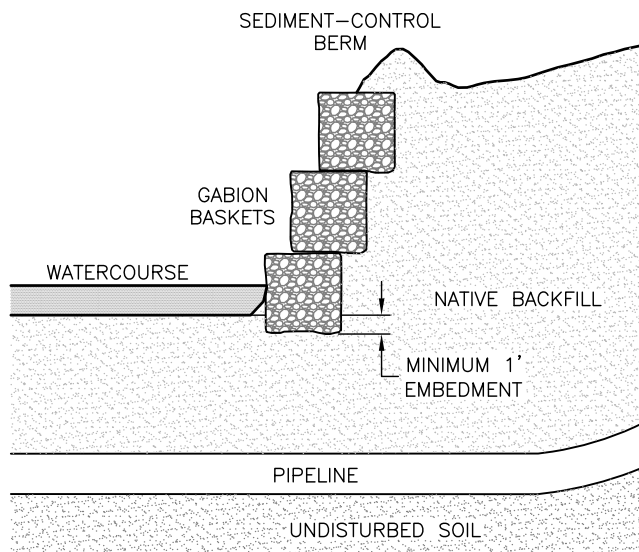
ALASKA LNG

ESC-38.6-A
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, GABION BASKET

Rev.
0



PLAN VIEW



PROFILE VIEW

NOTES:

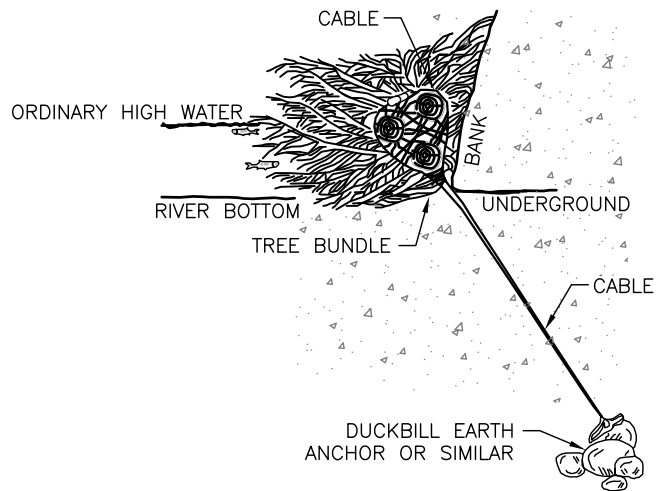
1. PROPER PLACEMENT AND DESIGN IS CRITICAL AND QUALIFIED SPECIALISTS SHOULD BE INVOLVED.
2. GABIONS SHOULD BE TIED TOGETHER WITH HEAVY GAUGE WIRE AND ANCHORED INTO THE BANKS AT THE UP AND DOWNSTREAM ENDS.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

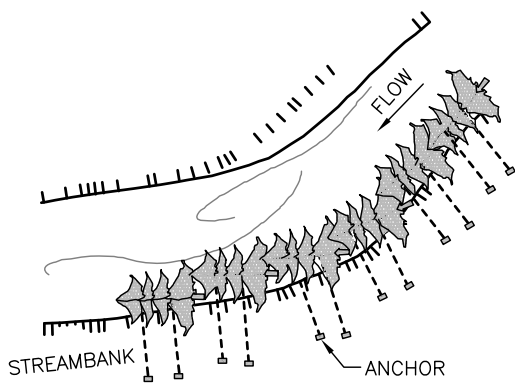
ALASKA LNG

ESC-38.6-B
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, GABION BASKET

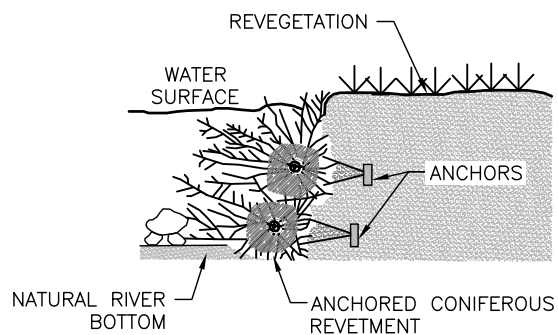
Rev.
0



Modified From: Steambank Re-vegetation and Protection, A guide for Alaska. 2005



TYPICAL PLAN VIEW



TYPICAL CROSS-SECTION

Adopted From: CAPP Pipeline Associated Watercourse Crossings. 2012

NOTES:

