PART 1 – GENERAL

1.1 Definitions

.1 Underwater Excavation: excavating, transporting and disposing of underwater materials below Chart Datum (CD).

.2 Excavated Material: loose or shale rock, silt, sand, quick sand, mud, gravel, clay and sand, boulders, hardpan, debris, and solid rock or boulders of any size.

.3 Debris: all construction material, including pieces of wood, wire rope, scrap steel, concrete, etc.

.4 Grade: plane above which all material is to be excavated to.

.5 Estimated quantity: volume of material calculated to be above grade and within specified side slopes.

.6 Sideslope: inclined surface or plane from grade at side limit of excavation area to intersect original ground line outside of side limit and to be expressed as a ratio of horizontal to vertical.

.7 CMPM: cubic metres place measurement prior to removal.

.8 CMTM: cubic metres truck measurement.

1.2 Related Work

.1 Section 01 35 44 Environmental Protection Procedures for Marine Work.

.2 Section 31 23 10 Excavation, Trenching and Backfilling.

1.3 Site Information

.1 Results of prior soundings, soil borings and soil investigations may be available for inspection at offices of Public Works and Government Services Canada, P.O. Box 1268, 3 Queen Street, Charlottetown, PE C1A 7M4.

.2 Results of most recent soundings are included with the drawings. This data is made available for tendering purposes only. It should be noted that this information may differ from present site conditions.

.3 Public Works and Government Services Canada may undertake a survey sweep prior to work to verify the volume of removed materials.

.4 The Contractor will be responsible for making their own interpretation of soil conditions at any location, other than borehole locations. Borehole descriptions shown on the logs are only descriptive of conditions at locations described by boreholes themselves.

1.4 Measurement For Payment

.1 Only material excavated above grade plane and within side slopes indicated or specified will be measured.

.2 Underwater Excavation and site preparation will be measured in accordance with Section 01 29 00.

.3 Material removed and dumped in the absence of the Department's Inspector will not be considered for payment.

PART 3 - EXECUTION

3.1 General

.1 Excavate area to the grade depths indicated on the plan.

.2 Use extreme caution when excavating adjacent to existing structures.

.3 Material removed from below grade depth or outside specified area or side slope is not part of work.

.4 Remove shoaling which occurs as a result of work. Once excavated, maintain area at grade.

.5 Remove material cast-over on surrounding area and dispose of it as excavated material.

3.2 Disposal of Material

.1 Dispose excavated underwater material as per the contract documents. Location and manner must be in accordance with all Provincial and Federal regulations.

.2 All materials deposited on private or public roads or properties in vicinity of site or as a result of trucking material to dump site will be removed to satisfaction of owners involved at no additional cost to Department.

.3 Excavated material will be disposed in an approved area as per Appendix B.

.4 Creosote timber, SSP and/or any other non-fill or sand stone type construction material is to be disposed of off department property and will have written approval from the Provincial Department of Environment and the property owner of their proposed dump site. Copies of these written approvals are to be provided to the Departmental Representative within one (1) week of award of contract. Failure to provide these documents may result in the contract being terminated.

3.3 Final Excavation Grade

.1 Verify the final grade in the excavation area by an acceptable method.

.2 Survey/sound the area where the pier is to be constructed to determine that required grade has been reached, record elevations of excavated grade and provide cross sections.

.3 If, as a result of incomplete work, additional verification of depths by sounding or sweeping becomes necessary, pay all additional costs involved.

END OF SECTION

PART 1 – GENERAL

1.1 Related Work

.1 Section 01 33 00 Submittal/Shop Drawings.

1.2 Reference Standards

.1 ASTM C127-15, Specific Gravity and Absorption or Coarse Aggregate.

.2 AASHTO T85-14, Specific Gravity and Absorption of Coarse Aggregate.

1.3 Submissions

.1 Advise of quarry for testing upon award.

.2 Provide methodology for carrying out the work.

1.4 Source Sampling

.1 Provide test results from the quarry supporting specified requirements.

1.5 Existing Conditions

.1 Determine what preparatory work will be required for the following:
.1 Preparation, maintenance and removal of temporary roadways to and on the breakwater for the use of trucks, excavators, draglines, etc.
.2 Haul route or request of use of a temporary bridge for excavation and/or disposal of materials.

