THE CITY OF WINNIPEG

TENDER

TENDER NO. 286-2024B

FERRY ROAD AND RIVERBEND COMBINED SEWER RELIEF - CONTRACT 6

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 FERRY ROAD AND RIVERBEND COMBINED SEWER RELIEF - CONTRACT 6

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, January 16, 2025.

B2.2 The Contract Administrator or the Manager of Purchasing 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 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.

B3.3 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.

B3.4 The Bidder/Proponent is responsible for inspecting the Site, the nature of the Work to be done and all conditions that might affect their Bid/Proposal or their performance of the Work, and shall assume all risk for conditions existing or arising in the course of the Work which have been or could have been determined through such inspection

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D6.1.

B4.2 If the Bidder finds errors, discrepancies or omissions in the Tender, 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 Tender 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 Tender 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.

B4.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

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 Tender 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 Tender, 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.

B6.3 Addenda will be available on the MERX website at www.merx.com.

B6.4 The Bidder is responsible for ensuring that they have received all addenda and is advised to check the MERX website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.

B6.5 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid/Proposal. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.

B6.6 Notwithstanding B4, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D6.

B7. SUBSTITUTES

B7.1 The Work is based on the Plant, Materials and methods specified in the Tender.

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 their 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 they wish 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 their 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 B18.

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/Proposal;

(b) Form B: Prices;

(c) Form G1: Bid Bond and Agreement to Bond.

B8.2 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.

B8.3 The Bid shall be submitted electronically through MERX at www.merx.com.

B8.3.1 Bids will **only** be accepted electronically through MERX.

B8.4 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B18.1(a).

B9. BID

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

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

(a) If the Bidder is a sole proprietor carrying on business in their own name, their 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 their 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/Proposal, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B9.4 Paragraph 13 of Form A: Bid/Proposal shall be signed in accordance with the following requirements:

(a) If the Bidder is a sole proprietor carrying on business in their 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 their duly authorized officer or officers;

(d) If the Bidder is carrying on business under a name other than their 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/Proposal should be entered 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.

B10.1.1 Prices stated on Form B: Prices shall not include any costs which may be incurred by the Contractor with respect to any applicable funding agreement obligations as outlined in D39. Any such costs shall be determined in accordance with D39.

B10.2 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.

B10.3 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.

B10.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B10.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.

B10.5.1 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

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 feasibility of shallow cover tunneling near the Assiniboine River was discussed with the following companies:

(a) Bothar Inc.;

(b) Michels Canada Co.

(c) Ward and Burke Microtunnelling

B12. CONFLICT OF INTEREST AND GOOD FAITH

B12.1 Further to C3.2, Bidders, by responding to this Tender, declare that no Conflict of Interest currently exists, or is reasonably expected to exist in the future.

B12.2 Conflict of Interest means any situation or circumstance where a Bidder or employee of the Bidder proposed for the Work has:

(a) Other commitments;

(b) Relationships;

(c) Financial interests; or

(d) Involvement in ongoing litigation;

that could or would be seen to:

(i) Exercise an improper influence over the objective, unbiased and impartial exercise of the independent judgment of the City with respect to the evaluation of Bids or award of the Contract; or

(ii) Compromise, impair or be incompatible with the effective performance of a Bidder's obligations under the Contract;

(e) Has contractual or other obligations to the City that could or would be seen to have been compromised or impaired as a result of their participation in the Tender process or the Work; or

(f) Has knowledge of confidential information (other than confidential information disclosed by the City in the normal course of the Tender process) of strategic and/or material relevance to the Tender process or to the Work that is not available to other bidders and that could or would be seen to give that Bidder an unfair competitive advantage.

B12.3 In connection with their Bid, each entity identified in B12.2 shall:

(a) Avoid any perceived, potential or actual Conflict of Interest in relation to the procurement process and the Work;

(b) Upon discovering any perceived, potential or actual Conflict of Interest at any time during the Tender process, promptly disclose a detailed description of the Conflict of Interest to the City in a written statement to the Contract Administrator; and

(c) Provide the City with the proposed means to avoid or mitigate, to the greatest extent practicable, any perceived, potential or actual Conflict of Interest and shall submit any additional information to the City that the City considers necessary to properly assess the perceived, potential or actual Conflict of Interest.

B12.4 Without limiting B12.3, the City may, in their sole discretion, waive any and all perceived, potential or actual Conflicts of Interest. The City's waiver may be based upon such terms and conditions as the City, in their sole discretion, requires to satisfy itself that the Conflict of Interest has been appropriately avoided or mitigated, including requiring the Bidder to put into place such policies, procedures, measures and other safeguards as may be required by and be acceptable to the City, in their sole discretion, to avoid or mitigate the impact of such Conflict of Interest.

B12.5 Without limiting B12.3, and in addition to all contractual or other rights or rights at law or in equity or legislation that may be available to the City, the City may, in their sole discretion:

(a) Disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of their employees proposed for the Work;

(b) Require the removal or replacement of any employees proposed for the Work that has a perceived, actual or potential Conflict of Interest that the City, in their sole discretion, determines cannot be avoided or mitigated;

(c) Disqualify a Bidder or employees proposed for the Work that fails to comply with any requirements prescribed by the City pursuant to B12.4 to avoid or mitigate a Conflict of Interest; and

(d) Disqualify a Bidder if the Bidder, or one of their employees proposed for the Work, has a perceived, potential or actual Conflict of Interest that, in the City's sole discretion, cannot be avoided or mitigated, or otherwise resolved.

B12.6 The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in their sole discretion.

B13. QUALIFICATION

B13.1 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.

B13.2 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, Purchasing Division website at https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf

B13.3 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) Have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B13.5 and D8);

(e) Upon request of the Contract Administrator, provide the Security Clearances in accordance with PART F - Security Clearance;

(f) Be a prequalified Contractor:

(i) The City has, through a Request for Qualification process (RFQ No. 286-20243A), identified Microtunnelling Contractors who have successfully prequalified to participate in this project. Only submissions from a prequalified Contractor will be accepted. Any Bid received from a Bidder who is not a prequalified Microtunnelling Contractor will be rejected.

(g) Further to (f), the following Contractors have been pre-qualified through the Request for Qualification process (RFQ No. 286-2024A):

(i) **Bothar Inc.**
RFP Bothargroup
235093 Wrangler Drive SE
Rocky View County, Alberta
T1X 0K3, Canada
Attn: Jonathan Barrie

(ii) **Clearway Construction Inc.**
379 Bowes Road
Concord, Ontario
L4K 1J1, Canada
Attn: George Vescio

(iii) **Erritt Construction Ltd.**
399 Applewood Crescent
Concord, Ontario
L4K 4J3, Canada
Attn: Vincent Walshe

(iv) **Michels Canada Co.**
Preconstruction Services
1102-16 Avenue
Nisku, Alberta
T9E 0A9, Canada
Attn: Mike Ireland

(v) **Shanghai Construction Group**
(Canada) Corporation
11810 Kingsway Avenue
Edmonton, Alberta
T5G 0X5, Canada
Attn: Danmeng Qian

(vi) **The Tunneling Company Inc.**
10085 Dallas Drive Kamloops,
British Columbia
V2C 6T4, Canada
Attn: Shawn Gaunt

(vii) **Ward and Burke Microtunnelling**
2410 Meadowpine Blvd., Unit 101
Mississauga, Ontario
L5N 6S2, Canada
Attn: Brian Fahy / Hubert Kopec

B13.4 Further to B13.3(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) Written confirmation of a safety and health certification meeting SAFE Work Manitoba's SAFE Work Certified Standard (e.g., COR™ and SECOR™) in the form of:

(i) 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

(ii) 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

(b) 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, Purchasing Division website at http://www.winnipeg.ca/matmgt/.

B13.5 Further to B13.3(d), the Bidder acknowledges they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at Accessibility Training for anyone that may have any interaction with the public on behalf of the City of Winnipeg.

B13.6 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.

B13.7 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.

B14. BID SECURITY

B14.1 The Bidder shall include in their Bid Submission bid security in the form of a digital 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 Form G1: Bid Bond and Agreement to Bond, available on The City of Winnipeg, Corporate Finance, Purchasing Division website at https://www.winnipeg.ca/MatMgt/templates/files/Bidsecurity.pdf.

B14.2 Bid security shall be submitted in a digital format meeting the following criteria:

(a) The version submitted by the Bidder must have valid digital signatures and seals;

(b) The version submitted by the Bidder must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) The version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding B14.2(a).

B14.3 Bonds failing the verification process will not be considered to be valid and the bid shall be determined to be non-responsive in accordance with B18.1(a).

B14.4 Bonds passing the verification process will be treated as original and authentic.

B14.4.1 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.

B14.5 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 formed with the successful Bidder and the contract securities are furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.

B14.6 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 Tender.

B15. OPENING OF BIDS AND RELEASE OF INFORMATION

B15.1 Bids will not be opened publicly.

B15.2 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 MERX website at www.merx.com.

B15.3 After award of Contract, the name(s) of the successful Bidder(s) and their Contract amount(s) will be available on the MERX website at www.merx.com.

B15.4 The Bidder is advised that any information contained in any Bid may be released if required by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law or by City policy or procedures (which may include access by members of City Council).

B15.4.1 To the extent permitted, the City shall treat as confidential information, those aspects of a Bid Submission identified by the Bidder as such in accordance with and by reference to Part 2, Section 17 or Section 18 or Section 26 of The Freedom of Information and Protection of Privacy Act (Manitoba), as amended.

B16. IRREVOCABLE BID

B16.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.

B16.2 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 formed and the contract securities have been 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/Proposal.

B17. WITHDRAWAL OF BIDS

B17.1 A Bidder may withdraw their Bid without penalty at any time prior to the Submission Deadline.

B18. EVALUATION OF BIDS

B18.1 Award of the Contract shall be based on the following bid evaluation criteria:

(a) Compliance by the Bidder with the requirements of the Tender, or acceptable deviation there from (pass/fail);

(b) Qualifications of the Bidder and the Subcontractors, if any, pursuant to B13 (pass/fail);

(c) Total Bid Price;

(d) Economic analysis of any approved alternative pursuant to B7.

B18.2 Further to B18.1(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.

B18.3 Further to B18.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in their Bid or in other information required to be submitted, that they are qualified.

B18.4 Further to B18.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.

B18.4.1 Bidders are advised that the calculation indicated in B18.4 will prevail over the Total Bid Price entered in MERX.

B18.4.2 Further to B18.1(a), in the event that a unit price is not provided on Form B: Prices, the City may determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B19. AWARD OF CONTRACT

B19.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B19.2 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 qualified, and the Bids are determined to be responsive.

B19.2.1 Without limiting the generality of B19.2, 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 their 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.

B19.3 If funding for the Work is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, Bidders are advised that the terms of D39 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.

B19.4 Where an award of Contract is made by the City, the award shall be made to the qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B18.

B19.4.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of their Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

C0.1 The *General Conditions for Construction* (Revision 2020-01-31) 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, Purchasing Division website at http://www.winnipeg.ca/matmgt/gen_cond.stm

C0.2 A reference in the Tender 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.

D2. FORM OF CONTRACT DOCUMENTS

D2.1 Notwithstanding C4.1(c) and C4.4, the Contract Documents will be provided to the Contractor electronically and there will be no requirement for execution and return to the City by the Contractor. Accordingly, the provisions under C4.4(a) and C4.4(b) are no longer applicable.

D3. SCOPE OF WORK

D3.1 The Work to be done under the Contract shall consist of the installation of a Trunk Land Drainage Sewer and Assiniboine River outfall. The trunk sewer route is through the western part of Bourkevale Park, along Rutland Street from Portage Avenue to Silver Avenue, then through St. James Memorial Sports Park ending near the projection of St. Matthews Avenue.

D3.2 The major components of the Work are as follows:

(a) Construction and installation of 1960 m of 2400 mm diameter reinforced concrete pipe using microtunnelling method with a section of open trench excavation near the Assiniboine River outlet.

(b) Construction of lateral land drainage sewer stubs for future connections ranging in size from 300 mm to 1200 mm diameter, by trenchless and open excavation methods.

(c) Construction of a 2700 mm diameter Structural Plate Corrugated Steel Pipe outfall and riprap lined channel into the Assiniboine River in Bourkevale Park.

(d) Construction of a combined sewer interference crossing at Ness Avenue and Rutland Street, including temporary replacement of the combined sewer during tunneling and final replacement including the pipe interference after tunneling is complete.

(e) Relocation of approximately 780 m of existing combined sewer and sewer services on Rutland Street to outside of the potential tunnel zone of influence.

(f) Installation of new connections to existing catch basin and catch basin leads to new Land Drainage Sewer, abandonment of existing catch basin leads to combined sewers, and replacement of deteriorated catch basins.

(g) Surface restoration, minor surface drainage improvements in park areas, and related works.

D4. SITE INVESTIGATION DUE DILIGENCE AND RISK

D4.1 Notwithstanding C3.1, the Contractor acknowledges that the site investigation reports and other site information included in this Tender have been provided to it and may be relied upon by the Contractor to the extent that the Contractor uses Good Industry Practice in interpreting such report(s) and site information and carries out the Work in accordance with Good Industry Practice based upon such report(s) and the information contained in them and such other site information. In the event that a site condition related to:

(a) The location of any utility which can be determined from the records or other information available at the offices of any public authority or person, including a municipal corporation and any board or commission thereof, having jurisdiction or control over the utility;

(b) The site conditions, including but not limited to subsurface hazardous materials or other concealed physical conditions;

(c) The location, nature, quality or quantity of the materials to be removed or to be employed in the performance of the work;

(d) The nature, quality or quantity of the plant needed to perform the work;

(e) All matters concerning access to the site, power supplies, location of existing services, utilities or materials necessary for the completion of the Work; and

(f) All other matters which could in any way affect the performance of the Work;

that could not have been "properly inferable", "readily apparent" and readily discoverable" using Good Industry Practice by the Contractor, results in additional Work which is a direct result of this newly discovered site condition, such additional Work will be considered by the City under Changes in Work.

D5. DEFINITIONS

D5.1 When used in this Tender:

(a) "**Alert Level"** means the value of instrumentation readings at which the Contract Administrator can order the Contractor to cease construction operations, make site and affected properties secure, and take necessary and agreed upon measures to mitigate unacceptable movements and to assure the safety of the work and the public;

(b) **"Annular Space"** means the void between the jacked pipe and the excavated perimeter of the tunnel. The annular space is created by the overcut and must be immediately filled with lubricants during progression of the drive, and as soon as the drive has been completed, including any leak acceptance testing, this space shall be contact grouted;

(c) "**Building Movement Monitoring Point (BMP)"** BMP are as indicated on the Drawings and are used to determine movement of a structure in relation to its existing, pre-construction vertical elevations through vertical control survey;

(d) "**Carrier Pipe**" means the permanent pipe installed using trenchless methods as specified herein to include jacking pipe directly installed by microtunnelling methods;

(e) "**Change-in-face Condition**" means a condition where two or more different types of soil and/or soil behavior are encountered along the length of any one tunnel drive;

(f) "**Cofferdam**" means a watertight excavation shoring system enclosing an area typically within a body of water within which construction of permanent Works can be safely carried out. A watertight (sealed) shaft excavation support system enclosing an area within which construction of permanent Works can be safely carried out;

(g) "**Compression Ring**" means an engineered material designed as a ring that fits around the ends of individual jacking pipe to add confinement to the pipe material at the joint such that larger jacking loads can be tolerated;

(h) "**Conditioning Agents**" means materials mixed with the ground to modify the behavior and aid in the excavation process;

(i) "**Construction Vibration**" means vibration occurring as a result of the operation of construction equipment during construction;

(j) "**Contact Grouting**" means Grouting to fill voids in the annular space just after completing the drive to obtain contact between the jacking pipe and the ground for transferring loads and minimizing settlements;

(k) "**Control Console**" means Electronic unit inside a container, located at the ground surface controlling operation of the MTBM. Electronic information is transmitted to the control console from the MTBM. This information includes (but is not limited to) laser position, head position, steering angle, steering jack position, cutter head torque, and slurry face pressure;

(l) "**Cut-off Grouting**" means the permanent pipe installed using trenchless methods as specified herein to include jacking pipe directly installed by microtunnelling methods;

(m) "**Cutter Head**" means the permanent pipe installed using trenchless methods as specified herein to include jacking pipe directly installed by microtunnelling methods;

(n) "**Entry and Exit Seals**" means mechanical seal, usually composed of one or more rubber flanges mounted on a steel ring, which in turn is mounted to the wall of the jacking/receiving shaft. The rubber flange seal is distended by the boring machine as it passes through, creating a seal to prevent inflows of groundwater, soil, slurry, and lubricant into the shaft during tunneling operations;

(o) "**Guidance System**" means a system that relates the actual position of the MTBM to a design reference;

(p) "**GBR**" means Geotechnical Baseline Report;

(q) "**GDR**" means Geotechnical Data Report;

(r) "**Guidance System**" means the permanent pipe installed using trenchless methods as specified herein to include jacking pipe directly installed by microtunnelling methods;

(s) "**Initial Support**" means ground support and stabilization elements installed in the shaft for excavation stability, control of ground water and safety during construction;

(t) "I**nadvertent Return**" means the loss of any drilling fluid including slurry, lubrication, or grout to the surface, or utility. This issue is also commonly referred to as "frac-out";

(u) "**Impermeable Shafts**" (Shafts 3,4,5) shall mean a ground shoring system designed for the design life of the Project, constructed and excavated without the use of active dewatering and with sufficient toe embedment and/or excavation base treatment to meet the infiltration and base stability requirements specified herein. Fully interlocked (including corners) sheet piles, fully interlocked secant piles, sinking caissons and slurry wall systems shall be considered as impermeable methods of shaft construction;

(v) "**Intermediate Jacking Station (IJS)**" means a fabricated steel cylinder, fitted with hydraulic jacks spaced around the circumference which is incorporated into the pipeline between two specially fabricated pipe sections. The function of an IJS is to increase the overall jacking capacity by distributing the jacking load over the pipe string during pipe installation. The hydraulic jacks are removed at the completion of the drive and the gap between the 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 shall be protected from corrosion, consistent with corrosion protection used for the carrier pipe;

(w) "J**acking and Receiving Shafts**" means Excavation from which the MTBM is driven and recovered;

(x) "**Jacking Frame**" means the structural component housing hydraulic cylinders used to push the MTBM and pipeline forward. The jacking frame serves to distribute jacking loads to the pipeline and reaction loads to the thrust block;

(y) "**Jacking Pipe**" means a specialty pipe that is engineered and manufactured with a smooth outer wall and flush watertight joints capable of transmitting the full jacking loads without damage or loss of water-tightness. Jacking pipe is specifically designed to be jacked through the ground as well as to serve as the carrier pipe;

(z) "**Jacking Record**" means a report that contains information on all pertinent MTBM pipe jacking operations, including rate of advance, installed tunnel length, jacking forces, steering corrections, machine inclination and roll, machine position, steering jack positions, line and grade offsets, cutter head torque, intermediate jacking station pressures, date, time, name of Operator, problems encountered with the tunneling machine and durations of and reasons for delays;

(aa) "**Launching shaft**" means vertical excavation (that is impermeable for shafts 3,4,5) from where microtunnelling equipment and the jacking pipe are launched into the ground and driven along the alignment. (This shaft contains the entrance seal to maintain impermeability during launching operations for shafts 3,4,5). Ground improvement is used, as required, to prevent the microtunnelling equipment from sinking during the launching process as well as to limit inflow of ground and groundwater into the shaft, as required. The launching shaft must be designed to accommodate the thrust wall;

(bb) "**Lubrication/Grout Port**" means a port located in the MTBM or a 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;

(cc) "**Microtunnelling**" means a remotely-controlled, guided, steerable, pipe jacking process that provides continuous and positive support to the excavation face. Microtunnelling involves pushing pipe behind a MTBM from a jacking shaft, using hydraulic jacks. Excavation is carried out using a closed-face MTBM. The microtunnelling process does not require routine personnel entry into the tunnel. A key element of microtunnelling is the ability to continuously support and control the tunnel face by applying positive mechanical or slurry fluid pressure to the tunnel face to balance soil and groundwater pressures;

(dd) "**Microtunnel Boring Machine (MTBM)**" means remote-controlled, guided tunnel shield that can provide continuous and positive support to the excavation face. The MTBM is operated from a control console located on the ground surface;

(ee) "**Mixed Face**" means a soil condition that presents two or more different types of soils and/or soil behaviors within the cross-sectional area of the tunnel face;

(ff) "**Obstruction**" means any buried object located completely or partially within the cross-section of the MTBM that stops the forward progress of the MTBM or impedes forward progress along the design path and within allowable tolerances. An obstruction must be larger than 30 per cent of the outer diameter of the cutter head and/or has an unconfined compressive strength greater than 250 MPa. A buried object may also be considered an obstruction if it causes severe damage to the pipe and/or damage to the TBM or conveyance equipment;

(gg) "**Overcut**" means the radial distance that the cutter wheel over excavates between the outside radius of the jacking pipe and the theoretical excavated bore radius to aid with the installation process;

(hh) "**Packer**" means high quality fiberboard or other material as recommended by the pipe manufacturer to protect the ends of the carrier pipe from damage. Fiberboard packer material shall not be less than ¾-inch thick;

(ii) "**Peak Particle Velocity (PPV)**" means the maximum rate of change with respect to time of the particle displacement, measured on the ground, and velocity amplitudes are given in units of millimeters per second from zero to peak amplitude;

(jj) **"Personal Protective Equipment (PPE)**" includes safety hats as well as protective clothing, footwear, glasses/eye protection, personal ventilation equipment (i.e. self-rescuers), oxygen and gas detectors and other equipment as approved and required by the Manitoba Labour and Immigration Division and outlined in WSH Act;

(kk) "**Piezometers (PZ)**" Piezometers shall consist of a slotted PVC well screen and a PVC riser pipe. The slotted well screen is installed in a sand filter at the base of the borehole. The top of the sensing zone is sealed with bentonite and the annulus around the riser pipe is filled with grout. Water levels in the riser pipe are monitored with a water level indicator;

(ll) "**Pipe Jacking**" means constructing a pipeline by hydraulically jacking consecutive sections of jacking pipe through the ground behind the MTBM;

(mm) "**Pipe Lubricant**" means fluid used to reduce jacking loads on jacking pipe. Lubricant may consist of a mixture of water and bentonite and/or polymer;

(nn) "**Pipe String**" means the succession of joined individual pipe segments installed in the ground that advances the excavation equipment as well as supports the walls of the excavated opening;

(oo) "**Receiving Shaft**" means a vertical excavation (that is impermeable for shafts 3,4,5) from which the microtunnelling equipment is recovered at the end of the drive. This shaft contains the exit seal and any ground improvement, as required, to enable the microtunnelling equipment to bore into the shaft;

(pp) **"Severe Damage to Pipe**" means visible damage to the pipe and/or joint materials, including but not limited to, cracks, chips, spalling, ovalization and/or tearing (shearing). May also consist of any damage which compromises structural capacity of the pipe in the

opinion of the City of Winnipeg or the Contract Administrator, including but not limited to, failure of the pipe barrel and/or loss of the structural integrity or pressure rating of the pipe joint;

(qq) "**Review Level**" means the value of instrumentation readings at which the Contract Administrator and Contractor jointly assess necessity of altering methods, rate or sequence of construction to control the effects of the construction;

(rr) "**Settlement Monitoring Marker (SMM)**" SMM are as indicated on the Drawings and are used to determine movement of ground surface in relation to its existing, pre-construction vertical elevations through vertical control survey;

(ss) "**Shaft Excavation Support System**" means the support system provided to maintain stability of an excavation made for any purpose and to be occupied by Contractor until the permanent structure is complete in place or piping and backfill is in place, the excavation is closed, and the structure is backfilled. Excavation support may be installed prior to or concurrent with excavation, depending on ground conditions and type of support. A temporary structure composed of steel liner plates, soldier piles and lagging, secant pile walls, concrete slurry walls, drop caissons or similar system required to support and retain earth and water in order to facilitate construction of permanent Works;

(tt) "**Shaft or Workshaft**" The terms "shaft" or "workshaft" shall mean the temporary ground excavation requiring a ground support system until the shaft structure or permanent facilities to be constructed within the excavation are complete and the excavation around and over the structure is backfilled;

(uu) "**Slurry**" means the succession of joined individual pipe segments installed in the ground that advances the excavation equipment as well as supports the walls of the excavated opening;

(vv) "**Slurry Line**" means the succession of joined individual pipe segments installed in the ground that advances the excavation equipment as well as supports the walls of the excavated opening;

(ww)"**Slurry Separation**" means the succession of joined individual pipe segments installed in the ground that advances the excavation equipment as well as supports the walls of the excavated opening;

(xx) "**Specials**" means the succession of joined individual pipe segments installed in the ground that advances the excavation equipment as well as supports the walls of the excavated opening;

(yy) "**Stabilization Grouting**" means treatment of the ground through grouting in order to improve the stability of the tunnel or shaft excavations;

(zz) "**Supply Chain Disruption"** means an inability by the Contractor to obtain goods or services from third parties necessary to perform the Work of the Contract within the schedule specified therein, despite the Contractor making all reasonable commercial efforts to procure same. Contractors are advised that increased costs do not, in and of themselves, amount to a Supply Chain Disruption;

(aaa) "**Surface Monitoring Points (SMP)"** SMP are as indicated on the Drawings and are used to determine movement of ground in relation to its existing, pre-construction vertical elevations through vertical control survey;

(bbb) **"Temporary Structures"** means structures of a short-term nature, such as shaft excavation shoring systems, vertical or lateral shoring of existing structures or utilities, and similar systems which will be required in order to execute construction of permanent Works;

(ccc) "**Thrust Block**" means structural element that transfers and distributes the jacking load from the jacking frame to the shaft wall; may be incorporated into shaft shoring;

(ddd) "**Thrust Ring**" means A fabricated ring that is mounted on the face of the jacking frame to transfer the jacking loads to the thrust bearing area/packer cushion of the new jacking pipe section being installed into the pipe string;

(eee) "**Unsealed Shaft Construction**" (Shafts 1, 2, 6, 7) means method of excavation and shaft support system construction which does not prevent ingress of groundwater. Unsealed shafts must be designed in conjunction with an appropriate dewatering system. Soldier pile and lagging systems shall be considered as unsealed methods of shaft construction;

(fff) "**Vibration Zone of Influence (vZOI)**" means the area of land within or adjacent to a construction site, including any buildings or structures, that potentially may be impacted by vibrations emanating from a construction activity where the peak particle velocity measured at the point of reception is equal to or greater than 5 mm/sec at any frequency;

D6. CONTRACT ADMINISTRATOR

D6.1 The Contract Administrator is Tetra Tech, represented by:

Mike Levreault, C.E.T.
Contract Administrator

Telephone No. 204 954-6927
Email Address michel.levreault@tetratech.com

D6.2 At the pre-construction meeting, Mr. Levreault will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D7. CONTRACTOR'S SUPERVISOR

D7.1 At the pre-construction meeting, the Contractor shall identify their designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D8. ACCESSIBLE CUSTOMER SERVICE REQUIREMENTS

D8.1 The Accessibility for Manitobans Act (AMA) imposes obligations on The City of Winnipeg to provide accessible customer service to all persons in accordance with the Customer Service Standard Regulation ("CSSR") to ensure inclusive access and participation for all people who live, work or visit Winnipeg regardless of their abilities.

D8.1.1 The Contractor agrees to comply with the accessible customer service obligations under the CSSR and further agrees that when providing the Goods or Services or otherwise acting on the City of Winnipeg's behalf, shall comply with all obligations under the AMA applicable to public sector bodies.

D8.1.2 The accessible customer service obligations include, but are not limited to:

(a) Providing barrier-free access to goods and services;

(b) Providing reasonable accommodations;

(c) Reasonably accommodating assistive devices, support persons, and support animals;

(d) Providing accessibility features e.g. Ramps, wide aisles, accessible washrooms, power doors and elevators;

(e) Inform the public when accessibility features are not available;

(f) Providing a mechanism or process for receiving and responding to public feedback on the accessibility of all goods and services; and

(g) Providing adequate training of staff and documentation of same.

D9. UNFAIR LABOUR PRACTICES

D9.1 Further to C3.2, the Contractor declares that in bidding for the Work and in entering into this Contract, the Contractor and any proposed Subcontractor(s) conduct their respective business in accordance with established international codes embodied in United Nations Universal

Declaration of Human Rights (UDHR) https://www.un.org/en/about-us/universal-declaration-of-human-rights International Labour Organization (ILO) https://www.ilo.org/global/lang--en/index.htm conventions as ratified by Canada.

D9.2 The City of Winnipeg is committed and requires its Contractors and their Subcontractors, to be committed to upholding and promoting international human and labour rights, including fundamental principles and rights at work covered by ILO eight (8) fundamental conventions and the United Nations Universal Declaration of Human Rights which includes child and forced labour.

D9.3 Upon request from the Contract Administrator, the Contractor shall provide disclosure of the sources (by company and country) of the raw materials used in the Work and a description of the manufacturing environment or processes (labour unions, minimum wages, safety, etc.).

D9.4 Failure to provide the evidence required under D9.3, may be determined to be an event of default in accordance with C18.

D9.5 In the event that the City, in its sole discretion, determines the Contractor to have violated the requirements of this section, it will be considered a fundamental breach of the Contract and the Contractor shall pay to the City a sum specified by the Contract Administrator in writing ("Unfair Labour Practice Penalty"). Such a violation shall also be considered an Event of Default, and shall entitle the City to pursue all other remedies it is entitled to in connection with same pursuant to the Contract.

D9.5.1 The Unfair Labour Practice Penalty shall be such a sum as determined appropriate by the City, having due regard to the gravity of the Contractor's violation of the above requirements, any cost of obtaining replacement goods/ services or rectification of the breach, and the impact upon the City's reputation in the eyes of the public as a result of same.

D9.5.2 The Contractor shall pay the Unfair Labour Practice Penalty to the City within thirty (30) Calendar Days of receiving a demand for same in accordance with D9.5. The City may also hold back the amount of the Unfair Labour Practice Penalty from payment for any amount it owes the Contractor.

D9.5.3 The obligations and rights conveyed by this clause survive the expiry or termination of this Contract and may be exercised by the City following the performance of the Work, should the City determine, that a violation by the Contractor of the above clauses has occurred following same. In no instance shall the Unfair Labour Practice Penalty exceed the total of twice the Contract value.

D10. FURNISHING OF DOCUMENTS

D10.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF and AutoCAD .DWG formats.

SUBMISSIONS

D11. AUTHORITY TO CARRY ON BUSINESS

D11.1 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.

D12. SAFE WORK PLAN

D12.1 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 Documents, if applicable.

D12.2 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, Purchasing Division website at http://www.winnipeg.ca/matmgt/Safety/default.stm

D12.3 Notwithstanding B13.4 at any time during the term of the Contract, the City may, at their sole discretion and acting reasonably, require an updated COR Certificate or Annual Letter of good Standing. A Contractor, who fails to provide a satisfactory COR Certificate or Annual Letter of good Standing, will not be permitted to continue to perform any Work.

D13. INSURANCE

D13.1 The City shall provide and maintain the following owner controlled insurance coverage to remain in place at all times during the performance of the Work:

(a) Wrap up liability insurance, in the amount of at least fifteen million dollars ($15,000,000.00) inclusive. The insured parties shall include the City, Contractor and all subcontractor whether named or unnamed in the policy and all others having an insurable interest in the Work. Manitoba, its ministers, officers, employees and agents to be listed as additional insureds. Wrap up liability insurance to include but not limited to:

(i) Products and completed operations;
(ii) Blanket contractual liability;
(iii) Unlicensed motor vehicle liability;
(iv) Sudden and accidental pollution liability with a minimum sublimit of $1,000,000;
(v) City and contractors protective coverage;
(vi) Blasting, tunneling or the removal or weakening of support of any land, whether such support be natural or otherwise;
(vii) No XCU exclusion;
(viii) Cross liability clauses; and
(ix) Non-owned automobile liability.

(b) 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 twenty-four months completed operations coverage that will take affect after Total Performance.

(c) The City reserves the right to add, delete, revise and redefine insurance requirements and deductibles at any time, at its sole discretion, or as necessitated by the placement, extensions/renewals of the insurance policy, during the term of the Project.

D13.2 Deductibles under the policy not to exceed $50,000 maximum of any one loss and shall be borne by the Contractor;

D13.3 The Contractor shall provide and maintain the following insurance coverage at all times during the performance of the Work and throughout the warranty period:

(a) Commercial general liability insurance, in the minimum amount of five million dollars ($5,000,000) inclusive per occurrence and five million dollars ($5,000,000) general aggregate. The said insurance shall include coverage for products and completed operations, blanket contractual, Contractors protective, sudden and accidental pollution, non-owned automobile, unlicensed motor vehicle liability, a cross liability clause and shall not contain any XCU exclusions or limitations and will add the City, Manitoba cts ministers, officers, employees and agents to be added as additional insureds.

(b) 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 $5,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident.

(c) An all-risks Installation Floater carrying adequate limits to cover all supplies and/or materials intended to enter into and form part of any installation.

(d) All risks property insurance for all equipment, machinery, portable offices, portable toilets including any tunnelling and trenchless sewer installation equipment, and tools used on the Project that may be owned, rented, leased or borrowed.

D13.4 Deductibles shall be borne by the Contractor.

D13.5 All policies shall be taken out with insurers licensed in the Province of Manitoba.

D13.6 The Contractor shall provide the City Solicitor 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 but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, as applicable.

D13.7 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least thirty (30) Calendar Days prior written notice to the Contract Administrator.

D13.8 The Contractor will be required to cooperate with the City and provide their project experience and project claims history and any other information necessary to obtain the owner-controlled project insurance as outlined in D13.1(a) and D13.1(b) within five (5) Business Days after request.

D14. CONTRACT SECURITY

D14.1 The Contractor shall provide and maintain the performance bond and the labour and material payment bond 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; and

(b) A labour and material payment bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H2: Labour and Material Payment Bond), in an amount equal to fifty percent (50%) of the Contract Price.

D14.1.1 Where the contract security is a performance bond, it may be submitted in hard copy or digital format. If submitted in digital format the contract security must meet the following criteria:

(a) The version submitted by the Contractor must have valid digital signatures and seals;

(b) The version submitted by the Contractor must be verifiable by the City with respect to the totality and wholeness of the bond form, including: the content; all digital signatures and digital seals; with the surety company, or an approved verification service provider of the surety company.

(c) The version submitted must be viewable, printable and storable in standard electronic file formats compatible with the City, and in a single file. Allowable formats include pdf.

(d) The verification may be conducted by the City immediately or at any time during the life of the bond and at the discretion of the City with no requirement for passwords or fees.

(e) The results of the verification must provide a clear, immediate and printable indication of pass or fail regarding D14.1(b).

D14.1.2 Digital bonds failing the verification process will not be considered to be valid and may be determined to be an event of default in accordance with C18.1. If a digital bond fails the verification process, the Contractor may provide a replacement bond (in hard copy or digital format) within seven (7) Calendar Days of the City's request or within such greater period of time as the City in their discretion, exercised reasonably, allows.

D14.1.3 Digital bonds passing the verification process will be treated as original and authentic.