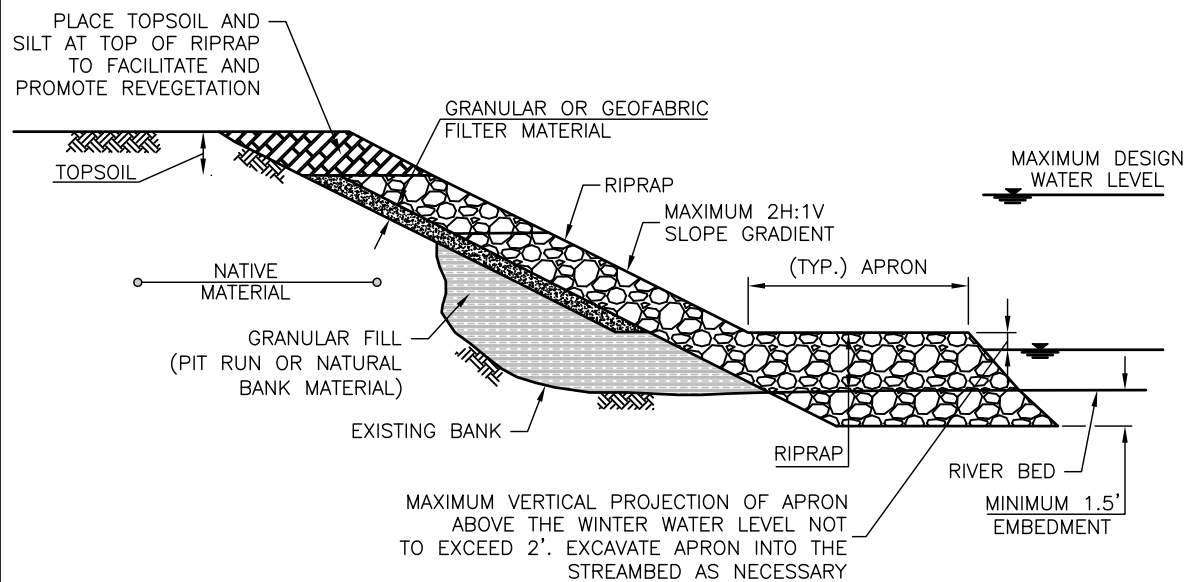
1. PROPER PLACEMENT AND DESIGN IS CRITICAL AND QUALIFIED SPECIALISTS SHOULD BE INVOLVED.
2. SELECT ONLY GOOD, SOUND, STRAIGHT CONIFEROUS TREES WITH ADEQUATE BRANCHES AND A MINIMUM LENGTH OF 30'.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

ALASKA LNG

ESC-38.7
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, TREE REVETMENT

Rev.
0



NOTE:

