

## SPECIFICATION

Project No. R.0066921.001  
Parks Canada  
Waskesiu Pedestrian Bridge  
Prince Albert National Park, Saskatchewan

Solicitation No. EV385-151747/A



CONTRACT SPECIFICATIONS  
FOR  
PWGSC WASKESIU RIVER PEDESTRIAN BRIDGE  
PRINCE ALBERT NATIONAL PARK  
PROJECT NO. R.066921.001  
NOVEMBER, 2014



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ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF SASKATCHEWAN CERTIFICATE OF AUTHORIZATION ASSOCIATED ENGINEERING (SASK.) LTD.		
NUMBER C116		
Permission to Consult Held By:		
Discipline	Sask. Reg No.	Signature
STRUCT. BRIDGES	14799	<i>Bob Dyer</i>
_____	_____	_____
_____	_____	_____

ASSOCIATED ENGINEERING QUALITY MANAGEMENT SIGN-OFF	
Signature:	<i>Shella</i>
Date:	<i>Nov. 13/2014</i>

Prepared by Associated Engineering (Sask.) Ltd.

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**Part 1      General**

**1.1      WORK COVERED BY CONTRACT DOCUMENTS**

- .1      Work included in this Contract shall consist of the following:
  - .1      Demolition of the existing timber superstructure and concrete control structure of the pedestrian bridge over the Waskesiu River adjacent to the Scenic Drive Bridge.
  - .2      Design, fabrication, and delivery of a 21.0 m long x 3.0 m wide prefabricated steel bridge structure.
  - .3      Construction of a new 21.0 m long x 3.0 m wide prefabricated steel pedestrian bridge over the Waskesiu River adjacent to the Scenic Drive Bridge including steel pipe piles, concrete abutment caps, and prefabricated bridge structure.
  - .4      Subgrade construction and resurfacing on both approaches to the pedestrian bridge over the Waskesiu River, as illustrated in the Contract location plan.

**1.2      HOURS OF WORK**

- .1      Obtain written permission of Departmental Representative before undertaking holiday work or night work.

**1.3      DRAWINGS AND SPECIFICATIONS**

- .1      Maintain at Site a complete set of drawings and specifications. Make available to Departmental Representative at any time.

**1.4      CONTRACTOR USE OF PREMISES**

- .1      Unrestricted use of site. Existing Trail in the vicinity of the bridge shall be closed to pedestrian traffic throughout the duration of the project.
- .2      Co-ordinate use of premises under direction of Departmental Representative.
- .3      Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work.
- .4      At completion of operations condition of existing work: equal to or better than that which existed before new work started.

**1.5      EXISTING SERVICES**

- .1      Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2      Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .3      Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .4      Protect or maintain existing active services.

- .5 Record locations of maintained, re-routed and abandoned service lines.

## **1.6 DOCUMENTS REQUIRED**

- .1 Maintain at job site, one copy each document as follows:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders.
  - .5 Other Modifications to Contract.
  - .6 Field Test Reports.
  - .7 Copy of Approved Work Schedule.
  - .8 Approved Shop Drawings

## **1.7 PROJECT CLOSEOUT**

- .1 Final Cleaning
  - .1 When the Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
  - .2 Remove waste materials and debris from site at regularly scheduled times or dispose of material. . Do not burn waste materials on site.
- .2 Inspection/Takeover Procedures
  - .1 Prior to application for Certificate of Total Performance, carefully inspect the Work and ensure it is complete, that all construction deficiencies are complete, defects are corrected and bridge is clean and in condition for occupancy. Notify Departmental Representative, in writing, of completion of the Work and request an inspection.
  - .2 During Departmental Representative inspection, a list of deficiencies and defects will be tabulated.

### **Part 2 Products**

Not Used.

### **Part 3 Execution**

Not Used.

**END OF SECTION**

**Part 1          General**

**1.1            MEASUREMENT FOR PAYMENT**

- .1      For each unit price item, Departmental Representative will calculate payment based on tendered unit price and Departmental Representative's determination of units of work item completed.
- .2      For lump sum price item, Departmental Representative will calculate payment based on tendered price and Departmental Representative's estimate of percentage of work completed.
- .3      Method of measurement to be used is detailed in the section of the specification covering each work item.
- .4      Where a method of measurement for payment for a work item is not specified, payment for that item will be deemed to be included in another pay item or other pay items.

**1.2            CHANGE ORDERS**

- .1      Complete and promptly return all change order price requests issued by the Departmental Representative, quoting unit and/or lump sum prices as requested. Include appropriate supporting documentation to verify prices.
- .2      Do not proceed with work affected by price request until authorized to do so by Change Order.
- .3      Make no change in Work unless Change Order issued. Change Order is only valid when signed by Departmental Representative and Contractor.

**1.3            PROGRESS PAYMENT**

- .1      Departmental Representative will issue to Contractor as per the Terms of Payment after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Departmental Representative determines to be due. If Departmental Representative amends application, Departmental Representative will give notification in writing giving reasons for amendment.

**1.4            FINAL PAYMENT**

- .1      Submit application for final payment when Work is completed.
- .2      Departmental Representative will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Departmental Representative will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.
- .3      Departmental Representative will issue final certificate for payment when application for final payment is found valid.

**Part 2          Products**

Not Used.

**Part 3          Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                PRECONSTRUCTION MEETING**

- .1        Within 30 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2        Departmental Representative, Contractor and major Subcontractors will be in attendance.
- .3        Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4        Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5        Agenda to include:
  - .1        Appointment of official representative of participants in the Work.
  - .2        Schedule of Work.
  - .3        Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences.
  - .4        Delivery schedule of specified equipment and materials.
  - .5        Site security.
  - .6        Contractor's site specific safety plan.
  - .7        Contractor's draft traffic accommodation plans.
  - .8        Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .9        Proposed aggregate sources.
  - .10       Record drawings.
  - .11       Maintenance manuals.
  - .12       Take-over procedures, acceptance, warranties.
  - .13       Monthly progress claims, administrative procedures, photographs, hold backs.
  - .14       Appointment of inspection and testing agencies or firms.

**1.2                PROGRESS MEETINGS**

- .1        During course of Work schedule progress meetings monthly. Additional meeting to be held 2 weeks prior to project completion.
- .2        Contractor, major Subcontractors involved in Work, and Departmental Representative are to be in attendance, and authorized to act on behalf of the party each represents.
- .3        Notify parties minimum 5 days prior to meetings.
- .4        Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 10 days after meeting.

**Part 2          Products**

Not Used.

**Part 3          Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                ADMINISTRATIVE**

- .1      Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2      Do not proceed with Work affected by submittal until review is complete.
- .3      Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4      Where items or information is not produced in SI Metric units converted values are acceptable.
- .5      Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6      Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7      Verify field measurements and affected adjacent Work are co-ordinated.
- .8      Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9      Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.
- .10     Keep one reviewed copy of each submission on site.

**1.2                SHOP DRAWINGS AND PRODUCT DATA**

- .1      The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2      Submit drawings stamped and signed by Professional Engineer registered or licensed in Province of Saskatchewan, Canada.
- .3      Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4      Allow 14 days for The Departmental Representative's review of each submission.

- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Departmental Representative review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

### **1.3 SAMPLES**

- .1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid Departmental Representative.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

### **1.4 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 4 locations.
  - .1 Viewpoints and their location as determined by the Departmental Representative
- .4 Frequency of photographic documentation: weekly
  - .1 Upon completion of: excavation, foundation, prefabricated bridge erection, and completion of project

### **Part 2 Products**

Not Used.

### **Part 3 Execution**

Not Used.

**END OF SECTION**

**Part 1           General**

**1.1           REFERENCES**

- .1   Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2   Province of Saskatchewan
  - .1   Occupational Health and Safety Act, 1993, S.S. - Updated 2012.

**1.2           ACTION AND INFORMATIONAL SUBMITTALS**

- .1   Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2   Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1   Results of site specific safety hazard assessment.
  - .2   Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3   Submit electronic copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative.
- .4   Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors to Departmental Representative.
- .5   Submit copies of incident and accident reports.
- .6   Keep a copy of WHMIS MSDS - Material Safety Data Sheets in site office.
- .7   Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8   Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .9   On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

**1.3           FILING OF NOTICE**

- .1   File Notice of Project with Provincial authorities prior to beginning of Work.
- .2   Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award. Contractor to submit written acknowledgement to CSST along with Ouverture de Chantier Notice.
- .3   Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

#### **1.4 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

#### **1.5 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

#### **1.6 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

#### **1.7 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

#### **1.8 COMPLIANCE REQUIREMENTS**

- .1 Comply with Occupational Health and Safety Regulations, 1996.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

#### **1.9 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

#### **1.10 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with bridge construction.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 Be on site during execution of Work [and report directly to and be under direction of site supervisor.

**1.11 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

**1.12 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

**1.13 BLASTING**

- .1 Blasting or other use of explosives is not permitted.

**1.14 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

**Part 2 Products**

Not Used.

**Part 3 Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                REFERENCES**

- .1    Definitions:
  - .1    Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2    Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

**1.2                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.

**1.3                FIRES**

- .1    Fires are not permitted.

**1.4                DRAINAGE**

- .1    Provide temporary drainage and pumping required to keep excavations and site free from water.
- .2    Pump standing water away from the work site into the bush or vegetated areas so it does not enter the waterway. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.5                SITE CLEARING AND PLANT PROTECTION**

- .1    Protect trees and plants on site and adjacent properties as indicated.
- .2    Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes,
- .3    Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1    Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4    Minimize stripping of topsoil and vegetation.
- .5    Restrict tree removal to areas indicated by Contract Documents.

**1.6                WORK ADJACENT TO WATERWAYS**

- .1    Construction equipment to be operated on land only.
- .2    Removal of material from waterway beds is prohibited..
- .3    Waterways to be kept free of excavated fill, waste material and debris.
- .4    Design and construct temporary crossings to minimize erosion to waterways.

- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Blasting is not allowed unless approved by the Departmental Representative. Any blasting must be done in isolation from the river. Cofferdams can be used to isolate the work area.
- .8 Silt fencing must be erected parallel to the work area along the length of the waterway.

## **1.7 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .5 All equipment must be properly maintained, in sound mechanical condition and free of any fuel, oil, hydraulic fluid or coolant leaks.
- .6 Equipment must be free of external grease, loose dirt or oil and the machinery must be pressure washed prior to the start of the project.
- .7 All machinery must be equipped with emergency spill kits large enough to contain 110% of any possible spills or leaks of oil, fuel, hydraulic fluid or coolant during the project. The operators of the equipment must be familiar with how to properly use the spill kits in the event of an emergency. Fuel, oils, lubricants, chemicals, and any potentially hazardous material must not be dispelled into the environment.
- .8 Machinery and vehicles must keep to roads, trails, or designated temporary workspaces and turnaround points. The Departmental Representative will identify approved off-road workspaces. Rutting and/or compaction of ground surfaces should be avoided as much as possible by keeping to designated work areas and away from wet locations.
- .9 All areas with rutting damage or noticeable compaction from heavy equipment must be re-graded and back-filled if necessary. Any holes or depressions caused by site preparation or construction will be back-filled and compacted to an appropriate degree.
- .10 Refuelling stations and fuel storage must occur a minimum of 100 m from any water body.
- .11 Refuelling of equipment and vehicles must occur over an impervious surface or an absorbent spill pad.

## **1.8 NOTIFICATION**

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

- .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

**Part 2 Products**

Not Used.

**Part 3 Execution**

**3.1 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 All rubbish, construction debris, and waste materials must be stored appropriately and transported to an approved landfill site in Prince Albert for proper disposal. Documentation must be provided. Wastes must not be burned or buried. Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

**END OF SECTION**

**Part 1           General**

**1.1           INSPECTION**

- .1       Refer to GC 17 – Review and Inspection of the Work.

**1.2           TESTING LABORATORY SERVICES**

- .1       Quality control testing to be performed by Department Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative. Specific material testing shall include:
  - .1       Review and approve of the Contractors asphalt concrete mix design.
  - .2       Random quality assurance testing on sieves analysis and Atterberg limits for granular materials.
  - .3       All proctor testing and field densities.
- .2       Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspections as Department Representative may require to verify acceptability of corrected work.
- .3       The Contractor is responsible for the asphalt concrete mix design, required sieve analyses, and Atterberg limits during the production of all granular materials for the project, and his own quality control materials testing. Cost of such services will be borne by the Contractor. The Contractor shall:
  - .1       Notify Department Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
  - .2       Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
  - .3       Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Department Representative.
- .4       Provide equipment required for executing inspection and testing by appointed agencies.

**1.3           ACCESS TO WORK**

- .1       Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2       Co-operate to provide reasonable facilities for such access.

**1.4           PROCEDURES**

- .1       Notify Department Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2       Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

**1.5 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Department Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Department Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Department Representative.

**1.6 REPORTS**

- .1 Submit one (1) copy of mix designs, sieve analysis and Atterberg Limits at least two (1) weeks prior to commencing work.
- .2 Promptly submit to the Department Representative one copy of all inspection and test reports.

**1.7 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Department Representative and may be authorized as recoverable.

**Part 2 Products**

Not Used.

**Part 3 Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                SURVEY REQUIREMENTS BY CONTRACTOR**

- .1      All surveying shall be the responsibility of the Contractor.
- .2      Locate, confirm and protect control points and legal survey markers prior to starting site work. Preserve permanent reference points during construction.
- .3      Report to the Departmental Representative when a reference point or legal survey marker is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

**1.2                SURVEY REQUIREMENTS BY DEPARTMENTAL REPRESENTATIVE**

- .1      Departmental Representative to supply Contractor with reference datum and horizontal control prior to starting work.

**Part 2            Products**

Not Used.

**Part 3            Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                INSTALLATION AND REMOVAL**

- .1    Provide temporary utilities controls in order to execute work expeditiously.
- .2    Remove from site all such work after use.

**1.2                DEWATERING**

- .1    Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- .2    Any standing water pumped away from the site must be directed into the bush where it cannot enter the waterway.

**1.3                WATER SUPPLY**

- .1    Provide continuous supply of potable water for construction use.
- .2    Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- .3    Pay utility charges at prevailing rates.

**1.4                TEMPORARY HEATING AND VENTILATION**

- .1    Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2    Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3    Provide temporary heat and ventilation in enclosed areas as required to:
  - .1    Facilitate progress of Work.
  - .2    Protect Work and products against dampness and cold.
  - .3    Prevent moisture condensation on surfaces.
  - .4    Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5    Provide adequate ventilation to meet health regulations for safe working environment.
- .4    Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5    Ventilating:
  - .1    Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2    Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Pay costs for maintaining temporary heat, when required.
- .7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

**1.5 TEMPORARY POWER AND LIGHT**

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

**1.6 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by governing codes, regulations and bylaws.

**Part 2 Products**

Not Used.

**Part 3 Execution**

Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Construction Documents Committee (CCDC)
  - .1 CCDC 2, Stipulated Price Contract.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.189, Exterior Alkyd Primer for Wood.
  - .2 CGSB 1.59, Alkyd Exterior Gloss Enamel.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CAN/CSA-S269.2-M1987 (R2003), Access Scaffolding for Construction Purposes.
  - .3 CAN/CSA-Z321-96 (R2001), Signs and Symbols for the Occupational Environment.
- .4 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as of: May 14, 2004.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

**1.3 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Indicate use of supplemental or other staging area.
- .3 Provide construction facilities in order to execute work expeditiously.
- .4 Remove from site all such work after use.

**1.4 HOISTING**

- .1 Provide, operate and maintain cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of cranes.
- .2 Cranes to be operated by qualified operator.

**1.5 SITE STORAGE/LOADING**

- .1 Contractor to store all materials within the boundaries of the construction site. All equipment/materials to be loaded/unloaded within these limits.

- .2 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .3 Do not load or permit to load any part of Work with weight or force that will endanger Work.

#### **1.6 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.

#### **1.7 OFFICES**

- .1 Provide and maintain temporary field office at the site.
- .2 Provide marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

#### **1.8 STORAGE**

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

#### **1.9 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

#### **1.10 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

**Part 2          Products**

Not Used.

**Part 3          Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                QUALITY**

- .1        Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2        If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .3        Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .4        Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .5        Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .6        Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .7        Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions.

**1.2                STORAGE, HANDLING AND PROTECTION**

- .1        Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2        Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3        Store products subject to damage from weather in weatherproof enclosures.
- .4        Store cementitious products clear of earth or concrete floors, and away from walls.
- .5        Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6        Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .7        Touch-up damaged factory finished surfaces to Departmental Representative satisfaction. Use touch-up materials to match original. Do not paint over name plates.

**1.3                TRANSPORTATION**

- .1        Pay costs of transportation of products required in performance of Work.

**1.4 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

**1.5 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

**1.6 CO-ORDINATION**

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

**1.7 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**Part 2 Products**

Not Used.

**Part 3 Execution**

Not Used.

**END OF SECTION**

**Part 1      General**

DESCRIPTION

.1 Mobilization

.1 Mobilization shall consist of preparatory work and operations including, but not limited to, those necessary to the movement of personnel, equipment, supplies and incidentals to Site; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on Site.

.2 Demobilization

.1 Demobilization shall consist of cleanup work and operations including, but not limited to, those necessary to the removal of personnel, equipment, and incidentals from Site.

PAYMENT

.3 50% of Lump Sum Price for Mobilization and Demobilization which is not to exceed 5% of the Total Contract price for all contract components to be paid when mobilization to site is complete.

.4 Remainder of Lump Sum Contract Price for Mobilization and Demobilization to be paid when work is complete and all materials, equipment, camp, buildings, shops, offices, and other facilities have been removed from site and site cleaned and left in condition to the satisfaction of the Departmental Representative.

.5 50% of Lump Sum Price for **Mobilization and Demobilization for Pile Driving** which is not to exceed 5% of the Total Contract price for all contract components to be paid when mobilization to site is complete.

.6 Remainder of Lump Sum Contract Price for **Mobilization and Demobilization for Pile Driving** to be paid when work is complete and all materials and equipment have been removed.

**Part 2      Products**

Not Used.

**Part 3      Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                PROJECT CLEANLINESS**

- .1      Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by other Contractors.
- .2      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .3      Dispose of waste materials and debris off site.
- .4      Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .5      Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces.

**1.2                FINAL CLEANING**

- .1      When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2      Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3      Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4      Remove waste products and debris including that caused by other Contractors.
- .5      Remove waste materials from site. Do not burn waste materials on site, unless approved by Departmental Representative.
- .6      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7      Remove dirt and other disfiguration from exterior surfaces.
- .8      Sweep and wash clean paved areas.

**Part 2            Products**

Not Used.

**Part 3            Execution**

Not Used.

**END OF SECTION**

**Part 1            General**

**1.1                MEASUREMENT AND PAYMENT**

- .1        Payment for Removal and disposal of the existing timber bridge superstructure and designated portion of concrete control structure shall be at the lump sum price in the tender form and shall be full compensation for all labour, equipment, tools, and incidental materials necessary to complete the work.

**1.2                REFERENCES**

- .1        Reference Standards:
  - .1        CSA International
    - .1        CSA S350- M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

**1.3                QUALITY ASSURANCE**

- .1        Regulatory Requirements: Ensure Work is performed in compliance with the requirements of the permits appended to these specifications, as well as any applicable Provincial regulations.

**1.4                SITE CONDITIONS**

- .1        Existing Conditions:
  - .1        The existing bridge is approximately 15.6 m long x 4.1 m wide complete with 3 lookouts on the east side of the structure. Each lookout is complete with an informative display panel.
  - .2        The existing superstructure is constructed of timber stringers, timber decking, and timber railings.
  - .3        The existing substructure is a cast-in-place concrete control structure previously used to control river levels prior to construction of the riffle weir downstream of the bridge. It consists of a single concrete pier, as well as 2 concrete abutments and wingwalls, with decorative wood panelling.
- .2        Environmental protection:
  - .1        Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
  - .2        Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
  - .3        Fires and burning of waste or materials is not permitted on site.
  - .4        Do not bury rubbish waste materials.
  - .5        Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
    - .1        Ensure proper disposal procedures are maintained throughout project.

- .6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction.
- .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .10 Cover or wet down dry materials and waste to prevent blowing dust and debris.

**Part 2 Products**

Not Used.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
- .2 Protection of in-place conditions:
  - .1 Work in accordance with Section 01 35 43 - Environmental Procedures.
  - .2 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, trees, landscaping, and adjacent grades.
    - .1 Provide bracing, shoring and underpinning as required.
    - .2 Repair damage caused by demolition to adjacent structures.
  - .3 Support affected structures and, if safety of structure being demolished, adjacent structures or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.

**3.2 DEMOLITION**

- .1 The existing timber superstructure shall be completely removed and disposed of at an approved landfill site in Prince Albert.
- .2 The existing cast-in-place concrete pier and abutment walls/wingwalls shall be completely removed to groundline as shown on the plans and disposed of at an approved landfill site in Prince Albert.

- .3 Contractor to salvage informative display panels and store onsite. Coordinate with Departmental Representative for final placement.
- .4 The contractor shall be responsible for loading, transporting, and unloading all material designated for disposal.
- .5 Blasting operations are not permitted during demolition.
- .6 At end of each day's work, leave Work in safe and stable condition.
- .7 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .8 Use natural lighting to do Work where possible.
  - .1 Shut off lighting except those required for security purposes at end of each day.

**END OF SECTION**

**Part 1      General**

**1.1      MEASUREMENT PROCEDURES**

- .1      No measurement will be made under this Section for precast structural concrete. Include costs for all required items in the applicable lump sum price.
- .2      Fabrication and Supply of Concrete Abutment Caps shall be at the lump sum price in the tender form and shall be full compensation for the fabrication and delivery of the caps including all necessary equipment, materials, and labour.
- .3      Erection of Concrete Abutment Caps shall be paid for at the lump sum price in the tender form and shall be full compensation for erection of the caps including all equipment, materials, and labour necessary to off-load and install the caps as per the details shown on the Contract Drawings.
- .4      Timber backwalls shall be paid for at the lump sum price in the tender form and will be full compensation for all labour, tools, and incidental material necessary to complete the work as per the details on the Contract Drawings.

**1.2      REFERENCES**

- .1      Canadian Standards Association (CSA International)
  - .1      CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CSA-A23.4, Precast Concrete - Materials and Construction.
  - .3      CAN/CSA-G30.18M, Billet-Steel Bars for Concrete Reinforcement.
  - .4      CAN/CSA-G40.21, Structural Quality Steel.
  - .5      CAN/CSA-G164M, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6      CAN/CSA-S6, Canadian Highway Bridge Design Code.
  - .7      CSA W47, Certification of Companies for Fusion Welding of Steel.
  - .8      CSA-W59-M, Welded Steel Construction (Metal Arc Welding).
  - .9      CSA-W186-M, Welding of Reinforcing Bars in Reinforced Concrete Construction.

**1.3      PERFORMANCE REQUIREMENTS**

- .1      Tolerance of precast elements to CSA-A23.4. Precast supplier to verify all precast elements meet requirements prior to release for shipping.

**1.4      ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit shop drawings in accordance with CSA-A23.3 and CSA-A23.4 and include following items:
  - .1      Details of members, reinforcement and their connections.
  - .2      Finishing schedules.

- .3 Methods of handling and erection.
- .4 Openings, sleeves, inserts and related reinforcement.

## **1.5 QUALIFICATIONS**

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified by Canadian Standards Association in appropriate categories according to CSA-A23.4
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender.
- .3 Only precast elements fabricated in such certified plants to be acceptable to Departmental Representative, and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.
- .2 Protect unit corners from contacting earth to prevent from staining.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Cement, aggregates, water, admixtures: to CAN/CSA-A23.1 and CAN/CSA-A23.4.
- .2 Reinforcing steel: to CAN/CSA-G30.18.
- .3 Hardware and miscellaneous materials: to CSA-A23.1
- .4 Forms: to CSA-A23.4.
- .5 Welding materials: to CSA W48.1.
- .6 Welding electrodes: to CSA W48.1 and certified by Canadian Welding Bureau.
- .7 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m<sup>2</sup> to CAN/CSA-G164.
- .8 Zinc-rich primer: to CAN/CGSB-1.181.

### **2.2 MIXES**

- .1 Concrete:
  - .1 Alternative 1 - Performance Method for specifying concrete: to meet Engineer performance criteria in accordance with CAN/CSA-A23.1/A23.2.
    - .1 Ensure concrete supplier meets performance criteria as established below. Provide concrete mix to meet following hard state requirements:
      - .1 Cement: use Type GU Portland cement
      - .2 Durability and class of exposure: C-1.

- .3 Minimum compressive strength at 28 days: 35 MPa.
  - .4 Nominal size of coarse aggregate: 20 mm
  - .5 Ratio of water to total cementitious materials: 0.38.
  - .6 Air content: 4.0 to 7.0%.
  - .7 Slump at time and point of discharge: 120 mm maximum.
- .2 Grout:
- .1 Non-shrink, non-metallic, minimum compressive strength: 35 MPa.

## **2.3 MANUFACTURED UNITS**

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not to be exposed.
- .3 Provide hardware suitable for handling elements.
- .4 Galvanize steel embedments after fabrication and touch up with zinc-rich primer after welding.

## **2.4 FINISHES**

- .1 Finish units to as shown on the contract drawings and to CSA-A23.4.

## **2.5 SOURCE QUALITY CONTROL**

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4 and CSA-G279.
- .2 Provide records from in-house quality control programme based upon plant certification requirements to Departmental Representative for inspection and review.
- .3 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, pre-stressing steel and provide to Departmental Representative for review upon request.

## **Part 3 Execution**

### **3.1 ERECTION**

- .1 Do precast concrete work in accordance with CSA-A23.4 and CSA-A23.3.
- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .3 Erect precast elements within allowable tolerances as indicated in CSA-A23.4.
- .4 Non-cumulative erection tolerances in accordance with CSA-A23-4.
- .5 Set elevations and alignment between units to within allowable tolerances before

- .6 Fasten precast units in place as indicated on reviewed shop drawings.
- .7 Secure with bolts using tack-weld nut to bolt.
- .8 Uniformly tighten bolted connections with torque indicated.
- .9 Clean field welds with wire brush and touch-up galvanized finish with zinc-rich primer.

### **3.2 CLEANING**

- .1 Use cleaning methods as reviewed by Departmental Representative before cleaning soiled precast concrete surfaces.

### **3.3 TIMBER BACKWALLS**

- .1 Construct timber backwalls as detailed on the Contract Drawings.
- .2 Backing planks shall be installed tight to the timber nailers and to the adjacent backing planks to minimize the occurrence of gaps.
- .3 Attach backwall planking to the timber nailers with 150 mm galvanized Ardox nails. A minimum of 2 nails shall be used at each nailer.

**END OF SECTION**

**Part 1          General**

**1.1          MEASUREMENT PROCEDURES**

.1          Foundation Excavation

1. Payment for foundation excavation will be made at the lump sum price shown in the Tender Form. Price shall include all costs associated with Removal of all material, of whatever nature, necessary for the construction of foundations and substructures in accordance with the plans or as directed by the Departmental Representative. Price shall include the furnishing of all necessary equipment, the construction of all cofferdams and the dewatering which may be necessary for the execution of the work. It shall also include the subsequent removal of cofferdams, cribs and access roads, and the placement of all necessary backfill as hereinafter specified. It shall also include the disposal of excavated waste material in an environmentally acceptable manner and location so as not to affect the hydraulic capacity of the stream channel, not be unsightly, and not decrease the stability of the roadway embankment or valley walls.
2. The contract price shall be full compensation for all labour, material, equipment, and other items required to complete the excavation. Contract prices shall also include the cost of clearing, grubbing, removing cofferdams and any waste material, and shall include the cost of backfilling in a compacted condition.

.2          Bridge End Fill

- .1          Bridge End Fill shall be paid for at the unit price shown in the tender form, within the lines and grades shown on the Contract Drawings.
- .2          The price to include supply, testing, screening, loading, hauling, dumping, placing, blading, and compacting the Bridge End Fill. In addition, the price shall also include the cost of the addition of any water or drying necessary to obtain the required density

.3          Granular Base Course

- .1          Payment of supply and installation of granular base course will not be paid for directly but will be considered a subsidiary obligation of the Contractor under the contract.

.4          Asphalt Paving

- .1          Payment of supply and installation of asphalt concrete will not be paid for directly but will be considered a subsidiary obligation of the Contractor under the contract.

.5          Removal and Replacement of Topsoil

- .1          Stripping, placing, and spreading of topsoil shall be paid for at the unit price shown on the Tender Form. Nominal depth of topsoil on finished slopes to be 50 mm.

