



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 748-2016

**CONSTRUCTION OF 2700 TRUNK SEWER -
COCKBURN & CALROSSIE SEWER RELIEF WORKS - CONTRACT 4**

BIDDERS PLEASE SEE NOTE D22

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APPENDIX B – Geotechnical Baseline Report (GBR)

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

- B1.1 CONSTRUCTION OF 2700 TRUNK SEWER -
COCKBURN & CALROSSIE SEWER RELIEF WORKS - CONTRACT 4

B2. SUBMISSION DEADLINE

- B2.1 The Submission Deadline is 12:00 noon Winnipeg time, January 26, 2017.
- B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.
- B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

- B3.1 Further to C3.1, the Bidder may view the Site without making an appointment
- B3.2 The Bidder shall be aware that several active construction sites exist around the Site. The Bidder should be mindful of the adjacent construction sites and should not knowingly enter areas designated as active construction areas. For safety, the Bidder should wear appropriate PPE for a construction site.
- B3.3 The Bidder shall not enter or cross the CN Railway right-of way during any such Site visit.
- B3.4 The Bidder is advised that before submitting a Bid, each Bidder may, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional information and data which pertain to subsurface or physical conditions at or contiguous to the Site or otherwise, which may affect cost, progress, performance, or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.
- B3.5 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B4. ENQUIRIES

- B4.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.
- B4.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.
- B4.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.
- B4.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.
- B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B4 unless that response or interpretation is provided by the Contract Administrator in writing.

B5. CONFIDENTIALITY

- B5.1 Information provided to a Bidder by the City or acquired by a Bidder by way of further enquiries or through investigation is confidential. Such information shall not be used or disclosed in any way without the prior written authorization of the Contract Administrator. The use and disclosure of the confidential information shall not apply to information which:
- (a) was known to the Bidder before receipt hereof; or
 - (b) becomes publicly known other than through the Bidder; or
 - (c) is disclosed pursuant to the requirements of a governmental authority or judicial order.
- B5.2 The Bidder shall not make any statement of fact or opinion regarding any aspect of the Bid Opportunity to the media or any member of the public without the prior written authorization of the Contract Administrator.

B6. ADDENDA

- B6.1 The Contract Administrator may, at any time prior to the Submission Deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.
- B6.2 The Contract Administrator will issue each addendum at least two (2) Business Days prior to the Submission Deadline, or provide at least two (2) Business Days by extending the Submission Deadline.
- B6.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>
- B6.2.2 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B6.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B7. SUBSTITUTES

- B7.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.
- B7.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B7.3 Requests for approval of a substitute will not be considered unless received in writing by the Contract Administrator at least five (5) Business Days prior to the Submission Deadline.
- B7.4 The Bidder shall ensure that any and all requests for approval of a substitute:
- (a) provide sufficient information and details to enable the Contract Administrator to determine the acceptability of the Plant, Material or method as either an approved equal or alternative;
 - (b) identify any and all changes required in the applicable Work, and all changes to any other Work, which would become necessary to accommodate the substitute;
 - (c) identify any anticipated cost or time savings that may be associated with the substitute;
 - (d) certify that, in the case of a request for approval as an approved equal, the substitute will fully perform the functions called for by the general design, be of equal or superior substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance;

(e) certify that, in the case of a request for approval as an approved alternative, the substitute will adequately perform the functions called for by the general design, be similar in substance to that specified, is suited to the same use and capable of performing the same function as that specified and can be incorporated into the Work, strictly in accordance with the proposed work schedule and the dates specified in the Supplemental Conditions for Substantial Performance and Total Performance.

B7.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.

B7.6 The Contract Administrator will provide a response in writing, at least two (2) Business Days prior to the Submission Deadline, to the Bidder who requested approval of the substitute.

B7.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

B7.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B7.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B17.

B7.9 No later claim by the Contractor for an addition to the Total Bid Price because of any other changes in the Work necessitated by the use of an approved equal or an approved alternative will be considered.

B8. BID COMPONENTS

B8.1 The Bid shall consist of the following components:

- (a) Form A: Bid;
- (b) Form B: Prices;
- (c) Bid Security
 - (i) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;

B8.2 Further to B8.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B7.

B8.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.

B8.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B8.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.

B8.5 Bidders are advised not to include any information/literature except as requested in accordance with B8.1.

B8.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B17.1(a).

B8.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B8.8 Bids shall be submitted to:

The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B9. BID

B9.1 The Bidder shall complete Form A: Bid, making all required entries.

B9.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her name shall be inserted;
- (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
- (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
- (d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B9.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B9.2.

B9.3 In Paragraph 3 of Form A: Bid, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B9.4 Paragraph 12 of Form A: Bid shall be signed in accordance with the following requirements:

- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, it shall be signed by the Bidder;
- (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
- (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, should be affixed;
- (d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B9.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed below such signatures.

B9.5 If a Bid is submitted jointly by two or more persons, the word "Bidder" shall mean each and all such persons, and the undertakings, covenants and obligations of such joint Bidders in the Bid and the Contract, when awarded, shall be both joint and several.

B10. PRICES

B10.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B10.2 The Bidder must complete the Approximate Quantity column for item D1 Initial Span on Form B: Prices in accordance with D22

- B10.3 The quantities listed on Form B: Prices are to be considered approximate only. The City will use said quantities for the purpose of comparing Bids.
- B10.4 The quantities for which payment will be made to the Contractor are to be determined by the Work actually performed and completed by the Contractor, to be measured as specified in the applicable Specifications.
- B10.5 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B11. DISCLOSURE

- B11.1 Various Persons provided information or services with respect to this Work. In the City's opinion, this relationship or association does not create a conflict of interest because of this full disclosure. Where applicable, additional material available as a result of contact with these Persons is listed below.
- B11.2 The Persons are:
- (a) Michels Tunnelling
 - (i) Provision of advice on typical shaft diameters, timing of works and potential shaft locations along the proposed route.
 - (b) Lafarge Canada Inc.
 - (i) Provision of advice on typical concrete pipe strengths and typical manhole sizing for installation for future considerations.

B12. QUALIFICATION

- B12.1 The Bidder shall:
- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba; and
 - (b) be financially capable of carrying out the terms of the Contract; and
 - (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.
- B12.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/debar.stm>
- B12.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) have successfully carried out work similar in nature, scope and value to the Work; and
 - (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
 - (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);
 - (d) The City has, through a Request for Qualification process, RFQ No. 908-2016 identified Tunnelling Contractors who have successfully prequalified to participate in this project. . Only submissions from one of the prequalified contractors will be accepted. Any Contractor submitting a tender bid using a Tunnelling Contractor not prequalified by this process will be rejected.

(e) The following Tunnelling Contractors have been prequalified:

- (i) CRS Tunnelling Inc.
Walter Trisi
Vice President
1151 South Service Road, West Unit #3
Oakville, ON, L6L 6K4
Ph: 905-469-1200
Fax: 905-469-1400
- (ii) Marathon Drilling Co. Ltd
Mario Venditti
Manager
6847 Hiram Drive
Greely, ON, K4P 1A2
Ph: 613-822-0571
Fax: 613-822-7176
- (iii) Michels Canada Co.
Sandra LeBreton
Contract and Proposal Manager
1102-16 Avenue
Nisku, AB, T9E 0A9
Ph: 780-955-2120 ext. 1234
Fax: 780-955-4240
- (iv) Shanghai Construction Group (Canada) Corporation
Junfeng Ye
Vice President
11810 Kingsway Avenue NW
Edmonton, AB, T5G 0X5
Ph: 780-953-8518
Fax: 780-453-5663
- (v) Technicore Underground Inc.
Nik Marinov, P.Eng
Project Manager
102 Bales Drive East, PO Box 93089
Newmarket, ON, L3Y 8K3
Ph: 905-898-4889
Fax: 905-898-2822
- (vi) Ward & Burke Microtunnelling Ltd.
Seamis Tynan
Engineer/Estimator
2410 Meadowpine Boulevard, Unit 101
Mississauga, ON, L5N 6S2
Ph: 416-891-9378
Fax: 905-821-1525

B12.4 Further to B12.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:

- (a) a copy of their valid Manitoba COR certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Certificate of Recognition (COR) Program administered

by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or

- (b) a copy of their valid Manitoba SECOR™ certificate and Letter of Good Standing (or Manitoba equivalency) as issued under the Small Employer Certificate of Recognition Program (SECOR™) administered by the Construction Safety Association of Manitoba or by the Manitoba Heavy Construction Association's WORKSAFELY™ COR™ Program; or
- (c) a report or letter to that effect from an independent reviewer acceptable to the City. (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>).

B12.5 The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.

B12.6 The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B13. BID SECURITY

B13.1 The Bidder shall provide bid security in the form of:

- (a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
- (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or
- (c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.

B13.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.

B13.1.2 All signatures on bid securities shall be original.

B13.1.3 The Bidder shall sign the Bid Bond.

B13.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.

B13.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B13.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B13.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B13.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B13.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

- B14.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.
- B14.1.1 Bidders or their representatives may attend.
- B14.1.2 Bids determined by the Manager of Materials, or his/her designate, to not include the bid security specified in B13 will not be read out.
- B14.2 Following the Submission Deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B14.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B14.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B15. IRREVOCABLE BID

- B15.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.
- B15.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

B16. WITHDRAWAL OF BIDS

- B16.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.
- B16.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.
- B16.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B16.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
 - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and
 - (c) if the notice has been given by any one of the persons specified in B16.1.3(b), declare the Bid withdrawn.
- B16.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B15.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative

Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

B17. EVALUATION OF BIDS

B17.1 Award of the Contract shall be based on the following bid evaluation criteria:

- (a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation there from (pass/fail);
- (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B12 (pass/fail);
- (c) Total Evaluated Bid Price;
- (d) economic analysis of any approved alternative pursuant to B7.

B17.2 Further to B17.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.

B17.3 Further to B17.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is responsible and qualified.

B17.4 Further to B17.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on either of Form B: Prices.

B17.4.1 Further to B17.1(a), in the event that a unit price is not provided on either Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B17.4.2 Further to B17.1(c) the Evaluated Total Bid Price shall include Site Occupancy Costs shown on Form B: Prices. Site Occupancy Costs shall be the Initial Span bid in the Charged Days, multiplied by the Site Occupancy Unit Price listed in Form B: Prices

B18. AWARD OF CONTRACT

B18.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B18.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.

B18.2.1 Without limiting the generality of B18.2, the City will have no obligation to award a Contract where:

- (a) the prices exceed the available City funds for the Work;
- (b) the prices are materially in excess of the prices received for similar work in the past;
- (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;
- (d) only one Bid is received; or
- (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.

B18.3 The Work of this Contract is contingent upon Council approval of sufficient funding in the 2017 Capital Budget. If the Capital Budget approved by Council does not include sufficient funding for the Work, the City will have no obligation to award a Contract.

B18.4 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B17.

B18.4.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 2006 12 15) are applicable to the Work of the Contract.
- C0.1.1 The *General Conditions for Construction* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm
- C0.2 A reference in the Bid Opportunity to a section, clause or subclause with the prefix “**C**” designates a section, clause or subclause in the *General Conditions for Construction*.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

- D1.1 In addition to the *General Conditions for Construction*, these Supplemental Conditions are applicable to the Work of the Contract.
- (a) Further to C2.4:
 - (i) Specifications shall govern over Geotechnical Baseline Report (GBR)
 - (ii) The GBR shall Govern over the Geotechnical Data Report (GDR)
 - (b) Further to C3.1(a), replace clause (ii) with the following:
 - (i) the nature of the surface and subsurface conditions at the Site, and reviewed the GBR and GDR appended to these Specifications.

D2. SCOPE OF WORK

- D2.1 The Work to be done under the Contract shall consist of the construction of land drainage sewers in accordance with the applicable Specifications and Drawings.
- D2.2 The major components of the Work are as follows:
- (a) Construction of 2700 mm diameter land drainage sewer by Tunnelling and Pipe Jacking.
 - (b) Construction of 1350 mm diameter land drainage sewer with manhole for future connection on Sparling Avenue.
 - (c) Instrumentation and monitoring of surface and subsurface features to identify potential settlements caused by the tunnelling operation. This is especially critical for the crossing of the Canadian National Railway main line and spur line which receives over 48 trains per day.
 - (d) Surface restoration and related works.

D3. DEFINITIONS

- D3.1 When used in this Bid Opportunity:
- (a) **“Building/Structure Monitoring Point”** (BMP) means a structural monitoring point be used to monitor horizontal and vertical deformation of structures. BMPs shall consist of non destructive and stable elements firmly attached to structures with locations clearly identified.
 - (b) **“Charged Day”** means the unit of measurement of time for Site Occupancy. For purposes of assessing Charged Days, a Charged Day will be equivalent to a Working Day as defined in C1.1 (jj) and amended in D16.
 - (c) **“Earth Pressure Balance Machine”** (EPBM) means a steerable tunnelling shield that achieves soil excavation by means of a rotating cutter-wheel. Tunnelling operations are usually performed from within the shield. A key attribute of EPBM tunnelling is the ability to maintain a pressurized face. The pressurized face is accomplished using a closed bulkhead wherein excavated materials at the face, mixed with injected soil conditioners such as foam, bentonite and/or polymers, are balanced against the in-situ soil and water pressures, thus providing a means of support at the face, without requiring dewatering, as the tunnel excavation is advanced.
 - (d) **“Final Span”** means the number of Charged Days assessed for Site Occupancy as calculated pursuant to D22.3.
 - (e) **“Initial Span”** means the number of Charged Days bid by the Contractor for Site Occupancy on Form B: Prices.

- (f) **“Intermediate Jacking Station”** (IJS) means a fabricated steel cylinder fitted with hydraulic jacks spaced around the circumference, which is incorporated into the string of jacking pipe between two specially fabricated pipe sections. The function of an intermediate jacking station is to distribute the jacking load along the pipe string during pipe installation. The hydraulic jacks are removed at the completion of a drive and the gap between adjacent pipe sections is fully closed by pushing the pipes together with the main shaft jacks or another IJS. The steel cylinder remains as an extended sleeve or coupling. The steel cylinder must be protected from corrosion, consistent with corrosion protection used for the jacking pipe and joints. Provide stainless steel cylinder of the same grade of steel required for the jacking pipe.
- (g) **“Jacking Pipe”** means pipe jacked behind the TBM, as shown on the drawings. The jacking pipe shall be specifically designed to be installed by the method of tunnelling and pipe jacking method selected by the Contractor.
- (h) **“Microtunnel Boring Machine”** (MTBM) means a remote-controlled, guided slurry tunnelling shield that can provide continuous support to the excavation face. The MTBM is operated from a control container located on the ground surface. Soil excavation is achieved by a rotating cutter-wheel. Excavated soil enters a slurry chamber where it is mixed with clean slurry to form a slurry with cuttings. Pumps cycle the slurry to the surface where a separation plant removes the solids from the slurry. The recycled slurry is then returned to the face in a closed-system of pumps and hoses. Because of the remote-control operation and the closed spoil-removal system, routine personnel entry into the MTBM is not required. Slurry used to convey spoil contains additives such as bentonite that thicken the slurry, allowing it to carry more solids and providing gel strength to prevent the slurry from permeating the soils at the heading. The guidance system consists of a laser or theodolite and electronic distance meter mounted in the jacking shaft communicating a reference line to a target mounted in the MTBM’s articulated steering head. The target in an MTBM provides the operator with information about machine attitude and pitch, and can allow for accurate steering control
- (i) **“Open Face Rotary Wheel TBM”** (TBM) Steerable tunnelling shield that achieves soil excavation by means of a rotating cutter-wheel. TBM operations are usually performed from within the TBM, and excavated soil is discharged to a conveyor or muck car where it is transported to the ground surface for disposal. An Earth-Pressure Balance Tunnelling Machine (EPBM) shield may also be used and operated in an open-face mode. The guidance system consists of a laser or theodolite and EDM device mounted in the jacking shaft communicating a reference line to a target mounted in the TBM’s articulated steering head. The target in the TBM provides the operator with information about machine attitude and pitch, and allows for accurate steering control.
- (j) **“Parker Lands”** means the lands bound between Canadian National Railway Line and Parker Avenue.
- (k) **“Settlement Point”** means a point with elevation and spatial location established by survey prior to construction. The point is re-surveyed periodically to monitor ground movements. The point may be a nail, pin, subsurface settlement rod, borehole extensometer, or other device that can be readily located and surveyed.
- (l) **“Site Occupancy”** means a system for monitoring and administering progress of the Work. Site occupancy involves the Contract Administrator setting a completion date for the Work along with a daily Contract Administration cost (Site Occupancy cost) for each Working Day the contractor is able to work. The Contractor bids the number of anticipated Working Days to complete the Work, and depending on the actual Working Days to complete the Work, there may be a bonus payment or deduction applied to the final payment.
- (m) **“Stormwater Retention Basin”** (SRB) means a constructed pond for the purpose of holding stormwater runoff, which for the Contract may mean either the Parker Stormwater Retention Basin, or the private existing land drainage sewer (LDS) pond on the east side of Wilton Avenue adjacent to Walmart.
- (n) **“Subsurface Monitoring Point”** (SSM) means a cased borehole settlement monitoring point located above the tunnel crown used for detecting settlement between the location of

the settlement point and the tunnel excavation. This device serves as a simple borehole extensometer.

- (o) **“Surface Monitoring Point”** (SMP) means monitoring points established to measure elevation of the ground surface.
- (p) **“Utility Monitoring Point”** (UMP) means a monitoring point set on the top of an existing pipeline using a steel rod within a cased hole.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is KGS Group, represented by:

Ray Offman, M.Sc., (CE), P.Eng.
Infrastructure Engineer/ Project Manager

Telephone No. 204-896-1209
Email: ROffman@kgsgroup.com

D4.2 At the pre-construction meeting, Ray Offman will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D4.3 Bids Submissions must be submitted to the address in B8.8.

D5. CONTRACTOR'S SUPERVISOR

D5.1 At the pre-construction meeting, the Contractor shall identify his/her designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D6. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

D6.1 The Contract, all deliverables produced or developed, and information provided to or acquired by the Contractor are the property of the City and shall not be appropriated for the Contractors own use, or for the use of any third party.

D6.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D6.3 The following shall be confidential and shall not be disclosed by the Contractor to the media or any member of the public without the prior written authorization of the Contract Administrator;

- (a) information provided to the Contractor by the City or acquired by the Contractor during the course of the Work;
- (b) the Contract, all deliverables produced or developed; and
- (c) any statement of fact or opinion regarding any aspect of the Contract.

D6.4 A Contractor who violates any provision of D6 may be determined to be in breach of Contract.

D7. NOTICES

D7.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

D7.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D7.3, D7.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the facsimile number identified in D4.1.

D7.3 Notwithstanding C21, all notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following facsimile number:

The City of Winnipeg
Chief Financial Officer

Facsimile No.: 204 949-1174

D7.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following facsimile number:

The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services

Facsimile No.: 204 947-9155

D7.5 Bids Submissions must be submitted to the address in B8.8.

D8. FURNISHING OF DOCUMENTS

D8.1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him/her at cost.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

D9.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D10. SAFE WORK PLAN

D10.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D10.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Safety/default.stm>

D11. INSURANCE

D11.1 The Contractor shall provide and maintain the following insurance coverage to remain in place at all times during the performance of the Work:

- (a) Wrap-up general liability insurance in an amount of no less than ten million dollars (\$10,000,000) inclusive per occurrence and ten million dollars (\$10,000,000) general aggregate. The insured parties shall include the City, Contractor, Canadian National Railway, all subcontractors whether named or unnamed in the policy and all others having an insurable interest in the Work. Wrap up liability insurance to also include but not limited to:
 - (i) products and completed operations
 - (ii) personal injury liability

- (iii) owners and contractors protective coverage
- (iv) broad form property damage
- (v) unlicensed motor vehicle liability
- (vi) non-owned automobile liability
- (vii) blanket written contractual liability
- (viii) cross liability clause
- (ix) no XCU exclusion
- (x) waiver of subrogation against the City and Canadian National Railway
- (xi) blasting, demolition, tunnelling or the removal or weakening of support of any land, whether such support be natural or otherwise
- (xii) contingent employer's liability
- (xiii) sudden and accidental pollution (as per IBC 2313 or similar) (120 hours/120 hours),

Wrap-up liability insurance shall be maintained from the date of the commencement of the Work until the date of Total Performance of the work and shall include an additional 24 months completed operation coverage which will take affect after Total Performance.

