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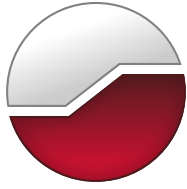
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**Erosion and Sediment Control Plan
Proposed Commercial Development
5506 Manotick Main Street
Ottawa, Ontario**

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Submitted to:

KGMS Construction c/o Cedar Sands Holdings Inc.
184 Redpath Drive
Ottawa, Ontario
K2G 6K5

**Erosion and Sediment Control Plan
Proposed Commercial Development
5506 Manotick Main Street
Ottawa, Ontario**

February 4, 2020
Project: 65032.03

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Ottawa, ON, Canada
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February 4, 2020

File: 65032.03 – R0

KGMS Construction c/o Cedar Sands Holdings Inc.
184 Redpath Drive
Ottawa, Ontario
K2G 6K5

Attention: Steve Menard

Re: Erosion and Sediment Control Plan
5506 Manotick Main Street, Ottawa, ON

Please find enclosed, the Erosion and Sediment Control plan prepared by our office for the proposed development at 5506 Manotick Main Street in Ottawa, Ontario.



Matthew Rainville, C.E.T., CISEC

Enclosures
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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists (GEMTEC) has been retained by KGMS Construction (the contractor) to prepare an Erosion and Sediment Control (ESC) Plan for the proposed commercial development at 5506 Manotick Main Street in Ottawa, ON. The purpose of this document is to provide an ESC plan (see Appendix A) in support of the proposed construction.

The recommendations provided herein are based on information that has been provided to our firm including, but not limited to, proposed development/construction details, specifications, and plans.

1.1 Project and Site Description

Based on details provided to our firm, it is understood that the project will consist of the removal of the existing building at the property and the construction of a two storey commercial building along with paved parking and laneway areas. The project limits (herein known as 'the project site'), are considered to be the property lines of the subject property. The project site has an area of approximately 1,400 square metres.

1.2 Background Information

The following project specific documentation, which was provided to our firm, was referenced during the preparation of the ESC plan:

- Surveyor's Teal Property Report, dated June 21, 2019, prepared by J.D. Barnes Limited
- Preliminary Site Plan, dated January 2020, prepared by Grant+Henley Design Group

2.0 PURPOSE

ESC procedures are developed and implemented in order to minimize and manage the potential for adjacent surface water bodies and watercourses, as well as adjacent properties, being adversely affected by sediment laden surface water runoff stemming from the erosion of soil caused by construction activities on the subject site.

The objective of minimizing the above risk is achieved by assessing, monitoring and managing surface water drainage patterns, both entering and exiting the project site, and implementing protective measures to alleviate the impact resulting from the temporary condition of altered surface water runoff from the project site during and following construction activities.

3.0 RESPONSIBILITIES AND TRAINING

3.1 Responsibilities

It is the responsibility of the contractor to ensure that the procedures outlined in this document, as well as OPSS.PROV 805, are properly implemented. This includes the provision of adequate training to all applicable site personnel.

3.2 Training

The contractor shall identify key site personnel that will be responsible for ESC measures and ensure that adequate, applicable training is provided to those identified individuals. Site personnel will be responsible for, but not limited to, the following tasks:

- Installation and maintenance of ESC measures;
- Sediment removal from ESC measures;
- Monitoring of ESC performance;
- Reporting of deficiencies/events noted during monitoring activities;
- Maintaining a monitoring and maintenance log;
- Monitoring of weather forecasts and planning of site activities accordingly; and,
- Implementing the Emergency Response Plan/Procedures.

4.0 EROSION AND SEDIMENT CONTROL PROCEDURES

4.1 General

Surface erosion and sediment runoff resulting from construction activities can negatively affect neighbouring properties and adjacent and downstream surface water bodies and watercourses, directly or indirectly through avenues such as storm sewers. As such, all construction activities are to be carried-out in such a manner as to meet the procedures provided in this ESC plan, as well as the requirements of all applicable legislation and regulations put forward by, but not limited to, the following authorities:

- City of Ottawa
- Ontario Ministry of the Environment, Conservation and Parks (MECP);
- Ontario Ministry of Natural Resources and Forestry (MNRF);
- Rideau Valley Conservation Authority;
- Department of Fisheries and Oceans Canada.

4.2 Procedures

The ESC plan for this project is provided in Appendix A (Figure 1). The proposed ESC measures associated with this project may include street sweeping, seeding and re-vegetation, sediment fencing, and check dams. Details pertaining to the installation of these measures are provided

on the ESC plan in Appendix A, OPSS.PROV 805 in Appendix B, and OPSD 219.110, OPSD 219.180, OPSD 219.200, and OPSD 219.211 in Appendix C. Where applicable, storm catch basin/manhole inlet protection shall be installed. Where practicable, Highcroft Drive and Manotick Main Street are to be kept clean of debris and loose soil/material during construction activities. Any collected debris/soil is to be disposed of in an acceptable manner. Given the size of the project site, it is our opinion that the installation of an effective mud track pad/mud mat is not feasible, and therefore allowance for roadway sweeping and/or washing at an increased frequency should be provided.

The contractor shall ensure that all key site personnel are aware of the ESC plan and have an adequate understanding of the requirements provided in the ESC plan.

The contractor is responsible for ESC activities including the implementation of the procedures outline in this ESC plan, as well as adhering to the requirements provided in OPSS.PROV 805 (see Appendix B).

Planning and scheduling of activities that will involve the disturbance of the ground surface should be done so as to minimize the area of disturbance (i.e. area of disturbance kept to minimum; staged/staggered disturbance of areas, etc.) and the length of time that the ground surface will remain disturbed in those areas. As well, and where feasible, such activities will not be carried out when heavy precipitation is forecast.

Construction activities, including excavation, relocation, and storage of excavated materials should occur in accordance with established policies and best management practices. Any activities undertaken in addition to those outlined in the project construction documents will be carried out in a manner so as to avoid any unnecessary disturbance of the existing ground surface.

Prior to implementing alterations to the proposed ESC measures, prior approval from the Engineer of Record (EOR) should be obtained.

4.3 Phasing

The ESC measures will be installed prior to the commencement of construction activities and altered during construction as required, will remain in place for the duration of construction activities or indefinitely as required, and will be removed, if applicable, as indicated in the following sections.

It is understood that the following general construction schedule is proposed:

Table 4.1 – Construction Phasing Schedule

Segment	Description	Date of Operations
Site Preparation	<ul style="list-style-type: none"> Topsoil Stripping, importing fill, grading. 	April 2020
Foundation Construction	<ul style="list-style-type: none"> Slab, walls 	May 2020
Building Construction	<ul style="list-style-type: none"> Building Envelope 	June to September 2020
Auxiliary areas	<ul style="list-style-type: none"> Parking, laneway, curbs 	September 2020
Final Landscaping	<ul style="list-style-type: none"> Grading, vegetation 	October 2020

4.4 Erosion Control

The control of erosion is considered to be the primary defense against the release of sediment into adjacent sewers, waterbodies and watercourses. The following table summarizes the erosion control methods that are proposed for specific locations as shown on the attached plan in Appendix A. Where applicable, the recommended sequence of installation is provided.

Table 4.2 - Recommended Erosion Control Measures

Location	Additional Description	Recommended Erosion Control Measures
All areas of proposed works	-	<ul style="list-style-type: none"> Minimize disturbance to existing vegetation; reinstate disturbed vegetation in a timely manner. Where vegetative disturbance will occur, schedule such works outside periods of forecasted precipitation. Where vegetative disturbance will occur, stage the operations so as to minimize the size of the areas that will be exposed (i.e. disturb and

Location	Additional Description	Recommended Erosion Control Measures
		<p>protect small areas before progressing to next area).</p> <ul style="list-style-type: none"> Where feasible, provide temporary protection to exposed soil surfaces until final stabilization measures are implemented (eg. seeding and surface protection products).