.6          Granular Filter Blanket

- .1          Payment for granular filter blanket will be at the contract unit price per cubic metre. The unit price will be full compensation for material, equipment, and

labour required for the supply, hauling, and installation of erosion control blanket.

.7 Erosion Control Blanket

.1 Payment for installation of erosion control blanket will be at the contract unit price per square metre. The unit price will be full compensation for material, equipment, and labour required for the supply, hauling, and installation of erosion control blanket.

.8 Seeding

.1 Refer to Specification 32 92 19 for seeding.

**1.2 REFERENCES**

.1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,000 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).

**1.3 DEFINITIONS**

.1 Earth excavation: excavation of materials that are not Stripping or Rock Excavation.

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

.3 Subcut: the top 150 mm of material below the subgrade surface in a cut section.

.4 Waste material: material unsuitable for use in embankment or surplus to requirements.

.5 Embankment: material derived from usable excavation or borrow sources and placed above the original ground or stripped surface up to subgrade elevation.

.6 Rocks and Boulders: rocks to be defined as being 600 mm in diameter or less. Boulders to be defined as rocks having a diameter greater than 600 mm.

**1.4 QUALITY ASSURANCE**

.1 Submit design and supporting data at least two (2) weeks prior to beginning Work.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Saskatchewan, Canada.

.3 Keep design and supporting data on site.

.4 For temporary works, engage services of qualified professional Engineer who is registered or licensed in Province of Saskatchewan, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.

**1.5 EXISTING CONDITIONS**

.1 Examine soil report appended to these Specifications.

.2 Buried services:

.1 Before commencing work verify location of buried services on and adjacent to site.

- .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
- .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
- .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .5 Confirm locations of buried utilities by careful soil hydrovac methods.
- .6 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .7 Where utility lines or structures exist in area of excavation, obtain direction of Engineer. Costs for such Work to be paid by the Departmental Representative.
- .8 Record location of maintained, re-routed and abandoned underground lines.
- .9 Confirm locations of recent excavations adjacent to area of excavation.

## Part 2 Products

### 2.1 MATERIALS

- .1 Bridge End Fill
  - .1 Supply crushed Bridge End Fill material meeting the following gradation requirements:

Sieve Designation	Percent by Weight Passing Canadian Metric Standard Sieves
50 mm	100
18 mm	55 – 100
5 mm	25 – 100
2 mm	15 – 85
400 µm	0 – 25
71 µm	0 – 5
Plasticity Index	0

- .2 Perform testing of material to establish conformance to the specifications. Provide results of these tests to the Departmental Representative before using the material in the work.
  - .3 The Departmental Representative at its discretion may undertake confirmation testing of this material.
- .2 Embankment materials require approval by Departmental Representative.
  - .3 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or any other unsuitable material.
  - .4 Borrow material

- .1 It is anticipated that sufficient quantities of earth material can be found within the abutment excavation within the project limits. However, no assurance is given or implied that these sources contain sufficient material for completion of the contract.

## **2.2 GRANULAR BASE COURSE**

- .1 Only base course Type 33 as per Saskatchewan Ministry of Highway & Infrastructure Specification 3505 will be permitted.

## **2.3 ASPHALT CONCRETE**

- .1 Only a mix design Type 3 as per Saskatchewan Ministry of Highway & Infrastructure Specification 4100 will be permitted.

## **2.4 GRANULAR FILTER BLANKET**

- .1 Granular filter blanket gradation to meet the requirements of Saskatchewan Ministry of Highway & Infrastructure Specification 6620.

## **2.5 EROSION CONTROL BLANKET**

- .1 North American Green BioNet S75BN or approved equivalent.

## **2.6 SEEDING**

- .1 All disturbed areas must be reseeded with a certified weed-free native seed mixture as directed by Departmental Representative.

## **Part 3 Execution**

### **3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff into the adjacent watercourse.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### **3.2 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

### **3.3 PREPARATION/PROTECTION**

- .1 Keep excavations clean, free of standing water, and loose soil.

- .2 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .3 Protect buried services that are required to remain undisturbed.

### **3.4 STOCKPILING**

- .1 Stockpile fill materials in suitable areas on site.
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.
- .4 Soil horizons must be excavated and stored separately. Organics and top soil should be salvaged and replaced in the reverse order of excavation over mineral soils during re-contouring activities, wherever possible.
- .5 Soils must be stored in separate piles on an impervious surface within temporary workspaces approved by the Departmental Representative. If soil storage is required for an extended period (greater than 7 days) or if heavy rain or wind is forecast, soil piles must be covered to reduce erosion loss.
- .6 Any soils removed from sloped areas must maintain the specified slope gradient, be capped with appropriate topsoil and reseeded as soon as possible. Erosion control must be installed until vegetation establishes.

### **3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Occupational Health and Safety Act for the Province of Saskatchewan.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course. Department of Fisheries and Oceans was consulted on this project and advises the following for temporary diversion of a watercourse:
  - .1 Construction work must proceed in a manner that ensures 100% of downstream flows are maintained at all times. The construction area will be effectively isolated from flowing water.
  - .2 Use dams made of non-earthen material, such as water inflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs, to separate the dewatered work site from flowing water.
    - .1 If granular material is used to build dams, use clean or washed material that is adequately sized (i.e., moderately sized rock and not sand or gravel) to withstand anticipated flows during the construction. If necessary, line the outside face of dams with heavy poly-plastic to make them impermeable to water. Material to build these dams should not be taken from below the HWM of any water body.
    - .2 Design dams to accommodate any expected high flows of the watercourse during the construction period.

- .3 Before dewatering, rescue any fish from within the isolated area and return them safely immediately downstream of the worksite.
- .4 Pump sediment laden dewatering discharge into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering any water body.
- .5 Remove accumulated sediment and excess spoil from the isolated area before removing dams.
- .6 Gradually remove the downstream dam first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle.
- .7 During the final removal of dams, restore the original channel shape, bottom gradient and substrate at these locations.
- .8 Pumped Diversions: Pumped diversions are used to divert water around the isolated area to maintain natural downstream flows and prevent upstream ponding.
  - .1 Ensure intakes are operated in a manner that prevents streambed disturbance and fish mortality. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (e.g., *Freshwater Intake End-of-Pipe Fish Screen Guideline* (1995), available at [www.dfo-mpo.gc.ca/Library/ 223669.pdf](http://www.dfo-mpo.gc.ca/Library/223669.pdf) (PDF Version, 2.93 Mb)).
  - .2 Ensure the pumping system is sized to accommodate any expected high flows of the watercourse during the construction period. Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure.
  - .3 Protect pump discharge area(s) to prevent erosion and the release of suspended sediments downstream, and remove this material when the works have been completed
- .3 Construct temporary Works to depths, heights and locations as indicated on approved shop drawings.
- .4 During backfill operation:
  - .1 Unless otherwise indicated or directed by the Departmental Representative, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .5 Upon completion of abutment construction:
  - .1 Remove cofferdams, shoring and bracing.
  - .2 Remove excess materials from site and restore watercourses.

### 3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress. Contractor shall bear all responsibility and associated costs regarding the dewatering excavations. All costs shall be included in the lump sum price for foundation excavation.

- .2 Provide the Departmental Representative details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.

### **3.7 ABUTMENT EXCAVATION**

- .1 The existing bridge embankments shall be excavated as shown on the Contract Drawings to facilitate the construction of the bridge abutments.

### **3.8 EMBANKMENT FILL AND COMPACTION**

- .1 General
  - .1 Strip the existing embankment slopes before widening or raising the embankment.
  - .2 The embankment shall be constructed by placing the material in successive layers. The depth of each layer shall not be more than 15 centimetres compacted.
  - .3 The full width of each segment of each layer shall be bladed with a motor grader at least twice prior to being compacted or proceeding to the next embankment layer.
  - .4 The slopes and surfaces of the embankment shall be shaped and trimmed to a uniform smooth surface conforming to the plans or as staked by the Departmental Representative.
- .2 Compaction
  - .1 The following compaction requirements shall apply:
    - .1 Compaction shall be required in the top 300 mm of the subgrade embankment, testing shall be as directed by Departmental Representative.
    - .2 The moisture and density on these sections will be considered satisfactory when:
      - .1 All individual moisture test results are equal to or less than the optimum moisture content.
      - .2 Density test results average not less than 98% of the maximum density.
      - .3 All individual density tests are greater than 96% of the maximum density.

- .2 If the moisture existing in the soil is insufficient for compacting to the specified density and for finishing, the Contractor may elect to add water. Payment for watering will not be paid directly and will be considered a subsidiary to the contract.

### 3.9 BACKFILLING

- .1 Bridge End Fill
  - .1 Place Bridge End Fill in horizontal layers not exceeding 150 mm in loose thickness.
  - .2 Compact each layer uniformly to not less than 100% of the laboratory density obtained by ASTM D698. Within 1.5 m setback from the retained soil face of an abutment or wing wall, comply with either of the following placement restrictions:
    - .1 Use hand-operated vibratory compaction equipment only, with an energy output equal to or less than 75 kilowatts; or
    - .2 Provide adequate monitoring to verify that the outward movements of the abutment or wing wall are less than  $H/500$ , where "H" equals the height of backfill. Take and record measurements and submit them to the Engineer for verification.
  - .3 Do not compact by puddling or jetting.

- .2 Common Excavation to Embankment
  - .1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.
  - .2 All individual density tests are to be greater than 96% of the maximum density. Density test results average not less than 98% of the maximum density. Compact top 150 mm of subgrade to 100% maximum density.
  - .3 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

**3.10 GRANULAR BASE COURSE**

- .1 Install granular base course as per the requirements of Saskatchewan Ministry of Highway & Infrastructure Specification 3505.

**3.11 ASPHALT CONCRETE**

- .1 Install granular base course as per the requirements of Saskatchewan Ministry of Highway & Infrastructure Specification 4100.

**3.12 GRANULAR FILTER BLANKET**

- .1 Install granular base course as per the requirements of Saskatchewan Ministry of Highway & Infrastructure Specification 6202.

**3.13 EROSION CONTROL BLANKET**

- .1 Prior to installation of the blanket, the installation area shall be true to grade and cross-section and free from irregularities.
- .2 Erosion control blanket shall not be placed prior to seeding being completed unless otherwise authorized by the Departmental Representative.
- .3 Erosion control blanket shall be installed at locations indicated on the Plans or as directed by the Departmental Representative.
- .4 Erosion control blanket shall be installed in accordance with the manufacturer's recommendations or as directed by the Departmental Representative.

**3.14 SEEDING**

- .1 Refer to specification 32 92 19 for seeding. Place seed at a rate of 20-24 kg/ha.
- .2 Seeding shall take place as soon as possible in the spring, as soon as the ground has thawed.

**3.15 RESTORATION**

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects.
- .2 Replace topsoil where necessary.
- .3 Reinstate lawns to elevation which existed before excavation.

- .4 Reinstatement of walkway pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

**Part 1 General**

**1.1 MEASUREMENT PROCEDURES**

- .1 Measure rip-rap in cubic metres of material placed. Measurement shall consist of surface area of material in place multiplied by average thickness.
- .2 Payment for rip-rap shall be made on the basis of the unit price per cubic metre as shown on the Tender Form.
- .3 The price to include supplying, loading, hauling, unloading, and placing of rip-rap and for staking, trimming, and shaping the surfaces to be armoured by rip-rap and granular filter blanket.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Granular Filter Blanket: gravel, free from undesirable quantities of soft flaky particles, loam and organic or other deleterious material, conforming to the following gradation requirements:

<b>Sieve Designation</b>	<b>Percent by Weight Passing Canadian Metric Standard Sieves</b>
100 mm	100
50 mm	65 - 100
25 mm	40 - 85
5 mm	20 - 60
900 µm	7 - 40
400 µm	5 - 35
71 µm	0 - 20

- .2 Rip-rap: hard and durable field stones, boulders or quarry rock conforming to the following gradation requirements:
  - .1 Class B
    - .1 100% smaller than 450 mm or 130 kg.
    - .2 At least 20% larger than 350 mm or 70 kg.
    - .3 At least 50% larger than 300 mm or 40 kg.
    - .4 At least 80% larger than 200 mm or 10 kg.

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**Part 3 Execution**

**3.1 GRANULAR FILTER BLANKET**

- .1 Where indicated on the Contract Drawing, place Granular Filter Blanket to the required length, width, and thickness. Finish granular materials to a uniform and even surface.

**3.2 RIPRAP**

- .1 Do not place rip-rap until permission to do so has been obtained from the Departmental Representative.
- .2 Take adequate precautions during the placing operation to prevent damage to the structure and to avoid disturbing the filter blanket.
- .3 Rip-rap must not be placed by dumping. Take adequate controls to ensure a reasonably uniform thickness and a well-graded distribution of stone sizes without protrusion of isolated large stones. If required, re-arrange individual stones by mechanical equipment or by hand.
- .4 Every effort will be made to minimize the introduction of sediment and the disturbance of sediment and debris during in-water work activities. This includes installation of silt fencing along banks of waterways within the work area.
- .5 Any sand fill material and rock/cobble used in stream will be obtained from off-site and not from below the high water level of any watercourse or water body.
- .6 During construction and until vegetation is re-established, effective sediment and erosion control measures will be used on disturbed areas to prevent silt and soil laden runoff from entering fish habitat. This may include seed matting (e.g. coconut matting) or other landscaping fabrics.

**3.3 PLACING**

- .1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.
- .2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.
- .3 Place rip-rap to thickness and details as indicated.
- .4 Place stones in manner approved Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.
- .5 Where necessary, trim and shape the area to be armoured by rip-rap.
- .6 Place base of riprap toe down to existing waterline, or as shown on drawings, whichever is lower.

**END OF SECTION**

**Part 1            General**

**1.1            MEASUREMENT PROCEDURES**

- .1    No measurement will be made under this Section. Include cost in the items for which piling is required.

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data: submit manufacturer's printed product literature, specifications and datasheet.
- .3    Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to Departmental Representative and await further instructions.
- .4    Submit schedule of planned sequence of driving to Departmental Representative for review, as specified.
- .5    Equipment:
  - .1    Submit prior to pile installation for approval by Departmental Representative, list and details of equipment for use in installation of piles.
  - .2    Impact hammers: submit manufacturer's written data as specified.
  - .3    Non-impact methods; submit characteristics to evaluate performance.
- .6    Submit driveability analysis as specified, to Departmental Representative for approval of hammers.
- .7    Quality assurance submittals:
  - .1    Test reports: submit one (1) electronic copy of certified test reports for piles from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .2    Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3            DELIVERY, STORAGE AND HANDLING**

- .1    Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2    Protect piles from damage due to excessive bending stresses, impact, abrasion or other causes during delivery, storage and handling.
- .3    Replace damaged piles as directed by Departmental Representative.

**1.4            EXISTING CONDITIONS**

- .1    Refer to Geotechnical Investigation Report in Appendix A of these documents for a description of subsurface conditions.

**1.5 SCHEDULING**

- .1 Provide schedule of planned sequence of driving to Departmental Representative for review, not less than two weeks prior to commencement of pile driving.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Material requirements for piles are specified in Section 31 62 16 19.

**2.2 EQUIPMENT**

- .1 Provide pile driving equipment capable of installing the piles to the required capacities and anticipated tip elevations shown on the Contract Drawings.
- .2 Impact hammers: provide manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer, mass of driving cap and type and elastic properties of hammer and pile cushions.
  - .1 Submit to Departmental Representative for review prior to pile installation.
- .3 Drop hammers: provide weight of drop hammer and drop height to ensure maximum energy requirements are not exceeded.

**Part 3 Execution**

**3.1 PREPARATION**

- .1 Protection:
  - .1 Protect adjacent structures, services and work of other sections from hazards due to pile driving operations.
  - .2 Arrange sequencing of pile driving operations and methods to avoid damages to adjacent existing structures.
  - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .2 Ensure that ground conditions at pile locations are adequate to support pile driving operation and load testing operation.
  - .1 Make provision for access and support of piling equipment during performance of Work.

### **3.2 INSTALLATION**

- .1 Allowable design load capacity of pile is as indicated on Contract Drawings.
- .2 Installation of each pile will be subject to approval of Departmental Representative.
  - .1 Departmental Representative will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine load capacity.
  - .2 Departmental Representative to approve final driving of all piles prior to removal of pile driving rig from site.
- .3 Drive each pile to pile tip elevation as indicated on drawings.

### **3.3 APPLICATION / DRIVING**

- .1 Hold piles securely and accurately in position while driving.
- .2 Deliver hammer blows along axis of pile.
- .3 Restrike already driven piles lifted during driving of adjacent piles to assure set.
- .4 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive foundation concrete.
- .5 Cut off piles neatly and squarely at elevations as indicated.
  - .1 Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.
  - .2 Do not cut tendons or other reinforcement, which will be used to tie pile caps to pile.
- .6 Remove cut-off lengths from site on completion of work.

### **3.4 DRIVING TOLERANCES**

- .1 Pile heads to be within 25 mm of locations as indicated parallel to the centerline of the bridge and 50 mm parallel to the centerline of the abutment cap.
- .2 Piles not to be more than 20 mm per metre of length out of vertical alignment.

### **3.5 OBSTRUCTIONS**

- .1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, proceed as directed by Departmental Representative.

### **3.6 REPAIR AND RESTORATION**

- .1 In the case of a rejected pile as determined by the Departmental Representative, one of the following options will be used at the discretion of the Departmental Representative:
  - .1 Pull out rejected piles and replace with new piles.
  - .2 Remove rejected pile and replace with new, and if necessary, longer pile.
  - .3 Leave rejected pile in place and cut off to groundline.

- .4 Leave rejected pile in place, place adjacent pile and modify pile cap. Modifications to be reviewed by the Departmental Representative.
- .5 No extra compensation will be made for removing and replacing or other work made necessary through rejection of defective piles.

### **3.7 FIELD QUALITY CONTROL**

- .1 Pile Driving Analyzer:
  - .1 The Departmental Representative if required will complete pile driving analyzer (PDA) testing to evaluate hammer efficiency and pile axial capacity for final acceptance. Testing to be performed by a CSA certified testing agency and paid for by the Departmental Representative.
  - .2 For the purpose of pile driving analysis, capacity of the pile to be not less than the ultimate capacity for the pile as shown of the Contract Drawings.
  - .3 If ordered by the Departmental Representative, re-drive one or more piles in each group after a waiting period of not less than 24 hours, in order to assess any increase in capacity.
- .2 Measurement:
  - .1 Maintain accurate records of driving for each pile, including:
    - .1 Type and make of hammer, stroke or related energy.
    - .2 Other driving equipment including water jet, driving cap, cushion.
    - .3 Pile size and length, location of pile in pile group, location or designation of pile group.
    - .4 Sequence of driving piles in group.
    - .5 Final tip and cut-off elevations.
    - .6 Other pertinent information such as interruption of continuous driving, pile damage.
    - .7 Record elevation taken on adjacent piles before and after driving of each pile.
  - .2 All measurements, observations and calculations associated with pile driving analyzer and wave equation analysis.
  - .3 Provide Departmental Representative with three copies of records.

**END OF SECTION**

**Part 1          General**

**1.1            RELATED REQUIREMENTS**

**1.2            MEASUREMENT PROCEDURES**

.1          Driven Piles:

- .1          Payment for driven piles shall include the supply and installation of piles and shall be made at the unit price per metre shown in the Tender Form.
- .2          The price includes provision for pre-drilling, installing driving shoes, reinforcing rings, splicing, hole cutting and all costs associated with driving piles, for piles up to and including 15,000 mm.
  - .1          If greater length than 15,000 mm is required for any pile, additional payments will be made under the following pay items.
- .3          Payment for piles not meeting the tolerances listed under Specification 31 61 13.3.4.1 for final position parallel to the centerline of the bridge shall be reduced by multiplying the unit price per metre by the percentages indicated below:
  - .1          25 mm to 100 mm: 90%
  - .2          101 mm to 125 mm: 80%
  - .3          Greater than 125 mm: 0%
- .4          Payment for piles not meeting the tolerances listed under Specification 31 61 13.3.4.1 for final position parallel to the centerline of the abutment cap shall be reduced by multiplying the unit price per metre by the percentages indicated below:
  - .1          50 mm to 150 mm: 90%
  - .2          151 mm to 300 mm: 80%
  - .3          301 mm to 450 mm: 70%
  - .4          Greater than 125 mm: 0%
- .5          Payment for piles not meeting the tolerances listed under Specification 31 61 13.3.4.2 for vertical deviation shall be reduced by multiplying the unit price per metre by the percentages indicated below:
  - .1          20 mm/m from the vertical to 50 mm/m from the vertical: 90%
  - .2          51 mm/m from the vertical to 100 mm/m from the vertical: 80%
  - .3          Greater than 100 mm/m from the vertical: 0%

**1.3            ADDITIONAL PILE LENGTHS (PROVISIONAL)**

- .1          Additional pile lengths will be paid for when pile lengths over and above 15,000 mm long are necessary in the opinion of the Departmental Representative.
- .2          Payment for additional pile lengths will be made at the price per metre shown in the Tender Form.

- .3 The price includes provision for reinforcing rings, splicing, hole cutting and all costs associated with driving piles, for piles beyond 15,000 mm in length.
- .4 No payment under this item will be made for the first 15,000 mm length of each pile.

#### **1.4 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A252, Standard Specification for Welded and Seamless Steel Pipe Piles.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
  - .3 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
  - .4 CSA W59-M, Welded Steel Construction (Metal Arc Welding) (metric version).
  - .5 CSA-Z245.1, Steel Pipe.

#### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheet.
- .3 Quality Assurance: test reports:
  - .1 Prior to fabrication, and, if requested, provide Departmental Representative with two copies of steel producer's certificates in accordance with ASTM A252.
  - .2 One Charpy V-notch test required per heat and results reported to Departmental Representative by manufacturer.
  - .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Submit details of pile stock material to be used, as described in PART 3 - FABRICATION, for review by Departmental Representative.

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Deliver new, undamaged materials to site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on pipe piling.
- .3 Storage and Protection:
  - .1 Store and handle pipe piling in accordance with manufacturer's written instructions to prevent permanent deflection, distortion or damage to interlocks.
  - .2 Support pipe piling on level blocks or racks spaced not more than 3 m apart and not more than 0.60 m from ends.

- .3 Store pipe piling to facilitate required inspection activities and prevent damage to coatings and corrosion prior to installation.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Pipe: to ASTM A252. Grade, size and wall thicknesses as indicated on the Contract Drawings.
- .2 Splices: to CAN/CSA G40.21.
- .3 Welding electrodes: to CSA W48 series.

## **Part 3 Execution**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 FABRICATION**

- .1 Fabricate full length piles to eliminate splicing during installation wherever possible.
- .2 Full length piles may be fabricated from piling material by splicing lengths together.
  - .1 Use complete joint penetration groove welds, as approved by Departmental Representative. Do not fabricate from sections of piling shorter than 3 m. Fabricate full length piles to be straight from end-to end.
- .3 Submit details of planned use of pile material stock to Departmental Representative for approval prior to start of fabrication. Re-use cut-off lengths only if permitted by Departmental Representative.
- .4 Repair defective welds as approved by Departmental Representative.
  - .1 Repairs: to CSA W59.
  - .2 Unauthorized weld repairs may be rejected.
- .5 Repair damaged exterior protective coating of piles.

### **3.3 INSTALLATION**

- .1 Install piling in accordance with Section 31 61 13 - Pile Foundations, General Requirements.
- .2 Pile driving equipment shall be capable of developing a total energy not less than 30 000 joules per blow and not more than 47 000 joules per blow. The hammer and pile shall be adequately cushioned to avoid damage to the top of the pile caused by the impact of driving forces. The cap and pile top shall be squared to distribute the hammer blow uniformly to the top surface of the pile.

- .3 If approved by Departmental Representative, splice piles in place during installation by welding.
  - .1 To prevent distortion, tack opposite points first and then weld opposite sections for pipe walls thinner than 10 mm weld against a backup ring . Hold members in alignment during splicing operation.
  - .2 Make splice by complete joint penetration groove welds.
- .4 Install pile caps as indicated.
- .5 Touch up scratched or uncoated surfaces with two applications of inorganic zinc coating and coal tar epoxy.

### **3.4 WELDING**

- .1 Weld to CSA W59.
- .2 Welding certification of companies: to CSA W47.1, Division 1 or 2.
- .3 Welding certification of companies welding steel reinforcing bars placed in reinforced concrete: in accordance with CSA W186.

**END OF SECTION**

**Part 1            General**

**1.1                DESCRIPTION**

- .1        The work shall consist of seeding with a weed free native see mixture representative of the surrounding area approved by the Department Representative in all areas designated by the Department Representative.

**1.2                MEASUREMENT AND PAYMENT**

- .1        Measurement of the area seeded will be measured in hectares by the Department Representative.
- .2        Payment for seeding will be made the contract unit price per hectare as specified on the Bid Form. The contract unit price shall be full compensation for all associated work, including but not limited to supply of all material, equipment and labour required for spreading, handling and placing of the seed material specified in the contract documents.

**1.3                SUBMITTALS**

- .1        Submit product data in accordance with section 01 33 00 – Submittal Procedures.
- .2        Provide product data for:
  - .1        Seed
- .3        The grass seed mixture must be approved by the Department Representative 2 weeks prior to commencing seeding.

**1.4                SCHEDULING**

- .1        Seeding shall be completed within the following periods unless otherwise authorized by the Department Representative.
  - .1        Spring Seeding Period: by June 15<sup>th</sup>
  - .2        Fall Seeding Period: October 15<sup>th</sup> to Freeze up.

**Part 2            Products**

**2.1                MATERIAL**

- .1        Supply of Materials
  - .1        All materials for seeding shall be supplied by the Contractor.
  - .2        Seed shall be stored dry and protected from direct sunlight and other detrimental conditions. Materials that have been subjected to detrimental conditions, as determined by the Department Representative, will not be accepted for use on the project.

## 2.2 GRASS SEED

- .1 Grass seed mixture:
  - .1 20% Slender Wheatgrass (*Elymus trachycaulus*)
  - .2 34% Western Wheatgrass (*Pascopyrum Smithii*)
  - .3 34% Awned Wheatgrass (*Elymus trachycaulus ssp. subsecundus*)
  - .4 10% Green Needle grass (*Stipa viridula*)
  - .5 2% June Grass (*Koeleria macranthan*)
- .2 Seed mix supplied by the Contractor shall be weed free, tested and certified weed free. The seed shall be mixed and tested by a recognized seed house, and shall be clearly marked with the name of the supplier and the certified mixture composition
- .3 The seed shall be mixed by a conditioner and bulk storage facility approved by the Authority responsible for Canada Seeds Act & Regulations. All seed shall be tested by a Registered Seed Lab, and each bag shall be clearly marked with the name of the supplier and the mixture composition.
- .4 Prior to the use on the project, the Contractor shall provide the Department Representative with a Certificate of Analysis for each lot of seed supplied. Test results from the Certificate of Seed Analysis shall specify the germination, or for native seeds that are not a part of the seed tables the Tetrazolium, and purity for each seed species of the mix as well as the seed mix composition expressed as a percentage of each seed species by dry mass for each seed mix specified.

## Part 3 Execution

### 3.1 QUALITY OF WORK

- .1 Do not perform work under adverse field conditions as determined by Department Representative.
- .2 Remove and dispose of weeds; debris; stones 80 mm in diameter and larger; soil contaminated by oil, gasoline and other deleterious materials; in location as directed by Department Representative.

### 3.2 SEED BED PREPARATION

- .1 Topsoil placement and finish grading shall be completed to the satisfaction of the Department Representative prior to any surface preparation. All eroded areas shall be corrected prior to surface preparation, as determined by the Department Representative, using imported material. Areas to be seeded shall be finished to a smooth and uniform surface, which is loosened to a depth of not less than 25 mm at the time of seeding. Where necessary, the surface shall be scarified and the Contractor shall dispose of stones and other debris as determined by the Department Representative.
- .2 Seeding will not be permitted on hardened, crusted or rutted soil. Seeding must occur as soon as possible after disturbance to reduce establishment of non-native species.

**3.3 WEATHER CONDITIONS**

- .1 The Contractor shall not proceed with the work when, in the opinion of the Department Representative, weather conditions are unsuitable. The Department Representative will not allow work to proceed when wind conditions are such that material is being carried beyond the designated work areas or that the material is not being uniformly applied.