D14.2 The Contractor shall provide the Contract Administrator identified in D6 with the required performance and labour and material payment bonds within seven (7) Calendar Days of notification of the award of the Contract by way of an award letter 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 Documents, if applicable.

D14.3 The Contractor shall, as soon as practicable after entering into a contract with a Subcontractor:

(a) Give the Subcontractor written notice of the existence of the labour and material payment bond in D14.1(b); and

(b) Post a notice of the bond and/or a copy of that bond in a conspicuous location at the Site of the Work.

D15. SUBCONTRACTOR LIST

D15.1 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 Documents, if applicable.

D16. DETAILED WORK SCHEDULE

D16.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least ten (10) 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.

D16.2 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.

D16.3 Further to D16.2(a), the schedule shall clearly identify start and completion dates of the following Work items:

(a) Commencement date;

(b) Mobilization;

(c) Utility locates;

(d) Utility relocations (by location);

(e) Existing sewer and water main relocation;

(f) Site laydown area setup;

(g) Shaft construction (by location);

(h) Tunnels drives (by launch and reception location, in sequence);

(i) Contact grouting (by segment);

(j) Shaft manhole construction;

(k) Sewer laterals and catch basin connections (by location);

(l) Outfall construction;

(m) Substantial Performance;

(n) Site Restoration; and

(o) Total Performance.

D16.4 Timelines and staging for traffic management identified in E22 as required to complete the Work should be included in the schedule.

D16.5 The Contractor shall update the schedule and provide it to the Contract Administrator prior to each weekly construction site meeting for review and discussion at the meetings.

D17. SITE DEVELOPMENT PLAN

D17.1 The Contractor shall provide the Contract Administrator with a Site Development Plan at least ten (10) Business Days prior to the commencement of any Work on the Site.

D17.2 The Site Development Plan shall at minimum include:

(a) Work areas showing all required elements to complete the Work including shafts identified at Launch or Reception, planned intermediate jacking stations, site drainage and tree removal or protection.

(b) Detailed plans of Laydown and Work areas showing the location of all required elements to complete the tunnel including shaft dimensions, material staging area, crane, pipe storage, spoil or separation plant (based on selected Tunnelling method), generator, site trailers, proposed fencing, gates, crane pads, pumps, etc.

(c) Office facility locations for Contract Administrator and Contractor.

(d) Temporary vehicle access/egress locations.

(e) Traffic Control including lane closures.

(f) Large scale map showing proposed travel routes in the project vicinity.

SCHEDULE OF WORK

D18. EXPEDITED SHOP DRAWINGS AND UTILITY LOCATES

D18.1 In order to expedite Shop Drawings with critical timeliness, the lowest responsive Bidder, as outlined in B15, will be permitted, after receiving written approval from the Contract Administrator, to arrange for the preparation of Shop Drawings for the following items with critical timelines:

(a) Shaft Shoring.

(b) Microtunnelling pipe.

D18.2 In order to expedite utility locates and relocations, the lowest responsive Bidder, as outlined in B15, will be required, after receiving written approval from the Contract Administrator, to arrange for utility locates and utility relocations for the Site.

D18.3 If Award is made to the lowest responsive Bidder, no payment for the preparation of Shop Drawings will be made.

D18.4 If Award is made to the lowest responsive Bidder, no payment for the booking of utility locates will be made.

D18.5 If no Contract is awarded, then the City of Winnipeg will pay the lowest responsive Bidder up to a maximum of five hundred dollars ($500.00) for each of the requested items identified in D18.1 for the preparation and delivery of Shop Drawings and a single payment for the booking of utility locates as per D18.2. Delivery of the Shop Drawings to the City, booking of Utility Locates, and payment of the above mentioned amounts will constitute full and final consideration of each

party to the other, and neither party will have any further liability to the other with respect to this Tender.

D19. COMMENCEMENT

D19.1 The Contractor shall not commence any Work until they are in receipt of an award letter from the Award Authority authorizing the commencement of the Work.

D19.2 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 D11;
  (ii) Evidence of the workers compensation coverage specified in C6.15;
  (iii) The Safe Work Plan specified in D12;
  (iv) Evidence of the insurance specified in D13;
  (v) The contract security specified in D14;
  (vi) The Subcontractor list specified in D15;
  (vii) The Detail Work Schedule specified in D16;
  (viii) The Site Development Plan specified in D17;
  (ix) The direct deposit application form specified in D33

(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.

D19.3 The Contractor shall commence the Work on the Site within thirty (30) Working Days of receipt of the award letter.

D19.4 The City intends to award this Contract by April 16, 2025.

D19.4.1 If the actual date of award is later than the intended date, the dates specified for Substantial Performance and Total Performance will be adjusted by the difference between the aforementioned intended and actual dates.

D19.4.2 Critical stage for completion of the river outfall will not change because it is weather dependent.

D20. CRITICAL STAGES

D20.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:

(a) Installation of outlet channel, river outfall and connecting sewer works, riverbank earthwork, riprap and associated works below the Assiniboine River high water level in Bourkevale Park completed before March 15, 2026.

D21. SUBSTANTIAL PERFORMANCE

D21.1 The Contractor shall achieve Substantial Performance by September 30, 2026.

D21.2 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.

D21.3 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.

D22. TOTAL PERFORMANCE

D22.1 The Contractor shall achieve Total Performance by October 28, 2026.

D22.2 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.

D22.3 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.

D23. LIQUIDATED DAMAGES

D23.1 If the Contractor fails to achieve, Critical Stages, Substantial Performance or Total Performance in accordance with the Contract by the days fixed herein for same, the Contractor shall pay the City the following amounts per Working Day for each and every Working Day following the days fixed herein for same during which such failure continues:

(a) Critical Stage – four thousand five hundred dollars ($4,000);

(b) Substantial Performance – four thousand dollars ($4,000); and

(c) Total Performance – One thousand five hundred dollars ($1,500).

D23.2 The amounts specified for liquidated damages in D23.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve, Critical Stages, Substantial Performance or Total Performance by the days fixed herein for same.

D23.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D24. SUPPLY CHAIN DISRUPTION SCHEDULE DELAYS

D24.1 The City acknowledges that the schedule for this Contract may be impacted by the Supply Chain Disruption. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the delivery requirements and schedule identified in the Contract in close consultation with the Contract Administrator.

D24.2 If the Contractor is delayed in the performance of the Work by reason of the Supply Chain Disruption, the Work schedule may be adjusted by a period of time equal to the time lost due to such delay and costs related to such delay will be determined as identified herein.

D24.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether a Supply Chain Disruption will affect the start date. The Contractor shall provide sufficient evidence that the delay is directly related to a Supply Chain Disruption, including but not limited to ordering of Material or Goods, production and/or manufacturing schedules or availability of staff as appropriate.

D24.4 For any delay related to Supply Chain Disruption and identified after Work has commenced, the Contractor shall within seven (7) Calendar Days of becoming aware of the anticipated delay declare the additional delay and shall provide sufficient evidence as indicated in D24.3. Failure to provide this notice will result in no additional time delays being considered by the City.

D24.5 The Work schedule, including the durations identified in D20 to D22 where applicable, will be adjusted to reflect delays accepted by the Contract Administrator. No additional payment will be made for adjustment of schedules except where seasonal work, not previously identified in the Contract, is carried over to the following construction season.

D24.6 Where Work not previously identified is being carried over solely as a result of delays related to Supply Chain Disruption, as confirmed by the Contract Administrator, the cost of temporary works to maintain the Work in a safe manner until Work recommences, will be considered by the Contract Administrator. Where the Work is carried over only partially due to Supply Chain Disruption, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D24.7 Any time or cost implications as a result of Supply Chain Disruption and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

D25. SCHEDULED MAINTENANCE

D25.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Seeding and/or Sodding as specified in CW3510 and Specifications included herein, and

(b) Watering and maintenance of new vegetation until established.

D25.2 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

D26. JOB MEETINGS

D26.1 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.

D26.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever they deem it necessary.

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

D27.1 Further to C6.26, 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).

D28. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D28.1 Further to B13.4, 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 their sole discretion and acting reasonably, require updated proof of compliance, as set out in B13.4.

D29. GEOTECHNICAL BASELINE REPORT (GBR) AND GEOTECHNICAL DATA REPORT (GDR)

D29.1 The Geotechnical Baseline Report and Geotechnical Data Report are provided in **Appendix A** and **Appendix B**, respectively.

D29.2 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.

D29.3 The GBR:

(a) Presents the geotechnical 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.

D29.4 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.

D29.5 The GDR provides a summary of results for the geotechnical and geophysical explorations, field testing, and laboratory testing undertaken within the project area and along the pipe alignment.

D29.6 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 include the boring method, the locations and logs of the borings, the levels of subsurface water (if any), laboratory test methods and results, geophysical survey data, and similar factual data. The Contractor is not entitled to rely upon other technical data.

(b) 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 and when subsurface water level readings were collected.

D29.7 Geophysical seismic refraction surveys were conducted to estimate the depth to till along the pipe alignment and the results are based on interpretation of the data. The depths to subsurface boundaries derived from seismic refraction surveys are generally accepted as accurate to within 1.0 m for relatively shallow boundaries less than 10 m depth.

D29.8 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.

D29.9 The City accepts the risks for subsurface conditions that are more adverse 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.

D29.10 If all of the foregoing conditions are satisfactorily met, additional compensation and schedule will be negotiated, based on the provisions described in D35 and E16.

D30. WORK UNDERNEATH OR NEAR HYDRO POWER INFRASTRUCTURE

D30.1 The Contractor is responsible for notifying Manitoba Hydro in advance of Work in the vicinity and underneath Hydro infrastructure (e.g. overhead transmission lines). The Contractor shall follow all Manitoba Hydro requirements for safe working distances and clearances from Hydro infrastructure including but not limited to overhead electrical lines.

D30.2 Manitoba Hydro requires a minimum vertical clearance from their overhead electrical lines as follows:

(a) Minimum 10 feet from overhead distribution lines;

(b) Minimum 15 feet from overhead transmission lines; and

(c) Minimum 20 feet from high voltage transmission lines.

D31. WORK IN PROXIMITY TO LARGE NATURAL GAS MAINS

D31.1 The Contractor shall be familiar with and comply with the requirements of the latest revision of Manitoba Hydro's "Safe Excavation & Safety Watch Guidelines". This document is available at: https://www.hydro.mb.ca/docs/safety/safe_excavation_safety_watch_guidelines.pdf

D31.2 Work precautions and procedures required for working near gas mains will be incidental to the Contract.

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.

MEASUREMENT AND PAYMENT

D33. PAYMENT

D33.1 Further to C12, the City shall make payments to the Contractor by direct deposit to the Contractor's banking institution, and by no other means. Payments will not be made until the Contractor has made satisfactory direct deposit arrangements with the City. Direct deposit application forms are at https://winnipeg.ca/finance/files/Direct_Deposit_Form.pdf.

D34. FUEL PRICE ADJUSTMENT

D34.1 The Contract is subject to a fuel price adjustment which will be calculated monthly based on eligible Work completed utilizing the following mathematical formulas;

(a) Where the price of fuel has increased - ((CFI/BFI)-1.15) x Q x FF; and

(b) Where the price of fuel has decreased - ((CFI/BFI)-0.85) x Q x FF; where

(i) BFI = base fuel index;

(ii) CFI = current fuel index;

(iii) FF = fuel factor; and

(iv) Q = monetary value of Work applied in the calculation.

D34.1.1 Eligible Work will be determined in accordance with D34.5.

D34.1.2 The base fuel index (BFI) will be the retail price of fuel identified on the Submission Deadline based on latest published "Monthly average retail prices for gasoline and fuel by geography" for Winnipeg, published by Statistics Canada, Table 18-10-0001-01. The BFI is a blended rate based on 15% regular unleaded gasoline at self-service filling stations and 85% diesel fuel at self-service filling stations.

D34.1.3 The current fuel index (CFI) based on the above blended rate will be determined for each monthly progress estimate and applied on the following progress estimate as a change order once rates are published by Statistics Canada.

D34.1.4 A Fuel Factor (FF) rate of the monetary value of all eligible Work completed that month based on the Contract Unit Prices will be used to calculate the assumed apportioned cost of fuel.

D34.2 Fuel cost adjustments may result in additional payment to the Contractor or credit to the City within the Contract by way of a monthly change order.

D34.3 The fuel escalation or de-escalation adjustment will not be applied if the CFI is within ±15% of the BFI.

D34.4 Fuel escalation adjustments will not be considered beyond the Substantial Performance except where those dates/Working Days are adjusted by change order. Fuel de-escalation adjustments will apply for Work that extends beyond the dates/Working Days specified for Substantial Performance/Critical Stages.

D34.5 The Fuel Factor (FF) rates will be set as follows:

(a) The Fuel Factor rate will be set at 1.2% of the monetary value of all Work identified on Form B: Prices related to Water & Waste Work.

D35. CHANGES IN WORK

D35.1 Further to C7.2.1 (a), add in the following 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 construction and/or tunnelling shall be allowed under the Changes of 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. The Contractor shall within 30 Calendar Days after notification to the City that the 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 E16. 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.

D36.1.2 For the purpose of contract security, the warranty period shall be one (1) year.

DISPUTE RESOLUTION

D37. DISPUTE RESOLUTION

D37.1 If the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator, the Contractor shall act in accordance with the Contract Administrator's opinion, determination, or decision unless and until same is modified by the process followed by the parties pursuant to D37.

D37.2 The entire text of C21.4 is deleted, and amended to read: "Intentionally Deleted"

D37.3 The entire text of C21.5 is deleted, and amended to read:

(a) If Legal Services has determined that the Disputed Matter may proceed in the Appeal Process, the Contractor must, within ten (10) Business Days of the date of the Legal Services Response Letter, submit their written Appeal Form, in the manner and format set out on the City's Purchasing Website, to the Chief Administrative Officer, and to the

Contract Administrator. The Contractor may not raise any other disputes other than the Disputed Matter in their Appeal Form.

D37.4 Further to C21, prior to the Contract Administrator's issuance of a Final Determination, the following informal dispute resolution process shall be followed where the Contractor disagrees with any opinion, determination, or decision of the Contract Administrator ("Dispute"):

(a) In the event of a Dispute, attempts shall be made by the Contract Administrator and the Contractor's equivalent representative to resolve Disputes within the normal course of project dealings between the Contract Administrator and the Contractor's equivalent representative.

(b) Disputes which in the reasonable opinion of the Contract Administrator or the Contractor's equivalent representative cannot be resolved within the normal course of project dealings as described above shall be referred to a without prejudice escalating negotiation process consisting of, at a minimum, the position levels as shown below and the equivalent Contractor representative levels:

(i) The Contract Administrator;

(ii) Supervisory level between the Contract Administrator and applicable Department Head; and

(iii) Department Head.

D37.4.1 Names and positions of Contractor representatives equivalent to the above City position levels shall be determined by the Contractor and communicated to the City at the pre-commencement or kick off meeting.

D37.4.2 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.

D37.4.3 Both the City and the Contractor agree to make all reasonable efforts to conduct the above escalating negotiation process within twenty (20) Business Days, unless both parties agree, in writing, to extend that period of time.

D37.4.4 If the Dispute is not resolved to the City and Contractor's mutual satisfaction after discussions have occurred at the final escalated level as described above, or the time period set out in D37.4.3, as extended if applicable, has elapsed, the Contract Administrator will issue a Final Determination as defined in C1.1(v), at which point the parties will be governed by the Dispute Resolution process set out in C21.

INDEMNITY

D38. INDEMNITY

D38.1 Indemnity shall be as stated in C17.

D38.2 Notwithstanding C17.1, the Contractor shall save harmless and indemnify the City in the amount of twice the Contract Price or five million dollars ($5,000,000), whichever is greater, against all costs, damages or expenses arising from actions, claims, demands and proceedings, by whomsoever brought, made or taken as a result of negligent acts or negligent omissions of the Contractor, their Subcontractors, employees or agents in the performance or purported performance of the Work, and more particularly from:

(a) Accidental injury to or death of any person whether retained by or in the employ of the contractor or not, arising directly or indirectly by reason of the performance of the Work, or by reason of any trespass on or damage to property;

(b) Damage to any property owned in whole or in part by the City, or which the City by duty or custom is obliged, directly or indirectly, in any way or to any degree, to construct, repair or maintain;

(c) Damage to, or trespass or encroachment upon, property owned by persons other than the City;

(d) Any claim for lien or trust claim served upon the City pursuant to The Builders' Liens Act;

(e) Failure to pay a Workers Compensation assessment, or Federal or Provincial taxes;

(f) Unauthorized use of any design, device, material or process covered by letters patent, copyright, trademark or trade name in connection with the Work; and

(g) Inaccuracies in any information provided to the City by the Contractor.

D38.3 Further to C17, The City shall save harmless and indemnify the Contractor in the amount of twice the Contract Price or five million dollars ($5,000,000), whichever is greater, against all costs, damages or expenses arising from actions, claims, demands and proceedings, by whomsoever brought, made or taken as a result of negligent acts or negligent omissions of the City, their employees or agents in the performance of its obligation under the Contract.

THIRD PARTY AGREEMENTS

D39. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

D39.1 In the event that funding for the Work of the Contract is provided to the City of Winnipeg by the Government of Manitoba and/or the Government of Canada, the following terms and conditions shall apply, as required by the applicable funding agreements.

D39.2 Further to D39.1, in the event that the obligations in D39 apply, actual costs legitimately incurred by the Contractor as a direct result of these obligations ("Funding Costs") shall be determined by the actual cost to the Contractor and not by the valuation method(s) outlined in C7.4. In all other respects Funding Costs will be processed in accordance with Changes in Work under C7.

D39.3 For the purposes of D39:

(a) **"Government of Canada"** includes the authorized officials, auditors, and representatives of the Government of Canada; and

(b) **"Government of Manitoba"** includes the authorized officials, auditors, and representatives of the Government of Manitoba.

D39.4 Modified Insurance Requirements

D39.4.1 If not already required under the insurance requirements identified in D13, the Contractor will be required to provide wrap-up liability insurance in an amount of no less than two million dollars ($2,000,000) inclusive per occurrence. Such policy will be written in the joint names of the City, Contractor, Consultants and all sub-contractors and sub-consultants and include twelve (12) months completed operations. The Government of Manitoba and their Ministers, officers, employees, and agents shall be added as additional insureds.

D39.4.2 If not already required under the insurance requirements identified in D13, the Contractor will be required to provide builders' risk insurance (including boiler and machinery insurance, as applicable) providing all risks coverage at full replacement cost, or such lower level of insurance that the City may identify on a case-by-case basis, such as an installation floater.

D39.4.3 The Contractor shall obtain and maintain third party liability insurance with minimum coverage of two million dollars ($2,000,000.00) per occurrence on all licensed vehicles operated at the Site. In the event that this requirement conflicts with another licensed vehicle insurance requirement in this Contract, then the requirement that provides the higher level of insurance shall apply.

D39.4.4 Further to D13.6, insurers shall provide satisfactory Certificates of Insurance to the Government of Manitoba prior to commencement of Work as written evidence of the insurance required. The Certificates of Insurance must provide for a minimum of thirty (30) days' prior written notice to the Government of Manitoba in case of insurance cancellation.

D39.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.

D39.5 Indemnification By Contractor

D39.5.1 In addition to the indemnity obligations outlined in C17 of the General Conditions for Construction, the Contractor agrees to indemnify and save harmless the Government of Canada and the Government of Manitoba and each of their respective Ministers, officers, servants, employees, and agents from and against all claims and demands, losses, costs, damages, actions, suit or other proceedings brought or pursued in any manner in respect of any matter caused by the Contractor or arising from this Contract or the Work, or from the goods or services provided or required to be provided by the Contractor, except those resulting from the negligence of any of the Government of Canada's or the Government of Manitoba's Ministers, officers, servants, employees, or agents, as the case may be.

D39.5.2 The Contractor agrees that in no event will Canada or Manitoba, their respective officers, servants, employees or agents be held liable for any damages in contract, tort (including negligence) or otherwise, for:

(a) Any injury to any person, including, but not limited to, death, economic loss or infringement of rights;

(b) Any damage to or loss or destruction of property of any person; or

(c) Any obligation of any person, including, but not limited to, any obligation arising from a loan, capital lease or other long term obligation.

in relation to this Contract or the Work.

D39.6 Records Retention and Audits

D39.6.1 The Contractor shall maintain and preserve accurate and complete records in respect of this Contract and the Work, including all accounting records, financial documents, copies of contracts with other parties and other records relating to this Contract and the Work during the term of the Contract and for at least six (6) years after Total Performance. Those records bearing original signatures or professional seals or stamps must be preserved in paper form; other records may be retained in electronic form.

D39.6.2 In addition to the record keeping and inspection obligations outlined in C6 of the General Conditions for Construction, the Contractor shall keep available for inspection and audit at all reasonable times while this Contract is in effect and until at least six (6) years after Total Performance, all records, documents, and contracts referred to in D39.6.1 for inspection, copying and audit by the City of Winnipeg, the Government of Manitoba and/or the Government of Canada and their respective representatives and auditors, and to produce them on demand; to provide reasonable facilities for such inspections, copying and audits, to provide copies of and extracts from such records, documents, or contracts upon request by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada and their respective representatives and auditors, and to promptly provide such other information and explanations as may be reasonably requested by the City of Winnipeg, the Government of Manitoba, and/or the Government of Canada from time-to-time.

D39.7 Other Obligations

D39.7.1 The Contractor consents to the City providing a copy of the Contract Documents to the Government of Manitoba and/or the Government of Canada upon request from either entity.

D39.7.2 If the Lobbyists Registration Act (Manitoba) applies to the Contractor, the Contractor represents and warrants that it has filed a return and is registered and in full compliance with the obligations of that Act, and covenants that it will continue to comply for the duration of this Contract.

D39.7.3 The Contractor shall comply with all applicable legislation and standards, whether federal, provincial, or municipal, including (without limitation) labour, environmental, and human rights laws, in the course of providing the Work.

D39.7.4 The Contractor shall properly account for the Work provided under this Contract and payment received in this respect, prepared in accordance with generally accepted accounting principles in effect in Canada, including those principles and standards approved or recommended from time-to-time by the Chartered Professional Accountants of Canada or the Public Sector Accounting Board, as applicable, applied on a consistent basis.

D39.7.5 The Contractor represents and warrants that no current or former public servant or public office holder, to whom the Value and Ethics Code for the Public Sector, the Policy on Conflict of Interest and Post Employment, or the Conflict of Interest Act applies, shall derive direct benefit from this Contract, including any employment, payments, or gifts, unless the provision or receipt of such benefits is in compliance with such codes and the legislation.

D39.7.6 The Contractor represents and warrants that no member of the House of Commons or of the Senate of Canada or of the Legislative Assembly of Manitoba is a shareholder, director or officer of the Contractor or of a Subcontractor, and that no such member is entitled to any benefits arising from this Contract or from a contract with the Contractor or a Subcontractor concerning the Work.

FORM H1: PERFORMANCE BOND
(See D14)

KNOW EVERYONE 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

TENDER NO. 286-2024B

FERRY ROAD AND RIVERBEND COMBINED SEWER RELIEF - CONTRACT 6

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: LABOUR AND MATERIAL PAYMENT BOND
(See D14)

KNOW EVERYONE BY THESE PRESENTS THAT

_____
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Principal"), and

_____ ,
his/its heirs, executors, administrators, successors or assigns (hereinafter called the "Surety"), are held and firmly bound unto **THE CITY OF WINNIPEG** (hereinafter called the "Obligee"), for the use and benefit of claimants as herein below defined, in the amount of

_____

_____ dollars ($_____.____)

of lawful money of Canada, for the payment whereof we, the Principal and the Surety jointly and severally bind ourselves firmly by these presents.

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

TENDER NO. 286-2024B

FERRY ROAD AND RIVERBEND COMBINED SEWER RELIEF - CONTRACT 6

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 promptly make payment to all claimants as hereinafter defined, for all labour, service and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void, otherwise it shall remain in full force and effect subject, however, to the following conditions:

(a) A claimant is defined as one having a direct contract with the Principal for labour, service and material, or any of them, used or reasonably required for use in the performance of the contract, labour, service and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment (but excluding rent of equipment where the rent pursuant to an agreement is to be applied towards the purchase price thereof) directly applicable to the Contract;

(b) The above-named Principal and Surety hereby jointly and severally agree with the Obligee that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant’s work, labour or service was done or performed, or materials were furnished by such claimant, may sue on this bond, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon;

(c) No suit or action shall be commenced hereunder by any claimant

(ii) unless claimant shall have given written notice to the Principal and the Surety above-named, within one hundred and twenty (120) days after such claimant did or performed the last of the work, labour or service, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work, labour or service was done or performed. Such notice shall be served by mailing the same by registered mail to the Principal, and Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the Province of Manitoba;

(iii) after the expiration of one (1) year following the date on which Principal ceased work on said Contract; including work performed under the guarantees provided in the Contract;

(iv) other than in a court of competent jurisdiction in the Province of Manitoba.

(d) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

(e) The Surety shall not be liable for a greater sum than the specified penalty of this bond.

The Principal and Surety hereby agree that The Guarantors' Liability Act (Manitoba) shall apply to this Bond.

IN TESTIMONY WHEREOF, the Principal has hereunto set its hand affixed its seal, and the Surety has caused these presents to be sealed and with its corporate seal duly attested by the authorized signature of its signing authority this

_____ 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)

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FORM J: SUBCONTRACTOR LIST

(See D15)

FERRY ROAD AND RIVERBEND COMBINED SEWER RELIEF - CONTRACT 6

Name	Address

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 their 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, Purchasing 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 Tender shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.3 Bidders are reminded that requests for approval of substitutes as an approved equal or an approved alternative shall be made in accordance with B7. In every instance where a brand name or design specification is used, the City will also consider approved equals and/or approved alternatives in accordance with B7.

E1.4 The following are applicable to the Work:

Drawing No.	Drawing Name/Title
LD-13163	COVER SHEET AND DRAWING INDEX
LD-13164	LEGEND & ABBREVIATIONS
LD-13165	GENERAL LAYOUT
LD-13166	ASSINIBOINE RIVER TO 100m N OF ASSINIBOINE RIVER
LD-13167	ASSINIBOINE PATHWAY TO STA 0+630
LD-13168	FROM STA 0+630 TO STA 0+765
LD-13169	FROM STA 0+765 TO STA 0+895
LD-13170	65m S OF PORTAGE AVE TO 25m N OF PORTAGE AVE
LD-13171	25m N OF PORTAGE AVE TO 104m N OF PUBLIC LANE
LD-13172	104m N OF PUBLIC LANE TO 15m S OF BRUCE AVE
LD-13173	15m S OF BRUCE AVE TO 105m N OF BRUCE AVE
LD-13174	105m N OF BRUCE AVE TO 65m S OF NESS AVE
LD-13175	65m S OF NESS AVE TO 43m N OF NESS AVE
LD-13176	43m N OF NESS AVE TO 130m N
LD-13177	FROM STA 1+795 TO 101m S OF SILVER AVE
LD-13178	101m S OF SILVER AVE TO 14m N OF SILVER AVE
LD-13179	14m N OF SILVER AVE TO 125m N
LD-13180	125m N OF SILVER AVE TO 250m N
LD-13181	N/L OF RUTLAND ST TO PROJECTION OF N/L OF ST MATTHEWS AVE
LD-13182	SEWER & WM CROSSING
LD-13183	450 AND 1200 LDS LATERALS
LD-13184	600 LDS LATERALS
LD-13185	EXISTING NESS AVE COMBINED SEWER REMOVAL AND REPLACEMENT
LD-13186	FUTURE 1200 AND 900 LDS AND FEEDER MAIN STABILIZATION
LD-13187	MANHOLE, PIPE CONNECTION AND SHAFT DETAILS
LD-13188	SADDLE MANHOLE AND PIPE CONNECTION STRUCTURAL DETAILS
LD-13189	OUTFALL DETAILS
LD-13190	TRENCH DAM, DIKE RESTORATION AND CATCH BASIN DETAILS
LD-13191	FENCE AND BOLLARD DETAILS
LD-13192	MICROTUNNEL PIPE DETAILS
LD-13193	INSTRUMENTATION DETAILS

LD-13194	FEEDER MAIN STABILIZATION DETAILS
LD-13195	CONTRACTOR WORK & LAYDOWN AREAS (SHEET 1 0F 6)
LD-13196	CONTRACTOR LAYDOWN AREAS (SHEET 2 0F 6)
LD-13197	CONTRACTOR LAYDOWN AREAS (SHEET 3 OF 6)
LD-13198	CONTRACTOR LAYDOWN AREAS (SHEET 4 OF 6)
LD-13199	CONTRACTOR LAYDOWN AREAS (SHEET 5 OF 6)
LD-13200	CONTRACTOR LAYDOWN AREAS (SHEET 6 OF 6)
LD-13201	RECONFIGURATION OF BOURKEVALE OFF-LEASH DOG PARK
LD-13202	RESTORATION WORK
LD-13203	TRAFFIC CONTROL (SHEET 1 0F 3)
LD-13204	TRAFFIC CONTROL (SHEET 2 0F 3)
LD-13205	TRAFFIC CONTROL (SHEET 3 0F 3)

E2. GEOTECHNICAL AND OTHER INVESTIGATION REPORTS

E2.1 Geotechnical Baseline Report (GBR)

(a) The GBR presents an interpretation of the geotechnical conditions to be anticipated during construction of the work, based on the GDR, for use by Bidders for Bid preparation and administration of the Contract. Further information is provided in D29 and a copy of the GBR is included in **Appendix A**.

E2.2 Geotechnical Data Report (GDR)

(a) The GDR summarizes the testing and geotechnical conditions observed along the alignments of the proposed pipeline infrastructure within the project area and provides technical support for the GBR. This report includes geotechnical and geophysical data collected at the project site and summary of encountered subsurface conditions along the alignments. A copy of the GDR is included in **Appendix B**.

E2.3 Geophysical Report

(a) A geophysical survey was conducted to aid in the interpolation of soil conditions between test holes. The interpreted clay-till interface is shown on the drawings. The resultant report is provided in **Appendix C**.

E2.4 Hydrogeological Information

(a) A hydrogeological investigation was undertaken to measure the hydraulic conductivity of soils at six locations along the pipe route zone. This information can be used to estimate the dewatering flow requirement for shafts. The report is present in **Appendix D**.

Periodic piezometer readings were done over the past several years for both this project and nearby Ferry Road contracts and these readings are also summarized in **Appendix D**. A time history of Assiniboine River stage based on the nearby City of Winnipeg St. James bridge gage, monthly rainfall based on the City of Winnipeg Riverbend pumping station rain gage and project piezometer readings are included in this appendix.

GENERAL REQUIREMENTS

E3. OFFICE FACILITIES

E3.1 The Contractor shall supply a site trailer or office space near the project site with available space for use by the Contract Administrator.

E3.2 The office facility shall meet the following requirements:

(a) The field office shall be for the exclusive use of the Contract Administrator and City staff and will be used for site meetings.

(b) Where possible, the field office trailer shall be located within the Contractor’s laydown area near an active launch shaft for the Tunnelling work. The Contractor will be required to

relocate the field office trailer during construction so that it is always near an active launch shaft location.

(c) The office shall have a minimum floor area of 25 square metres, minimum of two windows and a door entrance with suitable lock.

(d) The office shall include a large room for meetings, and two smaller offices for the Contract Administrator and Inspectors.

(e) The office shall be suitable for all-weather use. It shall be equipped with an electric heater and air conditioner capable of maintaining a temperature range between 16 °C and 25 °C.

(f) The office shall be supplied with adequate lighting and have a minimum of three wall outlets with 120 Volt power supply.

(g) The office shall have high speed internet access.

(h) The office shall be furnished with two desks, two meeting tables, one drafting table, one filing cabinet and a minimum of 12 chairs.

(i) A portable toilet shall be located near the field office. The toilet shall have a locking door.

(j) The field office shall be cleaned on a weekly basis, prior to the Site Meetings to the satisfaction of the Contract Administrator.

E3.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance.

E3.4 Measurement and Payment

(a) The Contractor shall be responsible for all installation, transportation and removal costs, all operating costs, provision of furnishings and equipment, cleaning and the general maintenance of the office facilities.

(b) Payment for the office facility is considered incidental to Site Development and Restoration.

E4. SITE DEVELOPMENT, MOBILIZATION, AND DEMOBILIZATION

E4.1 Description

E4.1.1 This Specification shall govern Mobilization and Demobilization from site, including temporary works necessary to access the site and complete the Work.

E4.2 Site Development Plan

E4.2.1 Refer to section D17.

E4.3 Temporary Access Roads

E4.3.1 The Contractor shall design and construct site access roads as shown on the Drawings.

E4.3.2 Access road shall be constructed to permit access to the site by all equipment and materials required to undertake the works.

E4.3.3 Access roads shall be kept in a rut free and well maintained condition.

E4.3.4 Maintain public roads providing access to temporary access roads free of dust and mud.

E4.4 Security Fence

E4.4.1 Temporary non-climbable 1.8 m fence panels or chain link fencing as approved by the Contract Administrator shall be installed at all laydown areas, open excavations, trench cages, cans, and shafts for the project duration.

E4.4.2 Fence sections shall be clamped or bolted together to eliminate easy disassembly and anchored to the ground.

E4.4.3 The Contractor shall be responsible for installation, maintenance of the fences in proper working condition and removal following completion of the works.

E4.4.4 Site fencing shall include perimeter runoff control (e.g. Filtrexx SiltSoxx or equivalent) where there is the potential for leakage from pumping or equipment that could contaminate runoff.

E4.4.5 Site fencing and perimeter runoff control shall not interfere with normal boulevard or roadway gutter drainage, and drainage should be accommodated by rerouting or the installation of temporary catch basins.

E4.4.6 Existing bollards may be removed at provide access points the laydown or work sites and must be replaced by lockable gates. Bollards shall be replaced upon completion of the work as part of restoration work.

E4.5 Site Office

E4.5.1 Refer to section E3.

E4.6 Measurement and Payment

E4.6.1 Mobilization and demobilization will be measured on a lump sum basis and paid for at the Contract Lump Sum Price for “Site Development, Mobilization and Demobilization” as listed in Form B: Prices. Payment for Mobilization and demobilization shall include but is not limited to the following:

(a) All costs associated with mobilization and demobilization.

(b) Development of site access roads.

(c) Development lay down areas.

(d) Erection, maintenance, and removal of security fencing and gates.

(e) Installation, maintenance, and removal of silt fencing or silt barriers.

(f) Supply and maintenance of site office facilities.

(g) Site cleanup.

(h) Removal of temporary access roads and approaches.

(i) Restoration of fences and bollards.

(j) Any other material and labour specified herein and required to complete the work, excluding pavement restoration which is a pay item.

E4.6.2 Payment for Mobilization and Demobilization will be made at the Contract Lump Sum Price for “Site Development, Mobilization and Demobilization”.

E4.6.3 Payment shall be according to the following schedule:

(a) Sixty percent (60%) payment of the Mobilization and Demobilization Lump Sum Price will be paid once the Contractor has completed the necessary site access modifications, site setup, and commenced with Work on Site, based on the total number of Launch shafts or major laydown areas identified in the Site Development Plan. Payment will be further broken down by Launch shaft or major laydown area, so for example if one of four planned laydown areas is setup then payment would be based on (1/4) of 60% of the Mobilization and Demobilization lump sump price.