4.5 Sediment Control

The following table summarizes the sediment control methods that are proposed for specific locations as shown on the attached plans in Appendix A. Where applicable, the recommended sequence of installation is provided.

Table 4.3 - Recommended Sediment Control Measures

Location	Additional Description	Recommended Sediment Control Measures
All areas of proposed works	-	<ul style="list-style-type: none"> Where disturbance of vegetation will occur, schedule such works outside periods of forecasted precipitation. When placing access laneway and parking area granular material, ensure the material is placed and compacted in a timely manner. Excess/Excavated material should be removed from the site, or stockpiled and stockpiles protected with a surround of Sediment Fence Barrier per OPSD 219.110. Adjacent ditches to the project site should have check dams installed. Catch basins/manholes/storm inlets should be protected from sediment by installing insert protection and/or perimeter barriers (eg. filter sock, perimeter berm).
Highcroft Drive and Manotick Main Street	Sections adjacent project site	<ul style="list-style-type: none"> Allow for monitoring and frequent sweeping/washing of the roadways.

Location	Additional Description	Recommended Sediment Control Measures
North, East, and South Site Limits		<ul style="list-style-type: none"> Install Sediment Fence Barrier per OPSD 219.110
West Site Limit		<ul style="list-style-type: none"> Maintain a natural vegetated buffer along the property line by minimizing stripping/disturbance of vegetation and the area of construction activities within this area

4.6 Monitoring and Maintenance

All temporary control measures shall be monitored and maintained by the contractor.

It is recommended that monitoring occur daily, and particularly prior to and following a heavy precipitation event. At a minimum, monitoring is to occur once a week. Any noted deficiencies in the performance of the measures are to be reported immediately to the EOR at GEMTEC. An inspection log should be maintained by the contractor (or its designate) and kept up to date and available for review by any applicable authorities.

It may be necessary that the contractor charge personnel with 24 hour monitoring depending on the stage of construction and potential for failure of the prescribed measures.

The EOR should requested attend the project site on a weekly basis to assess the performance of the ESC measures.

The contractor (or its designate) shall undertake monitoring of the quality of runoff water (where applicable) and dewatering effluent discharge as required by, but not limited to, the contract documents, regulatory requirements, and/or sewer use bylaws. Where no specific criteria have otherwise been identified, the following discharge objectives (provided on City of Ottawa Special Provision F-1004) shall be followed:

Table 4.4 - Minimum Water Quality Criteria

Source	Objective	Monitoring Frequency
Watercourse Impacts	Downstream turbidity not to exceed upstream levels by 25%.	Minimum daily for first three days of operation. Minimum twice weekly on an ongoing basis. Daily where work is

Source	Objective	Monitoring Frequency
		being conducted within 20 metres of a watercourse.
Discharge from Dewatering Operations	TSS maximum level of 25 mg/L.	Minimum daily for the first three days of operation. Minimum of twice weekly on an ongoing basis.

The contractor shall, when necessary, remove accumulated sediment and debris from the control devices. Removal shall occur in a manner so as to avoid the release of sediment and debris into any sewer, water body, or watercourse, or damage to the control devices.

4.7 Removals

Temporary ESC measures shall be removed and their associated excavations reinstated when the measures are no longer required due to the affected areas being adequately stabilized (eg vegetated, protected with long term measures, etc.), as determined by, and with written approval from, the EOR. The procedure for removing the measures shall ensure that no sediment or debris is released to any waterbody/watercourse during the removal.

5.0 DURING CONSTRUCTION DEWATERING

Any required dewatering operations will be completed such that discharge rates will not increase the likelihood of flooding or erosion conditions on or adjacent the project site. To mitigate the risk of sediment migration off site/downstream, dewatering discharge should be treated through the use of a dewatering bag installed on a suitable subgrade (eg. geotextile underlying a granular pad) and/or sediment traps/removal device. Treated water may be discharge to a gently sloped, vegetated area (when possible) greater than 30 metres from any watercourse, or alternatively, may be discharged to a sewer. In either case, where discharge water will enter the sewer system, the guidelines provided in the applicable sewer use regulations must be followed.

6.0 CONTINGENCY PLAN

The contingency plan is provided with the intention of minimizing the consequences and additional risks of a failure of the ESC measures. Contributors to a failure could include insufficient measures, unforeseeable circumstances, lack of maintenance, and/or severe weather conditions.

The contractor shall be responsible for the ESC contingency plan, and, at a minimum, will ensure the following items:

- Designated workers shall be on call and available for emergency situations, on a 24 hour basis, and responsible for implementing emergency measures as determined to be necessary;
- A spill control kit be kept on the project site at all times;
- A reserve supply of ESC materials (i.e. sand bags, tarps, filter cloth, stakes, sediment filter bags, pumps, etc.) should be on site and readily available at all times; and
- Heavy equipment shall be on stand-by for emergency works.

6.1 Contingency measures for increased risk of failure

Areas at increased risk of failure can be identified by monitoring the control measures (condition and performance) and forecasted severe weather conditions.

6.1.1 Risk identified through monitoring

Where monitoring has identified items with an increased potential for failure, corrective measures shall be undertaken immediately and may include repair or modification of the measure, or the addition of measures.

6.1.2 Risk due to forecast of severe weather

In the event of a forecast of significant rainfall (> 10 mm within a 24 hour period), the contractor shall complete the following:

- Prior to the event, assess the condition of all ESC measures;
- Prior to the event, ensure there is no exposed soil surfaces that could erode and lead to sedimentation of site; and
- Monitor the measures during and following the rainfall event, and report any noted issues to the EOR. Corrective actions are to be taken immediately where needed. See following section.

6.2 Contingency measures in case of failure

In the event of a failure, the contractor will cease all construction work and immediately attend to the ESC measures as required in order to stabilize/mitigate the failure. The contractor will notify the EOR immediately.

Where a significant failure is observed, the contractor shall immediately notify the applicable authorities as outlined in the following section.

7.0 SPILL AND EMERGENCY RESPONSE PROCEDURES

In the event of an accidental spill or occurrences (i.e. discharge of contaminants to water courses, adjacent properties, or sewer), the contractor shall immediately report the incident to all applicable authorities and the EOR.

Table 7.1 – Regulatory Contacts in case of events/spills.

Regulatory Authority	Contact Details
Ontario Spills Action Centre	1- (800) 268-6060
Rideau Valley Conservation Authority	1- (613) 692-3571

The contractor is responsible for developing and implementing a spill prevention and control plan (SPCP), and ensuring that all workers are aware of the emergency procedures. The SPCP will include the designation of acceptable equipment fueling and maintenance areas being, but not limited to, areas located at the greatest possible distance from sensitive features (i.e., watercourses, catch basins). In addition, concrete washout areas will be similarly established by the contractor and/or other subcontractors/contractors as necessary.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.



Matthew Rainville, C.E.T., CISEC



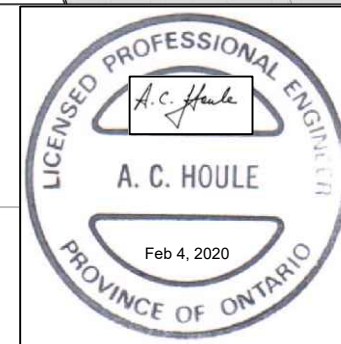
Craig Houle, M.Eng., P.Eng.





APPENDIX A

Erosion and Sediment Control Plan Figure 1





APPENDIX B

Ontario Provincial Standards Specification (OPSS) 805 Construction Specifications for Temporary Erosion and Sediment Control Measures



CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES

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805.01	SCOPE
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This specification describes the requirements for the installation, maintenance, and removal of temporary erosion and sediment control measures.