1.6 Haul Roads

.1 Construction and maintenance of temporary roads and/or bridges will be considered incidental to the work. Remove all temporary roads and/or bridges at the completion of the project and restore the land to its original condition.

.2 If a temporary bridge is requested, drawings must be submitted for approval that bear signature and dated stamp of a Professional Engineer registered or licensed in the Province of Prince Edward Island of the bridge and of the proposed abutment locations.

1.7 Measurement for Payment

.1 Core stone, filter stone and armour stone will be measured in accordance with Section 01 29 00.

.2 Excavation below Chart Datum, above Chart Datum and fill from existing breakwater will be measured in accordance with Section 01 29 00. PWGSC may perform a pre-excavation survey of the area to be used for verifying excavated quantities in combination with the cross section survey as they apply.

.3 Incidental to the work will be the haul and placement of excavated fill material in the locations indicated in Appendix B. Place material as outlined herein and/or as advised by the Departmental Representative.

.4 With reference to Appendix B, all excavated materials, outside of the existing breakwater footprint, that are not to be reused in the work are to be placed on the east beach. Access to the beach is as indicated in Appendix B. All equipment is to track along the beach below the high tide mark. The material is to be spread to an approximate 1.0m thickness. The haul distance will be approximately 600m east of the access point indicated.

.5 With reference to Appendix B, all excavated material within the existing breakwater footprint is to be sorted upon removal. Creosote timber is to be hauled away and disposed of in provincially approved and permitted manner. While timber, steel, and foreign debris is to be removed and hauled away for reuse or disposal in a provincial approved manner. Remaining excavated fill material is to be taken, stockpiled and levelled (at the end of the work) to the location indicated in blue in Appendix B.

.6 Incidental to the work will be the creation of a bermed containment cell in the location indicated in Appendix B. The berm will be made of dry excavated fill materials and will match the adjacent existing berms in size, slope and height. Wet and dry material disposed of and

contained within the cell to be levelled (at end of work) to the elevation of the berms.

.7 Incidental to the work will be the maintenance of the berm and the disposal cell (created by this work) and the supply and installation of a 600 mm diameter by 15 m long PVC pipe to drain the new cell. Pipe location, at the base of the cell and within the berm wall, to be provided by the Departmental Representative.

.8 Prices to include the entire cost of supplying and placing the material in the work, rough grading as necessary, the leveling and finish grading of the listed materials, taking soundings, producing cross sections, diving inspections all as shown on the drawings, and as specified.

.9 Transportation of excavated material will be considered incidental to the work.

.10 No payment will be made for working surfaces or haul roads, however there is an allowance in the core stone quantity to build a working surface (approximately 300mm thick) on top of the filter stone to provide access for construction along the crest of the rubblemound breakwater. Core stone used for the working surface to be removed down to the elevation of the top of the filter stone.

.11 Suitable on site fill material required for the new breakwater subgrade will be suitable fill materials removed from above Chart Datum, shaped and graded as required, is considered incidental to the work. Material must be approved by a Geotechnical Engineer registered or licensed in the Province of Prince Edward Island.

.12 Do not mix different categories of material in the same truckload. Only one class of material will be weighed for payment at any given time. If rocks of markedly different sizes are present, the Departmental Representative reserves the right to weigh such rocks separately for payment. There will be no

additional payment for weighing individual stone units which do not meet the category of material listed for the truckload.

.13 Layout and survey control, including cross sections during placement, is a bid item.

.14 Supply of traffic control devices and personnel will not be measured for payment.

.15 Transportation of stone and weigh slips are considered incidental to the work.

PART 2 – PRODUCTS

2.1 Materials

.1 Suitable on site fill material:
.1 Excavated material recovered from above Chart Datum that is free of debris, excessive fines, silt, clay, organic matter and other foreign substances.