(b) Notwithstanding the above clause, the initial payment for Mobilization and Demobilization will be limited to five percent (5%) of the total Contract value

(c) The remaining forty percent (40%) of the Mobilization and Demobilization Lump Sum Price will be paid after the completion of the works, site cleanup, restoration of existing fencing, and removal of temporary access roads.

E5. SUBMITTALS

E5.1 Description

E5.1.1 This specification shall cover the requirements for all submittals, shop drawings, RFIs, and other submitted information.

E5.1.2 Submittals shall be made electronically in PDF format unless otherwise approved by the Contract Administrator.

E5.2 All submittals shall have a cover page with at minimum the following information:

(a) Project Title and tender number or other project number assigned by the Contract Administrator

(b) Name of Contractor, Client, and Contract Administrator

(c) Submission number and type of submission: 001 or 001R1 if it is the second submission

(d) Date of submission

(e) Tag number or name of depicted item in accordance with the specification and drawings

(f) Product series number and location where the item is to be used

(g) Specification Section Reference

E5.3 Submittals fall into four categories: requests for information, shop drawings, submittals for review and comment, and submittals that are primarily for information only. Contractor shall maintain logs of each submittal type and if requested submit to the Contract Administrator a copy of the log in a PDF format.

E5.4 Requests for Information (RFI)

(a) Immediately upon discovery of the need for interpretation of the Contract Documents, prepare and submit a RFI in the form specified with all relevant information. Provide Contract Administrator with additional information as required to properly respond to RFI.

(b) Coordinate and submit RFIs in a prompt manner and with sufficient notice to permit the Contract Administrator the full response time required without delaying the Work.

(c) Limit RFI to only one subject.

(d) The Contract Administrator has no obligation to respond to nuisance or redundant RFIs, including: Resubmissions of previously addressed RFIs, Incomplete or inaccurately prepared RFIs, Requests for approval of submittals or substitutions, Requests for adjustments in price or schedule, Requests for information already indicated in the Contract Documents.

E5.5 Shop Drawings

(a) Submit shop drawings for all items and structures as detailed in individual sections

(b) Refer to City of Winnipeg specification CW 1110 for requirements on shop drawings

E5.6 Submittals for Review and Comment

(a) Submittals required for review and comment include, but are not limited to, the following:

(i) The Safe Work Plan specified in D12;
(ii) The Subcontractor List specified in D15;
(iii) The Detail Work Schedule specified in D16;
(iv) The Site Development Plan and Site Layouts specified in D17;
(v) Shop Drawings for supplied products or materials, designs, and other items or other aspects of the work, including expedited shop drawings as specified inD18;

(vi) Mud and Dust Control Plan specified in E8;
(vii) Environmental Protection Plan specified in E9;
(viii) Emergency Response Plan specified in E9;
(ix) Building Inspection Plan specified in E19;
(x) Pre-Construction building inspections reports specified in E19;
(xi) Post Construction building inspections reports specified in E19;
(xii) Vibration Monitoring Plan specified in E20;
(xiii) Sewer Flow Control Plan specified in E30;
(xiv) Dewatering Plan specified in E36;
(xv) MTBM Pipe Jacking Operation Plan in E38;
(xvi) Contact Grouting Plan specified in E39;

(b) The Contract Administrator will review the submittals and provide comments for revision as warranted.

E5.7 Submittals that are Primarily for Information Only

(a) Specified in the Contract Documents and include but not limited to Health and Safety Plan, Design drawings, calculations and specifications that are requested to be sealed by a Professional Engineer, Tests and Report, and Construction Photographs.

(b) Submittals that are primarily for information only are not subject to submittal review procedures and will be provided as part of the work under this Contract and their acceptability determined under normal inspection procedures.

E5.8 Allow ten (10) Business Days for the Contract Administrator to provide an initial response to each submittal. Within that review period, the Contract Administrator will prioritize responses to any RFIs marked urgent.

E5.9 Measurement and Payment

E5.9.1 Work associated with this specification will not be measured for payment and will be included with the Works.

E6. APPROVALS

E6.1 Any references within these specifications to "approval," "acceptance," "as accepted," or similar terms shall mean that the approval or acceptance of the item is required from the Contract Administrator or the Engineer. If not explicitly stated, it is assumed that the Contract Administrator's or the Engineer's approval is necessary. The Contract Administrator will designate the appropriate party to provide the required approval or acceptance."

E7. CONSTRUCTION SIGNAGE

E7.1 If the project receives Federal or Provincial contributions, project signage shall be erected to identify the project and funding partners.

E7.2 The Contractor shall obtain infrastructure signs from the Traffic Services Sign Shop at 421 Osborne Street.

E7.3 The Contractor shall mount each sign securely to a rigid backing material approved by the Contract Administrator. The Contractor shall fasten each sign to a suitable support and erect and maintain one sign at each street as directed by the Contract Administrator.

E7.4 When the Contract Administrator considers the Work complete, the Contractor shall remove and dispose of the signs and supports.

E7.5 Work associated with this specification will not be measured for payment and will be included with the Works.

E8. MUD AND DUST CONTROL

E8.1 Further to CW 1130 Clause 3.9, the Contractor shall plan for removing mud and dust from impacted streets weekly or more frequently during wet conditions.

E8.2 Spills or leakage of water, slurry or lubricant from Works or transported materials shall be promptly cleaned up.

E8.3 Impacted roadways shall be sanding following cleanup during the freezing season.

E8.4 Work associated with this specification will not be measured for payment and will be included with the Works.

E9. ENVIRONMENTAL PROTECTION PLAN

E9.1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the Environmental Protection Plan as herein specified.

E9.2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work:

(a) Federal
  (i) Canadian Environmental Assessment Act (CEAA), 1992 c.37;
  (ii) Canadian Environmental Protection Act (CEPA) c.16;
  (iii) Fisheries Act, 1985 c.F-14;
  (iv) Transportation of Dangerous Goods Act and Regulations, c.34;
  (v) Transportation Association of Canada's Transportation Association of Canada National Guide to Erosion and Sediment Control on Roadway Projects, 2005;
  (vi) Navigable Waters Protection Act; and
  (vii) Any other applicable Acts, Regulations, and By-laws.

(b) Provincial
  (i) The Dangerous Goods Handling and Transportation Act, D12;
  (ii) The Endangered Species Act, c.E111;
  (iii) The Environment Act, c.E125;
  (iv) The Fire Prevention Act, c.F80;
  (v) The Heritage Resources Act, c.H39.1;
  (vi) The Noxious Weeds Act, c.N110;
  (vii) The Nuisance Act, c.N120;
  (viii) The Pesticides Regulation, M.R. 94/88R
  (ix) The Public Health Act, c.P210;
  (x) The Water Protection Act, c.W65;
  (xi) The Workplace Safety and Health Act W210;
  (xii) Current applicable Associated Regulations;
  (xiii) The Manitoba Stream Crossing Guidelines for the Protection of Fish and Fish Habitat, Manitoba National Resources, 1996.; and
  (xiv) Any other applicable Acts, Regulations, and By-laws.

(c) Municipal
  (i) The City of Winnipeg Neighbourhood Liveability By-law No. 1/2008;
  (ii) The City of Winnipeg By-law No. 1573/77 and all amendments up to and including 7670/2000;

(iii) City of Winnipeg Best Management Practices for Activities In and Around the City's Waterways and Watercourses, City of Winnipeg 2005;

(iv) The City of Winnipeg Motor Vehicle Noise Policies and Guidelines;

(v) The City of Winnipeg By-law No. 2480/79 and all amendments up to and including 7976/2000; and

(vi) Any other applicable Acts, Regulations, and By-laws.

E9.3 The Contractor is advised that the following environmental protection measures apply to the Work.

E9.3.1 Materials Handling and Storage

(a) Storage on construction materials shall be confined to the defined laydown areas as shown on the Contract Drawings or at a location approved by the Contract Administrator.

(b) Construction materials shall not be deposited or stored on or near watercourses unless written acceptance from the Contract Administrator is received in advance.

(c) Construction materials and debris shall be tied down or secured if severe weather and high wind velocities are forecasted. Work shall be suspended during extreme high wind conditions.

(d) Construction materials and debris shall be prevented from entering watercourses. In the event that materials and/or debris inadvertently enter the land drainage system, the Contractor will be required to remove the material to an appropriate landfill or storage facility and restore the watercourse to its original condition.

E9.3.2 Fuel Handling and Storage

(a) The Contractor shall obtain all necessary permits from Manitoba Conservation and Water Stewardship for the handling and storage of fuel products and shall provide copies to the Contract Administrator.

(b) 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.

(c) 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.

(d) 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 Red River. 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.

(e) The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage.

(f) Products transferred from the fuel storage area(s) to specific Work Sites shall not exceed the daily usage requirement.

(g) 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.

(h) Washing, refuelling, and servicing of machinery and storage of fuel and other materials for the machinery shall take place at least 100 metres from a watercourse to prevent deleterious substances from entering the water.

(i) 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.

(j) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available on short notice.

(k) Machinery shall arrive on Site in a clean condition and shall be maintained to be free to fluid leaks.

(l) A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on Site. The Contractor shall ensure that additional material can be made available upon short notice. Additionally, appropriate staff on Site shall be trained for proper handling of deleterious liquids (i.e. fuelling) and trained in preventing and cleaning up minor spills.

E9.3.3 Waste Handling and Disposal

(a) The Construction area shall be kept clean and orderly at all times during and at completion of construction.

(b) 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.

(c) The Contractor shall, during and at the completion of construction, clean-up the construction area and 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 require special disposal methods.

(d) On Site volumes of sewage and/or septage will be removed on a weekly basis.

(e) The Contractor shall ensure sewage, septage, and other liquid wastes generated on Site are handled and disposed of by a certified disposal contractor.

(f) Indiscriminate dumping, littering, or abandonment shall not take place.

(g) No on-Site burning of waste is permitted.

(h) Waste storage areas shall not be located so as to block natural drainage.

(i) Runoff from a waste storage area shall not be allowed to cause siltation of a watercourse.

(j) 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.

(k) Equipment shall not be cleaned near watercourses; contaminated water from onshore cleaning operations shall not be permitted to enter watercourses.

E9.3.4 Dangerous Goods/Hazardous Waste Handling and Disposal

(a) Dangerous goods/hazardous waste are identified by, and shall be handled according to, The Dangerous Goods Handling and Transportation Act and Regulations.

(b) The Contractor shall be familiar with The Dangerous Goods Handling and Transportation Act and Regulations.

(c) 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.

(d) Different waste streams shall not be mixed.

(e) Disposal of dangerous goods/hazardous wastes shall be at approved hazardous waste facilities.

(f) Liquid hydrocarbons shall not be stored or disposed of in earthen pits on Site.

(g) 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.

(h) Used oil filters shall be drained, placed in suitable storage containers, and buried or incinerated at approved hazardous waste treatment and disposal facilities.

(i) Dangerous goods/hazardous waste storage areas shall be located at least 107 metres away from the edge of the water line for normal summer water levels and be diked.

(j) Dangerous goods/hazardous waste storage areas shall not be located so as to block natural drainage.

(k) Runoff from a dangerous goods/hazardous waste storage areas shall not be allowed to cause siltation of a watercourse.

(l) 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.

E9.3.5 Emergency Response

(a) The Contractor shall ensure that due care and caution is taken to prevent spills.

(b) 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 E9-1 below) to Manitoba Environment, immediately after occurrence of the environmental accident, by calling the 24-hour emergency phone number (204) 945-4888.

(c) The Contractor shall designate a qualified supervisor as the on-Site emergency response coordinator for the project. The emergency response coordinator shall have the authority to redirect manpower in order to respond in the event of a spill.

(d) 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 coordinator:

(i) Notify emergency-response coordinator of the accident:

i Identify exact location and time of accident;

ii Indicate injuries, if any;

iii Request assistance as required by magnitude of accident (Manitoba Environment 24-hour Spill Response Line (204) 945-4888, Police, Fire Department, Ambulance, company backup).

(ii) Attend to public safety:

i Stop traffic, roadblock/cordon off the immediate danger area;

ii Eliminate ignition sources; and

iii Initiate evacuation procedures if necessary.

(iii) Assess situation and gather information on the status of the situation, noting:

i Personnel on Site;

ii Cause and effect of spill;

iii Estimated extent of damage;

iv Amount and type of material involved; and

v Proximity to waterways, sewers, and manholes.

(iv) If safe to do so, try to stop the dispersion or flow of spill material:

i Approach from upwind;

ii Stop or reduce leak if safe to do so;

iii Dike spill material with dry, inert absorbent material or dry clay soil or sand;

iv Prevent spill material from entering waterways and utilities by diking;

v Prevent spill material from entering manholes and other openings by covering with rubber spill mats or diking; and

vi Resume any effective action to contain, clean up, or stop the flow of the spilled product.

(v) The emergency response coordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to Manitoba Environment 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.

(b) The on-site emergency response coordinator shall contact The Canadian Coast Guard, Selkirk (204) 785-6030, if the spill material reaches and is on or in the Assiniboine Rivers.

TABLE E9-1
SPILLS THAT MUST BE REPORTED TO THE
MANITOBA CONSERVATION AS ENVIRONMENTAL ACCIDENTS

Classification	Hazard	Reportable quantity/level
1	Explosives	All
2.1	Compressed Gas (Flammable)	100 L*
2.2	Compressed Gas	100 L*
2.3	Compressed Gas (Toxic)	All
2.4	Compressed Gas (Corrosive)	All
3	Flammable Liquids	100 L
4	Flammable Solids	1 Kg
5.1 PG** I & II	Oxidizer	1 kg or 1 L
PG** III	Oxidizer	50 kg or 50 L
5.2	Organic Peroxide	1 kg or 1 L
6.1 PG** I & II	Acute Toxic	1 kg or 1 L
PG** III	Acute Toxic	5 kg or 5 L
6.2	Infectious	All
7	Radioactive	Any discharge or radiation level exceeding 10 mSv/h at the package surface and 200 uSv/h at 1 m from the package surface
8	Corrosive	5 kg or 5 L
9.1	Miscellaneous (except PCB mixtures)	50 kg
9.2	PCB Mixtures	500 g
9.3	Aquatic Toxic	1 kg or 1 L
9.4	Wastes (chronic toxic)	5 kg or 5 L
* Container capacity (refers to container water capacity) ** PG = Packing Group(s)		

Source: Environmental Accident Reporting Regulation M.R. 439/87

E9.3.6 Noise and Vibration

(a) Noise-generating activities shall be limited to the hours indicated in the City of Winnipeg Noise Bylaw, and the Province of Manitoba Environment Act Licence, unless otherwise accepted in advance by the Contract Administrator.

(b) The Contractor shall be responsible for scheduling Work to avoid potential noise problems and/or employ noise reduction measures to reduce noise to acceptable limits. The Contractor shall also demonstrate to the Contract Administrator that Works to be performed during the night-time period, on Sundays, and Holidays as stated in the Licence shall not exceed the approved limit.

(c) The Contractor shall locate stationary noise generating equipment (i.e. generators) away from sensitive receptors and wildlife areas.

E9.3.7 Dust and Emissions

(a) Dust control practices implemented by the Contractor during construction shall include regular street cleaning and dampening of construction access roads and Work areas with water or approved chemicals at an adequate frequency to prevent the creation of dust.

(b) The Contractor shall minimize construction equipment idling times and turn off machinery, when feasible.

(c) Dust control practices implemented by the Contractor during construction will include regular street cleaning and dampening of construction access roads and Work areas with water or approved chemicals at an adequate frequency to prevent the creation of dust.

(d) Only water or chemicals approved by the Contract Administrator shall be used for dust control. The use of waste petroleum or petroleum by-products is not permitted.

(e) The Contractor shall ensure that trucks which are used to haul excavated material and backfill material to and from the Work Site utilize tarpaulin covers during transport to prevent material from falling onto the street and creating dust.

(f) Stockpiled soils shall be covered with tarpaulin covers to prevent the creation of dust.

E9.3.8 Landscaping

(a) Construction waste (excluding common construction gravel, sand etc.) shall be removed to a minimum depth of 600 mm below final grade in all areas that are to be backfilled with suitable material and revegetated in accordance with Standard City Practice.

(b) The Contractor shall adhere to the landscaping plan for maintenance of initial stage and development stages of the plant community.

E9.3.9 Construction Traffic

(a) Workforce parking shall be limited to the areas designated for such as detailed in the Contract Documents, or as otherwise may be directed by the Contract Administrator.

(b) The Contractor shall adhere to the Standard Provisions of the Standard Construction Specifications, and of the Manual of Temporary Traffic Control in Work Areas on City Streets of The City of Winnipeg, Works & Operations Division.

(c) The Contractor’s laydown area, construction Site and access road shall be fenced and gated to secure the Site and materials and to discourage pedestrian entrance to construction area and to control any potential hazard to the public, particularly children.

(d) For circumstances where the Contract Administrator has accepted Site access of special equipment or material, the Contractor shall provide adequate flagmen for traffic control in the vicinity of any public buildings.

E9.1 Measurement and Payment

E9.1.1 Work associated with this specification will not be measured for payment and will be included with the Works.

E10. NOISE ATTENUATION

E10.1 The City recognizes that long trenchless drives may require continuous operations, 24 hours per day, seven days per week during tunneling operations. The City will provide exemption to Neighbourhood Livability By-Law No. 1/2008 for critical and necessary tunneling operations required for this work. Work outside the times outlined in the By-Law will be restricted, including, but not limited to;

(a) Operation of equipment only critical to tunnel operations;

(b) Use of equipment meeting stringent noise output requirements;

(c) Use of sound attenuation barriers and devices;

(d) Use of equipment, trucks and other machinery that do not conform to the Livability By-law for removal of spoils from site, bringing materials to site, or other purposes not deemed essential for the tunneling operation, shall be prohibited.

(e) Monitor the ambient noise at the corner of the occupied building closest to noise generating equipment including but not limited to generators, cranes, and slurry separation equipment.

(f) Provide equipment with enclosures or construct portable sound barriers to minimize noise impact.

(g) Provide a generator and other equipment with a “residential” silencer and acoustic enclosure. Provide equipment that continuously meets the noise requirements.

(h) Provide equipment with mufflers, as needed, to mitigate the noise produced from construction.

(i) Contractor shall be required to rearrange equipment to minimize noise impact as necessary.

(j) Construct Slurry plant enclosure to mitigate noise and cold weather when and where needed.

E10.2 For the purposes of determining normal background noise, monitor nearest residential site for period of one week.

E10.3 For operations outside of restriction time frames set out in the By-Law (7:00 a.m. and after 9:00 p.m. on weekdays or before 9:00 a.m. and after 9:00 p.m. on Saturdays, Sundays and statutory holidays), the contractor shall maintain sound levels lower than following, measured at the nearest home;

(a) 55 dBA as measured on a one hour average;

(b) 65 dBA as measured on a 15 minute average;

(c) 5 dBA over the monitored average background levels.

E10.4 Measurement and Payment

E10.4.1 Work associated with this specification will not be measured for payment and will be included with the Works.

E11. PROTECTION OF EXISTING TREES

E11.1 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:

E11.1.1 All trees will have a 2.0m radius protective zone calculated from the circumference at the base of the trunk which will remain free of digging, trenching, grade changes, stock piling of materials, parking or vehicles or equipment, or other activities that could cause soil compaction throughout the duration of the Contract. Protective snow fencing complete with installation hardware demarking the protection zone is required.

E11.1.2 In addition to fencing, mature tree trunks shall be strapped with 25 x 150 x 2400 (1” x 6” x 8’) wood planks to protect against bark damage. Smaller trees shall be similarly protected using appropriately sized wood planks.

E11.1.3 Operation of equipment within the drip line of trees shall be kept to the minimum required to perform the work. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the drip lines of trees. The drip line of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches

E11.1.4 Construction operations shall be conducted so that they do not cause flooding or sediment deposition on areas where trees are located.

E11.1.5 Work on Site shall be carried out in such a manner so as to minimize damage to existing tree branches.

E11.1.6 Repair, replace and maintain tree protection material during construction of the Work.

E11.1.7 Remove snow fencing and strapping material without harming trees as soon as the construction and restoration work is complete.

E11.2 Obtain approval from the Contract Administrator to excavate within 2.0 meters of a tree.

E11.3 Excavations shall be carried out in such a manner so as to minimize damage to existing root systems. Roots over 50mm in diameter which must be cut to facilitate an excavation shall be neatly pruned prior to excavation and coated with an appropriate wound dressing to prevent infection. 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 neat, clean root end. Keep exposed roots in excavations and trenches moist or shaded.

E11.4 Take precautions to ensure tree limbs overhanging the Site are not damaged by construction equipment. Consult the Forestry Branch on pruning of overhanging or damaged limbs and branches and other unanticipated problems with trees during construction of the Works.

E11.5 All damage to existing trees caused by the Contractor’s activities shall be repaired as required by the Contract Administrator and the Forestry Branch. Damages must be repaired by an individual with a Manitoba Arborist license or by the Forestry Branch.

E11.6 American elm trees are 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.

E11.7 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 price. 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.

E11.8 Measurement and Payment

E11.8.1 Work associated with this specification will not be measured for payment and will be included with the Works.

E12. TREE REMOVAL

E12.1 Description

E12.1.1 This Specification shall cover the removal of living or dead trees designated for removal by the Contract Administrator.

E12.2 Construction Methods

E12.2.1 Before commencement of any work, the Contractor shall consult with the Contract Administrator as to which trees and/ or shrubs shall be removed. All other trees and shrubs shall be protected against damage from all construction activity in accordance with E10.4.1.

E12.2.2 Trees to be removed are to be felled so as to land within the limits of the works. The Contractor shall take all precautions to prevent damage to traffic, structures, pole lines, adjacent property and to trees and shrubs designated to be saved, and he shall be liable for any damages occurring in the performance of this work.

E12.2.3 The Contractor shall cut down all trees and shrubs designated for removal and grub out all stumps and roots.

E12.2.4 The Contractor shall load and haul all trees, stumps, roots, logs, brush, rubbish and all other surface litter from the site and dispose of these materials at dumps located by the Contractor and approved by the Contract Administrator.

E12.2.5 Wood and other plant material including lots, stumps, branches, stripped bark, and wood chips from specific disease-prone tree species shall be disposed of at Brady Road Landfill (wood disposal area).

E12.2.6 American Elm

(a) Full removal may be done at any time, wood to be disposed of at Brady Road Landfill.

(b) Wood may be used as firewood if debarked on site. Bark to be transported to Brady Road Landfill.

(c) Pruning shall not be done between the period commencing April 1 and ending July 31.

E12.2.7 Ash (Fraxinus) Species

(a) Full removal may be done at any time, wood to be disposed of at Brady Road Landfill.

(b) No plant material including firewood may be transported outside of the City of Winnipeg.

E12.2.8 Prunus Species

(a) Pruning or full removal may be done at any time.

(b) Plant material showing signs of black knot fungus to be disposed of at Brady Road Landfill.

E12.3 Measurement and Payment

E12.3.1 Measurement for payment shall be based on the Diameter at Breast Height (DBH) measured at 145 cm above ground level on trees with single trunks. On trees with double or multiple trunks the following rules shall apply:

(a) Where a single diameter measurement is possible above ground, the measurement will be made at a point just below the junction of the trunks where the total tree diameter is not influenced by the junction or the basal flare;

(b) Where a single diameter measurement above ground is not possible, then the total tree diameter will be based on the DBH (measured at 1.45 above ground level) of the largest trunk plus ½ the DBH of each subsequent trunks;

(c) Situations regarding the measurement of any tree not falling into one of the above categories must be referred to the Contract Administrator immediately for a decision prior to removal;

(d) Removal of trees smaller than 50 mm DBH will be paid for as part of clearing and grubbing.

E12.3.2 Removal of Trees will be paid for at the Contract Unit Price for “Tree Removal” listed here below, measured as specified herein, which price shall be payment in full for removing and disposing all tree materials and for completing all operations herein described and all other items incidental to the work included in this Specification.

(a) Tree Removal
  (i) 50 to 200 mm diameter
  (ii) 200 to 500 mm diameter
  (iii) Over 500 mm diameter

E13. WORK NEAR AIRPORT

E13.1 The Contractor is responsible for adhering to the Winnipeg International Airport Zoning Regulations (SOR/80-708) and all other requirements laid out by the Winnipeg Airports Authority, Transport Canada and Nav Canada, including equipment height restrictions, light disruption to aircraft and electromagnetic interference to aircraft.

E13.2 The Winnipeg Airports Authority has applied for the necessary permits for the Work through Transport Canada and Nav Canada. A copy of the final permit will be provided to the Contractor who shall retain a copy on site.

E13.3 At no time during construction should any construction work impede on the airspace Obstacle Limitation Surfaces. Details on the surfaces can be found in the following link.

(a) https://tc.canada.ca/sites/default/files/migrated/tp1247e.pdf

E13.4 Height restrictions at Shafts 1 and 2 at locations shown on the contract drawings is as follows.

(a) Shaft 1 (St. Matthews Avenue) 11 m

(b) Shaft 2 (Silver Avenue) 16 m

E13.5 In addition to the height restriction the contractor shall minimize lighting and electromagnetic waves which could potentially interfere with the airport's navigational aids, radars and telecommunication systems.

This includes:

(a) Shielding of floodlights below horizontal, for those lights that are directed within a 90 degree zone of Runway 13-31 for aircraft arriving or departing e.g. between compass readings of 5 degrees E of N and 85 degrees W of N and between compass readings of 175 degrees E of N and 85 degrees E of N (based on typical airport direction measurements and runway numbering with aircraft approaching from the south/heading north at 0 = 360 degrees and measured clockwise).

(b) Not operating vehicle with unshielded floodlights in the above directions.

(c) Not using radio communications or equipment that can interfere with the frequency bands used by aircraft communications.

(d) Not using equipment that can cause electromagnetic interference. This may include electrical operations such as arc welding.

E13.6 Certain works may require the use of equipment higher than the stipulated maximum and that may require airspace closures. The Contractor will be responsible for initiating a Crane Permit with Nav Canada for such works.

E13.7 Any communication with the WAA shall include the Contract Administrator or they should be made aware of any decision or information in regard to the contract work.

E13.8 The Winnipeg Airports Authority will conduct spot inspections of the construction works to verify compliance with airspace regulations to Transport Canada and Nav Canada requirements.

E14. WORK NEAR SCHOOLS

E14.1 A permanent easement for the tunnel route through St. James-Assiniboia School Division property is in the process of being finalized.

E14.2 No construction works or Contractor access is permitted on school property, except for underground tunneling and monitoring of surface settlement or building movement.

E14.3 Contractor shall inform the St. James Collegiate, George Waters Middle School, and City of Winnipeg St. James Branch Library prior to commencing work in the area and provide regular updates as the work proceeds. The Contract Administrator shall be included in all correspondence.

E15. HERITAGE RESOURCES PROTECTION PLAN

E15.1 This Heritage Resources Protection Plan (HRPP) shall cover the response to encountering heritage resources including archaeological objects, features of human activity, paleontological objects, or burials and potential human remains at work locations near the riverbank. The plan provides instructions for undertaking due diligence including what to do and whom to notify when heritage resources are encountered on site.

E15.2 Legislation

(a) Heritage Resources are protected under Manitoba's Heritage Resources Act (1986) C.C.S.M. c. H39.1 , available at:

https://web2.gov.mb.ca/laws/statutes/ccsm/_pdf.php?cap=h39.1

(b) Found Human Remains, including partial remains and teeth, are protected under Manitoba's Heritage Resources Act (1986) (The Act) and The Policy Concerning the Reporting, Exhumation and Reburial of Found Human Remains (1987) (The Burial's Policy). Heritage resources in Manitoba are managed by the Historic Resources Branch (HRB) under Manitoba's Department of Sport, Culture, and Heritage.

(c) The Heritage Resources Branch can be contacted at:

Heritage Resources Branch
Phone (204) 945-2118
Email HRB.archaeology@gov.mb.ca

E15.2.1 Under the Manitoba Heritage Resources Act 69(1), any person who contravenes or fails to observe a provision of this Act or a regulation, order, by-law, direction, or requirement made or imposed thereunder is guilty of an offence and subject to potential penalties on summary conviction. Where the person is an individual, to a fine of not more than $5,000 for each day that the offence continues and, where the person is a corporation, to a fine of not more than $50,000 for each day that the offence continues.

E15.3 Heritage Resources Impact Assessment and Project Archaeologist

E15.3.1 A Heritage Resources Impact Assessment (HRIA) was undertaken under Heritage Permit 135-24. The assessment area included Bourkevale Park between the Assiniboine River riverbank and south limit of the St. James Collegiate grounds and St. James Memorial Sports Park (St. James Rods football club grounds) and was limited to the pipe corridor. The HRIA is included in **Appendix F**.

E15.3.2 The HRIA did not result in the discovery of heritage resources within the park areas, both of which have been extensively disturbed including the placement of fill within the pipe corridor. However, many resources have been encountered within a 1 km buffer around the project corridor and photographs of some of these resources are included in **Appendix F**.

E15.3.3 The Legislation mandates that only a Professional Archeologist with a valid HRB heritage permit is allowed to document and collect artifacts and features.

E15.3.4 The City will retain the services of the professional archaeologist at no cost to the Contractor.

E15.3.5 Ms. Lisa Bobbie, M.A. of North Roots Research has been identified as the Project Archaeologist:

Lisa C. Bobbie, M.A.
Archaeological and Historical Consultant
North Roots Research
Phone (204) 997-3626
Email lbobbie@northrootsresearch.ca

E15.3.6 The Project Archeologist or their agent will be in attendance during excavations near the riverbank and flood protection dike and areas within 100 m of the riverbank (up to the location of the southmost limit of the lawn bowling green) and be on call if heritage resources are encountered elsewhere in the project.

E15.3.7 As a condition for holding a heritage permit, the Project Archaeologist must submit a detailed report to the HRB, outlining construction activities and their impacts on heritage resources, the procedures that were followed as laid out by this HRPP, and recommendations for site treatment and protection in relation to future works.

E15.4 Identification of Heritage Resources

E15.4.1 Many people find heritage objects accidentally. If these items are reported to the Historic Resources Branch, their significance can be assessed, and the resulting information can be shared with the public. Some heritage objects can be several thousand years old.

E15.4.2 All workers on site should be informed of the Heritage Resources Protection Plan in advance of work and the protocol to be undertaken should heritage resources be encountered.

E15.4.3 Examples of heritage resources as defined by The Heritage Resources Act include:

(a) "Heritage resource" includes
  (i) A heritage site,
  (ii) A heritage object, and
  (iii) Any work or assembly of works of nature or of human endeavour that is of value for its archaeological, palaeontological, pre-historic, historic, cultural, natural, scientific, or aesthetic features, and may be in the form of sites or objects or a combination thereof

(b) "Heritage object" includes
  (i) An archaeological object,
  (ii) A palaeontological object,
  (iii) A natural heritage object, and
  (iv) An object designated as a heritage object by the lieutenant governor in council under the act.

(c) "Archaeological object" means an object
  (i) That is the product of human art, workmanship, or use, including plant and animal remains that have been modified by or deposited due to human activities,
  (ii) That is of value for its historic or archaeological significance, and
  (iii) That is or has been discovered on or beneath land in Manitoba or submerged or partially submerged beneath the surface of any watercourse or permanent body of water in Manitoba.

(d) "Palaeontological object" means the remains or fossil or other object indicating the existence of extinct or prehistoric animals but does not include human remains.

(e) "Natural heritage object" means a work of nature consisting of or containing evidence of flora or fauna or geological processes.

(f) "Human remains" means remains of human bodies that in the opinion of the minister have heritage significance and that are situated or discovered outside a recognized cemetery or burial ground in respect of which there is some manner of identifying the persons buried therein.

E15.5 Protocol for Encountering Heritage Resources

E15.5.1 Stop work immediately if heritage resources or potential human remains are encountered.

E15.5.2 Do not touch the feature or object; all heritage resource items shall be left in the same position in which they were noted or discovered.

E15.5.3 Notify the Construction Manager about the discovery.

E15.5.4 Mark-off area with flagging tape to identify and restrict the area. Create a highly visible 25 m buffer around the feature or object.

E15.5.5 The Construction Manager will contact the Project Archaeologist at (204) 997-3626 and Historic Resources Branch at (204) 945-2118

E15.5.6 In the case of possible human remains, the Construction Manager will contact

(a) Historic Resources Branch at (204) 945-2118

(b) Winnipeg Police Service at (204) 986-6222

E15.5.7 Photographs of heritage resources that may be encountered are provided in **Appendix F**.

E15.6 Encountering Potential Human or Forensic Remains

E15.6.1 The Winnipeg Police Service will immediately attend the site and further secure the site.

E15.6.2 The Winnipeg Police Service may notify the Medical Examiner's Office of a potential case of founding human remains as per The Fatalities Inquiries Act.

E15.6.3 The Winnipeg Police Service and/or the Medical Examiner's Office may contact the Historic Resources Branch (HRB) or their own forensic anthropology consultant.

E15.6.4 The police and their consultant will determine if the remains are:

E15.6.5 Human or animal

(a) Forensic or archaeological in nature.

E15.6.6 If the remains are forensic in nature or cannot be immediately assessed, the police and medical examiner will have jurisdiction over the area.

E15.6.7 If remains are determined to be non-forensic (i.e., archaeological) in nature and their removal is required, HRB will be responsible for their exhumation and reburial as per Manitoba Burial Policy

E15.7 Encountering Objects other than Human Remains

E15.7.1 The Project Archaeologist and/or Historic Resources Branch (HRB) will visit the site and conduct a preliminary investigation of the find.

E15.7.2 The Project Archaeologist will notify HRB of the find.

E15.7.3 The HRB will determine if additional heritage mitigation work will be required.

E15.7.4 The Project Archaeologist will obtain the required heritage permits for the investigation as req.

E15.7.5 The Project Archaeologist will document the find with notes, photographs and recording of the GPS coordinates. Artifacts will be collected according to professional guidelines.

E15.7.6 The Project Archaeologist will work with HRB to determine if additional measures are required for the find.

E15.7.7 The Project Archaeologist will conduct or oversee others who will conduct activities relating to any additional measures as required. These activities may include salvage archaeology, mitigation strategies, and/or on-going monitoring and supervision of the removal of soils associated with the site until the Project Archaeologist is satisfied that the heritage resource is no longer endangered by the construction activity.

E15.7.8 Once HRB is satisfied with the outcome of the investigation, construction activities can resume in the find area unless alternate measures have been established.

E16. ALLOWANCE FOR MATERIAL SAMPLING AND TESTING

E16.1 Description

E16.1.1 Further to CW 2110, CW 2160, CW 3110, and CW 3410 this specification shall cover additional inspection and testing requirements for all materials used in the Work associated with this Tender.

E16.1.2 The Contractor shall be responsible to schedule, coordinate and provide material testing, including test reports, for all construction materials as outlined in CW 2110, CW 2160, CW 3110, CW 3410, other relevant City specifications, and the additional specifications within this Bid Opportunity. The Contractor shall engage an independent material inspection and testing agency for the purpose of conducting these material tests and obtaining associated documentation when directed by the Contract Administrator.

E16.2 Construction Methods

E16.2.1 The Contractor shall be responsible for scheduling field tests with an independent material inspection and testing Agency. All material tests conducted on Site shall be attended by the Contract Administrator. It is the Contractor's responsibility to coordinate each of the scheduled tests with the Contract Administrator.