805.02	REFERENCES
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This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 206	Grading
OPSS 517	Dewatering
OPSS 804	Seed and Cover

Ontario Provincial Standard Specifications, Material

OPSS 1004	Aggregates - Miscellaneous
OPSS 1801	Corrugated Steel Pipe Products
OPSS 1840	Non-Pressure Polyethylene Plastic Pipe Products

Canadian and Provincial Statutes

Ontario Water Resources Act, R.S.O. 1990, c. 0.40

805.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Diversion Ditch means a temporary channel to intercept and convey overland flow away from areas of disturbed or erodible soil and to minimize erosion of slopes from sheet flow.

Earth means as defined in OPSS 206.

Erosion means the physical removal or detachment of soil particles from an earth surface, followed by the transport of detached particles to another location by the action of a mobile agent including rain, flowing water, wind, equipment and vehicles.

Fibre Roll means an assembled or commercially available flexible, tubular structure that provides sediment control and may provide run-off filtration and includes wattles, filter socks and filter berms.

High Water Level means the highest point on the bank or floodplain of a waterbody where the water level reaches during high flow events or periods.

Riparian Vegetation means vegetation within 30 m of a waterbody.

Sediment means soil particles detached from an earth surface by erosion.

Waterbody means any permanent or intermittent, natural or constructed body of water including lakes, ponds, wetlands and watercourses, but does not include sewage works as defined in the Ontario Water Resources Act.

Waterbody Bank means the slope on or adjacent to a waterbody from the normal water level to the top of slope.

Watercourse means a stream, creek, river, or channel including ditches, in which the flow of water is permanent, intermittent, or temporary.

805.05 MATERIALS

805.05.01 Straw and Straw Bales

Straw shall be either wheat or oat straw.

Straw bales shall be dry and firm, be tied tightly in at least two places, show no evidence of straw or tie decay, and be free of sediment. They shall be of agricultural, rectangular formation and dimensions, as specified in the Contract Documents.

805.05.02 Geosynthetics

805.05.02.01 Geotextile

Geotextile shall be free of holes, tears, and punctures.

805.05.02.02 Silt Fence Geotextile

Geotextile for silt fence shall be according to OPSS 1860, Table 3.

Geotextile for silt fence may be separate from the stakes used to install it as a sediment barrier.

805.05.02.03 Berm Barrier and Rock Flow Check Dam Geotextile

Geotextile for berm barriers and rock flow check dams shall be a woven, Class II geotextile according to OPSS 1860. The filtration opening size (FOS) shall be no greater than 300 µm.

805.05.02.04 Turbidity Curtain Geosynthetic

Turbidity curtain geosynthetics shall have a grab tensile strength of at least 990 N, according to OPSS 1860 and be one of geotextile or geomembrane.

Geotextile shall be a woven material. The filtration opening size (FOS) shall be no greater than 300 µm, according to OPSS 1860.

Geomembrane shall be a low-permeability synthetic material or a geotextile impregnated with elastomeric spray.

805.05.02.05 Filter Bags

Geotextile for filter bags shall be non-woven, polypropylene, Class I according to Table 1 of OPSS 1860 unless otherwise specified in the Contract Documents.

805.05.03 Plastic Sheeting

Plastic sheeting used to wrap berm barriers or other sediment control measures shall be 6 mm polyethylene of maximum available width.

805.05.04 Stakes

Stakes shall be of sufficient strength and length to satisfy control measure installation, performance and maintenance requirements.

805.05.05 Control Measure Support

Control measure support for heavy-duty silt fence barrier shall be a separate product or one bonded to silt fence geotextile and be either plastic snow fence mesh, 0.81 mm diameter galvanized wire mesh or 1.63 mm diameter galvanized steel fence with a 5 cm by 10 cm weave and a 0.91 m height.

When a heavy-duty silt fence barrier is installed using a product manufactured with the control measure support bonded to the geotextile it shall be installed with the geotextile on the upstream side or front of the control measure support.

805.05.05.01 Posts

Posts to support heavy duty wire-backed silt fence barriers shall be metal T-posts. Metal ties shall be used to secure the silt fence to the metal T-posts.

805.05.06 Berm Barriers

Berm barriers shall be constructed using earth, sand, gravel, brush or compost.

805.05.07 Sandbags

Sandbags shall be made from heavy gauge plastic, agricultural burlap, or silt fence geotextile. Heavy gauge plastic shall contain stabilizers or inhibitors resistant to deterioration by ultraviolet radiation. Sandbags shall be filled with clean sand, 19 mm gravel or 6 mm pea gravel, containing no silt or clay.

805.05.08 Fibre Rolls

Fibre rolls shall be of a consistent internal thickness with even fibre distribution throughout the roll.

Fibre rolls shall be covered on the outside with an open-weave, biodegradable and photodegradable mesh or netting that securely contains the fibres within the rolls.

Fibre rolls shall be filled with 100% organic, biodegradable material such as shredded straw, wood fibres or compost and may contain seed.

805.05.09 Turbidity Curtain Hardware

805.05.09.01 Floatation

Turbidity curtain floatation shall be a material that has sufficient buoyancy to provide the curtain with continuous support, and a minimum of freeboard as specified in the Contract Documents.

805.05.09.02 Load Lines

Turbidity curtain load lines shall be 8 mm diameter steel cable or 19 mm diameter nylon or polypropylene rope.

805.05.09.03 Ballast

Turbidity curtain ballast shall be 8 mm steel chain.

805.05.09.04 Anchors

Turbidity curtain anchors shall be mushroom or kedge anchors with a minimum mass of 34 kg for firm mud bottoms or self-burying anchors with a minimum mass of 5 kg for sandy bottoms.

805.05.09.05 Mooring Buoys

Turbidity curtain mooring buoys shall have provision for the mooring line to be securely attached and be sufficiently buoyant to remain afloat under normal load conditions.

805.05.09.06 Mooring Lines

Turbidity curtain mooring lines shall be 19 mm diameter nylon or polypropylene rope.

805.05.09.07 Adjustment Lines

Turbidity curtain adjustment lines shall be 13 mm diameter nylon or polypropylene rope.

805.05.10 Rock

Rock for rock flow check dams shall be according to the requirements for rip-rap and gabion stone according to OPSS 1004.

805.05.11 Corrugated Pipe

Corrugated pipe slope drains shall be non-perforated, corrugated steel pipe according to OPSS 1801 or polyethylene plastic pipe according OPSS 1840. Pipe diameter shall be as specified in the Contract Documents.

805.05.12 End Sections

End sections for the inlet and outlet of slope drains shall be according to OPSS 1801, regardless of the material type of the pipe used.

805.05.13 Erosion Control Blankets

Erosion control blankets for diversion ditches shall be as specified in OPSS 804.

805.07 CONSTRUCTION

805.07.01 Operational Constraints

805.07.01.01 Retention of Riparian Vegetation

The area over which vegetation is removed on site shall affect no more than one third (1/3) of the total woody vegetation in the right-of-way within 30 m of the high water level of any waterbody unless otherwise specified in the Contract Documents.

805.07.01.02 Protection of Stockpiled Materials

All stockpiles of erodible construction materials and excess or surplus materials shall be protected from erosion and sediment transport within 48 hours of being built unless otherwise specified in the Contract Documents.

805.07.01.03 Dewatering

Dewatering effluent shall be controlled to prevent passage of sediment into waterbodies and other sensitive environmental features as specified in the Contract Documents or onto adjacent properties. Discharge of dewatering effluent to sediment traps for dewatering shall be controlled to avoid exceeding trap capacity and to prevent scour and washout.

