SECTION 2 CONTENTS

PART 1 GENERAL

1.1 Related Work

.1 Section 01330 - Submittal Procedures.

.2 Section 02315 - Excavating, Trenching and Backfilling.

.3 Section 02317 - Roadway Excavation Embankment and Compaction.

.4 Section 02072 - Geotextiles.

1.2 References

.1 Construction Quality Assurance (CQA) Plan.

.2 American Society for Testing and Materials (ASTM):

.1 ASTM D 5084, Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.

.2 ASTM D 5890, Standard Test Method for Water Absorption of Bentonite by the Porous Plate Method, Swell Index Test.

.3 ASTM D 4354, Standard Practice for Sampling of Geosynthetics for Testing.

.4 ASTM D 5993 Test Method for Measuring Mass per Unit Area of Geotextiles

.5 ASTM D 5891 Fluid Loss in Bentonite ClaysAmerican Society for Testing and Materials (ASTM)

1.3 Quality Control Certificates

.1 At least two (2) weeks prior to start of work, furnish CQA Consultant with copies of mill test data and certificate that GCL delivered to job site meets requirements of this Section.

The certificate shall include:

- Roll numbers and identification,
- Sampling procedures, and
- Results of quality control tests, including a description of test methods used.

.2 Remove and replace uncertified material and replace with new material at no cost to the Owner.

1.4 Material Warranty

.1 Provide the Owner with a written warranty against manufacturing defects for period of twenty (20) years from the date of installation.

1.5 Guarantee

.1 Provide the Owner with a written guarantee against defects in installation and workmanship for a period of five (5) years from the date of final acceptance, including the services of qualified technicians and materials necessary to make repairs, at no cost to the Owner.

PART 2 PRODUCTS

2.1 Material

.1 The geotextile component to be non-woven, needle punched polypropylene or polyester material with Minimum Average Roll Values meeting or exceeding the criteria specified Table 1523-3-1.

.2 Provide test results from the Manufacturer for the product, as well as a certification that the material properties meet or exceed the specified values, at the frequency indicated in Table 1523-3-2.

.3 Synthetic material to be manufactured from inert polymeric materials which retain their structure during handling, placement and long-term service, have satisfactory resistance to acid and alkali action, are indestructible by micro-organisms and insects and are ultra violet light resistant.

.4 GCL to be manufactured by either adhesive /glue bonding or the mechanical bonding of the needlepunch process. Bentonite to consist of montmorillonite (sodium bentonite).

.5 If manufactured by needle punch process, verify that the geotextile component has been inspected continuously for the presence of broken needles using an in-line metal detector. Employ a method acceptable to the CQA Consultant for removal of broken needles.

.6 Verify that the proper mass per unit area of bentonite has been added to the product as specified in Table 1523-3-1.

.7 Test all material in accordance with the Manufacturer's quality control program. Samples not satisfying the Manufacturer's specifications shall result in the rejection of the applicable rolls. At the Manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify the non-complying rolls and/or qualify individual rolls.

.8 GCL to be supplied in rolls of minimum 3.6 metre continuous width.

.9 Minimum roll length to equal Manufacturer's standard minimum length.

.10 During shipping and on-site storage, protect the GCL at all times against exposure from sun; moisture, contamination by mud, dust, dirt; puncture; tearing and any other damaging or deleterious conditions. Contaminated GCL may require removal as directed by Engineer.

2.2 Labeling

.1 Each GCL roll to have a waterproof label which contains the following information:

- Manufacturer's name
- Production Identification
- Lot Number
- Roll Number
- Roll Weight; and
- Roll Dimensions

PART 3 EXECUTION

3.1 Installation

.1 The installation of the liner shall be completed by a company with minimum five (5) years similar experience.

.2 PlaceHandle all GCL in such a manner as to ensure it is not damaged in any way.

.3 In the presence of wind, sufficiently weight all GCL's with sandbags or the equivalent. Install such sandbags during placement and maintain in place until replaced with cover material.

.4 Cut GCL using an utility blade in a manner recommended by the Manufacturer and exercise due care to prevent damage to any underlying or adjacent liner system components during cutting.

.5 Take care during placement not to entrap stones or moisture under the GCL and not to walk on or drag equipment across the exposed GCL.

.6 Replace or properly repair any GCL damaged by stones or other foreign objects, or installation activities at no additional cost to Owner.