E16.2.2 The contact information from the Contract Administrator and City staff shall be provided to the testing agencies and all test results from all laboratory and field tests shall be provided to the Contract Administrator for review and/or approval.

E16.2.3 Copies of invoices from the testing agencies shall be provided monthly to the Contract Administrator.

E16.3 Measurement and Payment

E16.3.1 The cost for material sampling and testing shall be paid for under the allowance for "Material Sampling and Testing." Costs will be based on actual invoiced costs for inspections, equipment, and monitoring with allowable mark-ups in accordance with the General Conditions.

E17. CHANGE IN CONTRACT CONDITIONS

E17.1 Description

E17.1.1 This specification covers changes identified to the scope of Work including changes in geotechnical and geological conditions that may impact the Trenchless Work, in addition to D35.

E17.1.2 The basis for the geotechnical and geologic conditions are described in the GBR and GDR as defined in section D29.

E17.1.3 The method for reviewing, recording, and accepting change to geotechnical and geologic conditions or obstructions is described in section D35.

E17.2 Measurement and Payment

E17.2.1 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 Contract Allowance "Change in Contract Conditions"

E17.2.2 Daily costs for all equipment, including but not limited to the microtunnelling, other equipment, construction vehicles, trucks, temporary site/storage facilities, rental equipment, and all other ancillary equipment required to undertake the Work and Work belonging to the Contractor or their sub-contractors shall be paid for at the daily rate under the Contract Unit Price for each of the following items:

(a) Daily Equipment Rate - Microtunnelling

(b) Daily Equipment Rate – Shaft Construction

E17.2.3 The Contractor shall submit a breakdown of the equipment costs included within the Daily Equipment Rate to be used in assessing delay claims from Change in Work. A breakdown of these costs must be submitted prior to Commencement of Work and add up to the total Daily Equipment Rate entered on Form B used to evaluate the Bids. Rates for equipment or resources not provided will be compensated at MHCA rental rates.

E17.2.4 Standby equipment that cannot reasonably be deployed elsewhere during the duration of the works shall be compensated at 50% of its established rate.

E18. ADDITIONAL WORK ALLOWANCE

E18.1 Additional Work may be necessitated due to unforeseen circumstances that may arise during the course of the project due to additions to the scope of Work by the Contract Administrator, beyond that defined herein.

E18.2 A cash allowance has been included on Form B: Prices.

E18.3 The City reserves the right to delete any or all of the Cash Allowance from the Contract if the Work intended to be covered by the Cash Allowance is not required, or if the Works intended are found to be more extensive than the provisional Cash Allowance.

E18.4 Cost of additional work shall be evaluated by the methods outlined in C7.4, and a Change Order prepared by the Contract Administrator. Cost of the Change Order will be paid on the Progress Estimate and deducted from the Cash Allowance. If the valuation of the authorized work exceeds the Value of the Cash Allowance, the Contract Value will be adjusted by the shortfall.

E18.5 Additional services and/or Work will not be initiated for:

(a) Reasons of lack of performance or errors in execution.

(b) Scheduling changes initiated by the City, where at least 24 hours notice is given prior to the Contractors schedule time to be on Site.

E18.6 Should it be determined that additional material or services are required, the Contract Administrator shall approve the Work, prior to commencement of the additional Work.

E18.7 Material Mark-Up Factors in accordance with C7:

(a) The base cost is to be the wholesale cost of the material, regardless of the Contractor or Subcontractor supplying the material.

(b) In general, the party (Contractor or Subcontractor) supplying the material is the party that purchases the material from a supplier who does not perform any work on Site, unless otherwise determined by the Contract Administrator.

(c) Where the Contractor is supplying the material, the mark-up on the material is limited to fifteen percent (15%).

(d) Where the Contractor's immediate Subcontractor is supplying the material the total mark-up on the material including all Subcontractors and the Contractor is limited to twenty-five percent (25%)

(i) The Subcontractor's mark-up on the material is limited to fifteen percent (15%);

(ii) The Contractor's mark-up on the material is limited to ten percent (10%).

(e) A Third-Level Subcontractor is a Subcontractor of a Subcontractor of the Contractor.

(i) No Third-Level Subcontractors on this project are approved for additional mark-up.

(ii) In the event that a Third-Level Subcontractor is utilized, that is not approved for additional mark-up, the Contractor is responsible for coordinating the split of the maximum approved mark-up between the Contractor and Subcontractors.

E19. BUILDING INSPECTIONS

E19.1 Description

E19.1.1 The work specified in this Section includes identifying buildings to be inspected based on the Contractor's proposed shaft locations, work area setup and proposed equipment, participating in joint pre and post construction building inspections with the Contract Administrator, and documenting the inspections.

E19.1.2 This work will be used as a basis for selecting key structures to be monitored for construction-related vibration during the works, as specified in E20.

E19.2 Submittals

E19.2.1 Prepare a Building Inspection Plan in accordance with E5. The plan shall identify buildings to be inspected within the vibration zone of influence (vZOI) of proposed shafts and work or laydown areas. The evaluation vZOI shall be in accordance with the US FHWA, US FTA, or Caltrans method. The evaluation shall be included as an appendix to the inspection plan. The vZOI is established as the distance around the work area where the highest vibration emitting activity will result with a ground borne vibration of 5 mm/s pk. Any building or part of building, not owned by the project, that is overlapped by the vZOI, is to be inspected.

E19.2.2 The plan shall identify buildings to be inspected within the zone of influence of proposed shafts and work or laydown areas.

E19.2.3 Prepare two reports documenting the pre-construction and post-construction inspections of buildings.

E19.2.4 The reports shall include the results of the surveys, photographs, video as needed, field notes, and sketches. Surveys should provide a record of existing cracks, damages and defects on the building structure including the foundation and interior finishes of all storeys below grade and exterior cladding, interior walls, floors, door, and window frames of the first two storeys above grade. The survey should document settlement issues and any other relevant structural features. Reports may be supplemented to report of inspections that occur during construction.

E19.2.5 Each individual building inspected should be documented in individual appendices to facilitate the provision of inspection records for each specific building to the building owners.

E19.2.6 The report appendices and collected data shall be made available and be provided to the homeowners or business owners adjacent to the work upon request.

E19.3 Construction

E19.3.1 The Contractor or their designate shall complete a pre-construction photographic survey of the existing structures adjacent to the work.

E19.3.2 The pre-construction survey should provide a record of existing cracks or other pre-existing damages and defects on foundation and interior finishes of all storeys below grade, and exterior cladding, interior walls, floors, door, and window frames of the first two storeys above grade, as well as settlement issues and any other relevant structural features.

E19.3.3 Pre-construction surveys shall be conducted in the presence of the Contract Administrator prior to commencement of construction activities.

E19.3.4 Where the Contractor is entering properties to undertake the photographic survey, bilingual notices shall be provided to the businesses or homeowners to arrange for interior inspections at a mutually agreed to date and time. A template for notices will be provided by the City. Notices shall be reviewed and accepted by the Contract Administrator and the City prior to issuance.

E19.3.5 Any individuals entering a private residence or meeting with citizens as part of this work shall have submitted security clearances to the Contract Administrator in accordance with Part F.

E19.3.6 Where homeowners of businesses will not permit access to structures for inspection, the Contractor shall duly document attempts to arrange access. Inspections shall be made from public right-of-way, noting any visual defects observed.

E19.3.7 Following construction activities, the Contractor shall arrange for a post construction inspection of any business or residences where pre-construction inspections were undertaken. The post construction inspection shall be conducted in the presence of the Contract Administrator.

E19.4 Measurement and Payment

E19.4.1 Building Inspections and reporting shall be paid for under the Contract Allowance for "Building Inspections". Costs will be based on actual invoiced costs for inspections, equipment, and report preparation with allowable mark-ups in accordance with the General Conditions.

E20. VIBRATION MONITORING

E20.1 Description

E20.1.1 The work specified in this Section includes furnishing of vibration monitoring instrumentation to monitor vibrations on nearby structures caused by construction activities. Target structures for monitoring are those nearest shafts and materials laydown and handling areas. Structures or representative locations to be monitored shall be consistent and be supported by the vZOI evaluation described in the section E19.

E20.1.2 Depending on the means and methods chosen by the Contractor, implementation of vibration monitoring may or may not be necessary. Implementation of vibration monitoring will be at the discretion of the Contract Administrator, to be determined following submission and review of the Contractor's planned means and methods of executing the Work.

E20.1.3 The work executed under in this specification, if undertaken, shall include but not be limited to performing pre-construction surveys as identified in section E19, supply and installation of vibration monitoring equipment, summarization of vibration data in weekly site construction reports, submission of vibration data and reports to the Contract Administrator, performing post-construction surveys, and removal of monitoring equipment.

E20.1.4 While a current by-law on acceptable construction vibrations does not exist for the City of Winnipeg, the monitoring data should be compared to the CalTrans "Transportation and Construction Vibration Guidance Manual" (April 2020) which presents the vibration damage potential thresholds as presented in the following table:

Structure or Condition	Maximum Peak Particle Velocity (mm/sec)	
	Transient Sources	Continuous / Frequent / Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	3	2
Fragile buildings	5	3

Historic and some old buildings	13	6
Older residential structures	13	8
New residential structures	25	13
Modern industrial/commercial buildings	51	13

E20.2 Submittals

E20.2.1 Upon request by the Contract Administrator, submit a Vibration Monitoring Plan in accordance with E5. The Vibration Monitoring Plan shall include, at a minimum:

(a) A sketch showing the proposed locations for monitoring devices including building addresses.

(b) Make and model of vibration monitors to be installed.

(c) Testing company contracted to perform the installation and monitoring.

(d) Methods for collecting, storing, and submitting vibration data.

(e) Schedule for execution of the Work.

(f) Procedures to address exceedances of the vibration damage thresholds presented in the above table.

(g) A complaint documentation and investigation protocol.

E20.2.2 Submit specification sheets and calibration certificates for proposed vibration monitoring equipment in accordance with E5 and meeting the requirements as specified herein. Calibration certificates must be within 1 month of deployment and are valid for 1 year.

E20.2.3 Reports and Records:

(a) The Contractor shall submit all reports of monitoring data to the Contract Administrator on a weekly basis.

(b) Each weekly report shall include drawings showing the installed locations for that week, the instrument identification number, the instrument type, the installation date and time, all vibration monitoring data for each location, monitoring periods exceeding the vibration alarm levels, monitoring periods exceeding the vibration damage thresholds presented in the above table, vibration sources contributing to any measured exceedances, procedure followed to address any exceedances, and summary of any complaints received.

E20.3 Quality Control

E20.3.1 Vibration monitoring shall be installed and performed by a suitable testing company with previous experience in performing related work.

E20.3.2 The testing company shall immediately attend to equipment errors and failures, allowing for no more than a total of 48-hours of lost data per week.

E20.4 Instrumentation

E20.4.1 Monitoring instruments shall be installed on structures at locations nearest to the proposed shaft locations or near major laydown areas. Refer to vZOI evaluation included with the Building Inspection Plan in E19 to justify locations requiring vibration monitoring. If access cannot be obtained to the structure, the monitoring instrument shall be placed at an equally representative or more conservative location.

E20.4.2 Vibration monitors shall be capable of measuring 0 – 400 mm/sec peak particle velocity continuously. Datalogging of root mean square (RMS) peak particle velocity (PPV) over 1 minute intervals, to be downloaded periodically as required by data storage and reporting requirements.

E20.4.3 Vibration alarm levels shall set to 75% of the continuous or transient levels (depending on source) identified in the above table.

E20.4.4 Vibration monitoring shall be installed prior to commencement of construction activities identified as requiring vibration monitoring. Obtain baseline measurements for five (5) consecutive days prior to commencement of construction activities identified as requiring vibration monitoring (refer to vZOI evaluation included with the Building Inspection Plan for locations identified as requiring vibration monitoring).

E20.4.5 Remove or abandon monitoring instrumentation upon completion of work identified as requiring vibration monitoring.

E20.5 Measurement and Payment

E20.5.1 Vibration Monitoring shall be paid for under the Contract Allowance for "Vibration Monitoring". Costs will be based on actual invoiced costs for inspections, equipment, and monitoring with allowable mark-ups in accordance with the General Conditions.

E21. PROVISIONAL ITEMS

E21.1 The Provisional Items listed on Form B: Prices are part of the Contract.

E21.2 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.

E21.3 Notwithstanding C: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.

TRAFFIC MANAGEMENT

E22. TRAFFIC CONTROL AND MAINTENANCE OF ACCESS

E22.1 The following specification amends CW 1130 clauses 3.6, 3.7 and 3.8.

E22.2 Traffic control shall be done in accordance with the Manual of Temporary Traffic Control on City Streets (MTTC). The manual is available on the City of Winnipeg, Public Works Department website at:
https://legacy.winnipeg.ca/publicworks/transportation/pdf/2022_Rev1_ManualOfTemporaryTrafficControl.pdf

E22.3 The Contractor ("Construction Agency" in the manual) shall be responsible for placing, maintaining, and removing the appropriate temporary traffic control devices as specified by the MTTC or by the Traffic Management Branch of the City of Winnipeg Public Works Department. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by their own forces or Subcontractor.

E22.4 Notwithstanding E22.1, in accordance with the MTTC, the Contract Administrator shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place, maintain, and remove all regulatory signs and traffic control devices authorized and/or required by the Traffic Management Branch in the following situations:

(a) Parking restrictions,

(b) Stopping restrictions,

(c) Turn restrictions,

(d) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.

(e) Traffic routed across a median,

(f) Full or directional closure of a non-regional street where there is a requirement for regulatory signs (turn restrictions, bus stop relocations, etc.) to implement the closure.

(g) Approved Designated Construction Zones with a temporary posted speed limit reduction. Traffic Services will be responsible for placing all of the advance signs and 'Construction Ends' (TC-4) signs. The Contractor is still responsible for all other temporary traffic control including but not limited to barricades, barrels and tall cones.

E22.5 Further to E22.4, where the Contract Administrator has determined that the services of the Traffic Services Branch are required, the City shall bear the 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.

E22.6 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the Site has been maintained.

E22.7 Further to E22.4(c)and E22.4(d) the Contractor shall make arrangements with the Traffic Services Branch of the City of Winnipeg to reinstall the permanent regulatory signs after the Contract Work is complete. At this time the Contractor shall make arrangements to drop off the stockpiled materials to Traffic Services at 495 Archibald Street.

E22.8 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 Contract Administrator, prior to disruption of access.

E22.9 Any changes to the approved traffic management plan must be submitted to the Contract Administrator a minimum of (five) 5 Working Days prior to the required change for approval.

E22.10 Ambulance/emergency vehicle access must be maintained at all times.

E22.11 Further to Clause 3.7 of CW 1130, the Contractor shall schedule construction activities to meet the following:

E22.11.1 Rutland Street

(a) Priority P3

(b) The Contractor shall sign the street “Road Closed – No Exit” in accordance with the Manual of Temporary Traffic Control.

(c) Driveways shall remain accessible but may be subject to periodic or short duration daytime closures. Residents to be notified prior to short term closures.

E22.11.2 Ferry Road (South of Portage Avenue)

(a) Priority P2 (treated as a collector bus/ school bus).

(b) The Contractor shall sign the street “Road Closed – No Exit” in accordance with the Manual of Temporary Traffic Control. Private and school approach access shall be maintained at all times.

(c) The Contractor shall provide flag persons to aid school buses dropping off and picking up students at normal school start and end times while working in the vicinity of the school.

E22.11.3 Portage Avenue

(a) Priority P1 (Regional Street).

(b) Maintain three (3) westbound lanes of traffic on Portage Avenue within project limits during traffic peak hours (7:00-9:00 AM and 3:30-5:30 PM) at all times, Monday through Friday throughout duration of the project. During non-peak hours, two (2) westbound lanes of traffic are to be maintained with catch basin connection work done from the low lane and sidewalk.

E22.11.4 Other Accesses and Roadways

a) Accesses to the Bourkevale Community Club and Ferry Road pumping stations shall remain open at all times.

b) The Contractor shall provide flag persons to aid vehicles entering Bourkevale Community Club or Bourkevale Park on an as-required basis during equipment movement or materials delivery.

E22.11.5 Active Transportation Pathways

(a) Assiniboine Avenue Pathway through Bourkevale Park and the Yellow Ribbon Greenway near St. Matthews Avenue / Ferry Road and Silver Avenue are part of the City of Winnipeg active transportation pathways.

(b) The Contractor shall reroute portions of these pathways around work areas as shown on the drawings and provide traffic control and detour signage in accordance with the MTTC and drawings, including barricades required for the safety of persons using the active transportation pathways. The Contract Administrator shall review and direct the Contractor for any changes or additions for signage and barricades.

E22.11.6 Measurement and Payment

(a) Traffic control and maintenance of access shall be incidental to Site Development, Mobilization, and Demobilization pay item.

E23. TRAVEL ROUTES, RESTRICTIONS AND CONTRACTOR PARKING

E23.1 Further to CW 1130 clause 3.5, equipment and truck travel routes are limited to the following streets:

(a) Portage Avenue
(b) Ferry Road
(c) Ness Avenue
(d) Silver Avenue
(e) Rutland Street
(f) Winchester Street (Silver to Ness section only)

E23.2 Equipment and trucks may not travel on:

(a) Back lanes
(b) Assiniboine Avenue
(c) Other Local Residential Street not mentioned above

E23.3 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.

E23.4 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.

E24. PEDESTRIAN SAFETY

E24.1 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.

E25. REFUSE AND RECYCLING COLLECTION

E25.1 While access to refuse and/or recycling collection vehicles is restricted, on collection day(s) the Contractor shall move all of the affected property owners refuse and/or recycling materials to a nearby common area, prior to an established time, in accordance with to permit the normal collection vehicles to collect the materials. Immediately following collection, the Contractor shall return receptacles to the addresses marked on the receptacles.

E25.2 The Refuse and Recycling Collection Schedule is as follows:

(a) Rutland Street:

(i) Collection Day: Friday B

(ii) Collection Time: 07:00 – 18:00

(iii) Collection Location: Back lane.

E26. SNOW CLEARING AND SPRING CLEANUP

E26.1 The Contractor will be required to perform snow clearing and sanding operations on City streets, sidewalks and public approaches 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.

E26.2 The works are within City Residential Snow Zone S. The Priority for impacted streets is as follows:

(a) Rutland Street - Priority P3

(b) Ferry Road (South of Portage Ave) – Priority P2

(c) Portage Avenue – Priority P1 (Regional)

(d) Bruce Avenue – Priority P2

(e) Ness Avenue – Priority P1 (Regional)

(f) Silver Avenue – Priority P2

E26.3 Snow built-up on sidewalks and roadways shall be maintained to the condition of the surrounding sidewalks and roadways.

E26.4 The rerouted Active Transportation pathways shall be maintained to the same or better standard as the adjoining pathways.

E26.5 The Contractor will be required to perform spring cleanup of wintertime road sand on local (non-regional) streets, lanes, sidewalks and pathway where access to City street sweeping crews is blocked due to construction activities.

E26.6 Measurement and Payment

E26.6.1 Work associated with this specification will not be measured for payment and will be included with the Works.

UTILITIES

E27. COORDINATION WITH UTILITIES FOR RELOCATION

E27.1 The Contractor shall be responsible for communicating with the various shallow utilities including Manitoba Hydro (Electrical Power and Natural Gas divisions), Bell MTS, TeraSpan and other telecommunication utilities for the purpose of arranging utility relocations to suite the Contractor’s proposed shaft locations.

E27.2 The Contractor shall direct the various utilities to invoice The City of Winnipeg directly for the relocation costs for impacted utilities.

E28. EXPLORATION OF EXISTING UTILITIES AND SERVICES

E28.1 Prior to construction, the Contractor shall verify the elevations of 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 in accordance with CW 1120 Clause 3.3.

E28.2 Exploration of buried infrastructure should be undertaken a minimum of 5 business days prior to any construction to determine if an alternate vertical or horizontal alignment of the proposed sewer may be beneficial to minimize conflicts with the existing utilities or services.

E28.3 The Contractor shall arrange for all required utility locations, safety watches and other required notifications.

E28.4 The Contractor shall provide the Contract Administrator with a minimum of 24 hours advanced notice prior to conducting utility exposures.

E28.5 Measurement and Payment

(a) Work associated with this specification will not be measured for payment and will be included with the Works.

E29. WATER SUPPLY

E29.1 Description

E29.1.1 Water supply for the Works may be obtained from City of Winnipeg hydrants, further to Section 3.14 of CW 2140 and Section 3.7 of CW 1120 of the General Requirements.

E29.2 Methods

E29.2.1 The Contractor shall make the following arrangements for hydrant or valve operations:

(a) Contact City of Winnipeg Water Services Division between the hours of 8 am and 3 pm Monday to Friday. Notification for turn on and turn off shall be provided a minimum of 24 hours in advance.

(b) Contact Emergency Services Branch with a minimum of 2 hours notice for operations required outside of the above hours.

(c) The Contractor shall wait at the subject hydrant or valve at the scheduled time until City staff arrive to operate the hydrant.

E29.2.2 Hydrants are considered to be “in the Contractor’s control” from the time the City has turned the hydrant on until the City has turned the hydrant off.

E29.2.3 During cold weather when whenever freezing temperatures are occurring or anticipated, the Contractor shall take all necessary precautions to prevent freezing of hydrants and related appurtenances for hydrants in their control and shall be responsible to pump out hydrants turned off by Emergency Services.

E29.2.4 If a hydrant or appurtenance is damaged due to freezing or improper turn on or turn off procedures while in the Contractor’s control, Water Services will assess the damage and determine if Water Services will repair the damage or if the Contractor will be responsible to repair the damage. Costs for repairs completed by Water Services will be deducted from payments owing the Contractor. Repairs completed by the Contractor will be at the Contractor’s expense.

E29.2.5 The Contractor shall provide a traffic ramp for hydrant connection hoses that cross roadways. The ramp shall be designed and constructed to not present a hazard to vehicles travelling over it and to ensure that no part of the hose is run over by a motor vehicle.

E29.3 Measurement and Payment

(a) The Contractor is responsible for obtaining City permits and paying for any charges associated with temporary water meters and water use.

(b) All other costs associated with sourcing construction water will be considered incidental to the Work and will not be measured for payment. No additional payment will be made.

E30. SEWER FLOW CONTROL

E30.1 Description

E30.1.1 This Specification shall cover flow control measures required to perform works impact existing sewers.

E30.2 Submittals

E30.2.1 Submit a written flow control plan for review by the Contract Administrator in accordance with E5, a minimum of ten (10) Business Days prior to undertaking connections to the existing sewer. Flow control plans shall be prepared and stamped by a Professional Engineer, registered in the Province of Manitoba and experienced in the design and implementation of temporary flow bypass works. Flow control plan shall include the following:

(a) A description and sketch detailing the arrangement of the proposed flow control measures.

(b) A list of the key components required for the flow control measures, including but not limited to cofferdams, inflatable plugs, bypass piping or hoses, pumps.

(c) A detailed procedure for installation and removal of the flow control measures.

(d) Monitoring plan and 24 hr contact person.

(e) Methods for dealing with excessive flows or wet weather events.

E30.3 Methods

E30.3.1 Provide necessary flow control measures for impacted combined sewers as required to undertake combined sewer relocation or modification works and other site works.

E30.3.2 Diversion of wastewater flow directly or indirectly to the environment, land drainage sewers, or storm relief sewers is not permitted.

E30.3.3 Construct sewer flow bypass systems during dry weather conditions.

E30.3.4 Maintain existing sewer flows from the upstream system during construction. Any flow control measures implemented must be capable of passing wet weather or high flow conditions through the site should they be encountered. Where complete blockage of the sewer is proposed (e.g. inflatable flow through plugs) the plugs must be readily deflated or removed from the pipe in an emergency.

E30.3.5 Provide security personnel for locations where bypass pumping requires normally secure or locked doors and access areas to be left open or unlocked.

E30.3.6 Ensure all flow control components and materials are removed from the sewer system upon completion of the work.

E30.3.7 The Contractor is responsible for bypassing or the temporary storage of all dry and wet weather flows.

E30.3.8 Flows have been provided for the purpose of developing flow management plans where it is anticipated that the Contractor will have modify the existing Combined Sewer (CS) system for the Work. Should the Contractor intend further modification of the existing system to complete the Work, the Contractor shall notify the Contract Administrator and provide a plan of the proposed modification, where the Contract Administrator will review and provide flows for development a plan flow management plan.

E30.3.9 The flow management plan to accommodate the dry weather flows shall ensure that the flows in the upstream sewer do not exceed the obvert of the pipe or the specified low basement elevation.

E30.3.10 Estimated service population, flow peaking factor and average and peak daily dry weather flow (Litres per second) for the design of bypass measures are shown in the following table. Bypass pumping flow rates should exceed peak dry weather flow by a nominal safety factor (e.g. +20%), but not so high as to exceed downstream system receiving capacity.

Location	Estimated Population	Peaking Factor	Avg Daily Flow	Peak Daily Flow
Ness Ave upstream of Rutland	2061	3.58	6.44	23.0
Bourkevale Park east of Douglas Park Rd	693	3.90	2.17	8.4
Rutland Street from Portage to Silver				
Sta 1+037 to 1+149 (lane to mid-block)	71	4.28	0.22	0.9
Sta 1+149 to 1+265 (mid-block to Bruce)	144	4.20	0.45	1.9
Sta 1+265 to 1+378 (Bruce to mid block)	205	4.14	0.64	2.7
Sta 1+378 to 1+493	281	4.09	0.88	3.6
Sta 1+493 to 1+623 (mid-block to Ness)	345	4.05	1.08	4.4
Sta 1+699 to 1+623 (Ness to mid-block)	228	4.13	0.71	2.9
Sta 1+806 to 1+699	189	4.16	0.59	2.5
St. James Rods building (max capacity)	15	4.40	0.05	0.2

E30.3.11 Wet weather must be considered in planning and undertaking flow bypass works. Review the Environment Canada weather forecasts and discuss with the Contract Administrator before activating bypass works. Delay work when the anticipated weather conditions are anticipated to cause flows that could exceed the capacity of bypass flow measures.

E30.3.12 Approximate maximum surcharged hydraulic grade line (HGL) elevations near low basements are shown in the table below. These were developed from Lidar ground elevations at each home, minus 2.1 m from ground to basement floor and minus another 0.4 m freeboard height below basement floor (e.g. ground minus 2.5 m). The Contractor should field verify the critical low basements upstream of each bypass pumping location.

Location	Critical Low Basement (m)	Max HGL Elevation (0.4m below basement floor)
Ness Ave upstream of Rutland	322 Albany Street	229.6
Bourkevale Park east of Douglas Park Rd	28 Deer Lodge Place	228.1
Rutland Street from Portage to Silver		
Sta 1+037 to 1+149 (lane to mid-block)	206 Rutland Street	231.3
Sta 1+149 to 1+265 (mid-block to Bruce)	257 Rutland Street	231.5
Sta 1+265 to 1+378 (Bruce to mid block)	265 Rutland Street	231.5
Sta 1+378 to 1+493	283 Rutland Street	231.8
Sta 1+493 to 1+623 (mid-block to Ness)	320 Rutland Street	232.2
Sta 1+699 to 1+623 (Ness to mid-block)	356 Rutland Street	232.4
Sta 1+806 to 1+699	380 Rutland Street	232.4
North of Sta 1+806	398 Rutland Street	232.5

E30.4 Measurement and Payment

E30.4.1 Flow control requiring bypass pumping will be measured and paid for at two locations:

(a) Ness Avenue combined sewer interference crossing

(b) Assiniboine Pathway combined sewer inverted siphon crossing

E30.4.2 Bypass Pumping and monitoring at the two locations will be measured on a time basis based on the number of months that the equipment is installed, operated, and monitored

during the flow bypass operation as required to complete the work. If equipment is in place for less than one month, the minimum payment shall be 1.0 months. For equipment in place and operating longer than a month, the payment will be measured in units of 0.25 months (e.g. weekly). Payment shall be at the Contract Unit Price for either "Bypass Pumping – Ness Ave Interference Crossing" or 'Bypass Pumping – Assiniboine Pathway crossing" and include all work relating to the item including pumps, hoses, temporary sewer connections and plugs, controls, instrumentation, and associated works.

E30.4.3 The remainder of flow control measures necessary to complete the work will be considered incidental to the works and will not be measured for payment. No additional payment will be made.

E31. PROTOCOL FOR WORKS IN CLOSE PROXIMITY TO FEEDER MAINS

E31.1 This Section details protocols for all work to be carried out in close proximity to the City feeder mains. Close proximity shall be deemed to be any construction activity within a 5 m horizontal offset from the centerline of the feeder main.

E31.1.1 The following shall be considered critical pipelines and water infrastructure for this project:

(a) Silver Avenue – West End Feeder Main (900mm PCCP)

(b) Silver Avenue – 400mm AC sub-feeder main

(c) St. Matthews Avenue and Ferry Road west lane – West End Feeder Main (900mm PCCP)

E31.2 General Considerations for Work in Close Proximity to Feeder Mains

E31.2.1 Feeder mains are a critical component of the City of Winnipeg Regional Water Supply System and work in close proximity to feeder mains shall be undertaken with an abundance of caution. Feeder mains cannot typically be taken out of service for extended periods to facilitate construction and inadvertent damage caused to the pipe would likely have catastrophic consequences.

E31.2.2 Work around feeder mains shall be planned and implemented to minimize the time period that work is carried out in close proximity to the pipe and to ensure that the pipeline is not subjected to excessive construction related loads, including excessive vibrations and/or concentrated or asymmetrical lateral loads during backfill placement.

E31.2.3 Large diameter pressure pipe shall not be made to withstand increased earth and live loading. Therefore, every precaution must be undertaken to ensure that applied loading during all phases of construction is within accepted loading parameters.

E31.2.4 Construction in close proximity to critical infrastructure shall not commence until both the equipment and construction method statements have been submitted, reviewed, and accepted by the Contract Administrator.

E31.3 Identify the location and elevation of the feeder main by soft excavation (hydro vac) prior to construction.

E31.4 Works carried out near the pipes should not subject the pipes to:

(a) Excessive loads from vehicles or material stockpiles.

(b) Excessive vibrations.

(c) Concentrated or asymmetrical loading.

(d) Drop-loading or impact.

E31.5 Do not impart excessive vibration loads on the pipes or that would cause settlement of the soil around or below the pipe.

(a) No large vibratory equipment shall be used overtop or within 5.0m measured horizontally on either side of the pipes.

(b) Compact pavement subgrade, subbase and base materials by static methods without vibration or with smaller approved equipment such as hand-held plate packers or smaller roller equipment.

E31.6 Materials must not be stockpiled overtop or within 5.0m of the feeder main centerline.

E31.7 Do not park vehicles overtop of the feeder main.

E31.8 Mark and install a continuous visual barrier (i.e. snow fence) or intermittent visual indicator (stakes with flagging, poly posts) on 4.0m offset both sides of the feeder main centerline within work area.

E31.9 Concrete demolition and removal within 5.0m horizontally of the feeder main shall be completed by saw cutting and removal, or use of hand held jack hammers. Use of machine mounted concrete breakers within 5.0m of a feeder main shall not be permitted.

E31.10 Measurement and Payment

E31.10.1 Protocol For Works in Close Proximity to Feeder Mains will be incidental to the Contract.

E32. SUPPORT OF WEST END FEEDER MAIN AT TUNNEL CROSSING

E32.1 Description

E32.1.1 This specification shall cover the stabilization of the 900 mm circa 1985 Prestressed Concrete Cylinder Pipe (PCCP) West End Feeder Main at the north boulevard of Silver Avenue. Stabilization of the pipe is necessary to mitigate the impact of settlement on the mortared pipe joints due to tunnel construction.

E32.2 Methods

E32.2.1 Demolition of the St. James Rod's driveway approach and removal to be in accordance with E31.9.

E32.2.2 Contact the Water Services Division to request that the feeder main be placed on reduced pressure.

E32.2.3 Excavate to expose the existing 900 mm PCCP feeder main for the installation of stabilization beams shall be undertaken using the requirements shown in section E32 and using the method described below to prevent damage to the feeder main or the parallel 400 mm AC feeder main.

E32.2.4 Excavation to 1.0m above the feeder main crown elevation by normal methods with a backhoe/excavator will be permitted. Excavation shall be done equally along the width of the trench to mitigate non-uniform loading on the pipe.

E32.2.5 Excavation equipment should straddle the pipe with tracks placed on either side of the pipe. If the pipe is shallow or if the excavation must be staged such that there is less than 2.0 m of cover between bottom of excavator tracks and top of pipe, excavation equipment should be positioned to the side of the pipe with tracks not closer than 2.0 m from the projected edge of pipe.

E32.2.6 Excavation of the pipe zone down to the proposed elevation of the support beams shall be by excavators with smooth edge buckets only, by hand or using soft dig methods. Excavation shall be done incrementally on both sides of the pipe to the desired depth to avoid non-uniform loading or displacing of the pipe.

E32.2.7 Install temporary blocking or bracing on both sides of the pipe to maintain the pipe alignment as it is exposed. Ensure trench walls are supported to avoid a collapse that could displace the pipe. Do not excavate deeper than required to install the support beams. Do not undermine or remove the pipe bedding.

E32.2.8 Clean pipe bedding and backfill material from the pipe top surface by hand methods so that the Contract Administrator can inspect the pipe joints. Any joints with damaged mortar will require cleaning and topping with grout.

E32.2.9 Install steel support beams on each side of the feeder main pipe. Beams to be spliced in accordance with the design requirement of CAN/CSA-S16.1, Limit States Design of Steel Structures.

E32.2.10 Block and shim the support beams between pipe and ground, utilizing rubber pads between blocking and pipe to prevent damage to the mortar jacket. Use a laser level and target system to verify that the pipe section remains straight. Do not raise the pipe off its bedding during shimming.

E32.2.11 Following the installation of support beams, reinstall the pipe bedding and backfill material in accordance with CW 2030 using only static or light compaction equipment minimum vibration.

E32.2.12 Install Utility Settlement Monitors as shown on the drawings as the pipe is backfilled.

E32.2.13 Contact the Water Services Division to request that the feeder main be returned to normal operating pressure. Observe the area for potential leaks and undertake an emergency shutdown and leak repair if leakage is found.

E32.2.14 Restore pavement overtop of the feeder main using methods that will not impose loading on the pipe. Compact the subgrade using static methods or light vibratory compaction only. Subbase and base materials shall not be dumped directly on the pipe but shall be bladed into place from beside the pipe.

E32.3 Measurement and Payment

E32.3.1 Stabilization of the feeder main will be measured on a lump sum basis and paid for at the Contract Unit Price for '900 PCCP Feeder Main Stabilization' including pavement removal, excavation, supply and installation of steel beams and blocking, backfilling and compaction.

TUNNEL SEWER CONSTRUCTION

E33. SHAFT EXCAVATION SUPPORT SYSTEMS

E33.1 Scope

E33.1.1 The Contractor shall support the ground to provide safety, to prevent loss of ground, and to keep the perimeters and faces of shaft excavations stable until completion.

E33.1.2 The Contractor shall be responsible for the selection and design of shaft excavation support systems for all tunnel and microtunnel shafts. The support system types and individual system requirements detailed in this specification are not meant to limit the Contractor's options for such systems, but rather to establish minimum requirements for commonly used systems.