- (b) All risks course of construction insurance, including testing and commissioning, in an amount of one hundred percent (100%) of the Contract Price. Coverage will extend for at least ten (10) days after the substantial completion date if all testing and commissioning has not been completed at that time, the policy will extend until such time as all testing and commissioning has been completed.
- (c) Automobile liability Insurance covering all motor vehicles, owned and operated and used or to be used by the Contractor directly or indirectly in the performance of the Work. The Limit of Liability shall not be less than five million dollars (\$5,000,000) inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence.
- (d) Contractors Pollution Liability (CPL) insurance in the amount of at least five million dollars (\$5,000,000) per occurrence and five million dollars (\$5,000,000) aggregate covering third party injury and property damage claims, defence costs; including clean-up costs and transported cargo as a result of pollution conditions arising from the Contractor's operations and completed operations. Such policy shall name the City, as additional insureds and include a twenty-four (24) month extended reporting period.

D11.2 Deductibles shall be borne by the Contractor.

D11.3 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D11.4 The Contractor shall provide the Contract Administrator with a certificate(s) of insurance, in a form satisfactory to the City Solicitor, at least two (2) business days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D11.5 The Contractor shall not cancel, materially alter, or cause any such policy or policies to lapse without a minimum thirty (30) calendar days prior written notice to the Contract Administrator.

D12. PERFORMANCE SECURITY

D12.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:

- (a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or

- (b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or
- (c) a certified cheque or draft payable to "The City of Winnipeg", drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.

D12.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.

D12.2 If the bid security provided in his/her Bid was not a certified cheque or draft pursuant to B13.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract.

D13. SUBCONTRACTOR LIST

D13.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.

D14. DETAILED WORK SCHEDULE

D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract.

D14.2 The detailed work schedule shall consist of the following:

- (a) A critical path method (CPM) schedule for the work; and
 - (b) A Gantt chart for the Work based on the CPM schedule;
- as acceptable by the Contract Administrator.

D14.3 Further to D14.2(a), the CPM schedule shall clearly identify start and completion dates of the following Work items:

- (a) Commencement Date
- (b) Mobilization
- (c) Shafts by location
 - (i) excavation and support
 - (ii) Working slab
 - (iii) Thrust block construction
 - (iv) Jacking equipment setup
 - (v) Entry/exit seal installation
- (d) Sewer Construction
 - (i) Tunnelling across the CN Rail ROW
 - (ii) Tunnelling from north of CN Rail line to STA 1+520.55 near the intersection of Taylor Avenue and Wilton Street.
 - (iii) Trenchless Installation along Sparling Avenue
- (e) Critical Date
- (f) Surface restoration

- (g) Substantial Performance
- (h) Total Performance

- D14.4 Further to D14.2(b), the Gantt chart shall, on a weekly basis, show the time required to carry out the Work of each trade or specification division. Time shall be on the horizontal axis and the type of trade shall be on the vertical axis.
- D14.5 The Contractor shall update the schedule to the Contract Administrator prior to each weekly construction site meeting for review and discussion at the meetings.

SCHEDULE OF WORK

D15. COMMENCEMENT

- D15.1 The Contractor shall not commence any Work until he/she is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.
- D15.2 The Contractor shall not commence any Work on the Site until:
- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D9;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the Safe Work Plan specified in D10;
 - (iv) evidence of the insurance specified in D11;
 - (v) the performance security specified in D12;
 - (vi) the Subcontractor list specified in D13; and
 - (vii) the detailed work schedule specified in D14.
 - (b) the Contractor has attended a pre-construction meeting with the Contract Administrator, or the Contract Administrator has waived the requirement for a pre-construction meeting.
- D15.3 The Contractor shall commence the Work on the Site no later than the date of Total Performance as indicated in D21, less the number of Working Days bid as Initial Span for Site Occupancy and indicated on Form B: Prices. For purposes of establishing this date, Charged Days will be applied assuming five (5) charged days per calendar week, and not including Statutory Holidays or the period after Substantial Performance at which permanent pavement restoration cannot proceed due to inclement weather and the subsequent May 15th date. If the Contractor has not commenced work by this date, Charged Days will be assessed for each day following this date, at the rate of five (5) Charged Days per calendar week, not including Statutory Holidays.
- D15.4 The Contractor shall commence with Work activities aimed at completing the tunnelling of the LDS sewer piping under the Canadian National Railway right-of-way, before any other tunnelling activities.
- D15.5 The City intends to award this Contract by April 10, 2017
- D15.5.1 If the actual date of award is later than the intended date, the dates specified for Critical Stages, Substantial Performance, and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D16. WORKING DAYS

- D16.1 Replace C1.1(jj) with the following:

Working Day” means any Calendar Day, other than a Saturday, Sunday, or a statutory or civic holiday, on which the Contract Administrator determines atmospheric and Site conditions are such that the Contractor is able to work at least seven (7) hours during the

period between 12:00 a.m. Winnipeg time or the time the Contractor's operations normally commence, whichever is the earlier, and 11:59 p.m. Winnipeg time.

- D16.2 Notwithstanding D16.1, a Working Day includes a Saturday, Sunday, or a statutory or civic holiday when the Contractor chooses to undertake work requiring the presence of the Contract Administrator and/or City resources.
- D16.3 Further to D16.1, the Contract Administrator's determination of whether or not atmospheric and Site conditions are such that a Working Day is deemed to have elapsed may be based at one time on one type of work while at another time a Working Day may be based on another type of work. When more than one type of major work is involved, the quantity of equipment that must be able to work in order to meet the requirements of a Working Day may vary considerably from that specified in the General Conditions...
- D16.4 In the event that incidental work is behind schedule which, in the opinion of the Contract Administrator, should have been or could have been carried out by the Contractor in conjunction with or immediately following work of a major type, the City hereby reserves the right to charge Working Days on the incidental work until such time as it is up to schedule.
- D16.5 When the major type of work involves restoration of the site to the condition it was prior to rainfall, Working Days shall not be charged.
- D16.6 The Contract Administrator will furnish the Contractor with a weekly record for each major type of work, the equipment used, the time it worked and Working Days charged. This record will be provided at regular site meetings.

D17. HOURS OF WORK

- D17.1 Contractors are permitted to conduct 24 hour operations when working within the permanent LDS Easement or LDS Construction Easement shown on LD-7958 between the CNR line and Taylor Avenue. Work on Taylor Avenue and Wilton Street, and vehicle traffic into and out of the Parker Lands must be conducted between 7:00 am and 9:00 pm (weekdays) and between 9:00 am and 9:00 pm (weekends and holidays) in accordance with the City of Winnipeg Neighbourhood Livability By-Law.

D18. CRITICAL STAGES

- D18.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:
- (a) Complete all Work that requires access to the Parker Lands by September 15, 2017.
 - (i) This includes but is not limited to all Work associated with the Tunnelling and Pipe Jacking across the CNR right of way, construction and backfilling of the shaft within the Parker Lands, and the development and restoration of the access into the Parker lands along the Rockman Street right-of-way.
 - (ii) The City intends for the construction of the SRB within the Parker Lands (by others) to commence on October 1, 2017. All Work associated with Contract 4 must be completed in order for this work to commence.

D19. LIQUIDATED DAMAGES

- D19.1 If the Contractor fails to achieve Critical Stages in accordance with the Contract by the day fixed herein for same, the Contractor shall pay the City the following amounts for each Calendar Day following the day herein for Critical Stages during which such failure continues.
- (a) Critical Stages – Three thousand dollars (\$3,000.00)
- D19.2 The amount specified for liquidated damages in D19.1 is based on a genuine pre-estimate of the City's damages in the event that the Contractor does not achieve Critical Stages by the day fixed herein for same.

D19.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D20. SUBSTANTIAL PERFORMANCE

D20.1 The Contractor shall achieve Substantial Performance by December 15, 2017.

D20.2 When the Contractor considers the Work to be substantially performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Substantial Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D20.3 The date on which the Work has been certified by the Contract Administrator as being substantially performed to the requirements of the Contract through the issue of a certificate of Substantial Performance is the date on which Substantial Performance has been achieved.

D20.4 At a minimum, all of the Work associated with the Sewer Installation (LDS) noted on the Form B must all be installed in accordance with the Drawings and Specifications to be considered for Substantial Performance.

D21. TOTAL PERFORMANCE

D21.1 The Contractor shall achieve Total Performance by June 15, 2018.

D21.2 When the Contractor or the Contract Administrator considers the Work to be totally performed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Total Performance. Any defects or deficiencies in the Work noted during that inspection shall be remedied by the Contractor at the earliest possible instance and the Contract Administrator notified so that the Work can be reinspected.

D21.3 The date on which the Work has been certified by the Contract Administrator as being totally performed to the requirements of the Contract through the issue of a certificate of Total Performance is the date on which Total Performance has been achieved.

D22. SITE OCCUPANCY

D22.1 Definitions

D22.1.1 Wherever the following terms are used, the intent and meaning will be interpreted as follows:

- (a) Charged Days: Means the unit of measurement for time of Site Occupancy. For the purpose of assessing Charged Days, a Charged Day will be equivalent to a Working Day as defined in C1.1 (jj) and amended in D15.3.
- (b) Initial Span: Means the number of Charged Days bid by the Contractor for Site Occupancy on Form B: Prices.
- (c) Final Span: Means the number of Charged Days assessed for Site Occupancy as calculated pursuant to D22.2.1

D22.2 Measurement

D22.2.1 Time shall be of the essence of the Contract. The Contractor shall provide the necessary material, labour and equipment to ensure that the Works will be completed within the consecutive amount of Charged Days Bid for Initial Span for Site Occupancy, and in no case later than the date specified for Substantial Performance for all work excluding permanent restoration and in no case later than the date specified for Total Performance for all Works. Failure to complete the Work within the Bid number of Charged Days will result in the deduction of Site Occupancy costs, as further defined herein. The total amount of Charged Days will be measures in whole numbers.

- D22.2.2 Charged Days will be assessed for every day except for the following:
- (a) Days prior to the Contractor starting work on a stage of the Contract. The Contractor shall provide a minimum of 14 days' notice to the City for commencement of the work. Failure of the Contractor to commence work as indicated, in the opinion of the Contract Administrator, may result in the assessment of Charged Days equivalent to the estimated costs incurred to the City;
 - (b) Days not worked due to Force Majeure.
 - (c) Days between Substantial Performance and May 15th, should the date of Substantial Performance be achieved at a time when permanent pavement works has been suspended as a result of inclement seasonal weather.
- D22.2.3 Should Substantial Performance be achieved at a date when permanent restorations can take place, Charged Days will be assessed until such time that permanent restorations are suspended.
- D22.2.4 Further to D22.2.2, the Contractor will be permitted one (1) suspension of on-site construction to facilitate coordination of subcontractors, materials deliveries or seasonal weather, Charged Days will not be charged during this period. During this period, the Site must be made secure, roadways completely operational, and all existing facilities and work in progress be protected from weather or other potentially harmful effects. Changes to Contract Critical Stages or completion dates resulting from suspension of Charged Days, will not be considered.
- D22.3 Final Span
- D22.3.1 Extensions to the Initial Span will determine the Final Span and will be calculated as follows:
- (a) Final Span = $(F \div A) \times I$
 - (b) Where: Final Span = adjusted number of Charged Days allowed (a fraction of a day will be rounded up to a full day);
 - (i) F = Final Contract Amount (excluding Site Occupancy)
 - (ii) I = Initial Span of the Contract
 - (iii) A = Total amount at Award (excluding Site Occupancy)
- D22.4 Site Occupancy Payment
- D22.4.1 Payment for Site Occupancy for the Contract will be made as follows:
- (a) If the number of Charged Days equals the Final Span, no payment or deduction will be made
 - (b) If the number of Charged Days is less than the Final Span, a payment equal to the Contract Unit Price per Charged Day multiplied by the difference between the Final Span and the actual number of Charged Days, to a maximum amount of two percent (2%) of the Total Bid Price, will be made to the Contractor
 - (c) If the number of Charged Days exceeds the Final Span, a deduction equal to the Contract Unit Price per Charged Day multiplied by the difference between the actual number of Charged Days and the Final Span will be made from the payment to the Contractor.

D23. SCHEDULED MAINTENANCE

- D23.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:
- (a) Sodding as specified in CW3510;
 - (b) Watering and maintaining of all new trees and vegetation until established.

D23.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D24. JOB MEETINGS

D24.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.

D24.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D25. COORDINATION WITH OTHERS

D25.1 Work by others on or near the Site will include but not necessarily be limited to:

- (a) Manitoba Hydro – Relocation of fiber optic and distribution lines in the Parker Lands west of Daniel; and a single fibre optic rail crossing east of the 2700 mm tunnel. (This Work is planned to occur from May to August 2017)
- (b) City of Winnipeg Traffic Services Branch - Erection and maintenance of temporary traffic control.
- (c) Plenary Group (P3 Team working on the City of Winnipeg Southwest Rapid Transit Project) – Construction of pump station and rail underpass within the Parker Lands north of at Wynne Street and Parker Avenue. (Work has commenced and will continue through the course of this project)
- (d) Contractors (TBD) – Cockburn & Calrossie Sewer Relief Works – Contract 3A – Clearing of Parker Lands. (This work is anticipated to occur from March to May, 2017)
- (e) Contractor (TBD) – Cockburn & Calrossie Sewer Relief Works – Contract 3B – Construction of a stormwater retention basin within the Parker Lands as shown on the Drawings. (This work is anticipated to commence in October 2017)

D25.2 The Work will take place adjacent to an existing Walmart retail store and parking lot which must remain in operation with access to rear of building through permanent LDS easement for product delivery (expected vehicles are WB-20).

D26. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D26.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D27. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D27.1 Further to B12.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B12.4.

D28. TRAFFIC CONTROL

D28.1 Further to clauses 3.6 and 3.7 of CW 1130:

- (a) Where directed, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planning drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW 3410.
- (b) In accordance with the Manual of Temporary Traffic Control on City Streets, the Contractor ("Agency" in the manual) shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place all temporary regulatory signs. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

D28.2 Further to Section 3.7 of CW 1130 of the Site Requirements the Contractor shall be responsible to redirect and maintain traffic with appropriate signing in accordance with The City of Winnipeg. "Manual of Temporary Traffic Control on City Streets" at all times during construction. The Contractor will maintain those streets as defined in D27.

D29. TRAFFIC MANAGEMENT

D29.1 The Contractor shall be responsible for all signage including but not limited to lane divisions, and general construction barricades, except for that signage identified in the Manual of Temporary Traffic Control on City Streets as being the responsibility of the Public Works Department, Traffic Services Branch. The Contractor will provide the City and Contract Administrator a suitable Traffic Accommodation Strategy covering all the details for traffic management (cones and signage etc.) in each street at least seven (7) business days prior to commencement of any lane closures.

D29.2 The Contractor shall not interfere with traffic signals. All modification of traffic signals shall be done by the Public Works Department, Traffic Signals Branch.

D29.3 The Contractor shall be responsible for contacting Public Works Department, Traffic Management Branch Lane Closures via the web form at winnipeg.ca/publicworks/trafficControl/laneClosures/ at least three (3) business days prior to the commencement of any lane closures on Regional Streets. The Contractor shall also be responsible for reporting any changes to lane closure locations or commencement and/or completion dates to the aforementioned contact.

D29.4 The Contractor will provide a detailed schedule of work activities to the Contract Administrator providing all construction activities and potential required lane closures at least five (5) business days prior to commencement of lane closures.

D29.5 The Contractor may assume the following lane closures within their construction plan

D29.5.1 The northbound and southbound lanes of Wilton Street from Taylor to the lane north of Taylor Avenue (located on the west side of Wilton Street) may be closed to establish a working area and to construct their shaft.

D29.5.2 The northbound and southbound lanes of Wilton Street from Sparling Avenue to Taylor Avenue may be closed (as shown on drawing LD-7958).

D29.5.3 Walmart rear access along Sparling Avenue at the west side of the existing Walmart building must be maintained for Walmart delivery access at all times.

D29.6 Further to clause 3.7 of CW 1130, for Regional Streets (Taylor Avenue):

D29.6.1 The Contractor shall schedule construction activities to meet the following:

- (a) Maintain all lanes both westbound and eastbound of traffic on Taylor Avenue during construction. Temporary lane closures of the westbound curb lane will be permitted to facilitate the shaft installation Works.
- (b) Left turns may be prohibited at the following locations:

- (i) Taylor Avenue Eastbound at Wilton Street
 - (ii) Taylor Avenue Westbound at Wilton Street
- (c) Right turns may be prohibited at the following locations:
 - (i) Taylor Avenue Westbound at Wilton Street
 - (ii) Taylor Avenue Eastbound at Wilton Street
- D29.6.2 No lane closures of any kind will be permitted on Taylor Avenue from July 27th, 2017 to August 13, 2017, to permit planned activities for the 2017 Canada Games.
- D29.6.3 Winnipeg Transit service shall be maintained at all times. Should the Contractor be unable to maintain bus stops or routes it shall be reviewed with the Contract Administrator at least 48 hours in advance to see if modifications can be made.
- D29.6.4 Maintain access to Manitoba Hydro Parking lot at all times.
- D29.6.5 Intersecting street, private approach and lane access shall be maintained at all times.
- D29.6.6 Should the Contractor be unable to maintain pedestrian or vehicular access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.
- D29.7 Further to clause 3.7 of CW 1130, for Local/Non-Regional streets
- D29.7.1 The Contractor shall schedule construction activities to meet the following:
 - (a) One lane of traffic on Local/Non-Regional streets shall be maintained during construction where possible. The Contractor shall sign the street in accordance with the Manual Temporary Traffic Control, similar to Figures 25 to 28, as applicable.
 - (b) Winnipeg Transit service shall be maintained at all times. Should the Contractor be unable to maintain bus stops or routes it shall be reviewed with the Contract Administrator at least 48 hours in advance to see if modifications can be made.
 - (c) Intersecting street, private approach and lane access shall be maintained at all times.
- D29.7.2 Should the Contractor be unable to maintain an existing access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contractor Administrator, prior to disruption of access.
- D29.8 The Contractor shall not park company or private vehicles inside the barricaded work zone in a manner that will block sightlines for vehicles and pedestrians approaching and crossing or create any other safety concern.
- D29.9 Ambulance/ emergency vehicle access must be maintained at all times.
- D29.10 Truck route access for delivery to Walmart is to be maintained at all times. Should the Contractor be unable to maintain delivery access to the rear of the Walmart building, the Contractor shall provide at least five (5) days notification to the Contract Administrator to see if modifications can be made. The route of delivery access may be modified during the construction period, as Work progresses but access to the rear of the building must be maintained.

D30. PEDESTRIAN SAFETY

- D30.1 Further to Section 3.6 of CW 1130 of the Site Requirements, the Contractor shall maintain safe pedestrian crossing at intersections at all times. If possible, only one pedestrian crossing at an intersection is to be blocked by construction at any one time. If more than one pedestrian crossing is blocked by construction at an intersection at the same time the Contractor shall provide flag persons to safely escort pedestrians across the intersection. The Contractor shall

leave pedestrian crossing locations safe and free of equipment that may hamper pedestrians when no construction activities are being performed at a particular crossing location.

- D30.2 Temporary metal secure fencing or alternative as approved by the Contract Administrator shall be installed at all open excavations, trench cages, cans and shafts for the project duration. The Contractor shall be responsible for maintaining the fence in a proper working condition. No measurement for payment shall be made for this work.

D31. WATER USE

- D31.1 The Contractor is responsible for obtaining City permits and paying for any charges associated with temporary water meter and water use.

D32. CONFINED SPACE ENTRY

- D32.1 The Contractor's attention is drawn to the Province of Manitoba Workplace Safety and Health Act ("the Act"), and the Regulations and Guidelines there-under pertaining to Confined Entry Work, and in particular the requirements for conducting hazard/risk assessment and providing personal protective equipment (PPE).
- D32.2 The Contractor shall assist and provide Supplied Air Breathing Apparatus conforming to the requirements of the Act, Regulations and Guidelines for the use of the Contract Administrator where confined entry is required to allow for inspection of the Work.

