



**NT
ENERGY**

Pursuing our Potential

INUVIK WIND PROJECT

EROSION AND SEDIMENT CONTROL PLAN

**NWT ENERGY CORPORATION (03) LTD. (NTEC)
INUVIK, NORTHWEST TERRITORIES**

DECEMBER 2021

DOCUMENT HISTORY				
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1. Introduction

This Erosion and Sediment Control Plan (ESCP) was prepared by the Northwest Territories Energy Corporation (NTEC) as per the requirements of the Type “A” Land Use Permit G18X005 and Type “B” Water Licence G18L8-001. The purpose of the ESCP is to reduce the potential for negative impacts on air and water quality and to control, respond to, and dispose of sediment and turbid water during the any construction activities or quarry operations. The plan presents current industry standards and implements best management practices.

This ESCP presents erosion and sediment control measures for all construction activities including work areas, staging areas, equipment, fuel, and material storage areas and material quarry sites and stockpiles. As site conditions change, continued evaluation and adaptive mitigation measures may be necessary to suit the changing conditions.

1.1. Company Name, Location and Mailing Address

NWT Energy Corporation (03) Ltd. (NTEC)
#4 Capital Drive
Hay River, NT X0E 1G2

Main Contact: Bruno Pereira – Director
Phone: (867) 874-5230
Email: bpereira@ntec.com

1.2. Effective Date of Erosion and Sediment Control Plan

The ESCP will be in effect for the duration of Project construction, which could begin as soon as December 2021 and continue until May 2023 at the latest.

1.3. Distribution List

This plan and the most recent revisions will be distributed to all staff and contractors working on the Project. The Plan will be presented during a construction tailgate meeting prior to the start of construction. The ESCP will be included as part of new staff orientation activities.

1.4. Additional Copies

Several copies of the plan are to be kept on site at all times. A copy is also to be held at the NTEC office in Inuvik and with the Gwich'in Land and Water Board. Additional copies of the plan can be obtained by contacting NTEC directly at the phone number or email presented in Section 1.1.

1.5. List of Revisions

Any revisions to the plan will be submitted to the Gwich'in Land and Water Board for approval prior to implementing any changes.