E33.1.3 Initial Support and installation methods shall be compatible with the anticipated geologic and hydrogeologic conditions described in the Geotechnical Baseline Report (GBR), Geotechnical Data Report (GDR), and anticipated construction loads induced by the Contractor's means and methods of construction.

E33.1.4 The number and size of tunnel shafts shall be determined by the Contractor. Proposed shaft locations have been provided on the drawing, alternate locations for shafts are permitted but are not allowed in the following locations:

(a) Portage Avenue (traffic volume);

(b) St James Colligate School yard (access to School Division property not granted);

(c) Ness Avenue Intersection (traffic volume and other project works including temporary relocation of the combined sewer); and

(d) Silver Avenue Intersection (limited space between high pressure gas main and feeder main).

E33.1.5 Utility relocations and water and sewer temporary relocation for shaft installation are incidental to the shafts.

E33.2 References

(a) Canadian Standards Association:
  (i) CAN/CSA-G40.20-M, General Requirements for Rolled or Welded Structural Quality Steel.
  (ii) CAN/CSA-G40.21-M, Structural Quality Steels.
  (iii) CAN/CSA-S16.1, Limit States Design of Steel Structures.
  (iv) CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
  (v) CSA W59-M, Welded Steel Construction (Metal Arc Welding).
  (vi) S16-14 Design of Steel Structures

(b) American Concrete Institute Standards (ACI):
  (i) ACI 304R-00 Guide for Measuring, Mixing, Transporting and Placing Concrete
  (ii) ACI 336.1-01 Reference Specification for the Construction of Driller Piers
  (iii) ACI C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
  (iv) ACI C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
  (v) ACI C143 Standard Test Method for Slump of Hydraulic-Cement Concrete
  (vi) ACI C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
  (vii) ACI C1064 Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete

(c) American Petroleum Institute (API)
  (i) Spec 13 A Specification for Drilling Fluid Materials
  (ii) RP 13B-1 Recommended Practice Standard Procedure for Field Testing Water-Based Drilling Fluids

(d) American Society for Testing and Materials (ASTM):
  (i) ASTM A36 Standard Specification for Carbon Structural Steel
  (ii) ASTM A992 Standard Specification for Structural Steel Shapes
  (iii) ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  (iv) ASTM A185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
  (v) ASTM A325M Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  (vi) ASTM A1011 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

(e) American Welding Society
  (i) AWS D1.1/D1.1M Structural Welding Code

E33.3 Design Requirements

E33.3.1 Excavation support systems shown on the Contract Drawings are not designed, and outlines of approximate shaft locations, maintenance holes, dimensions and shapes are shown for planning purposes only. The Contractor is responsible for selection and design of all Shaft Excavation Support Systems and shaft locations for excavations based on their

proposed means and methods and equipment for completing the Work. The shaft excavation support system shall be designed according to the following requirements:

(a) Shoring for Shafts 3, 4 and 5 shall consist of impermeable walls extending a minimum of 4 m below the base of excavation.

(b) Unsealed shafts are suitable for Shafts 1, 2, 6 and 7.

(c) In addition to the criteria mentioned in clauses E33.3.1 (a) and (b) the shaft design shall satisfy the restriction and limitation for discharging the removed groundwater into the sewer, as stipulated in E36 Surface Water and Groundwater Control.

(d) The shaft design shall satisfy the following deformation performance requirements:
  (i) Shafts 3, 4 and 5:
    i Maximum horizontal movement of the walls: 10 mm
    ii Maximum angle of distortion of the walls: 1:750
  (ii) Shafts 1, 2, 6 and 7:
    i Maximum horizontal movement of the walls: 25 mm
    ii Maximum angle of distortion of the walls: 1:250

(e) Retain the services of a Professional Engineer licensed in the Province of Manitoba to design, inspect and certify the shaft excavation support system.

(f) The Contractor's designs should take into account all information in the GDR, and any applicable baselines as stated in the GBR, the Contractor's proposed methods and planned equipment, including: construction staging; handling; erection; installation; equipment and jacking thrusts; loads imposed by subsequent construction operations; earth and ground water pressures; frost action, ground settlement and convergence control; grouting; basal stability, adjacent utilities and other conditions of service.

(g) Design shall be based on recognized geotechnical and structural theories for on-site conditions.

(h) Limit deflections of excavation support systems that retain material and support foundations at a higher elevation, so that retained material is not disturbed or weakened.

(i) Coordinate design of excavation shoring system and control of water systems per E36, including dewatering system if used, to meet performance requirements specified.

(j) Design splices in walers and bracing in accordance with requirements of CAN/CSA-S16.

(k) The Contractor shall use methods that prevent disturbance, destabilization, or failure of sides and the bottom of excavation during construction. Contractor shall not allow seepage or groundwater infiltration to result in piping of fines from the ground behind the shoring system. Contractor's methods shall be consistent with provisions of the Water Use Licence.

(l) Protect new and existing structures, piles, services, utilities, roads, and embankments from disturbance, displacement, settlement, or damage during construction.

(m) Design excavation support system in accordance with WSH Act requirements to protect personnel that enter excavations.

(n) The excavation support system shall be designed to positively ensure that no earth or other loading will be placed on the new work prior to the completion of the new work and until design strength has been reached. The Contractor shall be solely and completely responsible for any damage due to premature loading of the new work.

(o) The Contractor's designs shall specify the following items as a minimum: materials to be used for excavation support systems; constraints on maximum excavation limits relative to support installation stages; tolerances for size and position of excavation support elements; required preloading of excavation support elements; restrictions on surcharge loads and other loads that may act on the excavation support system and

grouting, ground freezing and groundwater pressures where applied to the support system; excavation support system and adjacent ground movement limits; provisions for subgrade stability and protection; and constraints on removal of support system elements as the permanent work is constructed and backfilling is completed.

(p) The Contractor's Shoring Engineer shall include requirements for geotechnical instrumentation and monitoring for each shoring system as part of the design, based on the design configuration and the Contractor's proposed construction means, methods, and procedures.

(q) Design a working slab for each shaft bottom to provide stable support for guide rails, thrust block, and other construction operations. The working slab shall be a minimum of 150 mm thick and shall not be connected to the thrust block.

(r) Design a ground improvement system for the excavation support system where the shoring is not complete and continuous in order to prevent damage to existing utilities, pavements and structures.

E33.3.2 Performance Requirements

(a) The design shall provide groundwater control or isolation, bottom stability and system stiffness sufficient to meet the Contract requirements for control of water and for protection of adjacent work and property as specified herein. The design shall allow for placement of excavation support systems and removal of excavation support systems where required. The design shall facilitate construction of the permanent work, and all other construction operations and requirements.

(b) Design each member or support element to support the maximum loads due to construction stages with appropriate safety factors.

(c) Design the shaft bases to prevent bottom heave due to surcharge, earth, and groundwater loads. Design an active dewatering system, where permitted, to be installed in advance of shaft construction as required to prevent bottom heave, in accordance with E36.

(d) Design the support system to minimize horizontal and vertical movements, and to protect adjacent utilities from damage. The type and stiffness of each ground support system and the methods of ground support installation shall be designed and constructed to meet the ground movement limits and adjacent property protection requirements specified herein and in E41.1.

(e) Design support system to maintain the stability of the excavation against sliding, as required based on the shaft configuration.

(f) Employ combinations of walers, struts, tie-back anchors and beams for bracing and lateral support as required to support excavation faces and control groundwater and prevent loss of ground with secant piles, sheeting systems or other methods of ground support. Provide struts with intermediate vertical and horizontal supports as required to prevent buckling. Provide timber lagging, liner plates, or steel sheeting as required to retain soil between supports. Trench shields and speed shores are not allowed for workshaft construction.

(g) Design a base slab equipped with a sump to pump out construction water for shaft excavation bottoms and to provide stability of the excavation base.

(h) Allow for entry and exit of a Microtunnel Boring Machine (MTBM), as required.

(i) Full responsibility for the design, installation, and maintenance of excavation shoring and bracing systems shall rest with the Contractor.

E33.4 Submittals

E33.4.1 At least 30 days prior to starting any shaft construction, submit a narrative along with shop and working drawings, signed and bearing the Professional Engineering seal of Contractor's Shoring Engineer licensed to practice in Manitoba, that shall describe all materials the Contractor proposes to use, and the method of construction and excavation intended in performing the Work in this Section. Provide design packages for all excavation

shoring systems. The design package shall include, but not be limited to, detailed drawings, with all pertinent descriptions, technical data, performance data, and design calculations for:

(a) Location of shafts by station, and limits of working sites;

(b) Description of site security arrangements in conformance with the Contract Documents and Provincial Regulation;

(c) General arrangement of temporary structures;

(d) Installation and deflection tolerances;

(e) Relationship of temporary structures to new and existing structures, services, and utilities;

(f) Vertical tunnel boring machines (if used) including detail of cutters, cutter arrangement, spoil removal arrangement, power, means of controlling the verticality and level, method of steering and precise survey, rating of all electrical equipment to be used in the shaft, means of access/egress during operation, and means for probing and shutdown of equipment if gas is encountered;

(g) Design calculations showing assumed loading conditions including equipment and stockpile surcharges, codes and reference standards used as a basis for design, estimated ground movements showing anticipated compliance with specified settlement limits, system component design, arrangement of supports and construction sequence for proposed support system(s). Calculations shall include stress evaluation and design details for tunnel portals;

(h) Provide maximum allowable spacing between bracing points on compression members to maintain stability and alignment. Show the elevation of struts, braces, or other supports as related to the depth of excavation at intermediate stages of construction;

(i) Provide details of bottom plug, mud slab, or concrete working slab, drains, and sump construction:

(j) Indicate sizes, shapes, and material specifications for all support elements including lagging, if used;

(k) Shaft dimensions, design criteria, and details for excavation support system, such as sheeting, shoring, bracing, and stabilization, protection of the excavation, special requirements for shaft penetrations, and working slabs. Shop drawings shall detail all connections, spacers, tie rods and other ancillary items. Allowable surcharge loads and any restrictions on surcharge capacity, including live loads, shall be clearly shown on the shaft construction drawings;

(l) Installation of excavation support, maintenance hole and shaft backfill where applicable or permanent structures where applicable, including the timing and sequencing in relation to excavation plan, and methods for controlling seepage from shaft walls to allow placement of permanent lining and backfill;

(m) All proposed equipment, facilities, and methods of construction, including hoisting plant, excavation supports, and any other pertinent details; and methods of boulder removal, groundwater control methods, ventilation, lighting, cuts, ramps and breakouts, temporary supports for excavations for structures adjacent to Shafts;

(n) Personnel transport systems in Shaft;

(o) Ventilation plan per the requirements of E34.14.1;

(p) Compressed air, water supply, lighting, communication, and electrical distribution plans;

(q) Proposed plan of spoil disposal and transfer provisions at top and bottom of shaft;

(r) Plans and procedures for protecting adjacent structures, utilities and facilities including: excavation, control of water, ground improvement, underpinning, monitoring and restoration of any damage;

(s) A site plan for each shaft indicating utilities, use of access roads, site grading and site development details for the excavation and all work areas, and the proposed limits of disturbance surrounding each excavation;

(t) Quality Control Procedures: address materials testing requirements and excavation monitoring provisions;

(u) Shaft abandonment plans, including backfilling and schedule of removal of temporary struts and walers;

(v) Flood contingency plans for Shafts and methods for preventing ingress of water inflow from surface;

(w) Means for monitoring excavation shoring system deflections and frequency of measurements per requirements of E41.1.

(x) Certificates to be provided as follows:

(y) Steel producer mill test data and certification.

(z) Welding certificates in accordance with CSA W47.1.

E33.4.2 Submit the following data and reports during the work:

(a) Daily summary of ground and groundwater conditions encountered.

(b) As-built record of abandoned excavation support system.

(c) Submit a copy of monitoring records of excavation shoring system deflection measurements to the Contract Administrator weekly, including any excavation monitoring analysis of horizontal and vertical deflections of supports, horizontal and vertical movements of adjacent ground and facilities, movements of adjacent buildings and properties, and measurements of strut loads being collected by the Contractor as specified by the Shoring Engineer.

(d) Monthly reports from Contractor’s Shoring Engineer on performance of ground support system elements and associated adjacent ground movements and protection of adjacent property; include any recommended measures to mitigate identified issues or performance concerns. Monthly report to be submitted prior to, or in association with, Progress Payment Applications.

E33.4.3 Any approvals or comments given by the City of Winnipeg or Contract Administrator to any procedure, operation, or construction methods do not relieve the Contractor from full responsibility for the adequacy and safety of the proposed excavation method or the Contractor's proposed design of primary supports and construction of the supports.

E33.5 Quality Assurance

E33.5.1 Contractor's Shoring Engineer: The design of the excavation shoring systems shall be prepared for the Contractor by a Professional Engineer licensed in the Province of Manitoba and employed or retained by the Contractor. This individual is referred to herein as the Shoring Engineer. The Shoring Engineer shall have a minimum of three (3) years’ experience as Professional Engineer in design and construction of similar types of excavation shoring systems and excavations and shall have designed a minimum of three shafts constructed using a comparable excavation support system in similar ground conditions in the past six (6) years.

E33.5.2 The Contractor shall retain the Shoring Engineer to maintain involvement and responsibility from design through installation, performance and abandonment or removal of excavation support systems.

E33.5.3 The Contractor shall ensure that the excavation shoring systems are installed by personnel experienced and trained in the installation of similar shoring systems.

E33.5.4 Superintendent overseeing shaft construction shall have a minimum of five (5) years experience in supervision of similar shaft construction techniques, including supervision of construction for a minimum of three (3) comparable shafts.

E33.5.5 Welder: CSA W47.1 certified.

E33.6 Site Conditions

E33.6.1 Refer to the Contract Drawings, Geotechnical Baseline Report (GBR) and Geotechnical Data Report (GDR) which form part of these Contract Documents.

E33.6.2 Comply with all restrictions set as conditions under which easements, agreements or permission (permits) were granted to the City of Winnipeg to perform the work of this Contract.

E33.6.3 Inspect the Workshaft site to observe the site conditions prior to starting the Work.

E33.7 Materials

E33.7.1 General excavation shoring system materials are as follows:

(a) Structural steel: CAN/CSA-G40.21-M grade 350W unless specified otherwise

(b) Welding: CSA W59-M

(c) Lumber: Graded lumber, sound and straight

(d) Planks for sheeting: Tongued and grooved

(e) Grout: Compressive strength of 25MPa minimum at seven Calendar Days and 35MPa at 28 days

(f) Concrete for cast-in-place secant piles:

(i) CAN/CSA A23.1 Exposure Class S-1

(ii) Compressive Strength 15 MPa

(iii) Duration 28 days

(iv) Maximum Aggregate Size 20 mm

(v) Air Content Category 2 (4-7%)

(g) Concrete Around Soldier Piles: Cement Stabilized Fill to CW 2160

E33.8 Installation

E33.8.1 General

(a) Install shaft excavation support system, as required by the soil, bedrock and groundwater conditions described in the Geotechnical Information or Workplace Safety and Health Regulation, Part 26, to prevent cave-ins of banks and sides of excavation.

(b) Shaft excavation support systems are mandatory in areas where excavation will potentially undermine existing structures, pipes, services, utilities, or roads.

(c) Drive/drill/install shaft excavation support system from ground elevation.

(d) For driven or drilled shaft excavation support systems, install within a tolerance determined by Shoring Engineer with the concurrence of the Contract Administrator.

(e) Do not encase any part of the shaft excavation support system in permanent concrete structure without written permission from the Contract Administrator.

(f) Schedule removal of bracing members and walers so that permanent structures, shaft excavation support system, or bracing members are not overstressed.

(g) Pumps and sumps shall be provided in the shaft base during construction to collect groundwater inflows that will occur even if advance dewatering or sealed shaft construction methods are utilised. Seepage flows will have a tendency to freeze during winter months and appropriate provisions shall be made to address ice build-up and prevent ice block falls.

(h) All equipment used for shaft excavation and installation/removal of shaft initial support shall not exceed the most stringent noise level regulations of the City of Winnipeg.

(i) Construction surcharges:

(i) Construction surcharges must be kept a minimum of 1.5 metres away from the shaft perimeter.

(ii) Material stockpiling is not allowed within 20 metres of shaft unless the support system is additionally braced or otherwise designed to support the additional loads imposed from the stockpiled material.

(j) Remove struts, walers, and diagonals as maintenance hole construction progresses. Maintain such supports until construction has reached an elevation within 600mm of the centreline of the supports and until concrete has achieved at least 70 per cent of its design strength.

(k) Cut off and remove all shaft initial support at a minimum depth of 3.0 m from the existing ground surface at the end of construction unless noted otherwise.

E33.8.2 Soldier Piles and Lagging Shafts

(a) Drill holes for soldier piles using temporary steel casings driven in advance of pile excavation, or utilise bentonite or drilling mud for support

(b) Install soldier piles to required dimensions and elevations in pre-drilled holes, with lean concrete placed for surround

(c) Shaft excavation shall not commence until the surrounding water table has been lowered to below the shaft base elevation.

(d) Timber laggings shall be installed as the shaft excavation advances, with excavation lift depths such that there is no opportunity for local collapse or disturbance of the surrounding soil or bedrock. Excavation lift depths shall not exceed 1.5m

(e) Do not leave sides of excavation exposed without lagging

(f) Fill voids between lagging and surrounding ground with drypack concrete rammed tightly in place

(g) Install walers, struts, and bracings at required elevations as excavation proceeds

(h) Install a concrete working slab and sump at the shaft base elevation. Water shall not be allowed to pool or pond in the excavation bottom. Dewatering of the shaft base shall continue until the permanent maintenance hole structure has been installed or pipe installation is complete.

E33.8.3 Slurry Wall Shafts

(a) Bentonite or other suitable supporting fluid shall be used during slurry wall excavation and pressures shall be maintained at a level which prevents disturbance of the surrounding ground.

(b) The slurry walls shall be founded at a depth which ensures adequate lateral support to the excavation, and which provides adequate toe embedment into competent material for shaft sidewall stability.

(c) Excavation within the overburden shall not be undertaken until a complete, fully interlocked slurry wall cofferdam has been created, with sufficient toe embedment into competent material to prevent groundwater inflows from the overburden soils.

(d) The temporary shaft structure shall be designed to ensure there is no possibility of flotation due to hydrostatic uplift pressures.

(e) Lateral support shall be installed as excavation proceeds, as required by the Contractor’s Shoring Engineer.

(f) Install a concrete working slab and sump at the shaft base elevation. Water shall not be allowed to pool or pond in the excavation bottom. Dewatering of the shaft base shall continue until the permanent maintenance hole structure has been installed.

E33.8.4 Secant Pile Shafts

(a) Drill holes for interlocking piles using temporary steel casings driven in advance of pile excavation or utilise bentonite or drilling muds for support.

(b) Ensure adequate interlock is achieved between adjacent piles.

(c) The secant piles shall be founded at a depth which ensures adequate lateral support to the excavation, and which provides adequate toe embedment into competent material for shaft sidewall stability.

(d) Guidewalls

(i) Use equipment that aids in the control of secant pile surface collaring, positioning, and verticality during boring.

(ii) Guidewalls must be constructed using reinforced concrete or other suitable materials. Design guidewalls for site and ground conditions.

(e) Excavation within the overburden shall not be undertaken until a complete, fully interlocked secant pile cofferdam has been created, with toe embedment into competent material to prevent groundwater inflows from the overburden soils.

(f) The temporary shaft structure shall be designed to ensure there is no possibility of flotation due to hydrostatic uplift pressures.

(g) Lateral support shall be installed as excavation proceeds, as required by the Contractor's Shoring Engineer.

(h) Install a concrete working slab and sump at the shaft base elevation. Water shall not be allowed to pool or pond in the excavation bottom. Dewatering of the shaft base shall continue until the permanent maintenance hole structure has been installed.

E33.8.5 Drop Caisson Shafts

(a) Bentonite or other supporting fluid shall be used in the annular void around the perimeter of the shaft support rings to prevent disturbance to the surrounding ground

(b) Where vertical thrust rams are being utilised for sinking the shaft support rings, tension piles or other means of resisting the upward vertical reaction shall be provided

(c) Provide a suitable means of sealing the joints between adjacent shaft support rings or precast segments

(d) The lowest shaft support ring shall be founded at a depth which ensures adequate lateral support to the excavation, and which provides adequate toe embedment into competent material for shaft sidewall stability.

(e) Excavation within the overburden shall be undertaken with the shaft in a flooded condition until the lowest shaft support ring is sufficiently embedded into competent material to prevent groundwater inflows from the overburden soils.

(f) The temporary shaft structure shall be designed to ensure there is no possibility of flotation due to hydrostatic uplift pressures.

(g) Lateral support shall be installed as excavation proceeds, as required by the Contractor's Shoring Engineer.

(h) Install a concrete working slab and sump at the shaft base elevation. Water shall not be allowed to pool or pond in the excavation bottom. Dewatering of the shaft base shall continue until the permanent maintenance hole structure has been installed.

E33.8.6 Interlocking Steel Sheet Piles

(a) Provide temporary guide frames and bracing to maintain the alignment of sheet piles during setting and driving.

(b) Sheet piles shall be installed in plumb position with each sheet pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm throughout the length of each run of wall, bearing tightly against original ground. Interlocks of steel-sheet piling wall shall be fully engaged to prevent soil migration into the excavation and to limit or prevent groundwater infiltration.

(c) Maximum infiltration into the excavation through sheet piles shall not exceed 10 L/min per 100 m2.

(d) Install walers and bracings (if required) so as not to interfere with the installation or placement of reinforcing bars or any other parts of the permanent structure.

(e) The Contractor may remove the sheeting after the final concrete structure has achieved the design strength. Any sheet piles left in place shall be cut and removed to 1.5 m below grade, unless otherwise specified in the Contract Documents.

(f) Do not excavate adjacent to any existing SOE until all bracing, anchoring, and testing has been completed.

(g) The steel sheet piles may be installed by driving the piles with or without pre-boring or using vibrations methods that ensure the sheet piles extend to adequate depth to cut-off groundwater flows.

(h) The Contractor shall use waterstops for the sheet piles to minimize seepage through the joint between sheet piles.

(i) Steel sheet piles may need to be interconnected to other SOE to avoid soil migration. To connect the steel sheet piles with other SOE additional secant piles may be required and potentially grouting the interface between the secant pile wall and the steel sheet pilling to minimize potential groundwater flows into the excavation.

(j) Sheet pile corners shall be installed with interlocks and bulbs properly engaged for full depth of sheet piles. If interlocks and bulbs cannot be properly engaged for full depth, the Contractor shall take measures that may include continuous welding of corner connections, to seal all gaps to avoid inflows of soils and minimize or prevent groundwater infiltration.

(k) Care shall be exercised in driving the steel sheet piles so that interlocking members can be extracted without damaging adjacent structures or utilities. The methods of driving, cutting, and splicing shall conform to the Shop Drawings as accepted by the Contract Administrator.

E33.9 Field Quality Assurance

E33.9.1 All elements of the Initial Support shall be maintained in good condition until construction of the final lining is complete. Any defect that threatens the satisfactory performance of the Initial Support, shall be repaired immediately.

E33.9.2 Any damaged or displaced Initial Support and any improperly installed Initial Support shall be removed and replaced or repaired immediately in a manner acceptable to the Contract Administrator.

E33.9.3 Tolerances

Tolerance Type	Description	Tolerance
Location	Excavation Centre of Shaft, and Centre of Secant Pile	± 30 mm
Excavation	Vertical tolerance, Out of plumb tolerance	0.5%

E33.9.4 Geotechnical Instrumentation Monitoring

(a) Monitor and protect adjacent utilities, property, and structures from damage during the entire duration of construction activities.

(b) After installation of geotechnical instrumentation at each shaft location, monitor instrumentation in accordance with the Contractor’s Geotechnical Instrumentation and Monitoring submittal.

(c) Install additional instrumentation and monitor to verify the stability of the shaft during construction and conformance with the ground movement tolerances as stipulated in this Section. All instrumentation shall be removed prior to demobilization in accordance with the Contract Documents.

(d) Provide unrestricted and safe access to geotechnical instrument locations, allowing measurements to be taken, as necessary.

E33.10 Measurement and Payment

E33.10.1 The construction of shafts for tunnel sewer construction will be measured on a Lump Sum basis which included all of the planned shafts identified by the Contractor on their Site Development Plan, inclusive of associated costs including utility relocation coordination, sewer, watermain and building service relocations, excavation, shaft construction, groundwater removal, stabilization, removal following construction. Payment will be at the Lump Sum Contract Price for "Shafts" based on the number of shafts installed and according to the following payment schedule:

(a) Seventy-five percent (75%) payment of the lump sum price for shafts will be paid once the Contractor has the shafts to the stage where they are ready for use. The shafts or major laydown areas identified in the Site Development Plan. Payment will be further broken down by the total number of shafts completed vs. the project total number of shafts as presented in the Site Development Plan, so for example if two of seven planned shafts are completed then payment would be based on (2/7) of 75% of the lump sump price.

(b) Notwithstanding the above clause, the initial payment for Mobilization and Demobilization will be limited to five percent (5%) of the total Contract value

(c) The remaining twenty-five percent (25%) of the lump sum price for shafts will be paid after the completion of the works including removal of the shaft, broken down on a per shaft basis similar to the initial payment as described above.

(d) If Shaft 1 near the north project limit is of a type suitable for the future construction of the St. Matthew's Avenue branch, the City may choose to retain this shaft for future use. The remaining payment for this shaft would be made when the shaft has been secured and covered following construction.

E34. TUNNEL AND SHAFT SAFETY

E34.1 Scope

E34.1.1 This section only refers to the safety requirements for tunnels and shafts.

E34.1.2 The Contractor is responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all reasonable precautions for the safety of, and provide the appropriate protection to prevent damage, injury, or loss to:

(a) All employees directly involved with the Work and other persons who may be affected thereby.

(b) All the Work and all materials or equipment to be incorporated therein, whether in use or in storage on or off the site.

E34.1.3 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction for the safety of persons or property, or to protect them from damage, injury, or loss. Erect and maintain, as required by the conditions and progress of the Work, all reasonable safeguards for its safety and protection. Notify owners of adjacent utilities when prosecution of the Work may affect them.

E34.1.4 All damage, injury or loss to any persons or property caused directly or indirectly, in whole or in part, by Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, shall be remedied by Contractor, except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of City of Winnipeg or Contract Administrator or anyone employed by either of them or anyone for whose acts either of them may be liable, and not

attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor.

E34.1.5 Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and the Contract Administrator has issued a notice to City of Winnipeg and Contractor that the Work is acceptable.

E34.1.6 No separate payment will be made for the safety measures and provisions described herein, and all costs in connection therewith, and other safety measures deemed necessary by the Contractor, shall be considered incidental to the work and included in the cost of the structure or Bid Item to which it pertains.

E34.1.7 All Work shall conform to the requirements of the Manitoba Labour and Immigration Division. No section or description in these documents shall be construed to replace, modify or supersede requirements of other codes, specifications and/or ordinances referenced throughout the document. If a conflict occurs between the referenced regulations and these documents the more stringent shall govern.

E34.1.8 Odorless gas under pressure may be encountered in the excavation of shafts and tunneling. All work in this area shall comply with applicable provisions of the Manitoba Workplace Safety and Health Act and Regulation (2022) (WSH Act), Workplace Safety and Health Regulation (M.R. 217/2006).

E34.1.9 All underground construction equipment shall be equipped with suitable safety systems in accordance with applicable Manitoba Electrical Code and the Workplace Safety and Health Regulation (M.R. 217/2006).requirements for underground construction equipment. Prior to use on this project, all electrical systems shall be configured to suit the ground conditions including the possibility of encountering gas in accordance with WSH Act requirements.

E34.1.10 The Contractor is fully responsible for the safety of all visitors to the Site, including tunnels and shafts at all times. The Contractor will provide a safety orientation to all visitors before entering the site. The Contractor will escort visitors at all times and ensure that all safety regulations are followed and that PPE is properly used. The Contractor will define a procedure for handling visitors.

E34.2 References

(a) Canadian Standards Association (CSA)

(b) Workplace Safety and Health Regulation (M.R. 217/2006)

(i) Part 2, General Duties

(ii) Part 4, General Workplace Requirements

(iii) Part 6, Personal Protective Equipment

(iv) Part 15, Confined Spaces

(v) Part 36, Control of Exposure to Biological or Chemical Agents

(vi) Part 26, Excavation and Tunnels

(c) ASME Section VIII, Div.1 – Pressure Vessels

(d) Manitoba Electrical Code

E34.3 Design and Submission Requirements

E34.3.1 The Contractor shall provide a project-designated Safety Officer who shall meet the following experience requirements:

(a) A resume of the qualifications of the Safety Officer shall be submitted that includes a description of the Safety Officer's experience, education, and special safety and first aid courses completed, and safety conferences attended.

(b) Safety Officer shall be knowledgeable of all applicable safety and health codes, statutes and ordinances as well as best safety practices recognized by the construction industry. The Safety Officer shall be able to demonstrate knowledge and ability to ensure compliance with same.

(c) The Safety Officer shall not be the project manager, project engineer, superintendent or anyone else working on the Project and shall have no other duties except those related to safety.

(d) The resume of the Safety Officer approved by the City of Winnipeg must be the individual the Contractor will have for the complete duration of the Work. If the individual approved by the City of Winnipeg becomes no longer employed by the Contractor throughout the course of the Work, similar experience requirements shall be met and submitted for approval of an alternate Safety Officer.

E34.3.2 Health and Safety Program:

(a) The Contractor's Health and Safety program shall in accordance with the requirements of The Workplace Safety and Health Act (Manitoba), and the shaft and tunnel-specific requirements as contained herein.

(b) Submit templates for all inspection checklist report forms and safety records and subsequently submit safety inspection reports and certifications from regulating agencies and insurance companies as they become available.

(c) Plan shall address eventuality of:

(i) Shaft, maintenance hole and tunnel evacuation procedure in the event of fire, flood, oxygen deficiency and presence of gas.

(ii) Evacuation/rescue in the case of collapse, accident or other significant events.

E34.3.3 Visitor Procedure:

(a) 15 days prior to the commencement of site work, submit a procedure for safely handling visitors to the Site, including shafts, maintenance holes and tunnels in accordance with Manitoba Labour and Immigration Division and outlined in WSH Act requirements.

(b) The following restrictions must be imposed on Site, shaft, maintenance hole and tunnel/sewer visits:

(i) Only personnel with legitimate technical/business interests, clients, or associates of the Contractor, Contract Administrator, or the City of Winnipeg may visit the site.

(ii) Unless otherwise approved by the City of Winnipeg/Contract Administrator the number of visitors allowed will be limited to no more than ten visitors at any time.

(iii) Visits must be scheduled a minimum of five working days in advance.

(iv) Children under 16 years old are not allowed onsite.

(v) No persons with pacemakers or other similar medical devices allowed on site.

(vi) No persons taking medication that results in drowsiness allowed onsite.

(vii) No person under the influence of illegal drugs or alcohol allowed onsite.

(c) All visitors must be advised of the potential risks which include but are not limited to the following:

(i) Visitors must receive and understand the visitor orientation training.

(ii) The tunnel invert is a curved surface and may be slippery.

(iii) Tripping and slipping hazards.

(iv) Many surfaces on site and in the shafts, including handrails, locomotive rails, etc. may be dirty or wet.

(v) Falling material or equipment is possible.

(vi) Lighting levels may be low.

(vii) Respiratory risk due to inhalation of bentonite powder.

(d) Visitors must advise of any medical condition that may be exacerbated by physical exertion, walking upslope, climbing, use of self-rescuers and any other required PPE, etc.

E34.3.4 For each shaft, prepare and have on site at all times a shaft manual. The shaft manual shall be specific to each shaft site and must be posted in a clearly visible location. At a minimum the shaft manual shall contain all pertinent details regarding the shaft design and logistics, shaft monitoring and safety provisions, contact information for key shaft site staff, and any other information that may be relevant to emergency services personnel responding to an emergency at the shaft site. Copies of the shaft manuals shall be submitted to the Contract Administrator for record purposes and distribution to appropriate emergency services agencies for their information and review.

E34.3.5 Submit shop drawings, calculations, and other details pertaining to the:

(a) Ventilation system

(b) Man Access/Shaft Elevator

(c) Backup Power

E34.4 Quality Assurance

E34.4.1 The Contractor shall have a competent Safety Officer(s) on the job that meets the experience qualifications set forth in this specification, with an appropriate office on the job site to maintain and keep available safety records and up-to-date copies of all pertinent safety rules and regulations. The Safety Officer shall:

(a) Ensure compliance with all applicable health and safety requirements of all governing legislation.

(b) Schedule and conduct safety meetings and safety training programs as required by law for all personnel engaged in the work.

(c) Post all appropriate notices regarding safety and health regulations at locations that afford maximum exposure to all personnel at the job site.

(d) Post the name, address, and hours of the nearest medical doctor; names and addresses of nearby clinics and hospitals; and the telephone numbers of the fire and police departments.

(e) Post appropriate instructions and warning signs with regard to all hazardous areas or conditions.

(f) Have proper safety and rescue equipment adequately maintained and readily available at all appropriate locations. This equipment shall include such applicable items as: proper fire extinguishers, first aid kits, safety ropes and harnesses, stretcher, life savers, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, explosion meters, and any other equipment mandated by law.

(g) Make inspections at least once daily in accordance with an inspection checklist report form to ensure that all machines, tools and equipment are in safe operating condition; that all work methods are not dangerous; and that all work methods are free of hazards.

(h) Notify Contract Administrator of a serious accident immediately, followed by a detailed written report within twenty-four (24) hours in accordance with notice requirements outlined within Manitoba Labour and Immigration Division and outlined in WSH Act. “Serious Accident” is defined as an incident requiring an absence from work beyond the day of the incident/accident and/or hospitalization.

(i) Notify Contract Administrator of any accident claim, followed up by a detailed written report on the claim and its resolution.

E34.5 Materials

E34.5.1 Have on hand, at all times, sufficient materials and equipment in good condition and in good working order for all emergencies that are likely to arise to secure the safety of all personnel and structures.

E34.6 Equipment

E34.6.1 All personnel employed by the Contractor and Subcontractors, whenever entering the job site, any shaft, or tunnel, shall be required to use personal protective equipment (PPE) as required by Manitoba Labour and Immigration Division and outlined in WSH Act .

E34.6.2 Where work is in progress in the shafts and/or tunnels the Contractor shall also provide as a minimum the following safety equipment:

(a) Adequate stretcher units placed in convenient locations adjacent to the work

(b) Oxygen deficiency indicators

(c) Carbon Monoxide testers

(d) Hydrogen Sulfide detectors

(e) An adequate number of Workplace Safety and Health Regulation, Part 15, approved self-rescuers in all areas where workers or visitors might be trapped by smoke or gas

(f) Provide air monitoring system for the detection of hazardous gases such as methane, petroleum, vapours, etc.:

(i) Position air-monitoring sensors at locations that provide for the most effective measurement of hazardous gases. Place sensors out of the fresh air stream.

(ii) Couple the air monitoring system to an alarm system to warn the tunnel and shaft crew when predetermined warning or alarm levels are exceeded.