**3.4 SEED PLACEMENT**

- .1 Where mechanical seeding is not possible the Contractor shall at no direct cost to the Owner, manual seed areas.
- .2 For mechanical seeding:
  - .1 Mechanical landscape drill seeder ("Brillion" type or equivalent) which accurately places seed at specified depth and rate and rolls in single operation.
  - .2 Use equipment and method acceptable to Departmental Representative.
- .3 For manual seeding:
  - .1 Use manually operated drop seeder ("Cyclone" type or equivalent).
  - .2 Use equipment and method acceptable to Departmental Representative.
- .4 Sow half of required amount of seed in one direction and remainder at right angles as applicable.
- .5 Erosion control measures must be installed following seeding and maintained until vegetation establishes.

**END OF SECTION**

**Part 1 General**

**1.1 GENERAL REQUIREMENTS**

- .1 This contract shall include the following work:
  - .1 Design, fabrication, delivery, and installation of a 21.0 m long x 3.0 m wide (clear width) steel truss pedestrian bridge, complete with timber railing, bearings, anchor bolt assemblies, and miscellaneous items as identified in this specification and on the Contract Drawings.
  - .2 Contractor to coordinate site access, delivery, and installation with bridge manufacturer and Departmental Representative.

**1.2 MEASUREMENT PROCEDURES**

- .1 Payment for Design, fabrication, and delivery of a Steel Truss Bridge will be made at the lump sum price shown in the Tender Form. The lump sum price will be full compensation for design, fabrication, and delivery of the steel truss bridge and all labour, equipment, tools and incidental materials necessary to complete the work.
- .2 The lump sum price in the Tender Form shall include the design, fabrication, supply, and installation of all bearings, anchor bolt assemblies, and miscellaneous items as identified in this specification and on the Contract Drawings.

**1.3 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-G40.21, Structural Quality Steels.
  - .2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CAN/CSA-S6, Canadian Highway Bridge Design Code.
  - .4 CAN/CSA-S16.1, Limit States Design of Steel Structures.
  - .5 CSA W48 Series, Electrodes.
  - .6 CSAW59, Welded Steel Construction, (Metal Arc Welding).
- .2 National Building Code of Canada 2010
- .3 American Society for Testing and Materials (ASTM)
  - .1 ASTM A325M, Specification for Structural Bolts, Steel, Heat Treated 120/105ksi Minimum Tensile Strength.
  - .2 ASTM A490M, Specification for High-Strength Steel Bolts, Classes 10.9 and for Structural Steel Joints.

**1.4 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for all bridge components and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit fabrication drawings and design calculations, both of which shall be stamped and signed by Professional Engineer registered in the Province of Saskatchewan, Canada.
  - .2 Indicate where applicable following information:
    - .1 Layout of work.
    - .2 Sizes and details of all components.
    - .3 Anchorage details.
    - .4 Dimensional characteristics.
    - .5 Finishes.
    - .6 Structural data including live load, dead load, wind load and snow load maximums, dead load camber, and live load deflections.
  - .3 Shop drawing shall be submitted for review a minimum of 14 days prior to commencing fabrication.
  - .4 Two sets of fabrication drawings shall be submitted to the Departmental Representative for review. One set of drawings containing suggestions for revisions shall be returned to the Contractor. Review of the drawings does not relieve the Contractor of his responsibility for errors, omissions and accurate fabrication according to the drawings.
  - .5 General Contractor to submit for review and approval erection drawings showing method and sequence of erection work a minimum of 14 days prior to bridge delivery.

## **1.5 QUALITY ASSURANCE**

- .1 The fabricator shall have a quality management system in place to monitor the fabrication of the steel truss pedestrian bridge including inspection of welds. The fabricator shall submit to the Departmental Representative the quality management plan along with the bridge shop drawings for review and approval at least 14 days prior to starting fabrication of the bridge.
- .2 Quality control and Quality Assurance documentation shall be supplied to the Departmental Representative following the completion of Fabrication.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect prefabricated bridge from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.

## **1.7 WARRANTY**

- .1 For Work of this Section 34 77 13 - Passenger Loading Bridges, 12 months warranty period is extended to 24 months.
  - .1 The bridge manufacturer shall warrant their steel structure to be free of design, material and workmanship defects.
  - .2 This warranty shall not cover defects in the bridge caused by abuse, misuse, overloading, accident, improper maintenance, alteration or any other cause not the result of defective materials or workmanship.
  - .3 Repair or replacement shall be the exclusive remedy for defects under this warranty.

## **Part 2 Products**

### **2.1 DESIGN**

- .1 Design shall meet the requirements of CAN/CSA-S6-06 "Canadian Highway Bridge Design Code".
- .2 In addition to dead loads and stress due to movement, entire bridge to support:
  - .1 Live load of 4 kPa, uniform loading.
  - .2 Live load of 80 kN maintenance vehicle as per CAN/CSA-S6-06 Figure 3.4.
  - .3 Snow, rain, and wind loading as specified in CAN/CSA S6-06 and National Building Code of Canada 2010.
  - .4 Railing loads as per CAN/CSA S6-06.
  - .5 These loads may be applied in total, or in part, singularly or simultaneously, and design must allow for worst possible condition.
- .3 The Bridge design shall include camber for dead load as well as live load deflections at the Serviceability Limit State in accordance with CAN/CSA S6-06.
- .4 Any bridge field splices shall be constructed using ASTM A325 bolts and shall be designed by the bridge manufacturer.
- .5 The steel truss pedestrian bridge shall be a "U" or "H" style truss bridge.
- .6 The total horizontal length of the bridge deck shall be 21.0 metres.
- .7 The minimum clear inside width shall be 3.0 metres.
- .8 The total height of the bridge truss shall be a minimum of 1.37 metres.
- .9 The bridge deck surface shall consist of pressure treated timber planks.
- .10 Wooden architectural features shall be added as follows:
  - .1 Top chord wood cladding.
  - .2 38 x 140 Wooden rub rails.

- .11 Fabricator to supply minimum 150 mm x 3.2 mm Threshold plates to be fastened to either end of the bridge.
- .12 Fabricator is responsible for the design, supply, and fabrication of bearing assemblies. Design bearing assemblies in accordance with CAN/CSA-S6-06 “Canadian Highway Bridge Design Code”

## 2.2 MATERIALS

- .1 Structural steel shall conform to the requirements of CAN/CSA-G40.21-M.
- .2 All structural steel shall be Type A or Type AT atmospheric corrosion-resistant steel.
- .3 Welding electrodes to CSA W48 series.
- .4 Anchor rods: Minimum grade of anchor rods to be ASTM A307.
- .5 High strength Bolts, nuts, and washers: ASTM A325/A 325M or ASTM A490/ A 490M. Bolts to be Type 3 unless a corrosion-protection system is provided and approved by the Engineer.
- .6 Hot dip galvanizing: to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.

## Part 3 Execution

### 3.1 BRIDGE FABRICATION

- .1 The steel truss pedestrian bridge shall be fabricated at a plant certified by the Canadian Welding Bureau to the requirements of CSA Standard W47.1-09, Division 1 or 2, and shall be fabricated using procedures which provide quality consistent with the assumptions made in CAN/CSA-S6-06 “Canadian Highway Bridge Design Code”.
- .2 All welding shall conform to the requirements of CSA Standard W59.
- .3 All exposed ends of HSS members shall be capped and seal welded.
- .4 All bolt holes shall be fabricated by drilling full size or by sub-drilling and reaming. All holes shall be deburred to provide an acceptable faying surface.
- .5 High strength bolts installed in the Fabricator’s plant shall be tightened by turn-of-nut method. After installation, exposed surfaces of the bolts, nuts and washers shall be cleaned to remove traces of oil.
- .6 All bridge railing hardware shall be galvanized in accordance with the requirements of CSA Standard G164. Threads of galvanized nuts shall be tapped in accordance with the requirements of ASTM Specification A563.
- .7 Upon completion of fabrication, steel surfaces contaminated with oil or grease shall be cleaned with a solvent. All surfaces shall be blast cleaned to remove all foreign matter and mill scale expect for slight shadows, streaks or discolorations caused by rust stain or mill scale oxide binder.

### 3.2 QUALITY CONTROL DURING FABRICATION

- .1 Definitions:
  - .1 Quality Control: those activities that the Fabricator performs to conform to the contract requirements.
  - .2 Quality Assurance: those activities that the Departmental Representative performs to audit the Contractor's quality control program.
- .2 Implement a Quality Control Program to meet the contract requirements. Submit details of the Quality Control Plan to the Departmental Representative for review.
- .3 Quality Objectives:
  - .1 Completed products shall fully conform to the governing codes and specifications stipulated in the Contract Documents.
  - .2 The Quality Control Program to be fully integrated into the ongoing manufacturing activities of the Fabricator.
  - .3 The operations of the Quality Control Program shall protect the interests of the Owner with respect to scheduled delivery date and contracted price.
- .4 The Quality Policy ensures that the product meets the Quality requirements of the contract, is delivered on time and is produced in a cost effective manner. The Quality Control Program applies to all stages of the design, drafting, procurement, manufacturing and testing of the product.
- .5 Establish a Quality Organization with the responsibility for the successful and timely implementation of all necessary Quality Control activities.
- .6 Appoint a Quality Control Manager with defined responsibilities in resolving quality matters and who reports to a senior management level. Quality Control Manager to:
  - .1 Document the successful completion of each stage as it progresses through fabrication and erection.
  - .2 Document quality control review of all design submissions by the Fabricator including, but not limited to, geometry checks, drafting checks, engineering checks and concept reviews.
  - .3 Maintain records of all materials used in the completed product to ensure traceability.
  - .4 Identify and report nonconforming components.
  - .5 Initiate or recommend disposition of nonconforming components.
  - .6 Verify corrections.
- .7 Retain and pay for an independent qualified inspection company to complete in-plant fabrication inspection. The inspection company will:
  - .1 Verify that the correct materials are incorporated into the structure.
  - .2 Complete all non-destructive weld testing.
  - .3 Complete fabrication inspections to verify the geometry conforms to the drawings and specifications.

- .8 Upon completion of the fabrication, the inspection company shall provide a report summarizing the work completed included summaries of all inspection work completed.
- .9 The Departmental Representative, at their discretion, may complete independent quality assurance inspection(s). Provide suitable access to allow these inspection(s) to be completed included moving and supporting components as required. The Departmental Representative will attempt to schedule non-destructive testing so as not to interfere with the progress of the work. Cost of re-inspection after defects are repaired to be borne by the Contractor.
  - .1 The Departmental Representative 's quality assurance inspection(s) will not absolve the Contractor of its responsibility for the quality control of the Work nor for completing the Work in accordance with the requirements of the Contract.
- .10 Welding inspectors are to be qualified by the CWB to the requirements of CSA W178.2.
- .11 Perform, as a minimum, the following non-destructive testing of welds:
  - .1 Visual inspection of all welds.
  - .2 Radiographic or ultrasonic inspection of groove welds in flanges and webs of built-up girders, as follows:
    - .1 Flange splices in tension or stress reversal zones: 100%.
    - .2 Flange splices in compression zones: 25%.
  - .3 Web splices: 100% for one-half of the depth from the tension flange and 25% for the remainder of the web.
  - .3 Magnetic particle inspection of web-to-flange fillet welds, as follows:
    - .1 Submerged-arc welds: 25%.
    - .2 Semi-automatic welds: 50%.
    - .3 Manual welds: 100%.
  - .4 Magnetic particle inspection of fillet welds, as follows, for connection plates and stiffeners to which cross bracing or diaphragms are attached:
    - .1 For one-half of the depth from the tension flange: 100%.
    - .2 Transverse welds on tension flanges: 100%.
  - .5 Perform radiographic and ultrasonic testing before assembly of the flanges to the webs.
- .12 The acceptance standards for dynamically loaded structures specified in CSA W59 of Clause 12.5.4 are to apply to weld defects. Remove welds that do not meet the acceptance standards of this specification and re-weld and retest. Perform repairs and non-destructive testing of fracture-critical and primary-tension members in accordance with this specification.
- .13 Welded shear studs shall be tested in accordance with Appendix H of CSA W59.
- .14 In the fabricator's plant, the specification and grade of steel used for main components are to be identified by use of suitable markings or recognized colour coding. Cut pieces that are identified by piece mark and contract number need not continue to carry specification identification markings when it has been established that such pieces

conform to the required material specifications. Keep records to identify the heat number of the material and the corresponding mill test report for each component of a fracture-critical or primary tension member.

### **3.3 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: Contractor to comply with bridge manufacturer's written recommendation or specifications, including handling, storage and erection instructions.

### **3.4 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to installation of pedestrian bridge.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.5 INSTALLATION**

- .1 Ensure work of this Section is done under continuous supervision of qualified superintendent experienced and competent in work similar to work of this Section.

### **3.6 BEARINGS**

- .1 Bridge bearings shall be fabricated and installed as per Fabrication Drawings.

### **3.7 ANCHOR BOLTS**

- .1 The bridge manufacturer shall determine the number, diameter, embedment depth, minimum grade and finish of all anchor bolts. The anchor bolts shall be designed to resist all horizontal and uplift forces to be transferred by the superstructure to the supporting foundations.
- .2 Design of the abutments and piles shall be the responsibility of the Departmental Representative.
- .3 The Contractor shall coordinate the installation of the anchor bolts with precast concrete supplier and shall ensure the anchors are installed in accordance with the manufacturer's anchor bolt spacing dimensions.
- .4 Information as to bridge support reactions and anchor bolt locations will be supplied by the bridge manufacturer to the Departmental Representative at the time of shop drawing submittal.

**END OF SECTION**

**Part 1           General**

**1.1               MEASUREMENT AND PAYMENT**

- .1       No measurement will be made for Preservation of Water Courses and Wetlands. The requirements of this Specification shall be considered a subsidiary obligation of the Contractor under this Contract.

**1.2               ENVIRONMENTAL REQUIREMENTS**

- .1       Contractor to meet the requirements of all permits. See permits appended to these specifications.
- .2       Construction equipment shall be operated from the banks of the river only and shall remain outside of the wetted perimeter of the river. Operation of construction equipment in water is prohibited.
- .3       All construction equipment shall be equipped with spill kits.
- .4       Contractor to install silt fencing as necessary to control surface runoff into the river. Silt fencing must be installed along the banks of the river, within the work area.
- .5       Removing material from watercourse is prohibited.
- .6       If required, design and construct temporary crossings to minimize environmental impact to watercourse. Submit plans for any temporary crossing to the Departmental Representative for review in accordance with 01 33 00 - Submittals
- .7       Constructing temporary crossings of watercourses where spawning beds are indicated is prohibited.
- .8       Dumping excavated fill, waste material, or debris in watercourse or wetland is prohibited.
- .9       Underwater blasting is not permitted.

**Part 2           Products**

Not Used.

**Part 3           Execution**

**3.1               EXISTING CONDITIONS**

- .1       Maintain existing flow pattern in natural watercourse systems.
- .2       In natural systems maintain existing riffle pool and step pool patterns.
- .3       In wetland systems, maintain existing hydrological conditions.

### **3.2 SITE CLEARING AND PLANT PROTECTION**

- .1 Temporary Erosion and Sedimentation Control:
  - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Minimize disturbance to vegetated buffer zones and protect trees and plants on site and adjacent properties where indicated.
- .3 Wrap trees and shrubs adjacent to construction work, storage areas and trucking lanes in burlap.
- .4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .5 Cuttings from trees and other vegetation must be removed from site.
- .6 Remove only trees that may offer future blockage problems as instructed by Departmental Representative.
- .7 Leave roots mass and stumps in place.
- .8 Maintain temporary erosion and pollution control features installed under this contract.

### **3.3 DRAINAGE**

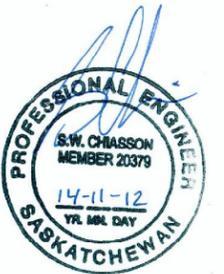
- .1 Pumping water containing suspended materials into watercourse is prohibited.
- .2 Establish rock chute spillways to accommodate safe surface water entry to watercourse as directed by Departmental Representative.

### **3.4 SITE RESTORATION**

- .1 Establish vegetated buffer zones with suitable vegetation to minimum 3 m along edge of watercourse banks as determined by Departmental Representative.
- .2 Plant vegetation natural to area, suitable for application without requirement for fertilizers, pesticides and other chemicals.
- .3 Control stream bank erosion in lower section of watercourse with irregular shaped rip rap underlain with non-toxic filter cloth of size determined by Departmental Representative.
- .4 Control stream bank erosion in upper section of watercourse by planting suitable vegetation.
- .5 Ensure erosion control measures are in place as soon as work in the watercourse is complete. Reseeding will take place in the spring as soon as the ground has thawed.

- .1 To reduce the spread of invasive species, all disturbed areas with bare soil must be re-seeded with a weed-free certified native seed mixture representative of the surrounding habitat as soon as possible after disturbance (spring in this case). Parks Canada can provide the specifications of the seed mixture composition.
- .2 Erosion control measures must be implemented and maintained on all re-seeded areas until vegetation re-establishes. Revegetation and erosion control plans must be approved by the Department Representative. Approved erosion control measures include but are not limited to, covering re-seeded areas with coconut matting until vegetation is established, and hydro seeding.

**END OF SECTION**



PROFESSIONAL SEALS

ASSOCIATION OF PROFESSIONAL ENGINEERS AND GEOSCIENTISTS OF SASKATCHEWAN  
CERTIFICATE OF AUTHORIZATION  
ASSOCIATED ENGINEERING (SASK.) LTD.  
NUMBER C116  
PERMISSION TO CONSULT HELD BY:  
DISCIPLINE: CIVIL  
SASK. REG. NO.: 14779  
SIGNATURE: S.W. Chiasson

DO NOT SCALE DRAWINGS

NO.	ISSUED FOR REVISION	DATE

Client/client  
Public Works and Government Services Canada

Project title/Titre du projet  
**WASKESIU RIVER PEDESTRIAN BRIDGE**

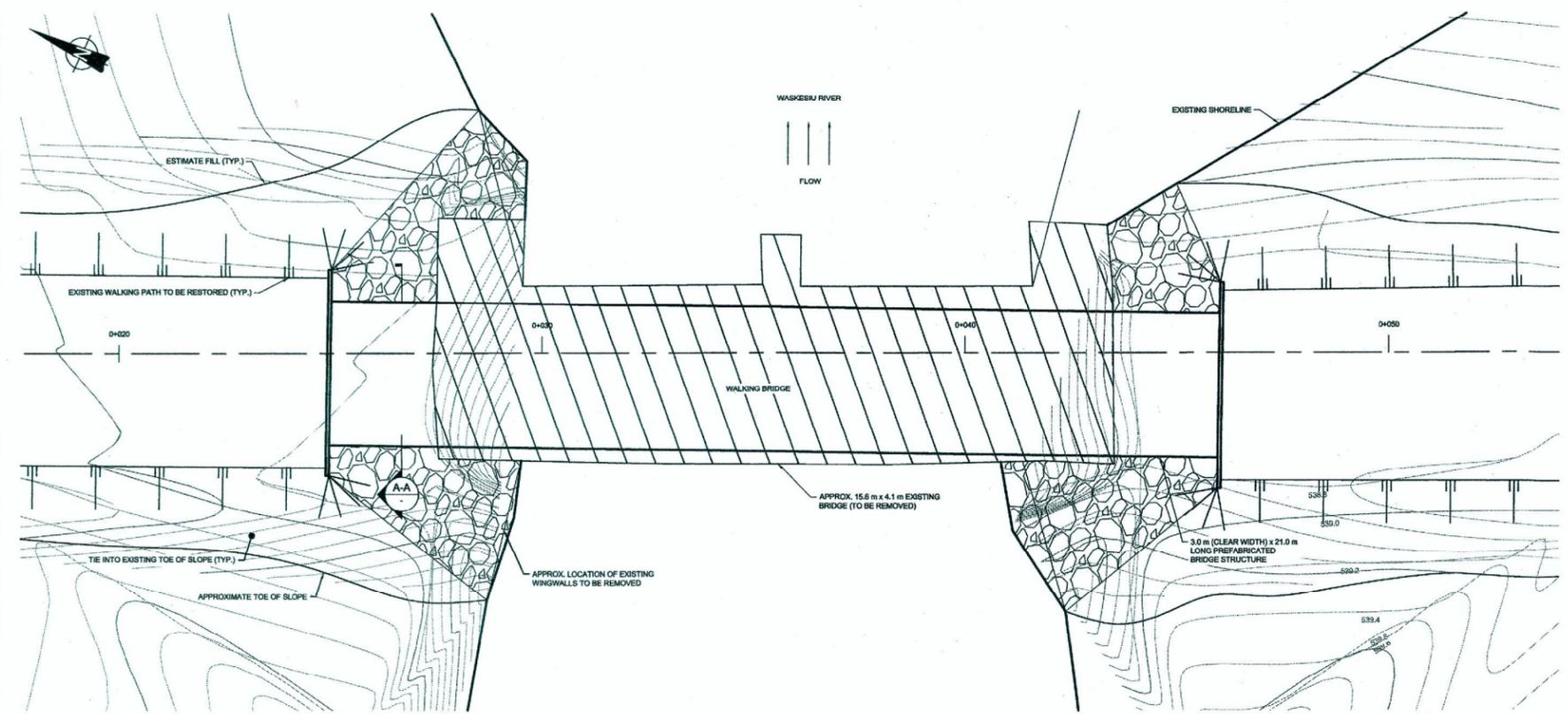
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Geoff Baran  
Designed by/Concept par  
Stephen Chiasson  
Drawn by/Dessiné par  
Stephanie Reid  
PWSC Project Manager/Administrateur de Projets TPSC  
Mark Van Boek  
PWSC, Professional and Engineering Resources Manager/  
Resources Architecturales et de Directeur d'Ingénierie, TPSC

Client/client  
Public Works and Government Services Canada  
Drawing title/Titre du dessin  
**Pedestrian Bridge General Arrangement**

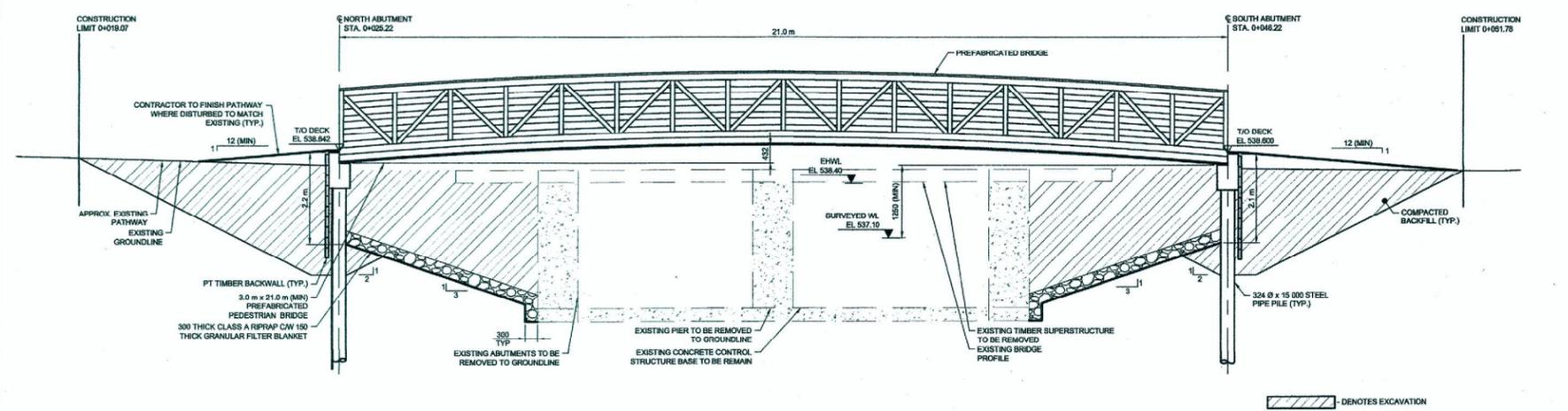
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Revision no./  
No. de Révision  
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1 OF 3

GENERAL NOTES:

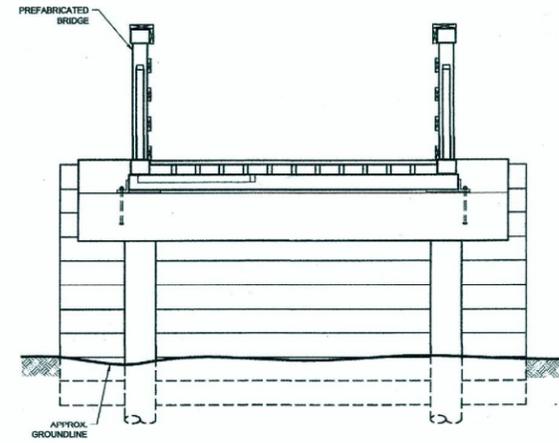
- A. GENERAL
- FOUNDATION DESIGN BASED UPON THE GEOTECHNICAL INVESTIGATION REPORT PREPARED BY P.MACHIBRODA ENGINEERING LTD. FILE NO. 513-0641 DATED DECEMBER 11, 2014.
  - EHWL IS ASSUMED BASED ON PREVIOUS PARK EXPERIENCE WITH PAST FLOOD EVENTS. SURVEYED WATER LEVEL RECORDED ON MARCH 18, 2014.
  - BRIDGE DESIGN TO CAN/CSA 96-08 "CANADIAN HIGHWAY BRIDGE DESIGN CODE".
  - BRIDGE DESIGN SHALL BEAR THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN THE PROVINCE OF SASKATCHEWAN.
  - ARCH IN BRIDGE STRUCTURE SHOWN IS BASED ON FINAL BRIDGE PROFILE. THIS IS IN ADDITION TO DESIGN CAMBER DUE TO DEAD LOADS.
  - DEAD LOAD
  - MATERIAL SELF WEIGHT
  - LIVE LOAD
    - 4 kPa UNIFORM LIVE LOAD
    - 1.8 kPa GROUND SNOW LOAD (PRINCE ALBERT, SK)
    - 80 kN MAINTENANCE VEHICLE (SEE CAN/CSA 96-08 FIGURE 3.4)
      - DESIGN WIND PRESSURE (BASED ON DATA FROM PRINCE ALBERT, SK):
        - 7.4.1. On: 260 Pa
        - 7.4.2. On: 285 Pa
      - DESIGN TEMPERATURE RANGE:
        - 7.5.1. MAXIMUM DAILY TEMPERATURE: 25°C
        - 7.5.2. MINIMUM DAILY TEMPERATURE: -43°C
  - CONTRACTOR TO PLACE GRANULAR BACKFILL BEHIND BOTH ABUTMENTS AS SHOWN ON DRAWING S-03.
  - ALL DIMENSIONS GIVEN IN METRES. ALL ELEVATIONS GIVEN IN MILLIMETRES UNLESS NOTED OTHERWISE.
- B. COORDINATION
- CONTRACTOR IS RESPONSIBLE FOR ALL SURVEYING REQUIRED TO LAY OUT AND CHECK THE WORK. ELEVATIONS ARE NOT GEODETIC. TAKE TOP OF NORTH ABUTMENT (I.E. CORNER) ELEVATION = 537.32 m.
  - PIER AND ABUTMENT WALLS TO BE REMOVED TO GROUNDLINE.
  - CONTRACTOR IS RESPONSIBLE FOR ALL DEWATERING AND TEMPORARY WORKS REQUIRED TO MAINTAIN A DRY EXCAVATION DURING CONSTRUCTION AND SHALL BEAR ALL COSTS ASSOCIATED WITH THIS WORK. CONSIDERATION SHOULD BE GIVEN TO MAINTAINING THE EXISTING CONTROL STRUCTURE DURING THE EXCAVATION AND CONSTRUCTION OF BRIDGE ABUTMENTS AND PLACEMENT OF GRANULAR FILTER BLANKET AND RRPPAP.
  - CONTRACTOR RESPONSIBLE FOR COORDINATION OF ANCHOR ROD LOCATIONS BETWEEN PRECAST CONCRETE SUPPLIER AND PREFABRICATED BRIDGE SUPPLIER.
  - CONTRACTOR RESPONSIBLE FOR ADEQUATE SUPPORT OF PREFABRICATED BRIDGE STRUCTURE DURING ERECTION. ERECT BRIDGE AS PER THE REQUIREMENTS OF THE DESIGN.
  - ALL CONSTRUCTION TO BE COMPLETED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
  - EXISTING PATH TO BE CLOSED TO PEDESTRIAN TRAFFIC FOR DURATION OF CONSTRUCTION.
- C. PILES
- 324 O.D. PIPE PILES SHALL CONFORM TO THE REQUIREMENTS OF ASTM SPECIFICATION A252, GRADE 2 OR BETTER.
  - THE TOP 6.0 m OF PILE SHALL BE HOT-DIP GALVANIZED.
  - PILES SHALL BE DRIVEN OPEN ENDED. PILES TO BE EQUIPPED WITH FULLY WELDED DRIVING SHOES.
  - ALL WELDING TO BE COMPLETED IN ACCORDANCE WITH CSA W59.
  - FIELD WELDING TO BE COMPLETED BY COMPANY CERTIFIED TO CSA W47.1, DIVISION 1 OR 2.
  - PILE DESIGN BASED ON CRITERIA OUTLINED IN P.MACHIBRODA ENGINEERING LTD. REPORT NO. 513884.
    - 0 m - 3 m = 0 kPa
    - 3 m - 4 m = 25 kPa
    - 4 m - 7 m = 125 kPa
    - 7 m - 12 m = 75 kPa
    - > 12 m = 100 kPa
  - ULTIMATE END BEARING PRESSURES
    - 8 m - 12 m = 1000 kPa
    - > 12 m = 3000 kPa
- D. CONCRETE
- REINFORCING STEEL TO CONFORM TO CSA-G30.18 GRADE 400.
  - CONCRETE TO CONFORM TO CSA-A23.1, EXPOSURE CLASS C1, F<sub>o</sub> = 35 MPa @ 28 DAYS.
  - PRECAST CONCRETE TO CONFORM TO CSA-A23.4 BY A CSA CERTIFIED PLANT.
- E. STEEL
- STEEL FOR PREFABRICATED BRIDGE STRUCTURE TO BE IN ACCORDANCE WITH CAN/CSA G40.21M GRADE 350 AT, CATEGORY 3.
  - ANY SPLICE CONNECTIONS IN THE PREFABRICATED BRIDGE STRUCTURE SHALL BE DESIGNED AND DETAILED BY THE PREFABRICATED BRIDGE DESIGNER.
  - FABRICATION SHALL BE IN ACCORDANCE WITH CAN/CSA 96-06.
  - ALL WELDING SHALL CONFORM TO CSA W59.
  - PERFORM NON-DESTRUCTIVE TESTING AS REQUIRED BY THE SPECIFICATIONS.
- F. TIMBER
- TIMBER BACKING PLANKS SHALL BE SELECT STRUCTURAL GRADE DOUGLAS FIR. TIMBER SHALL BE TREATED IN ACCORDANCE WITH THE REQUIREMENTS OF CSA STANDARD 080.
  - MACHINE BOLTS TO BE SUPPLIED WITH A HEX HEAD AND 150 mm OF THREAD.
  - MACHINE BOLTS TO BE INSTALLED WITH 2.0x10x90 PLATE WASHERS AND 1 NUT. PLATE WASHERS TO BE GRADE 300W AND SHALL BE HOT DIP GALVANIZED.
  - ALL CUT EDGES AND FIELD DRILLED HOLES IN TREATED TIMBER SHALL BE GIVEN AN APPLICATION OF OSMD-CRED OR EQUIVALENT.