.7 If white coloured geotextile is used to encapsulate the bentonite, take precautions against "snowblindness" of personnel.

.8 Do not install the GCL on standing water. Install the GCL in a way that reduces the potential for hydration of the mat prior to completion of construction of the overlying liner system.

.9 Do not install the GCL during precipitation, high winds or other conditions that may cause rapid hydration of or damage to the GCL.

.10 Install the GCL as indicated by the Manufacturer or Engineer.

.11 Place soil layers (clay liner, granular sub-liner sampler blanket) or geomembrane overlying the geosynthetic clay liner, immediately following the installation of the GCL. Remove the GCL and replace if it becomes hydrated before the overlying soil layer or geomembrane is placed, at Contractor's expense.

.12 Remove and replace all hydrated GCL with new material at no additional cost to Owner.

3.2 Overlaps

.1 Overlap all GCL panels. Along the length of the mat, the overlap shall be a minimum of 150 mm or as specified by the Manufacturer. Along the width of the mat, the overlap shall be a minimum of 0.3 m, as specified by the Manufacturer or Engineer. The edges of the GCL panels should be adjusted to smooth out any wrinkles, creases, or "fishmouths" in order to maximize contact with the underlying panel.

.2 Do not nail or staple the overlaps to the underlying materials.

.3 Place panels from the highest to the lowest elevation within the area to be lined. Up-slope panels to be shingled over down-slope panels in order that flow is over the seam and not into the seam.

.4 After panels are placed establish proper overlap orientation and pull back the edge of the panel to expose the overlap zone. Remove any soil or other deleterious material present in the overlap zone.

.5 Place or pour a fillet of granular bentonite, Volclay®, or other sealing material acceptable to the Engineer, in a continuous manner along the overlap zone at a rate of at least 1800 grams per lineal metre (0.25 pound per lineal foot) to seal the overlaps.

.6 No vehicles permitted directly on geotextile.

3.3 Repair

.1 Repair any holes or tears in the GCL by placing a GCL patch over the hole, overlapping the edges of the hole or tear by at least 0.3 m in all directions. The patch may be secured with a water-based adhesive approved by the Manufacturer.

.2 Take care to remove any soil or other material which may have penetrated the torn GCL.

.3 Make all repairs at no additional cost to Owner.

.4 Do not nail or staple patches.

3.4 Placement of Overlaying Materials

.1 Place materials above the GCL in such a manner as to ensure that the GCL is not damaged.

.2 Do not drive equipment used for placing other materials directly on the GCL. In areas of heavy vehicle traffic, such as access ramps, the soil thickness should be at least 1.0 m.

.3 Ensure that the GCL is not damaged while working around the appurtenances and ensure that connections of the GCL to appurtenances are properly sealed, including using bentonite if required.

3.5 Product Protection

.1 Protect all prior work and materials.

.2 In the event of damage, immediately make all repairs and replacements necessary, to the approval of Engineer and at no additional cost to the Owner.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 02701 - Aggregates: General.

1.2 References

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C 117- 03, Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C 136- 01, Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D 422- 63(2002), Test Method for Particle-Size Analysis of Soils.

.4 ASTM D 698- 00, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.5 ASTM D 4318- 00, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-8.1- 88, Sieves, Testing, Woven Wire, Inch Series.

.2 CAN/CGSB-8.2- M88, Sieves, Testing, Woven Wire, Metric.

.3 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1- 94, Concrete Materials and Methods of Concrete Construction.

.4 Contractor is to complete his work in compliance with the Department of Fisheries Authorization. A letter of authorization has been applied for by the Owner. The Contractor shall be responsible to meet the terms and conditions of the letter of Authorization from DFO. The cost to provide a silt curtain around the excavation throughout the underwater section shall be included in the contract price.

1.3 Definitions

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock : any solid material in excess of 0.25 m^3 and which cannot be removed by means of duty mechanical excavating equipment having a 0.95 to 1.15 m^3 bucket. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Waste material: excavated material unsuitable for use in work or surplus to requirements.

.3 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.4 Unsuitable materials:

.1 Weak and compressible materials under excavated areas.

.2 Frost susceptible materials under excavated areas.

.3 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 : Sieve sizes to CAN/CGSB-8.1.

.2 Table

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

.3 Coarse-grained soils containing more than 20 % by mass passing 0.075 mm sieve.

.5 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 Samples

.1 Submit samples in accordance with Section 01330 - Submittal Procedures.