D33. GEOTECHNICAL BASELINE REPORT (GBR) AND GEOTECHNICAL DATA REPORT (GDR)

- D33.1 The primary purpose of the GBR is to establish a contractual understanding of the geotechnical conditions anticipated to be encountered during construction of the project. The GBR sets baselines for geotechnical conditions and material behavior anticipated to be encountered during construction in order to provide a basis for bidding and assist in resolution of disputes that may arise over subsurface conditions. Secondly, the GBR:
- (a) Presents the geotechnical and construction conditions that formed the basis of design.
 - (b) Identifies important considerations, key project constraints, and select requirements that must be addressed by the Contractor during bid preparation and construction
 - (c) Provides information to assist the Contractor in evaluating requirements for excavating and supporting the ground.
 - (d) Provides guidance to the Contract Administrator in administering the contract and monitoring Contractor performance.
- D33.2 The GBR provides the basis for identifying geotechnical and geologic conditions that qualify as a "substantial difference in the nature of the surface or subsurface conditions", as defined in D35. The geotechnical baseline conditions (baseline) contained within the GBR are not necessarily geotechnical fact. The baseline was developed using judgment to interpolate between borings and extrapolate beyond the boring logs and laboratory test data. The judgment applied in the interpolations and extrapolations reflects the view of the author of the report in describing the baseline. Bidders should use the baseline subsurface conditions and the surface conditions which can be observed during a site visit as the basis for bids. It should be noted that the project design was based on assumed construction methods and levels of workmanship. The behavior of the geologic materials present in the surface and subsurface excavations will be influenced by the Contractor's selected equipment, means, and methods.
- D33.3 The GDR provides a summary of results for the geotechnical testing undertaken along the pipe alignment.
- D33.4 Bidders should have a geotechnical engineer and/or engineering geologist review and explain the information presented in the GBR and GDR to assure a complete understanding of the reported information as a basis for submitting a Bid. Additional documents used to develop the GBR are listed in the References section of the GBR.

- (a) The GBR was developed in part from the GDR. The technical data contained within the GDR upon which Contractor may rely are: the boring method, the locations and logs of the borings, the levels of subsurface water (if any), laboratory test methods and results, and similar factual data. Bore hole information represents subsurface characteristics to the extent indicated, only for the point location of the bore hole and, with regard to the level of subsurface water (if any), only at the time the boring was made. Contractor is not entitled to rely upon other technical data.

D33.5 Risks associated with subsurface conditions consistent with, or less adverse than the baseline conditions are allocated to the Contractor. Those risks associated with subsurface conditions more adverse than the baseline condition are accepted by the City. The provision of a baseline condition in the Contract is not a warranty that the baseline condition will be encountered. The baseline condition is the contractual standard that the City and the Contractor will agree to use when interpreting D35.

D33.6 The City accepts the risks for subsurface conditions that are less favorable than the stated baseline conditions. The City will negotiate with the Contractor for additional reasonable compensation to the Contractor if these three conditions exist:

- (a) The actual subsurface conditions encountered are more adverse than the baseline conditions.
- (b) The Contractor can document that the subsurface conditions are more adverse than those described in the baseline and that the conditions materially and significantly increased the cost and/or time required to complete the work.
- (c) The Contractor has made diligent efforts to complete the work described in the Contract Documents, including any changes to methods, equipment, labor, and materials made necessary by the adverse conditions using the most cost effective means.

If all of the foregoing conditions are satisfactorily met, additional compensation and schedule will be negotiated, based on the provisions described in E28 and D35.

MEASUREMENT AND PAYMENT

D34. PAYMENT

- D34.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.
- D34.2 Further to D22, no payment will be made for Site Occupancy, other than as set out in D22.4. Site Occupancy Amount on Form B: Prices will be used for evaluation of Bids.

D35. CHANGES IN WORK

- D35.1 Amend C7.2.1 (a) to include the following additional clauses:
 - (a) Contractor shall notify the Contract Administrator promptly in writing of any changes in geotechnical, geologic or material behaviour conditions that the Contractor considers more adverse than the GBR baseline conditions upon discovery and before they are disturbed, in any event no later than five (5) calendar days after discovery.”
 - (b) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under the Contract Documents.”
 - (c) No claim by the Contractor related to shaft excavation or tunneling and pipejacking shall be allowed under the CHANGES IN WORK provisions unless the Contractor investigates and demonstrates that such alleged conditions are materially different from those conditions identified in the Geotechnical Baseline Report and results in an increase in the Contractor's cost of and/or time required for performance of the Work. Contractor shall within 30 calendar days after notification to the City that Contractor believes a material difference exists, provide the documentation, backup, justification, and compensation for the alleged

impact to Contractor's cost of and/or time required for performance of the Work. Any and all costs incurred by the Contractor for demonstrating that a material difference exists shall be borne by the Contractor unless the City agrees that the material difference does have a cost and/or time impact. If City agrees that there is a material difference that impacts Contractor's cost and/or time, payment for geologic investigation(s) and testing of the material difference will be paid for by the City. Payment will be made by the City for reasonable and customary prices for geologic investigation(s) and testing. Contractor is encouraged to review geologic investigations and/or testing planned to demonstrate a material difference with the Contract Administrator prior to execution of the same. City will be sole judge of what is reasonable and customary."

- (d) The Contractor expressly agrees to maintain detailed daily labor, material, production, and equipment logs defining hours and costs for all periods of Contractor performance representing claimed differing site conditions. These logs shall fully separate bid Contract Work from claimed differing site condition work, and the Contractor shall provide these documents to the Contract Administrator for review. These daily logs shall constitute documentation of performance, and must be signed on a daily basis both by the Contractor and Contract Administrator. Said signatures do not mean acceptance of the claim or value of adjustment of Contract Price and/or Time but will serve to document the Contractor's use of labor, material, and equipment. If Contract Administrator and City agree that there is a material difference that impacts Contractor's cost and/or time, payment for the material difference in labour, material, production and equipment will be paid for by the City based on reasonable and customary prices, using the methods defined in C7.4. Equipment rates will be established in accordance with the Daily Equipment Rate listed on the Form B and as defined in E28. The failure of the Contractor to maintain said logs or to obtain signatures on the logs shall render the Contract Administrators daily records as definitive."

WARRANTY

D36. WARRANTY

- D36.1 Notwithstanding C13.2, the Contract Administrator may permit the warranty period for a portion or portions of the Work to begin prior to the date of Total Performance if:
- (a) a portion of the Work cannot be completed because of unseasonable weather or other conditions reasonably beyond the control of the Contractor but that portion does not prevent the balance of the Work from being put to its intended use.
- D36.1.1 In such case, the date specified by the Contract Administrator for the warranty period to begin shall be substituted for the date specified in C13.2 for the warranty period to begin.

FORM H1: PERFORMANCE BOND
(See D12)

KNOW ALL MEN BY THESE PRESENTS THAT

_____ ,
(hereinafter called the "Principal"), and

_____ ,
(hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), in the sum of

_____ dollars (\$ _____ . _____)

of lawful money of Canada to be paid to the Obligee, or its successors or assigns, for the payment of which sum the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has entered into a written contract with the Obligee for

BID OPPORTUNITY NO. 748-2016

CONSTRUCTION OF 2700 TRUNK SEWER -
COCKBURN & CALROSSIE SEWER RELIEF WORKS - CONTRACT 4

which is by reference made part hereof and is hereinafter referred to as the "Contract".

NOW THEREFORE the condition of the above obligation is such that if the Principal shall:

- (a) carry out and perform the Contract and every part thereof in the manner and within the times set forth in the Contract and in accordance with the terms and conditions specified in the Contract;
- (b) perform the Work in a good, proper, workmanlike manner;
- (c) make all the payments whether to the Obligee or to others as therein provided;
- (d) in every other respect comply with the conditions and perform the covenants contained in the Contract; and
- (e) indemnify and save harmless the Obligee against and from all loss, costs, damages, claims, and demands of every description as set forth in the Contract, and from all penalties, assessments, claims, actions for loss, damages or compensation whether arising under "The Workers Compensation Act", or any other Act or otherwise arising out of or in any way connected with the performance or non-performance of the Contract or any part thereof during the term of the Contract and the warranty period provided for therein;

THEN THIS OBLIGATION SHALL BE VOID, but otherwise shall remain in full force and effect. The Surety shall not, however, be liable for a greater sum than the sum specified above.

AND IT IS HEREBY DECLARED AND AGREED that the Surety shall be liable as Principal, and that nothing of any kind or matter whatsoever that will not discharge the Principal shall operate as a discharge or release of liability of the Surety, any law or usage relating to the liability of Sureties to the contrary notwithstanding.

IN WITNESS WHEREOF the Principal and Surety have signed and sealed this bond the

_____ day of _____, 20____ .

SIGNED AND SEALED
in the presence of:

(Witness as to Principal if no seal)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

By: _____ (Seal)
(Attorney-in-Fact)

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)**
(See D12)

(Date)

The City of Winnipeg
Legal Services Department
185 King Street, 3rd Floor
Winnipeg MB R3B 1J1

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 748-2016

CONSTRUCTION OF 2700 TRUNK SEWER -
COCKBURN & CALROSSIE SEWER RELIEF WORKS - CONTRACT 4

Pursuant to the request of and for the account of our customer,

(Name of Contractor)

(Address of Contractor)

WE HEREBY ESTABLISH in your favour our irrevocable Standby Letter of Credit for a sum not exceeding in the aggregate

_____ Canadian dollars.

This Standby Letter of Credit may be drawn on by you at any time and from time to time upon written demand for payment made upon us by you. It is understood that we are obligated under this Standby Letter of Credit for the payment of monies only and we hereby agree that we shall honour your demand for payment without inquiring whether you have a right as between yourself and our customer to make such demand and without recognizing any claim of our customer or objection by the customer to payment by us.

The amount of this Standby Letter of Credit may be reduced from time to time only by amounts drawn upon it by you or by formal notice in writing given to us by you if you desire such reduction or are willing that it be made.

Partial drawings are permitted.

We engage with you that all demands for payment made within the terms and currency of this Standby Letter of Credit will be duly honoured if presented to us at:

(Address)

and we confirm and hereby undertake to ensure that all demands for payment will be duly honoured by us.

All demands for payment shall specifically state that they are drawn under this Standby Letter of Credit.

Subject to the condition hereinafter set forth, this Standby Letter of Credit will expire on

(Date)

It is a condition of this Standby Letter of Credit that it shall be deemed to be automatically extended from year to year without amendment from the present or any future expiry date, unless at least 30 days prior to the present or any future expiry date, we notify you in writing that we elect not to consider this Standby Letter of Credit to be renewable for any additional period.

This Standby Letter of Credit may not be revoked or amended without your prior written approval.

This credit is subject to the Uniform Customs and Practice for Documentary Credit (2007 Revision), International Chamber of Commerce Publication Number 600.

(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm>
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.
- E1.3 The following are applicable to the Work:

| <u>Document Rev.</u> | <u>Document Title</u> |
|----------------------|--|
| FINAL – REV2 | Cockburn and Calrossie Combined Sewer Relief Works C4 – 2700 Trunk Sewer Geotechnical Baseline Report (October 2016) |
| FINAL | Cockburn and Calrossie Combined Sewer Relief Works C4 – 2700 Trunk Sewer Geotechnical Data Report (October 2016) |
| 4715-RVR-2.91 | CN Railway Crossing Agreement (September 2016) |

| <u>Drawing No.</u> | <u>Drawing Name/Title</u> |
|--------------------|---|
| LD-7889 | Cover Sheet |
| LD-7890 | General Plan and Manhole Schedule |
| LD-7957 | General South Construction Access |
| LD-7958 | General North Construction Access |
| LD-7891 | From STA 1+000 to 1+040 |
| LD-7892 | CNR Crossing From STA 1+000 to MH 31 |
| LD-7893 | Wilton Street From MH 31 to STA 1+220 |
| LD-7894 | Wilton Street From STA 1+220 to 1+310 |
| LD-7895 | Wilton Street From STA 1+310 to 1+410 |
| LD-7896 | Wilton Street From STA 1+410 to MH 32 |
| LD-7897 | Riser Manhole And Monitoring Point Details |
| LD-7898 | Sparling Avenue Connection and Jacking Pipe Details |

E2. GEOTECHNICAL INVESTIGATION REPORTS

- E2.1 Geotechnical Data Report (GDR)
- (a) The GDR summarizes the testing and geotechnical conditions observed along the alignment from the proposed Parker Lands SRB to Taylor Avenue and provides technical support for the GBR. This report includes geotechnical data collected at the project site and summary of anticipated subsurface conditions along the alignment. A copy of the GDR is included in Appendix A.
- E2.2 Geotechnical Baseline Report (GBR)
- (a) The GBR summarizes the geotechnical condition observed along the alignment from the proposed Parker Lands SRB to Taylor Avenue and provides construction considerations for use by Bidders for Bid preparation and administration of the Contract. Further information is provided in clause D33 and a copy of the GBR is included in Appendix B.

GENERAL REQUIREMENTS

E3. OFFICE FACILITIES

- E3.1 The Contractor shall supply office facilities meeting the following requirements:
- (a) The field office shall be located near the Site of Work.
 - (b) The field office shall be for the exclusive use of the Contract Administrator and City staff and will be used for site meetings.
 - (c) The building shall have a minimum floor area of 20 square metres, with window area of 3 square metres and a door entrance with suitable lock satisfactory to the Contract Administrator.
 - (d) The building shall be suitable for all-weather use. It shall be capable of maintain temperature range between 16 C and 25 C.
 - (e) The building shall be supplied with adequate lighting and 120 Volt power supply.
 - (f) The building shall be supplied with fluorescent lights and electrical wall outlets.
 - (g) The building shall be furnished with one desk, one meeting table, one drafting table, one filing cabinet and six chairs, all satisfactory to the Contract Administrator.
 - (h) A portable toilet shall be located near the field office building. The toilet shall have a locking door.
 - (i) The field office shall be cleaned prior to the Job Site Meetings to the satisfaction of the Contract Administrator.
- E3.2 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance. The office shall be located within or adjacent to the Work site and be relocated as necessary during construction to a location as approved by the Contract Administrator.
- E3.3 Measurement and Payment
- (a) The Contractor shall be responsible for all installation, transportation and removal costs, all operating costs, provision of aforementioned furnishings and equipment, and the general maintenance of the office facilities.
 - (b) Payment for the office facility will be considered incidental to site development and restoration.

E4. PROTECTION OF EXISTING TREES

- E4.1 The Contractor shall take the following precautionary steps to avoid damage from his construction activities to existing boulevard trees within and adjacent to the limits of construction. Contact the City of Winnipeg Forestry Branch at 204-986-2004 if you require further information on these specifications:
- (a) For trees greater than 100mm in diameter, attach wood strapping material having a minimum thickness of 25 millimetres and minimum length of 2440 millimetres around tree trunks in a manner that will not harm the trees. Do not use nails or other fasteners that penetrate into trees. The width of strapping should suit the size of the tree being protected. Length of strapping may be reduced to suit tree being protected as approved by the Contract Administrator.
 - (b) For trees least than 100mm in diameter, these shall be similarly protected as Clause E4.1(a) using appropriately sized wood strapping material.
 - (c) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work. Equipment shall not be parked, repaired, refueled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of the trees. The driplines of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure

that the operations do not cause flooding or sediment deposit on areas where trees are located.

- (d) Repair, replace and maintain tree protection material during construction of the Work.
 - (e) Remove strapping material without harming trees as soon as the construction and restoration work is complete.
- E4.2 Obtain approval from the Contract Administrator to excavate within 2.0 meters of a tree.
- E4.3 Trees identified to be at risk by the Contract Administrator are to be strapped with 25 x100 x 2400 millimetre wood planks, or suitably protected as approved by the Contract Administrator.
- E4.4 Excavate in a manner to minimize damage to root systems. Keep exposed roots in excavations and trenches moist or shaded.
- E4.5 Prune exposed roots with equipment such as trenchers, chain saws, root cutters or other methods acceptable to the Contract Administrator in a manner that will leave a new, clean root end and shall be coated with an appropriate wound dressing to prevent infection.
- E4.6 Take precautions to ensure tree limbs overhanging the Site are not damaged by construction equipment. Consult Forestry Branch on pruning of overhanging or damaged limbs and branches and other unanticipated problems with trees during construction of the Works.
- E4.7 American elm trees not to be pruned between April 1st and August 1st and Siberian elm trees between April 1st and July 1st of any year under provisions of The Dutch Elm Disease Act.
- E4.8 All damages to existing trees caused by the Contractor's construction activities shall be repaired to the requirements and satisfaction of the City of Winnipeg, Public Works Department, Urban Forestry Branch. Damages must be repaired by an individual with a Manitoba Arborist license or by the Forestry Branch. Trees shall not be felled into watercourses.
- E4.9 The Forestry Branch will remove and replace any trees deemed to have died or that are dying due to damage from carelessness during construction. Removal and replacement costs will be determined by size and market place. The market price will be a comparable transplantable tree of the same or different species or may be the appraised value of the existing tree, as determined by an evaluation procedure presently used by Forestry Branch in conjunction with City Claims Branch. The evaluation procedure is in accordance with current International Society of Arboriculture evaluation procedure.
- E4.10 Protection of existing trees, repair of trees and pruning of damaged limbs will not be measured for payment and will be included with Underground or Surface Works. Removal and replacement of existing trees by the Forestry Branch deemed to have died or that are dying due to damage from carelessness during construction will be at the Contractor's cost and will be invoiced or deducted from any payments owing.

E5. TREE PLANTING

E5.1 Description

- (a) This Specification shall cover the installation of new trees to replace trees removed as a direct requirement of the Work shown on the Drawings. Trees removed as part of the development of a Contractor's laydown area will not be covered under this specification and are to be considered part of Site Development and Restoration E8.
- (b) The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead labour, materials, and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.
- (c) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.

E5.2 Materials

(a) Trees

- (i) The trees to be placed as part Parker Lands revegetation shall consist of native species approximately 75 mm in diameter. The number and species of trees to be planted will be based on the number and species of trees removed during construction and will be determined by the Contract Administrator.

(b) Tree species specific to the Site include:

- ◆ Manitoba Maples
- ◆ Green Ash
- ◆ American Elm
- ◆ Basswood
- ◆ Cottonwood

E5.3 Construction Methods

(a) Trees

- (i) The trees shall be planted in the general vicinity of where trees were removed prior to the commencement of works or as directed by the Contract Administrator.

(b) Quality Control

(i) Inspection

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection by the Contract Administrator including all operations from the selection of materials through the final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection of approval that may have been previously given.

(ii) Access

The Contract Administrator shall be afforded full access for the inspection of materials at the site to determine whether the material is being selected and placed in accordance with this Specification.

E5.4 Measurement and Payment

- (a) Replacement of trees removed as a direct impact of the Work shown on the Drawings will be paid at the Contract unit price of "Tree Planting" for each tree planted in accordance with this Specification.

E6. TRUCK WEIGHT LIMITS

- E6.1 Spring weight restrictions may apply to streets within the area of Work. The City shall not pay for any portion of material which results in the vehicle exceeding the maximum gross vehicle weight allowed under The City of Winnipeg Traffic By-Law, unless such vehicle is operating under special permit.

E7. ENVIRONMENTAL PROTECTION

- E7.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the environmental protection measures as herein specified.

- E7.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

E7.2.1 Federal

- (a) Canadian Environmental Protection Act (CEPA) c.16

- (b) Canadian Environmental Assessment Act (CEAA) c.37
- (c) Transportation of Dangerous Goods Act and Regulations c.34

E7.2.2 Provincial

- (a) The Dangerous Goods Handling and Transportation Act D12
- (b) The Endangered Species Act E111
- (c) The Environment Act c.E125
- (d) The Fire Prevention Act F80
- (e) The Manitoba Nuisance Act N120
- (f) The Public Health Act c.P210
- (g) The Workplace Safety and Health Act W120
- (h) And current applicable associated regulations.

E7.3 The Contractor is advised that the following environmental protection measures apply to the Work.

- (a) Materials Handling and Storage
 - (i) Construction materials shall not be deposited or stored on the banks of the storm water pond adjacent to Walmart unless written acceptance from the Contract Administrator is received in advance.
- (b) Fuel Handling and Storage
 - (i) The Contractor shall obtain all necessary permits from Manitoba Conservation for the handling and storage of fuel products and shall provide copies to the Contract Administrator.
 - (ii) All fuel handling and storage facilities shall comply with The Dangerous Goods and Transportation Act Storage and Handling of Petroleum Products Regulation and any local land use permits.
 - (iii) Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.
 - (iv) In accordance with Section 2.5 (Construction: General Guidelines) of the Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, (DFO and DNR, 1996), the Contractor shall ensure that any temporary fuel storage areas established for construction of the project are contained by an impermeable dike and are located a minimum distance of 100 metres away from the high water line of the storm water pond adjacent to Walmart. Dikes shall be designed, constructed, and maintained to retain not less than 100% of the capacity of the total number of containers or 110% of the largest container, whichever is greatest. The dikes shall be constructed of clay or similar impervious material. If this type of material is not available, the dike shall be constructed of locally available material and lined with high density polyethylene (HDPE). Furthermore, the fuel storage area(s) shall be secured by a barrier such as a high fence and gate to prevent vandalism.
 - (v) The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage.
 - (vi) Products transferred from the fuel storage area(s) to specific Work Sites shall not exceed the daily usage requirement.
 - (vii) When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill.
 - (viii) Refuelling of mobile equipment and vehicles shall take place at least 100 metres from a watercourse.
 - (ix) The area around storage Sites and fuel lines shall be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.