PLAN VIEW  
1:50



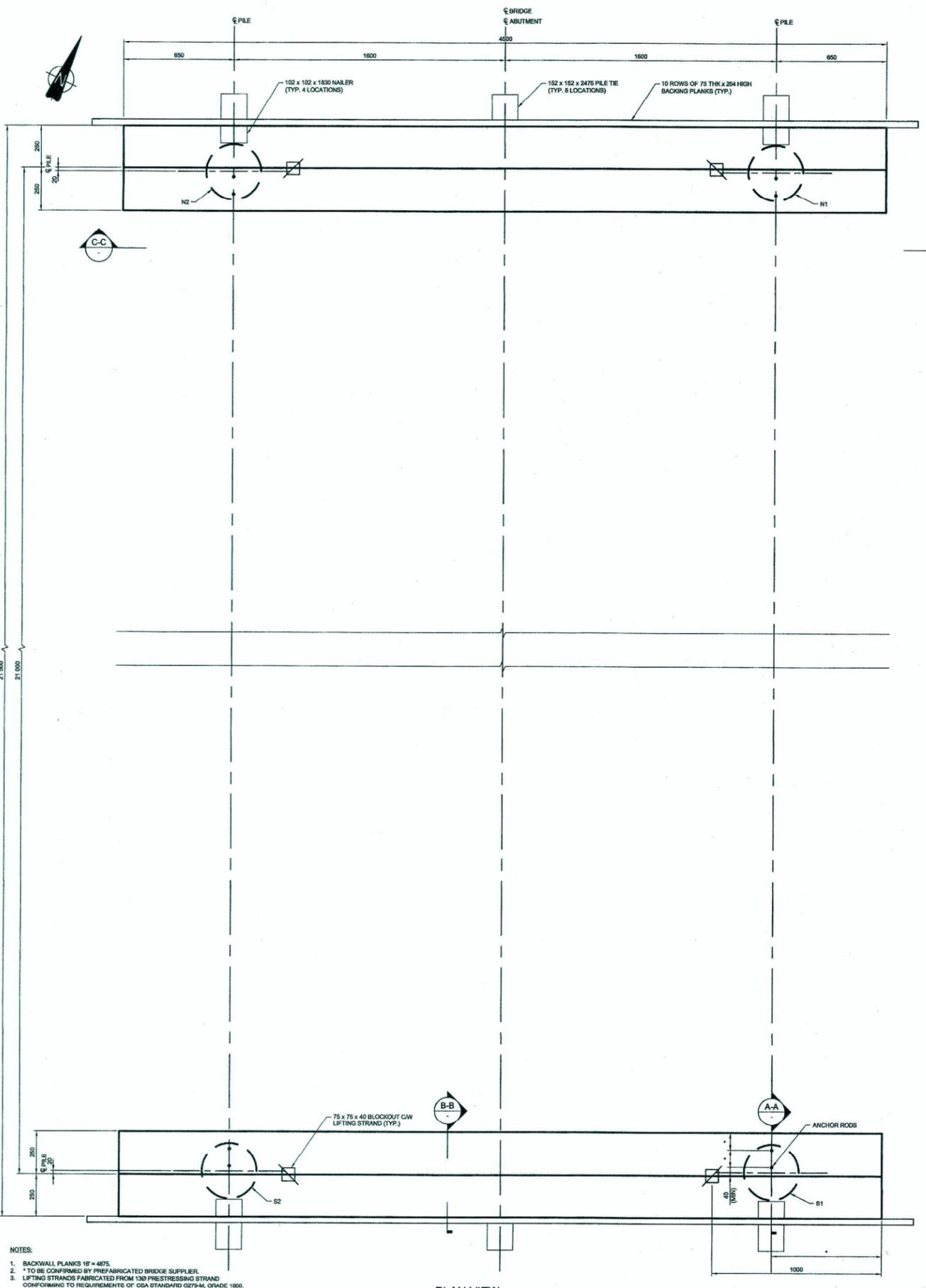
ELEVATION VIEW  
1:50



ABUTMENT VIEW A-A  
1:50

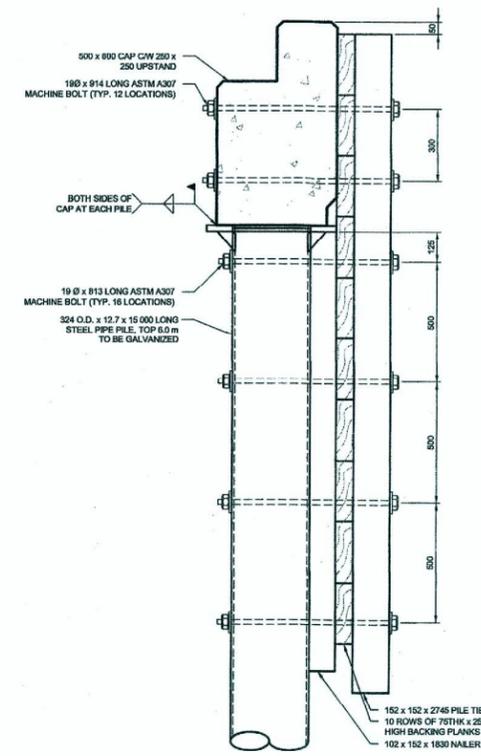
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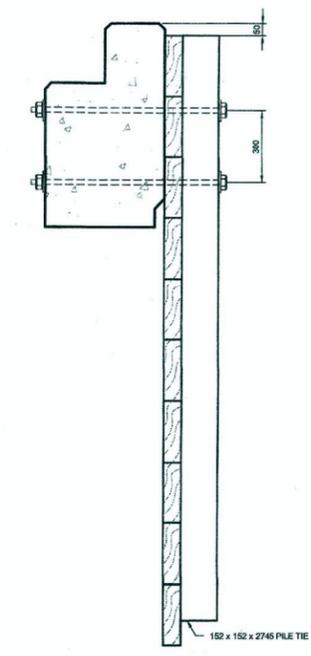


PILE LOCATIONS		
PILE MK	NORTHING	EASTING
N1	5 979 983.488	429 882.388
N2	5 979 982.161	429 882.485
S1	5 980 002.802	429 998.709
S2	5 980 001.278	429 883.783

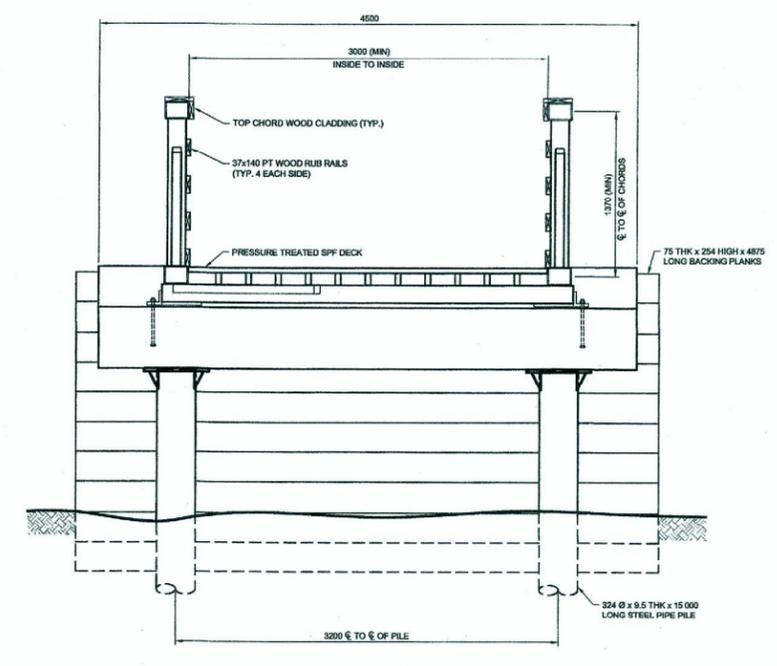
- NOTES:
- PILE POSITIONS ARE GIVEN IN ASSOCIATED ENGINEERING (AE) LOCAL COORDINATE SYSTEM.
  - COORDINATE CONTROL POINTS WITH ASSOCIATED ENGINEERING (AE).



SECTION A-A  
1:10



SECTION B-B  
1:10



SECTION C-C  
1:20

- NOTES:
- BACKWALL PLANKS 15' x 4875.
  - \* TO BE CONFIRMED BY PREFABRICATED BRIDGE SUPPLIER.
  - LIFTING STRANDS FABRICATED FROM 130 PRESTRESSING STRAND CONFORMING TO REQUIREMENTS OF CSA STANDARD C307-04. SPACING 1000. EACH LIFTING STRAND SHALL CONSIST OF TWO 130 STRANDS EMBEDDED A MINIMUM OF 1200 BELOW TOP REINFORCING STEEL WITH A 100 LAP.

PLAN VIEW  
1:10



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ASSOCIATED ENGINEERING (SASK.) LTD.  
NUMBER C116  
PERMISSION TO CONSULT HELD BY:  
DISCIPLINE: CIVIL ENGINEERING  
S.W. Chasson 14/11/12

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ISSUED FOR TENDER	DATE	
	2014/1/12	
REVISION / MODIFICATION	DESCRIPTION / DESCRIPTION	DATE / DATE

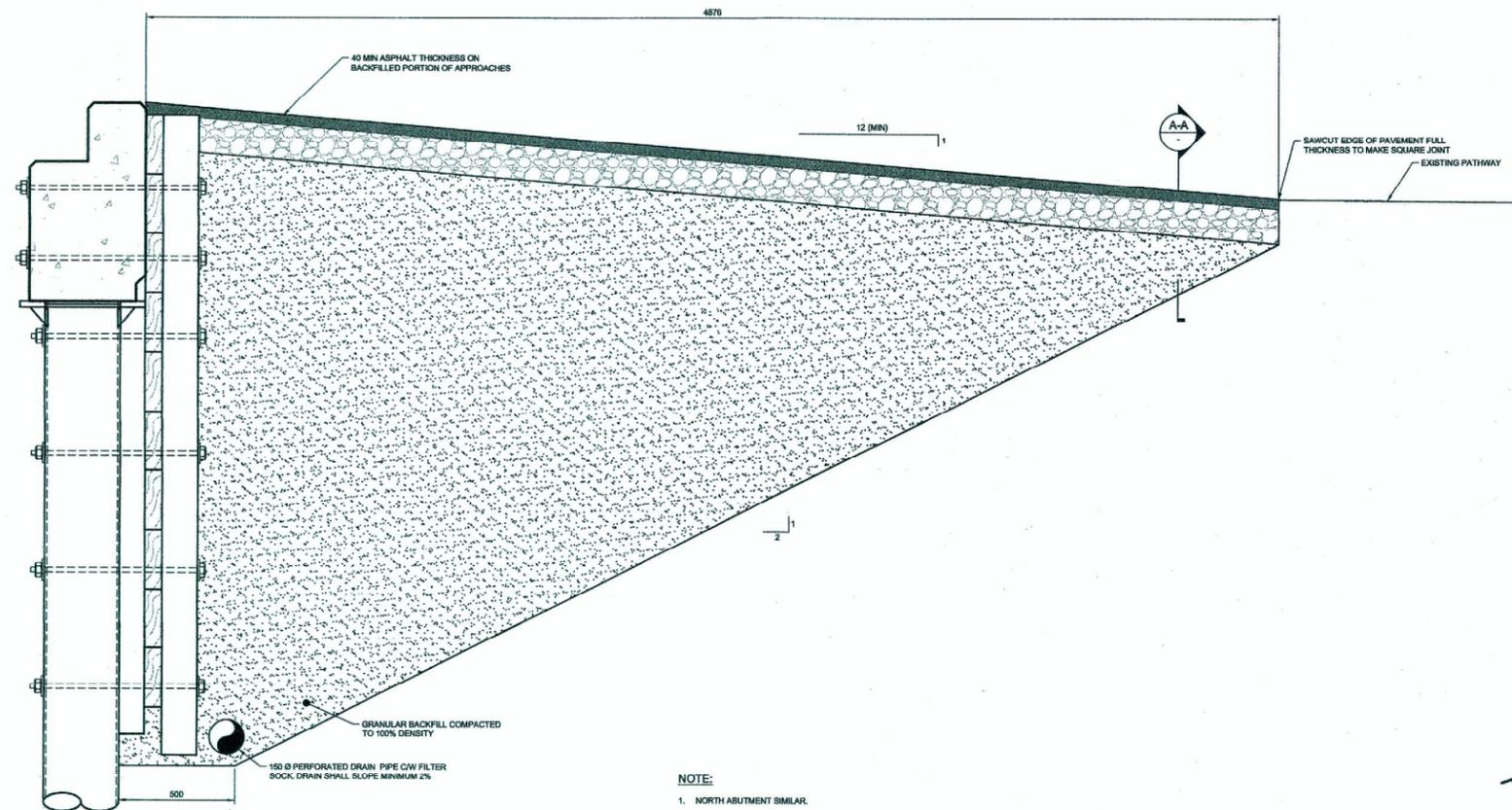
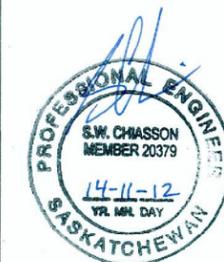
Client/Client: Public Works and Government Services Canada

Project/Projet: WASKESIU RIVER PEDESTRIAN BRIDGE

Approved by/Approve par: Geoff Sarason  
Designed by/Concept par: Stephan Chasson  
Drawn by/Dessiné par: Stephanie Reid  
PWSC: Project Manager/Administrateur de Projets TPSGC  
Mark Van Steek  
PWSC: Architectural and Engineering Resources Manager/ Ressources Architecturales et de Directeur d'ingénierie, TPSGC

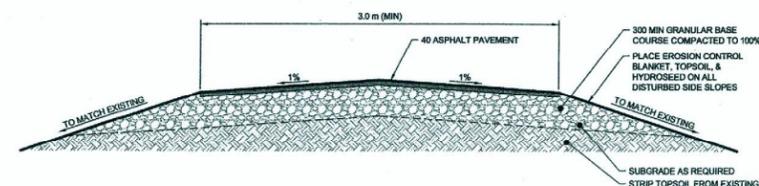
Client/Client: Public Works and Government Services Canada

Drawing Title/Titre du dessin: Pedestrian Bridge Details

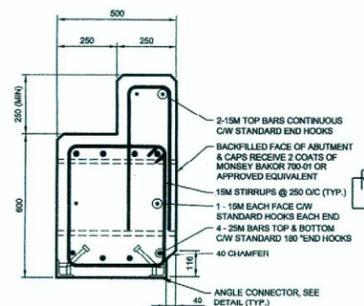


NOTE:  
1. NORTH ABUTMENT SIMILAR.

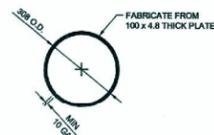
DETAIL  
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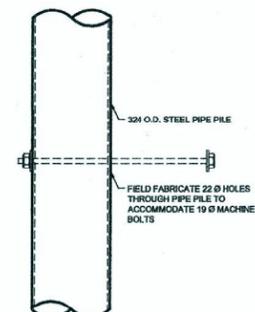
DETAIL A-A  
1:20



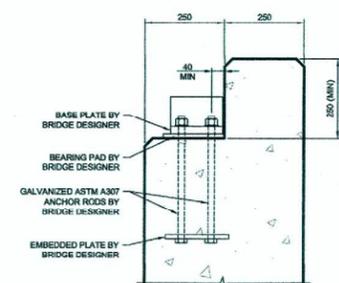
DETAIL  
1:10



SPLICE COLLAR  
DETAIL  
1:10

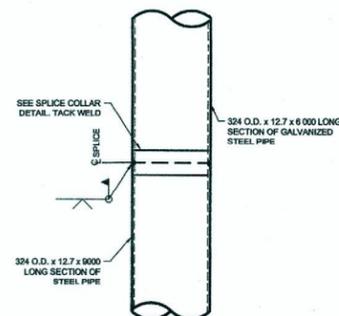


DETAIL  
1:10

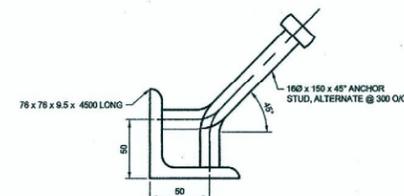


NOTES:  
1. REBAR NOT SHOWN FOR CLARITY.  
2. CONTRACTOR TO COORDINATE LOCATION OF ANCHOR RODS WITH BRIDGE AND PRECAST SUPPLIER.  
3. POST INSTALLED ANCHORS WILL BE CONSIDERED IF DESIGNED AND DETAILED BY BRIDGE DESIGNER.

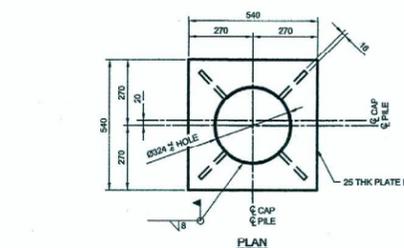
DETAIL  
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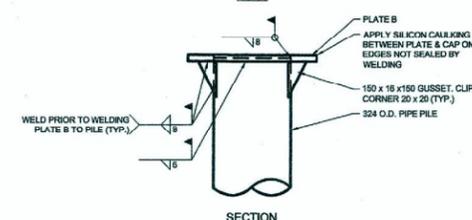
DETAIL  
1:10



DETAIL  
1:2



FLAN



SECTION

NOTE:  
1. PILE CUTOFF SHALL BE 10 BELOW TOP OF PLATE B.

DETAIL  
1:10

PROFESSIONAL SEALS

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DISCIPLINE: *Structural* SASK. REG. NO.: *147199* SIGNATURE: *[Signature]*

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REV.	ISSUED FOR TENDER	DATE
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2	DESCRIPTION	DATE
3	DESCRIPTION	DATE
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8	DESCRIPTION	DATE
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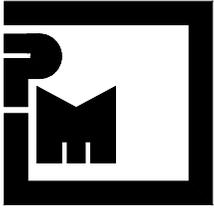
Public Works and Government Services Canada

WASKESIU RIVER PEDESTRIAN BRIDGE

Approved by/Approved par: *Ouelt Savadok*  
Designed by/Concept par: *Stephen Chasson*  
Drawn by/Dessiné par: *Stephanie Reid*  
Mark Van Bask: *Project Manager/Administrateur de Projets TPSCC*  
Mark Van Bask: *Project Manager/Administrateur de Projets TPSCC*

Client/Client: Public Works and Government Services Canada

Pedestrian Bridge Details



**P. MACHIBRODA  
ENGINEERING  
LTD.**

CONSULTING  
GEOTECHNICAL  
GEOENVIRONMENTAL  
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GEOSCIENTISTS

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Companies/Canada

December 11, 2013

Associated Engineering (Sask.) Ltd.  
131 – 1061 Central Avenue  
Prince Albert, Saskatchewan  
S6V 4V4

**ATTENTION: Mr. Patrick Murphy, P.Eng., Project Engineer**

**RE: GEOTECHNICAL INVESTIGATION  
ROADWAY IMPROVEMENT PROJECT  
PRINCE ALBERT NATIONAL PARK  
NEAR PRINCE ALBERT, SASKATCHEWAN  
PMEL FILE NO. S13-8641**

**Introduction**

The following letter report has been prepared on the basis of the results of test drilling and soil sampling conducted at the above-referenced site. The purpose of the investigation was to provide the soil profile and calculated CBR values at select locations along the existing roadways (selected by the client) within the Prince Albert National Park, and, to provide design recommendations for pile foundation design for the proposed Pedestrian Bridge reconstruction project.

Authorization to proceed with this investigation was provided on October 30, 2013. The Terms of Reference for this investigation were presented in P. Machibroda Engineering Ltd. (PMEL) Proposal No. 1004-8272, dated October 23, 2013.

The field test drilling and soil sampling were conducted on November 20, 2013.

**Field Investigation**

Nine (9) test holes, located as shown on the Site Plan, Drawing No. S13-8641-1, were dry drilled using our truck-mounted, continuous flight solid stem auger drill rig. The test holes were 150 mm in diameter and extended to depths of 1.5 to 13.5 metres below the existing ground surface. Test hole logs were compiled during test drilling to record the soil stratification, the groundwater conditions, the position of unstable sloughing soils and the depths at which cobblestones and/or boulders were encountered.

Disturbed samples of auger cuttings were collected during test drilling and sealed in plastic bags to minimize moisture loss. The collected soil samples were taken to our laboratory for analysis.

### **Field Drill Logs**

The field drill logs recorded during test drilling have been shown plotted on Drawing Nos. S13-8641-2 to 10, inclusive.

The location at each test hole was estimated using hand held GPS equipment. The test holes are located approximately as shown on the Site Plan, Drawing No. S13-8641-1.

Groundwater seepage, sloughing conditions, cobblestones and boulders were encountered during test drilling. The depths at which the above-mentioned conditions were encountered have been shown on Drawing Nos. S13-8641-2 to 10, inclusive.

### **Soil Profile**

#### **Pedestrian Bridge (Test Hole Nos. 13-1 and 13-2)**

The general soil profile at the site of the Pedestrian Bridge consisted of approximately 2.7 metres of organic topsoil, granular fill and/or clay fill overlying about 300 mm of soft, spongy organics (peat) followed by a thin layer of soft clay (extending to a depth of about 3.3 to 3.9 metres) then dense, saturated sand/gravel (extending to a depth of about 7.4 to 8.6 metres). The sand/gravel was underlain by glacial till, which extended to a depth of at least 13.5 metres (i.e., the maximum depth explored with our Test Holes at this site). Cobblestones and boulders were encountered during test drilling within the sand, gravel and glacial till soils.

Groundwater seepage and sloughing conditions were encountered during test drilling. Based on the depths at which groundwater seepage was encountered, the groundwater table is anticipated to be situated approximately 2.9 to 3.2 metres below grade. Higher groundwater levels should be expected during and/or following spring snowmelt and/or periods of precipitation.

#### **Work Area 6 (Test Hole No. 13-3)**

The general soil profile at Work Area 6 consisted of about 30 mm of asphalt concrete overlying about 320 mm of granular fill followed by silt fill (extending to a depth of about 1.4 metres) then sand and silt, which extended to a depth of at least 3 metres (i.e., the maximum depth explored with our Test Holes at Work Area 6).

Groundwater seepage and sloughing conditions were encountered during test drilling. Based on the depths at which groundwater seepage was encountered, the groundwater table is anticipated to be situated approximately 1.9 metres below grade. Higher groundwater levels should be expected during and/or following spring snowmelt and/or periods of precipitation.

### Cookson Road (Test Hole Nos. 13-4 to 13-6, inclusive)

The general soil profile at Cookson Road consisted of about 50 mm of granular fill overlying glacial till, silt fill and/or silt, which extended to a depth of at least 1.5 metres (i.e., the maximum depth explored with our Test Holes on Cookson Road).

The Test Holes remained dry and open during and immediately following test drilling. Higher groundwater levels should be expected during and/or following spring snowmelt and/or periods of precipitation.

### Work Area 5 (Test Hole No. 13-7)

The general soil profile at Work Area 5 consisted of about 40 mm of asphalt concrete overlying about 260 mm of granular fill followed by gravel (extending to a depth of about 2.7 metres) then soft clay, which extended to a depth of at least 3 metres (i.e., the maximum depth explored with our Test Holes at Work Area 5).

Groundwater seepage and sloughing conditions were encountered within the gravel during test drilling. Based on the depths at which groundwater seepage was encountered, the groundwater table is anticipated to be situated approximately 1.6 metres below grade. Higher groundwater levels should be expected during and/or following spring snowmelt and/or periods of precipitation.

### Lennox Creek (Test Hole Nos. 13-8 and 13-9)

The general soil profile at Lennox Creek consisted of about 2.3 to 2.5 metres of granular, silt or clay fill overlying peat (extending to a depth of about 3.1 to 3.5 metres) followed by silt and/or sand, which extended to a depth of at least 4.5 metres (i.e., the maximum depth explored with our Test Holes at Lennox Creek).

Groundwater seepage and sloughing conditions were encountered within the gravel during test drilling. Based on the results of the test drilling, the groundwater table is anticipated to be situated approximately 0.6 to 1.7 metres below grade. Higher groundwater levels should be expected during and/or following spring snowmelt and/or periods of precipitation.

### Laboratory Analysis

The soil classification and index tests performed during this investigation consisted of a visual classification of the soil, water contents, Atterberg limits and grain size distribution analysis.

The results of soil classification and index tests conducted on representative samples of soil recovered from this site have been plotted on the field drill logs alongside the corresponding depths at which the samples were recovered as shown on Drawing Nos. S13-8641-2 to 10, inclusive.

The results of the grain size distribution analyses have been presented on Drawing Nos. S13-8641-11 to 13, inclusive.

A summary of the results of the soil index testing has been presented in Table I. The soil index test results were utilized to calculate the Group Index value for the soil tested and an estimated soaked CBR value was derived using the Saskatchewan Highways Surfacing Design Manual (see Appendix B for correlation curve for determining Group Index converted CBR values).

**TABLE I. CALCULATED CBR VALUES**

Test Hole	Depth (mm)	Percent Passing No. 200 Sieve	Atterberg Limits		Group Index	CBR
			Liquid Limit	Plasticity Index		
13-3	600	54.3	23	9	3.9	10
13-4	600	63.3	26	15	7.7	6.5
13-5	600	70.2	-	NP	7.0	7
13-6	600	85.1	23	7	8.0	6
13-7	600	8.3	-	NP	-	-
13-8	600	12.9	-	NP	-	-
13-9	600	48.1	-	NP	2.6	11

NP – Non-Plastic

It should be noted that soils containing large quantities of silt typically result in calculated CBR values that are much higher than recommended. Soils containing large quantities of silt will become soft/weak during spring thaw and if saturated. Therefore, we would recommend a CBR of 3 be utilized for subgrade soils containing a large amount of silt (i.e., Test Hole Nos. 13-3, 13-4, 13-5, 13-6 and 13-9).