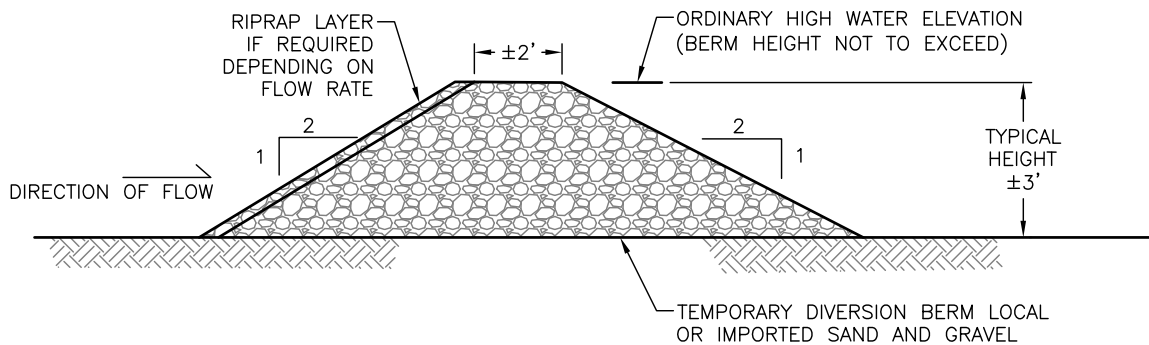
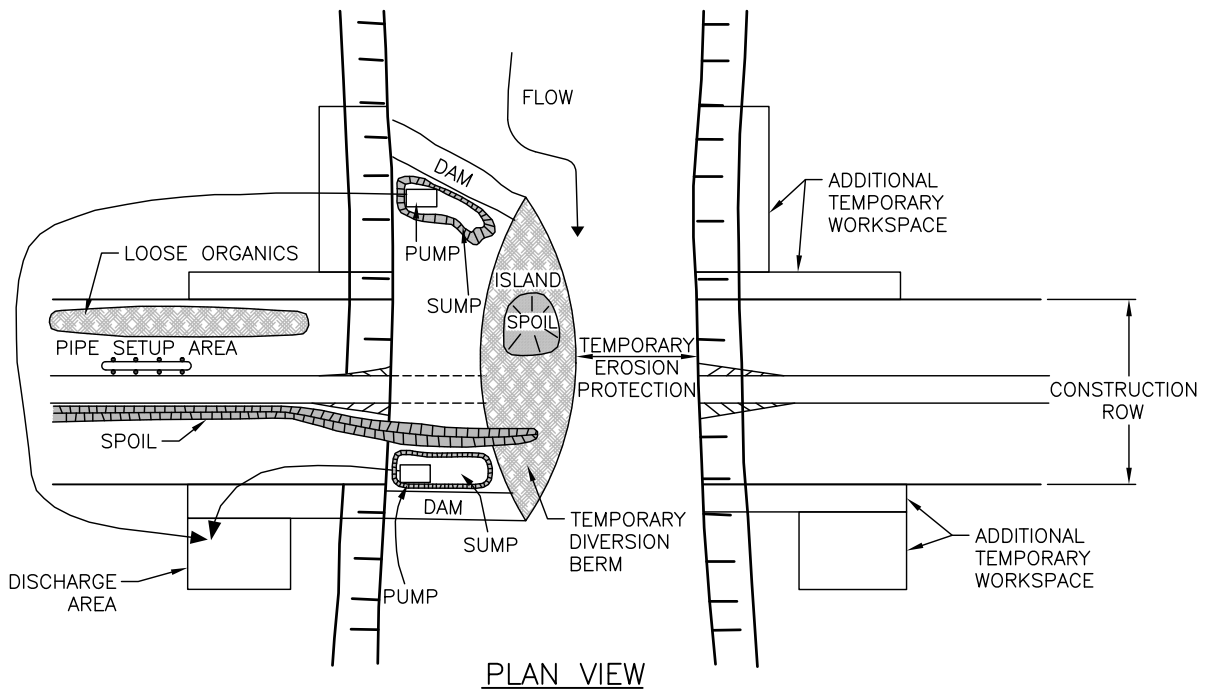
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

NOT FOR CONSTRUCTION

ALASKA LNG

ESC-38.8
ALASKA LNG PIPELINE PROJECT
BANK RECLAMATION, ROCK REVETMENT

Rev.
0



TYPICAL TEMPORARY DIVERSION BERM SECTION

NOTES:

1. USE DIVERSION BERM TO DEFLECT WATER TO SUB-CHANNELS WITHIN SAME WATERCOURSE.
2. DIVERSION BERM MUST BE ELIMINATED OR REMOVED SUBSEQUENT TO CONSTRUCTION ACTIVITIES.
3. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