- (x) A sufficient supply of materials, such as absorbent material and plastic oil booms to clean up minor spills shall be stores nearby on-site. The Contractor shall ensure that additional material can be made available on short notice.
- (c) Waste Handling and Disposal
 - (i) The construction area shall be kept clean and orderly at all times during and at completion of construction.
 - (ii) At no time during construction shall personal or construction waste be permitted to accumulate for more than one day at any location on the construction Site, other than at a dedicated storage area as may be approved by the Contract Administrator.
 - (iii) All resulting debris shall be deposited at a Waste Disposal Ground operating under the authority of Manitoba Regulation #150/91. Exceptions are liquid industrial and hazardous wastes which may require special disposal methods (see SC:21.4 D).
 - (iv) Indiscriminate dumping, littering, or abandonment shall not take place.
 - (v) No on-site burning of waste is permitted.
 - (vi) Waste storage areas shall not be located so as to block natural drainage.
 - (vii) Run-off from a waste storage area shall not be allowed to cause siltation of a watercourse.
 - (viii) Waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.
 - (ix) Equipment shall not be cleaned near watercourses; contaminated water from onshore cleaning operations shall not be permitted to enter watercourses.
- (d) Dangerous Goods/Hazardous Waste Handling and Disposal
 - (i) Dangerous goods/hazardous wastes are identified by, and shall be handled according to, The Dangerous Goods Handling and Transportation Act and Regulations.
 - (ii) The Contractor shall be familiar with The Dangerous Goods Handling and Transportation Act and Regulations.
 - (iii) The Contractor shall have on-site staff that is trained and certified in the handling of the dangerous/hazardous goods, when said dangerous/hazardous goods are being utilized on-site for the performance of the Work.
 - (iv) Different waste streams shall not be mixed.
 - (v) Disposal of dangerous goods/hazardous wastes shall be at approved hazardous waste facilities.
 - (vi) Liquid hydrocarbons shall not be stored or disposed of in earthen pits on-site.
 - (vii) Used oils shall be stored in appropriate drums, or tankage, until shipment to waste oil recycling centres, incinerators, or secure disposal facilities approved for such wastes.
 - (viii) Used oil filters shall be drained, placed in suitable storage containers, and buried or incinerated at approved hazardous waste treatment and disposal facilities.
 - (ix) Dangerous goods/hazardous waste storage areas shall be located at least 100 metres away from the high water line and be dyked.
 - (x) Dangerous goods/hazardous waste storage areas shall not be located so as to block natural drainage.
 - (xi) Run-off from a dangerous goods/hazardous waste storage area shall not be allowed to cause siltation of a watercourse.
 - (xii) Dangerous goods/hazardous waste storage areas shall be left in a neat and finished appearance and/or restored to their original condition to the satisfaction of the Contract Administrator.
- (e) Emergency Response
 - (xiii) The Contractor shall ensure that due care and caution is taken to prevent spills.
 - (xiv) The Contractor shall report all major spills of petroleum products or other hazardous substances with significant impact on the environment and threat to human health and

- safety (as defined in Table 1 below) to Manitoba Conservation, immediately after occurrence of the environmental accident, by calling the 24-hour emergency phone number (204) 945-4888. The Contract Administrator shall also be notified.
- (xv) The Contractor shall designate a qualified supervisor as the on-site emergency response co-ordinator for the project. The emergency response co-ordinator shall have the authority to redirect manpower in order to respond in the event of a spill.
- (xvi) The following actions shall be taken by the person in charge of the spilled material or the first person(s) arriving at the scene of a hazardous material accident or the on-site emergency response co-ordinator:
- (i) Notify emergency-response co-ordinator of the accident:
 - ◆ identify exact location and time of accident
 - ◆ indicate injuries, if any
 - ◆ request assistance as required by magnitude of accident (Manitoba Conservation 24-hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup)
 - (ii) Attend to public safety:
 - ◆ stop traffic, roadblock/cordon off the immediate danger area
 - ◆ eliminate ignition sources
 - ◆ initiate evacuation procedures if necessary
 - (iii) Assess situation and gather information on the status of the situation, noting:
 - ◆ personnel on-site
 - ◆ cause and effect of spill
 - ◆ estimated extent of damage
 - ◆ amount and type of material involved
 - ◆ proximity to waterways, sewers, and manholes
 - (iv) If safe to do so, try to stop the dispersion or flow of spill material:
 - ◆ approach from upwind
 - ◆ stop or reduce leak if safe to do so
 - ◆ dike spill material with dry, inert sorbet material or dry clay soil or sand
 - ◆ prevent spill material from entering waterways and utilities by diking
 - ◆ prevent spill material from entering manholes and other openings by covering with rubber spill mats or diking. Resume any effective action to contain, clean up, or stop the flow of the spilled product.
 - (v) The emergency response co-ordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to Manitoba Conservation according to The Dangerous Goods Handling and Transportation Act Environmental Accident Report Regulation 439/87.
 - (vi) When dangerous goods are used on-site, materials for containment and cleanup of spill material (e.g. absorbent materials, plastic oil booms, and oversized recovery drums) shall be available on-site.
 - (vii) Minor spills of such substances that may be contained on land with no significant impact on the environment may be responded to with in-house resources without formal notification to Manitoba Environment.
 - (viii) City emergency response, 9-1-1, shall be used if other means are not available.
- (f) Vegetation
- (xvii) Vegetation shall not be distributed without written permission of the Contract Administrator. The Contractor shall protect plants which may be at risk of accidental damage. Such measures may include protective fencing or signage and shall be approved in advance by the Contractor Administrator.
 - (xviii) Herbicides and pesticides shall not be used adjacent to any surface watercourses.

- (xix) All landowners adjacent to the area of application of herbicides or pesticides shall be notified prior to the Work.
- (xx) Shrubs shall not be felled into watercourses.
- (xxi) Areas where vegetation is removed during clearing, construction, and decommissioning activities, shall be revegetated as soon as possible in accordance with the landscaping plans forming part of the contract, or as directed by the Contract Administrator.

E7.4 Method of Measurement and Payment

- (a) Adherence to the laws that govern the requirements for Environmental Protection are incidental to the Contract.

E8. SITE DEVELOPMENT AND RESTORATION

E8.1 Description

- (a) This Specification shall cover all aspects of the Site Development and Restoration Work, including but not limited to mobilization, erection, maintenance and removal of safety fencing with gates, general access development, maintenance and removal, construction access and laydown areas, traffic control and signage, snow clearing, flow control, protection of existing trees, office facilities, cleanup, demobilization and final Site restoration.

E8.2 Submittals

E8.2.1 Access and Layout Plans for review and approval by the Contract Administrator, in accordance with CW 1110, for the following items:

- (a) Site access plan for Parker Lands.
- (b) Site access and equipment layout plan for LDS easement along Wilton Street.

E8.3 Equipment

- (a) All equipment, implements, tools and facilities used shall be of a size and type as required to complete the Work in a reasonable time, approved by the Contract Administrator. The Contractor shall keep all equipment in good Working order, and have sufficient standby equipment available at all times.

E8.4 Construction Methods

E8.4.1 Site Access to Parker Lands

- (a) The Contractor shall be responsible to develop suitable Site access. A temporary access road is required to allow construction traffic to enter the Parker Lands lay-down area. This includes but is not limited to, access road (as per DWG LD-7957), temporary bridging over structures, temporary removal and reinstallation of safety fencing, any landscaping and grading repairs, removal and restoration of vegetation necessary to restore any Site and construction access areas to their pre-existing condition. Prior to commencing construction the Contractor shall submit their site access plan(s) to the Contract Administrator for approval.
- (b) The Contractor's access to the Parker Lands will be restricted to the Rockman Street right-of-way as shown on drawing LD-7957
- (c) The Contractor is responsible for obtaining and paying for all required permits that are necessary for Site access.

E8.4.2 Vegetation Removal

- (a) Vegetation (living trees smaller than 50 mm and sod) removal may be permitted in order to facilitate Site access and temporary lay-down area. Existing vegetation shall not be removed without prior approval from the Contract Administrator.

- (b) Vegetation within the Parker Lands between the north property line of Heatherdale Avenue and the north limit of the Transit Corridor beyond the boundary of temporary site access road (refer to DWG LD-7957) may not be removed.

E8.4.3 General Site Cleanup and Restoration

- (a) All areas of the construction Site shall be restored to a condition to the same or better than the original condition prior to initiation of Work. This may include, but is not necessarily limited to the Contractor's lay down area, the removal of the Contract Administrator Site trailer, and removal of all temporary access paths and fencing.

E8.4.4 Topsoil and Sod

- (a) All topsoil and sodding Work shall be performed in accordance with CW 3510. Topsoil and Sodding Work shall include all existing grassed areas disturbed by the Contractor during construction. The Contractor shall restore all areas disturbed during construction to the condition prior to the initiation of the Work or better, using topsoil and sod at his own cost.
- (b) The Contractor will **not** be responsible to restore the vegetation within the portion of the Parker Lands designated for the future storm retention basin under the Cockburn and Calrossie Sewer Relief Works.

E8.4.5 Laydown Area

- (a) Proposed laydown areas are shown on drawing LD-7957 and LD-7958 and are described as:
 - (i) Within the permanent and construction LDS easements along Wilton Street south of Taylor Avenue
 - (ii) Parker Lands on the south side of the CN rail crossing
- (b) Laydown areas on the north side of the CN railway shall be located and kept within the Permanent easement and Construction easement indicated on Drawings LD-7958.
- (c) Any modification or increase in space requirements shall be submitted with the proposed Shaft Layout Drawings as per Specification E18.4.4.

E8.4.6 Traffic Control and Signage

- (a) Coordinate, install and maintain traffic control and signage in accordance with D28 and D29.

E8.4.7 Snow Clearing

- (a) The Contractor will be required to perform snow clearing and sanding operations on City streets and sidewalks within the Site where access to City snow clearing and sanding crews is blocked due to construction activities or where construction activities have created unsafe, icy conditions.
- (b) Snow build-up on sidewalks and roadways shall be maintained to the condition of the surrounding sidewalks and roadways

E8.4.8 Construction Fencing

- (a) The erection of temporary construction fencing is required in the Walmart car park area.
- (b) The erection of temporary construction fencing is required around all construction activity work activities to ensure provision of safe work site.

E8.5 Method of Measurement and Payment

E8.6 Flow Control

- (a) Maintaining Existing Sewer Flows, Flow Control, Diversions and Bypass Pumping required to complete the Works in the Contract as per Clause 4.16.1 of CW 2130.

E8.7

- (a) Site development and restoration will be measured and paid for at the Contract Lump Sum Price for "Site Development and Restoration", which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work included in this Specification.
- (b) 60% of the Site Development and Restoration unit price will be paid on the first progress payment following commencement of the Work.
- (c) 10% of the Site Development and Restoration unit price will be paid on the progress payment following completion of Substantial Performance.
- (d) 30% of the Site Development and Restoration unit price will be paid on the progress payment following Total Completion.

E9. EXCAVATION, BEDDING AND BACKFILL

E9.1 Related Specifications

- (a) Shafts E19
- (b) Temporary backfill E12 and temporary surface restorations E10.6.
- (c) Environmental protection, Section E7
- (d) Excavation within the Parker Lands may require soils testing E25 and disposal of contaminated soils E26

E9.2 Submittals

- (a) Submit shoring designs to Contract Administrator, in accordance with CW 2030 and E18.4.4.

E9.3 Existing Utilities

- (a) Arrange and pay for any required safety watches around existing utilities as per CW 1120.
- (b) The contractor shall arrange provide temporary or permanent relocation of existing utilities, and or temporary support of existing utilities required for the excavation of the shafts. Work on private utilities may not occur without submittal and approval of your utility plan to the Contract Administrator and approval from the utility owner.

E9.4 Disposal of Unsuitable or Surplus Excavated Material

- (a) The Contractor is responsible for arranging for a disposal site for all excavated material, and associated works including transportation and payment of tipping fees.
- (b) There shall be no measurement of surplus soil material disposed of at any disposal site. No additional payment will be made for disposal of surplus soil materials. It shall be considered incidental to the cost of the Work.

E9.5 Foundation and Bedding and Initial Backfill

- (a) Shaft located in Wilton Street at STA 1+520.55, north of Taylor Avenue intersection
 - (i) Class A bedding shall be used with concrete pipe with cement stabilized fill (as per Table CW 2160 with the maximum compressive strength at 28 days to be no more than 1 MPa) for remainder of initial backfill.
- (b) Shafts for MH 31 & MH 32 (or other shafts under pavement)
 - (i) Class A bedding shall be used with concrete pipe with Type 3 material for remainder of initial backfill.
 - (ii) Class A bedding shall be used with concrete pipe with cement stabilized fill (as per Table CW 2160 with the maximum compressive strength at 28 days to be no more than 1 MPa) for the remainder of initial backfill in all pipe installations in an Open Trench.
- (c) Shafts located in Parker Lands

- (i) Class A bedding shall be used with concrete pipe with Type 3 material for remainder of initial backfill.

E9.6 Backfill

- (a) Shaft located in Wilton Street at STA 1+520.55, north of Taylor Avenue intersection
 - (i) The shaft shall be backfilled with cement stabilized fill (further to Table CW 2160, the maximum compressive strength at 28 days to be no more than 1 MPa).
- (b) Shaft for MH 31 or other shafts under pavement
 - (i) The shaft shall be backfilled with Class 3 backfill as per SD-002. Class 2 backfill would also be acceptable, but at no additional cost.
- (c) Shaft for MH 32
 - (i) The shaft shall be backfilled with cement stabilized fill (further to Table CW 2160, the maximum compressive strength at 28 days to be no more than 1 MPa).
- (d) Shafts located within Parker Lands
 - (i) The shaft shall be backfilled with Class 5 as per SD-002, provided the excavated material is clay. Excavated material used as Class 5 must be approved by the Contract Administrator prior to installation..
- (e) Material excavated when frozen, or when air temperature is less than 0 °C shall not be used as fill or backfill until material completely thaws.
- (f) The Contractor shall have personnel available for immediate repairs of settlement at shaft locations from the start of construction until final restoration is complete.

E9.7 Final Surface Restoration

- (a) Shaft located in Wilton Street at STA 1+520.55, north of Taylor Avenue intersection
 - (i) The pavement shall be completed in accordance with CW 3310 or as directed by the Contract Administrator.
- (b) All other shafts located in Wilton Street
 - (i) The excavation shall be jetted and tamped twice, as per CW 2030.
 - (ii) After the second jetting operation is completed, the excavation is to be subcut to 1.5m below final surface elevation and recompact in 300mm lifts to the subgrade level using vibratory compaction methods in accordance with CW 2030 backfill.
 - (iii) Pavement shall be completed in accordance with CW 3310 or CW 3410, depending on type of existing pavement surface.
- (c) Shaft located in Sparling Avenue
 - (i) The pavement shall be completed in accordance with CW 3310.
- (d) All shafts located within Parker Lands
 - (i) The restoration shall be completed in accordance with CW 3510 or CW 3520, depending on the type of existing surface.
- (e) All boulevard restoration shall be completed in accordance with CW 3510.

E9.8 Measurement and Payment

- (a) All costs associated with Excavation, bedding and backfill as described herein are incidental to the installation of the LDS sewer piping covered in Tunnelling, and Pipe Jacking and Trenchless Sewer Installation.
- (b) Unless specified as alternate items on the Form B, payment for the temporary or permanent relocation of existing utilities, and or temporary support of existing utilities required for the placement of shafts shall be incidental to the installation of the LDS sewer piping in Tunnelling and Pipe Jacking, and Trenchless Sewer Installation.

E10. PAVEMENT SURFACE RESTORATION – STREET CLASSIFICATION AND SURFACE TYPE

E10.1 The Contractor will follow the City's Street By-law No. 1481/77 and Street Cuts Manual (2016) for all pavement restoration unless otherwise shown on the drawing or specifications or as directed by the Contract Administrator.

E10.2 The street material and condition within the project work area are classified as follows:

| Street Name | Segment | Pavement Type | Condition |
|--------------------|--|-----------------------|------------------|
| Taylor Avenue | Taylor Avenue – Wilton Street Intersection | Asphalt over Concrete | New |
| Wilton Street | Taylor Avenue to Sparling Avenue | Asphalt | New |
| Sparling Avenue | Wilton Street – Sparling Avenue Intersection east to Harrow Street | Concrete | Poor |
| Rockman Street | Heatherdale Avenue to Rosemount Avenue | Asphalt over Concrete | Good |
| Rockman Street | Rosemount Avenue to Byng Place | Asphalt | Poor |
| Byng Place | Rockman Street to CN Railway | Asphalt | Good |
| Byng Place | CN Railway to Pembina Highway | Asphalt | Poor |

E10.3 Notwithstanding the restoration requirements identified in E10.4, all street segments within the work area impacted by the Work as determined by the Contract Administrator shall be maintained and restored with the following additional requirements.

- (a) Review and record the condition of each street segment with the Contract Administrator and a City Representative from Public Works prior to the initiation of Work.

E10.4 Review and record the condition of each street segment with the Contract Administrator and a City Representative from Public Works prior to surface restoration. The surface restoration required for each street segment will be agreed upon at this time.

E10.5 Pavement Restoration Guidelines are summarized in the following tables:

(a) Asphalt & Asphalt over concrete

| Rated Pavement Condition of Segment | Regional (Priority I) | | Collector (Priority II) | | Local (Priority III) | |
|-------------------------------------|---|-------------------------|--|-------------------------|--|-------------------------|
| | Action Required | Responsibility | Action Required | Responsibility | Action Required | Responsibility |
| New | Grind & repave full lane width - length of project | Utility conducting work | Grind & repave full lane width - length of project | Utility conducting work | Grind & repave full lane width - length of project | Utility conducting work |
| Good | | | | | | |
| Fair | Decision after inspection by Public Works Department <i>See Note (A-2)</i> | | Decision after inspection by Public Works Department <i>See Notes (A-2) & (A-3)</i> | | Decision after inspection by Public Works Department <i>See Notes (A-2) & (A-3)</i> | |
| Poor | | | Isolated repairs accepted | Utility conducting work | Isolated repairs accepted | Utility conducting work |

NOTES:

(A-1) This table is only a guide. The actual extent of all pavement restorations are subject to pre-construction inspection, and final approval by the Public Works Department.

(A-2) Factors used by Public Works to determine the extent of pavement restoration:
 (Generally, in order of importance)

- Condition of pavement prior to start of project;
- Age of pavement;
- Classification of segment (e.g. arterial vs. collector);
- Planned work in the right-of-way (future street projects);
- Length of project;
- Number of cuts project requires (i.e. one cut at each end vs. 15 in a row, 10m apart)

(A-3) In some cases - locations where renewal work is warranted and/or Streets Maintenance is considering improvements in the current or following construction year - partnering with the Public Works Department may be possible. A pre-construction meeting with the Area Inspector is required to determine the extent of the work required and amount payable by the Department.

(b) Portland cement concrete

| Rated Pavement Condition of Segment | Regional (Priority I) | | Collector (Priority II) | | Local (Priority III) | |
|-------------------------------------|---|-------------------------|---|-------------------------|---|---|
| | Action Required | Responsibility | Action Required | Responsibility | Action Required | Responsibility |
| New | Full panel repair | Utility conducting work | Full panel repair | Utility conducting work | Half panel repair | Utility conducting work |
| Good | Half panel repair | | Half panel repair | | Decision after inspection by Public Works Department <i>See Note (B-2)</i> | Decision after inspection by Public Works Department <i>See Note (B-2)</i> |
| Fair | Decision after inspection by Public Works Department <i>See Note (B-2)</i> | | Decision after inspection by Public Works Department <i>See Note (B-2)</i> | | | |
| Poor | | | Isolated repairs accepted | Utility conducting work | Isolated repairs accepted | Utility conducting work |

NOTES:

(B-1) This table is only a guide. The actual extent of all pavement restorations are subject to pre-construction inspection, and final approval by the Public Works Department.

(B-2) Factors used by Public Works to determine the extent of pavement restoration:
 (Generally, in order of importance)

- Condition of pavement prior to start of project;
- Age of pavement;
- Classification of segment (e.g. arterial vs. collector);
- Planned work in the right-of-way (future street projects);
- Length of project;
- Number of cuts project requires (i.e. one cut at each end vs. 15 in a row, 10m apart)

E10.6 Measurement and Payment

(a) Further to CW 2130:

- (i) All costs associated with Pavement Restoration as described herein is incidental to the cost of the LDS sewer installation under Tunnelling and Pipe Jacking and/or Trenchless Sewer Construction.