(iii) At 20 per cent LEL, promptly de-energize AC power to all electrical equipment not approved for use in hazardous atmospheres and within or exposed to the forward or reverse airstream.

(iv) In shaft, maintenance hole and tunnel work an additional portable air monitoring system shall be provided at any location where work is in progress at all times which will continuously monitor for the presence of explosive gases. This air monitoring system shall be the type that automatically provides both visual and audible alarms.

(v) Air monitoring devices used for monitoring the air for hazardous gases and vapors shall be WSH Act approved for use in the underground works or interventions associated with tunnel excavation

(vi) Calibrate air monitoring devices with a known mixture of gas in conformance with the manufacturer’s recommendations, at least once every 30 days. Maintain calibration records and make available to the City of Winnipeg on request.

(vii) Make the air monitoring system and ventilation system high priorities in the sequence of reconnecting tunnel services following placement of each length of pipe;

(viii) Provide crews with an air horn or other means to alert the crew of gas inflows.

E34.7 Ventilation

E34.7.1 The Contractor shall maintain the shaft, maintenance hole and tunnel air in a condition suitable for the health of the occupants at all times. Ventilating plants shall be of capacity per this Section or greater as deemed necessary by the Contractor and shall be installed and operated while the work is going on in the shafts, maintenance holes and tunnels and at other times as may be necessary.

E34.7.2 The entire ventilating system shall be maintained in a good working condition and shall be under the direction of an employee experienced in tunnel ventilation operation and maintenance. The design of the ventilation system shall be submitted to the Contract Administrator for information before installation.

E34.7.3 No employee will be allowed to work in areas where concentrations of air borne contaminants exceed governing regulatory threshold limits. Respirators shall not be substituted for environmental control measures and shall be used only as prescribed by Manitoba Labour and Immigration Division and outlined in WSH Act .

E34.7.4 Internal combustion equipment other than mobile diesel powered equipment shall not be used underground. All diesel powered mobile equipment used underground shall be as prescribed in Manitoba Labour and Immigration Division and be operated in compliance with Manitoba Labour and Immigration Division regulations. The Contractor, upon request shall submit proof of certification to the Contract Administrator.

E34.7.5 All internal combustion equipment allowed under this specification section shall be operated in such a manner as to prevent health hazards to personnel from exhaust fumes.

E34.7.6 Conduct all excavation and tunnelling operations by methods and with equipment which will positively control dust, fumes, vapours, gases, fibers, fogs, mists, or other atmospheric impurities in accordance with WSH Act requirements.

E34.7.7 Smoking and vaping are strictly prohibited within the tunnels, or anywhere on site excluding assigned designated smoking areas.

E34.8 Subsurface Gases

E34.8.1 Certain soils, shales and other rock formations have been known to give off considerable amounts of toxic and explosive gases. The Contractor shall provide continuous monitoring for toxic and explosive gases at locations within tunnels and shafts where work is in progress. The Contractor shall take all possible safety precautions as the Work progresses under these conditions and shall increase ventilation to the extent that explosive and toxic mixtures are not allowed to form.

E34.8.2 The Contractor shall anticipate that explosive and toxic gases will be encountered during shaft excavation and tunnelling operations and shall take the necessary measures to provide for safety during these operations which, at a minimum, comply with all Manitoba Labour and Immigration Division regulations and outlined in WSH Act.

E34.8.3 Odorless gas under pressure was observed at test holes TH 19-161 and TH 19-162 north of Bruce Avenue. The gas was allowed to vent for 10-15 minutes. No samples were obtained.

E34.8.4 All electrical equipment within the tunnel shall be classified as Class 1, Zone 2 in accordance with the Canadian Electrical Code (CSA 22.1).

E34.9 Other

E34.9.1 The Contractor shall provide lighting in accordance with Manitoba Workplace Safety and Health Regulation Part 4 and Part 26, Manitoba Electrical Code requirements for the entire length of the tunnel.

(a) Light shall be adequate as determined by the Contract Administrator, to permit proper inspection of all operations at all times.

(b) Open flame lights shall not be used.

(c) Flashlights and appropriate fixtures shall be explosion proof.

E34.9.2 Lights, fencing, barricades, covers, and signs shall be provided and maintained to properly protect the public, the workers and the work against injury or damage.

(a) Provide barricades at the top of shafts in accordance with Manitoba Labour and Immigration Division and outlined in WSH Act requirements.

(b) Install temporary covers on shafts during periods of construction inactivity at the shaft sites. The shaft covers may be grated where the shaft is to be used as a ventilation inlet and shall be designed by the Contractor to prevent accidental entry of personnel, debris, etc., into the shafts.

(c) All shafts shall be enclosed with a security fence meeting the City of Winnipeg's requirements, which shall be secure at any time the site is unattended by Contractor's personnel. The fence shall have all necessary gates and entrances with keys furnished to the Contract Administrator for all locking devices.

(d) All storage areas and workshops shall be so segregated so that their use during times of site inactivity does not compromise the security of the shaft area.

E34.10 Fire Prevention and Control: All underground construction shall be performed in accordance with the applicable fire prevention and control requirements of Manitoba Labour and Immigration Division and outlined in WSH Act , and Local fire department ordinances.

E34.11 Dust and Mud Control: Control dust and mud in the worksite and adjoining areas to E8.

E34.12 Noise Attenuation: Control noise to E10.

E34.13 All haulage equipment such as hoists, cages, and elevators in operation in excavations and shafts shall conform to all requirements described in Manitoba Labour and Immigration Division and outlined in WSH Act.

E34.13.1 Equip tunnel logistics trains with acceptable braking systems (inclusive of a manual braking over-ride, safety chains and other measures as required to prevent runaway trains.

E34.14 Measurement and Payment

E34.14.1 All costs associated with this Specification shall be incidental to the Contract Lump Sum Price for “Shafts”.

E35. TUNNEL AND SHAFT VENTILATION AND UTILITIES

E35.1 Scope

E35.1.1 The work specified in this Section includes the design, procurement, installation, operation and removal of all temporary facilities required for the following:

(a) Ventilation, cooling, dust removal and maintenance of acceptable air quality and environmental conditions, including the providing of sufficient ventilation flow for dispersion, dilution and exhaust of toxic or explosive gases which may enter the tunnel through in gaseous phase through the rock or via groundwater flows and seepage. The ventilation system will also provide for dispersion, dilution and exhaust of fumes from equipment operation and other activities within the tunnels and shafts.

(b) Lighting along the length of tunnels, in shaft bottom areas, in shafts, and in the vicinity of all equipment for safe operations.

(c) Mine paging/communication system in shafts and tunnels.

(d) Water and compressed air for construction, fire protection, and other use in shafts and tunnels. Water supply is available from the City as stated in E28.5(a).

(e) Discharge lines and intermediate sump pumps to convey groundwater inflows and other construction water in tunnels and shafts.

(f) Electric lines and transformers as required for operation of lighting, communications equipment and other construction equipment such as TBMs, conveyors, pumps and ventilation equipment.

(g) Emergency generator(s)/power for operation of pumps, ventilation systems and safety equipment in case of general power outage.

(h) Sanitary facilities at the tunnel headings and at the bottom of the construction shafts.

E35.1.2 All work specified in this Section shall be the Contractor’s responsibility. All work shall comply with all applicable federal, provincial and local codes, laws, regulations and ordinances.

E35.1.3 The facilities to be provided include, but are not limited to, the following items: fans, ventilation ducting, scrubbers, pumps, piping, water, compressed air, lighting, components for hanging, fastening, and securing the facilities, power supplies, controls, monitors, communication lines, heating facilities if required, and spot coolers as required.

E35.2 Quality Control

E35.2.1 The specified facilities must be designed by a firm or individual with at least two years of experience in the last five years in designing ventilation and electrical facilities for tunnel construction. The firm must be operated and maintained by personnel with a minimum of two years of relevant experience within the last five years.

E35.2.2 All electrical systems, including electrical components of the ventilation system, shall comply with applicable requirements of Manitoba Workplace Safety and Health Act and Regulation(2022) (WSH Act), Workplace Safety and Health Regulation (M.R. 217/2006)Electrical systems as specified in E34, shall also comply with requirements stated that section for operation in Class I, Division 2 locations.

E35.2.3 Reference Codes, Standards and Other Documents:

(a) Manitoba Workplace Safety and Health Act and Regulation(2022) (WSH Act)Canadian Standards Association – CSA Z462, Workplace Electrical Safety.

(b) Canadian Standards Association – CSA Z462, Workplace Electrical Safety.

(c) Canadian Standards Association – M421-11, Use of Electricity in Mines.

(d) All other federal, provincial and local requirements and regulations in effect at the time of construction.

(e) Air Monitoring Program: The Contractor shall monitor air quality at the TBM and other relevant locations in accordance with applicable regulations and requirements stated in E34.

E35.3 Submittals

E35.3.1 Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents. Additionally, the following specific information must be provided:

(a) Layout, details and specifications for all ventilation components, including but not limited to: locations, sizes, manufacturer's operating manuals, operating configurations, ducting and methods of joining lengths of duct together, methods of suspending the ducts, noise attenuation devices, fan noise performance data, fan pressure/performance curves, control and operating systems, backup systems for electrical power and controls to ensure continuous airflow in the tunnels and shafts in case of power loss or system failure.

(b) Ventilation system designer qualifications.

(c) Layout, details, and specifications of all tunnel utilities.

(d) Daily air quality measurements, to be submitted weekly to the Contract Administrator.

(e) Details and layout of all water flow monitoring equipment, including data on water volumes used, collected, pumped, and treated as construction water as defined in E35. All flow monitoring data shall be submitted as required by E35.

(f) Details of all air flow and pressure monitoring equipment, along with a schedule for proposed periodic air quality measurements at the face and at other working areas. All air flow monitoring and ventilation system performance data must be submitted electronically, in a form acceptable to the Engineer on a weekly basis.

(g) Plan for emergency response in the event of a fire in the tunnel, including an assessment of the likely heat release rate and location of potential fires.

E35.4 Products

E35.4.1 Materials and Equipment

(a) Materials may be new or used but must be adequate for their intended purposes and comply with all relevant codes and regulations. Tunnel and shaft support equipment and materials, including but not limited to utilities, must be made and maintained to prevent production impairment or worker safety hazards due to deterioration from exposure to gases or other contaminants identified in the contract documents or

reasonably anticipated. Equipment and utilities within the tunnel and shafts must be designed, fabricated, maintained, and operated to avoid accidents due to explosion or fire from equipment operation in an explosive atmosphere.

(b) Select equipment and components that are sturdy, resistant to water damage, and able to withstand the Project's conditions.

(c) Select fan sizes to provide airflow to meet the requirements of E34 and the Manitoba Workplace Safety and Health Act and Regulation (2022) (WSH Act).

(d) Design ventilation ducts for maximum airflow, and minimal air leakage, and resistance to fire hazards. The Contractor shall determine duct sizes. Total leakage along the duct line must not exceed half of the air volume flow at the inlet. All bends must be formed of rigid duct materials.

(e) The Contractor is responsible for procuring electrical power, potable water, sewer services, and sanitary facilities.

E35.5 Execution

E35.5.1 Design

(a) Systems must be installed in a neat and orderly manner, ensuring they are structurally, mechanically, and electrically sound. They must be maintained to provide safe, continuous services at required and meet the minimum requirements outlined in these specifications. Systems should be modified and extended as work progresses.

(b) Fresh air must be supplied to all underground work areas in sufficient amounts to prevent any dangerous or harmful accumulation of dust, fumes, vapours, or gases in accordance with requirements as stated in E34 and Manitoba Workplace Safety and Health Act and Regulation (2022) (WSH Act), Workplace Safety and Health Regulation (M.R. 217/2006). Adequate ventilation must always be provided to disperse and dilute contaminants below acceptable levels. When calculating the acceptable airflow levels, consider the additive effect of multiple contaminants. The design and operation of the tunnel and shaft ventilation system must also account for the equipment used and the potential for encountering toxic or explosive gases during excavation. The ventilation system must be designed to operate in an explosive gas atmosphere as required E34. The design of the ventilation system shall consider at least the following:

(i) Safety considerations dictated in referenced or other applicable codes and standards.

(ii) Special attention shall be made regarding dispersion and dilution of contaminated gases and flammable, explosive or other hazardous gases or materials.

(iii) Tunnel Geometry: Depth, length, cross section.

(iv) Ambient Conditions: External summer and winter climate, in-situ rock temperature, water infiltration.

(v) Maximum number of personnel in tunnel.

(vi) Number and types of equipment in the tunnel, and their effects on air quality and temperature.

(vii) Methods of cooling TBM motors; water sprays for dust control; ventilation of tunnel face; and removal of dust from the ventilation air.

(viii) Friction losses, loss of air through duct leakage, minimum air velocity in the tunnel.

(ix) Phasing of the systems as the shaft and tunnel advances, and during retreat at completion.

(x) Local ventilation requirements at locations of welding, concrete placement, and elsewhere, as required.

(xi) Fire resistance and electrical safety. Ventilation ducting shall be fire-resistant.

(xii) Sizes of diesel and electrical motors used in underground equipment during excavation, carrier pipe placement and lining operations.

(xiii) Contaminated groundwater or gases and flammable, explosive or other hazardous gases or materials.

(c) The Contractor shall design lighting and illumination systems in the tunnels and any other general underground work area during all operations in conformance with the requirements of E34.

E35.5.2 Operation

(a) Control of the ventilation systems must be at ground surface; appropriate delays and interlocks must be provided for proper sequencing and operation of fans, including reversal of fans.

(b) Ensure that the exhaust/intake of the fans are placed away from potential sources of contamination, such as vehicle exhausts or industrial emissions, to avoid drawing polluted air into the tunnel, and the fans are positioned a minimum of 15 m from the edge of the shaft.

(c) Ground electrical equipment to an installation, which extends throughout the underground workings.

(d) Lighting and ventilation facilities must remain in the tunnels and shafts until they need to be removed for activities such as backfilling around the carrier pipe. When appropriate, remove all lighting, ventilation facilities, and any loose or projecting hangers and supports. Ventilation ducting may be removed after excavation is complete, provided that positive through-tunnel ventilation is maintained using a bulkhead and ventilation fans, or other arrangements such as a jet fan. Sufficient ventilation must always be provided to adequately disperse and dilute contaminants below acceptable levels.

(e) Provide and maintain communication systems in accordance with E35.5.3.

(f) Monitor and provide weekly airflow measurement data. Submit the results to the Contract Administrator in a form and format approved by the Contract Administrator, demonstrating that the ventilation system meets the minimum airflow requirements outlined in these specifications.

(g) Maintain backup power to allow re-energization within minutes of a power outage.

E35.5.3 Fire Safety

(a) General: Provide appropriate portable fire-suppression equipment shall be provided in all underground work areas.

(b) Conveyor Systems:

(i) Vertical conveyors must be equipped with a deluge system, and the drive motor stations of horizontal conveyors must be protected by water or dry chemical systems. Booster drives, splicing stations, tail pulleys, and other fixed equipment on vertical and horizontal conveyors and related assemblies used underground must be protected by fixed fire sprinklers or other means. The deluge sprinkler system design must include a Siamese connection for an alternate water source. Provide means of testing all systems twice a year.

(ii) Test samples of the actual conveyor belt materials must be tested by a recognized testing laboratory to determine the fire propagation index. Use the test results for emergency planning purposes.

(iii) All underground belt conveyors must have pulley slippage systems that shut down the belt if sliding friction develops between the drive pulley(s) and the belt. Inspect the slippage system according to the manufacturer’s recommendations.

(iv) Conveyor belt systems must have interlock(s) compatible with all conveyor components, which shut down the belt conveyors if any conveyor in the system

stops or reduces speed, or if a conveyor-related fire protection system is activated.

(v) Fixed combustible materials such as lagging, posts, cribbing, and roof supports must be either metal-guarded from contact by conveyor belts or located at least half the width of the belt for an idler or pulley. Machinery guarding in the drive area and at other points along the belt must be made of non-combustible material.

(vi) Belt conveyors must use structures that do not provide a deck between the upper and lower strands of the belt, except at necessary transfer points and belt splicing locations. Structures at transfer points and belt-splicing locations must not cause hazardous accumulations of material.

(c) Communication Systems:

(i) Voice communication must always be provided between the surface and underground work areas at all times.

(ii) Each field office of the Contract Administrator must have a dedicated device for maintaining communication with the underground work area at all times. Additionally, each field office must be provided with four radios and chargers of the same type used by the Contractor including all frequencies and channels.

(iii) Fixed communications wiring and equipment must be located away from fire sources such as, but not limited to, transformers and conveyor systems.

(iv) Fixed wire communications equipment along the tunnel alignment must be located as to avoid unnecessary reaching or climbing on the tunnel walls for access.

(v) Where radio systems are used for emergency communications, repeater systems must be installed and located to ensure uninterrupted and audible communications between the surface and underground work locations.

(vi) All communications equipment (primary and secondary) must be tested weekly, and a record of the tests must be maintained by the Contractor for the duration of the work.

(d) Electrical Systems: Electrical power supplying critical operating equipment to support evacuation of persons from the underground work area(s) such as, but not limited to, hoisting, pumping, communications, and hauling equipment, must have redundancy. All electrical transformers used underground must be of the dry type. Conform to the requirements of E34, regarding requirements for electrical equipment in the tunnel.

(e) Drainage Systems: The drainage system in underground work areas of the tunnel shall be designed and installed as to accommodate the maximum expected sprinkler or fire hose discharge in addition to all other construction water as indicated in E36.

E35.5.4 Cleaning

(a) Upon completion of the work, all temporary lighting, tunnel track system, ventilation equipment and utility lines shall remain the property of the Contractor and shall be removed from the site.

(b) All areas disturbed by the installation must be restored to a condition satisfactory to the Contract Administrator, including patching of any anchorages in permanent chamber concrete lining.

E35.6 Measurement and Payment

E35.6.1 All costs associated with this Specification shall be incidental to the Contract Lump Sum Price for “Shafts”.

E36. SURFACE WATER AND GROUNDWATER CONTROL

E36.1 Description

E36.1.1 The Contractor is responsible for the control, diversion, storage and pumping of all water including without limitation rain, snow melt, groundwater, leaking infrastructure and water in pipes throughout all stages of the Work.

E36.1.2 Discharge of drainage water from construction site, including routing gutter flow from roadway gutters interrupted by shafts around the shafts.

E36.1.3 Removing groundwater, including perched water, using active well-type dewatering systems from cohesionless soils within structure excavation envelopes before excavation to protect against flowing ground conditions during excavation. Groundwater dewatering may be required for shaft construction and to prevent basal instability in shafts. I

E36.1.4 Implementing common groundwater level lowering, de-pressurization, and dewatering methods including, but not limited to, deep gravity wells, vacuum well points, vacuum lances, eductor wells, and any combinations thereof.

E36.1.5 Treatment of groundwater to meet applicable discharge standards at the receiver(s).

E36.1.6 Bypass pumping of sewers may be required to complete the Work and is described in section E30. Note that area combined sewers have a limited capacity to accommodate additional flow and may not be suitable for the discharge of groundwater at higher flow rates.

E36.1.7 Prior to the design of dewatering systems, the Contractor shall provide the Contract Administrator with pump capacities and estimated discharge rates and the Contract Administrator perform a capacity assessment using the district hydraulic model to verify if the receiving sewer system can accommodate the flow without causing localized basement flooding or combined sewer overflow at the Ferry Road Combined Sewer outfall.

E36.1.8 Discharge to the combined sewer system may have springtime or seasonal restrictions. During springtime high river level, The City of Winnipeg will close a gate on the Ferry Road Combined Sewer Trunk to prevent river backup and install a trailer mounted pump to dewater the trunk. In this configuration, the system will have lower capacity to receive dewatering flow.

E36.1.9 Dewatering in Bourkevale Park may be pumped directly to the Assiniboine River, subject to environmental restrictions for sediment and water quality. Flow from site drainage or dewatering may also directed towards the Ferry Road land drainage sewer installed during a previous contract in the area, and this will be facilitated by the construction of swales and a new catch basin near Ferry Road or a new branch land drainage sewer as part of the Works. The new land drainage sewer should accommodate a constant inflow of 1000 L/sec or somewhat less during rainfall, but the system capacity will be assessed by the Contract Administrator once potential discharge rates are provided by the Contractor. Thawing or de-icing of the river outfall will be require for wintertime discharge, since the land drainage outfall is above winter ice level.

E36.1.10 Truro Creek is located several blocks west of Rutland Street and was not seen as an option for the discharge of dewatering flow due to the need to construct a temporary pumped drainage system to the shallow creek.

E36.1.11 Dewatering capacity near Silver Avenue is very limited since the location is at the high end of the combined sewer system and relatively far from Truro Creek.

E36.1.12 Dewatering near the north project limit near St .Matthews Avenue can either route flow west Truro Creek via constructed ditches along the St. Matthews Avenue right of way, or restricted flow to the Ferry Road combined sewer.

E36.1.13 All discharge into existing sewers, ditches, water bodies and streets will be subject to City of Winnipeg approval.

E36.2 Methods

E36.2.1 The Contractor is required to submit a dewatering plan to the Contract Administrator for review and approval prior to commencing the work. The dewatering plan will be reviewed with the City of Winnipeg.

E36.2.2 Control of the inflow of surface runoff or groundwater into shafts on within excavations. If groundwater is mixed with slurry or lubricant, it shall be prevented from entering the shaft.

E36.2.3 Prevent piping and loss of fines from the surrounding soils.

E36.2.4 Utilize appropriate measures such as advance ground treatment and/or adequate wall toe-in depths to prevent the possibility of base heave or soil piping.

E36.2.5 Take appropriate measures to prevent flooding of the shaft during periods of rainfall or overland flood.

E36.2.6 Prevent ice formation on shaft walls by groundwater cut-off, frequent scaling, heating of ventilation air, or other measures as necessary to eliminate the hazard of falling ice.

E36.2.7 Do not pump or drain any water containing excessive suspended materials or harmful substances into waterways, sewers, or other drainage systems. Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with the governing authority's limitations and requirements.

E36.2.8 The Contractor shall be responsible for all damages within or outside the Site directly resultant from the Contractor's actions, omissions or neglect which may be caused by, or which may result from water backing up, flowing through, overflowing or excessive surcharge of drainage systems.

E36.2.9 All dewatering equipment and discharge hoses shall be protected from freezing and shall remain fully operational in freezing weather.

E36.2.10 Dispose of all water drained or pumped as above by discharging it into sewers, drainage ditches or natural water courses as reviewed by the Contract Administrator, and in compliance with all local, Municipal, Provincial and Federal environmental regulations, ordinances, bylaws, etc., and provide documentation indicating that authority has been granted to discharge effluent water into any drainage ditch, brook, creek, or river. The Contractor shall develop and implement at their own cost any filtration, settlement or other acceptable treatment methods required prior to disposal.

E36.2.11 Keep all drainage channels, gutters, swales, ditches, sewers, culverts, and disposal areas free of silt, sand, debris, gravel, and ice and remove such deposits as required.

E36.2.12 Monitor flow from dewatering systems either using flow meters or runtime meters and submit to Contract Administrator monthly. Flow data will be used for the planning of future projects.

E36.3 Measurement and Payment

E36.3.1 The Contractor shall organize and bear all costs related to the effective dewatering of the excavations and all other pumping and drainage necessary for the proper execution of the Work, including keeping the pipes, structures, shafts, excavations, and trenches free of undesirable accumulations of groundwater, seepage, surface water, melt water or rain water. Dewatering and surface or groundwater control will not be measured and will be incidental to sewer construction.

E37. REINFORCED CONCRETE MICROTUNNELLING PIPE

E37.1 Description

E37.1.1 This Section specifies the minimum requirements for 2400mm (nominal) internal diameter Reinforced Concrete Microtunnelling Pipe (RCMP) to be installed using microtunnelling methods, as identified on the Contract Drawings. RCMP that meets the requirements as contained herein will be considered acceptable for use on this project. Microtunnelling methods shall be in accordance with E37.15.1.

E37.2 References

(a) The Contractor shall ensure that they and all their subcontractors read and comply with the latest versions of all referenced standards and specifications listed herein.

(b) Canadian Standards Association:
  (i) CAN/CSA A5 – Portland Cement.
  (ii) CSA A23.1/2 – Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  (iii) CSA A23.3 - Design of Concrete Structures
  (iv) CSA A23.4 - Precast concrete - Materials and Construction
  (v) CSA-A257.2 – Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
  (vi) CSA-A257.3 – Joints for Circular Concrete Sewer and Culvert Using Rubber Gaskets.
  (vii) CSA-A3001 – Cementitious materials for use in concrete.
  (viii) CSA W59 – Welded Steel Construction (Metal Arc Welding)

(c) American Society of Civil Engineers:
  (i) ASCE 27-17 – Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction
  (ii) ASCE 36-15 – Standard Construction Guidelines for Microtunnelling.

(d) American Society for Testing and Materials (ASTM):
  (i) ASTM A36 – Standard Specification for Carbon Structural Steel.
  (ii) ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  (iii) ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
  (iv) ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  (v) ASTM A1064 – Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
  (vi) ASTM C33 – Standard Specification for Concrete Aggregates.
  (vii) ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  (viii) ASTM C76 – Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
  (ix) ASTM C150 – Standard Specification for Portland Cement.
  (x) ASTM C443 – Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
  (xi) ASTM C497 – Standard Test Methods for Concrete Pipe, Maintenance Hole Sections, or Tile.
  (xii) ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as Mineral Admixture in Concrete.
  (xiii) ASTM C655 – Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe.

E37.3 Standard Requirements

E37.3.1 Prior to the selecting RCMP for installation, Contractor shall take into account the properties of RCMP, the means and methods that will be used to install the pipe, the specified leakage test requirements, and the ground and groundwater conditions as defined in the Geotechnical Data Report (GDR) and baselined in the Geotechnical Baseline Report (GBR).

E37.3.2 Contractor is responsible for selecting an acceptable pipe material to be installed without damage to either the pipe or the pipe joints using equipment selected by Contractor for use in the ground and groundwater conditions as defined in the GDR and GBR that meets the specified leakage test requirements.

E37.3.3 Furnish and install pipe that meets or exceeds the criteria for Class 140-D in accordance with CSA-A257.2 and the minimum requirements as contained herein.

E37.3.4 Contractor shall hire a Professional Engineer licensed in the Province of Manitoba meeting the requirements as contained herein. Contractor is responsible for the work produced by this engineer.

E37.3.5 Contractor's engineer shall evaluate the pipe design against all temporary load conditions due to handling, shipping, storage, transport, and microtunnelling installation. Design and furnish this pipe with additional strength, reinforcement, and wall thickness as necessary to withstand all temporary load conditions due to handling, shipping, storage, transport, and installation. The pipe shall be handled, shipped, stored, transported, and installed without damage.

E37.3.6 Contractors' engineer shall evaluate the joint design/configuration against all temporary load conditions due to handling, shipping, storage, transport, and microtunnelling installation as well as ensuring that the joints meet the specified leakage criteria after installation. Design and furnish joints in this pipe that meet the specified leakage criteria and that safely withstand all temporary loading conditions due to handling, shipping, storage, transport, and installation. The pipe shall be handled, shipped, stored, transported, and installed without damage to the joints, and upon installation, the specified leakage criteria shall be met. Furnish joint cushions that meet or exceed pipe manufacturer recommendations.

E37.3.7 If required, furnish Internal Jacking Station Specials in accordance with E37.15.1.

E37.3.8 Lubrication/Grout ports:

(a) Grout injection ports shall be cast into the pipe during manufacturing. Grout injection ports shall have a minimum nominal diameter of 50-mm and shall be made entirely from corrosion-resistant material.

(b) A minimum of three lubrication/grout ports must be provided at intervals of not more than 15 metres unless otherwise approved by the Contract Administrator.

(i) Lubrication/grout ports must be located at 12 o' clock, 4 o' clock, and 8 o' clock positions on the pipe circumference.

(ii) Lubrication/grout ports must be sealed with screw-type plugs capable of withstanding external water pressure of 3-bar (44 psi) or greater.

E37.4 Design Requirements

E37.4.1 RCMP pipe and class shall be as specified and shown on the Contract Drawings.

E37.4.2 The pipe shall be additionally designed by Contractor to safely withstand all anticipated temporary loads due to handling, shipping, storage, transport, and installation of the sewer pipe in accordance with ASCE 27-17, Standard Practice for Direct Design of Precast Concrete Pipe for Jacking in Trenchless Construction and the requirements as contained herein. Also account for contact grouting of the pipe after trenchless operations have been completed.

E37.4.3 Additional reinforcement, strength of pipe, wall thickness, and provisions for joints shall be designed by contractor and furnished as necessary to ensure the adequacy of the pipe for all temporary load conditions.

E37.4.4 If this pipe material cannot be manufactured with sufficient strength and/or wall thickness to withstand all of the handling, shipping, storage, transport, and trenchless installation loads, then this product shall not be considered suitable for installation on this project by microtunnelling methods. Furthermore, if the joints lack sufficient strength to withstand all of the handling, shipping, storage, transport, and jacking installation loads or if the joints

lack sufficient water tightness to meet the specified leakage criteria after installation, then this product shall not be considered suitable for installation on this project by microtunnelling methods.

E37.4.5 The minimum factor of safety for axial jacking forces shall be 2.5 based on a straight alignment.

E37.4.6 The licensed professional engineer hired by Contractor shall sign, seal, and date all pipe design submittals to include the calculations.

E37.5 Submittals

E37.5.1 Submit shop drawings and calculations 30 days prior to microtunnelling operations to the Contract Administrator for review (except as noted otherwise).

E37.5.2 Submit shop drawings in accordance with E5.

E37.5.3 Pipe design that complies with the requirements as contained herein. Provide complete design documents to include detailed calculations.

E37.5.4 Certification by Contractor's engineer that the pipe is sufficient for installation, as indicated on the Drawings using microtunnelling methods as selected by Contractor for the ground and groundwater conditions as defined in the GDR and baselined in the GBR.

E37.5.5 The pipe manufacturer shall certify that the ground and groundwater conditions, as defined in the GDR and baselined in the GBR, as well as the installation methods, as selected by Contractor, have been reviewed prior to manufacturing the pipe. Pipe manufacturer shall also certify that the pipe is manufactured in accordance with the approved pipe design submittals and the requirements as contained herein.

E37.6 Product Data:

E37.6.1 Manufacturer's product data describing materials, mix design, casting process, and testing process.

E37.6.2 Provide laboratory test results that demonstrate the pipe conforms to CSA-A257.2 and show that the pipe joints conform to CSA-A257.3.

E37.6.3 Shop Drawings showing pipe fitting and wall construction details to include length, wall thickness, reinforcement, manufacturing tolerances, pipe joint design and configuration, allowable angular deflection, packer (joint) cushions, compression rings, location of grout ports, and other pipe appurtenances. Show method for closure of ports.

E37.6.4 Pipe Fabrication Details: Submit manufacturer record keeping for maintaining quality control of the pipes during the fabrication and curing processes to include any tracking methods, serial numbers, inspections, and physical testing. Also furnish control measures and manufacturing tolerances on the straightness of pipe, squareness of pipe ends, smoothness of outside surface, inside and outside diameter of pipe, circumferential uniformity, and roundness.

E37.6.5 Manufacturer literature stating the handling, shipping, storage, transport, and installation recommendations for the pipe.

E37.6.6 Internal Jacking Station Specials (if required): The lead and trailing pipe in front of and behind an Internal Jacking Station. Furnish the design for each type of Internal Jacking Station Special to be used, complete with shop drawings that show details. The Special "A" is the pipe leading an Internal Jacking Station and the Special "B" is the pipe trailing the Internal Jacking Station during the jacking process.

E37.6.7 Provide descriptions of packers, including materials, dimensions, and products for fastening to the RCMP.

E37.6.8 Refer to section E39 for Contact Grouting.

E37.6.9 As-Constructed survey of the installed pipe.

E37.7 Packaging, Handling, Shipping, Storage, and Transport to Site

E37.7.1 Packaging, handling, shipping, storage, and site transport shall be done in accordance with the manufacturer's instructions and approved submittals. Do not ship until the pipe is marked in accordance with the requirements as contained herein. The pipes must be stored in accordance with approved submittals.

E37.7.2 Care shall be exercised in handling, storing, transporting and placing pipe to prevent damage. No interior hooks or slings shall be used in lifting pipe. All handling operations shall be done with an exterior sling or other approved device.

E37.7.3 All rubber gaskets shall be stored in as cool a place as practicable, preferably at 20º C or less, and in no case shall the rubber gaskets be exposed to the direct rays of the sun for more than 72 hours.

E37.7.4 Damaged pipes, fittings and specials will not be accepted.

E37.8 Quality Control

E37.8.1 The Contractor's engineer shall meet the following minimum experience requirements:

(a) At least five (5) years experience in the design of RCMP of similar diameters, lengths, and wall thicknesses required for the Work.

(b) Professional Engineer registered in the Province of Manitoba.

E37.8.2 Precast concrete drainage products to be supplied from a manufacturer that is prequalified by the Canadian Precast Concrete Quality Assurance (CPCQA) Certification Program for the 2400mm internal diameter RCMP as specified herein prior to the time of bid.

E37.8.3 All RCMP covered in this Section to be marked in accordance with CSA 257.2 in a position readily visible for inspection. Place serial numbers on the pipe interior for unique identification. The CPCQA certification logo is also to be marked on every pipe. Only precast pipe fabricated under the CPCQA plant certification program to be acceptable, and plant certification is to be maintained for the duration of fabrication, installation, and until warranty expires.

E37.8.4 Do not manufacture any pipe until all relevant submittals have been approved.

E37.8.5 Inspect pipe as it is delivered from manufacturer. Immediately reject any pipe that has not been properly marked, shipped, or handled in accordance with the approved submittals or that does not meet the requirements as contained herein.

E37.8.6 Allow the City/Contract Administrator access to inspect the shipping, handling, storage, transport, and installation of each pipe.

E37.8.7 The City/Contract Administrator shall also be entitled to observe and inspect the pipe manufacturing and testing process if requested.

E37.8.8 Installed pipe shall be subjected to a visual inspection walk through in conjunction with the City/Contract Administrator, if required.

E37.9 Inspection

E37.9.1 The Contract Administrator shall be entitled to inspect pipes or witness the pipe manufacturing and testing processes.

E37.9.2 Manufacturer's Notification to Contract Administrator: Should the Contract Administrator request to see specific pipes during any phase of the manufacturing process, the manufacturer shall provide Contract Administrator with adequate advance notice of when and where the production of those pipes will take place.

E37.10 Materials

E37.10.1 Cement is to be type HSb and shall conform to CSA A23.4.

E37.10.2 Aggregates shall conform to CSA 23.1/2.

E37.10.3 Pozzolan shall conform to ASTM C618.

E37.10.4 Reinforcing steel shall conform to ASTM A82, A185, A496, A497, and A615, as applicable.

E37.10.5 Rubber gaskets used in pipe joints shall meet the requirements of CSA-A257.3.

E37.10.6 External joint bands shall conform to ASTM A36.

E37.11 Dimensions

E37.11.1 Dimensions: The pipes and joints shall be in accordance with the permissible variations contained in CSA-A257.2 and CSA-A257.3, except as required below. The more restrictive of these criteria shall apply.

E37.11.2 Lengths: Pipe shall be supplied in nominal lengths as indicated on the Contract Drawings. At least 90 per cent of the total footage, excluding special order lengths, shall be furnished in nominal length sections.