2. Regulatory Requirements and Guidelines

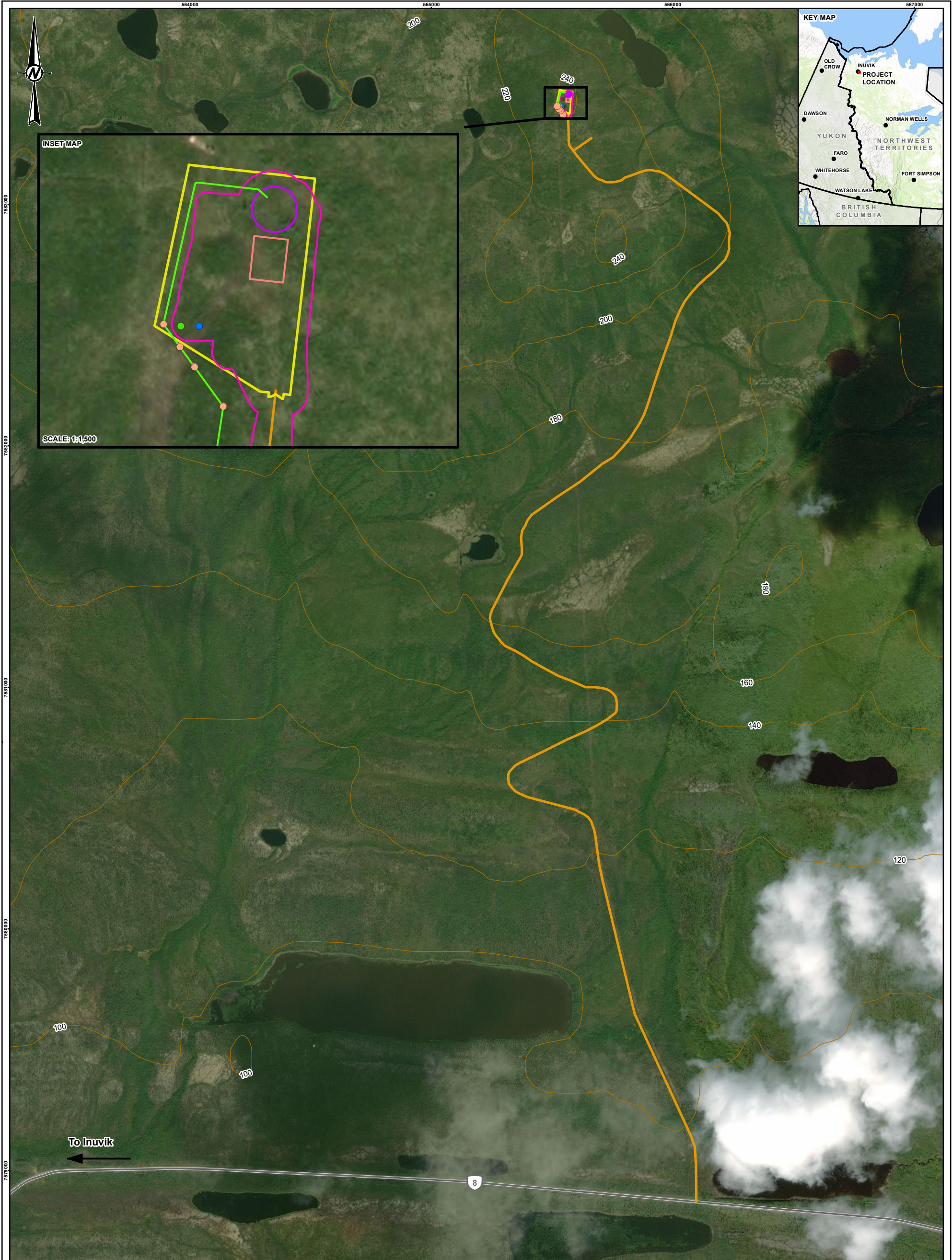
All erosion and sediment control measures for the Project should be installed and operated as per the standard specifications found in the applicable guidelines and be in accordance with territorial and federal legislation which includes:

- National Guide to Erosion and Sediment Control of Roadway Projects
- DFO Land Development Guidelines for the Protection of Aquatic Habitat
- Gwich'in Land and Water Board Land Use Permit including approved management plans
- Federal Fisheries Act
- NWT Forest Management Act
- NWT Wildlife Act
- NWT Mackenzie Valley Resource Management Act
- Northwest Territories Waters Act

3. Project Description

NTEC proposes to construct, operate, and maintain one wind turbine at a site known as High Point (68°21'23.60N latitude and 133°24'29.60W longitude), located 12 km east of the community of Inuvik, NT, and 6.5 km north of the Inuvik airport. The town of Inuvik has a population of approximately 3,500 people and an average electricity demand of approximately 3.5MW. The Inuvik Wind Project (the Project) will involve installing one 2 to 4 MW wind turbine with a 75 to 100 m hub height, and construction and maintenance of the associated infrastructure. The primary project components will include one wind turbine generator, an all-season access road, and upgrades to the current electrical transmission system.

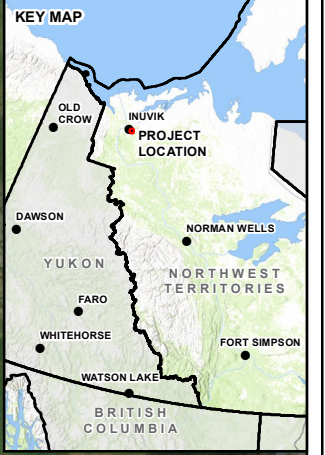
Currently, electricity is provided to the town by an LNG/diesel power plant. The plant was previously supplied by gas from the Mackenzie Delta gas pipeline. However, use of this gas pipeline was restricted in 2012 leading to 100% reliance on diesel and LNG transported to the town along the Dempster Highway. As a result of this, the cost of electricity in the town has increased dramatically.