.2 Inform Engineer at least four (4) weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.

.3 Submit 70 kg samples of type of fill specified.

.4 Ship samples prepaid to Ottawa, in tightly closed containers to prevent contamination.

1.5 Protection of Existing Features

.1 Existing buried utilities and structures:

.1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.2 Prior to commencing excavation work, notify applicable owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.

.3 Confirm locations of buried utilities by careful test excavations.

.4 .

.2 Existing buildings and surface features:

.1 Conduct, with Engineer, condition survey of existing buildings, service poles, wires, survey bench marks and monuments which may be affected by work.

.2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Engineer.

1.6 Shoring, Bracing and Underpinning

.1 Protect existing features in accordance with Section 01560 - Temporary Barriers and Enclosures and applicable local regulations.

.2 Engage services of qualified professional engineer who is registered or licensed in the Nunavut Territory, Canada in which work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for work.

.3 Submit design and supporting data at least two (2) weeks prior to commencing work.

.4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Nunavut Territory, Canada.

PART 2 PRODUCTS

2.1 Materials

.1 Type 1 and Type 2 fill: properties to section 02701 - Aggregates: General and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

.3 Table

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

.2 Type 3 fill: selected material from excavation or other sources, approved by Engineer for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

.3 Unshrinkable fill: proportioned and mixed to provide:

.1 Maximum compressive strength of 0.4 MPa at 28 days.

.2 Maximum Portland cement content of 25 kg/m^3.

.3 Minimum strength of 0.07 MPa at 24 h.

.4 Concrete aggregates: to CAN/CSA-A23.1.

.5 Portland cement: Type 10.

.6 Slump: 160 to 200 mm.

.4 Silt Curtian

.1 The silt curtain to be constructed of a woven geo-texile. Standard of Acceptance: Typar 3401.

.2 Curtain to be weighted using standard heavy gage chain, or similar stable material. Weights to be free of all grease or other soluble materials.

PART 3 EXECUTION

3.1 Site Preparation

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

.2 Install silt curtain prior to any excavation of riverbed materials below the water elevation. Silt curtain to extend from the top of the ice surface to the top of the riverbed. Gaps in the silt curtain are not permitted.

3.2 Stockpiling

.1 Stockpile fill materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

3.3 Excavation

.1 Advise Engineer at least seven (7) days in advance of excavation operations for initial cross sections to be taken.

.2 Excavate to lines, grades, elevations and dimensions as indicated Engineer.

.3 For trench excavation, unless otherwise authorized by Engineer in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.4 Dispose of surplus and unsuitable excavated material off site.

.5 Do not obstruct flow of surface drainage or natural watercourses.

.6 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.7 Notify Engineer when bottom of excavation is reached.

.8 Obtain Engineer approval of completed excavation.

.9 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer.

.10 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with fill concrete.

.2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected maximum dry density.

.11 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Engineer.

3.4 Fill Types and Compaction

.1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTMD698.

.1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95%.

.2 Place bedding and surround material in unfrozen condition.

3.5 Backfilling

.1 ..... Do not proceed with backfilling operations until Engineer has inspected and approved installations.

.2 ..... Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.3 Do not use backfill material which is frozen or contains ice, snow or debris.

.4 Place unshrinkable fill in areas as indicated. Consolidate and level unshrinkable fill with internal vibrators.

.5 Vibratory compaction equipment: Use a hand compactor in trench.

.6 Shape bed true to grade to provide continuous uniform bearing surface for pipe using type I material.

.7 Shape transverse depressions in bedding as required to suit joints.

.8 Compact each layer full width of bed to at least 95% maximum density to ASTMD698.

.9 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

3.6 Restoration

.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Engineer.

.2 Clean and reinstate areas affected by work as directed by Engineer.

END OF SECTION

Approved: 2001-12-04

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01330 - Submittal Procedure.

.2 Section 01560 - Temporary Barriers and Enclosures.

.3 Section 01705 - Health and Safety.

.4 Section 02315 - Excavating, Trenching and Backfilling.

1.2 MEASUREMENT PROCEDURES

.1 Quantities will be taken from cross section showing original rock surface and actual grade line set by Engineer, except that minimum depth of rock required to be excavated to be considered as 50 mm.

1.3 DEFINITION

.1 Rock: any solid material in excess of 0.25 m^3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. Frozen material not classified as rock.

.2 PPV: peak particle velocity.