E11. TEMPORARY SURFACE RESTORATION

E11.1 Further to clause 3.3 of CW 1130 and E10, where permanent surface restorations cannot be made due to cold weather, the Contractor shall temporarily restore surfaces as follows:

- (a) backfill and level boulevards and grassed areas to match existing surface elevations,
- (b) cap excavations in concrete pavement with a 100 millimetre thick layer of concrete for "Temporary Restoration of Utility Pavement Cuts" as specified in CW 3310,
- (c) cap excavations in sidewalk pavement with a 50 millimetre thick layer of concrete for "Temporary Restoration of Utility Pavement Cuts" as specified in CW 3310,
- (d) insulate temporary concrete where required during 48hr curing period,
- (e) where curb has been removed as part of the pavement cut pour temporary curb using "Concrete for Temporary Restoration of Utility Pavement Cuts" as specified in CW 3310.
- (f) remove all temporary pavements prior to permanent restorations.

- E11.2 The Contractor shall monitor and maintain temporarily restored surfaces as required until permanent restoration is complete.
- E11.3 If, in the opinion of the Contract Administrator, temporarily restored surfaces are not being adequately maintained or were not properly constructed and pose a danger to the public, maintenance or reconstruction will be done by the City forces with no advance notification the Contractor.
- E11.4 All costs associated with the maintenance or reconstruction of temporary pavement incurred by the City shall be deducted from future payments to the Contractor.
- E11.5 Temporary surface restorations shall be measured and paid as follows:
- (a) Temporary restoration associated with the shafts locations and identified utility relocations on the Form B will be paid on a square meter basis at the Contract unit price for "Temporary Surface Restorations".
 - (b) Temporary restoration other road cuts not defined in E11.5(a) will be considered incidental to Site Development and Restoration.
- E11.6 No measurement or payment will be made for the temporary restoration of barrier or lip curb.
- E11.7 No measurement or payment will be made for the temporary restorations of boulevards and grassed areas.
- E11.8 No measurement or payment will be made for the removal of temporary pavement prior to permanent restoration.

E12. BACKFILL UNDER TEMPORARY SURFACE RESTORATIONS

- E12.1 Use Class 2 backfill in excavation under temporary street pavement and sidewalk where Class 3 backfill cannot be jetted and flooded due to cold weather.
- E12.2 Class 2 backfill may be compacted in 600mm lifts where backhoe operated pneumatic plate compactors are used.
- E12.3 Jet and flood Class 2, Class 3 and Class 5 backfilled excavations in spring when ground is not frozen prior to permanent restoration.
- E12.4 No extra payment will be made for the installation of Class 2 backfill under temporary street pavement and sidewalk.

E13. FULL DEPTH PARTIAL SLAB PATCHES

- E13.1 Construct full depth partial slab patches in accordance with CW 3230.
- E13.2 Full depth partial slab patches shall be measured on an area basis and paid for at the Contract Unit price per square meter for "Partial Slab Patches" for each type of pavement.
- E13.3 No differentiation will be made for class of patch.
- E13.4 No separate measurement or payment will be made for Drilled Dowels or Tie Bars, the cost for which shall be included in the prices for "Partial Slab Patches".

E14. EXPLORATION OF EXISTING UTILITIES AND SERVICES

- E14.1 Further to CW 1120, the Contractor shall perform exploratory excavations by soft dig methods or other methods suitable to the Contract Administrator to verify and locate buried utilities including but not limited to sewers, watermains, large diameter fire service watermains, gas

mains, power and telecommunications ducts and conduits, traffic signal conduits, street lighting and other communication cables at proposed crossing locations.

- E14.2 The exploration shall be done following all utility location surveys and a minimum of ten (10) days prior to any construction. The information obtained will determine if an alternate vertical or horizontal alignment of the proposed sewer may be beneficial to minimize conflicts with the existing utilities or services.
- E14.3 The Contractor shall arrange for all required utility locations, safety watches and other required notifications.
- E14.4 The Contractor shall provide a minimum of two (2) Business Days' notice to the Contract Administrator prior to conducting utility exposures.
- E14.5 Measurement and Payment
- (a) Exploration of utility locations and elevations are incidental to the cost of the LDS sewer installation under Tunnelling and Pipe Jacking and/or Trenchless Sewer Construction.

E15. MANHOLES

E15.1 Description

- (a) This Specification supplements and amends City of Winnipeg Standard Construction Specification CW 2130 Gravity Sewers, and shall cover the installation of large diameter manholes.
- (b) For the purposes of this specification, large diameter manholes are precast concrete manholes sized to accommodate pipe larger than 525mm as shown on the Drawings.
- (i) This item covers manhole 32 shown on the Drawings.
- (c) For the purposes of this specification, large diameter pipe manholes are those sized to accommodate pipe larger than 525mm as shown on SD-011 and the Drawings.
- (i) This item covers manhole 31 shown on the Drawings.

E15.2 Materials

- (a) Precast concrete sections and adjusting rings, ladder rungs, joint gaskets and cast iron frames and covers in accordance with CW 2130.

E15.3 Submittals

- (a) Submit shoring design, shop drawings for pre-cast sections, reinforcing steel shop drawings and concrete mix design in accordance to CW 2160.

E15.4 Construction Methods

- (a) Manhole installation as per CW 2130 and as shown on the Drawings.
- (b) Manhole benching shall be completed in the field and approved by the Contract Administrator. All surfaces shall slope to the manhole outlet and the channel shall extend from inlet to outlet. Benching shall be constructed as follows:
- (i) Depth of bench to invert: minimum one-half of largest pipe diameter.
- (ii) Slope of invert bench: 4% minimum; 12% maximum.
- (c) Provision of future connection pre-cored hole
- (i) To accommodate the future 1350mm diameter connection within the Sparling Avenue manhole (MH 32), a suitable pre-cored hole will be provided as per Drawing LD-7897 to allow connection with a future 1350mm RCP pipe. The hole will be suitably plugged with a temporary plug structure to support a surcharge water level to 0.6 m from surface with no water leakage out of the manhole.

E15.5 Method of Measurement and Basis of Payment

- (a) Construction of Manholes shall be measured on a vertical metre basis at the contract price for each type a manhole as listed below. The price shall include but not be limited to the work herein described, the excavation, shoring, backfill, reducers, adjusting rings, frames and covers, benching, rungs, couplings, and all appurtenances and miscellaneous metals and materials.
 - (i) Large Diameter Pipe Manholes
2700 Pipe Manhole with 1200 mm riser (MH 31)
 - (ii) Large Diameter Pipe Manholes
2400mm Dia. x 2400mm high base (MH 32)
- (b) Prices include connections of the new LDS piping to the manholes as detailed on the drawings.

E16. SUPPORT OF EXISTING PIPES AND UTILITIES

- E16.1 The Contractor shall provide support to existing services and utilities when excavations for new works expose these services. This shall be done to the requirements of the utility. Services may only be interrupted with the permission of the Contract Administrator.
- E16.2 Measurement and Payment
 - (a) Support of existing pipes and utilities will be incidental to the cost of the LDS sewer installation under Tunnelling and Pipe Jacking and/or Trenchless Sewer Construction.

E17. INSTRUMENTATION AND MONITORING

- E17.1 Description
 - (a) The work specified in this Section includes furnishing and installing geotechnical instrumentation to monitor ground water levels and potential movements to surface features, utilities, ground and railway track around and above pipe jacking and tunnelling operations, and all excavations. The work includes, but is not limited to installing: surface monitoring points, subsurface monitoring points, utility monitoring points, structure monitoring points and track monitoring points. Also included are furnishing monitoring equipment before pipe jacking, tunnelling, and excavation work.
 - (b) The Contractor is responsible for surveying the elevations and locations of the instruments in accordance with the requirements herein. Baseline readings and elevations shall be determined before shaft or tunnel construction begins to establish a baseline, and during and after operations to monitor any movements related to the pipe jacking, tunnelling, and shaft construction.
 - (c) Standpipe piezometers installed to measure ground water pressures.
 - (d) Minimum instrumentation requirements are shown on the drawings and specified herein.
- E17.2 Materials
 - (a) Surface Monitoring Points: Surface monitoring points shall be established by an inscribed marking or approved Surveyor's nail driven flush with the surface in asphalt or concrete paved areas. In landscaped areas, surface monitoring points shall be established by driving a 500-mm length of steel rebar or 50-mm by 50-mm timber stake flush with the ground. Each monitoring point shall have a tag or marking indicating the station and offset from centerline.
 - (b) Subsurface Monitoring Point: Install as indicated in the Drawings. The settlement rod shall be secured to the PVC casing with a 300-mm length of loose cable or chain to prevent the rod from falling more than approximately 300 mm. The casing shall be flush with pavement or recessed, and capped and protected with a traffic rated road box in accordance with permit requirements.

- (c) Utility Monitoring Point: Install as indicated in the Drawings. Do not use drilling techniques. Vacuum excavation of the hole is acceptable. Do not damage the existing pipeline.
- (d) Building/Structure Monitoring Point: Structural monitoring points shall be established by an inscribed marking or approved Surveyor's nail driven flush with the surface. Each control point shall have a tag or marking indicating the identification number and offset from centerline.
- (e) Track Monitoring Point: Establish track monitoring points by identifying a series of track locations to be monitored daily. The track locations shall be approved by the Contract Administrator and the CNR Local Track Supervisor. The locations should be clearly marked so as to ensure that repeated surveys can be accurately compared. Surveying of the tracks must be in agreement with the Local Track Supervisor. Flagging or other requirements set forth by CNR must be adhered to when undertaking monitoring within the CNR right-of-way.
- (f) Standpipe piezometers: Install as indicated on the Drawings

E17.3 Submittals

- (a) Submittals shall be made in accordance with CW 1110, providing sufficient detail to allow the Contract Administrator to judge whether the proposed equipment, materials, and procedures will meet the Contract requirements. All Drawings shall be legible with dimensions accurately shown and clearly marked in English. Drawings and photographs transmitted by a facsimile will not be accepted. The Contract Administrator's review of submitted details and data will be based on consideration of requirements for the completed work, protection of existing utilities, and the possibility of unnecessary delays in the execution of the work to be constructed under this Contract.
- (b) Qualifications: Submit surveying personnel qualifications in accordance with the requirements herein.
- (c) Submit the following, at least two (2) weeks before scheduled installation of instruments:
 - (i) Instrumentation Installation Schedule: Submit the proposed schedule for installing the instruments.
 - (ii) Description of methods and materials for installing and protecting instruments.
 - (iii) Confirmation that monitoring points will be installed at locations shown in the drawings and as specified herein, or if deviations are proposed, submit shop drawings with locations of proposed monitoring points shown in plan and profile.
- (d) Reports and Records:
 - (i) The Contractor shall submit all reports of monitoring data to the Contract Administrator within 24 hours.
 - (ii) Within 72 hours following installation of the instruments, submit drawings showing the actual as-built installed location, the instrument identification number, the instrument type, the installation date and time, and the tip elevation and instrument length where applicable. Include details of installed instruments, accessories and protective measures, including all dimensions and materials used.
 - (iii) Submit surveyed measurements of all instruments at least fourteen (14) days prior to commencing shaft excavation to establish baseline readings.
 - (iv) Submit pre and post construction surveys including photographs, video, field notes, and sketches along the entire alignment. Surveys should concentrate on significant man made features along the alignment including buildings, gutters, sidewalks, driveways, and other structures or improvements.

E17.4 Definitions

- (a) Control Point means: a Marker established as a referenced point for survey methods.
- (b) Benchmark: Permanent reference control point established by the Contractor.
- (c) Surface Monitoring Point (SMP): Monitoring points established to measure elevation of the ground surface.

- (d) Subsurface Monitoring Point (SSM): A cased borehole settlement monitoring point located above the tunnel crown used for detecting settlement between the location of the settlement point and the tunnel excavation. This device serves as a simple borehole extensometer.
- (e) Utility Monitoring Point (UMP): A monitoring point set on the top of an existing pipeline using a steel rod within a cased hole.
- (f) Building/Structure Monitoring Point (BMP): Structural monitoring point be used to monitor horizontal and vertical deformation of structures. BMPs shall consist of non destructive and stable elements firmly attached to structures with locations clearly identified.
- (g) Standpipe piezometer: a tube inserted into the soil used as a piezometer to measure ground water levels.

E17.5 Quality Control

- (a) Settlement surveying shall be performed by a competent individual with previous experience surveying for the detection of surface deformations. Record the initial elevations of movement detection instruments to 0.001 meter.
- (b) Install all monitoring points and instrumentation at locations shown in the drawings or as directed by the Contract Administrator.
- (c) Should actual field conditions prevent installation of instruments at the location shown on the Drawings or specified herein, obtain acceptance from the Contract Administrator for new instrument location and elevation.
- (d) Surveying of instrumentation shall be referenced to the same control points and benchmarks established for setting out the work. Control points shall be tied to benchmarks and other monuments outside of the zone of influence of the excavation.
- (e) Installation of instrumentation shall, at all times, be performed in the presence of the Contract Administrator.

E17.6 Construction Methods

- (a) Coordination with Railway
 - (i) Contractor shall comply with all standards, terms, conditions and safety requirements defined in Canadian National Railway (CNR) crossing agreement, attached to these Specifications.
 - (ii) The Contractor must review the frequency of monitoring and threshold of settlement with the CN Local Track Supervisor before commencement of tunnelling
 - (iii) Contractor shall obtain written approval from CNR to proceed with instrumentation and monitoring of the railway within the required timelines, as required under the crossing agreement.
- (b) General Requirements
 - (i) Instrumentation shall be installed at the locations shown in the Instrumentation Schedule on the Drawings, and as specified herein. Instruments shall be installed in accordance with the submitted and approved installation schedule.
 - (ii) The Contractor shall confirm locations of conduits and underground utilities in all areas where holes are to be drilled and instruments installed in accordance with Clause E14. Instrument locations shall be modified, as approved by the Contract Administrator, to avoid interference with the existing conduit and utilities. Repair damage to existing utilities resulting from instrument installations at no additional cost to the City.
 - (iii) The Contractor shall install and perform a baseline survey of all surface and subsurface settlement monitoring devices, including structure settlement markers and inclinometers, at least seven (7) days prior to the commencement of shaft excavation.
 - (iv) Once tunnelling commences, survey monitoring points located within 15 meters of the excavation face at least once per day and remaining points at least every other

day while shafts or pits are open. Once tunnelling operations are complete and shaft are backfilled, survey all monitoring points once every other day for a period of 1 week, and once again at 14 days after tunnelling and shaft backfill is completed.

- (v) The Contractor shall provide access and assistance to the Contract Administrator for obtaining supplemental monitoring data, as requested by Contract Administrator.
- (c) Installation of Instruments
 - (i) Coordinate with CNR to obtain access to tracks for daily monitoring. Obtain permits and provide flaggers, as required, and pay all fees associated with providing access to establishing and performing settlement monitoring. Provide all required worker training to access CNR right-of-way and tracks.
 - (ii) Following completion of the work all instrumentation shall be removed or abandoned according to applicable codes and standards unless otherwise noted.
- (d) Instrument Protection, Maintenance, and Repair
 - (i) Protect the instruments and surface control points from damage. Damaged installations shall be replaced or repaired prior to continuing excavation, pipe jacking, or tunnelling, unless permitted otherwise in writing by the Contract Administrator.
- (e) Response Values
 - (i) Establish and measure the location (X,Y) and elevation (Z) of points on the rail over the tunnel centerline and at points offset 9.5 metres (31 feet) on either side of the centerline of the tunnel. Either rail may be used as the line rail; however, the same rail shall be used for the full length of that tangential segment of track. The measurement shall be taken as the deviation (plus or minus) of the mid offset from an 18.9 metre (62-foot) line centered over the tunneled crossing in accordance with Rules Respecting Track Safety (TC E-54) Subpart C - Track Geometry.

(ii) Instrument Response Values:

| Feature | Threshold Value (Action Required) | Response Value | Shutdown Value |
|---|-----------------------------------|----------------|----------------|
| | mm | mm | mm |
| Underground Utilities (V) | 13 | 23 | 25 |
| Streets (V) | 13 | 23 | 25 |
| Center Track Monitoring Points ¹ (V) | 8 | 12 | 15* |
| Building Monitoring Points (H & V) | 8 | 13 | 15 |
| Paved Driveways, Sidewalks and Curbs (V) | 13 | 23 | 25 |

¹Taken as the vertical offset (+ or -) of the centerline of the track along a 19 m (62 foot) tangential length centered over the centerline of the tunneled crossing.

H: horizontal V: vertical

*Contractor to confirm value with CN Local Track Supervisor

- (iii) When the instruments indicate movement equal to 50% of the maximum allowable value has occurred, the Threshold Value is said to have been reached. At this time, the Contractor shall meet with City to discuss his construction means and methods to determine what changes, if any, shall be made to better control ground movement. Instrument readings shall be required on a daily basis until readings remain unchanged for 5 consecutive days.

- (iv) When the instruments indicate movement equal to 90% of the maximum allowable value has occurred (or as listed above), the Contractor Response Value is said to have been reached. At this time, the Contractor shall actively control ground movement in accordance with the approved plan to prevent reaching the Maximum Allowable Value. Where this movement impacts railways, the railway company shall be notified so repairs to tracks can be undertaken as required (Costs of railway repairs undertaken by the railway shall be borne by the Contractor). Instrument readings shall be required on a daily basis until readings remain unchanged for 5 consecutive days.
- (v) When the instruments indicate movement equal to 100% of the maximum allowable value has occurred, the Contractor shall stop all work immediately, and must meet with the City to develop a plan of action before work can be resumed.
- (f) Abandonment of Instruments
 - (i) Control Points: All surface control points on public property shall remain in place at the completion of the work. Remove all surface control points on private property during the cleanup and restoration work, or as required by the Contract Administrator.
 - (ii) Monitoring Instruments:
 - (i) Surface monitoring points shall remain in place unless directed by the Contract Administrator to remove and dispose of the points.
 - (ii) Properly abandon all subsurface and utility settlement monitoring point boreholes, by grouting drilled holes and casing with cement bentonite grout conforming to the requirements of Contact Grout in Clause E18.3.2.
 - (iii) Structural monitoring points shall be removed by the Contractor after completion of the adjacent work and as allowed by the Contract Administrator. The sites shall be restored to the conditions existing prior to installation of the structural monitoring points.

E17.7 Method of Measurement and Basis of Payment

- (a) Installation and Monitoring will be paid for each type at the contract unit prices described below:
 - Surface/Subsurface Monitoring Array
 - Structure Monitoring Point
 - Track Monitoring Point
 - Utility Monitoring Point
 - Standpipe Piezometer
- (i) The price shall include but not be limited to the installation and protection of the instruments, replacement of damaged utilities, performing baseline measurements, ongoing monitoring, providing electronic monitoring results within 24 hours of taking the measurements, submitting formal data, and abandoning of the instruments
- (ii) 50% of the price will be paid following the installation of each instrument; and the remaining 50% will be paid once the particular instrument no longer requires monitoring as described within the Specifications.

E18. TUNNELLING AND PIPE JACKING

E18.1 Description

- E18.1.1 This specification covers the minimum tunnelling and pipe jacking requirements for the tunnelled installation of the 2700 mm LDS Reinforced Concrete Jacking Pipe (RCP) works shown on the Drawings.

E18.1.2 This Specification includes additional requirements for the RCP to be installed using tunnelling and pipe jacking.

E18.1.3 This Specification includes additional requirements for the shoring to be installed to support the tunnelling and pipe jacking works.

E18.2 Definitions

- (a) **Tunnelling and Pipe Jacking:** A guided, steerable, pipe jacking process that uses a pressurized bentonite slurry, a screw auger, muck carts, or belt conveyors for a spoil removal system. The tunnelling can be completed using an open face rotary wheel TBM, an earth pressure balance machine, or a microtunnel boring machine jacked at the leading end of a string of jacking pipe from a launch shaft to a receiving shaft. Where the term "TBM" is used in this specification it shall refer to an open face rotary wheel TBM, an earth pressure balance machine, or a microtunnel boring machine, as selected by the Contractor.
- (b) **Launch/Retrieval Seal or Entry/Exit Seal:** A mechanical seal usually comprised of one or more rubber flanges attached to a steel housing that is mounted to the wall of the jacking/receiving shaft. The TBM or jacking pipe distends the flange seal as it passes through, creating a seal to reduce water, lubrication, and soil inflows into the shaft during pipe jacking operations.
- (c) **Lubrication/Grout Port:** A port located within the TBM or in a jacking pipe segment, fitted with a one-way valve, for injection of lubrication material or grout into the annular space between the pipe and the ground. Lubrication ports within the pipe are typically threaded to accept lubrication/grout fittings. Pipe plugs are inserted after grouting is completed. A lubrication station consists of an array of lubrication ports at TBM or pipe positions.
- (d) **Electronic Jacking Record:** Electronic data in native format, such as ASCII, TXT or HTML, or as imported into Excel, and as recorded by the data logger of the microtunnelling control system. In no case shall the term "electronic jacking record" be construed to mean a scan or printout of machine operating parameters submitted in portable document format (PDF).
- (e) **Settlement Point:** A point with elevation and spatial location established by survey prior to construction. The point is re-surveyed periodically to monitor ground movements. The point may be a nail, pin, subsurface settlement rod, borehole extensometer, or other device that can be readily located and surveyed.