INSET MAP

SCALE: 1:1,500

KEY MAP



LEGEND

- HAZARDOUS MATERIALS STORAGE AREA
- POLE
- SPILL KIT
- COLLECTOR LINE
- CONTOUR (20m INTERVAL)
- DEMPSTER HIGHWAY
- PROPOSED ROAD
- CRANE AREA
- FENCE
- FILL AREA
- TURBINE



REFERENCE(S)

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CLIENT
NWT ENERGY CORPORATION

PROJECT
INUVIK WIND PROJECT

TITLE
SITE LAYOUT

CONSULTANT



PROJECT NO.
20447725

CONTROL

YYYY-MM-DD	2021-03-09
DESIGNED	KR
PREPARED	AB
REVIEWED	LB
APPROVED	DP

REV.
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FIGURE
1

4. Erosion and Sediment Control Management

4.1. Erosion and Sediment Potential and Management

Some of the proposed activities that could potentially cause erosion and/or sedimentation are presented below along with corresponding mitigation measures. Locations of susceptible work areas and mitigation measures will be outlined in detail in site specific work plans and site drawings.

The proposed activities are assigned a potential risk of low, medium and high. The potential risk for erosion is based upon:

- Proximity to a water course
 - The closer to a water course the higher the risk
- Slope of working and downstream areas
 - The steeper the slope the higher the risk
- Level of disturbance to existing ground
 - The more ground disturbance the higher the risk

The proposed activities, potential impacts, areas susceptible, risk and mitigation measures are presented below in Table 1.

Table 1- Erosion and Sediment Potential and Mitigation Measures

Proposed Works	Potential Impacts	Areas Susceptible	Risk	Mitigation Measures
Operation of quarry sites	1- Sedimentation from exposed earthworks and operation of equipment 2- Erosion of exposed slopes 3- Alterations to local drainage	1,2,3- Quarry locations	1- Low 2- Low 3- Low	1-Check Dams at downstream end of pit and roadside ditching downstream where required 2, 3-Grading procedures will be implemented to ensure stability of slopes and positive drainage
Construction of Access Road	1- Sedimentation from exposed earthworks 2- Erosion of exposed slopes 3- Alterations to local drainage	1,2,3- Full length of Access Road 3-Water Crossings	1-Medium 2-Medium 3- Medium to High	1- Silt fencing or straw wattles will be installed around the perimeter of work areas 2,3,- Check Dams at downstream ends and downstream roadside ditching as required
Installation of crane pads, turbine foundations	1- Sedimentation from exposed earthworks and movement of vehicles	1-Turbine Area	1-Low/Medium	1-Silt fencing or straw wattles will be installed around the perimeter of work areas

4.2. Construction Sequencing

The implementation of the recommended erosion and sediment control measures should be completed in sequencing that mitigates any increased sediment transportation from the development area due to the construction. Only once the Erosion and Sediment Control measures are in place should major construction work begin. Construction staging and sequencing strategy will be activity specific, but the general order of measures are as follows:

- Install perimeter silt fencing and/or straw wattles
- Install erosion control blankets at slopes and channels
- Install sediment traps on approaches to bridges to intercept roadway drainage
- Install culverts and inlet and outlet protection at all road culvert crossings as required
- Installing drainage swales and drainage ditches as required along the crest of slopes and along access routes
- Install rock check dams across natural or man-made channels or drainage ditches
- Install sediment basins and ESC measures at material quarry sites.

Site specific details will incorporate the above measures and will be included on drawings and reviewed with crews as part of their pre-task instructions. After the above measures are completed all other proposed construction can be completed.

4.3. Contractor Responsibilities

The contractor will be responsible for ensuring compliance with all erosion and sediment control measures outlined within this document. At all times during construction, erosion control measures are to be maintained in working order, cleaned, and adjusted as required to achieve the desired objective. When the construction works are completed, and the permanent erosion and sediment control measures are functioning correctly, any temporary best management practices measures can be removed and any collected sedimentation during construction works is to be removed.