Discharge of water from sediment traps for dewatering shall be according to OPSS 517.

805.07.01.04 Slope Drains

When slope drains are specified in the Contract Documents, the slope drain and associated berm barrier shall be constructed in the same day.

805.07.01.05 Turbidity Curtains and Cofferdams

Equipment shall not be operated in a waterbody outside a turbidity curtain or cofferdam other than hand held equipment or boats.

805.07.01.06 Construction and Removal of Measures

The construction and removal times for temporary erosion and sediment control measures shall be as specified in the Contract Documents.

805.07.02 Light-Duty Sediment Barriers, General

Light-duty sediment barriers are light-duty straw bale barriers, light-duty silt fence barriers, or light duty fibre roll barriers.

Light-duty sediment barriers shall be constructed as specified in the Contract Documents.

Light-duty sediment barriers shall not be installed in or across waterbodies.

When the Light-Duty Sediment Barriers item is specified in the Contract Documents, any light-duty sediment barriers may be used. When a specific light-duty sediment barrier is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Light-duty sediment barriers shall include protection placed against the downslope side at the low points of the barrier so that any overflow of the barrier is prevented from causing soil scour and erosion.

805.07.02.01 Light-Duty Straw Bale Barriers

Light-duty straw bale barriers shall be constructed as specified in the Contract Documents.

When specified to be installed around catch basins, straw bales shall be placed completely around catch basins and ditch inlets without gaps. When a double row of straw bales is specified in the Contract Documents, the straw bales shall be placed such that the joints between the straw bales of each row are not in-line with the joints of the straw bales of the adjacent row.

Stakes securing the bales shall be driven through the bales without breaking the bale ties or otherwise disturbing bale firmness and shape.

Maintenance shall include the replacement of each bale at intervals not exceeding 45 Days.

805.07.02.02 Light-Duty Silt Fence Barriers

Light-duty silt fence barriers shall be constructed as specified in the Contract Documents.

Light-duty silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Light-duty silt fence barriers shall be installed within a trench excavated along the contour of the ground such that the elevation of the above ground portion of the fence is the same along its entire length except at the ends. Light-duty silt fence barriers shall be installed without breaks or gaps along their entire length. Light-duty silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another light-duty silt fence barrier shall be installed as specified in the Contract Documents.

The geotextile shall be attached firmly, without sagging, to the upslope side of the stakes. Stakes shall be spaced to ensure the geotextile remains vertical. Where the geotextile is joined to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to the stakes using cable ties or soft wire at the top of the geotextile only. The geotextile shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

When geotextile is supplied without stakes attached, the geotextile shall be installed into the trench in the ground first, the stakes shall be driven into the ground behind the geotextile, and the geotextile shall be attached to the upslope side of the stakes using cable ties or soft wire at the top of geotextile only.

805.07.02.03**Light-Duty Fibre Roll Barriers**

Light-duty fibre roll barriers shall be sized and constructed as specified in the Contract Documents.

Light-duty fibre roll barriers shall be installed along the contour of the ground into trenches that have been excavated into the soil perpendicular to the slope face to a depth of approximately one half the roll diameter and width across the width of the slope.

Any rills and gullies shall be filled in where light-duty fibre roll barriers are to be installed. Light-duty fibre roll barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another light-duty fibre roll barrier shall be installed tightly butted against the first one.

Light-duty fibre roll barriers shall be installed so that their base is in continuous contact with the underlying soil along their entire length without gaps and angled upslope at each end run in a "J" pattern. The ends of adjacent fibre roll segments shall be tightly butted against each other and shall not be overlapped vertically or horizontally.

A metal bar shall be used to make pilot holes perpendicular to the slope face through the centre of the fibre rolls as specified in the Contract Documents. Pilot holes shall also be made at the ends of each fibre roll segment angled towards the next abutting fibre roll to hold adjacent rolls together.

Wooden stakes shall be driven into the pilot holes as specified in the Contract Documents.

Soil excavated from the trenches shall be placed along the upslope side of the fibre rolls and compacted into the front of the trench to minimize possible undermining by runoff.

The soil on the upslope and downslope sides of the fibre rolls shall be seeded according to OPSS 804.

805.07.03**Heavy-Duty Sediment Barriers, General**

Heavy-duty sediment barriers are heavy-duty silt fence barriers, heavy-duty wire-backed silt fence barriers, berm barriers, or sandbag barriers.

Heavy-duty sediment barriers shall be constructed as specified in the Contract Documents, without gaps and without undermining to prevent sediment passage through, under, or around the barrier.

When heavy-duty sediment barriers are specified in the Contract Documents, the Contractor has the option to select any of the heavy-duty sediment barriers or any combination of them. When a specific heavy-duty sediment barrier is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Heavy-duty silt fence barriers shall include control measure support placed against the downstream side at the low points of the barrier so that any overflow of the barrier is prevented from causing soil scour and erosion.

805.07.03.01**Heavy-Duty Silt Fence Barriers**

Heavy-duty silt fence barriers shall be constructed as specified in the Contract Documents.

Heavy-duty silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Heavy-duty silt fence barriers shall be installed within a trench excavated along the contour of the ground such that the elevation of the bottom of the fence is the same along its entire length except at the ends. Heavy-duty silt fence barriers shall be installed without breaks or gaps along their entire length. Heavy-

duty silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another heavy-duty silt fence barrier shall be installed as specified in the Contract Documents.

The geotextile shall be attached firmly to the upstream side of the control measure support and the stakes. Stakes shall be spaced to ensure the geotextile and the control measure support remains vertical. Where the geotextile or the control measure support is joined to itself to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to stakes using wire ties at the top of the geotextile or the control measure support only. The geotextile and control measure support shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

When geotextile is supplied without the control measure support or stakes attached, the control measure support shall be installed into the trench in the ground first, the geotextile shall be installed into the trench on the upslope side of the control measures support, the stakes shall be driven into the ground behind the geotextile and the control measure support, and the geotextile and control measure support shall be attached to the stakes using wire ties at the top of the geotextile and control measure support and only.

805.07.03.02 Heavy-Duty Wire-Backed Silt Fence Barriers

Heavy-duty wire-backed silt fence barriers shall be constructed as specified in the Contract Documents.

Heavy-duty wire-backed silt fence barriers shall not be used for perimeter control or property line delineation unless specified in the Contract Documents.

Heavy-duty wire-backed silt fence barriers shall be installed in a trench excavated along the contour of the ground such that the elevation of the bottom of the fence is the same along its entire length except at the ends. Heavy-duty wire-backed silt fence shall be installed without breaks or gaps along their entire length. Heavy-duty wire-backed silt fence barriers shall only be installed on flat ground with a minimum offset of 2 m from the toe of the slope being protected. When a longer sediment barrier is required, another heavy-duty wire-backed silt fence barrier shall be installed as specified in the Contract Documents.

The wire control measure support shall be installed into the trench in the ground. The geotextile shall be installed into the trench on the upslope side of the wire control measure support. T-posts shall be installed into the ground behind the geotextile and wire control measure support and spaced to ensure the geotextile and wire control measure support remain vertical. The geotextile and the wire control measure support shall be attached securely to the T-posts using wire ties at the top of the geotextile and wire control measure support only. Where the geotextile or the wire control measure support is joined to itself to provide a continuous run, the ends shall be overlapped a minimum of 500 mm and securely fastened to T-posts using wire ties at the top of the geotextile or wire control measure support only. The geotextile wire control measure support shall be angled upslope at the ends of each run in a "J" pattern and so that the ends are at a higher elevation than the bottom of the run.