.2 Core stone, filter stone and armour stone materials:
.1 Hard durable crushed quarried rock, free from excessive fines, silt, clay, organic matter and other foreign substances and free from splits, seams or defects likely to impair its soundness during handling or under action of water.
.2 Specific gravity of not less than 2.65 when tested to ASTM C127 or AASHTO T85. Max absorption will be 3.5% for core stone, and 2.0% for armour stone and filter stone. Actual specific gravity and absorption will be determined by testing selected samples of material being incorporated into the work. Materials with a specific gravity less than the specified minimum or an absorption rate in excess of the specified maximum will be rejected.
.3 Core stone to be well graded and free from fines. Gradation as per Table 1. The following materials will not be considered acceptable for use as core stone: slate, siltstone, sandstone, shale, conglomerate, and mudstone. The material is to be blended to

ensure a homogeneous mix of smaller and larger stone sizes will be obtained. Material to be screened, if required to ensure no more than 1 to 3% fines or stones less than 0.1 kilograms are placed in the work.

Table 1

SIEVE SIZE	% PASSING
600mm	100
200mm	45-70
100mm	25-40
50mm	0

.4 Filter stone:

.1 All filter stone shall be angular in shape, with the ratio of maximum to minimum dimensions (aspect ratio) not exceeding 2.0.

.2 Filter stone shall conform to 200 kg to 800 kg Class designation, 500 kg Median weight and:

.1 No more than 5% shall be less than 100 kg.

.2 No more than 10% shall be less than 200 kg.

.3 No less than 70% shall be less than 800 kg.

.4 No less than 97% shall be less than 1200 kg.

.5 Armour Stone:

.1 All armour stone shall be angular in shape, with the ratio of maximum to minimum dimensions (aspect ratio) not exceeding 2.0.

.2 Armour stone shall conform to 4.0 tonne to 6.0 tonne Class designation, 5.0 tonne median weight and:

.1 No more than 5% shall be less than 2000 kg.

.2 No more than 10% shall be less than 4000 kg.

.3 No less than 70% shall be less than 6000 kg.

.4 No less than 97% shall be less than 9000 kg.

PART 3 – EXECUTION

3.1 Preparation

.1 For the construction of the toe cross section, sound area and record elevation of material on which new material will be placed before placement.

.2 Take soundings of the area in advance of the operation.

.3 Ensure that the new breakwater structure is stable and safe for equipment, workers and material loads throughout construction.

.4 If there is any marine sediment present under the new work, it may displace or may settle in a non-uniform manner. Inform Departmental Representative if existing conditions differ from expected based on borehole records.

3.2 Placement

.1 Submit proposed access to construct, methods of material placement, and construction sequence for review and consideration prior to starting work.

.2 Build a working surface (out of core stone material only) on top of the filter stone layer to provide access for construction equipment. Remove any core stone material required to build the working surface to the top of filter stone to the satisfaction of the Departmental Representative.

.3 Place core material according to the following:
.1 Place material to lines, grades and dimensions indicated on the plan. Harbour bottom should be free from organic material, debris, snow, ice, etc.
.2 Execute work in such a manner to protect material from storm wave action and erosion damage. Replacement of material lost due to storm or erosion damage.
.3 Material may be placed by end dumping. However, note that due to the side slopes of the breakwater that mechanical placing

of the material will be necessary to produce the slopes and shapes required.

.4 Layout of the work shall be by a surveyor licensed to practice in the Province of PEI. Provide cross sections of each layer of material to the Departmental Representative for review and approval prior to placement of the successive layer.

.4 Place filter stone and armour stone layers according to the following:

.1 Place each stone layer to lines, grades and dimensions indicated on the drawings.

.2 Construct the breakwater in uniform lifts across the site to avoid non-uniform loading of the marine soils and to ensure stable conditions during fill placement.

.3 Place each stone individually using mechanical means to the lines, grades and dimensions shown on the plans. Do not dump units into place. Commence placement at toe of slope and proceed up the slope towards the crest. Place each stone so that it is stable, secure on slope and supported by units below. Control placement of stone so as to produce a uniform and continuous cover over the underlying layer.

.4 Handle stone with care. Do not damage units during placement. Replace damaged or broken units at no additional cost to the Contract.

.5 For all materials, grades, lines, dimensions, slopes and quantity of stones to be reviewed and approved by the Departmental Representative before proceeding with the overlying layer.

.6 Replace or reset material lost or displaced due to storm at no additional cost to the Contract.

.7 Choose stones and place them in such a way that the whole structure will be interlocked and consolidated to as great an extent as nature of rock will allow. Stones of varying size will be required to achieve the slopes and grades indicated.

.8 Mechanically place armour stone so as to knit together with adjacent stones.