4.4. Water Management

In general turbid water will be managed by:

- Containment and Elimination of Source – contain the discharge with silt fences, pipes, sandbags, or a soil berm down-slope from the affected area.
- Cleanup – when containment is complete, turbid water and sediment will be directed to the most logical settling pond to either infiltrate or settle the suspended particles.
- Before discharging to watercourses or drainage areas, discharge water must be sampled and tested to ensure quality requirements in accordance with regulatory agencies, including but not limited to the ministry of environment and natural resources, are adhered to. Where water is not suitable for discharge into the adjacent watercourses or drainage areas, it must be disposed off-site at an approved disposal facility.

4.5. Erosion and Sediment Control Maintenance

The Erosion and Sediment Control's shall be maintained for the duration of construction. Should any new areas of the project become subject to erosion, the same best management practices and procedures outlined in this document should be used to stabilize the area and eliminate erosion and sedimentation from recurring.

The sediments removed during maintenance should be placed in a designated location with silt fencing and permanently stabilized with the use of hand seeding or hydro-seeding. Once the area is established with vegetation it is considered stabilized and silt fencing can be removed.

4.6. Erosion & Sediment Control Inspection and Monitoring

During construction, the ESC measures shall be monitored and inspected on a daily and weekly basis and after significant rainfall events. For areas that are considered moderate to high-risk as noted in Table 2, the ESC measures will be monitored on a daily basis where work is actively occurring. Deficiencies identified during inspections shall be remediated immediately to prevent sediment mobilization, as directed by the ESC Monitor.

The inspections will include:

- Observe runoff leaving the site during storms checking for turbid water.
- Inspect downslope areas surrounding the site for tracking of sediment.
- Report the results of the inspection and recommended improvements, if any, to the contractor.
- Evaluate the implementation of specified measures and ensure installation is in accordance with the drawings and manufacturers specifications.

Inspection reports will be completed to summarize results of daily monitoring, weekly inspections, and inspections after major rainfall events. Copies of the inspection reports will be kept onsite and available for review upon request. If the ESC measures were to fail and turbid water reached a watercourse the Contractor may also complete TSS/turbidity monitoring if required.

4.7. Emergency Response Framework and Contingency Planning

In the event of a large storm event, the contractor shall immediately control and respond to turbid water discharges and sediment transport outside of the developed site area. Appropriate action includes the following:

- Hazard Assessment - assess the source, extent, and quantity of the discharge.
- Containment and Elimination of Source – contain the discharge with silt fences, pipes, sandbags, or a soil berm down-slope from the affected area.
- Cleanup – when containment is complete, turbid water and sediment will be directed to the most logical settling pond to either infiltrate or settle the suspended particles.

- Notification – all discharges of turbid water to tributaries or natural drainage courses leading to any watercourse should be reported immediately the contract administrator and applicable regulatory agencies.

The response framework for contingency planning is presented in Table 2. This approach constitutes passive adaptive management, or the application of best practices. Reports of actions under the Response Framework will be provided to the Gwich'in Land and Water Board as required under the permit.

Table 2- Response Framework for Erosion and Sediment Control Measures

Threshold	Description	Action Level	Tasks
Erosion and Sediment Control Measures are functioning as required	<ul style="list-style-type: none"> • Sediment is being contained by proposed measures • Erosion is not present in working areas and on slopes 	None	<ul style="list-style-type: none"> • Continue with construction with no further mitigation actions required • Continue with required ESC weekly and post-rainfall monitoring and inspections
Erosion and Sediment Control Measures require maintenance but there is no risk of failure	<ul style="list-style-type: none"> • Sediment is being contained by proposed measures, but measures are no longer functioning as required • Signs of minor erosion are present in working areas and slopes, but no risk of failure is present 	Low	<ul style="list-style-type: none"> • Remove sediment so that the ESC measure can properly function • Repair erosion as required • Investigate areas upstream of sedimentation and/or erosion for any deficiencies • Continue with required ESC weekly and post-rainfall monitoring and inspections
Erosion and Sediment Control Measures require maintenance and there is risk of failure	<ul style="list-style-type: none"> • Sediment is being contained by proposed measures, measures are no longer functioning as required and risk of failure due to accumulation is present • Signs of erosion are present in working areas and slopes, risk of failure is present 	Medium	<ul style="list-style-type: none"> • Notify the Project Supervisor or designate • Mobilize resources within 24-48 hours to remove sediment and/or repair erosion as required so risk of failure is no longer present • Investigate areas upstream of sedimentation and/or erosion for any deficiencies • Increase monitoring to daily inspections until stability is confirmed • Continue with required ESC weekly and post-rainfall monitoring and inspection
Erosion and Sediment Control Measures have failed	<ul style="list-style-type: none"> • Sediment is no longer being contained and measures have failed • Erosion has resulted in failure of slopes in working area 	High	<ul style="list-style-type: none"> • Notify Project Supervisor or designate • Stop all earthworks and mobilize equipment to repair measures that have failed • Follow spill response protocols in the Spill Contingency Plan if required • Implement additional ESC measures outlined in Section 7 to contain sediment from travelling offsite if required • Increase frequency of monitoring to every two hours until stability is confirmed, complete TSS monitoring if required • Continue with required ESC weekly and post-rainfall monitoring and inspection