805.07.03.03 Berm Barriers

Berm barriers shall be constructed and wrapped in geotextile or plastic sheeting as specified in the Contract Documents. The geotextile or plastic sheeting shall be secured to the ground.

805.07.03.04 Sandbag Barriers

Sandbags shall be securely tied at the top.

Sandbag barriers shall be constructed as specified in the Contract Documents

Sandbags within each row shall be placed with the sides of the bags butted tightly against one another without gaps. The ends of sandbags in adjacent rows shall be butted tightly against one another without gaps.

When sandbag barriers are constructed on earth surfaces, the trench into which the sandbags are placed shall be backfilled around the sandbags to existing grade and compacted.

When sandbag barriers are to be constructed on sod, erosion control blanket, existing turf, or bedrock, they shall be placed so there are no gaps between the sandbags and the underlying surface.

Sandbag barriers shall be maintained with undamaged bags that are firmly seated.

805.07.04 Fibre Roll Grade Breaks

Fibre roll grade breaks shall be constructed as specified in the Contract Documents.

Fibre rolls shall be installed horizontally starting from the toe of the slope and working up to the top of the slope. Any rills and gullies on the slope face shall be filled in as the fibre rolls are installed.

Fibre rolls shall be installed along the contour of the ground into trenches that have been excavated into the soil perpendicular to the slope face and width across the slope.

Fibre rolls shall be installed so that their base is in continuous contact with the underlying soil along their entire length without gaps and angled upslope at each end run in a "J" pattern. The ends of adjacent fibre roll segments shall be tightly butted up against each other and shall not be overlapped vertically or horizontally.

A metal bar shall be used to make pilot holes perpendicular to the slope face through the centre of the fibre rolls as specified in the Contract Documents. Pilot holes shall also be made at the ends of each fibre roll segment angled towards the next abutting fibre roll to hold adjacent rolls together.

Wooden stakes shall be driven into the pilot holes perpendicular to the slope face to secure the fibre rolls to the slope along their entire length. Additional stakes shall be driven into the fibre rolls along the downslope side at every grade change or if soils are very loose and uncompacted or the slope is steep.

Soil excavated from the trenches shall be placed along the upslope side of the fibre rolls and well compacted into the front of the trench to minimize possible undermining by runoff.

The soil on the upslope and downslope sides of the fibre rolls shall be seeded as specified in the Contract Documents.

805.07.05 Flow Check Dams - General

Flow check dams are straw bale flow check dams, fibre roll flow check dams, sandbag flow check dams, or rock flow check dams.

Flow check dams shall be constructed as specified in the Contract Documents such that the spillway level of the downstream flow check dam is the same as the base of the upstream flow check dam when they are specified in series. Flow check dams shall be constructed without gaps and without undermining to prevent sediment passage through, under, or around the flow check dam.

When the Flow Check Dams item is specified in the Contract Documents, any of the flow check dams or any combination of them may be used. When a specific flow check dam is specified in the Contract Documents, there shall be no option of substitution for the control measure.

Flow check dams shall include protection placed against the downstream side at the lowest point of the flow check dam so that any overflow of the flow check dam is prevented from causing soil scour and erosion.

805.07.05.01 Straw Bale Flow Check Dams

Straw bale flow check dams shall be constructed as specified in the Contract Documents and shall be replaced every 45 days.

805.07.05.02 Fibre Roll Flow Check Dams

Fibre roll flow check dams shall be constructed as specified in the Contract Documents.

805.07.05.03 Sandbag Flow Check Dams

Sandbag flow check dams shall be constructed as specified in the Contract Documents.

805.07.05.04 Rock Flow Check Dams

Rock flow check dams shall be constructed as specified in the Contract Documents.

805.07.06 Sediment Traps

Sediment traps shall be constructed as specified in the Contract Documents to prevent sediment passage from the upstream to the downstream side of the trap and so that the majority of the sediment is collected in the excavated basin.

Sediment traps shall be constructed as a single control measure consisting of an excavated basin and a rock flow check dam.

A temporary fence shall be erected around the sediment trap to restrict public access.

805.07.07 Slope Drains

Slope drains shall be constructed as specified in the Contract Documents.

Slope drains shall be constructed as a single control measure consisting of a corrugated pipe, two end sections including an inlet and an outlet, and a sediment trap constructed at the outlet end of the pipe.

The pipe inlet shall be placed through a berm barrier in such a manner that flow is directed to the pipe inlet without scouring of the berm. The toe plate of the inlet end section shall be fully imbedded into the ground surface.

Pipes shall be maintained in place without gaps and without undermining so that water is conveyed from the upstream side of the berm and collected in the sediment trap.

805.07.08 Diversion Ditches

Diversion ditches shall be constructed as specified in the Contract Documents.

When diversion ditches are specified to be lined with rolled erosion control blanket along their entire length it shall be according to OPSS 804.

Flow check dams shall be installed at regular intervals along the entire length of diversion ditches as specified in the Contract Documents.

Where diversion ditches are specified to be lined with rip-rap or granular it shall be according to OPSS 1004.

805.07.09 Sediment Traps for Dewatering

Sediment traps for dewatering shall be constructed as specified in the Contract Documents.

Sediment traps for dewatering shall be constructed a minimum of 30 m away from waterbodies or as far away as practicable from the top of the bank of any waterbody.

The shape of the excavated basin may be varied to suit the characteristics of the area surrounding it.

The sediment barrier and rock flow check dam shall be constructed as specified in the Contract Documents.

Construction of the sediment barrier shall be according to the requirements for light-duty sediment barriers with the following exceptions:

- a) End runs are not required.
- b) The rock flow check dam shall be located at the low point of the light-duty sediment barrier.

A temporary fence shall be erected around the sediment trap to restrict public access.

Discharge of water from sediment traps for dewatering shall be according to OPSS 517.

805.07.10 Filter Bags

Filter bags, hoses and pumps shall be sized appropriately to the volume as specified in the Contract Documents of water to be filtered. Bags shall have a FOS as specified in the Contract Documents.

Filter bags shall be situated in a vegetated area or placed on a permeable surface on a slight slope with the opening of the bag facing upslope a minimum of 30 m away from waterbodies or as far as practicable from the top of the bank of any waterbody.

The opening of the filter bag shall be securely attached with mechanical connections to the discharge hose using commercially available hose couplers and placed in the retention facility to be dewatered.

Discharge of water from filter bags shall be according to OPSS 517.

805.07.11 Turbidity Curtains

Turbidity curtains shall be constructed as specified in the Contract Documents. Turbidity curtains shall be free of tears and gaps, and the bottom edge of the curtain shall be continuously in contact with the waterbody bed so that sediment passage from the enclosed area is prevented.

Turbidity curtains shall be constructed according to the following:

- a) Breaks may be made in the lower sleeve to facilitate pulling of the ballast, provided they are a maximum 100 mm in size and spaced at minimum 3 m intervals.
- b) Where turbidity curtain geosynthetic is joined to provide a continuous run, the sections shall be connected to provide a continuous seal to prevent the escape of turbid water between the sections.
- c) The turbidity curtain shall be of sufficient width to account for water depth and wave action.

- d) The turbidity curtain shall be prepared for installation by furling and tying securely with furling ties every 1.5 m for the entire length of the curtain.
- e) Anchor locations shall be established as necessary to maintain the turbidity curtain in place and functioning.

The sequence of installation shall be according to the following:

- a) Tie-downs shall firmly anchor the turbidity curtain to the shoreline.
- b) One end of the furled curtain shall be firmly attached to the upstream tie-down.
- c) The furled curtain shall be launched and placed.
- d) The other end of the furled curtain shall be attached to the downstream tie-down.
- e) Each anchor shall be attached to the turbidity curtain load line with a mooring line.
- f) Mooring buoys shall be attached to the mooring line at a distance of 1 m from the load line to keep the turbidity curtain in place at locations where it changes direction.
- g) The furling ties shall be released to allow the turbidity curtain ballast to sink to its maximum depth.
- h) The location and depth of the ballast shall be adjusted as necessary using the adjustment lines.