E18.3 Materials

E18.3.1 Reinforced concrete pipe (RCP) used as jacking pipe shall conform to the requirements of CW 2130 for reinforced concrete bell and spigot straight wall pipe used for jacking, except that the steel joint band shall be Type 304 stainless steel or an approved alternate joint configuration in accordance by B7. RCP shall be specifically designed for pipe jacking and the means and methods selected by the Contractor. The Contractor to follow ASTM C76 and ASCE 27 for the design of the jacking pipe.

E18.3.2 Contact Grout:

- (a) **Cement:** Cement shall be MS or HS portland cement conforming to ASTM C 150 and CSA A3000-08. MS cement shall meet false set requirements of ASTM C150 and CSA A3000-08.
- (b) **Bentonite:** Bentonite shall be a commercially processed powdered bentonite, Wyoming type, such as Baroid, Imacco-gel, and Black Hills.
- (c) **Sand:** Conform to ASTM C144 except where modified in the following subparagraphs.
- (d) **Fineness modulus:** Between 1.50 and 2.00.
- (e) **Grading Requirements:**

| <u>Sieve Sizes</u> | <u>Percentage Passing by Weight</u> |
|--------------------|---|
| No. 8 | 100 |
| No. 16 | 95 - 100 |
| No. 30 | 60 - 85 |
| No. 50 | 20 - 50 |
| No. 10 | 10 - 30 |
| No. 200 | 0 - 5 |

- (f) Fluidifier: Fluidifiers shall hold the solid constituents of the grout in colloidal suspension, be compatible with the cement and water used in the grouting work, and comply with the requirements of ASTM C937.
- (g) Admixtures: Other admixtures may be used subject to the written approval of the Contract Administrator to improve the pumpability, to control set time, to hold sand in suspension, and to prevent segregation and bleeding.

E18.4 Submittals

- E18.4.1 Submittals shall be made in accordance with CW 1110, providing sufficient detail to allow the Contract Administrator to judge whether the proposed equipment, materials, and procedures will meet the Contract requirements. All Drawings shall be legible with dimensions accurately shown and clearly marked in English with metric units. Drawings and photographs transmitted by a facsimile will not be accepted. The Contract Administrator's review of submitted details and data will be based on consideration of requirements for the completed work, protection of existing utilities, and the possibility of unnecessary delays in the execution of the work to be constructed under this Contract. Review of Submittals will be undertaken for general compliance with the Contract documents and does not relieve the Contractor of responsibility for their designs, approach and methodology, equipment or otherwise.
- E18.4.2 Qualifications: Submit personnel qualifications in accordance with Item Quality Control. Provide qualifications and training records for superintendent, TBM operator, site safety representative, personnel responsible for air quality monitoring, and surveyors.
- E18.4.3 TBM and Pipe Jacking Equipment: Submit the following describing the TBM and pipe jacking equipment and construction methods:
 - (a) A detailed description of the methods and equipment to be used in completing each pipe jacking drive.
 - (b) The excavation diameter based upon the outermost dimensions of the gauge cutters or shield. Also provide the radial overcut which shall be determined as the difference between the maximum excavation diameter and the outer diameter of the jacking pipe, divided by two.
 - (c) Manufacturer's literature describing the pipe jacking system including the TBM and all ancillary equipment. If a used or refurbished TBM is proposed, list previous usage, modifications made and dates of modifications, and detailed description of the extent and dates of refurbishment. Include the following information concerning the TBM:
 - (i) Dimensions.
 - (ii) Torque, rotation speed range.
 - (iii) Cutter types, configuration, and gauge cutter setting for overcut.
 - (iv) Upsizing kit details (for MTBM), including the original MTBM model designation.
 - (v) Percentage of open area of cutterhead.
 - (vi) Excavation chamber and cutterhead jets/ports.
 - (vii) Articulation and steering capability.
 - (viii) Face accessibility and plate or flood door provisions.

- (ix) Tail seal.
- (x) Mucking system.
- (d) A description of the alignment control system. Provide manufacturer's literature and Drawings, showing setup and support provisions, and other details for the laser or theodolite system. Submit a description of surveying methods to set guidance system positions and a description of procedures to check and reset or realign guidance system during construction. Submit a description of methods to ensure that thrust block, launch seal, and jacking frame are installed on proper line and grade. Confirm that these systems can achieve the required line and grade within the specified tolerances.
- (e) Results of line and grade survey to ensure that the thrust block, jacking frame, and launch and retrieval seals are installed properly, prior to launch.
- (f) Ventilation and air quality monitoring system, including monitors for TBM deactivation and alarm activation.
- (g) Capacity, number, and arrangement of main jacks. Provide details of thrust ring, thrust block, jacking frame, jacking controls, pressure gages, and jack calibration data (pressure vs. force relationship for each stage of the jacks).
- (h) Details of pipe lubrication injection system and pipe lubricants to be used during pipe jacking, including manufacturer's literature and MSDS sheets. Include a description of proposed lubrication procedures during jacking, including estimated volumes of lubricant that will be pumped. Confirm that sufficient volume of lubricant will be pumped at all times to completely fill the annular space outside the TBM and jacking pipe.
- (i) Details of spoil removal and handling systems, transport, and disposal equipment and procedures including spoil disposal sites.
- (j) Drawings and design details for intermediate jacking stations, indicating number required, shell materials, number and spacing of jacks, proposed spacing, criteria for installing, and method of operation.
- (k) Winter Operations Plan – If tunnelling operations are expected to occur between November and March of any given year, the Contractor shall submit a plan indicating how their proposed tunnelling method will operate in the expected climate conditions.

E18.4.4 Shafts

- (a) Layout Drawings: Submit shaft layout drawings detailing dimensions and locations of all equipment, including overall work area boundaries, crane, loader, forklift, spoil stockpiles, spoil hauling equipment, jacking frame, pumps, generator, lubrication plant, slurry separation system for MTBM, pipe storage area, tool trailer or containers, fences, and staging area. Drawings shall be to scale, or show correct dimensions. Show that all equipment and operations shall be completely contained within the allowable work areas.
- (b) Calculations: Submit calculations sealed by a professional engineer licenced in Manitoba that demonstrate that the shaft elements can withstand all earth and groundwater pressures, equipment, applicable traffic, rail, and construction loads and other surcharges in accordance with the baselined soil, and any other requirements described in the Drawings and Specifications. Submit calculations demonstrating that any thrust blocks can withstand the anticipated thrust forces with a minimum factor of safety of 2.0.

E18.4.5 Daily Records:

- (a) Submit the following daily records to the onsite Contract Administrator for review, by noon on the next Working Day following the shift for which the data or records were taken:
 - (i) Manual Jacking Records: Provide complete written jacking records to the Contract Administrator. These records shall include for each pipe, at a minimum: date, time, name of operator, tunnel drive identification, installed pipe number and

corresponding tunnel length, start and end time of each jacked pipe, time required to set subsequent pipe, spoil volumes (muck carts per pipe joint), soil conditions including occurrences of unstable soils and estimated groundwater inflow rates if any, jacking forces, steering jack positions, line and grade offsets, any movement of the guidance system, TBM roll, intermediate jacking station use and jacking forces, volume and location of lubricant pumped, problems encountered with the TBM or other components or equipment, and durations and reasons for delays. Recorded observations should be made at intervals of not less than four times per pipe, whenever conditions change, and as directed by the Contract Administrator. At least seven (7) days prior to the launch of the TBM, submit samples of the jacking logs or records to be used.

- (ii) **Electronic Jacking Records:** For MTBM, provide complete electronic jacking records to the Contract Administrator. These records shall include, at a minimum: date, time, name of operator, tunnel drive identification, installed pipe number and corresponding tunnel length, rate of advance, face/excavation chamber pressures, jacking forces, cutterhead speed and torque, slurry flow rates and pressures, bypass valve position, use of any cutting or high-pressure nozzles, face pressure, steering jack positions, line and grade offsets, any movement of the guidance system, machine inclination and roll, intermediate jacking station use and jacking forces, and pressure, volume, and location of any lubricant pumped. The computer-recorded data shall be referenced to time and distance and shall be recorded at time intervals of one minute or less. In addition, manually recorded observations of the same parameters shall also be made at intervals of not less than 5 feet of advance, as conditions change, and as directed by the Contract Administrator. At least 7 days prior to the launch of the MTBM, submit samples of the automated jacking records. Samples shall include electronic data and any necessary programs to interpret data.
- (iii) **Slurry Additives:** The Contractor shall provide records of all slurry additives including any bentonite and polymers. The time and volume, or weight, of the additive shall be noted. Measurements of mud weights, specific gravity and viscosity will be made at the beginning, middle, and end of each shift, and submitted with the daily logs. Measurements will be made on slurry samples taken from the slurry tanks and noted accordingly.
- (iv) **Contact Grout Reports and Records:** Maintain and submit daily logs of grouting operations, including grouting locations, pressures, volumes, and grout mix pumped, and time of pumping. Note any problems or unusual observations on logs.

E18.4.6 Calculations:

- (a) Calculations shall be submitted in a neat, legible format. Assumptions used in calculations shall be consistent with information provided in the GBR. All calculations shall be prepared by a professional engineer licensed in the Province of Manitoba, who shall stamp and sign calculations.
- (v) Estimate of the maximum jacking force expected to complete each drive, accounting for thrust pressures and frictional resistance along the pipe string including potential soil set-up after delays in jacking and considering squeezing of the clay soils.
- (vi) In the event that the pipe manufacturer does not provide the ultimate and allowable jacking capacity, provide calculations demonstrating that the proposed jacking pipe is capable of supporting the maximum stresses to be imposed during jacking. The calculations shall take into account ground and hydrostatic loads, axial and eccentric jacking forces, external loads such as live loads due to traffic, and any other loads that may be reasonably anticipated during jacking. All loads shall be shown and described. Include assumed maximum drive length.
- (vii) Calculations demonstrating that the ground support system and soils behind the thrust block can transfer the maximum planned jacking forces exerted by the main jacks to the ground during pipe installation with an acceptable factor of safety of at least 2.0, without excessive stresses, deflection or displacement.

E18.4.7 Jacking Pipe:

- (a) Contractor to submit detailed drawings of the jacking pipe indicating the location and spacing of lubrication/grout fittings, joint details, joint cushioning materials, gaskets, and intermediate jacking station pipe details. Indicate the ultimate and allowable jacking capacity for axial and eccentric loading, and the required fabrication tolerances to prevent damage to the pipe during installation.

E18.4.8 Safety Plan:

- (a) Contractor to submit a Safety Plan for the pipe jacking operations including air monitoring equipment and procedures and provisions for lighting, ventilation, and electrical system safeguards. Provide name of site safety representative responsible for implementing safety program.

E18.4.9 Detailed procedure for preventing ground loss whenever the machine is stopped and restarted.

E18.5 Design Criteria

E18.5.1 Pipe Jacking Equipment:

- (a) The TBM shall be designed to support all ground loads which may be imposed upon it as well as any surcharge loads and loads imposed by the thrust jacks, steering mechanisms, and other appurtenances. The TBM shall be continuous around its full perimeter and shall have suitable breast tables, breast jacks, closable flood doors, or other such provisions to temporarily support the excavation face and prevent loss of ground during periods of shutdown or in the event of running/flowing ground conditions.
- (b) The TBM and excavation equipment selected for the project shall be compatible with the geologic conditions described in the Geotechnical Baseline Report, and the geologic conditions anticipated by the Contractor. The TBM, including the weight, dimensions, steering capabilities, and other characteristics, shall be suitable for, and capable of, efficiently advancing through the geologic conditions described in the Geotechnical Baseline Report and the geologic conditions anticipated by the Contractor. The pipe jacking shield shall be capable of excavating or handling boulders or other hard objects up to 30% of the outside diameter of the shield.
- (c) The TBM shall have an articulation joint between two segments of the shield, with a watertight joint. The shield shall be steerable in both the vertical and horizontal directions to allow the operator to maintain line and grade within the specified tolerances listed in this Section. The shield shall be laser or theodolite guided, and monitored continuously by the operator. The guidance system shall be designed to function at the maximum required drive length without loss of accuracy or reliability of function. The cutterhead shall have a reversible drive system so that it can rotate in either direction to minimize rotation or roll of the shield and/or pipe during installation.
- (d) The tail of the TBM shall have gaskets to prevent material from moving into the tunnel through the joint between the tail skin and the jacking pipe.
- (e) The maximum radial overcut allowed shall be 30 mm. The minimum radial overcut shall be 12 mm.
- (f) Maximum allowable radial overcut values have been selected to minimize potential settlements of the ground and subsurface facilities. The radial overcut will be determined as the difference between the maximum diameter created by the cutting teeth or overcut band on the TBM (whichever is greater) and the outer diameter of the pipeline, divided by two.
- (g) The TBM shall bear the name of the City, Contractor, Contract Administrator's firm, and other participating agencies and consultants. Lettering shall be black or dark blue applied on the side of the MTBM by an experienced sign painter. Paint shall be exterior type enamel. Information and logos to be included will be provided by the Contract Administrator.

- E18.5.2 The jacking system shall be capable of continuously monitoring the jacking pressure, the rate of advancement, and the distance jacked. The jacking system shall develop a uniform distribution of jacking forces on the end of the pipe.
- E18.5.3 A lubrication injection system shall be provided to inject pipe lubricant around the TBM and jacking pipe to completely fill the annular space outside the TBM and jacking pipe to reduce ground squeezing and decrease frictional resistance. Lubrication materials may include a mixture of bentonite and/or polymers and water. Lubrication ports shall be provided in the shield and jacking pipe to allow for lubrication along the pipe string at intervals not more than three (3) metres. Lubrication ports shall also be used for contact grouting upon completion of the drive. Lubrication ports have a diameter and orientation as shown on the Drawings. The complete filling of the overcut outside the TBM with lubricant is considered critical, given the baselined soil conditions.
- E18.5.4 The spoil conveyance system shall be designed for the full range of ground conditions described in the Geotechnical Reports and anticipated by the Contractor. The system shall allow determination of muck volumes per pipe segment.
- E18.5.5 The MTBM slurry separation plant shall be designed to achieve the rates of spoil separation and slurry cleaning required for planned production rates and in consideration of the baselined soil properties. The separation plant must fit within the allowable work space. Excavated slurry pits or ponds will not be allowed. Onsite disposal shall not be permitted.
- E18.5.6 Methods and equipment used shall control surface settlement and heave above the pipeline to prevent damage to existing utilities, facilities, and improvements. Ground movements (settlement/heave) shall be limited to values that shall not cause damage to adjacent utilities and facilities. In no case shall settlements exceed the applicable values listed in Clause E17.6(e)(ii).
- E18.5.7 The thrust block face shall be constructed perpendicular to the proposed pipe alignment. The thrust block shall be designed to withstand the maximum jacking forces developed by the main jacks, without excessive stresses, deflection, or displacement.
- E18.5.8 Pipe design for jacking loads and acceptable fabrication tolerances is the responsibility of the Contractor. Maximum jacking loads applied to the jacking pipe shall not exceed 50% of the ultimate compressive strength of the pipe material, or the maximum allowable jacking strength of the pipe as established by the manufacturer, whichever is lower.
- E18.5.9 Intermediate jacking stations shall be fully gasketed between the interjack shell and each interjack pipe, with two (2) gaskets installed on each pipe. The interjack shell shall be fabricated of stainless steel of the same grade as the pipe joint collars. At least one fully assembled IJS and two pipe specials shall be onsite for each pipe jacking drive exceeding 200 metres. The Contractor shall determine required spacing of intermediate jacking stations, based on geotechnical conditions described in the GBR, estimated jacking forces, and jacking load capacity of the pipe and jacking frame proposed by the Contractor. Install and use an IJS within 10 metres of the tail of the TBM regardless of anticipated or actual jacking forces. Install and use additional IJS's if anticipated or actual jacking forces exceed 70% of the allowable design capacity of the jacking pipe, jacking frame, thrust block, or thrust capacity of the main jacks, whichever is the lowest.
- E18.6 Quality Control
- E18.6.1 All tunnelling and pipe jacking work shall be performed by a pre-qualified Contractor under City of Winnipeg RFQ NO. 908-2016. Failure to provide a pre-qualified tunnel Contractor is failure to fulfill the Contract and the Contractor will be required to obtain a subcontractor that meets the pre-qualification requirements.
- E18.6.2 The project superintendent shall have at least three (3) years of experience supervising TBM pipe jacking construction. The Contractor shall submit a description of referenced projects including Owner's name and contact information, project superintendent, and machine operators.

- E18.6.3 The tunnelling and pipe jacking operator(s) shall have technical training in the operation of the proposed tunnelling and pipe jacking equipment and shall have completed, as a primary operator, at least three (3) similar tunnelling and pipe jacking projects
- E18.6.4 The site safety representative and personnel responsible for air quality monitoring shall have verifiable experience in tunnel construction.
- E18.6.5 The surveyor responsible for line and grade control shall have experience in similar projects.
- E18.6.6 The Contractor shall provide written notice to the Contract Administrator at least 72 hours in advance of the planned launch of the pipe jacking shield. All work by the Contractor shall be done in the presence of the Contract Administrator unless the Contract Administrator grants prior written approval to perform such work in Contract Administrator's absence. The Contractor shall immediately notify the Contract Administrator, in writing, when any problems are encountered with equipment or materials, or if the Contractor believes the conditions encountered are materially and significantly different from those represented within the Contract Documents.
- E18.6.7 The Contractor shall allow access to the Contract Administrator and shall furnish necessary assistance and cooperation to aid the Contract Administrator in observations, measurements, data, and sample collection, including, but not limited to the following:
- E18.6.8 The City and/or Contract Administrator shall have full access to the TBM and jacking system hydraulic pressure gauges prior to, during, and following all pipe jacking operations. Additionally, the Contractor shall allow the Contract Administrator reasonable access to the TBM for inspection of the excavation face.
- E18.6.9 The City and/or Contract Administrator shall have full access to the jacking and reception shafts prior to, during, and following all jacking operations. This shall include, but not be limited to, visual inspection of installed pipes, launch and retrieval seals, and verification of line and grade. The Contractor shall provide safe access in accordance with all safety regulations.
- E18.6.10 The City and/or Contract Administrator shall have full access to spoils removed from the tunnel excavation prior to, during, and following all pipe jacking operations. The Contract Administrator shall be allowed to collect soil samples from the muck buckets or spoil piles a minimum of once per installed pipe section, or every three (3) metres, whichever is more often, and at any time when changes in soil conditions or obstructions are apparent or suspected.
- E18.6.11 The City and/or Contract Administrator shall have full access to the bentonite lubrication plant prior to, during, and following all jacking operations. This shall include, but not be limited to, full access to visually inspect storage and mixing tanks, lubricant pressures and pumping rates, amount and type of lubricants on site and sampling and testing to determine lubricant properties.
- E18.6.12 The City and Contract Administrator shall have full access to the slurry separation plant prior to, during, and following all microtunnelling operations. This shall include, but not be limited to, full access to shaker screens, hydrocyclones, conveyor belts, centrifuge equipment, and slurry and spoil holding tanks. The Contract Administrator shall be allowed to collect soil samples from the shaker screens and/or spoil holding tanks on the slurry separation plant a minimum of once per installed pipe section, or every 3 metres, whichever is more often, and at any time when changes in soil conditions or obstructions are apparent or suspected.
- E18.6.13 City and Contract Administrator shall have the right and opportunity to visit the plant where the tunnelling and pipe jacking equipment is being manufactured or refurbished, prior to acceptance and shipping of tunnelling and pipe jacking equipment to Site. Notify Contract Administrator of schedule for manufacture or refurbishment at least 14 days before manufacturer/refurbishment work begins and coordinate visit with manufacturer if Contract Administrator indicates desire to visit plant.