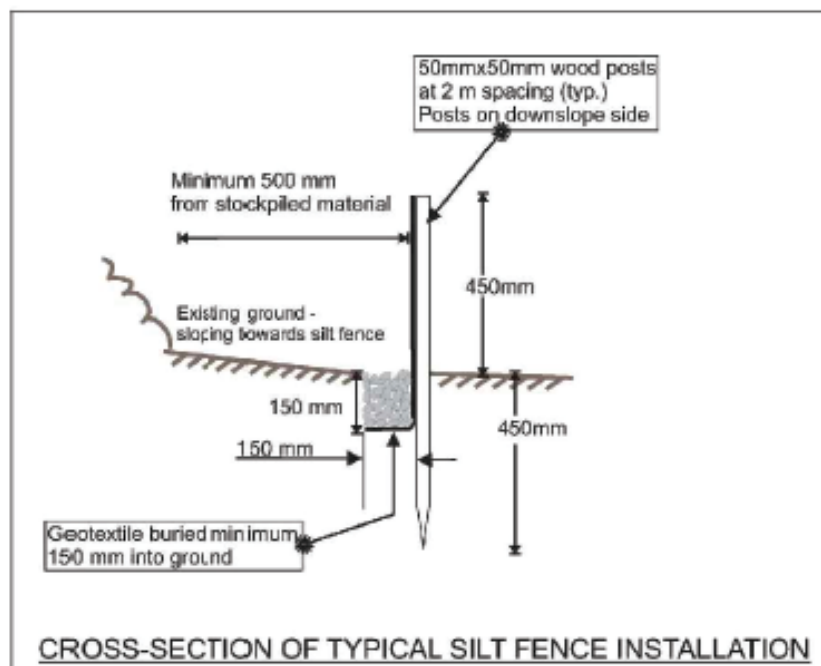
5. Proposed Erosion and Sediment Control Measures

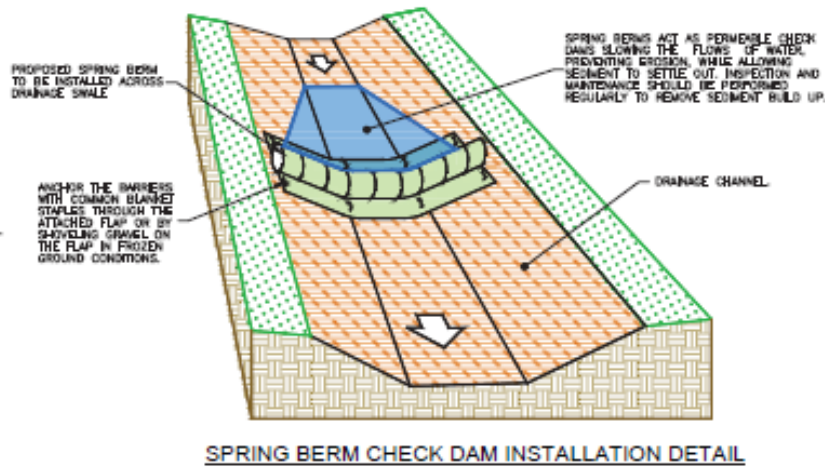
Site specific work plans will incorporate the following erosion and sediment control measures applicable to the areas where construction activities are taking place. The proposed erosion and sediment control measures will be included on site drawings and reviewed with crews as part of their pre-task instructions.