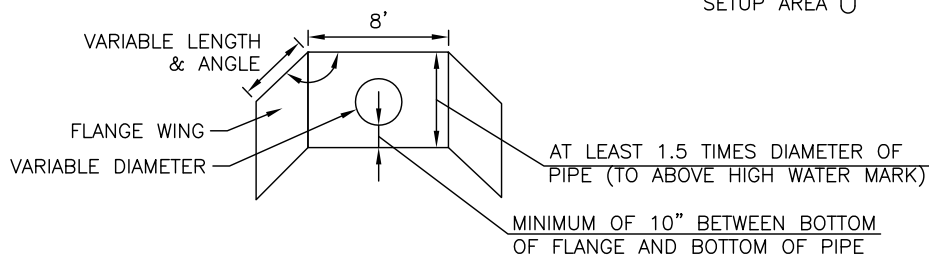
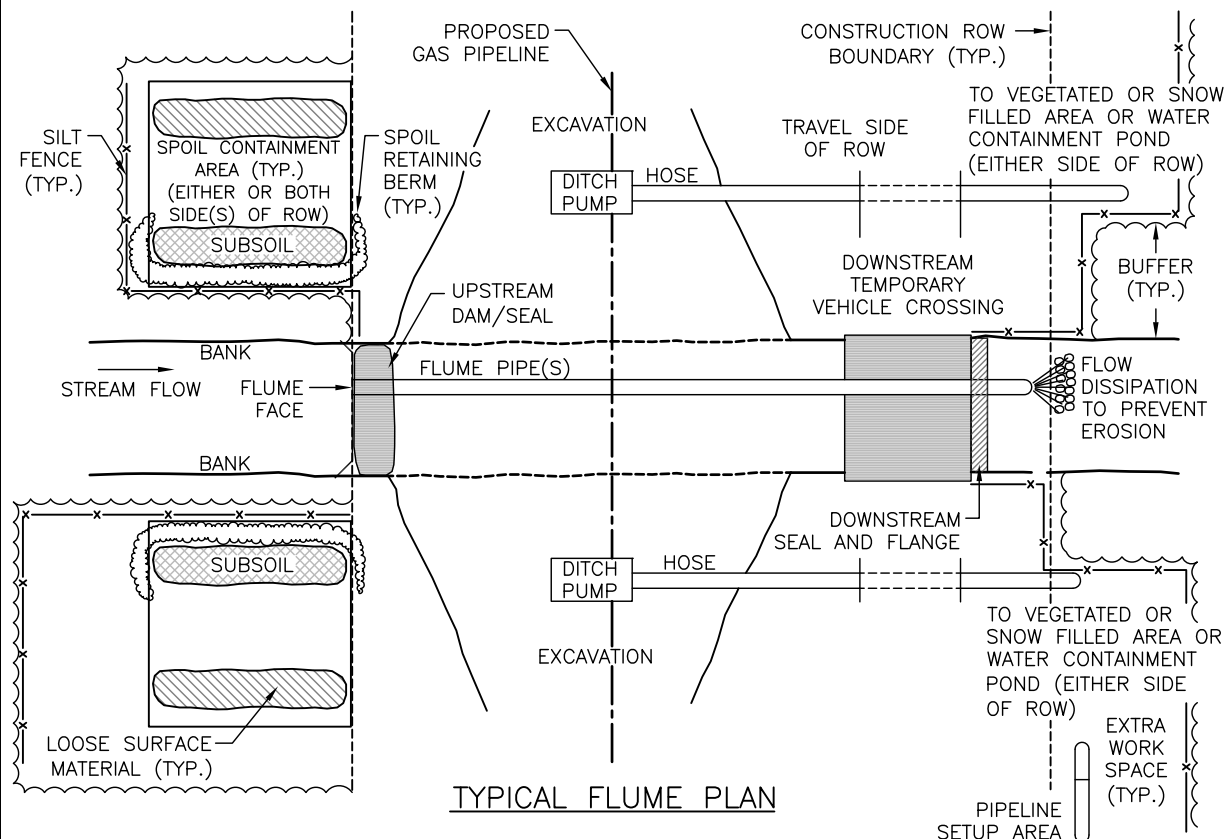
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Modified From: CAPP Pipeline Associated Watercourse Crossings. 2012

ALASKA LNG

ESC-39.1
ALASKA LNG PIPELINE PROJECT
WATERBODY DIVERSION, TEMPORARY DIVERSION BERM

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FRONT VIEW OF FLUME FACE (UPSTREAM)

NOTES:

1. STOCKPILE ALL REQUIRED MATERIALS AND EQUIPMENT ON THE SITE PRIOR TO BEGINNING INSTREAM WORK.
2. PREPARE SPOIL CONTAINMENT AREAS AND INSTALL ALL REQUIRED TEMPORARY EROSION CONTROL MEASURES.
3. PREPARE THE WATERBODY PIPE SECTION PRIOR TO BEGINNING INSTREAM WORK.
4. ENSURE THERE IS CLEAN WATER FLOW AROUND THE INSTREAM EXCAVATION AT ALL TIMES.
5. SALVAGE ANY FISH TRAPPED BETWEEN THE DAMS PRIOR TO BEGINNING INSTREAM WORK.
6. RE-ESTABLISH STREAM BED TO ORIGINAL CONTOURS AS MUCH AS PRACTICAL AND RECLAIM BANKS TO A STABLE CONFIGURATION.
7. COMPLETE ALL BACKFILLING AND INITIAL BANK RECLAMATION PRIOR TO REMOVING THE DAMS.
8. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