The recommended CBR value for 13-7 and 13-8 would be in the order of 20 and 15, respectively.

### **Design Considerations**

It is understood that the existing Pedestrian Bridge will be replaced and will be supported on a pile foundation system. The existing Pedestrian Bridge foundation reportedly consists of treated, timber piles.

Based on the soil conditions encountered at the Pedestrian Bridge site (i.e., abundance of cobblestones, boulders, dense soil conditions, groundwater seepage and sloughing conditions), driven, steel H-piles are the recommended foundation support system at this site. Other pile types were considered (i.e., drilled, cast-in-place concrete piles; driven, timber piles; helical screw piles; and driven, open-end steel pipe piles), but were not recommended due to the above-mentioned site conditions.

Construction difficulties should be anticipated during the installation of driven, steel H-piles. Some piles may terminate shallow on cobblestones, boulders and/or the dense sand/gravel soils.

Recommendations have been prepared for driven, steel H-Piles; factor of safety/resistance factor; and, lateral thrust and tension forces.

### Driven, Steel H-Piles

Driven, steel H-piles piles may be designed on the basis of skin friction and end bearing capacity. The ultimate skin friction and end bearing pressures for driven, steel H-piles are as follows:

**TABLE II. SKIN FRICTION BEARING PRESSURES (DRIVEN, H- PILES)**

Zone (metres)	Ultimate Skin Friction Bearing Pressure (kPa)*
0 to 3	0
3 to 4	25
4 to 7	125
7 to 12	75
Below 12	100

**TABLE III. END BEARING PRESSURE (DRIVEN, H-PILES)**

Zone (metres)	*Ultimate End Bearing Pressure (kPa)
8 to 12	1,000
Below 12	3,000

\*Based on pile achieving termination criteria presented in Table IV.

Piles should not be subject to additional driving if the following termination criteria has been met. Pile termination may occur for piles driven into the dense sand/gravel or hard glacial till soils. The actual termination depth will vary at each pile location.

**TABLE IV. TERMINATION CRITERIA (DRIVEN H-PILES)**

Nominal Pile Size	*Rated Energy per Drop Hammer Blow (kilojoules)**	Termination Criteria (Hammer Blows for 25 mm Penetration)
HP 200 x 53 kg/m	25	6
HP 250 x 62 kg/m	30	6
HP 310 x 79 kg/m	40	8
HP 360 x 132 kg/m	40	8

\* Maximum driving energy 600 kJ/cm<sup>2</sup> of end steel area

\*\* Note: 1 foot-pound-force = 1.356 Joules

### Notes:

1. The skin friction capacity of driven, steel H-piles may be calculated on the basis of the projected perimeter surface area ( $A_s$ ) of the pile shaft where  $b$  = width,  $d$  = depth and  $A_s = 2b + 2d$ . End bearing capacity may be determined assuming a fully plugged condition and the projected perimeter x-sectional area ( $A_b$ ) of the pile toe (i.e.,  $A_b = b \times d$ ).

2. To minimize the potential for frost jacking, driven, steel H-piles should have a minimum embedment length of 8 metres. If piles terminate shallow of the minimum embedment, or design, length, the pile installation details should be reviewed by the Geotechnical Consultant.
3. For drop hammers, a minimum drop hammer mass of twice the mass of the pile, but not exceeding five times the mass of the pile and helmet, is recommended.
4. Piles should be equipped with drive shoes.
5. Pre-boring is recommended through frozen soil, and, where the pile being driven is located within 9 pile diameters of underground utilities. A pre-bore diameter equal to the pile diagonal plus 50 mm should be used through the depth of frost penetration. Where steel H-pile locations have been pre-bored and the piles will be subject to lateral load, the annulus between the pile and the pre-bored hole must be filled with lean mix concrete.
6. The installation of each pile and the elevation monitoring of each pile within nine pile diameters which could be affected by the installation of adjacent piles should be documented during construction by a representative of the Geotechnical Consultant. Each pile should be inspected for damage as a result of the driving operations.

#### Factor of Safety/Resistance Factor

When using traditional Working (allowable) Stress Design (WSD) to design the foundations, an appropriate Factor of Safety must be applied to the ultimate bearing pressures presented in this report. PMEL typically recommends a Factor of Safety of 2.5 for compressive loading and 3.5 to 4 for tensile loading. The actual Factor of Safety should be based on the governing design requirements/codes.

As with WSD, an appropriate reduction must be applied to the ultimate bearing pressures (otherwise known as Ultimate Limit State, ULS) when designing the foundations on the basis of Limit States Design (LSD). This is accomplished in the form of using resistance factors ( $\Phi$ ). As per the National Building Code of Canada - NBCC (2010), the following resistance factors are considered appropriate for the design of:

- Deep foundations:
  - Compressive Resistance,  $\Phi = 0.4$
  - Uplift Resistance,  $\Phi = 0.3$

For both WSD and LSD, a settlement analysis of the foundation must also be evaluated to ensure the structure is not negatively impacted by excessive settlement at the design load. This is also known as Serviceability Limit States (SLS) when designing on the basis of LSD.

Provided the foundation is designed using the appropriate factors of safety or resistance factors presented above, the amount of settlement of a deep foundation at the design load will be small and within tolerable limits (typically less than 10 mm). Hence, settlement typically does not govern in the majority of cases of deep foundation design.

In contrast, the lateral capacity of a deep foundation is typically governed by allowable displacement (SLS) at the design load and not ultimate capacity (ULS). The lateral pile deflection can be determined using the concepts presented in Lateral Thrust and Tension Forces.

### Lateral Thrust and Tension Forces

For driven, steel H-piles, the vertical tensile capacity may be calculated on the basis of the skin friction capacity values presented in Table II (using the appropriate factors provided in the preceding Factor of Safety/Resistance Factor section).

If the piles, designed to support the axial compressive loads, are inadequate to support the lateral thrust loads, the allowable lateral thrust capacity of the piles can be increased by inclining the piles, increasing the pile diameter or installing a group of piles.

Pile deflection typically governs the design of laterally loaded piles. Subgrade reaction theory may be utilized to estimate lateral pile deflection. The estimated coefficients of horizontal subgrade reaction of the subgrade soils have been presented in Table V.

**TABLE V. ESTIMATED COEFFICIENTS OF HORIZONTAL SUBGRADE REACTION**

<b>Zone (metres)</b>	<b>Coefficient of Horizontal Subgrade Reaction, <math>K_s</math> (kN/m<sup>3</sup>)</b>
0 to 1.5D	0
1.5D to 4	3,000/D
4 to 7	11,000z/D
7 to 12	10,000/D
Below 12	30,000/D

Where D = pile diameter/diagonal and z = depth below grade in metres.

If a more detailed lateral analysis is deemed warranted, PMEL can model the interaction between the soil and the pile, in accordance with the *p-y* method. Specific pile details (i.e., loading, type, diameter, length, etc.) would be required in order to perform the analysis.

### Foundation Concrete

Water-soluble sulphate salts (gypsum crystals) exist in the geologic deposits in this region. Sulphate resistant cement should be used for all concrete in contact with the subgrade soil. All concrete at this site should be manufactured in accordance with current CSA standards. It should be recognized that water soluble sulphate salts combined with moist soil conditions or low pH soils, could render the soil highly corrosive to some types of metal water lines, elbows, connectors, etc., in contact with the soil.

## **Closure**

The presentation of the summary of the field drill logs and foundation design recommendations has been completed as authorized. Nine, 150 mm diameter test holes were dry drilled using our continuous flight auger drill rig. Field drill logs were compiled for the Test Holes during test drilling which, we believe, were representative of the subsurface conditions at the Test Hole locations at the time of test drilling.

Variations in the subsurface conditions from that shown on the drill logs at locations other than the exact Test Hole locations should be anticipated. If conditions should differ from those reported here, then we should be notified immediately in order that we may examine the conditions in the field and reassess our recommendations in the light of any new findings.

No detectable evidence (i.e., odor or visual) of environmentally sensitive materials was detected during the actual time of the field test drilling program. If, on the basis of any knowledge, other than that formally communicated to us, there is reason to suspect that environmentally sensitive materials may exist, then additional test holes should be drilled and samples recovered for chemical analysis.

The subsurface investigation necessitated the drilling of deep test holes. The test holes were backfilled at the completion of test drilling. Please be advised that some settlement of the backfill materials will occur which may leave a depression or an open hole. It is the responsibility of the client to inspect the site and backfill, as required, to ensure that the ground surface at each Test Hole location is maintained level with the existing grade.

This report has been prepared for the exclusive use of Associated Engineering (Sask.) Ltd. and their agents for specific application to the proposed Roadway Improvements to be constructed at the locations specified by the client within Prince Albert National Park located near Prince Albert, Saskatchewan. It has been prepared in accordance with generally accepted geotechnical engineering practices and no other warranty, express or implied, is made.

Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such Third Party. Governing Agencies such as municipal, provincial or federal agencies having jurisdiction with respect to this development and/or construction of the facilities described herein have full jurisdiction with respect to the described development. Any other unspecified subsequent development would be considered Third Party and would, therefore require prior review by PMEL. PMEL accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

The acceptance of responsibility for the design/construction recommendations presented in this report is contingent on adequate and/or full time inspection (as required, based on site conditions at the time of construction) by a representative of the Geotechnical Consultant. PMEL will not accept any responsibility on this project for any unsatisfactory performance if adequate and/or full time inspection is not performed by a representative of PMEL.

If this report has been transmitted electronically, it has been digitally signed and secured with personal passwords to lock the document. Due to the possibility of digital modification, only originally signed reports and those reports sent directly by PMEL can be relied upon without fault.

We trust that this letter report meets your requirements for this project. Please call if additional information is required.

**P. MACHIBRODA ENGINEERING LTD.**



Association of Professional Engineers & Geoscientists of Saskatchewan		
<b>CERTIFICATE OF AUTHORIZATION</b>		
P. MACHIBRODA ENGINEERING LTD.		
Number 172		
Permission to Consult held by:		
Discipline	Sk. Reg. No.	Signature
Geotechnical	4955	<i>T. Werbovetski</i>
		13-12-11

*Jennifer Krasowski*  
Jennifer Krasowski, P.Eng.

*T. Werbovetski*  
Terry Werbovetski, P. Eng.  
JK/TW/lw

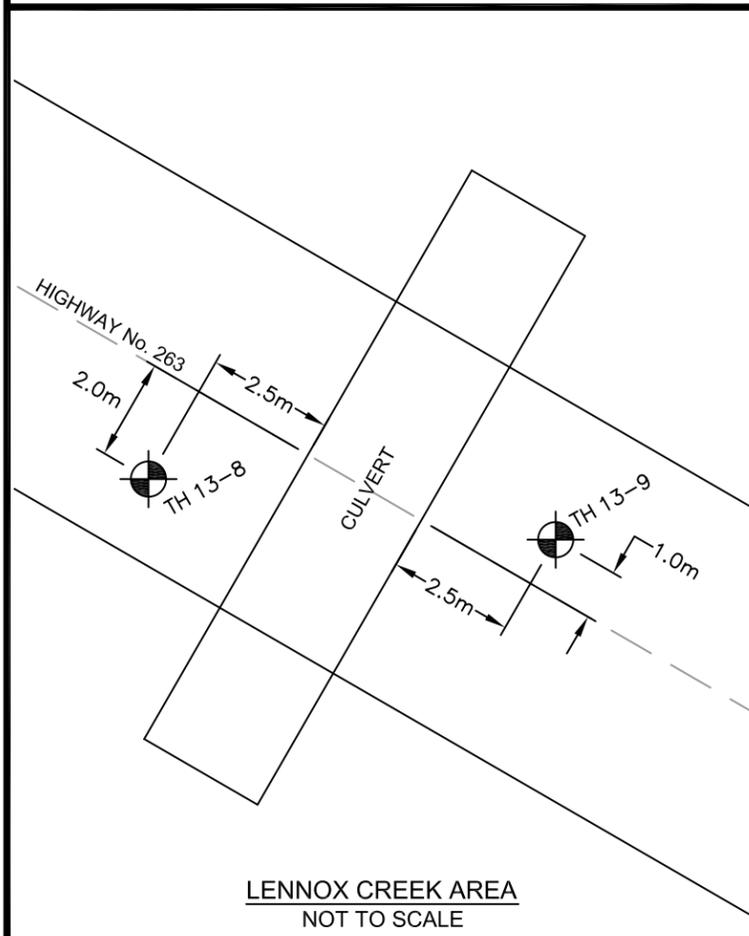
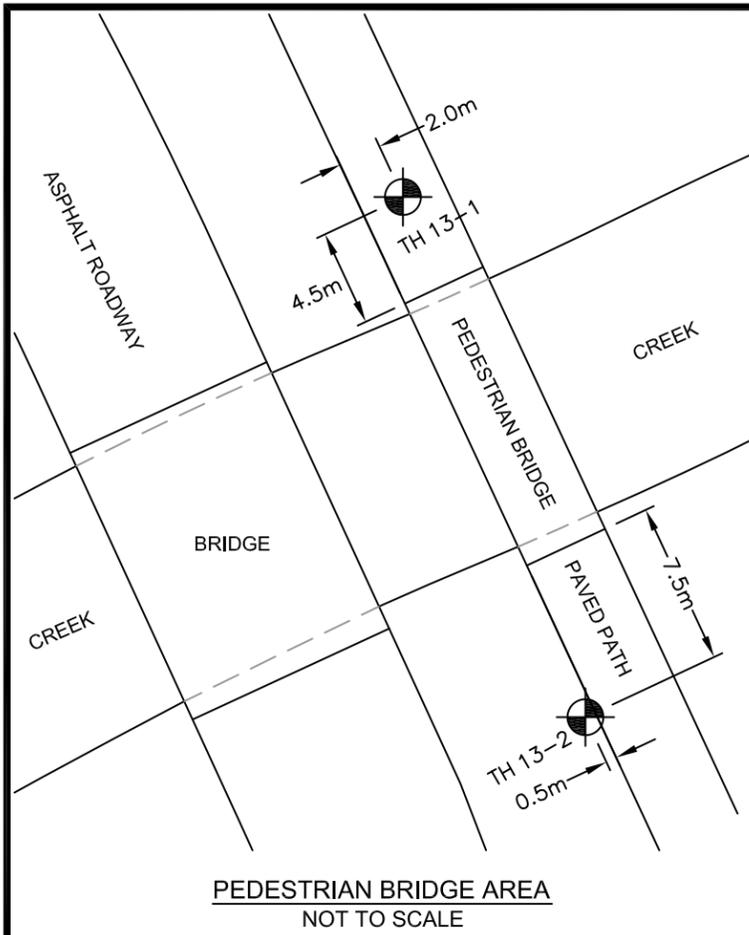
Enclosures:

- Appendix A – Explanation of Terms on Test Hole Logs
- Appendix B - Correlation Curve for Determining Group Index Converted CBR Values
- Drawing No. S13-8641-1, Site Plan – Test Hole Locations
- Drawing Nos. S13-8641-2 to 10 (inclusive), Field Drill Logs and Soil Test Results
- Drawing Nos. S13-8641-11 to 13 (inclusive), Grain Size Distribution Analysis



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ENGINEERS

**DRAWINGS**



NOTE:  
1. THIS DRAWING IS FOR CONCEPTUAL PURPOSES ONLY. ACTUAL LOCATIONS MAY VARY AND NOT ALL STRUCTURES ARE SHOWN.  
2. THIS DRAWING WAS COMPILED FROM GOOGLE EARTH ©2013, IMAGE ©2013 DIGITALGLOBE.

**LEGEND**

 - PMEL TEST HOLE

**P. MACHIBRODA ENGINEERING LTD.**

 CONSULTING  
GEOENVIRONMENTAL  
GEOTECHNICAL  
ENGINEERS  
806 - 48th STREET EAST  
SASKATOON, SK  
S7K 3Y4

DRAWING TITLE:  
**SITE PLAN - TEST HOLE LOCATIONS**

PROJECT:  
**ROADWAY IMPROVEMENT PROJECT  
PRINCE ALBERT NATIONAL PARK,  
PRINCE ALBERT, SK**

APPROVED BY: <b>JK</b>	DRAWN BY: <b>BH</b>
---------------------------	------------------------

DATE: DECEMBER, 2013	DRAWING NUMBER: <b>S13-8641-1</b>
SCALE: NOT TO SCALE	

**TEST HOLE 13-1**

DEPTH  
(m)

DEPTH (m)	N	U	$\gamma_w$	Pw	Lw	w
0						
0.2		PP				6.2
0.4						4.2
1.0						10.1
2.0	22					11.0
3.0						92.7
3.2	3.0 m I.A.D.					
3.4	7					18.8
5.0	80					12.3
6.0						13.9
7.0						8.6
9.0	<0.5		11	22	14.1	
10.0						13.0
10.6	0.75					
11.0						12.4
11.5	1.75					

**FILL**, sand, silty, some clay, trace gravel, compact, well graded, fine to coarse grained, moist, brown.  
 -P200 = 31.3% at 300 mm.  
 -SO<sub>4</sub> <0.01% at 300 mm.  
 -some silt, trace clay 400 to 800 mm.  
 -moist to wet, grey below 1.5 m.

**PEAT**, organic, soft, dark brown, spongy.

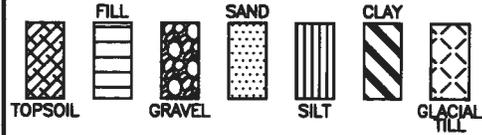
**CLAY**, silty, soft, medium plastic, moist to wet, grey.  
 -sand and gravel lense, wet, seepage, sloughing at 3.2 m.

**GRAVEL AND SAND**, some silt, very dense, well graded, fine to coarse grained, wet, grey, seepage, sloughing, cobbles/boulders.

**GLACIAL TILL**, clay, silty, sandy, some gravel, soft, low plastic, moist to wet, grey.  
 -firm below 9.5 m.  
 -stiff below 10.6 m.  
 -cobbles/boulders to 12.0 m.

**N.W. SIDE OF PEDESTRIAN BRIDGE**

**LEGEND:**



- w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)
- Lw...LIQUID LIMIT
- Pw...PLASTIC LIMIT
- $\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)
- U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)
- pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)
- N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])
- SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)
- P200...% PASSING No. 200 SIEVE
- I.A.D.....IMMEDIATELY AFTER DRILLING
- ▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)
- ▼...RECORDED WATER LEVEL (PIEZO)
- SHELBY TUBE
- ⊗ SPLIT SPOON
- ◻ CUTTINGS

**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

**P. MACHIBRODA ENGINEERING LTD.**

**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:** ROADWAY IMPROVEMENT PROJECT

**LOCATION:** PRINCE ALBERT NATIONAL PARK PRINCE ALBERT, SK

**NORTHING:** 5980002 **EASTING:** 429685

**DATE DRILLED:** NOV 20/13

**DRAWING NUMBER:** S13-8641-2

CONTINUED ON NEXT PAGE

**TEST HOLE 13-1**

DEPTH  
(m)

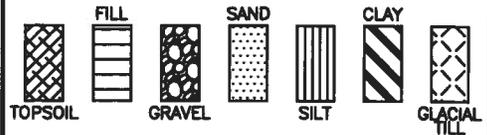
DEPTH (m)	N	U	$\gamma_w$	Pw	Lw	w
12		pp				
13				12	25	11.8
14		4.0				
15						
16						
17						
18						
19						
20						
21						
22						
23						

**GLACIAL TILL**, clay, silty, sandy, some gravel, stiff, low plastic, moist to wet, grey.  
-very stiff to hard below 12.1 m.  
-sand lense, wet, seepage, sloughing at 12.8 m.

NOTE:  
1. Test Hole sloughed to 3.5 m I.A.D.

**N.W. SIDE OF PEDESTRIAN BRIDGE**

**LEGEND:**



w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

$\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

∇...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

∇...RECORDED WATER LEVEL (PIEZO)



**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA ENGINEERING LTD.**

**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:**  
ROADWAY IMPROVEMENT PROJECT

**LOCATION:**  
PRINCE ALBERT NATIONAL PARK  
PRINCE ALBERT, SK

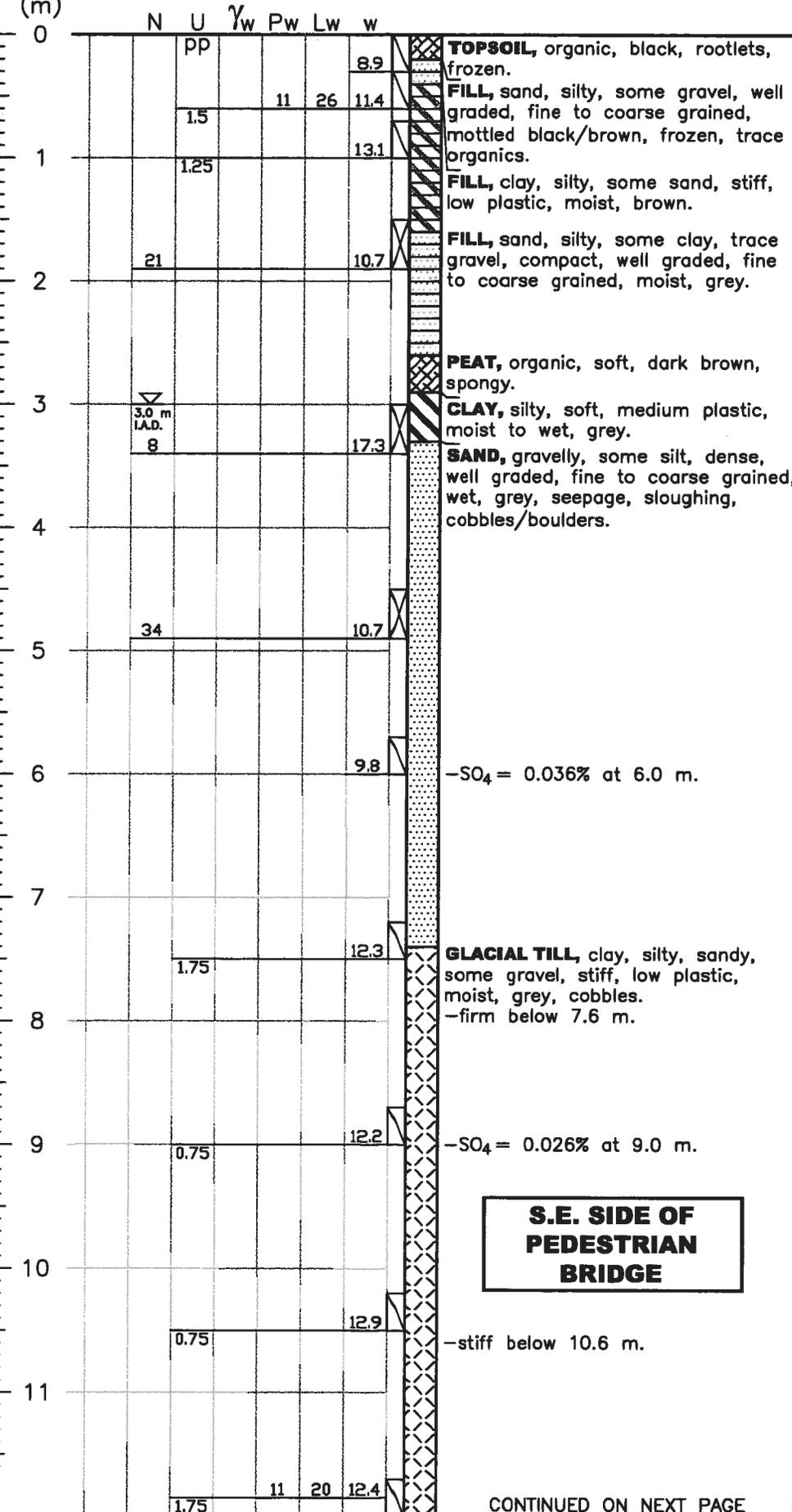
**NORTHING:** 5980002 **EASTING:** 429685

**DATE DRILLED:**  
NOV 20/13

**DRAWING NUMBER:**  
S13-8641-2A

**TEST HOLE 13-2**

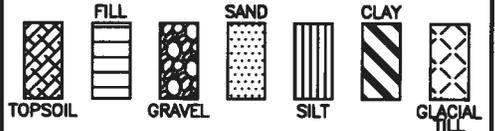
DEPTH  
(m)



**S.E. SIDE OF PEDESTRIAN BRIDGE**

CONTINUED ON NEXT PAGE

**LEGEND:**



- w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)
- Lw...LIQUID LIMIT
- Pw...PLASTIC LIMIT
- $\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)
- U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)
- pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)
- N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])
- SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)
- P200...% PASSING No. 200 SIEVE
- I.A.D.....IMMEDIATELY AFTER DRILLING
- ▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)
- ▼...RECORDED WATER LEVEL (PIEZO)
- SHELBY TUBE
- ⊗ SPLIT SPOON
- ◻ CUTTINGS

**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



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**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:** ROADWAY IMPROVEMENT PROJECT

**LOCATION:** PRINCE ALBERT NATIONAL PARK PRINCE ALBERT, SK

**NORTHING:** 5979971 **EASTING:** 429697

**DATE DRILLED:** NOV 20/13

**DRAWING NUMBER:** S13-8641-3

**TEST HOLE 13-2**

DEPTH  
(m)

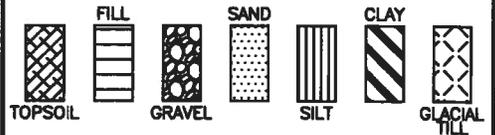
DEPTH (m)	N	U	$\gamma_w$	P <sub>w</sub>	L <sub>w</sub>	w
12		pp				
13						11.0
14			3.75			
15						
16						
17						
18						
19						
20						
21						
22						
23						

**GLACIAL TILL**, clay, silty, sandy, some gravel, stiff, low plastic, moist, grey, cobbles. -very stiff below 12.1 m.

NOTE:  
1. Test Hole sloughed to 3.6 m I.A.D.

**S.E. SIDE OF PEDESTRIAN BRIDGE**

**LEGEND:**



- w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)
- L<sub>w</sub>...LIQUID LIMIT
- P<sub>w</sub>...PLASTIC LIMIT
- $\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)
- U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)
- pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)
- N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])
- SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)
- P200...% PASSING No. 200 SIEVE
- I.A.D.....IMMEDIATELY AFTER DRILLING
- ∇...RECORDED WATER LEVEL (TEST HOLE I.A.D.)
- ▼...RECORDED WATER LEVEL (PIEZO)



**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA ENGINEERING LTD.**

**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:** ROADWAY IMPROVEMENT PROJECT

**LOCATION:** PRINCE ALBERT NATIONAL PARK PRINCE ALBERT, SK

**NORTHING:** 5979971 **EASTING:** 429697

**DATE DRILLED:** NOV 20/13

**DRAWING NUMBER:** S13-8641-3A

DEPTH  
(m)

**TEST HOLE 13-3**

DEPTH (m)	N	U	$\gamma_w$	Pw	Lw	w
0						
0.84						
1.151				14	23	
1.118						
2.141						
3.135						
2.6						
4						
5						
6						
7						
8						
9						
10						
11						

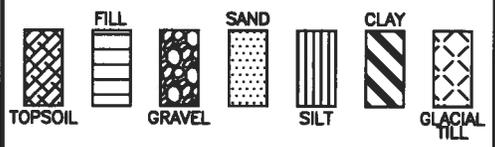
2.6 m  
I.A.D.

**ASPHALT CONCRETE** (30 mm).  
**FILL**, sand, some gravel, some silt, some clay, well graded, fine to coarse grained, brown, frozen.  
**FILL**, silt and sand, some clay, low plastic, moist, grey, organics.  
 -P200 = 54.3% at 600 mm.  
 -frozen to 700 mm.  
 -firm below 700 mm.  
**SAND AND SILT**, compact, well graded, fine to coarse grained, moist, brown.  
 -wet, seepage, sloughing below 1.9 m.

NOTE:  
 1. Test Hole sloughed to 2.6 m I.A.D.