5.1. Silt Fencing & Straw Wattle/Silt Socks

Silt fencing allows surface water to pond so sediment particles can settle. It is to be installed where sheet flow run-off is expected or is occurring and are not to be used within drainage channels or ditches. Silt fencing should be installed around the perimeter of all work areas. It should be installed in any area where it is determined that sedimentation will be an issue, specifically in any areas that are adjacent to water bodies, rivers, creeks, ditches or other areas where sedimentation is a potential concern. The fences should be inspected daily and after all rain events. At the discretion of the ESC Monitor, silt fences should be installed at the base of new fill/cut slopes, along temporary access construction, and at any location where sedimentation is of concern, especially areas directly adjacent to streams, drainage courses or riparian areas. Silt fencing is to be maintained regularly until a solution can be implemented to manage the source of sheet flow, erosion, and sediment transport.

In areas with minimal soil cover, which would make the installation of silt fencing ineffective straw wattles or silt socks will be installed to trap running sediment during construction.

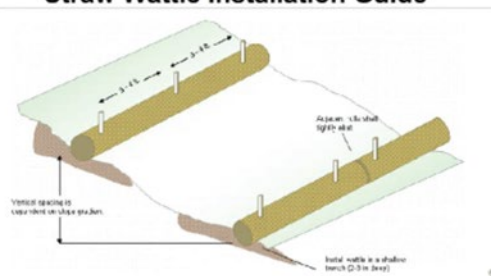






Straw Wattle Installation Guide

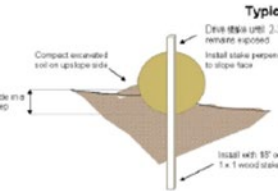
A **terracor** Company



Typical Wattle Installation Guide

Vertical stakes to be driven on slope gradient.

Install wattle in a shallow trench (2-3 in deep).



Entrenchment Detail

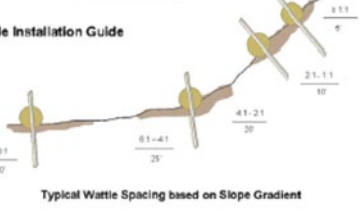
Set wattle in a 2.5" deep trench.

Compact excavated soil on upslope side.

Drive stakes into 2.5" remains exposed.

Install stake perpendicular to slope face.

Install with 18" or 24" 1 x 1 wood stakes.



Typical Wattle Spacing based on Slope Gradient

Slope Ratio	Wattle Spacing
3:1	5'
2:1	10'
1.5:1	15'
1:1	20'
0.75:1	25'
0.5:1	30'

1. BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" (5-7.5 CM) DEEP X 9" (22.9 CM) WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UP-SLOPE FROM THE ANCHOR TRENCH.
2. PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UPHILL SIDE. ADJACENT WATTLES SHOULD TIGHTLY ADJUT.
3. SECURE THE WATTLE WITH 18-24" (45.7-61 CM) STAKES EVERY 3-4' (0.9 - 1.2 M) AND WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE WATTLE LEAVING AT LEAST 2-3" (5-7.5 CM) OF STAKE EXTENDING ABOVE THE WATTLE. STAKES SHOULD BE DRIVEN PERPENDICULAR TO SLOPE FACE.

North American Green Straw Wattles are a Best Management Practice (BMP) that offers an effective and economical alternative to silt fence and straw bales for sediment control and storm water runoff.

Guidelines are provided to assist in design, installation, and structure spacing. The guidelines may require modification due to variation in soil type, rainfall intensity or duration, and amount of runoff affecting the application site.

To maximize sediment containment with the Straw Wattle, place the initial structure at the top/crest of the slope if significant runoff is expected from above. If no runoff from above is expected, the initial Straw Wattle can be installed at the appropriate distance downhill from the top/crest of the slope. The final structure should be installed at or just beyond the bottom/toe of the slope. Wattles should be installed perpendicular to the primary direction of overland flow.