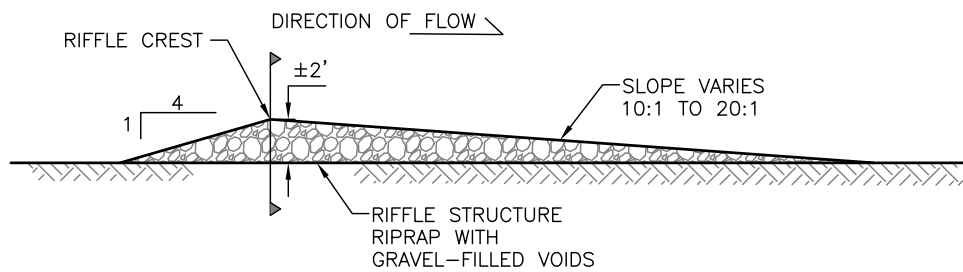
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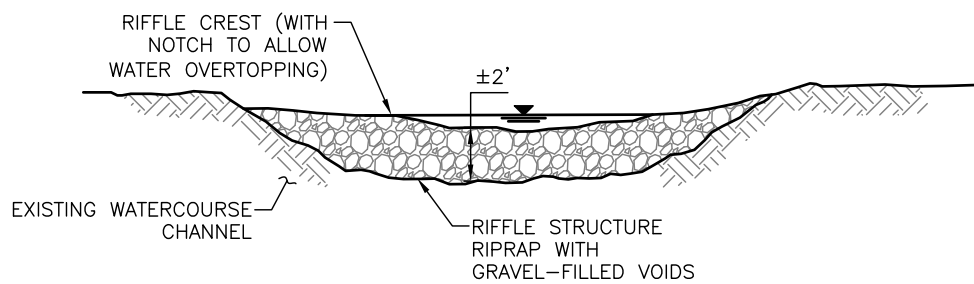
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WATERBODY DIVERSION – FLUME

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TYPICAL RIFFLE STRUCTURE PROFILE



TYPICAL RIFFLE STRUCTURE SECTION

NOTE:

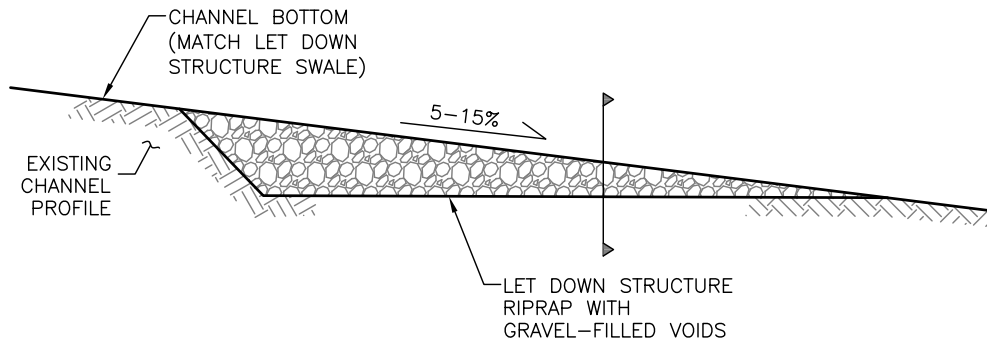
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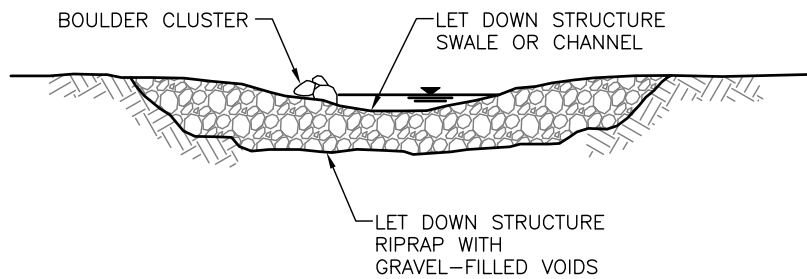
ALASKA LNG