3.3 Tolerances

.1 Armour and filter stone layers to be within 150mm of lines and grades shown on the drawings.

.2 Core stone layer to be within 100mm of lines shown.

3.4 Protection

.1 Take into account anticipated weather conditions and degree of exposure of site in setting requirements for protection.

.2 Schedule and carry out construction so that the core and filter layers are not built any longer than 10.0m out before they are protected by armour.

.3 The work site is subject to water level variations due to tidal action and portions of the breakwater will be submerged periodically during construction.

3.5 Cross Sections

.1 During construction submit digital cross-sections compiled by a licensed surveyor or onboard proven survey accurate equipment to the Departmental Representative showing the following:

.1 Cross-sections as-built at stations every 10 metres along the breakwater slope.

.2 The design cross-section layers showing proposed core, filter, armour stone and existing sand or till surface in solid lines.

.3 Superimposed, in dashed lines, take elevations at 2 metre intervals perpendicular to the centerline and at top and toe of slopes, showing the core, filter, armour stone and existing material (including toe excavation) as constructed surfaces.

.4 Reference cross-sections to the plan view of the breakwater with stations shown for reference.

.5 Submit cross-sections as work at each station is completed for each class of stone. Do not place next layer until the Departmental Representative has reviewed and approved the as-built elevations for underlying layer.

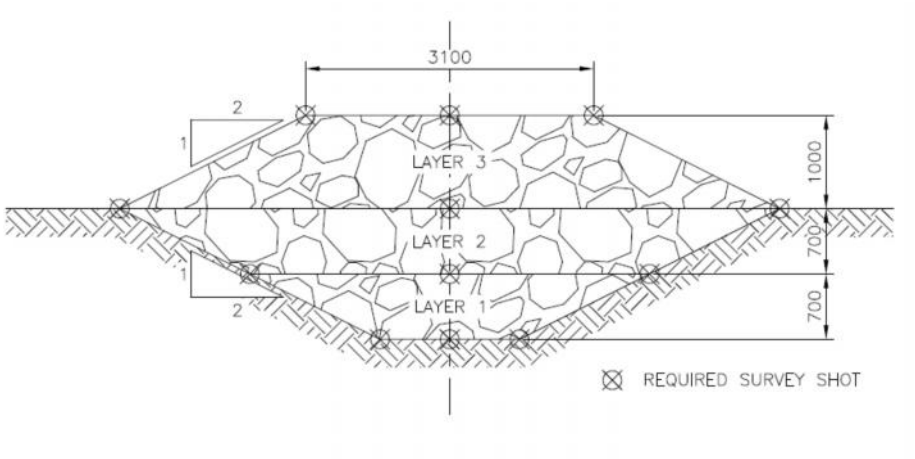
.2 After construction is complete and before the Final Certificate of Completion will be paid, submit detailed as-built survey plan to Departmental Representative to show that grades and elevations have been achieved. Provide an electronic file of the cross sections and two sets or prints. Divers will be required to assist with the survey for elevations required below chart datum. The following minimum requirements to be met:

.1 Elevations every 10 meters along the centerline of the breakwater and every 6 meters perpendicular to the centerline, on the end cone, top and bottom of slopes.

.2 All survey work to be in meters with elevations relative to chart datum (CD) and coordinates referenced to NAD83 CSRS (Zone 20) PEI Double Stereographic Datum.

3.6 SURVEY CONTROL TEST PRIOR TO WORK COMMENCEMENT

.1 Prior to commencing rubble mound breakwater construction, build a mock-up rubble mound structure which is a minimum of 10.0m long and to the cross section shown below. The cross section is shown as a minimum. The larger mockup may be constructed if desired but only upon approval by the departmental representative. An area at the project site will be designated by the departmental representative.



.2 Demonstrate that the cross section shown above can be built to the tolerances listed in this specification and that the cross section can be surveyed at the required locations (i.e. indicated by an ‘X’ in the sketch above) for each layer.

.3 The mockup construction may be monitored by the departmental representative and surveyed independently for comparison.

.4 Produce digital survey files of the mockup survey for review and approval prior to commencing work on the new structure.

.5 Material used for layers 1, 2, and 3 may all be the same material however they must be a minimum of 200-800kg filter stone size. Material sourced for the construction of the new breakwater may be used in the mock-up and reused.

END OF SECTION