Straw Wattles are a temporary sediment control device and are not intended to replace rolled erosion control products (RECPs) or hydraulic erosion control products (HECPs). If vegetation is desired for permanent erosion control, North American Green recommends that RECPs or HECPs be used to provide effective immediate erosion control until vegetation is established. Straw Wattles may be used in conjunction with blankets, mats, and mulches as supplemental sediment and runoff control for these applications. Like all sediment control devices, the effectiveness of the Straw Wattle is dependent on storage capacity.

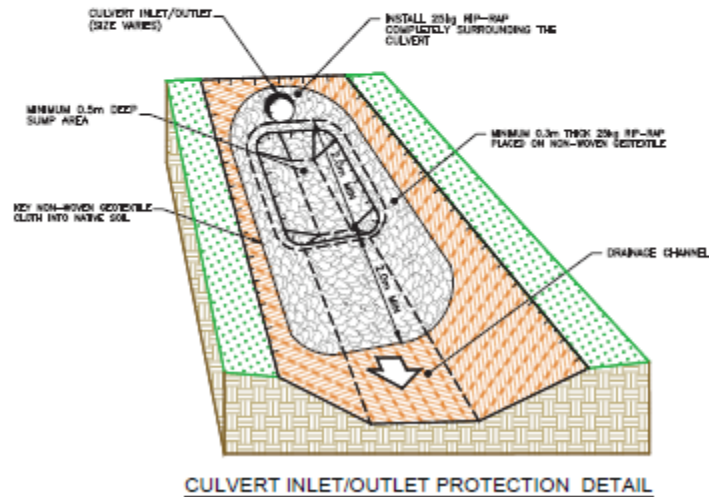
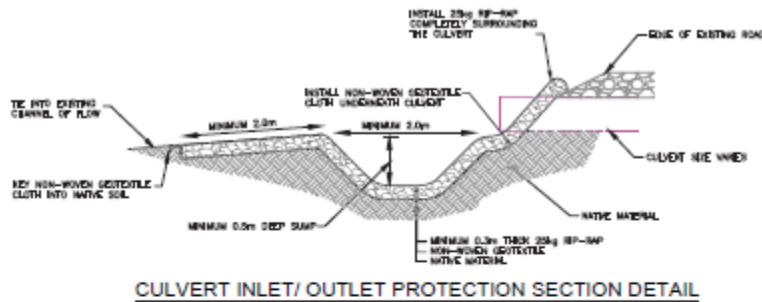
For additional installation assistance, please contact North American Green's Technical Services Department at 1-800-772-2040

5401 St. Wendel – Cynthia Road, Poseyville, IN 47653
1-800-772-2040 www.nagreen.com

Rev. 1/2011

5.2. Culverts and Inlet/Outlet Protection

All culverts around work areas should be protected with rock armored sumps to catch sediment on both inlets and outlets. Where temporary measures are required, the contractor will protect stormwater inlets with mesh and geotextile fabric and berm the perimeter.



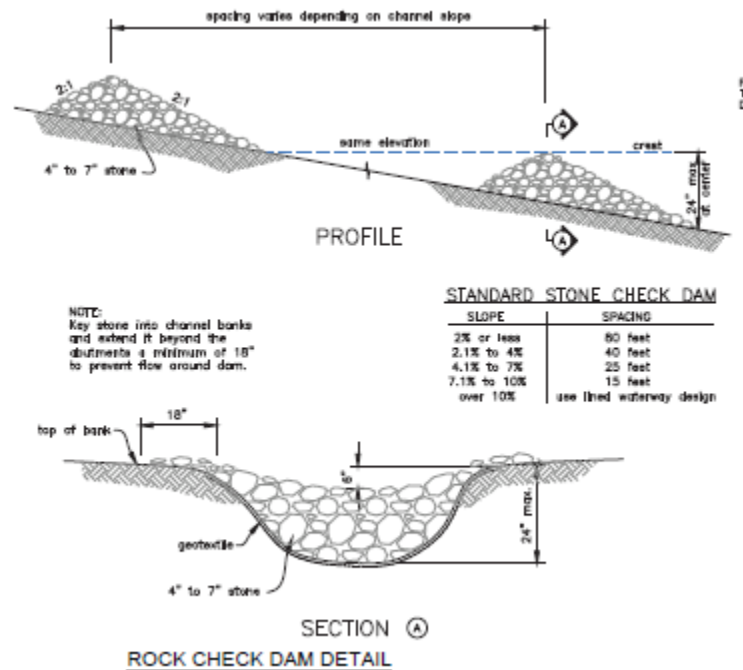
5.3. Drainage Swales/ Ditching and Diversion Ditching/ Berming