1.4 SUBMITTALS

.1 Blasting Operation

.1 Submit to Engineer and local authorities having jurisdiction for approval, written proposal of operations for removal of rock by blasting, in accordance with Section 01330 - Submittal Procedures.

.2 Indicate proposed method of carrying out work. Include details on protective measures, time of blasting and other pertinent details.

.3 Submit records to Engineer at end of each shift. Maintain complete and accurate record of drilling and blasting operations.

1.5 QUALIFICATIONS

.1 Retain licensed explosives expert to program and supervise blasting work, and to determine precautions, preparation and operations techniques.

1.6 BLASTING SURVEY AND MONITORING

.1 Engineer will visit property holders of adjacent buildings and structures to determine existing conditions and describe blasting and seismic recording operations.

1.7 BLASTING AND VIBRATION CONTROL

.1 Reduce ground vibrations to avoid damage to structures or remaining rock mass.

Part 2 Products

2.1 MATERIALS

.1 Not used.

Part 3 Execution

3.1 PROTECTION

.1 Prevent damage to surroundings and injury to persons in accordance with Section 01560 - Temporary Barriers and Enclosures. Erect fencing, post guards, sound warnings and display signs when blasting to take place.

3.2 ROCK REMOVAL

.1 Co-ordinate this Section with Section 01705 - Health and Safety.

.2 Remove rock to alignments, profiles, and cross sections as indicated.

.3 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.

.4 Excavate trenches to lines and grades to minimum of 50 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.

.5 Cut trenches to widths as indicated.

.6 Use pre-shearing, cushion blasting or other smooth wall drilling and blasting techniques or directed by Engineer.

.7 Remove boulders and fragments which may slide or roll into excavated areas.

.8 Correct unauthorized rock removal at no extra cost, in accordance with Section 02315 - Excavating, Trenching and Backfilling.

3.3 ROCK DISPOSAL

.1 Dispose of surplus removed rock off site.

.2 Do not dispose removed rock into landfill. Material must be sent to appropriate location as approved by the Engineer.

END OF SECTION

Part 1 GENERAL

1.1 References

.1 ASTM D698-98, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft3) (600 kN-m/m3).

1.2 Definitions

.1 Rock Excavation: excavation of:

- .1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort from Caterpilar D9L or equivalent to be considered integral with parent mass.
- .2 Boulder or rock fragments measuring in volume one (1) cubic meter or more.

.2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping.

.3 Unclassified Excavation: excavation of whatever character other than stripping encountered in the work.

.4 Stripping: excavation of organic material covering original ground.

.5 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved.

.6 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.

.7 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.

.8 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.

1.3 Requirements of Regulatory Agencies

.1 Adhere to regulations of authority having jurisdiction if blasting is required.

.2 Adhere to Territorial and National Environmental requirements if potentially toxic materials are involved.

Part 2 PRODUCTS

2.1 Materials

.1 Embankment materials require approval by Engineer.

.2 Borrow material:

.1 Obtain from borrow pit to be approved by Engineer.

Part 3 EXECUTION

3.1 Compaction Equiomeent

.1 Compaction equipment must be capable of obtaining required densities in materials on project. Equipment that does not achieve specified densities must be replaced or supplemented.

.2 Operate minimum equivalent of one 12 tonne vibratory packer continuously in each embankment when placing material.

3.2 Excavating

.1 General:

.1 Notify Engineer whenever waste materials are encountered and remove to depth and extent directed.

.2 Subcut 500 mm below subgrade in cut sections unless otherwise directed. Compact top 150 mm below subcut to minimum 95% maximum dry density, ASTM D698 (AASHTO T99). Replace with approved embankment material and compact.

.3 Where subgrade is on transition from excavation to embankment treat ground slopes at grade points as directed by Engineer.

.2 Drainage:

.1 Maintain profiles, crowns and cross slopes to provide good surface drainage.

.2 Provide ditches as work progresses to provide drainage.

.3 Construct interceptor ditches as shown on plans or as directed before excavating or placing embankment in adjacent area.

.3 Rock excavation:

.1 If, during excavation, material appearing to conform to classification for rock is encountered, notify Engineer and provide sufficient time to enable measurements to be made to determine volume of rock.

.2 Shatter rock to 300 mm below subgrade elevation as indicated on plans.

.3 Reduce overbreak and increase stability of all rock faces by using smooth blasting techniques, such as pre-shearing, cushion blasting, buffer blasting, perimeter blasting and line drilling.