Equipment is permitted in the working area enclosed by the turbidity curtain.

Folds in the turbidity curtain that form next to the floatation collar shall be regularly monitored and cleared of collected sediment.

805.07.12 Cofferdams

Cofferdams shall be constructed as specified in the Contract Documents to:

- a) Isolate the working area from the waterbody.
- b) Prevent the release of sediment and debris into the surrounding waterbody.

Equipment is permitted in the working area enclosed by the cofferdam.

805.07.13 Monitoring

All temporary erosion and sediment control measures shall be monitored to ensure they are in effective working order. Monitoring shall be once a week, at minimum, prior to any forecast rain event and following any rain event.

805.07.14 Maintenance

All temporary erosion and sediment control measures constructed under this specification shall be maintained in an effective, functioning, stable condition.

805.07.15 Sediment Removal

The work shall consist of the removal and management of accumulated sediment.

Sediment that is accumulated by the temporary erosion and sediment control measures shall be removed in a manner that avoids escape of the sediment to the downstream side of the control measure and avoids damage to the control measure. Sediment shall be removed to the level of the grade existing at the time the control measure was constructed and be according to the following:

- a) For light-duty sediment barriers and flow check dams, accumulated sediment shall be removed once it reaches the lesser of the following:
 - i. A depth of one-half the effective height of the control measure. For flow check dams, the effective height shall be determined relative to the lowest point of the flow check dam.
 - ii. A depth of 300 mm immediately upstream of the control measure.
- b) For heavy-duty sediment barriers, sediment traps, and sediment traps for dewatering, accumulated sediment shall be removed once it reaches one-half the effective height or depth of the control measure.
- c) For all control measures, accumulated sediment shall be removed as necessary to perform maintenance repairs.
- d) Accumulated sediment shall be removed immediately prior to the removal of the control measure.

805.07.16 Control Measure Removal

Ditch, permanent slope, and any other embankment cover specified elsewhere in the Contract Documents to be placed within the area controlled by the temporary erosion and sediment control measure shall be in place and established prior to the removal of such control measure.

Temporary erosion and sediment control measures shall be removed and associated excavations backfilled and compacted when the measures are no longer required.

Temporary erosion and sediment control measures shall be removed in a manner that:

- a) Prevents entry of equipment, other than hand-held equipment or boats, to any waterbody.
- b) Prevents release of sediment and debris to any waterbody.

Prior to removal of the in-water control measures, the area enclosed by turbidity curtains and cofferdams shall be cleaned of all debris. For cofferdams, accumulated sediment shall be removed prior to removal of the sediment control measure.

Any seeding and mulching, temporary cover, sod, other surface application, or original turf cover disturbed by removal or backfilling of erosion and sediment control measures and removal of accumulated sediment, shall be brought to final grade and restored as specified in the Contract Documents.

805.07.17 Protection of Waterbodies and Waterbody Banks

Protection of waterbodies and waterbody banks shall be as specified in the Contract Documents.

805.07.18 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

805.09 MEASUREMENT FOR PAYMENT

805.09.01 Actual Measurement

805.09.01.01
Light-Duty Sediment Barriers
Light-Duty Straw Bale Barriers
Light-Duty Silt Fence Barriers
Light-Duty Fibre Roll Barriers
Heavy-Duty Sediment Barriers
Heavy-Duty Silt Fence Barriers
Heavy-Duty Wire-Backed Silt Fence Barriers
Berm Barriers
Sandbag Barriers
Fibre Roll Grade Breaks

Measurement shall be the length in lineal metres from end to end of the barrier constructed, maintained, and removed, following the contours of the ground.

805.09.01.02
Flow Check Dams
Straw Bale Flow Check Dams
Fibre Roll Flow Check Dams
Sandbag Flow Check Dams
Rock Flow Check Dams

For measurement purposes, a count shall be made of the flow check dams constructed, maintained, and removed.

805.09.01.03
Sediment Traps
Slope Drains
Diversion Ditches
Sediment Traps for Dewatering
Filter Bags

For measurement purposes, a count shall be made of the number of sediment traps, slope drains, diversion ditches, sediment traps for dewatering and filter bags constructed or installed, maintained, and removed. Component parts shall not be counted separately for payment.

805.09.01.04 Turbidity Curtains

Measurement of turbidity curtain shall be made in lineal metres along its length from end to end between tie-downs for each turbidity curtain installed, maintained, and removed.

805.09.01.05 Cofferdams

For measurement purposes, a count shall be made of the number of cofferdams constructed, maintained, and removed.

805.09.01.06 Sediment Removal

Measurement shall be as specified in the Contract Documents by the volume of sediment excavated in cubic meters or by the number of hours required for excavation of sediment.

805.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

805.10**BASIS OF PAYMENT****805.10.01**

Light-Duty Sediment Barriers - Item
Light-Duty Straw Bale Barriers - Item
Light-Duty Silt Fence Barriers – Item
Light-Duty Fibre Roll Barriers - Item
Heavy-Duty Sediment Barriers - Item
Heavy-Duty Silt Fence Barriers – Item
Heavy-Duty Wire-Backed Silt Fence Barriers – Item
Berm Barriers - Item
Sandbag Barriers - Item
Fibre Roll Grade Breaks – Item
Flow Check Dams - Item
Straw Bale Flow Check Dams - Item
Fibre Roll Flow Check Dams - Item
Sandbag Flow Check Dams - Item
Rock Flow Check Dams – Item
Sediment Traps - Item
Slope Drains – Item
Diversion Ditches - Item
Sediment Traps for Dewatering – Item
Filter Bags - Item
Turbidity Curtains - Item
Cofferdams - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material required to do the work.

Progress payments for the temporary erosion and sediment control measures shall be made as follows:

- a) 30% for initial construction.
- b) 50% for maintenance.
- c) 20% for removal.

805.10.02**Sediment Removal - Item**

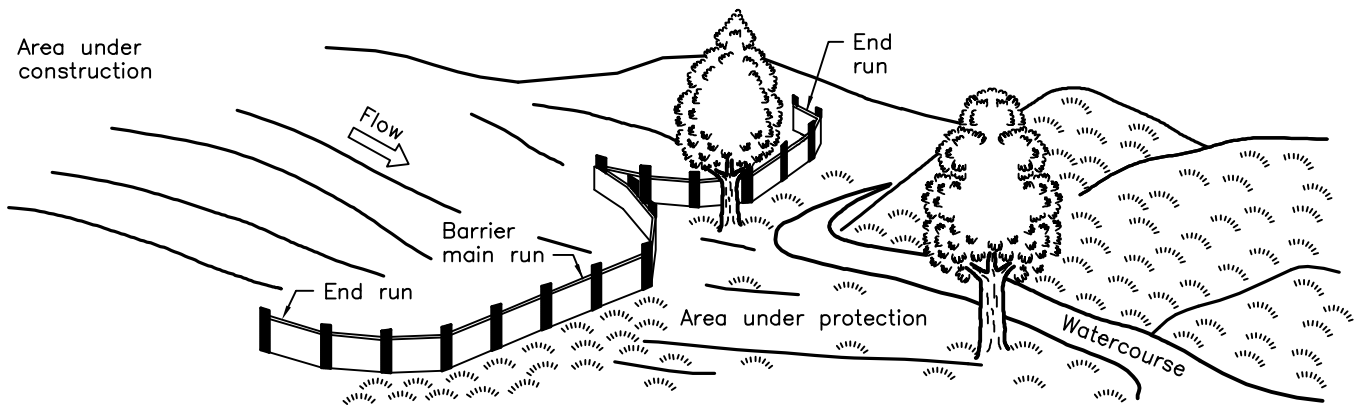
Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract Documents do not have a separate item for sediment removal, payment at the Contract price for the appropriate tender item for the installation of the sediment control measures shall be full compensation for all labour, Material, and Equipment to do the work of sediment removal.