**WORK AREA 6**

**LEGEND:**



- w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)
- Lw...LIQUID LIMIT
- Pw...PLASTIC LIMIT
- $\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)
- U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)
- pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)
- N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])
- SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)
- P200...% PASSING No. 200 SIEVE
- I.A.D.....IMMEDIATELY AFTER DRILLING
- ∇...RECORDED WATER LEVEL (TEST HOLE I.A.D.)
- ▼...RECORDED WATER LEVEL (PIEZO)
- SHELBY TUBE
- ⊠ SPLIT SPOON
- CUTTINGS

**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA  
ENGINEERING  
LTD.**

**FIELD DRILL LOG  
AND  
SOIL TEST RESULTS**

**PROJECT:**  
 ROADWAY  
 IMPROVEMENT PROJECT

**LOCATION:**  
 PRINCE ALBERT NATIONAL PARK  
 PRINCE ALBERT, SK

**NORTHING:** 5958264 **EASTING:** 431151

**DATE DRILLED:**  
 NOV 20/13

**DRAWING NUMBER:**  
 S13-8641-4

DEPTH  
(m)

**TEST HOLE 13-4**

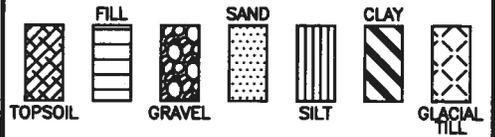
DEPTH (m)	N	U	$\gamma_w$	Pw	Lw	w
0		PP				
9.6						
8.5	11	26				
8.6						
8.9						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

**FILL**, gravel, sandy, some silt, well graded, fine to coarse grained, brown, frozen.  
**GLACIAL TILL**, silt, sandy, some clay, some gravel, low plastic, moist, brown, gypsum crystals.  
 -frozen to 400 mm.  
 -very stiff below 400 mm.  
 -P200 = 63.3% at 600 mm.

**NOTE:**  
 1. Test Hole open to 1.5 m and dry I.A.D.

**COOKSON EAST**

**LEGEND:**



w.....WATER CONTENT  
(PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

$\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)



**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA ENGINEERING LTD.**

**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:**

ROADWAY IMPROVEMENT PROJECT

**LOCATION:**

PRINCE ALBERT NATIONAL PARK  
 PRINCE ALBERT, SK

**NORTHING:** 5939005 **EASTING:** 417135

**DATE DRILLED:**  
 NOV 20/13

**DRAWING NUMBER:**  
 S13-8641-5

DEPTH  
(m)

**TEST HOLE 13-5**

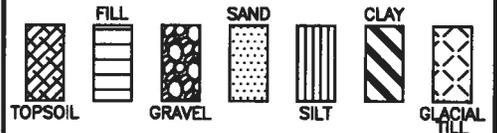
DEPTH (m)	N	U	$\gamma_w$	Pw	Lw	w
0		PP				
12.6						
12.9			NON PLASTIC			
5.7						
6.5						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

**FILL**, gravel, sandy, some silt, well graded, fine to coarse grained, brown, frozen.  
**FILL**, silt, some sand, some clay, low plastic, moist, brown, frozen.  
**SILT**, sandy, soft, low plastic, moist, brown.  
 -black, trace organics at 600 mm.  
 -P200 = 70.2% at 600 mm.

**NOTE:**  
 1. Test Hole open to 1.5 m and dry I.A.D.

**COOKSON MIDDLE**

**LEGEND:**



w.....WATER CONTENT  
 (PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

$\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)

U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)

N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])

SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

∇...RECORDED WATER LEVEL (TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)



**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA ENGINEERING LTD.**

**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:**

ROADWAY IMPROVEMENT PROJECT

**LOCATION:**

PRINCE ALBERT NATIONAL PARK  
 PRINCE ALBERT, SK

**NORTHING:** 5938774 **EASTING:** 415664

**DATE DRILLED:**  
 NOV 20/13

**DRAWING NUMBER:**  
 S13-8641-6

DEPTH  
(m)

**TEST HOLE 13-6**

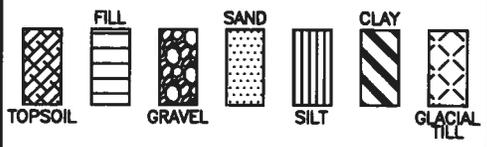
DEPTH (m)	N	U	$\gamma_w$	Pw	Lw	w
0		pp				
0.185						
0.16				23		12.1
0.90						
1.16.1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

**FILL**, gravel, sandy, some silt, well graded, fine to coarse grained, brown, frozen.  
**SILT**, some sand, trace clay, low plastic, moist, brown.  
 -frozen to 500 mm.  
 -soft to firm below 500 mm.  
 -P200 = 85.1% at 600 mm.

NOTE:  
 1. Test Hole open to 1.5 m and dry I.A.D.

**COOKSON WEST**

**LEGEND:**



- w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)
- Lw...LIQUID LIMIT
- Pw...PLASTIC LIMIT
- $\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)
- U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)
- pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)
- N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])
- SO<sub>4</sub>.....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)
- P200...% PASSING No. 200 SIEVE
- I.A.D.....IMMEDIATELY AFTER DRILLING
- ▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)
- ▼...RECORDED WATER LEVEL (PIEZO)
- SHELBY TUBE
- ⊗ SPLIT SPOON
- ◻ CUTTINGS

**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA ENGINEERING LTD.**

**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:**  
 ROADWAY IMPROVEMENT PROJECT

**LOCATION:**  
 PRINCE ALBERT NATIONAL PARK  
 PRINCE ALBERT, SK

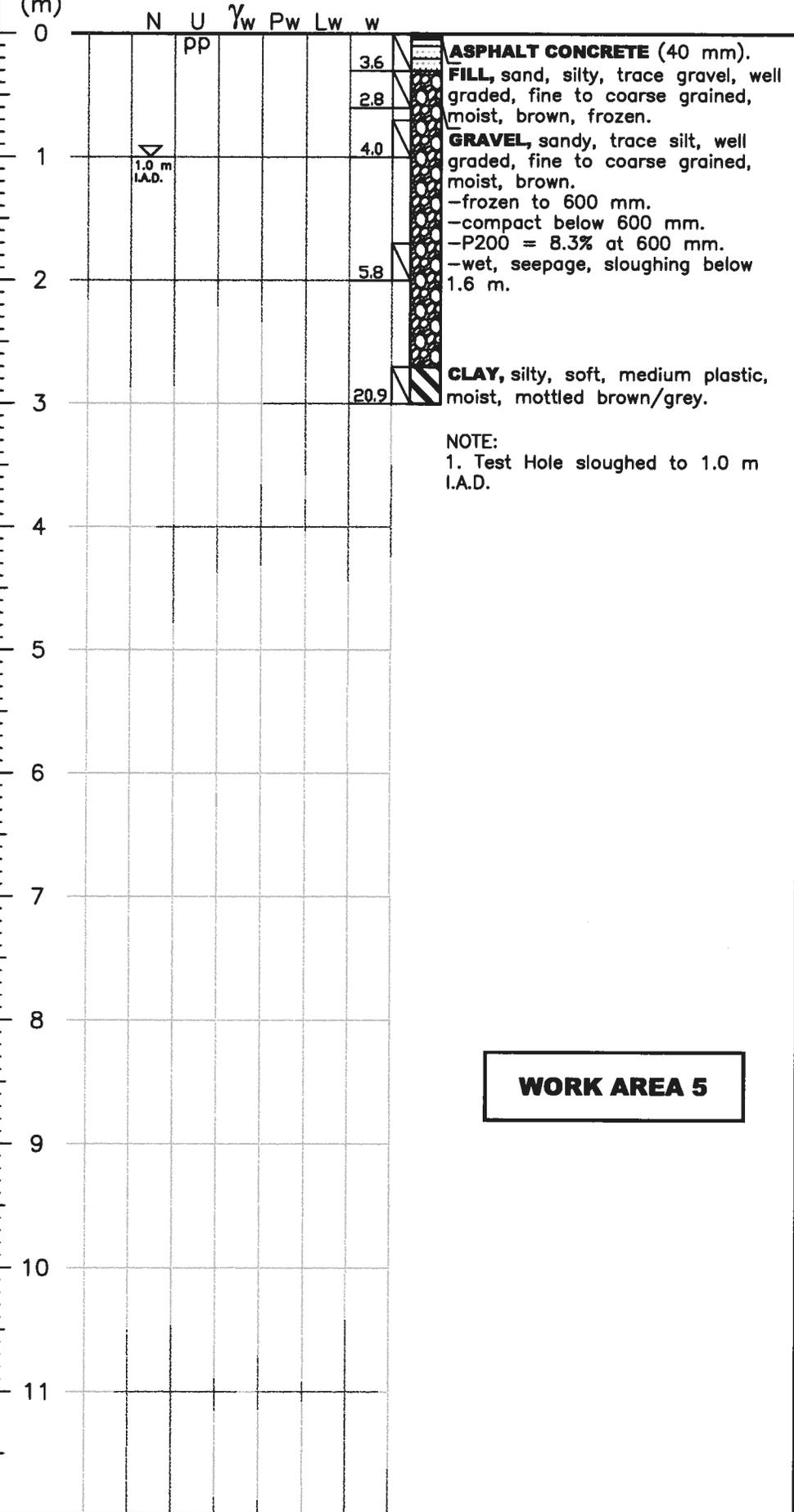
**NORTHING:** 5938005 **EASTING:** 414466

**DATE DRILLED:**  
 NOV 20/13

**DRAWING NUMBER:**  
 S13-8641-7

DEPTH  
(m)

**TEST HOLE 13-7**



NOTE:  
1. Test Hole sloughed to 1.0 m I.A.D.

**WORK AREA 5**

**LEGEND:**

TOPSOIL	FILL	GRAVEL	SAND	SILT	CLAY	GLACIAL TILL

- w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)
  - Lw...LIQUID LIMIT
  - Pw...PLASTIC LIMIT
  - $\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)
  - U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)
  - pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)
  - N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])
  - SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)
  - P200...% PASSING No. 200 SIEVE
  - I.A.D.....IMMEDIATELY AFTER DRILLING
  - ▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)
  - ▼...RECORDED WATER LEVEL (PIEZO)
- |             |             |          |
|-------------|-------------|----------|
|             |             |          |
| SHELBY TUBE | SPLIT SPOON | CUTTINGS |

**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.

	<b>P. MACHIBRODA ENGINEERING LTD.</b>
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**FIELD DRILL LOG AND SOIL TEST RESULTS**

**PROJECT:**  
ROADWAY IMPROVEMENT PROJECT

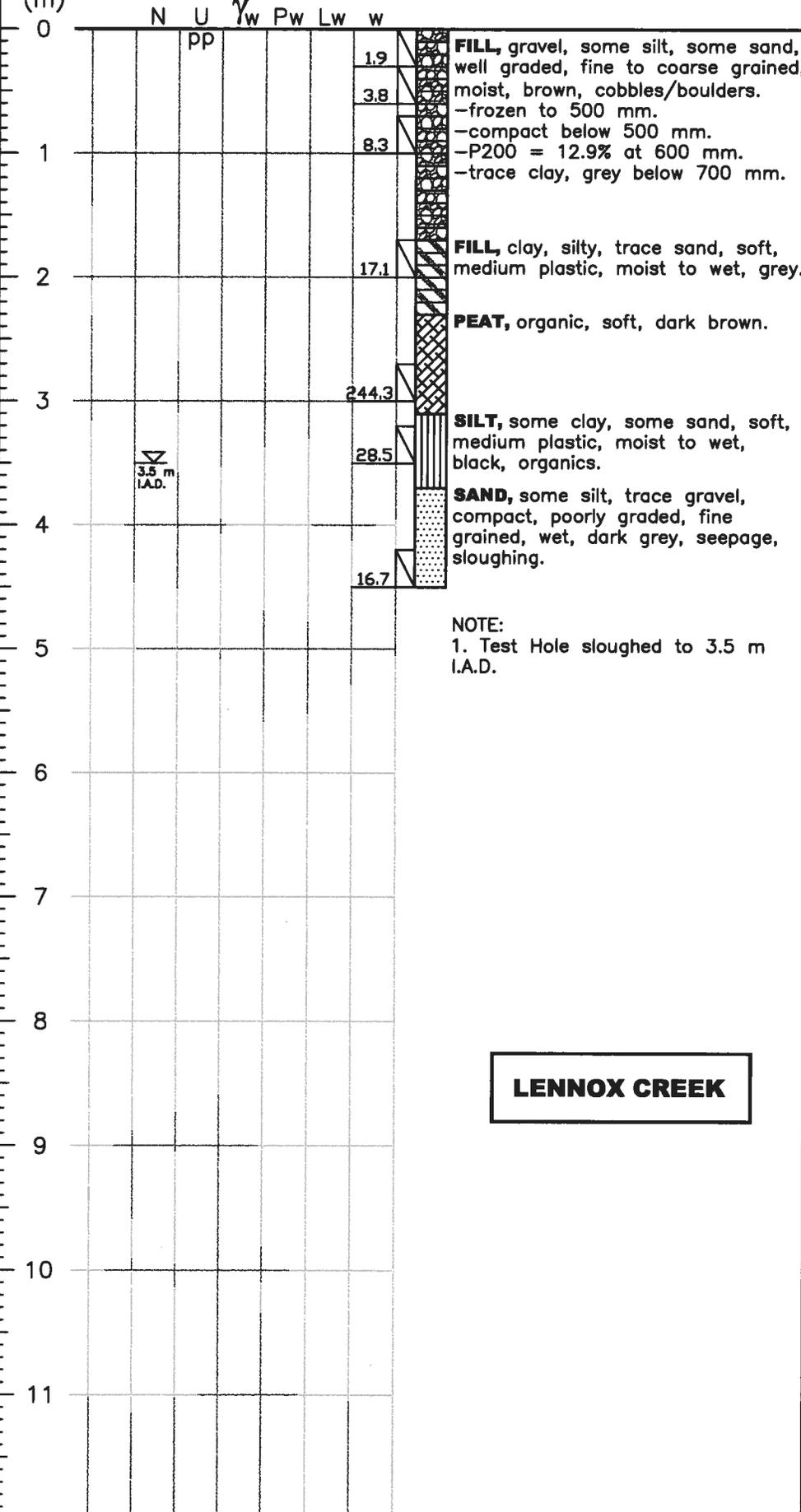
**LOCATION:**  
PRINCE ALBERT NATIONAL PARK  
PRINCE ALBERT, SK

**NORTHING:** 5937831 **EASTING:** 430630

<b>DATE DRILLED:</b> NOV 20/13	<b>DRAWING NUMBER:</b> S13-8641-8
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DEPTH  
(m)

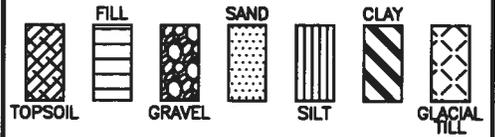
**TEST HOLE 13-8**



NOTE:  
1. Test Hole sloughed to 3.5 m I.A.D.

**LENNOX CREEK**

**LEGEND:**



w.....WATER CONTENT  
(PERCENT OF DRY SOIL WEIGHT)

Lw...LIQUID LIMIT

Pw...PLASTIC LIMIT

$\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)

U.....UNCONFINED COMPRESSIVE  
STRENGTH (kPa)

pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)

N.....STANDARD PENETRATION TEST  
(SAFETY HAMMER w/AUTOMATIC TRIP)  
(50/125 = BLOWS/SAMPLER  
PENETRATION [mm])

SO<sub>4</sub> .....SULPHATE CONTENT  
(PERCENT OF DRY SOIL WEIGHT)

P200...% PASSING No. 200 SIEVE

I.A.D.....IMMEDIATELY AFTER DRILLING

▽...RECORDED WATER LEVEL  
(TEST HOLE I.A.D.)

▼...RECORDED WATER LEVEL (PIEZO)



**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA  
ENGINEERING  
LTD.**

**FIELD DRILL LOG  
AND  
SOIL TEST RESULTS**

**PROJECT:**

ROADWAY  
IMPROVEMENT PROJECT

**LOCATION:**

PRINCE ALBERT NATIONAL PARK  
PRINCE ALBERT, SK

**NORTHING:** 5936205 **EASTING:** 433234

**DATE DRILLED:**

NOV 20/13

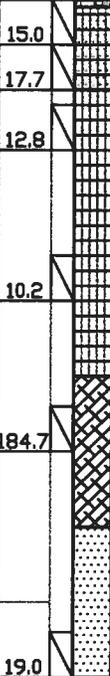
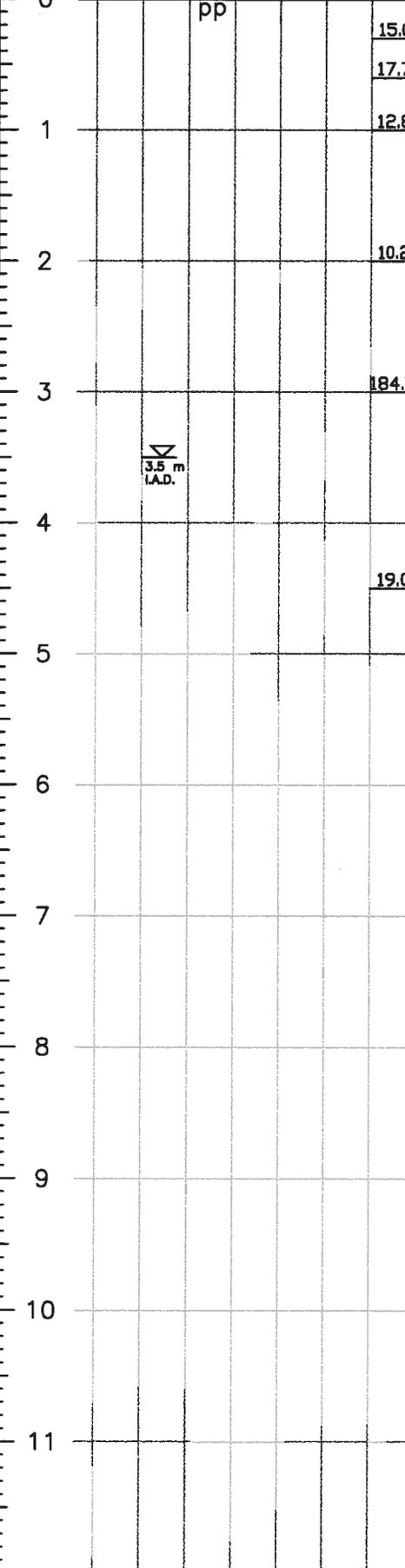
**DRAWING NUMBER:**

S13-8641-9

DEPTH  
(m)

**TEST HOLE 13-9**

N U  $\gamma_w$  Pw Lw w

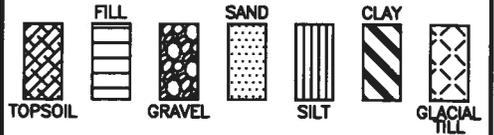


**FILL**, gravel, sandy, some silt, well graded, fine to coarse grained, moist, brown, frozen.  
**FILL**, silt and sand, trace gravel, low plastic, mottled brown/black. -frozen to 500 mm. -firm, moist below 500 mm.  
**FILL**, silt, some sand, trace clay, soft, low plastic, moist to wet, mottled brown/black. -P200 = 48.1% at 600 mm. -firm, moist, grey below 900 mm. -gravelly below 1.5 m.  
**PEAT**, organic, soft, dark brown.  
**SAND**, silty, trace gravel, compact, poorly graded, fine grained, wet, grey, seepage, sloughing.

NOTE:  
1. Test Hole sloughed to 3.5 m I.A.D.

**LENNOX CREEK**

**LEGEND:**



- w.....WATER CONTENT (PERCENT OF DRY SOIL WEIGHT)
- Lw...LIQUID LIMIT
- Pw...PLASTIC LIMIT
- $\gamma_w$ ...WET UNIT WEIGHT (kN/m<sup>3</sup>)
- U.....UNCONFINED COMPRESSIVE STRENGTH (kPa)
- pp...POCKET PENETROMETER (kg/cm<sup>2</sup>)
- N.....STANDARD PENETRATION TEST (SAFETY HAMMER w/AUTOMATIC TRIP) (50/125 = BLOWS/SAMPLER PENETRATION [mm])
- SO<sub>4</sub> .....SULPHATE CONTENT (PERCENT OF DRY SOIL WEIGHT)
- P200...% PASSING No. 200 SIEVE
- I.A.D.....IMMEDIATELY AFTER DRILLING
- ▽...RECORDED WATER LEVEL (TEST HOLE I.A.D.)
- ▼...RECORDED WATER LEVEL (PIEZO)
- SHELBY TUBE
- ⊗ SPLIT SPOON
- ◻ CUTTINGS

**LIMITATIONS:** THE FIELD DRILL LOG IS A SUMMARY OF THE SUBSURFACE CONDITIONS ENCOUNTERED AT THE SPECIFIC TEST HOLE LOCATION AT THE TIME OF TEST DRILLING. SUBSURFACE CONDITIONS MAY VARY AT OTHER LOCATIONS OF THIS SITE AND, IN TIME, MAY CHANGE AT THIS SPECIFIC TEST HOLE LOCATION.



**P. MACHIBRODA  
ENGINEERING  
LTD.**

**FIELD DRILL LOG  
AND  
SOIL TEST RESULTS**

<b>PROJECT:</b> ROADWAY IMPROVEMENT PROJECT	
<b>LOCATION:</b> PRINCE ALBERT NATIONAL PARK PRINCE ALBERT, SK	
<b>NORTHING:</b> 5936205 <b>EASTING:</b> 433241	
<b>DATE DRILLED:</b> NOV 20/13	<b>DRAWING NUMBER:</b> S13-8641-10

# GRAIN SIZE DISTRIBUTION TEST REPORT

Project: ROADWAY IMPROVEMENT PROJECT  
 PRINCE ALBERT NATIONAL PARK,  
 PRINCE ALBERT, SK

Project No.: S13-8641  
 Date Tested: NOVEMBER 29, 2013  
 Test Hole No.: 13-1  
 Sample No.: 9  
 Depth (m): 7.5

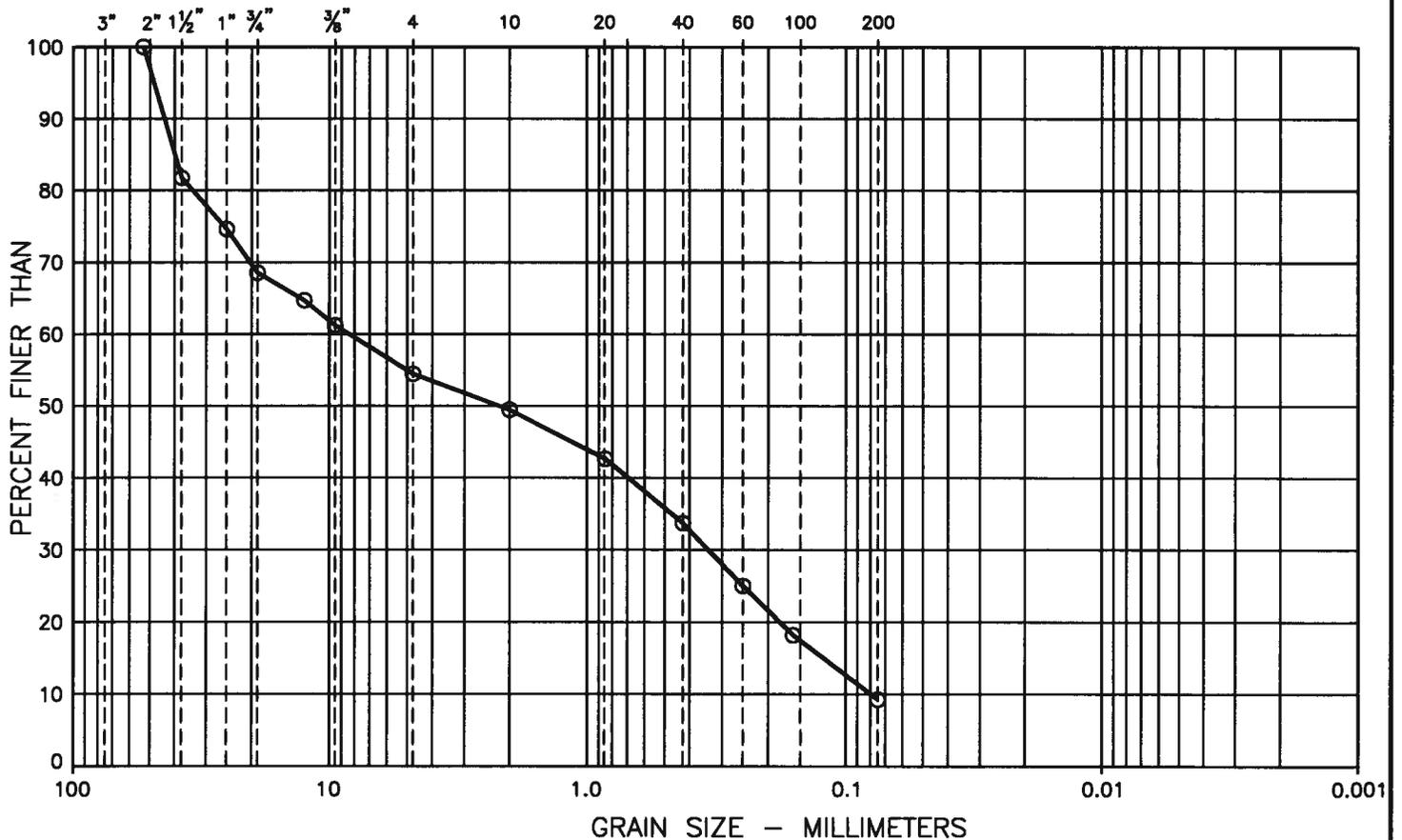
SIEVE SIZE (mm)	PERCENT PASSING
53.000	100.0
37.500	81.7
25.000	74.6
19.000	68.5
12.500	64.7
9.500	61.2
4.750	54.4
2.000	49.5
0.850	42.6
0.425	33.7
0.250	25.0
0.160	18.2
0.075	9.2

## Material Description

% Gravel Sizes	% Sand Sizes	% Silt and Clay Sizes
46	45	9

GRAVEL SIZES		SAND SIZES			SILT AND CLAY SIZES
COARSE	FINE	COARSE	MEDIUM	FINE	

← INCHES →      ← SIEVE SIZES →



**P. MACHIBRODA  
 ENGINEERING LTD.**

DRAWING NO.

**S13-8641-11**

## ASTM D422: GRAIN SIZE ANALYSIS OF SOIL

**Project:** Roadway Improvement Project  
 Prince Albert National Park, Prince Albert, Sk

**Project No.:** S13-8641

**Date Tested:** December 2, 2013

**Test Hole No.:** 13-1

**Sample No.:** 11

**Depth (m):** 10.5

Sieve	Diameter mm	% Finer
3"	76.2	100
2"	50.8	100
1"	25.4	100
3/4"	19.1	100
3/8"	9.5	98
# 4	4.75	96
# 10	2.00	93
# 20	0.850	83
# 40	0.425	73.3
# 60	0.250	63.6
# 100	0.150	53.5
# 200	0.075	41.3

Hydrometer Analysis:	Diameter mm	% Finer
Dispersing Agent:	0.0660	41.3
<i>Sodium Hexametaphosphate</i>	0.0468	37.3
	0.0331	33.3
	0.0236	31.6
	0.0168	29.6
	0.0123	28.3
	0.0087	26.5
	0.0062	22.2
	0.0045	18.9
	0.0032	15.9
	0.0023	13.6
	0.0014	11.4

**Material Description:**

% Gravel Sizes	% Sand Sizes	% Silt Sizes	% Clay Sizes
4	55	28	14

**Remarks:**

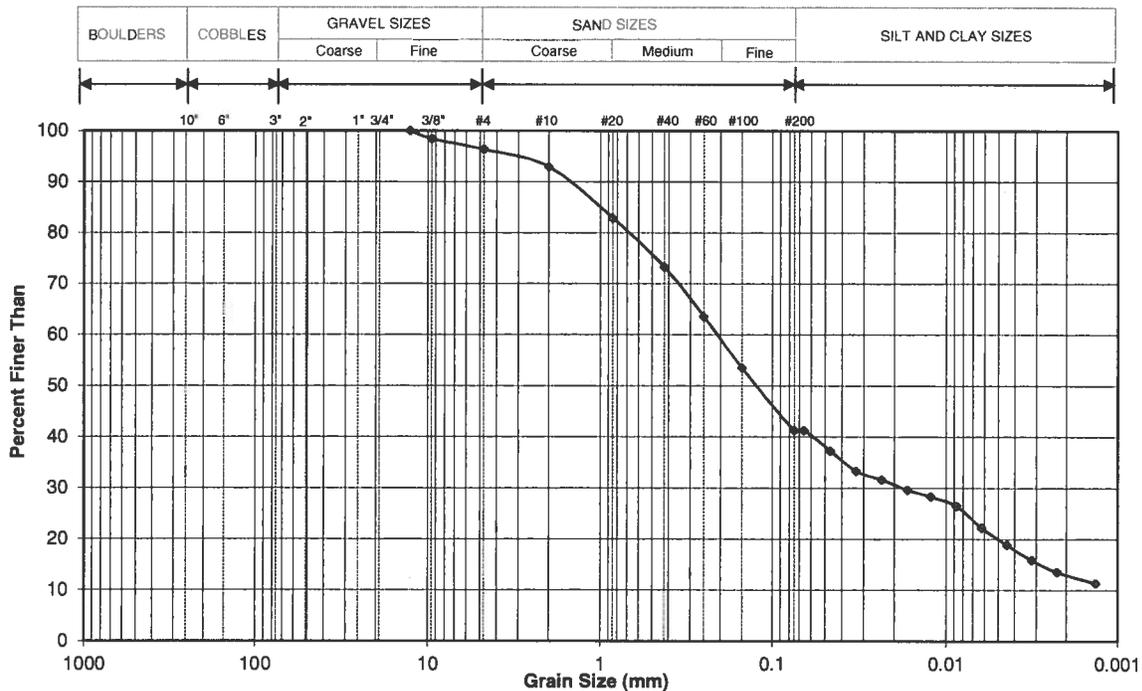
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**P. MACHIBRODA  
ENGINEERING LTD.**

DRAWING NO.