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ALASKA LNG PIPELINE PROJECT
WATERBODY DIVERSION, RIFFLE STRUCTURE

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PROFILE



CROSS SECTION

NOTE:

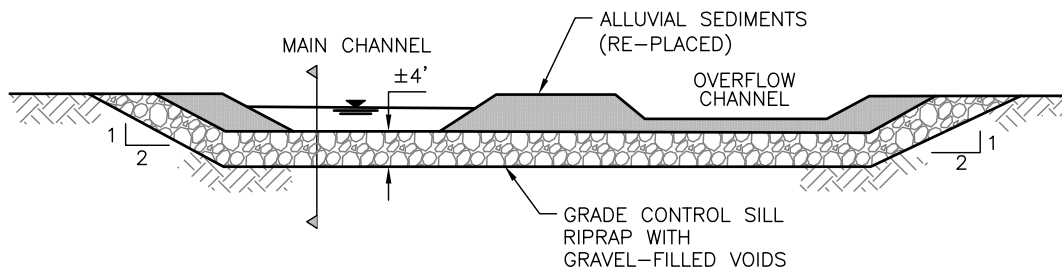
1. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

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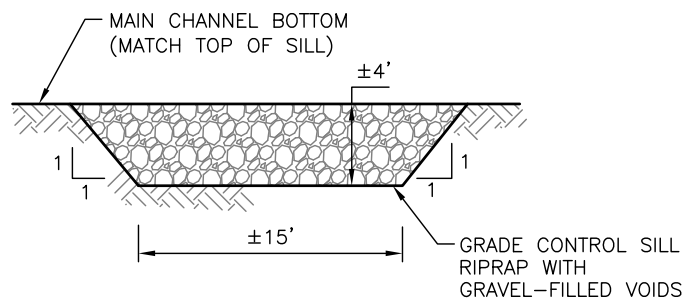
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ESC-40.2
ALASKA LNG PIPELINE PROJECT
WATERBODY DIVERSION, LET DOWN STRUCTURE

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TYPICAL GRADE CONTROL SILL BENEATH WATERCOURSE — PROFILE



TYPICAL GRADE CONTROL SILL BENEATH WATERCOURSE — SECTION

NOTE:

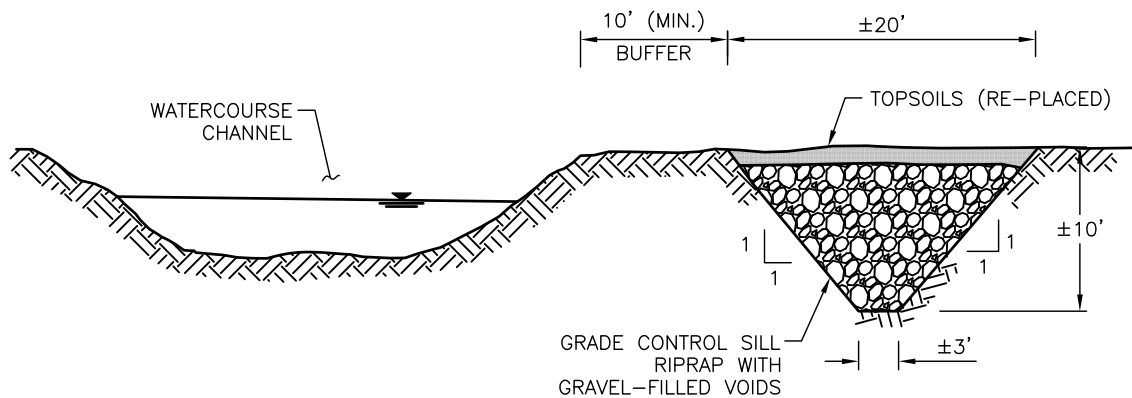
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ESC-40.3-A
ALASKA LNG PIPELINE PROJECT
WATERBODY DIVERSION, GRADE CONTROL SILL

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TYPICAL GRADE CONTROL SILL NEAR WATERCOURSE – PROFILE

NOTES:

1. DURING EXCAVATION, SAVE LOCAL GRAVELS AND TOPSOILS FOR RE-USE.
2. THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

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ALASKA LNG

ESC-40.3-B
ALASKA LNG PIPELINE PROJECT
WATER DIVERSION, GRADE CONTROL SILL

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