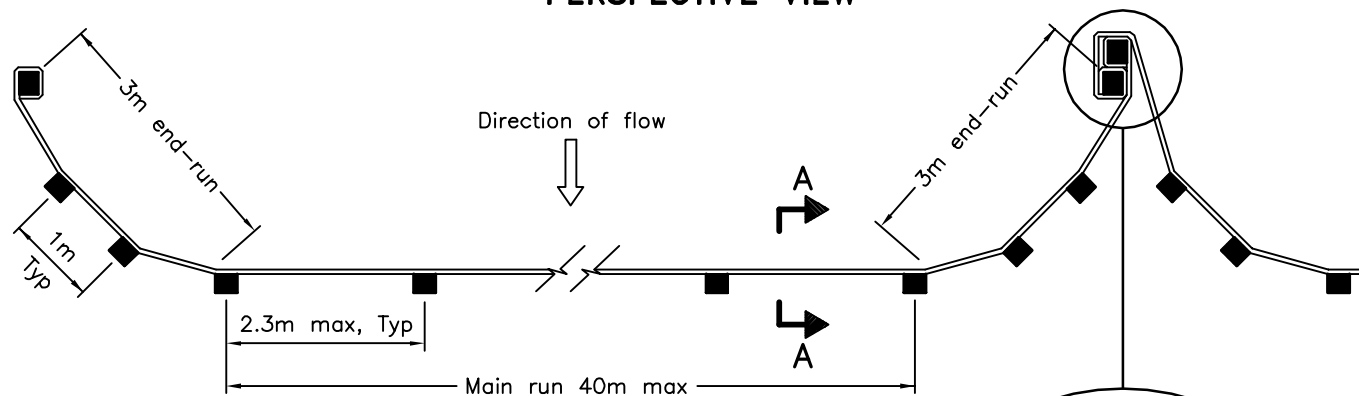


APPENDIX C

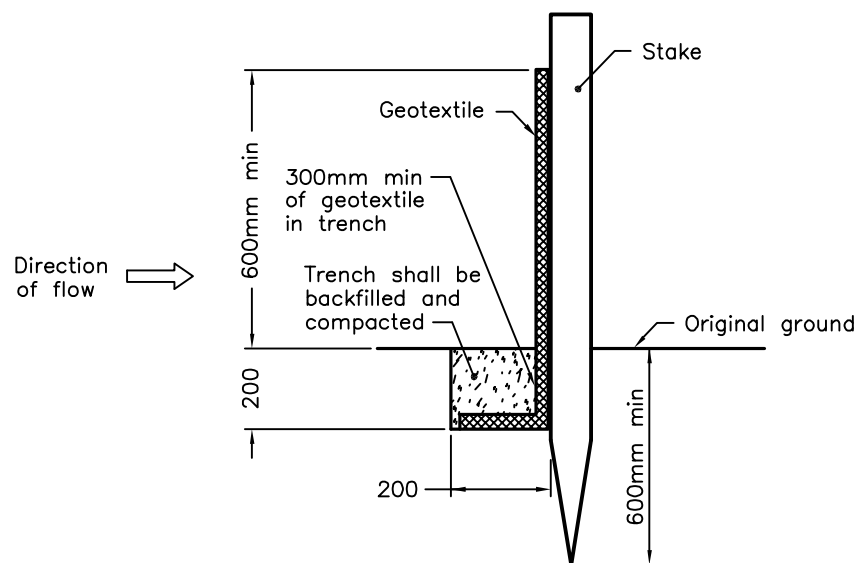
Ontario Provincial Standards Documents



PERSPECTIVE VIEW



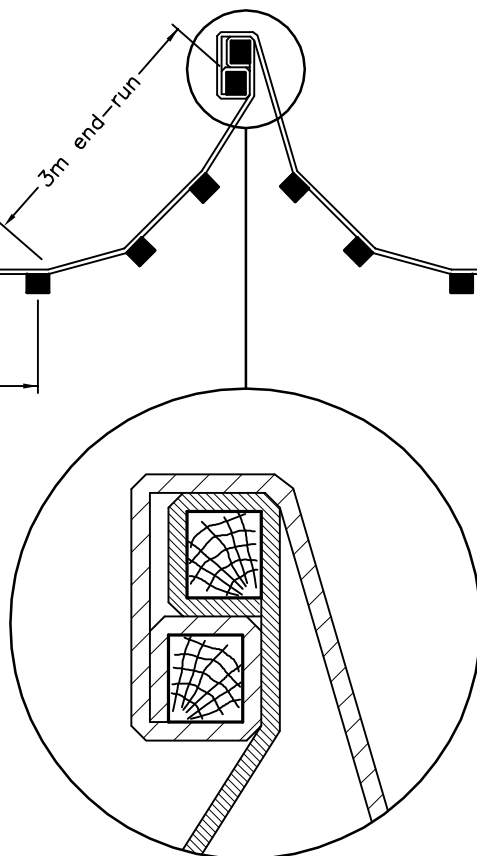
PLAN



SECTION A-A

NOTE:

A All dimensions are in millimetres unless otherwise shown.