**S13-8641-12**

# GRAIN SIZE DISTRIBUTION TEST REPORT

Project: ROADWAY IMPROVEMENT PROJECT  
 PRINCE ALBERT NATIONAL PARK,  
 PRINCE ALBERT, SK

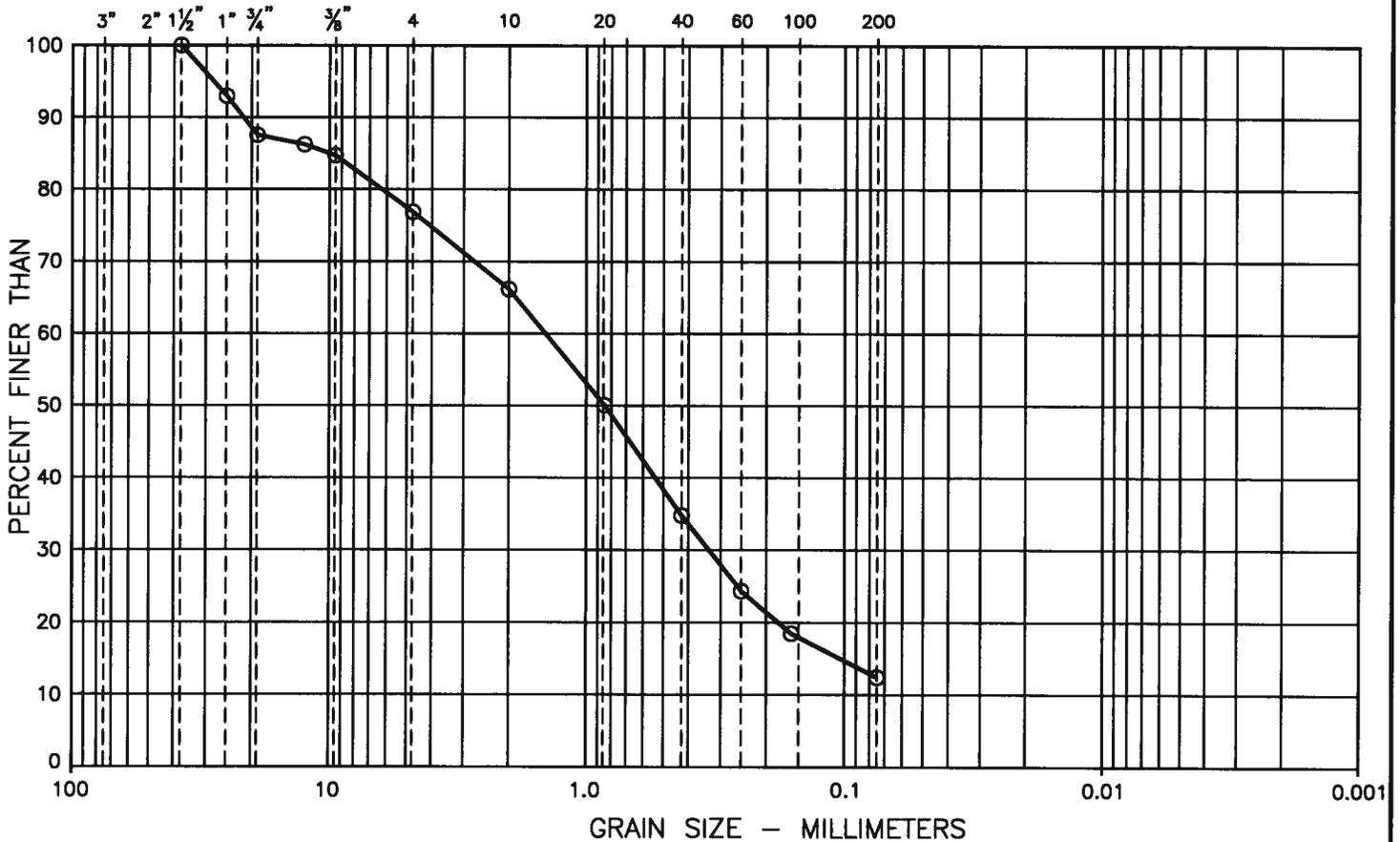
Project No.: S13-8641  
 Date Tested: NOVEMBER 29, 2013  
 Test Hole No.: 13-2  
 Sample No.: 20  
 Depth (m): 6.0

SIEVE SIZE (mm)	PERCENT PASSING
37.500	100.0
25.000	92.9
19.000	87.5
12.500	86.2
9.500	84.7
4.750	76.8
2.000	66.1
0.850	50.1
0.425	34.8
0.250	24.3
0.160	18.5
0.075	12.4

## Material Description

% Gravel Sizes 23	% Sand Sizes 65	% Silt and Clay Sizes 12
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GRAVEL SIZES		SAND SIZES			SILT AND CLAY SIZES
COARSE	FINE	COARSE	MEDIUM	FINE	
INCHES		SIEVE SIZES			



**P. MACHIBRODA  
 ENGINEERING LTD.**

DRAWING NO.

**S13-8641-13**

# **APPENDIX A**

## **EXPLANATION OF TERMS ON TEST HOLE LOGS**

## CLASSIFICATION OF SOILS

**Coarse-Grained Soils:** Soils containing particles that are visible to the naked eye. They include gravels and sands and are generally referred to as cohesionless or non-cohesive soils. Coarse-grained soils are soils having more than 50 percent of the dry weight larger than particle size 0.080 mm.

**Fine-Grained Soils:** Soils containing particles that are not visible to the naked eye. They include silts and clays. Fine-grained soils are soils having more than 50 percent of the dry weight smaller than particle size 0.080 mm.

**Organic Soils:** Soils containing a high natural organic content.

### **Soil Classification By Particle Size**

Clay – particles of size	< 0.002 mm
Silt – particles of size	0.002 – 0.060 mm
Sand – particles of size	0.06 – 2.0 mm
Gravel – particles of size	2.0 – 60 mm
Cobbles – particles of size	60 – 200 mm
Boulders – particles of size	>200 mm

### TERMS DESCRIBING CONSISTENCY OR CONDITION

**Coarse-grained soils:** Described in terms of compactness condition and are often interpreted from the results of a Standard Penetration Test (SPT). The standard penetration test is described as the number of blows, N, required to drive a 51 mm outside diameter (O.D.) split barrel sampler into the soil a distance of 0.3 m (from 0.15 m to 0.45 m) with a 63.5 kg weight having a free fall of 0.76 m.

Compactness Condition	SPT N-Index (blows per 0.3 m)
Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	Over 50

**Fine-Grained Soils:** Classified in relation to undrained shear strength.

Consistency	Undrained Shear Strength (kPa)	N Value (Approximate)	Field Identification
Very Soft	<12	0-2	Easily penetrated several centimetres by the fist.
Soft	12-25	2-4	Easily penetrated several centimetres by the thumb.
Firm	25-50	4-8	Can be penetrated several centimetres by the thumb with moderate effort.
Stiff	50-100	8-15	Readily indented by the thumb, but penetrated only with great effort.
Very Stiff	100-200	15-30	Readily indented by the thumb nail.
Hard	>200	>30	Indented with difficulty by the thumbnail.

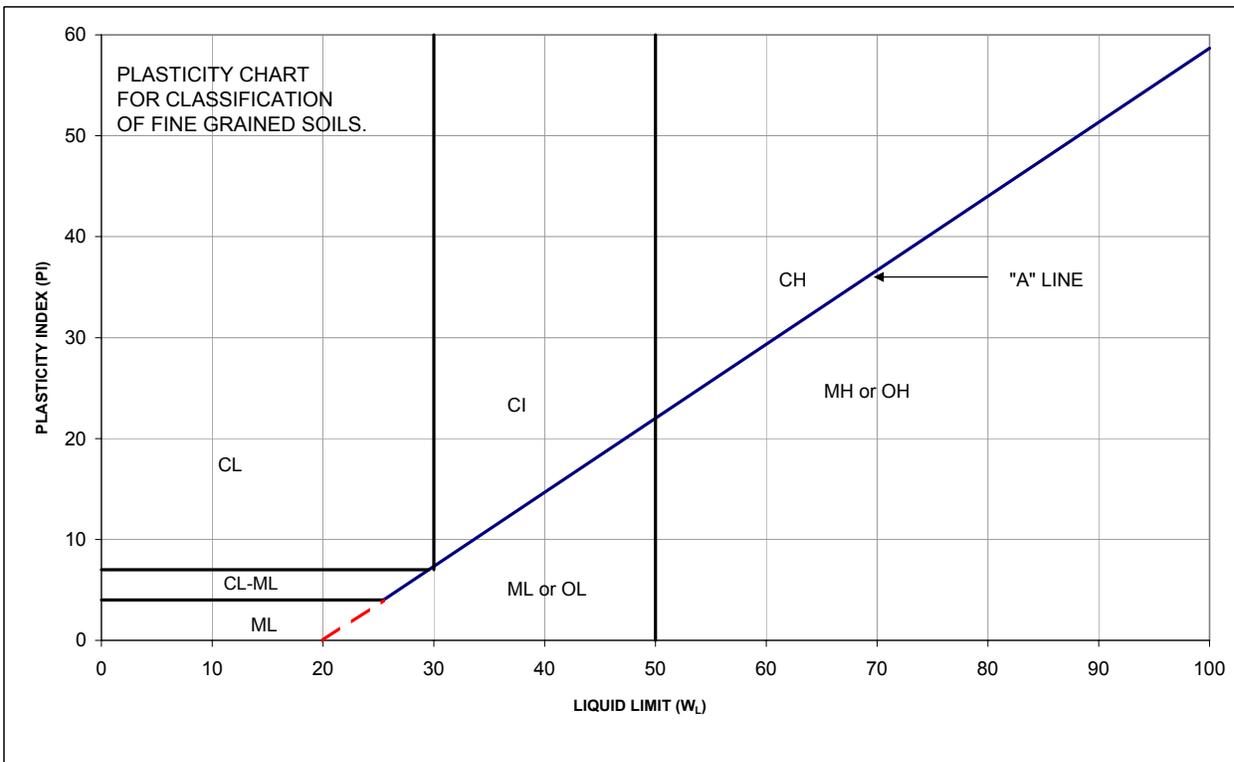
**Organic Soils:** Readily identified by colour, odour, spongy feel and frequently by fibrous texture.

### DESCRIPTIVE TERMS COMMONLY USED TO CHARACTERIZE SOILS

Poorly Graded	- predominance of particles of one grain size.
Well Graded	- having no excess of particles in any size range with no intermediate sizes lacking.
Mottled	- marked with different coloured spots.
Nuggety	- structure consisting of small prismatic cubes.
Laminated	- structure consisting of thin layers of varying colour and texture.
Slickensided	- having inclined planes of weakness that are slick and glossy in appearance.
Fissured	- containing shrinkage cracks.
Fractured	- broken by randomly oriented interconnecting cracks in all 3 dimensions.

**SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)**

MAJOR DIVISION		GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
HIGHLY ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR AND OFTEN FIBROUS TEXTURE
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS More than half coarse fraction larger than No. 4 sieve size	CLEAN GRAVELS	GW WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = 1 \text{ to } 3$
			GP POORLY-GRADED GRAVELS AND GRAVEL-SAND MIXTURES <5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS FOR GW
		DIRTY GRAVELS	GM SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $PI < 4$
			GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE WITH $PI > 7$
	SANDS More than half coarse fraction smaller than No. 4 sieve size	CLEAN SANDS	SW WELL-GRADED SANDS, GRAVELLY SANDS MIXTURES <5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{60} \times D_{10}} = 1 \text{ to } 3$
			SP POORLY-GRADED SANDS OR GRAVELLY SANDS <5% FINES	NOT MEETING ALL GRADATION REQUIREMENTS FOR SW
		DIRTY SANDS	SM SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $PI < 4$
			SC CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE WITH $PI > 7$
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSING NO. 200 SIEVE SIZE)	SILTS Below "A" line on plasticity chart; negligible organic content	ML INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$	
		MH INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$	
	CLAYS Above "A" line on plasticity chart; negligible organic content	CL INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$	
		CI INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	$W_L > 30 < 50$	
		CH INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$	
	ORGANIC SILTS & ORGANIC CLAYS Below "A" line on plasticity chart	OL ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$	
		OH ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$	



**APPENDIX B**  
**COORELATION CURVE FOR DETERMINING**  
**GROUP INDEX CONVERTED CBR VALUE**

Section:

SUBGRADE

Subject:

SUBGRADE STRENGTH  
EVALUATION

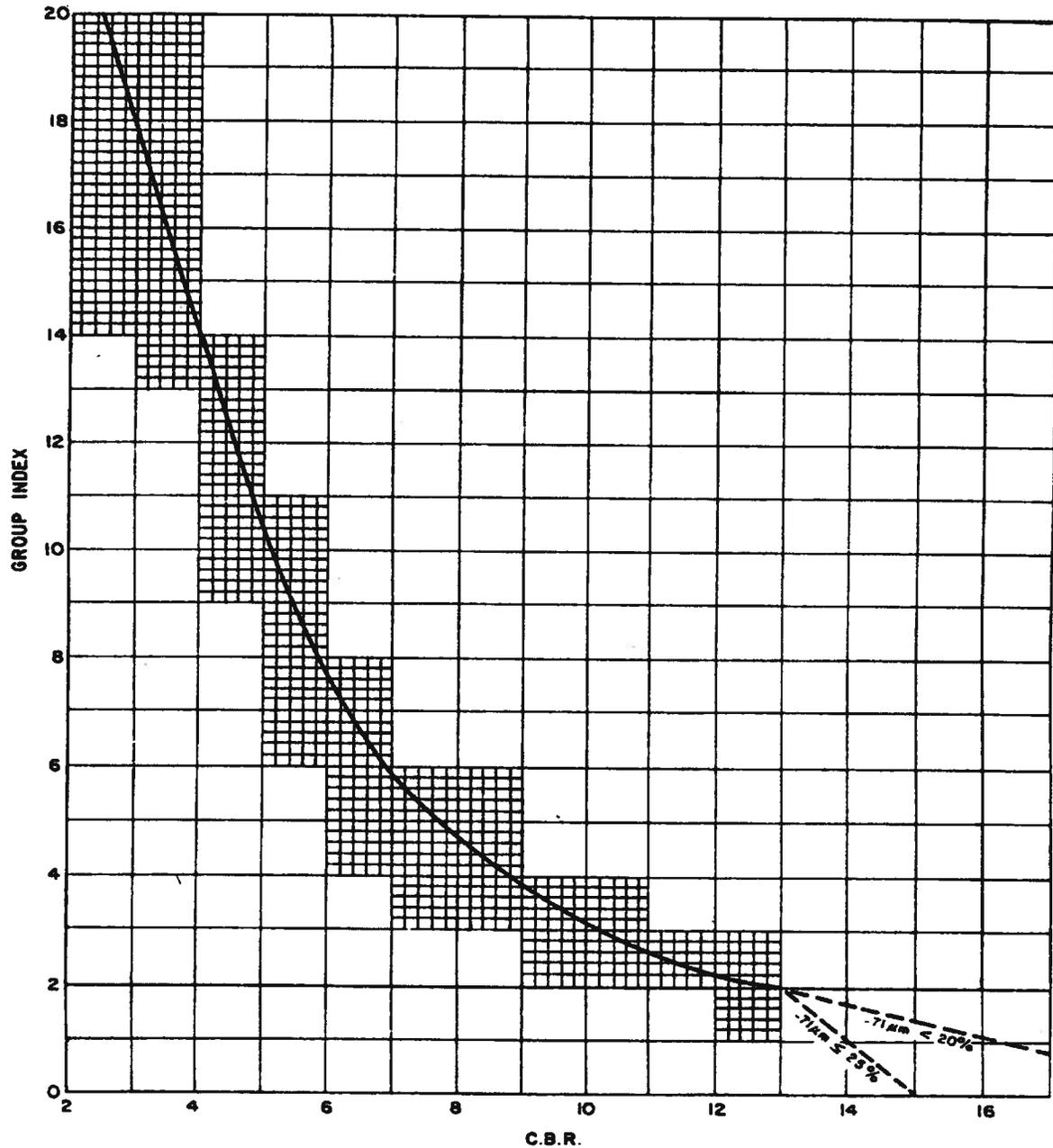


Figure 940-1 GI vs. CBR as used by Saskatchewan MHI

Date

2001-03-15

Page

3 of 7



parcscanada.gc.ca  
parkscanada.gc.ca

## Basic Impact Analysis

# Waskesiu Pedestrian Bridge Replacement

Prince Albert National Park

September 2014



Parks  
Canada

Parcs  
Canada

Canada



**1. PROJECT TITLE**

Waskesiu River Pedestrian Bridge Replacement

**2. PROJECT LOCATION**

Prince Albert National Park, SK

**3. PROJECT SITE(S)**

Waskesiu River, Prince Albert National Park (pedestrian bridge adjacent to highway bridge over Waskesiu River)

**4. PROPONENT**

Michael Caswell

**5. PROPONENT CONTACT INFORMATION**

[michael.caswell@pc.gc.ca](mailto:michael.caswell@pc.gc.ca)

office phone: (306) 975-6469

**6. PROJECT DATES**

Commencement: 2014-09-24

Completion: 2015-03-31

**7. INTERNAL PROJECT FILE #**

PANP-0001174

**8. PROJECT DESCRIPTION**

The object of this project is to replace the current pedestrian bridge which formerly served as a dam controlling water levels on Waskesiu Lake and vehicle bridge before the highway was rerouted and a new concrete bridge (Scenic Drive Bridge) was built to accommodate two lanes of traffic. The pedestrian bridge will be replaced with a longer, narrower clearspan steel bridge.

A complete description of the work is available in the Statement of Work. Key project components include:

- Removal and demolition of current pedestrian bridge, including timber and concrete control structure.
- Design, fabrication and delivery of a 21 m long x 3 m wide steel prefabricated clearspan pedestrian bridge.
- Placement of the bridge over the Waskesiu River in the same location of the current bridge adjacent to the Scenic Drive Bridge. This includes steel pipe piles, concrete abutment caps and the prefabricated bridge structure.
- Subgrade construction and resurfacing on both approaches to pedestrian bridge over the Waskesiu River.

Demolition /removal of existing pedestrian bridge

- Existing timber superstructure to be completely removed and disposed of.
- Existing cast-in-place concrete pier and abutment/wingwalls completely removed to groundline and disposed of. This work will be done in isolation (isolating work area from stream flow. See Attachment B) and mitigation measures described below should be followed.
- Informative display panels to be removed and salvaged according to Project Manager's direction.

Construction and bridge placement including concrete abutment caps and piles

- Bridge construction will be done off site.
- Concrete elements will be precast off site.





- Steel piles manufactured off site
- Fill under old bridge to be removed and sloped widening the channel to a width of approximately 21 m to match slopes in the area and former high watermark. Embankment under bridge will be constructed with layers of compacted fill. Granular filter blanket and rip-rap to cover embankment. Fill may be used for sloping bridge ends to smoothly meet existing trail.
- Repair trail surface and approach to bridge.

#### Reclamation/Decommissioning

- Removal of waste materials and debris and trim slopes.
- Disturbed areas will be reseeded with native species and topsoil replaced if necessary.
- Erosion and sediment filters will remain in place until vegetation is well established.
- Work area restored to pre-construction condition.
- Protect newly graded areas from traffic and erosion.

### 9. ENVIRONMENTAL COMPONENTS LIKELY TO BE AFFECTED

Water

Soil

Fish

Vegetation

Air

Visitor access (minimal but work area and trail will be temporarily closed to the public until work is complete)

Visitor Safety (work is to be carried out in area that sees heavy visitor use during the peak season but is still used during the shoulder season)

### 10. IMPORTANT EFFECTS IDENTIFIED

#### Staging Area for Equipment and Temporary Facilities for Use during Construction

- Introduction and spread of non-native species – disturbed sites provide an excellent opportunity for these plants to establish and disperse
- Soil quality and compaction
- Potential for contamination of soil from fuelling and fuel storage activities
- Noise from running equipment disturb wildlife
- Wastewater disposal
- Waste disposal

#### Construction Location Access and Egress

- Introduction and spread of non-native species – disturbed sites provide an excellent opportunity for these plants to establish and disperse
- Soil quality and compaction
- Potential soil contamination from leaking equipment
- Noise from running equipment disturb wildlife

#### Demolition of Bridge (cement abutments and timber)

- Sedimentation of fish bearing stream during removal of cement abutments, timber wings and bridge
- Fuel and oil spills during demolition-potential for creation of contaminated sites and pollution of waterway
- Riparian vegetation impacts from equipment working at site





### Placement of New Bridge Backfilling Bridge Ends after Placement

- Sedimentation of fish bearing stream during bridge placement and backfilling
- Fuel and oil spills during demolition-potential for creation of contaminated sites and pollution of waterway
- Riparian vegetation impacts from equipment working at site
- Establishment and dispersal of non-native species on disturbed area

## 11. MITIGATION MEASURES

The construction area will be secured from public access and signage will be in place. Signage will provide information in regard to construction activities. All signage will be in both official languages or graphic illustrations. When equipment is working from traffic bridge appropriate signage and traffic control (i.e. flag person on both sides of construction area controlling traffic).

Disturbance to park visitors is expected to be minimal during the time of construction considering the time of year, late fall and winter, which is a low visitor period. The trail and immediate area will be closed to the public during construction. Visitors will be notified of the closure times with signage at the site and at the Visitor Centre. It will also be posted on the web. The closure will be temporary and during low visitor use and the end result of the project will be an improved visitor experience.

Construction is planned October 2014 to March 31, 2015 during freeze up and/or lowest flows.

- No fall or winter spawning fish are anticipated to be in the creeks, according to a Prince Albert National Park inventory (Environment Canada, Parks 1986).
- The work will be completed within a stream isolated area, with isolation mitigation measures being followed as per the "Isolated or Dry Open-cut Crossings Operational Statement" (seen as part of the mitigation measures below).

To reduce potential impacts to fish and fish habitat, the following mitigations are recommended:

- Every effort will be made to minimize the introduction of sediment and the disturbance of sediment and debris during in-water work activities. This includes installation of silt fencing along banks of waterways within the work area.
- Any sand fill material and rock/cobble used in stream will be obtained from off-site and not from below the high water level of any watercourse or waterbody.
- During construction and until vegetation is re-established, effective sediment and erosion control measures will be used on disturbed areas to prevent silt and soil laden runoff from entering fish habitat. This may include seed matting (e.g. coconut matting) or other landscaping fabrics.
- Upon completion of the project all debris will be removed from the site. Construction material and equipment will be stored as directed by the Project Proponent. See attached map in section 19.
- Appropriate precautions must be taken to ensure that deleterious substances do not enter fish habitat:
  - Equipment operating near fish habitat will be properly maintained, in sound mechanical condition and free of any fuel, oil, hydraulic fluid or coolant leaks.
  - Equipment will be free of external grease, loose dirt or oil and the machinery will be pressure washed off-site prior to the start of the project.
  - Refuelling of vehicles and equipment must be kept to locations approved by Project Proponent
  - Refuelling stations and fuelling storage must occur a minimum of 100 m from any waterbody
  - Refuelling of equipment and vehicles must occur over an impervious surface or an absorbent pad
  - Spill kits capable of containing 110% of the fuel volume must be kept on site at all times
  - Fuels, oils, lubricants, chemicals and any potential hazardous material must not be dispelled into the environment. All waste products must be stored appropriately and transported to the Prince Albert landfill for proper disposal.





- All machinery will be equipped with emergency spill kits large enough to contain any possible spills or leaks of oil, fuel, hydraulic fluid or coolant during the project. The operators of the equipment will be familiar with how to properly use the spill kits in the event of an emergency.
  - Any spilled deleterious materials must be cleaned up as soon as possible and disposed of in an environmentally safe manner and reported to the EA Coordinator and Spill Control (See Attachment D for these and emergency contact numbers). Spilled deleterious material cannot be left where it may enter any watercourse.
  - If these measures are insufficient for effective control, it is the responsibility of the proponent to implement alternative measures as required for effective deleterious substance control.
- Construction work must proceed in a manner that ensures 100% of downstream flows are maintained at all times. The construction area will be effectively isolated from flowing water.
  - Use dams made of non-earthen material, such as water inflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs, to separate the dewatered work site from flowing water.
    - If granular material is used to build dams, use clean or washed material that is adequately sized (i.e., moderately sized rock and not sand or gravel) to withstand anticipated flows during the construction. If necessary, line the outside face of dams with heavy poly-plastic to make them impermeable to water. Material to build these dams should not be taken from below the HWM of any water body.
    - Design dams to accommodate any expected high flows of the watercourse during the construction period.
  - Before dewatering, rescue any fish from within the isolated area and return them safely immediately downstream of the worksite.
  - Pump sediment laden dewatering discharge into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering any water body.
  - Remove accumulated sediment and excess spoil from the isolated area before removing dams.
  - Gradually remove the downstream dam first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle.
  - During the final removal of dams, restore the original channel shape, bottom gradient and substrate at these locations.
  - **Pumped Diversions**

Pumped diversions are used to divert water around the isolated area to maintain natural downstream flows and prevent upstream ponding.

    - Ensure intakes are operated in a manner that prevents streambed disturbance and fish mortality. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (e.g., *Freshwater Intake End-of-Pipe Fish Screen Guideline* (1995), available at [www.dfo-mpo.gc.ca/Library/223669.pdf](http://www.dfo-mpo.gc.ca/Library/223669.pdf) (PDF Version, 2.93 Mb)).
    - Ensure the pumping system is sized to accommodate any expected high flows of the watercourse during the construction period. Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure.
    - Protect pump discharge area(s) to prevent erosion and the release of suspended sediments downstream, and remove this material when the works have been completed.

If project plans change or if the description of your proposal is incomplete you should consult the Department of Fisheries and Oceans to determine if a DFO review is required.

#### Revegetation and Erosion Control

- All disturbed areas with bare soil must be reseeded with a native seed mixture as soon as possible. The park will supply an approved native seed mixture for the contractor; the contractor will be responsible for reseeding





- Erosion control measures must be installed on all reseeded areas and maintained until vegetation reestablishes. Approved erosion control measures include but are not limited to covering reseeded areas with coconut matting until vegetation established and hydro-seeding. Revegetation and erosion control plans must be approved by Project Proponent.

## 12. IMPACT SIGNIFICANCE

This project will improve Visitor Experience of the Waskesiu River Trail and Day Use Area with the replacement of the old bridge with a new one. The removal of the bridge abutments and widening of stream channel beneath bridge will better accommodate the movement of vegetation debris in high flow events. By implementing the identified mitigation measures, effects from this project are likely to be restricted to small-scale, short-term and/or reversible negative environmental impacts. As a result, the project is unlikely to cause significant adverse environmental or cultural effects.