In locations close to watercourses and/or with steep gradients, roadside ditching or drainage swales will be implemented to collect runoff, trap sediment and avoid sheet flows which may damage roadways or work areas.

During excavation activities, diversion ditching/ berming will be used to prevent water from entering the site and to direct water out of the site. Ditches will incorporate check dams and flow dissipaters.

5.4. Rock Check Dams

Rock check dams are used in drainage channels to reduce the velocity of flowing water and prevent scouring; they also allow mobilized sediment to settle out of turbid water. Check dams are commonly constructed out of rock, sandbags, or manufactured products such as spring berms. The rock check dams will be constructed from clean fill from one of the borrow locations. Rock check dams will be installed at roadside swales or ditching near water and/or with a steep gradient. As directed by the ESC Monitor, check dams may be installed in new or existing drainage courses as required. All check dams must be monitored and maintained regularly.



5.5. Vegetation Protection

To reduce the disturbed area, the limits of any clearing and the limits of any brush and topsoil removal shall be kept to the minimum required to complete construction. Construction vehicles will have designated access routes from and to the construction area. Limits of clearing shall be clearly marked with flagging or other appropriate measures. Vegetation clearing should be planned to avoid nesting period for breeding birds (early-May to mid-August)

To reduce the potential for erosion, grubbing (removal of stumps, roots, and undergrowth) will be limited to only where required. Equipment laydown and areas under trailers can be left undisturbed. Grubbed material will be placed along the perimeter of the area, seeded and left to revegetate. This material will be incorporated into site reclamation planning following the construction period.

As with quarry sites, the work and laydown areas will be designed to be free draining to prevent standing water. The berms from grubbed material will act to divert any stormwater around the site and ditching will be incorporated to both divert and collect drainage.

5.6. Soil and Construction Debris Stockpiles and Supplies On-Site

During construction, any accumulated construction materials should either be removed off-site or stockpiled. Any debris or accumulated soils that are stockpiled should be contained within an area surrounded by silt fencing and covered with tarps to prevent and erosion

Extra erosion and sediment control supplies (e.g., additional silt fencing, etc.) should be stored on-site if an emergency requires the need for attention or repair to installed measures. These materials should be kept on-site for the duration of construction and site restoration until disturbed slopes are stabilized.

5.7. Wind Erosion and Dust Control

Dust on a construction sites is typically caused vehicle traffic or wind which can then cause mobilize exposed soils as a result of wind erosion. The following methods can be implemented to minimize control wind erosion and dust generation:

- Reduce vehicle traffic from entering and leaving the Site
- Reduction of vehicle and equipment speed within the Site
- Covering stockpiles with tarps
- Installation of silt fences or similar barriers
- Applying water daily exposed soils and stockpiles during dry periods

5.8. Site Access Management

The following site access management measures will be used to minimize site disturbance for overall construction activities for all areas:

- Access to construction sites will be limited to essential personnel.
- Personnel will coordinate travel and use shuttle buses to limit the number of vehicles in the ROW.
- Tracked equipment will be used wherever practical to avoid rutting from tire-mounted equipment.

For access road construction, operation and maintenance the following measure will be used:

- Construction right-of-way will be clearly demarcated. Personnel will be instructed to stay within the right-of-way.
- Heavy equipment will be mobilized during winter (frozen) and/or summer (dry) conditions as much as possible.
- Equipment will operate/travel along future road footprint to avoid permanent damage.
- Drainage ditches or diversions will discharge to areas away from waterbodies