E18.7 Construction Methods

E18.7.1 General Requirements

- (a) Pipe jacking shall not begin until the following tasks have been completed:
- (i) All required submittals have been provided, reviewed, and accepted.
 - (ii) Jacking and receiving shaft excavations and support systems have been completed for the planned drive in accordance with accepted submittals and the requirements of this Section and CW 2030.
 - (iii) The Contractor has confirmed that the ground will remain stable without movement of soil or water while the entry/exit location shoring is removed and while the TBM is being launched or received into a shaft or during jacking operations. The progressive steps identified below shall be used to confirm suitable ground improvements for all shaft types and entry/exit locations:
 - ◆ Demonstrate the stability of the ground by cutting a 50 mm diameter hole in the shoring wall near the center of the bore. If no obvious soil and less than 10 litres per minute (lpm) of water enters the shaft, the Contractor may progress to the next demonstration step. If any soil or greater than 10 lpm of water enters the shaft, the Contractor shall seal the demonstration hole and improve the ground before repeating the demonstration step.
 - ◆ After successful completion of the first demonstration step, the Contractor shall demonstrate the stability of the ground by cutting a 300 mm diameter hole in the shoring wall at the location of previous demonstration hole. If no soil and less than 10 lpm of water enters, the Contractor may progress to the next demonstration step. If any soil or greater than 10 lpm of water enters the shaft, the Contractor shall seal the demonstration hole and further improve the ground before repeating the demonstration step.
 - ◆ After successful completion of the first two demonstration steps, and if the Contractor believes the ground improvements are sufficient, the Contractor may proceed with remainder of the shaft wall penetration procedures.
 - (iv) The location, orientation and grade of the jacking frame or guide rails and entry/exit seals for the planned drive have been surveyed to ensure they are on proper line and grade and to verify that they are properly supported. Special care shall be taken when setting the guide rails and jacking frame to ensure stability and correctness of the alignment and grade. Guide rails or jacking frame shall be securely attached to the shaft supports or concrete working slab, with supplementary braces, concrete, or grout if necessary, to prevent movement or shifting during the work.
 - (v) A start-up inspection of all mechanical and hydraulic systems associated with the pipe jacking operations has been completed. The system shall be tested to ensure that the pipe jacking shield and supporting equipment is functioning properly. The Contract Administrator shall be notified at least 72 hours prior to the start-up inspection and a site inspector representing the Contract Administrator shall be present during the start-up inspection. Key TBM performance data shall be measured and recorded by the Contractor during this inspection, including cutterhead rotational torque, correct functioning of main and steering jacks, laser, and other components. The records of the start-up inspection shall be submitted to the Contract Administrator within 24 hours of the completed inspection.
 - (vi) All specified geotechnical instrumentation for the planned drive has been installed, approved, and baselined.
 - (vii) Pre-construction photographic survey and documentation of existing conditions, i.e., roadways, driveways, sidewalks, curb and gutter, structures, etc. has been completed and transmitted to the Contract Administrator.

- (b) The Contractor shall furnish all necessary equipment, power, water, and utilities for pipe jacking, pipe lubricant mixing and pumping, spoil removal and disposal, grouting, and other associated work required for the Contractor's methods of construction.
- (c) Conduct all operations such that trucks and other vehicles do not interfere with traffic or create a mud, dust, or noise nuisance in the streets and to adjacent properties. Promptly clean up, remove, and dispose of mud or spoil spillage.
- (d) All work shall be done so as not to disturb roadways, railroads, canal channels, adjacent structures, landscaped areas, or existing utilities. Any damage shall be immediately repaired to original or better condition and to the satisfaction of Contract Administrator, at no additional cost to the City.
- (e) Whenever there is a condition that is likely to endanger the stability of the excavation or adjacent structures, the Contractor shall operate with a full crew 24 hours a day, including weekends and holidays, without interruption, until those conditions no longer jeopardize the stability of the work, and as approved by the Contract Administrator.

E18.7.2 GWL Monitoring/ Excavation Depressurization

- (a) The Contractor shall monitor the groundwater level (GWL) at each of their shaft locations to ensure that the potential for basal heave is controlled to the safety factor levels indicated in the Geotechnical Baseline Report.
 - (i) A standpipe piezometer shall be drilled into the till allowing for monitoring of the till pressures.
 - (ii) The piezometer shall be drilled within 1-3 m of edge of the shaft/excavation.
 - (iii) The Contractor is required to monitor the groundwater levels in accordance with the following monitoring schedule:
 - ◆ If monitoring to ensure GWL are below threshold that requires depressurization – minimum one reading per day.
 - ◆ If monitoring active depressurization to determine impact of pumping on GWL – Minimum twice per day.
- (b) Depressurization system shall control ground water levels and pressures and protect against excavation basal heave/blowout.
 - (i) The depressurized system shall include a bedrock pumping well system or an alternate approved design in accordance with B7 and as approved by the Contract Administrator.
 - (ii) Once required, the well system shall operate continuously to the safety factors indicated within the GBR.
 - (iii) The Contractor shall be responsible to obtain a Temporary Authorization Water Use Licence from the Province of Manitoba for their proposed depressurization system, and any other permits necessary for operation of the depressurization system.
- (c) Prior to construction the Contractor shall submit an excavation depressurization system plan designed and sealed by a Professional Engineer or Professional Geologist registered to practice in the Province of Manitoba for review by the Contract Administrator including:
 - (i) An evaluation of static groundwater conditions and required drawdown elevations for successful completion of the Project excavations.
 - (ii) Permissible groundwater levels (pressures) at various stages of excavation and backfill to prevent uplift of soil layers and to prevent any other disturbance to the in-situ foundation soils due to any excess groundwater pressures.
 - (iii) Confirmation of the elevation to which the excavation may proceed before the well system commences operation.
 - (iv) Confirmation of the extent to which chamber construction and backfill must be completed before the depressurization well system can cease operation.
 - (v) Number of wells, including location, size, pumps and installation details.

- (vi) Schedule of monitoring, maintenance, manpower estimates, and for interpreting of ground water levels throughout the duration of the Project.

E18.7.3 Pipe Jacking

- (a) Pipe jacking shall be completed in accordance with the accepted submittals, and all applicable permit conditions.
- (b) Provide a suitable jacking frame and thrust block to carry out the work. Provide intermediate jacking stations (IJS) to complete the pipe jacking drives indicated on the Drawings.
- (c) Transport the jacking pipe from storage to jacking shaft without damage. Transport methods shall be acceptable to pipe manufacturer. Damaged jacking pipe shall not be used in the work, unless permitted in writing by the Contract Administrator. Set the pipe to be jacked on properly braced and supported guide rails or jacking frame.
- (d) The axial forces from the thrust jacks shall be distributed to the jacking pipe uniformly through a properly designed thrust ring and cushion material to prevent damage to the ends of the pipe. The Contractor or pipe manufacturer shall install pipe cushion materials between each jacking pipe joint. The cushion materials or compression rings shall be made of plywood or other materials recommended by the pipe manufacturer. The compression rings shall not protrude beyond the inner or outer diameter of the pipe. The compression rings shall be of sufficient thickness and stiffness to distribute the jacking load between successive pipe sections, and minimize eccentric loading. Jacking forces applied to the pipe shall not exceed the specified allowable limits submitted by the Contractor and approved by the Contract Administrator.
- (e) Jack pipe sections into position following the design line and grade without damaging the pipe. In the event a section of pipe is damaged during the jacking operation, the Contractor, with approval from the Contract Administrator, shall make temporary repairs to the pipe and shall jack the pipe through to the receiving shaft for removal. Other methods of repairing the damaged pipe may be proposed in a submittal for review and acceptance of the Contract Administrator.
- (f) The TBM shall be operated to restrict the excavation of the materials to a volume equal to the shield and pipe jacked with allowance for the radial overcut, to prevent loss of ground and settlement or possible damage to overlying structures. The Contractor shall monitor, measure, and report excavated spoil volume. If excavated spoil volume with proper bulking factors exceeds the theoretical volume of the shield and pipe being installed, the Contractor shall notify the Contract Administrator and promptly modify excavation procedures to prevent further over excavation.
- (g) Pipe jacking operations shall control surface settlement and heave above the pipeline to prevent damage to existing utilities, facilities, and improvements. The Contractor shall repair any damage resulting from construction activities, at no additional cost to City and without extension of schedule for completion. The Contractor shall contact grout any voids caused by or encountered during the shaft construction or pipe jacking including the annular space created by the radial overcut of the shield. The Contractor shall modify equipment and procedures as required to avoid recurrence of excessive settlements or damage.
- (h) Provide a lubrication system, and inject pipe lubricants through injection ports at the rear of the TBM and ports in the jacking pipe to completely fill the annular space, to reduce the squeezing of soil, and to minimize pipe friction. Injection ports shall be installed by the pipe manufacturer in the pipe at intervals not to exceed three (3) metres along the pipe string. Pipe lubricants shall be injected continuously as the pipe is advanced. The volume injected shall not be less than that required to fill the annular void space outside the pipe. Inject greater volumes as required to minimize jacking forces.
- (i) Completely contain, transport, and dispose of all excavated materials away from the construction site. Use only the disposal sites identified in approved submittals for spoil disposal.

- (j) Contact Grouting: Within 48 hours after pipe jacking is complete, fill the annular space created by the overcut of the TBM with contact grout.

E18.7.4 Control of Line and Grade

- (a) The Contract Administrator will arrange for benchmarks on the site, for use during construction. The Contractor shall verify these benchmarks by survey prior to the start of construction, and shall confirm positions or report any errors or discrepancies in writing to the Contract Administrator.
- (b) After confirming that all established benchmarks provided for the Contractor's use are accurate, use these benchmarks to furnish and maintain all reference lines and grades for pipe jacking. The Contractor shall use these lines and grades to establish the exact location of the jacking pipe using a laser or theodolite guidance system. Submit to the Contract Administrator copies of field notes used to establish all lines and grades and allow the Contract Administrator to check guidance system setup prior to beginning each pipe jacking drive. Provide access for the Contract Administrator to perform survey checks of the guidance system and the line and grade of the jacking pipe on a daily basis during pipe jacking operations. The Contractor shall be fully responsible for the accuracy of the work and the correction of it, as required.
- (c) The jacking pipe shall be installed in accordance with the following tolerances:
 - (i) Variations from Design Line (Horizontal): 50 mm maximum.
 - (ii) Variations from Design Grade (Vertical): 25 mm maximum.
- (d) The TBM shall be steered to maintain line and grade within the tolerances specified. This shall be achieved by continuously monitoring and adjusting line, grade, roll, and steering attitude during the operation. If the installation deviates from line or grade, make the necessary corrections, and return to the design alignment and grade at a rate of not more than 1:300.
- (e) The guidance system shall be mounted independently from the thrust block and jacking frame to maintain alignment if there is movement of equipment during jacking. Stop pipe jacking operations and reset guidance system if its alignment shifts or is moved off design alignment and grade for any reason. Check guidance system setup at least once per shift. Guidance system should only be reset by experienced, competent surveying personnel in accordance with acceptable procedures.
- (f) Monitor line and grade continuously during pipe jacking operations. Record deviation with respect to design line and grade at least twice per pipe segment and submit records to Contract Administrator as requested.
- (g) If the pipe installation does not meet the specified tolerance, the Contractor shall correct the installation including any necessary redesign of the pipeline or structures and acquisition of necessary easements. All corrective work shall be performed by the Contractor at no additional cost to the City and without schedule extension, and is subject to the written approval of the Contract Administrator.

E18.7.5 Contact Grouting

- (a) Provide equipment for mixing and injecting grout to satisfactorily mix and agitate the grout and force it into the grout holes, in a continuous flow at the desired pressure. Provide pumps capable of continuously developing a sustained pressure of 350 kPa at the grout port connections.
- (b) Provide two pressure gauges, one at the grout pump and one at the collar of each hole being grouted. Provide gauge savers for all gauge, to prevent the entry of grout into the gauge housing. Check the accuracy of the gauges periodically with an accurately calibrated pressure gauge. Make available a minimum of two spare pressure gauges onsite.
- (c) Provide the grouting equipment with a meter to determine the volume of grout injected. Calibrate the meter in cubic metre to the nearest one-tenth of a cubic metre.

- (d) Maintain the grouting equipment in satisfactory operating condition throughout the course of the Work to ensure continuous and efficient performance during grouting operations.
- (e) Provide suitable stop valves at the collar of each hole for use in maintaining pressure as required until the grout has set.
- (f) Provide grout hoses with an inside diameter not less than 30 mm nor greater than 50 mm and capable of withstanding the maximum water and grout pressures to be used.

E18.7.6 Mixing And Injection of Contact Grout

- (a) Provide materials free of lumps when put into the mixer. Constantly agitate the grout mix. Install grout that flows unimpeded and completely fill voids. Waste grout not injected after 90 minutes of mixing.
- (b) Operate and control the grouting process so that the grout will be delivered uniformly and steadily. The locations of contact grout holes in the pipe are shown on the Drawings. Drilling grout holes through pipe will not be permitted.
- (c) Recirculate grout mixes when any new mix is batched or after adding water, fluidifier, or sand to mix. Recirculate mix for at least 2 minutes prior to pumping grout into grout hole.
- (d) Grouting will be considered completed when less than 0.25 cubic metre of grout of the accepted mix and consistency can be pumped in 5 minutes under the specified maximum pressure. After the grouting is finished, close the valve before the grout header is removed and leave closed until grout has set.
- (e) The maximum sustained grouting pressure shall be 200 kPa or 10 kPa per metre of earth cover, whichever is less, at the grout hole collar connection unless otherwise approved in writing by the Contract Administrator.

E18.7.7 Contact Grouting of Jacking Pipe

- (a) Commence contact grouting outside of the jacking pipe within 24 hours following the completion of each tunnelled drive. Conduct grouting operations continuously until completed.
- (b) Install contact grout ports in the jacking pipe as shown on the drawings. Drilling grout holes through installed jacking pipe will not be permitted. Provide grout ports threaded to accept valve fittings and plugs.
- (c) Hook up and attempt to pump grout at every tunnelled pipe grout port or coupling unless approval is granted by the Contract Administrator in writing to omit grouting of selected ports.
- (d) Inject grout through the tunnelled pipe grout connections in such a manner as to completely fill voids outside the pipe resulting from, or encountered during, tunnelling operations. Control grout pressure so as to avoid damaging the pipe, and to avoid movement of the surrounding ground or improvements.
- (e) Grouting to generally progress sequentially in a constant upgradient direction from one grout port to the next grout port in the sequence indicated in the approved submittals.
- (f) During the grouting operations, clean and make ready for grouting the sufficient contact grout ports ahead of the port to be grouted. Attach valves or other suitable devices and place in the fully open position on ungrouted ports within the maximum grout communication distance.
- (g) For any hole ahead of the grouting operation, with a valve attached, and the valve in the open position, such hole shall be considered grouted if grout issues forth of the same consistency and color, and at the same rate as that being pumped. Replace grout plugs in pipe at the completion of grouting.
- (h) Seal pipe grout fittings with screw type plugs upon completion of grouting. Use dry pack mortar to fill any recesses, and to provide a smooth surface.

E18.7.8 Safety

- (a) The Contractor is responsible for safety on the job site. Methods of construction shall be such as to ensure the safety of the work, Contractor's and other employees on site, and the public. Perform all work in accordance with all current applicable regulations and safety requirements of Federal, Provincial and local agencies.
- (b) When personnel are underground, furnish and operate a temporary ventilation system, and air monitoring system conforming to Federal and Provincial requirements. Operate and maintain a ventilation system that provides a sufficient supply of fresh air and maintains an atmosphere free of toxic or flammable gasses in all underground work areas.
- (c) No gasoline-powered equipment shall be permitted in jacking and receiving shafts. Diesel, electrical, hydraulic, and air powered equipment is acceptable, subject to applicable local, Provincial and Federal regulations.

E18.7.9 Cleanup And Restoration

- (a) After completion of pipe jacking, remove all construction debris, spoils, oil, grease, and other materials from the jacking pipe, jacking and receiving shafts, and all Contractor work areas. Cleaning shall be incidental to the construction. No separate payment shall be made for cleanup.
- (b) Restoration shall follow construction as the work progresses, and shall be completed as soon as possible. Restore and repair any damage resulting from surface settlement caused by shaft excavation, or pipe jacking. Any property damaged or destroyed, shall be restored to a condition equal to or better than existing prior to construction. Restoration shall be completed no later than thirty (30) days after the pipe jacking is complete. This provision for restoration shall include all property affected by the construction operations.

E18.8 Method of Measurement and Basis of Payment

E18.8.1 Tunnelling and Pipe Jacking

- (a) Construction of the tunnelled installation of the RCP jacking pipe shall be measured on a linear metre basis and paid at the contract unit price of "Tunnelling and Pipe Jacking" for each pipe diameter installed using this method. The price shall include all work described herein (with the exception of groundwater monitoring and depressurization) and includes shaft excavation, shoring, tunnelling, pipe, contact grouting, bedding, backfilling, surface reinstatement, and all appurtenances and miscellaneous materials.
 - (i) Measurement for length of sewer will be made horizontally at grade above the centreline of pipe through shafts from centre to centre of manholes, or end of pipe
 - (ii) Connecting new sewers to new manholes will be included in sewer installation.
 - (iii) Repair of damage to underground and surface structures due to surface subsidence and soil heaving caused by trenchless installation methods will be at own expense.
 - (iv) Shaft Installation and shoring described herein will be incidental to Tunneling and pipe Jacking
 - (v) Excavation, bedding and backfill described in section E9 will be incidental to Tunneling and Pipe Jacking.
 - (vi) Surface restorations described in section E10 will be incidental to Tunneling and Pipe Jacking.
 - (vii) Costs for installation of standpipe piezometers and monitoring of the groundwater level are paid separately under E17.

E18.8.2 Groundwater Depressurization

- (a) The setup of the depressurization system (if required) and daily operation of the depressurization system(s) (as required) shall be paid as follows:.

- (i) The installation of the depressurization will be paid at the lump sum price for each shaft location at the Contract unit price of "Depressurization System Installation"
 - This cost shall cover drilling of depressurization wells, pumps, electrical supply and hook-up, outlet hoses, flowmeter to measure discharge, permits, staffing, and any other appurtenances associated with the set up of the depressurization system.
 - Depressurization installation will only be paid for where groundwater levels indicate that depressurization is required, in accordance with this specification
- (ii) The daily operation of the depressurization system will be paid for at the daily rate under the contract unit price of "Daily Depressurization System Operation".
 - The price shall cover the costs for each day that the pumping is used (either full 24 operation or partial day) to maintain the GWL below the threshold described herein.
 - The costs shall include pumps, generator, fuel cost, staffing, and any other costs associated with the daily operation of the depressurization system.
 - Where more than one depressurization system is running on any given day, a unit one day will be paid out for the operation of each system.

E19. TRENCHLESS SEWER CONSTRUCTION

E19.1 Description

- (a) This Specification supplements and amends City of Winnipeg Standard Construction Specification CW 2130 Gravity Sewers, and shall cover the installation of the 1350 mm LDS Sewers.
- (b) Further to Clause 3.4.1 of CW 2130, sewers shall be installed by trenchless methods. Where necessary tie-ins to existing sewers may be through open cut methods.

E19.2 Materials

- (a) Pipe Classes indicated on Drawings or within the Bid documents represent long term design conditions and loading. The Contractor shall verify that the pipe class, strength, reinforcing and joint design are suitable for his proposed installation methods and procedures. Design of any pipe to suit installation methods is the responsibility of the Contractor.
- (b) Material of the piping shall be reinforced concrete to ASTM C76 with strength class type indicated on Drawings or listed in the Bid documents are acceptable.

E19.3 Construction Methods

- (a) Land drainage sewers shall be installed in accordance with CW 2130.
- (b) Selection of excavation equipment for installation of sewers by trenchless methods shall be the responsibility of the Contractor and shall be made based on expected soil conditions as detailed on the test hole logs. Trenchless sewer installation may be by any suitable methods including coring, pipe jacking, hand tunnelling or by tunnel boring machine that will meet the design objective.

E19.4 Measurement and Payment

- (a) Measurement and payment for sewer installation shall be in accordance with CW 2130 for the diameter, class, bedding and backfill requirements listed on the Form B.
- (b) Payment for the temporary or permanent relocation of existing utilities, and or temporary support of existing utilities required for the placement of shafts shall be incidental to Trenchless Sewer Construction.

- (c) Cost of shaft construction required for the installation of the works described herein, is incidental to Trenchless Sewer Construction.

E20. CANADIAN NATIONAL RAILWAY RIGHT OF WAY CROSSING REQUIREMENTS

E20.1 Description

E20.1.1 This Specification covers the potential costs borne by the Contractor imposed by the Canadian National Railway (CNR) in order to comply with the Crossing agreement. The crossing agreement must be adhered to for all Work shown on the Drawings within the CNR right-of-way.