## 13. SITE INSPECTION

Site inspection not required

Site inspection required

## 14. EXPERTS CONSULTED (Including PC Experts)

Department/Agency/Institution: Department of Fisheries and Oceans

### Contact Information

Expert's Name: Rick Kiriluk

Title: Fisheries Protection Biologist

Coordinates: Burlington, ON

**Date of Request:** 2014-09-25

Expertise Requested: Permit required for project and recommendations to follow when working around/in water for this project.

**Response:** No permit required for project. Advised to follow Measures to Avoid Harm on DFO's website. Included in Attachment A is email to engineering company, Associated Engineering, stating that no permit is required based on the specifications of the project and links are provided to pertinent information on measures to avoid harm as well as a link to the self assessment page.

## 15. PUBLIC PARTICIPATION

Public participation required:

No  Yes

## 16. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

not likely to cause significant adverse environmental effects.

likely to cause significant adverse environmental effects.





## SIGNATURES AND APPROVAL

### EA Author

Name: Theresa Stene

Title: Resource Management Officer

### EA Recommendation

Name:

Title:

Signature

Date:

## DECISION APPROVAL

Name: Alan Fehr

Title: Field Unit Superintendent

Signature

Date:

## 17. REFERENCE LIST

List the main references and information sources used during preparation of the basic EIA.

## 18. ATTACHMENTS LIST

Attachment A – DFO – LOA – Mitigation Measures For Crossing

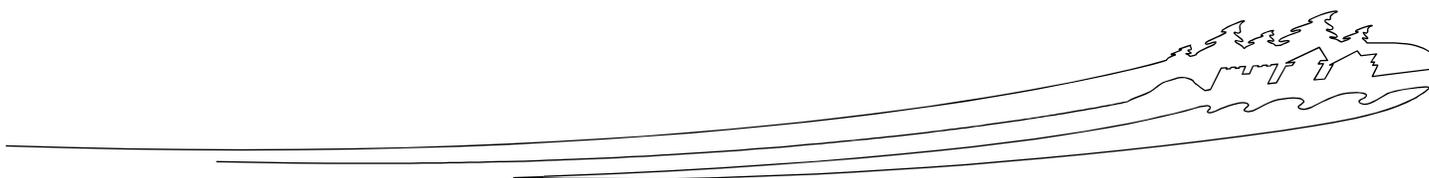
Attachment B – DFO – Operational Statement – Isolation Work

Attachment C – DFO – Operational Statement – Maintenance of Riparian Vegetation in Existing Right of Ways

Attachment D - Emergency Contact Numbers

List of items attached to this form that are part of the basic EA.

## 19. ADDITIONAL CONSIDERATIONS / COMMENTS



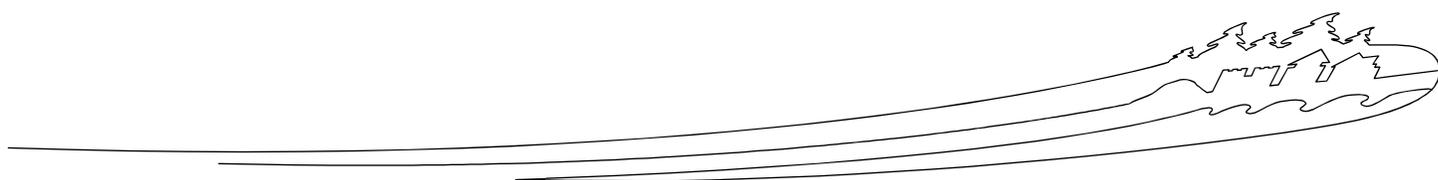




Bridge Photos/Drawings



Waskesiu River Existing Pedestrian Bridge







## REFERENCES

Environment Canada, Parks. 1986. Prince Albert National Park Resource Description and Analysis. Natural Resource Conservation Section, Environment Canada, Parks, Prairie and Northern Region, Winnipeg. 2 Vols.





## Attachment A: Mitigation Measures for Replacement of Existing Pedestrian Bridge

**From:** Fisheries Protection

**Sent:** September-25-14 1:02 PM

**To:** Stephen Chiasson

**Cc:** [theresa.stene@pc.gc.ca](mailto:theresa.stene@pc.gc.ca)

**Subject:** RE: 14-HCAA-01309 - Replacement of Existing Pedestrian Bridge in Prince Albert National Park

Dear Mr. Chiassons:

Subject: Serious harm to fish can be avoided or mitigated.

Bridge Replacement, Waskesiu River, Town of Waskesiu

DFO File #: 14-HCAA-01309

The Fisheries Protection Program (the Program) of Fisheries and Oceans Canada received your proposal on September 17, 2014.

Based on the information provided, your proposal has been identified as a project where a Fisheries Act authorization is not required given that serious harm to fish can be avoided by following standard measures. Proposals in this category are not considered to need an authorization from the Program under the Fisheries Act in order to proceed. In order to comply with the Act, it is recommended that you follow our guidance tools which can be found at the following website (<http://www.dfo-mpo.gc.ca/pnw-ppe/measure-mesures/index-eng.html>). It remains your responsibility to meet the other requirements of federal, provincial and municipal agencies.

Should your plans change or if you have omitted some information in your proposal such that your proposal meets the criteria for a site specific review, as described on our website (<http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>), you should complete and submit the request for review form that is also available on the website.

Should you have any questions or concerns about the compliance of your proposal with the Fisheries Act and/or those prohibitions of the Species at Risk Act that apply to listed aquatic species\*, you may wish to engage an environmental professional familiar with measures to avoid impacts to fish and fish habitat (<http://www.dfo-mpo.gc.ca/pnw-ppe/env-pro-eng.html>).

\*Those sections most relevant to the review of development proposals include 20 and 35 of the Fisheries Act and sections 32, 33 and 58 of the Species at Risk Act. For more information please visit [www.dfo-mpo.gc.ca](http://www.dfo-mpo.gc.ca).

Yours sincerely,

Jennifer Thomas

A/Team Leader, Triage and Planning

Fisheries and Oceans Canada

Fisheries and Oceans Canada has changed the way new project proposals (referrals), reports of potential Fisheries Act violations (occurrences) and information requests are managed in Central and Arctic Region (Alberta, Saskatchewan, Manitoba, Ontario, Nunavut and the Northwest Territories). Please be advised that general information regarding the management of impacts to fish and fish habitat and self-assessment tools (e.g. Measures to Avoid Harm) that enable you to determine Fisheries Act requirements are available at DFO's "Projects Near Water" website at [www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html](http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html). For all occurrence reports, or project proposals where you have determined, following self-assessment, that you cannot avoid impacts to fish and fish habitat, please submit to [fisheriesprotection@dfo-mpo.gc.ca](mailto:fisheriesprotection@dfo-mpo.gc.ca). For general inquiries call 1 855 852-8320.





## Attachment B: Operational Statement for Working in Isolation Isolated or Dry Open-cut Stream Crossings

Version 1.0

Fisheries and Oceans Canada  
Saskatchewan Operational Statement

For the purpose of this Operational Statement, the term "Isolated Crossing" means a temporary stream crossing technique that allows work (e.g., trenched pipeline or cable installation) to be carried out "in-the-dry" while diverting the natural flow around the site during construction. These types of open trenched crossings are isolated using flume or dam and pump techniques (see *Pipeline Associated Watercrossings*, 2005 at [www.capp.ca/library/publications/industryOperations/pages/pubInfo.aspx?DocId=96717](http://www.capp.ca/library/publications/industryOperations/pages/pubInfo.aspx?DocId=96717)). The term "Dry Open-cut Stream Crossing" means a temporary stream crossing work (e.g., trenched pipeline or cable installation) that is carried out during a period when the entire stream width is seasonally dry or is frozen to the bottom.

The risks to fish and fish habitat associated with isolated open cut stream crossings include the potential for direct damage to substrates, release of excessive sediments, loss of riparian habitat, stranding of fish in dewatered areas, impingement/entrainment of fish at pump intakes, and disruption of essential fish movement patterns. Similarly, dry open-cut stream crossings pose a risk to fish and fish habitat due to potential harmful alteration of substrates, loss of riparian habitat, and release of excessive sediment once stream flows resume.

The order of preference for carrying out a cable or pipeline stream crossing, in order to protect fish and fish habitat, is: a) punch or bore crossing (see *Punch & Bore Crossings* Operational Statement); b) high-pressure directional drill crossing (see *High-Pressure Directional Drilling* Operational Statement); c) dry open-cut crossing; and d) isolated open-cut crossing. This order must be balanced with practical considerations at the site.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the *Fisheries Act* no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the *Fisheries Act*.

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to incorporate into your project in order to avoid negative impacts to fish habitat. You may proceed with your isolated or dry open-cut stream crossing project without a DFO review when you meet the following conditions:

- for dry, open-cut crossings the watercourse is dry or frozen completely to the bottom at the site,
- for isolated crossings, the channel width of the watercourse at the crossing site is less than 5 meters from ordinary high water mark to ordinary high water mark (HWM) (see definition below),
- the isolated crossing does not involve the construction or use of an off-stream diversion channel, or the use of earthen dams,
- the isolated crossing ensures that all natural upstream flows are conveyed downstream during construction, with no change in quality or quantity,
- the site does not occur at a stream location involving known fish spawning habitat, particularly if it is dependent on groundwater upwelling,
- the use of explosives is not required to complete the crossing, and





- you incorporate the *Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-cut Stream Crossing* listed below.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the [Fisheries Act](#) and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the [Fisheries Act](#).

**You are required to respect all municipal, provincial and federal legislation that applies to the work being carried out in relation to this Operational Statement.** The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* (SARA) ([www.sararegistry.gc.ca](http://www.sararegistry.gc.ca)). If you have questions regarding this Operational Statement, please contact the DFO office in your area (see Saskatchewan DFO office list).

We ask that you notify DFO, preferably 10 working days before starting your work, by filling out and sending the Saskatchewan Operational Statement notification form ([www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territoires-territoires/sk/os-eo20-eng.htm](http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territoires-territoires/sk/os-eo20-eng.htm)) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

### Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated or Dry Open-Cut Stream Crossing

1. Use existing trails, roads or cut lines wherever possible as access routes to avoid disturbance to the riparian vegetation.
2. Locate crossings at straight sections of the stream, perpendicular to the banks, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, active floodplains or any other area that is inherently unstable and may result in the erosion and scouring of the stream bed.
3. Complete the crossing in a manner that minimizes the duration of instream work.
4. Construction should be avoided during unusually wet, rainy or winter thaw conditions.
5. While this Operational Statement does not cover the clearing of riparian vegetation, the removal of select plants may be necessary to access the construction site. This removal should be kept to a minimum and within the utility right-of-way.
6. Machinery fording a flowing watercourse to bring equipment required for construction to the opposite side is limited to a one-time event (over and back) and is to occur only if an existing crossing at another location is not available or practical to use. Operational Statements are also available for *Ice Bridges and Snow Fills*, *Clear-Span Bridges*, and *Temporary Stream Crossing*.
  - 6.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
  - 6.2. Grading of the stream banks for the approaches should not occur.
  - 6.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation is likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
  - 6.4. Time the one-time fording to prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Saskatchewan In-Water Closed Construction Timing Windows*).





- 6.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.
- 7. Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.
  - 7.1. Protect entrances at machinery access points (e.g., using swamp mats) and establish single site entry and exit.
  - 7.2. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
  - 7.3. Wash, refuel and service machinery and store fuel and other materials for the machinery away from the water to prevent deleterious substances from entering the water.
  - 7.4. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
- 8. Install effective sediment and erosion control measures before starting work to prevent entry of sediment into the watercourse. Inspect them regularly during the course of construction and make all necessary repairs if any damage occurs.
- 9. Stabilize any waste materials removed from the work site, above the HWM, to prevent them from entering the watercourse. This could include covering spoil piles with biodegradable mats or tarps or planting them with grass or shrubs.
- 10. Vegetate any disturbed areas by planting and seeding, preferably with native trees, shrubs or grasses and cover such areas with mulch to prevent soil erosion and to help seeds germinate. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
  - 10.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.
  -

#### ***Measures to Protect Fish and Fish Habitat when Carrying Out an Isolated Crossing***

Temporary isolation is used to allow work "in-the-dry" while maintaining the natural downstream flow by installing dams up and downstream of the site and conveying all of the natural upstream flow into a flume, or pumping it around the isolated area. In addition to measures 1 to 10, the following measures should be carried out when conducting an isolated stream crossing:

- 11. Time isolated crossings to protect sensitive fish life stages by adhering to fisheries timing windows (see Measure 6.4).
- 12. Use dams made of non-earthen material, such as waterinflated portable dams, pea gravel bags, concrete blocks, steel or wood wall, clean rock, sheet pile or other appropriate designs, to separate the dewatered work site from flowing water.
  - 12.1. If granular material is used to build dams, use clean or washed material that is adequately sized (i.e., moderately sized rock and not sand or gravel) to withstand anticipated flows during the construction. If necessary, line the outside face of dams with heavy poly-plastic to make them impermeable to water. Material to build these dams should not be taken from below the HWM of any water body.
  - 12.2. Design dams to accommodate any expected high flows of the watercourse during the construction period.
- 13. Before dewatering, rescue any fish from within the isolated area and return them safely immediately downstream of the worksite.
  - 13.1. You will require a permit from DFO to relocate any aquatic species that are listed as either endangered or threatened under SARA. Please contact the DFO office in your area to determine if an aquatic species at risk is in the vicinity of your project and, if





appropriate, use the DFO website at [www.dfo-mpo.gc.ca/species-especies/act-loi/act-loi-eng.htm](http://www.dfo-mpo.gc.ca/species-especies/act-loi/act-loi-eng.htm) to apply for a permit.

14. Pump sediment laden dewatering discharge into a vegetated area or settling basin, and prevent sediment and other deleterious substances from entering any water body.
15. Remove accumulated sediment and excess spoil from the isolated area before removing dams.
16. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition before removing dams.
17. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and revegetated, preferably with native species.
18. If rock is used to stabilize banks, it should be clean, free of fine materials, and of sufficient size to resist displacement during peak flood events. The rock should be placed at the original stream bank grade to ensure there is no infilling or narrowing of the watercourse.
19. Gradually remove the downstream dam first, to equalize water levels inside and outside of the isolated area and to allow suspended sediments to settle.
20. During the final removal of dams, restore the original channel shape, bottom gradient and substrate at these locations.

#### 21. **Pumped Diversions**

Pumped diversions are used to divert water around the isolated area to maintain natural downstream flows and prevent upstream ponding.

- 21.1. Ensure intakes are operated in a manner that prevents streambed disturbance and fish mortality. Guidelines to determine the appropriate mesh size for intake screens may be obtained from DFO (e.g., *Freshwater Intake End-of-Pipe Fish Screen Guideline* (1995), available at [www.dfo-mpo.gc.ca/Library/223669.pdf](http://www.dfo-mpo.gc.ca/Library/223669.pdf) (PDF Version, 2.93 Mb)).
- 21.2. Ensure the pumping system is sized to accommodate any expected high flows of the watercourse during the construction period. Pumps should be monitored at all times, and back-up pumps should be readily available on-site in case of pump failure.
- 21.3. Protect pump discharge area(s) to prevent erosion and the release of suspended sediments downstream, and remove this material when the works have been completed.
- 

#### *Measures to Protect Fish and Fish Habitat when Carrying Out a Dry Open-Cut Stream Crossing*

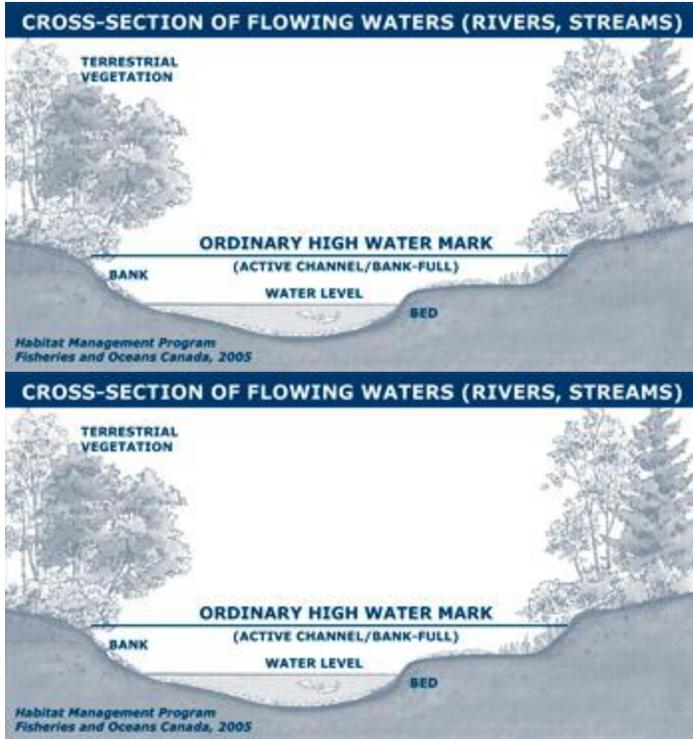
In addition to measures 1 to 10, the following measures should be carried out when conducting a dry open-cut stream crossing:

22. Stabilize the **streambed** and restore the original channel shape, bottom gradient and substrate to pre-construction condition.
23. Ensure **banks** are stabilized, restored to original shape, adequately protected from erosion and revegetated, preferably with native species.

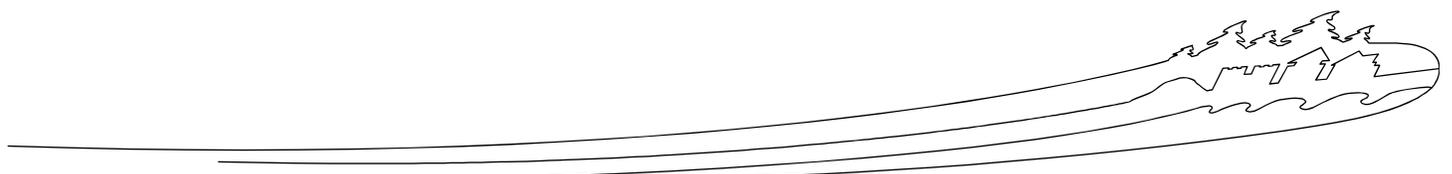
#### **Definition:**

**Ordinary high water mark (HWM)** – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the "active channel/bank-full level" which is often the 1:2 year flood flow return level. In inland lakes or wetlands, it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).





*Aussi disponible*





## Attachment C: Statement of Operation for Riparian Vegetation Maintenance

### Maintenance of Riparian Vegetation in Existing Rights-of-Way

Version 3.0

Fisheries and Oceans Canada  
Saskatchewan Operational Statement

Rights-of-way are areas of land devoted to providing transportation corridors (e.g., highways, railways) or utilities (e.g., pipelines, power lines, water lines) that often intersect waterways. Vegetation is closely managed in these areas to prevent disruption to transportation or utilities (e.g., circuit outages, fires) and to ensure personal safety. Maintenance activities include mowing, brushing, topping and slashing of terrestrial vegetation. This Operational Statement applies only to existing rights-of-way at the location where they intersect and cross a water body.

Riparian areas are the vegetated areas adjacent to a water body and directly contribute to fish habitat by providing shade, cover and food production areas. Riparian areas are also important because they stabilize stream banks and shorelines. In order to minimize disturbance to fish habitat and prevent bank erosion, it is important to retain as much riparian vegetation as possible, especially the vegetation directly adjacent to the watercourse, in the right-of-way corridor.

Activities carried out to maintain riparian vegetation in existing rights-of-way can negatively impact fish and fish habitat by causing excessive loss of riparian vegetation, erosion and sedimentation, disturbance to the banks and the bottom of the water body from use of heavy equipment, and introduction of deleterious substances as a result of inadequate containment of spoil piles and improper maintenance of equipment.

Fisheries and Oceans Canada (DFO) is responsible for protecting fish and fish habitat across Canada. Under the [Fisheries Act](#) no one may carry out a work or undertaking that will cause the harmful alteration, disruption or destruction (HADD) of fish habitat unless it has been authorized by DFO. By following the conditions and measures set out below you will be in compliance with subsection 35(1) of the [Fisheries Act](#).

The purpose of this Operational Statement is to describe the conditions under which it is applicable to your project and the measures to be incorporated into your project in order to avoid negative impacts to fish habitat. You may proceed with your right-of-way maintenance project without a DFO review when you meet the following conditions:

- the work involves the maintenance of vegetation in an **existing** right-of-way for a transportation or utility corridor and not construction of a new right-of-way,
- it is an existing right-of-way at the location where it intersects and crosses a water body,
- it involves the use of vegetative maintenance techniques that allow the root system to stay intact, to help bind the soil and encourage rapid colonization of low-growing plant species, and
- you incorporate the *Measures to Protect Fish and Fish Habitat when Maintaining Riparian Vegetation in Rights-of-Way* listed below in this Operational Statement.

If you cannot meet all of the conditions listed above and cannot incorporate all of the measures listed below then your project may result in a violation of subsection 35(1) of the [Fisheries Act](#) and you could be subject to enforcement action. In this case, you should contact the DFO office in your area if you wish to obtain DFO's opinion on the possible options you should consider to avoid contravention of the [Fisheries Act](#).





**You are required to respect all municipal, provincial or federal legislation that applies to the work being carried out in relation to this Operational Statement.** The activities undertaken in this Operational Statement must also comply with the *Species at Risk Act* ([www.sararegistry.gc.ca](http://www.sararegistry.gc.ca)). If you have questions regarding this Operational Statement, please contact the DFO office in your area (see Saskatchewan DFO office list).

We ask that you notify DFO, preferably 10 working days before starting your work by filling out and sending the Saskatchewan Operational Statement notification form (<http://www.dfo-mpo.ca/regions/central/habitat/os-ee/provinces-territoires-territoires/sk/os-ee20-eng.htm>) to the DFO office in your area. This information is requested in order to evaluate the effectiveness of the work carried out in relation to this Operational Statement.

### Measures to Protect Fish and Fish Habitat when Maintaining Riparian Vegetation in Rights-of-way

1. While this Operational Statement does not cover the complete clearing of riparian vegetation, the alteration (e.g., topping and pruning) of select plants may be necessary to meet operational and safety needs.
2. Combined maintenance activities (e.g., mowing, brushing, topping, slashing, etc.) will affect no more than one third (1/3) of the total woody vegetation, such as trees and shrubs, in the right-of-way within 30 metres of the ordinary high water mark (see definition below) in any given year.
3. When practicable, alter riparian vegetation in the right-of-way by hand. If machinery must be used, operate machinery on land and in a manner that minimizes disturbance to the banks of the water body.
  - 3.1. Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
  - 3.2. Wash, refuel and service machinery and store fuel and other materials for the machinery, which include hand tools, at locations away from the water to prevent any deleterious substance from entering the water body.
  - 3.3. Keep an emergency spill kit on site in case of fluid leaks or spills from machinery.
  - 3.4. Restore banks to original condition if any disturbance occurs.
4. Machinery fording the watercourse to bring equipment required for maintenance to the opposite side is limited to a one-time event (over and back) and should occur only if an existing crossing at another location is not available or practical to use. A *Temporary Stream Crossing Operational Statement* is also available.
  - 4.1. If minor rutting is likely to occur, stream bank and bed protection methods (e.g., swamp mats, pads) should be used provided they do not constrict flows or block fish passage.
  - 4.2. Grading of the stream banks for the approaches should not occur.
  - 4.3. If the stream bed and banks are steep and highly erodible (e.g., dominated by organic materials and silts) and erosion and degradation are likely to occur as a result of equipment fording, then a temporary crossing structure or other practice should be used to protect these areas.
  - 4.4. The one-time fording should prevent disruption to sensitive fish life stages by adhering to appropriate fisheries timing windows (see the *Saskatchewan In-Water Closed Construction Timing Windows*).
  - 4.5. Fording should occur under low flow conditions and not when flows are elevated due to local rain events or seasonal flooding.
5. When altering a tree that is located on the bank of a water body, ensure that the root structure and stability are maintained.

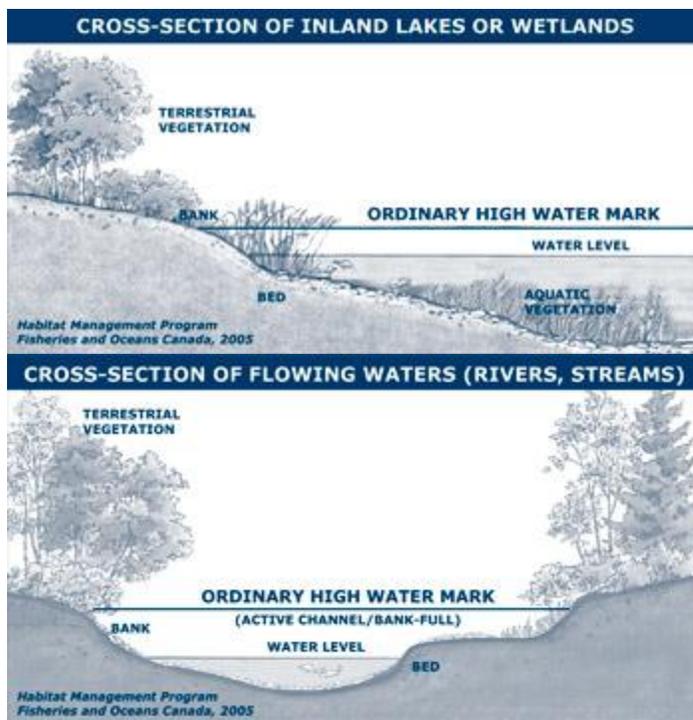




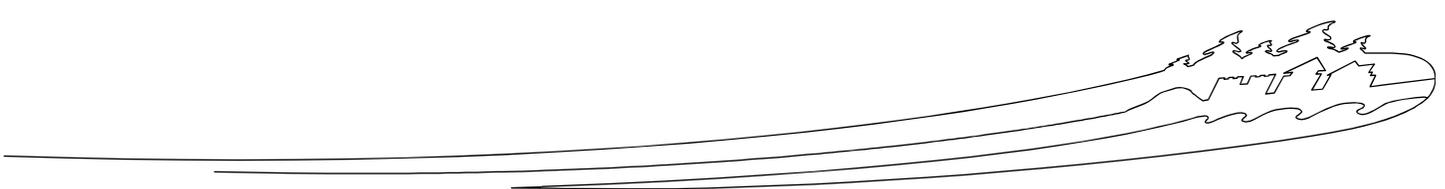
6. Stabilize any waste materials removed from the work site to prevent them from entering the water body. This could include covering spoil piles with biodegradable mats or tarps. All long-term storage of waste materials should be kept outside of the riparian area.
7. In order to prevent erosion and to help seeds germinate, vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs or grasses and cover such areas with mulch. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
  - o 7.1. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.

**Definition:**

**Ordinary high water mark** – The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land. In flowing waters (rivers, streams) this refers to the “active channel/bank-full level” which is often the 1:2 year flood flow return level. In inland lakes or wetlands, it refers to those parts of the water body bed and banks that are frequently flooded by water so as to leave a mark on the land and where the natural vegetation changes from predominately aquatic vegetation to terrestrial vegetation (excepting water tolerant species). For reservoirs this refers to normal high operating levels (Full Supply Level).



[\*Aussi disponible en français\*](#)





## Attachment C: Emergency Contacts and Spill Reporting

The following phone numbers are provided for **24 hour contact for Emergencies**.

**Parks Canada Jasper Dispatch.....1-877-852-3100**

**Waskesiu Lake Fire Department.....911**

**Waskesiu Lake RCMP Detachment.....911**

**Spill Report.....1-800-667-7525**

Non-emergency contact numbers

**PANP Resource Conservation Office.....(306) 663-4532**

**PANP Environmental Officer.....(306) 663-4543**

In case of a spill of a hazardous substance, waste or other pollutant, take immediate action to stop the spill and contain the substance only if you are trained and the substance is identifiable from an appropriate distance. If you are not trained, use rule of thumb. Place your thumb in front of one eye and look at the scene, if the scene spreads outside your thumb, you are too close. Advise the Environmental Officer or Warden Service immediately. Record and be prepared to report the following information:

1. Location and time of the spill
2. Type and quantity of pollutant spilled
3. The cause and potential effects of the spill
4. A description of the immediate spill site and surrounding area (soil type, nearness to water sources, distance to dwellings, location of domestic services)
5. Details of actions taken to contain and abate the spill.