E37.11.3 Wall Thickness: The minimum wall thickness, measured at the bottom of the spigot gasket groove where the wall cross-section has been reduced, shall be determined from the maximum jacking loads.

E37.12 Joints

E37.12.1 Pipe joints shall have an ASCE Type C joint configuration, unless otherwise accepted by the Contract Administrator.

E37.12.2 Pipe joints shall be gasketed joints and designed to withstand 3-bar internal and external water pressure without leakage.

E37.12.3 External joint bands shall be designed to ensure joint sealing is achieved in either straight or curved or corrective alignments and shall be epoxy coated (minimum 2 coats), zinc metalized or stainless steel (type 316).

E37.12.4 Gaskets shall meet the requirements of CSA A257.3.

E37.13 Manufacture and Construction

E37.13.1 Pipes shall conform to CSA-A257.2.

E37.13.2 Pipe joints shall conform to CSA-A257.3.

E37.13.3 Testing Pipes shall be tested in accordance with CSA-A257.2. The compressive strength of the concrete shall be tested in accordance with CSA A23.1/A23.2. Provide the results of this testing.

E37.13.4 Pipes shall be hydrostatically tested for leakage in accordance with the requirements of CSA 257.0 without leakage at the joints, except that the testing pressures shall be 3-bar or greater. Provide the results of this testing.

E37.14 Execution

E37.14.1 Examination

(a) Notify Contract Administrator immediately of manufacturing imperfections or damage caused by improper handling.

(b) Verify size, pipe condition, and pipe class prior to installation of pipe.

(c) Repairs to RCMP pipe section will be allowed, only if reviewed and approved in writing by the Contract Administrator. However, the repaired pipes will be rejected if unsound, not properly finished and cured or does not conform to the requirements of the standard.

(d) Severely damaged pipe which, in opinion of the Contract Administrator, cannot be repaired will be rejected and removed from the Project site.

E37.14.2 Installation

(a) The installation of pipe and fittings shall be the responsibility of Contractor in accordance with E37.15.1.

E37.14.3 Pipe Handling:

(a) Use methods in accordance with approved submittals and requirements as contained herein.

E37.14.4 Pipe Jointing:

(a) Inspect pipe end, gasket, and sealing surfaces for damages.

(b) Clean ends of pipe and joint components.

(c) Apply joint lubricant to the bell interior surface and the rubber seals. Use only lubricants approved by the pipe manufacturer.

(d) Use suitable equipment and end protection to push the pipes together.

(e) Do not exceed forces as recommended by the manufacturer for joining or pushing the pipe.

E37.15 Measurement and Payment

E37.15.1 Design, supply and installation of Microtunnelling pipe will be included in the Contract Unit Price per lineal meter for “Trunk Sewer, Microtunnelling” by pipe diameter which shall include all costs for labour, equipment, and materials for procurement of microtunnel boring machine and appurtenant equipment and jacking pipe as shown on the Contract Drawings and as specified herein.

E38. MICROTUNNELLING

E38.1 Description

E38.1.1 This Specification covers the minimum requirements for trenchless installation of a 2400 mm nominal diameter (ND) Reinforced Concrete Microtunnelling Pipe (RCMP) as indicated on the Contract Drawings, by microtunnelling. Appurtenant systems and measures including spoils control, treatment and disposal are included.

E38.2 References

(a) American Society of Civil Engineers:

(i) ASCE/CI 36-15 – Standard Design and Construction Guidelines for Microtunnelling.

(b) American Petroleum Institute (API)

(i) API SPEC 13A - Specification for Drilling-Fluid Materials

(c) Regulations under the Manitoba Workplace Safety and Health Act (WSH Act).

E38.3 Design and Performance Requirements:

E38.3.1 MTBM pipe jacking equipment selected for the project shall be compatible with the geologic and subsurface conditions described in the Geotechnical Data Report (GDR) and baselined in the Geotechnical Baseline Report (GBR) (i.e. capable of safely and efficiently advancing through and excavating, handling, and removing material described in the GDR and GBR).

E38.3.2 The MTBM shall be new or suitably refurbished MTBM system.

E38.3.3 The MTBM shall have provisions for access to the excavation chamber and backside of the cutterhead for inspection of tools, tool replacement, removal of obstructions or repairs.

E38.3.4 The tools on the cutter head shall be new, and of robust and suitably durable construction in order to reduce the need for frequent replacement during the drive. The cutter head shall have provision for mounting disc cutters. They shall be replaceable from the rear of the cutter head. The MTBM cutter head shall also have fresh hard facing in order to reduce

cutter head wear. The Contractor shall be responsible for inspection and regular maintenance of the MTBM.

E38.3.5 The MTBM shall be capable of fully supporting the tunnel face during both excavation and shutdown periods and shall have the capability of exerting a controllable, measurable, continuous, positive stabilizing pressure at the tunnel face required in order to prevent loss of soil and groundwater inflows.

E38.3.6 The MTBM shall have a plenum chamber capable of being pressurized. A pressure gage shall be provided to monitor the pressure exerted at the tunnel heading.

E38.3.7 Slurry MTBMs shall be equipped with a slurry booster pump to assist in the removal of waste slurry from the tunnel heading.

E38.3.8 The MTBM shall be operated, guided, and monitored continuously by the operator. The MTBM guidance system shall be designed to function at the required drive length without loss of accuracy or function.

E38.3.9 The MTBM shall be equipped with a computerized data acquisition system for collecting information for the jacking record. An on-site means of data transfer is required for transmitting the daily jacking record.

E38.3.10 The MTBM shall have an articulated shield with a water tight joint capable of withstanding external water pressure of 2 Bar (29 psi) or greater. The MTBM shall have an articulated shield that is steerable in both the vertical and horizontal directions to maintain line and grade within the specified tolerances.

E38.3.11 The MTBM shall be equipped to minimize rotation or roll of the machine during operation.

E38.3.12 The MTBM shall be equipped for continuous gas monitoring. The Contractor shall have a shut-down plan that includes activation of the slurry by-pass in the event that a gassy environment is detected in the heading.

E38.3.13 An automated lubrication injection system shall be provided and be continuously operated to inject lubricant around the jacking pipe to decrease required jacking forces. Lubrication materials may include a mixture of bentonite and/or polymers and water. Lubrication ports shall be provided in the MTBM and jacking pipe to allow for lubrication along the pipe string at intervals of not more than fifteen (15) metres. The lubrication ports in the jacking pipe shall also be used for contact grouting.

E38.3.14 The maximum radial overcut shall not exceed 50 mm. The minimum radial overcut shall not be less than 30mm. The radial overcut will be determined by the difference between the maximum diameter created by the cutting teeth (gage cutters) on the cutter head and the outer diameter of the jacking pipe divided by 2.

E38.3.15 The connections between the leading and trailing sections of the MTBM, as well as the connection between the trailing sections of the MTBM and the first pipe section shall be fully gasketed and sealed to prevent material or water from flowing into the machine during tunneling operations. The sealed joint must be capable of withstanding external water pressure of 2 Bar or greater.

E38.3.16 The jacking system, including any intermediate jacking stations shall be capable of continuously monitoring the jacking pressure, rate of advancement, and jacking distance. The jacking system shall develop a uniform distribution of jacking forces on the ends of the jacking pipe.

E38.3.17 The outer shell or “can” of the IJS shall be constructed of steel. The IJS shell shall be fully gasketed between the outer shell and the adjacent pipes. The sealed joint must be capable of withstanding external water pressure of 2 Bar (20 psi) or greater.

E38.3.18 The MTBM must have provision for high pressure water jets to aid in cleaning of tooling and help prevent the plenum chamber from becoming clogged.

E38.3.19 The MTBM shall include a spoils removal system to transport tunnel spoils through the pipe string.

E38.3.20 Where a slurry MTBM is used:

(a) The microtunnel system shall include a slurry separation plant that can achieve the rates of spoil separation and slurry cleaning required by the Contractor to achieve planned production rates. Where centrifuges are used, the Contractor must actively manage the use of polymer additives including both the polymer type and dosing rate.

(b) Slurry must be used in a closed-loop system for transporting spoils and for counterbalancing earth and groundwater pressures during microtunnelling. The treatment and disposal of process water used in the microtunnelling operation is the Contractor's responsibility. Any costs associated with the disposal of process water shall be considered to be incidental and Contractor shall be due no additional compensation.

(c) The Contractor is advised that the separation plant must fit within the allowable work areas indicated on the Contract Drawings.

E38.3.21 All excavated tunnel spoils and/or slurry must be contained in sealed trucks, tanks, or other sealed containers. Dumping of excavated spoils on the ground or into adjacent water bodies, discharge into sewers, or discharge in shafts will not be permitted unless approved in writing by the Contract Administrator. All spoils (including waste slurry or process water) to be transported and legally disposed of off-Site at an approved disposal facility that meets the Ministry of the Environment and Climate Change requirements.

E38.3.22 RCMP shall be as specified and shown on the Contract Drawings. The maximum applied jacking loads applied to the jacking pipe shall not exceed fifty percent (50%) of the ultimate compressive strength of the pipe material or the maximum design strength of the pipe, whichever is lower.

E38.3.23 The thrust block shall be perpendicular to the pipe alignment and shall be designed to withstand the anticipated jacking force with a factor of safety of a minimum of 2.0. The thrust block shall be designed to transmit the applied jacking forces to the earth behind the shaft excavation shoring without excessive deflection or displacement (causing misalignment of the jacking frame or failure of the shoring wall). The thrust block shall be removed prior to backfilling unless approved in writing by the Contract Administrator.

E38.3.24 The jacking shaft shall be designed with a concrete working slab. The Guide rails and the jacking frame shall be securely attached to the concrete working slab with supplementary concrete or grout, if necessary, to prevent movement or shifting during the Work.

E38.3.25 Ground surface settlement or heave above the tunnel centerline and within the zone of influence of the pipe jacking operations shall be limited to values that do not cause damage or distress to surface or subsurface features, utilities, or improvements and shall in no case be greater than the alert levels in E41.1.

E38.3.26 The Contractor shall perform post-construction surveys after completion of the contact grouting operations and shall document all post-construction conditions. Post-construction surveys shall be performed according to the schedule in E41.1.

E38.3.27 The Contractor shall repair any damage resulting from surface settlement or heave caused by shaft excavation, any dewatering, and/or pipe jacking at no additional cost to the City of Winnipeg. The Contractor shall pressure grout any voids caused by shaft construction or pipe jacking.

E38.3.28 Tolerances: The following tolerances apply to the pipelines installed by microtunnelling:

(a) Line Tolerance: 50mm.

(b) Grade Tolerance: 25mm.

E38.3.29 Safety:

(a) All Work must be performed in accordance with the Manitoba Workplace Safety and Health Act requirements, including, but not limited to, current applicable regulations for underground construction and pipe jacking.

(b) No gasoline-powered equipment shall be permitted in launching and reception shafts.

E38.4 Submittals

E38.4.1 Unless otherwise noted, at least 30 calendar days prior to mobilization of equipment to site for commencement of jacking operations, the Contractor shall submit three copies of design calculations and shop drawings to the City of Winnipeg for review. Provide quality assurance/quality control (QA/QC) review documentation for all calculations submitted to the Contract Administrator. All drawings shall be to scale, legible with dimensions accurately shown and clearly marked.

E38.4.2 Calculations:

(a) Submit all calculations in a digital format using appropriate design software.

(b) Submit calculations for anticipated jacking forces. The anticipated jacking forces shall be based on anticipated face pressures and frictional forces along the pipeline. Calculations shall also indicate/take into account the placement of IJS's as specified, or as required.

(c) Submit calculations demonstrating that the soils behind the thrust block are capable of sustaining the maximum anticipated jacking forces required to complete the drive or the maximum capacity of the jacking frame, whichever is less, with an appropriate factor of safety of a minimum of 2.0. Design calculations for the thrust block shall be sealed and signed by a registered Professional Engineer licensed to practice in the province of Manitoba.

E38.4.3 MTBM Pipe Jacking Operation Plan:

(a) All drawings shall be prepared in digital format using appropriate software (Autocad (DWG) file format, or other acceptable format approved by the Contract Administrator), to scale, legible with dimensions accurately shown and clearly marked in English.

(b) Drawings and photographs transmitted by a facsimile will not be accepted.

(c) MTBM Pipe Jacking Equipment Product Data and Details. Submit/provide details for the following:

(i) Submit a detailed description of the MTBM pipe jacking equipment (particularly the cutting head configuration) and procedures to be employed. Provide manufacturer's literature and operator's manual, including mechanical and electrical specifications and physical dimensions and weights, describing the MTBM pipe jacking equipment in detail, including modifications of any major component overhauled or replaced in the last 2 years.

(ii) Additionally, for a used MTBM, prior to starting this project, provide a certification in writing that the MTBM has been refurbished and reconditioned to meet the requirements for this project's conditions by a MTBM manufacturer's recommended qualified machine rebuilder. This shall include, but not be limited to motors, jacks, hydraulics, boulder crushing capability, slurry pumps, mechanical components, bearings, seals and electrical equipment. Include the qualifications of the machine rebuilder.

(iii) Method and capabilities for providing stabilizing pressure at the tunnel heading. Provide calculations for the range of face pressures anticipated to be required to stabilize the tunnel heading and the methods and equipment to be used to monitor and control face pressure. Indicate the torque required to rotate the cutter head under no face pressure as well as the maximum available torque.

(iv) Alignment control and steering system: Confirm these systems can achieve the required tolerance for pipeline line and grade. Include a description of the equipment and procedure for checking the position of the MTBM. Provide documentation that the guidance system has been calibrated for the drive length at least 30 calendar days prior to commencing pipe jacking operations.

(d) Provide details on jacking frame, including diagram of the main jacks, thrust ring, pipe brake (if required), jacking controls, and pressure gages.

(i) Provide details on the maximum jacking capacity of the jacking frame and the hydraulic pressure required to develop the maximum pressure at least 30 calendar days prior to commencing pipe jacking operations.

(ii) Provide the conversion factor from gauge pressure for the hydraulic jacks to thrust, in tons.

(e) Survey of Jacking Frame Rails: Contractor shall submit results of survey of installed jacking frame rails to confirm design line and grade prior to launch of the MTBM.

(i) Submit results of preliminary survey for at least 30 calendar days prior to commencing with pipe jacking operations.

(f) Lubrication System Product Data and Details. Submit/provide details for the following:

(i) Lubrication injection system used for lubrication of the pipeline during pipe jacking operations.

(ii) Lubrication port locations and orientation to be used along the pipeline and the injection scheme that will be used. Provide details of the calculated volume of the annular space (the minimum volume that will be continuously pumped throughout the installation procedure).

(iii) Provide description of the lubrication materials that will be used.

(g) Provide details on spoils/muck handling, transport, and disposal equipment and procedures. Submit/provide details for the following:

(i) For Slurry MTBMs: Slurry mixing, separation, and recirculation systems. Details shall be provided on the planned slurry composition and any slurry additives that are anticipated for use during the microtunnelling operations. The use of water alone as a slurry is prohibited.

(ii) For Slurry MTBMs: Diagrams showing the location of all slurry delivery and return pumps.

(iii) For Slurry MTBMs: Detailed description of slurry separation plant, including dimension, specifications, noise ratings and soundproofing.

(iv) For EPB MTBMs: Spoil conditioning and earth pressure management system (i.e., screw conveyor).

(v) For EPB MTBMs: Spoil transport system.

(vi) Include written documentation signed by the disposal site manager, indicating the site will accept the tunnel spoils/slurry and are in compliance with all applicable local, provincial and federal environmental regulations including the Ministry of the Environment and Climate Change.

(vii) Provide tunnel spoils transport plans including route of travel and measures taken to avoid spillage on-site or between tunneling site and receiving site at least 30 calendar days prior to commencing pipe jacking operations.

(viii) Spoils/muck handling, transport, and disposal procedures must comply with E9.

(h) Provide details on the intermediate jacking stations, including detailed drawings of the alignment of the jacks, the number and capacity of each jack, and the instrumentation for recording jacking pressures at each IJS location as required.

(i) Provide details on the entry and exit seals and the mounting procedures.

(j) Provide details on procedures to confirm stable ground conditions at entry and exit shafts on break-in and break-out respectively.

(k) Provide details on procedures and materials used to grout the overcut annular space upon completion of microtunnelling activities. Refer to E39.

(l) Provide details on the on-site equipment including dimensions, noise ratings and soundproofing. The on-site equipment shall meet local noise regulations and E10. Vibrations produced by the equipment shall be below peak particle velocity levels of 50mm per second at a distance of 3m and shall not cause surface settlement, settlement or damage to adjacent improvements or structures.

(m) Qualifications of site superintendent, MTBM operator(s) and tunnel surveyor meeting the requirements stated herein.

(n) Prior to launch of the MTBM, provide a written inspection report prepared and signed by the manufacturer's representative and/or the Contractor's designated competent person documenting the MTBM condition including conditions of the cutter head, bearing, hydraulic, electrical, sensors and all systems of the MTBM specified in this Section. Include qualifications of the manufacturer's representative and/or a designated competent person preparing the report. The report shall include measurements of wear on the cutting tools, pictures to document conditions and statement if the cutting tools are required to be replaced. Similar report is required at the beginning and end of each drive. Upon determination by manufacturer's representative or a designated competent person, worn cutters shall be changed before launch to reduce potential stoppages during tunnelling. Records of the start-up inspection shall be submitted to the Contract Administrator/City of Winnipeg within 24 hours of the completed inspection for each drive.

E38.4.4 Schedule:

(a) Provide a schedule for all microtunnelling work, identifying all major construction activities as independent items.

(b) The schedule shall include, as minimum, the following activities:

(i) Refurbishment/Manufacture MTBM.

(ii) Mobilization, jacking equipment setup, MTBM launch for each tunnel drive, contact grouting, cleanup, and demobilization.

(iii) The schedule shall also include the working hours for each activity, and a written description of the construction activities.

(iv) The schedule shall be reviewed by the Contract Administrator and will be updated and resubmitted by the Contractor every two weeks or more frequently if requested by the Contract Administrator.

E38.4.5 Daily Records

(a) The following daily records shall be submitted to the Contract Administrator for review no later than the day following shift for which the data was collected

(b) Jacking Records: the MTBM operating system shall continuously provide performance data to the operator. Recorded data shall be referenced to time and shall be recorded at time intervals of two minute or less. A minimum of seven (7) days prior to the launch of the MTBM, the Contractor shall submit a sample of any necessary operating system output and programs to interpret MTBM performance data. MTBM performance data (1 digital and 2 printed copies) shall include, at a minimum, the following:

(i) The name of the operator.

(ii) Tunnel drive identification.

(iii) The installed length of tunnel

(iv) The date and time.

(v) Rate of advancement.

(vi) MTBM position

(vii) Jacking forces at main jacks.

(viii) Slurry inlet and outlet flow rates and pressures.

(ix) Face pressure.

(x) MTBM cutterhead torque

(xi) MTBM roll

(xii) Steering adjustments.

(xiii) Line and grade deviations.

(xiv) Jacking force at all intermediate jacking stations (if required)

(c) In addition to the above data, the Contractor shall manually record observations at intervals of a minimum of two times per pipe section, as conditions change, or as directed by the Contract Administrator. Manually recorded observations shall include, at a minimum, the following:

(i) The name of the operator.
(ii) Tunnel drive identification.
(iii) The date and time.
(iv) The installed length of tunnel.
(v) Average rate of advancement.
(vi) Average jacking forces.
(vii) Average slurry inlet and outlet flow rates and pressures.
(viii) Average face pressure.
(ix) Average cutter head torque.
(x) Average machine roll and inclination.
(xi) Tunnel spoils quantity excavated per pipe section based on spoil/muck cart volumes.
(xii) Any movement of laser.
(xiii) Use of intermediate jacking stations.
(xiv) Any problems encountered including vibration observations where higher than normal.
(xv) Duration of any stops.

E38.4.6 Lubrication Records:

(a) Provide lubrication records, including the amount of lubrication pumped throughout the drive, reported as pumped volume per pipe, and total pumped volume for each shift. Provide port locations where lubricant was pumped.

E38.4.7 Slurry Composition:

(a) Provide records detailing the composition and properties of the slurry, including any additives. Records shall be submitted with the daily jacking records. The time and volume of any addition to the slurry shall be noted. Measurements of density and viscosity will be made at the beginning, middle, and end of each shift, and submitted with the daily jacking records. Measurements will be taken at the charge and discharge lines and noted accordingly. The Contractor shall keep accurate records of slurry additions, including volumes added to the slurry tanks.

E38.4.8 Spoils/Slurry weights:

(a) Provide truck weigh tags or similar documentation detailing the weight of spoils/slurry removed from Site. Documentation shall be provided to the Contract Administrator at the end of each Working Day.

E38.4.9 Survey Measurement:

(a) Refer to E41.1.

E38.4.10 Safety Plan:

(a) Protection of Adjacent Structures: Provide details on measures to be taken to monitor and protect adjacent utilities, structures, and roadways. Provide details on monitoring equipment and provisions including the confirmed layout of all surface settlement points and other monitoring points.

(b) Submit safety plan for personnel conducting the pipe jacking operations, including but not limited to provisions for lighting, ventilation, and electrical system safeguards. Include in the safety plan a copy of safe practices and an emergency response and mine rescue plan in accordance with applicable regulatory requirements.

E38.4.11 Contingency Plans:

(a) Submit contingency plans at least 30 calendar days prior to start of work to Contract Administrator for approval for the following:

(i) Obstruction Removal

i Procedure to remove obstruction by means of a rescue shaft.

ii Procedure to remove obstruction through MTBM face/chamber access.

iii Procedure to remove obstruction that breach the pipe from within the pipe string.

(ii) Machine unable to advance.

i Possible obstruction.

ii Machine malfunction.

(iii) Strong hydrocarbon smell is detected in the slurry return lines or in the jacking or receiving shaft.

(iv) Gas monitors indicate the presence of gas in tunnel over 20% LEL.

(v) MTBM guidance system malfunction caused by heat, humidity, or physical disturbance.

(vi) Jacking forces:

i Jacking forces increase dramatically or suddenly.

ii Jacking forces reach design capacity of pipe casing, jacking frame, or thrust block (treat these scenarios as separate incidents).

(vii) Settlement/Heave:

i Excavated volumes exceed pipe casing volume plus overcut volume.

ii Slurry face pressures and/or torque on head decrease suddenly and/or significantly.

(viii) Slurry Returns to Ground Surface:

i Describe procedures for preventing slurry losses or spills to or on the ground surface (including watercourses). The plan shall also address changes that may be required to the Contractor’s operations to avoid recurrences.

(ix) Groundwater inflow to shaft increases significantly and/or transports soils into shaft in measurable quantities.

(x) Steering difficulties result in line and grade tolerances and/or allowable steering corrections being exceeded.

(xi) Pipe damaged or found to be out of compliance with specifications.

i Before installation.

ii During or after installation.

(xii) Thrust block deforms excessively (causing misalignment of the jacking frame or failure of the shoring wall) under jacking loads or provides insufficient capacity to advance pipe.

(xiii) Voids are created by inadvertent over-excavation.

(xiv) Control signal is lost. Cannot monitor position, torque, thrust, steering jack position or other MTBM performance parameters.

(xv) Plan for failure of main drive components including main drive bearing.

(xvi) For Slurry MTBMs: Slurry separation problems.

i Cuttings do not settle out using the Contractor’s on-Site slurry separation plant.

ii Slurry density results in segregation and slurry line plugging

iii Cuttings settle out in the slurry lines before reaching the separation plant.

(xvii) For EPB MTBMs: cuttings conditioning problems.

i Cuttings do not achieve required consistency (i.e., too wet/liquid or too dry/solid).

(xviii) Breach of entry or exit seal.

(xix) Leakage through pipe joints.

(xx) MTBM guidance system malfunction caused by heat, humidity, or physical disturbance.

(xxi) Slurry/Lubrication Returns to Ground Surface or to Surface Waters:

i Describe procedures for preventing and mitigating slurry/lubrication losses or spills to or on the ground surface/surface waters. The plan shall also address changes that may be required to the Contractor's operations to avoid recurrences.

E38.4.12 Site Layout Plans:

(a) The Contractor shall submit shaft layout drawings detailing locations of all equipment used in the pipe jacking operation including but not limited to crane, generator, pipe and materials storage area, sound baffles, and staging area. Shaft layout drawings will be required for each launch shaft location and shall be to scale.

E38.4.13 Intermediate Jacking Station:

(a) Provide structural details of intermediate jacking station including male and female pipe segments as required.

E38.4.14 Survey of Jacking Frame Rails:

(a) The Contractor shall submit results of survey of installed jacking frame rails to confirm design line and grade prior to launch of the MTBM.

E38.4.15 As-Built Survey:

(a) For each microtunnel drive, within 30 days after completion, submit an as-built survey providing the line, elevation, and stationing for the first pipe, last pipe, every third pipe in the string, and the steel push rings for the IJS. Provide the as-built survey data in AutoCAD and CSV formats.

E38.4.16 Qualifications: Submit qualifications of Contractor and key personnel meeting requirements specified herein.

E38.5 Quality Assurance

E38.5.1 The Contractor shall employ MTBM pipe jacking supervisory personnel and operators with the following minimum qualifications:

(a) Microtunnel Project Manager and Microtunnel Site Superintendent as identified in the Contractor's prequalification submission, or City of Winnipeg approved alternates.

(b) Operator with minimum five years of microtunnelling experience.

(c) Microtunnel Surveyor with minimum five years of experience surveying on underground construction with at least one year experience in surveying tunnel construction.

E38.5.2 The microtunnel site superintendent and/or operator shall be on-site full-time during the microtunnelling operations.

E38.5.3 The Contractor shall ensure that MTBM operators are familiar with the operational procedures recommended by the MTBM manufacturer, including those for curved drives, and shall have received training in operation of the MTBM used for the project from the manufacturer, or from a trainer familiar with the MTBM.

E38.5.4 The Contractor shall ensure that personnel engaged in set up and operation of the MTBM guidance system shall be trained in the use of the system.

E38.6 Site Conditions

E38.6.1 Excavation will be executed around existing structures and underground utilities. Take all of the necessary precautions to ensure that utilities and services are not interrupted unless prior written permission is granted by the City of Winnipeg or Contract Administrator

E38.6.2 Refer to the Contract Drawings, Geotechnical Baseline Report (GBR) and Geotechnical Data Report (GDR) which form part of these Contract Documents.

E38.7 Products

E38.7.1 Jacking Pipe

(a) Reinforced Concrete Microtunnelling Pipe (RCMP) in accordance with E36. Contractor to be responsible for the supply of packers and threaded caps for lubrication ports.

E38.7.2 Contact Grout

(a) Contact grout in accordance with E39.

E38.7.3 Pipe Lubricant

(a) Additives and chemicals may be added to the pipe lubricant, upon the approval of the Contract Administrator, to maintain the necessary properties. Restrict the use of polymers and additives, and their disposal to all applicable laws, ordinances, and regulations.

E38.7.4 Bentonite:

(a) Shall be a commercially processed powdered bentonite in accordance with API SPEC 13A.

(b) Applicable literature shall be submitted of the bentonite manufacturer. The manufacturer's recommended handling, storage, transport and treatment procedures for the bentonite shall be included.

E38.7.5 Packers:

(a) Packers shall not be less than 19 mm thick.

(b) Packers shall be designed and cut in consultation with the Contractor’s jacking pipe design engineer such that the cushioning material does not adversely affect pipe joint sealing or axial jacking capacity and to ensure the full bearing width of the joint is protected.

E38.8 Execution

E38.8.1 Installation

(a) General

(i) The Contractor shall not begin microtunnelling operations until the following requirements have been met:

(ii) All required submittals have been made and the Contract Administrator has reviewed and accepted all submittals.

(iii) Required pre-construction surveys have been completed.

(iv) Shaft excavation and support has been completed in accordance with E33.

(v) A pre-construction safety conference has been conducted. The conference must be arranged and the Contract Administrator notified of the date a minimum of 7 Days in advance of the conference.

(vi) Necessary materials, equipment and facilities, including pipe, spoils handling, etc., are on-site and available to prevent delays in pipe installation.

(b) MTBM Microtunnelling

(i) MTBM installation of the pipeline shall be between the limits indicated on the Drawings to the specified line and grade and shall be accomplished using methods which include due regard for safety of workers, adjacent structures and improvements, utilities, and the public. Launch and reception shafts shall

be located approximately as indicated on Drawings, unless otherwise approved in writing by the Contract Administrator. The Contractor shall verify the exact size and location of all launch and reception shafts prior to excavation.

(ii) The Contractor shall furnish all necessary equipment, power, water, and utilities for MTBM operation, shafts excavation, removal and disposal of spoils, and other associated work consistent with the Contractor's methods of construction.

(iii) The Contractor shall retain a Surveyor with a minimum of five (5) years of experience in tunnel surveying to survey the location and orientation of the jacking frame, guide rails and entry/exit seals prior to starting microtunnelling operations to ensure they are on the proper line and grade.

(iv) Prior to launch of the MTBM, the Contractor shall conduct a start-up inspection of all mechanical and hydraulic systems associated with the MTBM operations. The system will be tested on the surface to ensure that the MTBM and supporting equipment is functioning properly. The Contract Administrator shall be notified a minimum of 3 Working Days prior to the start-up inspection and a site inspector representing the Contract Administrator will be present during the start-up inspection. Key machine performance data will be measured and recorded during this inspection, including cutter head torque, correct functioning of steering jacks, guidance system, and other components. Records of the start-up inspection shall be submitted to the Contract Administrator within 24 hours of the completed inspection.

(v) The Contractor shall position thrust blocks normal to the proposed pipeline alignment. If a concrete thrust block or treated soil zone is used, concrete or other materials shall have attained the required strength before jacking.

(vi) The Contractor shall stage construction to ensure that microtunnelling progresses in an as continuous and uninterrupted a fashion as possible. Extended stoppages or down time must be minimized to the greatest extent possible.

(vii) The Contractor shall ensure that each pipe section shall be jacked as the excavation progresses in such a way that no length of tunnel is left unsupported at any time.

(viii) The Contractor shall ensure that steering corrections are gradual, with corrections made at a maximum rate of 25mm over 7.5m of drive length.

(ix) The Contractor shall jack the pipes into place without damaging the pipe. In the event a section of pipe is damaged during the jacking operation, the pipe shall be jacked through to the receiving shaft and removed.

(x) The Contractor shall control the advance rate of the machine and shall balance the rate of removal of excavated material with the rate of excavation and pipe installation to avoid over-excavation that can lead to subsidence or under-excavation that can lead to heave.

(xi) The MTBM guidance system shall be securely mounted and be independent from the jacking frame and thrust block. The Contractor shall stop tunneling and immediately notify the Contract Administrator if the guidance system malfunctions or has been disturbed and must be reset.

(xii) If the pipeline installation does not meet the specified tolerance, the Contractor shall correct the installation, including, if 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 of Winnipeg and is subject to the approval of the Contract Administrator.

(xiii) The Contractor shall measure, maintain and control the face pressure exerted at the tunnel heading to balance soil and groundwater pressures and prevent loss of ground, groundwater inflows, and settlement or heave of the ground surface and formation of voids.

(xiv) The Contractor's operations shall prevent excessive settlement or heave of the ground. The Contractor shall repair any damage resulting from surface settlement or heave caused by shaft excavation, shaft dewatering, or tunneling

at no additional cost to the City of Winnipeg and will modify any practices that caused or contributed to the ground disturbance to avoid continuing or reoccurring problems.

(xv) The Contractor shall take active measures to prevent loss of ground during launch and retrieval of the machine. Soil, groundwater or slurry inflows into the shaft during launch and retrieval will not be permitted. A launch and retrieval seal will be required for the tunnel drive. A pipe brake shall be used as necessary to prevent backward movement of MTBM and pipe string.

(xvi) The Contractor shall use alignment control and steering system capable of maintaining the position of the MTBM to the specified line and grade.

(xvii) The Contractor shall use an automated lubrication injection system to provide continuous lubrication of the pipeline. Lubrication material shall be pumped in sufficient volume to completely fill the annular space around the pipeline, or that area between the outer diameter of the pipe and overcut diameter. Pipes with lubrication ports shall be provided at maximum 15m on center. Lubricant injection pressure shall not exceed 30kPa greater than the external hydrostatic pressure.

(xviii) The composition of the slurry shall be monitored by the Contractor during pipe jacking operations. Density and viscosity measurements shall be taken at no more than two-hour intervals and must be included with the daily jacking record. Measurements are to be taken at the charge and discharge lines and noted accordingly. The Contractor shall keep accurate records of slurry additions, including volumes added to the slurry tanks

(xix) Intermediate Jacking Stations (IJS): The Contractor shall maintain a minimum of one IJS on hand at all times and install/operate if jacking forces reach 50 per cent of the ultimate compressive strength of the pipe material or the maximum design strength of the pipe, whichever is lower. The Contractor shall insert the IJS in the pipeline and actuate the IJS to distribute jacking forces along the pipe string. The Contractor shall evaluate the need for additional IJS(s) based on rational assessment of anticipated jacking force and Contractor's operations and work plan. The microtunnel equipment shall be capable of continuously monitoring the jacking forces at the IJS. This information shall be recorded on the daily jacking records. Upon completion of the microtunnel drive, the IJS hydraulic jacks shall be fully removed and the adjacent pipe sections shall be pushed together.

(xx) Further to E8, The Contractor shall conduct all operations such that trucks and other vehicles do no create dust or mud nuisance or traffic hazard in the street and adjacent properties. Any tunnel spoils/slurry spillage or slurry/lubrication breakthroughs shall be promptly cleaned up, removed and properly disposed.

(xxi) The Contractor shall perform all Work so as not to disturb roadways, adjacent structures, landscaped areas, or utilities. Any damage shall be immediately repaired by the Contractor to the satisfaction of the Contract Administrator, at no additional cost to the City of Winnipeg.

(xxii) If the pipe jacking operation encounters an obstruction that stops the forward progress of the MTBM, impedes forward progress along the design path and within allowable tolerances or causes severe damage to the pipe, the Contractor shall notify the Contract Administrator immediately. The Contractor shall remove, clear, or otherwise make it possible for the MTBM and jacked pipe to advance past any obstructions. Upon written notification of the Contract Administrator, the Contractor shall immediately proceed with the removal of the obstruction by means of an obstruction removal shaft or by the other approved means, as submitted by the Contractor and approved by the Contract Administrator in reviewed submittals. An obstruction removal shaft shall consist of a small excavation for the purpose of removing the obstruction. Obstruction removal shafts shall be designed by a Professional Contract Administrator licensed in the province of Manitoba and must be reviewed by the Contract Administrator. Any obstruction removal process that does not allow direct

inspection of the nature and position of the obstruction will not be considered for payment. The Contractor shall receive no additional compensation for removing, clearing, or otherwise making it possible for the MTBM to advance past objects which do not meet the definition of an obstruction.

(xxiii) In the event that voids are created along the tunnel, the Contractor shall grout the voids using the lubrication/grout ports and materials and procedures that have been submitted in the Contingency Plan and reviewed with no exception taken by the Contract Administrator. The Contractor shall immediately modify construction practices or equipment as appropriate to avoid or protect against further voids and damage.