E20.1.2 Installation through the CN right-of-way is subject to the additional requirements of the railway. The following documents shall apply:

- (a) A Guide to the Pipe and Wire Process – Water/Sewer Pipeline – General Guidelines (CN)
- (b) Pipeline Crossing Specifications by CN Rail
- (c) Standards Respecting Pipeline Crossings Under Railways – TC E-10 (Transport Canada)
- (d) Safety Guidelines for Contractors and Non-CN Personnel, December 2013

E20.1.3 Crossing Agreement

The installation of sewer pipe through the Canadian National Railway (CNR) right-of-way is dependent on the execution of a crossing agreement between the City of Winnipeg and CNR. KGS Group submitted the crossing agreement on behalf of the City on July 14, 2016 consisting of Drawing C-232 and a geotechnical Investigation report. Copies of the versions of the drawings and report included within the crossing application are available for examination at KGS Group during regular business hours. These documents are for information only and do not form part of the Contract. The City has received the Crossing agreement from CNR and are in the final stages of reviewing the document before signing. It is anticipated that the agreement will be fully executed in advance of award of the construction contract.

- (b) Rail Elevation Monitoring Plan
 - (i) Details of monitoring plan as identified in Clause E17.

E20.2 Submittals

E20.2.1 Pipeline Crossing Warning Signs

- (a) Drawings showing layouts, actual letter sizes and styles, and mounting details.
- (b) Manufacturer's literature showing letter sizes and styles, sign materials, and standard mounting details.

E20.3 Materials

E20.3.1 Pipeline Crossing Warning Signs

- (a) In conformance with CSA Standard Z662 and as amended in TC E-10.
- (b) Sign size will be a minimum size of 250mm x 350mm or as appropriate to display text.
- (c) Sign Material: Baked enamel finished 14-gauge (minimum) steel or 12-gauge (minimum) aluminum signs.
- (d) Sign Post: 2-inch U-Channel galvanized steel post meeting ASTM A36 and ASTM A123.
- (e) Fasteners: Stainless steel screws or bolts of appropriate size.

E20.4 Methods

- (a) The Contractor is responsible for all coordination with CN and any fees required to meet the CN requirements before and during the Work.

E20.4.1 Flagging and Signals

- (a) A minimum fee for flagging and signals protection has been prepaid by the City of Winnipeg as part of the initial crossing application fee. All additional charges for flagging and signals protection incurred to complete the work listed herein, in the geotechnical report, and shown on drawings shall be at the Contractor's own expense.
- (b) Prior to the start of construction, a minimum notice of ten working days must be given to CN to arrange flagging protection

E20.4.2 Settlement and Construction Monitoring

- (a) Refer to Clause E17 for monitoring requirements for railway monitoring.

E20.4.3 Railway Safety

- (a) Comply with CN Safety Guidelines for non-CN personnel, including training, protective equipment and procedures
- (b) All personnel entering onto CN property must familiarise themselves with the CN Safety Package, complete a Contractor Orientation Course, and must be registered on the Contractor Completion Database which can be found at the following website: www.railroadcourses.com

E20.4.4 Emergency Response Plan

- (a) If an urgent or near urgent defect is detected during monitoring, an on-site meeting shall be conducted to determine the cause of the defect and remedial action.
- (b) The Contractor will be required to carry-out remedial action as directed by the Contract Administrator.

E20.4.5 Railway Warning Signs

- (a) Warning signs shall be fabricated and installed at each side of the pipeline crossing through of the CN Right-of-Way. Final location shall be approved by the Contract Administrator.
- (b) Signs shall include the following information, printed on a background of sharply contrasting colour:
 - (i) the word "Caution" prominently displayed, in 25 mm high, bold lettering;
 - (ii) the type of pipeline system, "Land Drainage Pipeline", prominently displayed in 13 mm high bold lettering;
 - (iii) the statement "Pipeline Information"; and
 - (iv) the name and logo of the City of Winnipeg and emergency notification information, including an emergency telephone number with area code. Contract Administrator will provide the details upon request.
- (c) Sign posts of a minimum length of 1.5m shall be installed directly into the boulevard with a minimum length of 0.6m below grade using appropriate post driver.
 - (i) Top of post to be no greater than 0.9 metres above grade.
- (d) Sign shall be installed so top of sign is flush with the top of the post.

E20.5 Measurement and Payment

- (a) Any costs incurred by the Contractor from CNR associated with the Work shown on the Drawing and described within the Specifications within the CNR right-of-way, will be paid from the allowance under the Contact unit price "CNR Right-of-Way Crossing Requirements"
- (b) The costs paid shall be the actual invoiced costs and any allowable mark-ups as stated within the General Conditions.

E21. REPLACEMENT OF EXISTING SHALLOW IRRIGATION SYSTEM

E21.1 Description

- (a) Private irrigation lines and sprinkler heads exist within the LDS Construction Easement that are anticipated to be impacted by the construction activities. Following construction, these lines are to be replaced to their preconstruction condition.

E21.2 Materials

- (a) The irrigation lines and heads shall be replaced with the same materials as exist before construction.

E21.3 Construction

- (a) The Contractor shall provide a pre-construction survey of the existing condition of the private irrigation system. Any existing damages should be identified.
- (b) The Contractor shall coordinate with the owner of the irrigation system to have the water turned off in advance of construction activities that may impact the lines.
- (c) Any portions of the irrigation system damaged by Construction shall be replaced in accordance with the manufacturers installation guide.

E21.4 Measurement and Payment

- (a) The replacement of the irrigation system will be paid for under the Contract Price for "Replacement of Irrigation System". Costs will be based on actual invoiced costs for the materials and labour with allowable mark-ups in accordance with the General Conditions.

E22. ALLOWANCE FOR VIBRATION MONITORING

E22.1 Description

- (a) The Contractor is advised that vibration monitors are required to be installed by a suitable testing company for this Contract. These instruments will be set up on structures in close proximity to shaft locations and significant construction activities. Specifically, these will include the Walmart Building, the house at 1021 Taylor Avenue, and the apartment building at 999 Taylor Avenue.
- (b) While a current by-law on acceptable vibrations does not exist for the City of Winnipeg, The monitoring data should be compared to the California Department of Transportation Guidance Manual (September 2013) which presents probabilistic damages thresholds.
- (c) The contractor should select construction method that they feel results in a vibration tolerance limit that they deem is an acceptable risk

E22.2 Construction

- (a) The Contractor or their designate shall complete a pre-construction photographic survey of the existing structures adjacent to the work (and for which vibration monitors may be installed upon).
- (b) Where the contractor is entering properties to undertake the photographic survey notices shall be provided to the businesses or homeowners in advance to arrange for interior inspections. Notices will need to be approved by the Contract Administrator and the City. Any individuals entering into a private residence or coming into contact with private citizens as part of this work shall have first submitted their security clearances to the Contract Administrator in accordance with Part F.
- (c) Vibration monitors should be installed in adjacent to structure. The monitors should be capable of measuring 0 – 400 mm/sec, continuously. Where data storage permits continuous monitoring, the data should be downloaded periodically to provide sufficient storage for continuous monitoring.
- (d) The vibration monitoring will be set up prior to any construction activities to ensure a baseline reading is developed.

- (e) Data should be recorded and provided to the Contract Administer
- (f) The collected data will be provided to the homeowners or business owners adjacent to the work upon request.

E22.3 Measurement and Payment

- E22.3.1 The cost for the vibration monitors shall be paid for under the Contract Price for "Allowance for Vibration Monitoring". Costs will be based on actual invoiced costs for sampling and testing with allowable mark-ups in accordance with the General Conditions.

E23. CONNECTION TO 2700MM PIPE

E23.1 Description

- (a) This Specification covers the connection of the 1350 mm pipe with a concrete collar on Sparling to the 2700 mm LDS pipe.

E23.2 Materials

- (a) The materials shall be in accordance with CW 2160 or as shown on the Drawings.

E23.3 Construction Method

- (a) The construction shall be in accordance with the sections and details for the 1350 mm to the 270 mm pipe as shown on the Drawings.

E23.4 Measurement and Payment

- (a) The connection of the 1350 mm pipe will to the 2700 mm pipe will be paid out as a lump sum price under the contract unit price of "Connection to 2700 mm Pipe". The price shall include all work described herein.

E24. TEMPORARY PLUGS

- E24.1 This specification covers the supply and installation temporary plugs for the diameter and locations indicated on the Drawings.

E24.2 Materials

- (a) The plugs shall be precast concrete, as show on the Drawings or an alternate as approved by the Contact Administrator in accordance with B7.

E24.3 Submittals

- (a) Submit shop drawings for review and approval by the Contract Administrator, in accordance with CW 1110.

E24.4 Construction:

- (a) Clean interior contact surfaces of pipe and install temporary plug.
- (b) Plugs shall be watertight and capable of withstanding internal water pressures (surcharge to surface) and external soil pressures without leakage.
- (c) Plug locations shall be surveyed in with records provided to the Contract Administrator.
- (d) Where plugs are installed at the end of a pipe section where a manhole is not present, above grade markers shall be installed to indicate the location of the plug/future pipe connection. Where the plug is within a grassed area, the marker shall be a 19 mm rebar, 1 m long installed in the ground with 50 mm exposed above surface. A 1.5 m 4x4 wooden post shall be installed adjacent to the rebar with 0.6 m below grace an 0.9 m above grade. Where the plug is within finished concrete or asphalt, the marker shall be a 3 inch bolt drilled and grouted into the surface with the head of the bold 3mm below surface.

- (e) Two temporary plugs to be pre-cast concrete to fit 2700mm Diameter concrete pipe installed into place at STA 0+000 and STA 1+520.55. Temporary Plug to be Lafarge precast concrete plug

E24.5 Measurement and Payment

- (a) Supply and installation of Temporary Plugs and markers shall be paid on a lump sum basis for each plug diameter. The price shall include all works and materials necessary to complete the installation as identified herein and as indicated on the Drawings.

E25. ALLOWANCE FOR ENVIRONMENTAL SAMPLING AND TESTING

E25.1 General

E25.1.1 Description

- (a) This specification covers the environmental sampling and testing of soils excavated from within the Site (if required).

E25.1.2 Background

- (a) For a period of time between 1930 and 1960 a CN Rail yard existed within the portion of the Parker Lands designated for the future stormwater retention basin being constructed for the Cockburn and Calrossie Sewer Relief project. In anticipation for Contract 4, a soil sample was collected at the shaft location for the CN Rail crossing (TH15-01) to determine if contaminated soils were present that would require excavated material to be transported to a soil treatment and processing facility, rather than a conventional landfill. The testing indicated that soils were within acceptable guidelines for transport to a conventional landfill such as the City run Brady Road Resource Management Facility (Brady Road landfill).
- (b) The environmental samples collected (including the sample at the shaft location) were submitted to Maxxam Analytics, a CALA accredited analytical laboratory for analysis. Samples for metals analysis were selected from the upper surface soils (<1.5 m) and samples for analysis of PAHs and PHCs were selected based on those samples which had the highest head space vapour readings. A total of three (3) samples, one from each test hole, were submitted for analysis of metals, PAHs and PHCs.
- (c) The environmental laboratory results were compared to the standards of the Canadian Council of Ministers of the Environment (CCME), which are the guidelines adopted by the Province of Manitoba for the assessment of contaminated sites in Manitoba. For this project, federal criteria from the CCME Canadian Environmental Quality Guidelines (CEQG) for Canadian Soil Quality Guidelines for the Protection of Environmental Human Health (1999, Updated 2007) were used to assess metal, PAH and PHC concentrations in soil. The CCME document Canada-Wide Standards for Petroleum Hydrocarbons (PHCs) in Soil from May 2001 (revised January 2008; Updated July 2012) was also used to assess PHC concentrations. Based on the presence of the adjacent CN railway and the proposed development of a retention pond on the property, land use at the site was considered to be commercial. However, soil that is removed from the site and requiring disposal at a landfill must be compared to industrial property use guidelines. The laboratory data collected from the three environmental test holes was tabulated and compared to the CCME guidelines for industrial land use. Laboratory data is included in Appendix C. All soil results for PHC, PAH and metals are below the CCME guidelines for industrial land use.
- (d) While PHC, PAH and metals soil concentrations tested from the sample location and depth do not exceed guideline levels, adjacent soils within the historic rail yard and soils removed from beneath the current CN rail lines may contain higher concentrations. As such, provisions for testing and sampling soils (at the discretion of the Contract Administrator) have been included in the bid documents.

E25.2 Construction Methods

- E25.2.1 If soil removed from the shaft within the Parker Lands, from beneath the rail line, or at other locations on the project Site are suspected of being contaminated, then the excavated soils will be subject to environmental testing at the discretion of the Contract Administrator.
- E25.2.2 Suspect soils will be stockpiled at an approved location within the Parker Lands.
- E25.2.3 Tunnelling operations may continue.
- E25.2.4 The Contractor shall ensure that excavated material is sampled and sent for testing at an accredited laboratory. Sampling shall be undertaken in the presence of the Contract Administrator.
- E25.2.5 Soil samples shall be placed in heavy polyethylene bags, and tested for volatile hydrocarbon vapour concentrations using a Photovac Photo-Ionization Detector (PID), calibrated with an isobutylene standard at the start of the day. Samples for metals analysis to be selected from the upper surface soils (<1.5 m) and samples for analysis of PAHs and PHCs to be selected based on those samples which had the highest head space vapour readings.
- E25.2.6 Select soil samples are to be placed in EPA approved sample containers, and transported to a CALA accredited analytical laboratory for analysis for metals, polycyclic aromatic hydrocarbons (PAHs) and petroleum hydrocarbons (PHCs) including benzene, toluene, ethylbenzene, and xylenes (BTEX) and PHC fractions F1 to F4.
- E25.2.7 Environmental laboratory testing results are to be provided to the Contract Administrator for review.
- E25.3 Measurement and Payment
- E25.3.1 Environmental Sampling and Testing will be paid for under the Contract Price for "Allowance for Environmental Sampling and Testing". Costs will be based on actual invoiced costs for sampling and testing with allowable mark-ups in accordance with the General Conditions.

E26. DISPOSAL OF CONTAMINATED SOILS

- E26.1 General
- E26.1.1 Description
- (a) This specification shall cover the disposal of contaminated materials excavated from within the Site.
- E26.1.2 Criteria for Classification of Contaminated Material
- (a) If excavated materials from the drilling shaft are found to have concentrations of contaminants that are above the acceptable standards, as per soil testing requirements in E24, then this material must be disposed of at suitable treatment facility.
- E26.1.3 Suitable Soil Treatment Facilities
- (a) Suitable soil treatment facilities include the Miller Environmental Treatment & Processing Facility (St.Jean Baptiste, Manitoba), the Mid-Canada Environmental Landfill (Ile des Chenes, Manitoba), or an approved equal in accordance with B7.
- E26.2 Construction Methods
- E26.2.1 Contaminated materials are to be separated from other soils and hauled to a suitable treatment facility. If stockpiles are not removed in a timely manner then they must be covered with poly sheeting to mitigate erosion and transmission of contaminants into other areas of the Site.
- E26.3 Measurement and Payment

Disposal of Contaminated Materials will be measured on a volumetric basis and will be paid for under the item "Disposal of Contaminated Materials". The volume to be paid for shall be the total number of cubic metres removed from the Site and disposed of at a suitable landfill in accordance with this Specification and accepted by the Contract Administrator.

E27. PROVISIONAL ITEMS

- E27.1 The Provisional Items listed on Form B: Prices are part of the Contract.
- E27.2 The Contractor shall not perform Work included in the Provisional Items without prior authorization from the Contract Administrator. All Work included in the Provisional Items will be carried out within the construction areas shown on the Drawings.
- E27.3 Notwithstanding GC:7, the City reserves the right to diminish all or any portion of the items of work listed in the Provisional Items and no claim shall be made for damages on the grounds of loss of anticipated profit or for any other reason.

E28. CHANGE IN CONTRACT CONDITIONS

E28.1 Description

- (a) This specification covers changes identified to the scope of work including changes in geotechnical and geological conditions that may impact the Tunnelling and Pipe Jacking or Trenchless Installation of the LDS sewer piping.
- (b) The basis for the geotechnical and geologic conditions are described in the GBR and GDR as defined in section D33.
- (c) If the pipe jacking operations should encounter an obstruction that prevents the forward progress of the TBM, the Contractor shall notify the Contract Administrator immediately. The Contractor shall correct the condition, and remove, clear, or otherwise make it possible for the TBM and jacking pipe to advance past any objects or obstructions that impede forward progress of the TBM. Upon written notification by the Contract Administrator, the Contractor shall immediately proceed with removal of the object or obstruction by means of an obstruction removal shaft or by other approved methods, as submitted by the Contractor in approved submittals. An obstruction removal shaft shall consist of a small excavation for removing the obstruction. The Contractor will receive compensation for removal of obstructions, as defined as metallic debris, reinforced concrete, rocks, and other hard objects larger than 30% of the outer diameter of the shield, which cannot be broken up by the cutting tools with diligent effort, that are partially or wholly within the cross sectional area of the bore. Any removal process that does not allow direct inspection of the nature and position of the obstruction will not be considered for payment. The Contractor will receive no additional compensation for removing, clearing, or otherwise making it possible for the shield to advance past objects consisting of cobbles, boulders, wood, non-reinforced concrete, and other non-metallic objects or debris with maximum lateral dimensions less than 30% of the outer diameter of the shield.
- (d) The method for reviewing, recording and accepting a change to geotechnical and geologic conditions or obstructions is described in section D35.

E28.2 Measurement and Payment

- (a) Where a Contractor has made a claim in accordance with C7 or D35 which has been accepted by the Contract Administrator and City, the Contractor will be compensated in accordance with D35 from the allowance under the Contact unit price "Change in Contract Conditions"
- (b) Daily costs for all equipment, including but not limited to tunnelling machine (TBM, MTBM, EPBM) and associated equipment and separation plants, other trenchless pipe equipment, construction vehicles, Contractor trucks and their staff's personal vehicles, temporary site/storage facilities, rental equipment, and all other ancillary equipment required to

undertake the tunnelling Work belonging to the Contractor or their sub-contractor's shall be paid for at the daily rate under the contract unit price of "Daily Equipment Rate"

- (i) Prior to commencement of tunnelling Works, the Contractor shall submit to the Contract Administrator a breakdown of the equipment costs included within the Daily Equipment Rate to be used in assessing delay claims from Change in Work

PART F - SECURITY CLEARANCE

F1. SECURITY CLEARANCE

- F1.1 Each individual proposed to perform the following portions of the Work:
- (a) any Work on private property;
 - (b) any Work within City facilities other than:
 - (i) an underground structure such as a manhole;
 - (ii) in areas and at times normally open to the public;
- F1.1.1 Each Individual shall be required to obtain a Criminal Record Search Certificate from the police service having jurisdiction at his/her place of residence. Or
- (a) BackCheck, forms to be completed can be found on the website at: <http://www.backcheck.net/> ; or
 - (b) Commissionaires (Manitoba Division), forms to be completed can be found on the website at: <https://www.commissionaires.ca/en/manitoba/home> .
- F1.2 The following is a link to information for obtaining the Criminal Record Search certificate from the City of Winnipeg Police Service. http://winnipeg.ca/police/pr/info_request.stm
- F1.2.1 The Criminal Record Search shall include a Vulnerable Sector Screening. This can be obtained by following the link below http://winnipeg.ca/police/pr/info_request.stm
- (a) Individuals will need to state in the form, that they may be working in City of Winnipeg pools, libraries and community centres;
- F1.2.2 The original Criminal Record Search Certificate (Form P-253) will be provided by the Winnipeg Police Service to the individual applicant. The original has a validation sticker from the Winnipeg Police Service in the top right hand corner. The applicant shall:
- (a) Provide the original Criminal Record Search Certificate (Form P-253) to the Contract Administrator.
- F1.3 Prior to the award of Contract, and during the term of the Contract if additional or replacement individuals are proposed to perform Work, the Contractor shall supply the Contract Administrator with a Criminal Record Search Certificate obtained not earlier than one (1) year prior to the Submission Deadline, or a certified true copy thereof, for each individual proposed to perform such Work.
- F1.4 Any individual for whom a Criminal Record Search Certificate is not provided, or for whom a Criminal Record Search Certificate indicates any convictions or pending charges related to property offences or crimes against another person will not be permitted to perform any Work specified in F1.1.
- F1.5 Any Criminal Record Search Certificate obtained thereby will be deemed valid for the duration of the Contract subject to a repeated records search as hereinafter specified.
- F1.6 Notwithstanding the foregoing, at any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require an updated criminal records search. Any individual who fails to provide a satisfactory Criminal Record Search Certificate as a result of a repeated criminal records search will not be permitted to continue to perform any Work specified in F1.1.