.4 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.

.5 Control blasting to minimize flying particles.

.4 Borrow Excavation:

.1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.

.2 Obtain embankment materials in excess of what is available from cut areas from designated borrow areas.

.1 Engineer to designate extent of borrow areas and allowable depth of excavation.

.2 Remove waste and stripping material from borrow pits to designated locations.

.3 Slope edges of borrow areas to minimum 3:1 and provide drainage as directed.

.4 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

3.3 Embankments

.1 When directed, scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces. Method used to be subject to prior approval of Engineer.

.2 Break up or scarify existing road surface prior to placing embankment material.

.3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized.

.4 Maintain crowned surface during construction to ensure ready run-off of surface water.

.5 Drain low areas before placing materials.

.1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Engineer may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.

.6 Where material consists of rock:

.1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.

.2 Carefully distribute rock material to fill voids with smaller fragments to form compact mass.

.3 Fill surface voids at subgrade level with rock spalls or selected material to form an earth-tight surface.

.4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of subgrade elevation.

.7 Deductions from excavation will be made for overbuild of embankments.

3.4 Subgrade Compaction

.1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.

.2 Compact each layer to minimum 95% maximum dry density, ASTM D698 (AASHTO T99) except top 150 mm of subgrade. Compact top 150 mm to 100% maximum dry density.

.3 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.5 Finishing

.1 Shape entire roadbed to within 50 mm of design elevations.

.2 Finish slopes, ditch bottoms and borrow pits to neat condition, true to lines, grades and drawings where applicable.

.3 Remove rocks over 150 mm in any dimension from slopes and ditch bottoms.

.4 Hand finish slopes that cannot be finished satisfactorily by machine.

.5 Round top of backslope 1.5 m both sides of top of slope.

.6 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

3.6 Protection

.1 Maintain finished surfaces in condition conforming to this section until acceptance by Engineer.

END OF SECTION

PART 1 GENERAL

1.1 Related Work

.1 Not used

PART 2 PRODUCTS

2.1 Stone

.1 Hard, with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:

.1 Random rip-rap:

.1 Not more than 10% of total volume of stones with individual diameters less than 300 mm.

.2 Not less than 50% of total volume of stones with individual diameters of 600 mm or more.

.3 Remaining percentage of total volume to have uniform distribution of stones between 300 mm and 600 mm size.

PART 3 EXECUTION

3.1 Placing

.1 Grade areas above water line to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.

.2 Place rip-rap to thickness and details as indicated.

.3 Place stones in manner approved by Engineer to secure surface and create a stable mass. Place larger stones at bottom of slopes.

END OF SECTION

PART 1 GENERAL

1.1 Related Sections

.1 Section 01561 - Environmental Protection.

1.2 Environmental Requirements

.1 Operation of construction equipment in water is prohibited.

.2 Use borrow material from watercourse beds when approved by Engineer.

.3 Design and construct temporary crossings to minimize environmental impact to watercourse.

.4 Constructing temporary crossings of watercourses when spawning beds are indicated is prohibited.

.5 Placing material in watercourse is to be completed in accordance with the Department of Fisheries and Oceans requirements.

PART 2 PRODUCTS

2.1 Preparation

.1 Obtain work permits from governing Federal, Territorial and/or Municipal authorities.

PART 3 EXECUTION

3.1 Existing Conditions

.1 Maintain existing flow pattern in natural watercourse systems.

3.2 Site Clearing

.1 Maintain temporary erosion and pollution control features installed under this contract.

3.3 Drainage

.1 Pumping water containing suspended materials into watercourse is prohibited.

END OF SECTION

..... 1996-06-30

PART 1 GENERAL

1.1 Related Work

.1 Section 02701- Aggregates: General

.2 Section 02315 - Excavating, Trenching and Backfilling

1.2 References

.1 ASTM D1759 Standard Practice for Design of HDPE Manholes for Subsurface Applications.

.2 ASTM F894 Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.

.3 ASTM F714 Standard Practice or Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

.4 ISO 9001:2000 Quality management systems - Requirements

1.3 Material Certification

.1 Submit manufacturer's test data and certification at least four (4) weeks prior to commencing work. Include manufacturer's drawings, information and shop drawings where pertinent.