JOINT DETAIL

ONTARIO PROVINCIAL STANDARD DRAWING

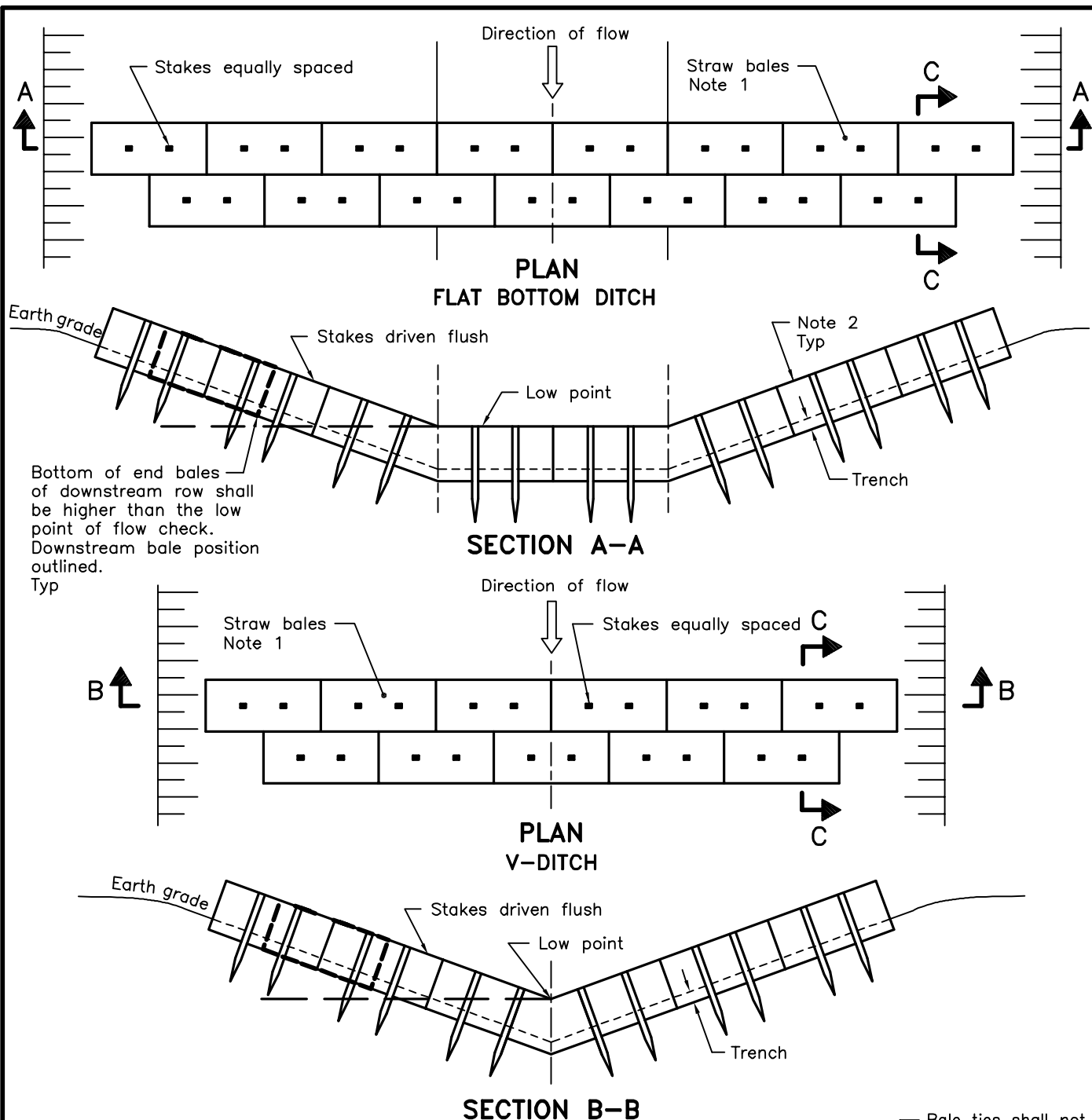
Nov 2015

Rev 2

**LIGHT-DUTY
SILT FENCE BARRIER**



OPSD 219.110



NOTES:

- 1 Number of bales varies and shall suit ditch.
- 2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

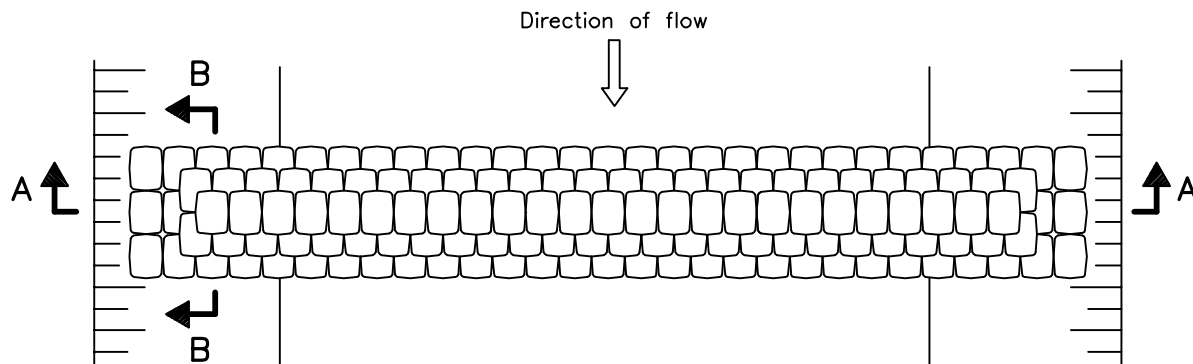
Nov 2015

Rev 2

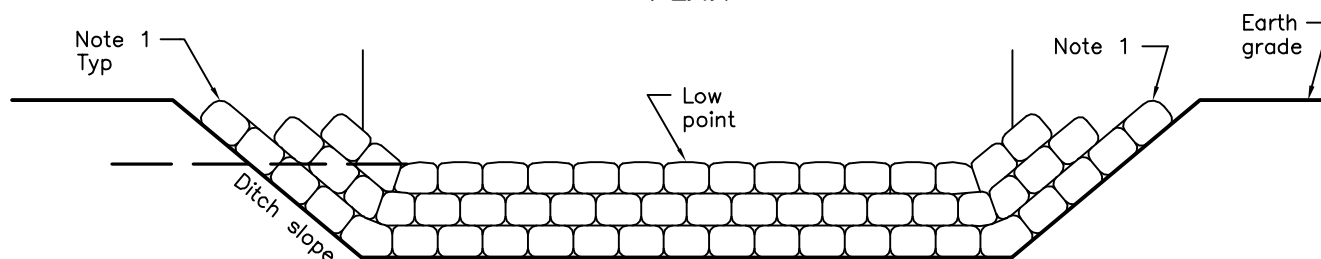
STRAW BALE FLOW CHECK DAM

OPSD 219.180

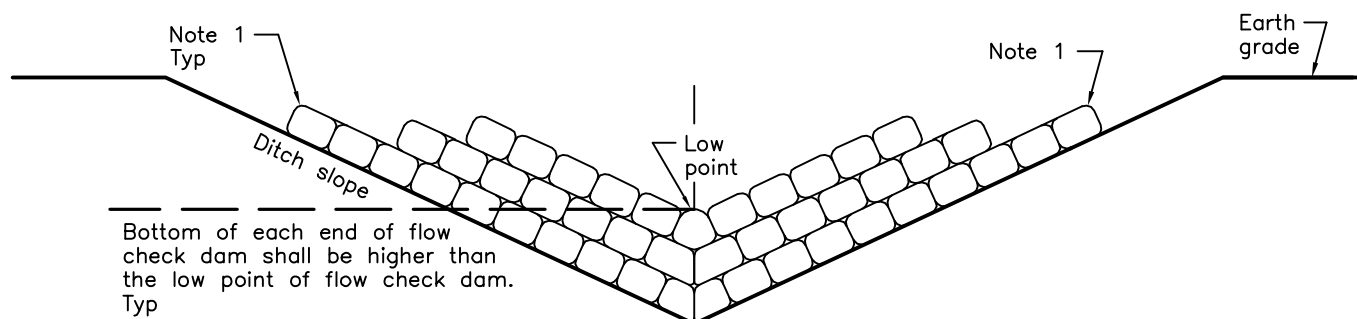




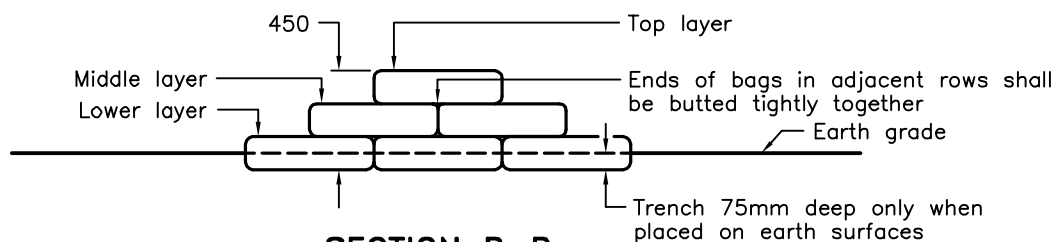
PLAN



**SECTION A-A
FLAT BOTTOM DITCH**



**SECTION A-A
V-DITCH**



SECTION B-B

NOTES:

- 1 Sufficient sandbags shall be placed to prevent end scouring.
- 2 For sandbag dimensions see OPSD 219.150.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2015

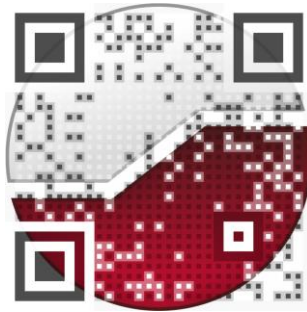
Rev 2

SANDBAG FLOW CHECK DAM

OPSD 219.200



experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

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