PART 2 PRODUCTS

2.1 Materials

.1 The riser pipe shall only be manufactured from a closed profile high density polyethylene pipe that conforms to the requirements of section 5.1 'Base Materials' of ASTM F894, and that no materials other than the approved base materials shall be used to manufacture the pipe. When requested to do so, the manufacturer shall certify that the materials used to manufacture the riser pipe meets these requirements.

.2 All solid wall pipe used in the manhole fabrication shall meet the requirements of ASTM F714 and shall conform to the OD and DR requirements specified on the contract documents.

.3 The polyethylene raw material for riser pipe and solid wall pipe shall contain a minimum of 2%, well dispersed finely divided carbon black for UV stabilization. Additives that can be conclusively proven not to be detrimental to the pipe may also be used provided that the pipe produced meets or exceeds all of the requirements of this specification.

.4 The pipe shall contain no recycled compound except that generated in the manufacturers' own plant.

.5 The pipe manufacturers Quality System shall be certified as meeting the requirements of an ISO 9001:2000 Quality management system, by a qualified independent body.

.6 The riser pipe material and all solid wall pipe shall be resistant to corrosion resulting from the presence of Hydrogen Sulfide and to pH values between 2 and 13.

.7 The riser pipe shall be manufactured with dimensions and tolerances in accordance with the manufacturer's internal manufacturing standard. The pipe must meet the requirements of ASTM F894 when the pipe is marked as such. The nominal inside diameter of the pipe shall be true to the specified pipe size. The pipe shall be manufactured by the continuous winding of a closed profile onto suitably sized mandrels. It shall be produced to constant internal diameters.

.8 When more than 1 length of riser pipe is used to fabricate the riser, the termination of the helically wound profile that forms the pipe shall be manufactured with a 30° plated end cut.

.9 The pipe shall be manufactured in such a manner that the pipe is available in lengths from 3-60 feet. A variety of lengths are available to accommodate installation, storage or varying ground conditions. Unless otherwise stated, the standard laying length shall be 50 feet (15 meters). Each standard and random length of pipe in compliance with ASTM F894 shall be clearly marked as such as required by the standard.

.10 The pipe shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

.11 Manholes shall be designed in accordance with the requirements of ASTM D1759. The design shall be based on the site conditions identified on the project drawings and / or as identified by the owner.

PART 3 EXECUTION

3.1 Excavation and Backfill

.1 Excavate and backfill in accordance with Section 02315 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain approval of Engineer before installing outfall structures and manhole.

3.2 Installation

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Dewater excavation to approval of Engineer and remove soft and foreign material before placing base.

.3 Set manhole base on 150 mm minimum of granular bedding compacted to 100% maximum density to ASTM D 698.

.4 Compact granular backfill to [95]% maximum density to ASTM D 698.

.5 Place unshrinkable backfill in accordance with Section 02315 - Excavating, Trenching and Backfill.

.6 Place frame and cover on top section to elevation as indicated. If adjustment required use mandhole riser ring.

.7 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

.8 Install safety platforms in manholes having depth of five (5) m or greater, as indicated.

.9 Manholes shall be factory fabricated to ensure consistency in product assembly.

.10 All joints in riser pipe sections shall be formed by extrusion welding along the helical 'profile cut' joints. Unless otherwise specifically noted on the contract documents, the profile winding shall be cut and sealed at a 30 ° angle, prior to extrusion welding of adjacent sections, to prevent flow along the pipe wall helix.

.11 All joints in solid wall pipe shall be by fusion welding unless specifically stated otherwise on the contract documents.

.12 All joints between the HDPE base plate, manhole base slope sections, manhole riser pipe, and mainline pipe extensions, shall be by extrusion welding. All extrusion welds shall conform to the requirements of the contract documents and WPS KWH01 (or equivalent).

.13 Connection of solid wall (ASTM F714) manhole stub extensions to HPDE mainline pipe meeting the same specification may be by mechanical connection, or by fusion welding.

.14 All fusion welds must be made following the fusion equipment manufacturers recommendations or the pipe manufacturers' butt fusion procedures.

3.3 Leakage Test

.1 Install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole.

.2 If permissible leakage is exceeded, correct defects. Repeat until acceptable to Engineer.

.3 Engineer will issue Test Certificate for each manhole passing test.

.4 Leak Testing: Installed sections of the fabricated HDPE manhole shall be examined for leaks by in-filtration where the ground water is 'high', or by ex-filtration where the ground water is 'low'.