(xxiv) The Contractor shall perform all Work within the noise requirements as specified in the Contract Documents and in accordance with the requirements of the Ministry of the Environment and Climate Change.

(c) Settlement/Heave Monitoring

(i) Refer to E41.1.

(d) Temporary Fencing and Protection of Public

(i) The Contractor shall provide and maintain such guards, fences, barriers, signs, lights, watchpersons and other safety devices adjacent to and on the Site as may be necessary to prevent accidents and damage to property, the environment, and the public. The Contractor shall furnish, place and maintain such lights as may be necessary for illuminating the said safety devices.

(ii) The Contractor shall provide temporary fences and other protective measures necessary to protect the public and to protect the Work and temporary facilities against theft, violence, trespass, or vandalism.

(e) Contact Grouting

(i) Upon completion of tunneling, all grout ports shall be checked and injected with grout to ensure filling of the overcut annular space around the carrier pipe as specified in E39.

E38.8.2 Completion and Acceptance:

(a) Perform an as-built survey of the completed microtunnel.

(b) Leakage testing will not be required, any infiltration into the pipe with observable trickle flow will require sealing.

E38.8.3 Field Quality Control

(a) The Contractor shall provide a minimum of 3 Working Days' advance written notice to the Contract Administrator of the planned commencement of microtunnelling Work.

(b) All microtunnelling Work performed by the Contractor shall be performed in the presence of the Contract Administrator unless the Contract Administrator grants prior written approval to perform such work in the Contract Administrator's absence.

(c) 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 than those represented within the Contract Documents.

(d) The Contract Administrator's inspector shall have full and unfettered access to all areas of the Work, including the operations control station, the mucking/separation plant and shafts for inspection and collection of data, measurements, slurry/spoil samples and observations at all times and without restriction.

E38.9 Measurement and Payment

E38.9.1 Pipe installed by Microtunnel shall be measured on a lineal meter basis and paid for at the Contract Unit Price for "Trunk Sewer, Microtunnelling". Measurement for length of tunnel will be made horizontally at grade above the centreline of pipe through shafts from the downstream face of the upstream manhole to the upstream face of the downstream

manhole. The price shall include all Work described herein (with the exception of shaft installation).

E38.9.2 The unit price for this item shall include all costs to supply and install the reinforced concrete jacking pipe, liner, cap strips, welding and QAQC, lubrication, contact grouting, and microtunnelling plan development. Costs shall include the supply and use of microtunnel boring machines (MTBM), slurry management units, lubrication and grouting systems, and ancillary equipment needed to install the interceptor sewer on line and grade.

E38.9.3 Price shall include all water, drilling fluids, polymers, and admixtures required for the installation. Price shall also include all management, testing, and disposal for the disposal of drilling fluids and cuttings.

E38.10 Payment Schedule

E38.10.1 Microtunnelling listed on Form B: Prices will be paid in accordance with the following payment schedule:

(a) 30% paid upon completion of pipe installation

(b) 50% paid upon completion of contact grouting

(c) 20% paid upon completion of joint welding, internal grouting and QAQC documentation

E39. CONTACT GROUTING

E39.1 Description

E39.1.1 This Specification covers contact grouting to fill the voids resulting from over-excavation of ground outside the 2400 Reinforced Concrete Microtunnelling Pipe (RCMP) during Microtunnelling.

E39.2 References

(a) American Society for Testing and Materials (ASTM)

(i) ASTM C 109/C109M Standard Test Method for Compressive Strength Testing of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens.

(ii) ASTM C138/C138M, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

(iii) ASTM C144, Standard Specification for Aggregate for Masonry Mortar

(iv) ASTM C150/C150M, Standard Specification for Portland Cement

(v) ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete

(vi) ASTM C618 REV A, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

(vii) ASTM C937, Standard Specification for Grout Fluidifier for Preplaced-Aggregate Concrete

(viii) ASTM C939, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)

(ix) ASTM C940 REV A, Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory

(x) ASTM C942, Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory

(xi) ASTM C953, Standard Test Method for Time of Setting of Grouts for Preplaced-Aggregate Concrete in the Laboratory

(xii) ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

(b) Provincial/Municipal Standard Specification

(i) CW 2160 – Concrete Underground Structures and Works

(ii) CW 2030 – Excavation Bedding and Backfill

E39.3 Design Requirements

E39.3.1 All voids between the outside of the carrier pipe (2400 RCMP) and the excavation surface shall be completely filled with contact grout.

E39.3.2 Contact grout shall have a minimum compressive strength of 0.35 MPa at 24 hours and a maximum compressive strength of 5 MPa at 28 Days.

E39.4 Submittals

E39.4.1 Shop Drawings:

(a) Submit shop drawings and work plans 15 Days prior to starting grouting operations to Contract Administrator for review (except as noted otherwise) for the following:

(b) Detailed contact grouting plan including the following:

(i) A plan detailing the proposed sequence of contact grouting.

(ii) Materials including contact grout mix design, unconfined compressive strengths, and set times. Provide technical specifications and Material Safety Data Sheet (MSDS) for grout materials.

(iii) Equipment including mixers, pumps, grout injection hoses and grouting port connections, gauges, etc.

(iv) Methods of contact grouting execution and sequences including injection pressures and methods of controlling contact grout pressure.

(v) Anticipated contact grout injection volumes.

(vi) Methods of monitoring and evaluating quality assurance including methods of grout sampling and compressive strength testing.

(vii) Cleanup and restoration.

E39.5 Daily Records:

E39.5.1 Maintain and submit daily logs of contact grouting operations, including pressures, volumes, and grout mix pumped, time of pumping, and slump of grout mix.

E39.6 Quality Assurance

E39.6.1 Contractor shall perform a minimum of one slump test from each truck load or batch of contact grout.

E39.6.2 Contractor shall perform 7-Day and 28-Day compressive strength tests on samples from each truck load or batch of contact grout. Grout for the cylinders or cubes shall be taken from the nozzle of the grout injection line.

E39.7 Site Conditions

E39.7.1 Refer to the Contract Drawings, Geotechnical Baseline Report (GBR and Geotechnical Data Report (GDR) which form part of these Contract Documents.

E39.8 Materials

E39.8.1 Portland Cement shall be according to CW 2160 clause 2.1.

E39.8.2 Water shall be according to CW 2160 clause 2.4.

E39.8.3 Aggregates shall be according to CW 2160 clauses 2.2 and shall have a maximum aggregate size of 4.75mm. Slag aggregate shall not be used.

E39.8.4 Admixtures shall be according to CW 2130 clause 2.5.

E39.8.5 Fluidifier shall be according E39.14.1.

E39.8.6 Bentonite: Shall be a commercially processed powdered bentonite, Wyoming type, such as Imacco-gel, Black Hills or approved equal.

E39.9 Equipment

E39.9.1 Equipment for mixing and injecting grout shall be adequate to satisfactorily mix and agitate the grout and force it into the grout ports in a continuous flow at the desired pressure. Pumps shall be capable of continuously developing a sustained pressure of 100 kPa at the grout port connection.

E39.9.2 The grouting equipment shall be maintained in operating condition to the satisfaction of the Contract Administrator throughout the course of the Work to ensure continuous and efficient performance during grouting operations

E39.9.3 Two pressure gauges shall be provided; one at the grout pump and one at the collar of each port being grouted. The accuracy of the gauges shall be periodically checked with an accurately calibrated pressure gage.

E39.9.4 Suitable stop valves shall be provided at the collar of each port for use in maintaining pressure as required until the grout has set.

E39.9.5 The grouting equipment shall be provided with a meter to determine the volume of grout injected.

E39.9.6 Grout hoses shall be capable of withstanding the maximum water and grout pressures to be used.

E39.10 Installation

E39.10.1 Microtunnelling

(a) Contact grouting shall be performed as specified herein. An attempt must be made to hook up and pump grout at every grout port or coupling unless approval is granted by the Contract Administrator to skip selected ports.

(b) Immediately after completion of the microtunnelling operations, the Contractor shall inject contact grout through the grout connections in such a manner that will completely fill all voids outside the pipe resulting from the auger boring or microtunnelling operations. Grout pressure shall be controlled in order to avoid damaging the pipe and to avoid movement of the surrounding ground or improvements.

E39.10.2 Grout Mixes

(a) The Contractor shall develop one or more grout mixes designed to completely fill the annular space outside the pipe and to provide strength and durability acceptable to the Contract Administrator. All grout mix proportions shall be submitted a minimum of 15 Calendar Days prior to scheduled use for review and acceptance by the Contract Administrator.

E39.10.3 Mixing and Injection of Grout

(a) All grouting operations are to be performed in the presence of the Contract Administrator. Notify the Contract Administrator a minimum of one Working Day in advance of starting grouting operations.

(b) All materials shall be free of lumps when put into the mixer, and the grout mix shall be constantly agitated. Grout shall flow unimpeded and shall completely fill all voids. Grout not injected after 2 hours of mixing shall be disposed of in a manner complying with all applicable environmental regulations at no additional cost to the City of Winnipeg.

(c) The grouting process shall be operated and controlled so that the grout will be delivered uniformly and steadily.

(d) Do not perform grouting without the appropriate pressure gauges and flowmeters in place and in working order.

(e) Contact grout must be injected through grout ports that have been installed in the pipe prior to installation. Drilling grout ports through the installed pipe will not be permitted.

(f) Contact grouting shall progress from grout port to grout port in the sequence indicated on the approved shop drawings.

(g) In general, contact grouting will be considered completed when less than 28 litres of grout can be pumped in 10 minutes under the specified maximum pressure. After the grouting is finished, the pressure shall be maintained by means of a stop valve or other suitable device until the grout has set to the extent that it will be retained in the grout port. Replace grout plugs in pipe at the completion of contact grouting.

(h) Contact grout port fittings shall be sealed with screw type plugs upon completion of contact grouting. Plugs shall be covered with an appropriate grout compound.

(i) Unless otherwise directed by the Contract Administrator the minimum contact grouting pressure shall be 35kPa and the maximum sustained contact grouting pressure shall be 55kPa, as measured at the grout port collar connection.

E39.11 Cleanup

E39.11.1 Take all necessary precautions to protect and preserve the interior surfaces of the pipe from damage. Grout spills shall be minimized and contained, and cleanup shall proceed immediately after grouting. Any damage to the pipe caused by or occurring during the grouting operations shall be repaired by a method approved by the Contract Administrator at no additional cost to the City of Winnipeg.

E39.11.2 Remove and properly dispose of all waste grout resulting from grouting operations.

E39.12 Field Quality Control

E39.12.1 Maintain and submit daily logs of grouting operations, including pressures, volumes, and grout mix pumped, time of pumping, and slump of grout mix.

E39.12.2 Daily compressive strength testing of grout cubes. Contractor shall test a minimum of four (4) cubes per day on which grouting is performed and submit all records to the Contract Administrator.

E39.13 Pressure gauges and flowmeters

E39.13.1 Perform testing of all field gauges and flowmeters at least once every week using the accurately calibrated pressure gauge and flowmeters.

E39.13.2 Perform field tests in the presence of the Contract Administrator

E39.13.3 Verify accuracy of pressure gauges and flowmeters though the use of a test laboratory at least once every two months.

E39.14 Measurement and Payment

E39.14.1 All costs associated with this Specification shall be incidental to “Trunk Sewer, Microtunnelling”.

E40. TUNNEL AND SHAFT GROUTING

E40.1 Scope

E40.1.1 This Section covers the minimum requirements for stabilization grouting and cut-off grouting in tunnels and shafts as required in order to complete the Project.

E40.1.2 The Contractor shall be responsible for all phases of the control of the quality and workmanship to the satisfaction of the Contract Administrator. The Contractor shall furnish all labour, materials, equipment, and incidentals necessary for drilling grout holes, installing pipe for grouting, connections to grout holes, and grouting.

E40.2 References

(a) American Society for Testing and Materials (ASTM)

(i) ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

(ii) ASTM C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

(iii) ASTM C144 Standard Specification for Masonry Mortar

(iv) ASTM C150 Standard Specification for Portland Cement

(v) ASTM C494 Standard Specification for Chemical Admixture for Concrete

(vi) ASTM C618 Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

(vii) ASTM C937 Standard Specification Grout Fluidifier for Preplaced-Aggregate Concrete

(viii) ASTM C939 Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)

(ix) ASTM C940 Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Preplaced-Aggregate Concrete in the Laboratory

(x) ASTM C942 Standard Test Method for Compressive Strength of Grout for Preplaced-Aggregate Concrete in the Laboratory

(xi) ASTM C953 Standard Test Method for Time of Setting of Grout for Preplaced-Aggregate Concrete in the Laboratory

(xii) ASTM C1017 Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete

(b) Canadian Standards Association

(i) CSA A23.1-09 Concrete Materials and Methods of Concrete Construction

(ii) CSA A23.2-09 Test Methods and Standard Practices for Concrete

(iii) CSA A3000 Cementitious Materials Compendium

(c) Manitoba and Winnipeg Provincial/Municipal Standard Specifications

(i) CW 2160 – Concrete Underground Structures and Works

(ii) CW 2030 – Excavation Bedding and Backfill

(d) U.S. Army Corps of Engineers

(i) USACE CRD C621 Specification for Non-shrink Grout

E40.3 Design and Submission Requirements

E40.3.1 Submit documentation indicating the experience and qualifications of the grouting supervisors demonstrating that each supervisor meets the requirements specified herein.

E40.3.2 Submit, prior to shipping equipment and at least 30 days prior to grouting, a description of materials, grout mix, equipment and operational procedures for each of the grouting techniques. Include:

(a) Location of mixing equipment, pumps, injection points.

(b) Venting method.

(c) Extent of possible grout envelopes.

(d) Direction of flow.

(e) Material Certificates of Compliance.

(f) Pressure measurement and maximum allowable pressure; certification of calibration of pressure gauges and flow meters.

(g) Volume measurement.

(h) Description of proposed stage grouting sequence, injection pressures, grout materials, mix proportions, and procedure for altering mix proportions based on observed grout take.

(i) Details of each batch of grout injected including mix, start time, start pressure, stop time, stop pressure, rate of pumping and volume injected including estimated wastage.

E40.3.3 Maintain daily logs of grouting operations. Within 24 hours of any grouting application, provide location (chainage) and details of such application, including number and layout of grout holes, types or depth of grout, graphical grout-take logs, injection pressures, water pressure injection tests, and other relevant data depending on the application and the grout type.

E40.3.4 Submit a grout mix design report at least 30 days prior to grouting, including:

(a) Grout type and designation.

(b) Grout mix constituents and proportions, including materials by weight and volume.

(c) Grout densities and viscosities, including wet density at point of placement.

(d) Initial set time of grout.

(e) Bleeding, shrinkage/expansion.

(f) Compressive strength.

E40.4 Products

E40.4.1 General

(a) Do not include toxic or poisonous substances in the grout mix or otherwise inject such substances underground.

(b) All materials shall be free of lumps when put into the mixer and the grout mix shall be constantly agitated. Grout shall flow unimpeded and shall completely fill all voids.

(c) Cement:

(i) GU, according to CW 2160 and CSA A3000

(ii) Type 30 or ultrafine cement.

(iii) Only cement furnished in sacks shall be used. A sufficient quantity of cement shall be stored at the site of the Work to ensure that grouting operations will not be delayed by shortage of materials.

(iv) In the event the cement is found to contain lumps or foreign matter of a nature and in amounts which, in the opinion of the Contract Administrator, may be deleterious to the grouting operations, screening through a standard 100-mesh screen will be required. No additional payment will be made for such screening.

(d) Fly Ash shall be according to CW 2160 clause 2.3.

(e) Water shall be according to CW 2160 clause 2.4.

(f) Sand for sand-cement mortar mix:

(i) Conform to CW 2160 clause 2.2, except all of the sand shall pass a 2.36mm (#8) screen, and less than 5% shall be finer than the 75µm (#200) screen, unless otherwise permitted by the Contract Administrator.

(ii) Natural, fine silty sand, clear and well-graded.

(iii) 1:6 cement-sand ratio by weight or less sand as specified herein, unless otherwise permitted by the Contract Administrator.

(g) Pozzolan: ASTM C618, Type F.

(h) Fluidifier:

(i) ASTM C937

(ii) Fluidifier shall contain a shrinkage compensator and shall be of calcium ligno-sulfonate or sodium ligno-sulfonate composition.

(iii) Bentonite or other clay-like substances will not be acceptable as Fluidifiers.

(iv) The Fluidifier shall be compatible with the cement and water used in the grouting program.

(v) Furnish in moisture resistant paper sacks, ship in sealed containers and handle/store so as to avoid absorption of moisture, damage or waste. Discard material which has become caked due to moisture absorption.

(i) Admixtures:

(i) Conform to CW 2160 clause 2.2.

(ii) Use, as required, to improve pumpability, to control time of set, to hold sand in suspension and to reduce segregation and bleeding.

(iii) Anti-washout admixture shall be used for grout placed in wet conditions.

(iv) Provide written confirmation from the admixture manufacturer of their compatibility with other ingredients in the mix design.

(j) Grout Pipe: Black steel conforming to ASTM A53.

E40.4.2 Grout Mixes:

(a) Grout Mixes: Develop one or more grout mixes designed to stabilize the ground, control water ingress, and to provide acceptable set time, strength, and durability. All grout mix proportions shall be subject to review and acceptance by the Contract Administrator.

(b) Stabilization Grouting

(i) Use sand-cement grout mix to fill voids and stabilize the mined/to be mined formation.

(ii) Strength of the grout should ensure that grout is durable enough to stabilize the grouted formation and to last long enough to allow safe mining, placement of final structures, etc., without ground instability.

(c) Cut-Off Grouting

(i) Use cement grout mix, or Contract Administrator approved alternate, depending on flows, joints etc. Modify grout mix to meet the characteristics of each hole as revealed by the grouting operation.

(ii) No sand shall be permitted with cut-off grouting unless otherwise permitted by the Contract Administrator.

(iii) Accelerators shall be used to control set time.

(iv) Strength of the grout should ensure that grout is durable enough to serve its cut-off purpose and to last long enough to allow placement of final structures without excessive water inflows.

E40.4.3 Equipment

(a) Equipment for mixing and injecting grout must be approved by the Contract Administrator and be adequately sized to mix, agitate, and inject the grout into the holes continuously at the desired pressure.

(b) Pumps:

(i) Must be capable of developing a uniform pressure up to 1,000 kPa at the grout hole connection.

(ii) Must deliver the grout from the holding tank to the injection point at a steady, pulsation-free pressure.

(c) Grouting equipment must allow for continuous grout circulation and accurate pressure control. Equipment and lines should be kept clean through continuous grout circulation and periodic water flushing.

(d) Use mechanical agitator tanks with 100 mesh screens in addition to the grout mixer. The grout mixer shall pump grout into a mechanically agitated holding tank.

(e) Provide two pressure gauges: one at the grout pump and one at the manifold hookup at each hole being grouted. Check gauge accuracy periodically with a calibrated high-pressure gauge. Keep a spare gauge on-site and calibrate all gauges weekly.

(f) Ensure grouting equipment and procedures prevent pressures exceeding the specified maximum at the grout hole connection. Install stop valves at each injection point to regulate and monitor pressure and grout flow, maintaining pressure until the grout sets.

(g) Equip the grouting equipment with a meter to measure the volume of grout injected, calibrate to an accuracy of 5%.

(h) Grouting hoses shall have an inside diameter of 40 to 75 mm and shall be capable of withstanding the maximum water and grout pressures with a margin of safety.

(i) Packers shall consist of pneumatic expandable rings of rubber or other approved material, attached to the end of the grout supply pipe. The Packers must always be available, designed to seal the drill holes when expanded, and withstand water pressure water pressure equal to the maximum grout pressure for at least five (5) minutes without leakage.

E40.5 Execution

E40.5.1 General Requirements

(a) Operate dewatering systems until grouting operations are complete. Monitor well discharge during adjacent grouting to avoid interference with dewatering.

(b) Provide telephonic or signaling systems to facilitate operations and control when the distance between any plant element and the grouting hole exceeds 30 meters.

E40.5.2 Mixing and Injection of Grout

(a) Remove and discard grout not injected within 90 minutes of mixing from the mixer and including the sump, and supply line.

(b) Clean grouting equipment and piping through periodic flushing with water or other suitable means. Do not use flush water in the grout mix.

(c) Re-circulate all grout mixes in the lines for at least two minutes before pumping into the grout hole. This includes any initial or newly batched mix or after adding water, fluidifier, or sand.

(d) Perform continuous grout injection to fill all spaces and voids, avoiding disturbance of grout that has set. Ensure uniform and steady delivery. shall be operated and controlled so that the grout will be delivered uniformly and steadily.

(e) Grouting is complete when no more grout can be forced through the pipe and there are no visible escape outlets. Prevent grout from escaping into basements, manholes, sewers, or causing damage to utilities. Should it become evident that more grout is being used than could reasonably be effective, the reason for the apparent surplus shall be determined by the Contractor and remedial measures shall be taken by the Contractor at no additional cost to the City of Winnipeg.

E40.5.3 Cut-Off Grouting

(a) The Geotechnical Baseline Report (GBR) describes anticipated ground water inflow into shafts assuming bid-basis shaft initial support systems and in the absence of Cut-Off Grouting. The purpose of Cut-Off Grouting is to reduce ground water inflow into the shafts to manageable levels to minimize disruption to the Work and to remain within groundwater inflow tolerances detailed in E33. Provided the groundwater inflow tolerances detailed in E33 for Shafts are not exceeded, the Contractor may choose not to grout and instead remove all water in Shafts by means of gravity and pumping. Provisional items for grouting have been provided in the quantity and price schedule.

(b) The Geotechnical Baseline Report (GBR) describes anticipated ground water inflow into the Tunnel in the absence of Cut-Off Grouting. The Contract Administrator may direct the Contractor to complete Cut-Off Grouting in the Tunnel at any time, for any level of inflow. Provisional items for grouting and for TBM standby due to Contract Administrator directed grouting have been provided in the quantity and price schedule.

(c) Drill grout holes, inject grout, and drill test holes in patterns and sequences to check grout penetration. Use glands, stuffing boxes, packers, or similar devices to control water and grout under pressure.

(d) Adjust the grout mix for each hole or set of holes as needed, starting with a 5:1 (water-cement by volume), and ending with a 0.5:1 mix. Use admixtures to minimize bleeding of water if the mix ratio exceeds 1:1. Add fine sand or pozzolans (or both) for large fissures with approval of the Contract Administrator.

(e) Use cement with sodium silicate or other accelerators where flowing water hinders grout setting.

(f) Continue grouting until the hole refuses grout at 90% of the highest pressure stipulated for that hole, or as approved by the Contract Administrator.

E40.5.4 Stabilization Grouting

(a) Perform Stabilization Grouting operations where required to improve the stability of the excavation prior to installation of the initial support at locations, as agreed by the Contract Administrator.

(b) Fill voids or disturbed ground outside the excavation limits caused by caving or collapse with gravity or gravity or pressure injected sand-cement grout

(c) Verify Stabilization Grouting adequacy through proof drilling at intervals and positions agreed by the Contract Administrator.

(d) Drilling for grout placement shall be done through packers at a minimum distance of 300 mm into the surrounding ground. Seal holes to prevent return of grout, rapid water inflow, and soil loss.

(e) Limit grouting pressure to avoid any damage or instability to the excavation or supports of the Tunnel or Shaft.

E40.5.5 Cleanup

(a) Take all the necessary precautions to protect and preserve the interior surfaces of the final lining from damage. Repair any damage caused during grouting by a method approved by the Contract Administrator at no additional cost to the City of Winnipeg.

(b) Maintain the interior surface of the final lining smooth and defect-free. Minimize grout spills and clean up immediately after grouting.

(c) Provide removable couplings for grout pipes projecting through the liner, ensuring no pipe remains closer than 50 mm to the finished concrete surface.

(d) Fill voids left after removing the packers or grout pipes with a non-shrink epoxy. Replace grout plugs and fill depressions or recesses with non-shrink epoxy to match the undisturbed surface smoothness.

(e) Ensure adequate disposal of all waste and wastewater during grouting. Remove all waste grouts.

(f) Remove temporary bulkheads installed for grouting.

E40.5.6 Quality Assurance

(a) Notify Contract Administrator at least 24 hours in advance of grouting operations. All grouting shall be done in the presence of the Contract Administrator.

(b) Grouting supervisors must have at least five (5) years experience of relevant grouting types.

(c) Employ a commercial testing laboratory, acceptable to the Contract Administrator, to prepare and test the grout mix design. The Contractor's costs for the commercial testing laboratory is incidental to this work.

(d) Establish grout mixes, methods, and criteria in accordance with these Specifications. Ensure the grouting system has sufficient gauges, monitoring devices, and tests to determine the effectiveness of the grouting operation. The Contractor shall modify the grouting operations if necessary, at no additional cost to the City of Winnipeg.

E40.5.7 During construction sampling for compressive strength testing:

Grouting Method	Sampling Frequency	No. of Specimens per Sampling
Stabilization and Cut-Off Grouting	At every location where Stabilization and Cut-Off Grouting is performed	One set of four (4) compressive test specimens

E40.6 Measurement and Payment

E40.6.1 All costs associated with this Specification shall be incidental to "Trunk Sewer, Microtunnelling".

E41. NESS AVENUE INTERFERENCE CROSSING

E41.1 A temporary gravity overflow pipe shall be installed on the Ness Avenue Combined Sewer to allow the proposed tunnel to cross Ness Avenue. The existing combined sewers impacted are constructed of brick and have egg shaped cross-sections. Two new manholes will be constructed on the combined sewer.

E41.2 The overflow will backup water within the upstream combined sewer system and will require bypass pumping. Following tunnel advancement and contact grouting, a permanent replacement combined sewer can be constructed at the original combined sewer invert elevation.

E41.3 Once the Rutland Street trunk is installed and contact grouting completed, the permanent interference crossing will be constructed.

E41.4 Bypass Pumping

E41.4.1 Contractor shall provide bypass pumping during the construction of the overflow pipe and temporary interference crossing. The bypass pumping system shall remain in place and maintained for the entire duration of tunneling under Ness Avenue and until the replacement Ness Avenue combined sewer is complete.

E41.4.2 The Contractor shall submit a bypass pumping plan and equipment prior to the commencement of work.

E41.4.3 Estimated average daily and peak domestic dry weather flow are shown in E30. The bypass pumping capacity should be designed to accommodate peak dry weather flow plus a safety factor.

E41.4.4 The intended functions of the bypass pumping system are to dewater the upstream sewer between rainfall events and improve the flow capacity of the gravity bypass during rainfall events. Critical low basements and maximum allowable hydraulic grade line elevations are shown in E30, above which basement flooding could occur.

E41.4.5 Backup for pumps and other key equipment shall be kept on site during any bypass pumping operation to ensure minimal downtime in case of failure.

E41.5 Gravity Bypass

E41.5.1 A temporary gravity bypass pipe shall be constructed prior to tunneling. This pipe will be installed at higher elevation to avoid the trunk sewer microtunnel path.

E41.5.2 The bypass pipe construction will include the construction of a new manhole on the west side of the intersection, abandonment or removal of the existing manhole receiving the existing Rutland Street combined sewers and installation of a replacement manhole further east to accommodate the realignment of the Rutland Street combined sewer. The existing brick sewers upstream and downstream of the new manhole installation shall be stabilized during construction and regrouted or reconstructed as necessary to connect into the manholes.

E41.5.3 The purpose of the temporary gravity bypass pipe is to provide additional wet weather capacity

E41.5.4 Installation of the temporary bypass pipe or manholes should be deferred until rain is not anticipated.

E41.5.5 The gravity bypass pipe will intrude into the crown of the existing combined sewer, the existing sewer may be removed and filled with gravel or lean mix concrete, or the remaining part of the sewer filled with lean mix concrete or flowable fill, or another method. The sewer abandonment method shall be the responsibility of the Contractor and must be designed to consider the tunneling operation.

E41.5.6 Support the temporary overflow pipe during tunneling with the use of beams or other methods approved by Contract Administrator.

E41.6 Overflow Decommissioning and Interference Crossing Installation

E41.6.1 Once Tunnel installation under Ness Avenue is complete, the temporary gravity overflow may be removed and permanent replacement sewer with interference crossing into the crown of the Rutland Trunk sewer shall be constructed. Bypass pumping must remain functional during this work.

E41.6.2 Contractor to design a reinforced concrete interference crossing between the Rutland Trunk and Ness Avenue combined sewer.

E41.6.3 Holes in the new Ness Avenue manholes shall be patches with bricks and mortar, or the precast rings may be replaced.

E41.6.4 Install an air vent as shown on the drawings. The vent may be omitted if the interference from the replacement Ness Avenue combined sewer into the obvert of the Rutland Trunk sewer is 200 mm or less.

E41.6.5 The combined sewer system upstream of the crossing shall be cleaned and inspected following the completion of the Ness Avenue combined sewer. These sewers do not require defect coding to City of Winnipeg requirement, they inspection operation is only to confirm that the pipes do not contain sediment following the flow bypassing operation. The Contract Administrator may authorize a reduction in the extents of cleaning depending upon the limits of flooding and number of rainfall events that occurred during the bypass pumping and gravity overflow operation.

E41.7 Measurement and Payment

E41.7.1 Construction of the temporary Ness Avenue gravity bypass sewer including removal or abandonment of the existing sewer will be measured on a length basis based on the length of the temporary sewer measured from manhole inside wall to manhole inside wall. Payment shall be at the Contract Unit Price for “Combined Sewer, 1050 mm RCP, Temporary Overflow” including all work relating to the installation including utility locates, excavation, shoring, dewatering, abandonment or removal of the existing sewer, installation of the temporary gravity bypass sewer, and all other works required to complete the installation.

E41.7.2 Construction of the permanent Ness Avenue combined sewer including removal of the temporary gravity overflow pipe and including the interference crossing will be measured

on a length basis based on the length of the permanent sewer measured from manhole inside wall to manhole inside wall. Payment shall be at the Contract Unit Price for "Combined Sewer, 1050 mm RCP, Replacement sewer with Interference crossing" including all work relating to the installation including excavation, removal of temporary sewer, installation of new sewer, breaking into crown of Tunnel sewer and construction of interference crossing, pipe bedding and Class 2 backfill, removal of shoring, and all other works required to complete the permanent installation.

E41.7.3 Measurement and Payment for pavement restoration will be in accordance with E48.

E41.7.4 Construction of manholes on the Ness Avenue combined sewer will be measured on a lump sum basis for each individual manhole configuration identified by manhole identification number on the drawings and including repair or replacement of the manhole sidewalls at the temporary gravity overflow pipe connection locations. Payment shall be at the Contract Unit Prices for "Manholes" for each manhole identification number.

E41.7.5 Ness Avenue Bypass Pumping and Monitoring will be measured and paid for in accordance with E30.

E41.7.6 Cleaning and CCTV inspection of existing sewers upstream of the bypass location will be measured on a length basis for each size classification of sewer acceptably cleaned and inspected following the flow bypass operation, but not requiring City of Winnipeg defect coding. Payment shall be at the Contract Unit Price for "Sewer Cleaning of Existing Combined Sewer - Post Bypass Pumping" will be paid for based on the measurement of sewer lengths (centre of manhole to centre of manhole) by each nominal pipe diameter cleaned and inspected including associated traffic control and ancillary work.

E42. INSTRUMENTATION AND MONITORING

E42.1 Scope

E42.1.1 The work specified in this Section includes furnishing, installing, monitoring, protecting, maintaining and decommissioning geotechnical instrumentation to monitor ground and structure movements within, around, and above shafts and tunnel excavations and to monitor ground water levels as required under the Contract Documents.

E42.1.2 Locations for the drilling and installation of instrumentation are shown in the Contract plans and shall be coordinated with the drilling and installation of pumping and observation wells, shaft and tunnel excavations, and open cut excavation.

E42.2 References

(a) American Society for Testing and Materials (ASTM):
  (i) ASTM C778, Standard Specification for Standard Sand
  (ii) ASTM C114, Specification for Aggregate for Masonry Mortar

(b) Manitoba Groundwater and Water Well Act, Continuing Consolidation of the Statutes of Manitoba (C.C.S.M) chapter (c.) G110

E42.3 Design and Submission Requirements

E42.3.1 Submit personnel qualifications in accordance with the requirements of E5.

E42.3.2 Submit all submittals as listed below, as prepared by qualified specialists submitted above.

(a) Shop Drawings.

(b) Instrument Installation Schedule: submit the proposed schedule for installing instruments a minimum of 30 days prior to anticipated date of installation. The Instrument Installation Schedule shall include drawings detailing the instrumentation and its location and noting the position of any instrumentation that is proposed to be changed based on locations of construction equipment, existing utilities, etc. The Contract Administrator shall be informed a minimum of forty-eight (48) hours before instrumentation installation operations commence.

(c) Methods and equipment to be used for drilling and grouting, including manufacturer and model number of drill rigs, and method to be used for cleaning inside casing or augers.

(d) Methods, materials and procedures for piezometer installation, development and abandonment.

(e) Methods related to the installation and protection of BMP's, SMP's, and SMM's, and all other geotechnical instruments specified in this Section.

(f) Method for overcoming buoyancy of instrumentation components during grouting.

(g) Method of sealing joints in instrumentation pipes to prevent ingress of grout.

(h) Materials and mix proportions for grout installation of instruments.

(i) Method for conducting post-installation acceptance test.

(j) Following installation of the instruments, submit "As-Constructed" drawings showing the exact installed location, the instrument identification number, the instrument type, the installation date and time, the heading station, or portal or shaft excavation depth on the installation date and the anchor or tip elevation and instrument length, when and where applicable. Include details of installed instruments, accessories and protective measures including all dimensions and materials used.

(k) Response Plan for Review and Alert Levels.

E42.3.3 The Contractor shall develop and submit a preliminary Response Plans for Review and Alert Levels for review by the Contract Administrator 30 days prior to construction.

E42.3.4 The Contractor shall develop preliminary means and methods to respond to Review and Alert Levels scenarios based on the types of instruments showing readings that have reached or exceeded the Review and Alert Levels.

E42.3.5 At a minimum, the Contractor shall include the following in the Response Plan:

(a) Names, telephone numbers and locations of persons responsible for the implementation of contingency plans.

(b) Verification of qualifications of personnel listed in the Response Plan.

(c) Materials and equipment required to implement contingency plans and their location on-site.

(d) Step-by-step procedure for performing the work involved in the implementation of the contingency plans.

(e) Specific actions related to the Alert Level values of all instruments, including means of reducing or eliminating movements and rates of movements.

(f) Inspection of affected facilities, structures, utilities and the performance of acceptable corrective and restorative measures.

(g) A clear indication of objectives of the contingency plans and methods to measure plan's success.

E42.3.6 Product data and samples:

(a) Submit all applicable manufacturer's literature describing the geotechnical instrumentation manufacturer's recommendations and instructions for installation, monitoring, operation and maintenance procedures for the geotechnical instrumentation specified in this Section and as shown on the Drawings. Provide manufacturer's brochures on each product and all related equipment and accessories.

(b) For each instrument to be installed, submit, as applicable, a certificate issued by the instrument's manufacturer stating that the manufacturer has inspected and tested each instrument before it leaves the factory to see that the instrument is working correctly and has no defects or missing parts.

E42.3.7 Monitoring Reports:

(a) Baseline Monitoring Report: The Contractor shall submit a baseline monitoring report including details related to the methodology used to analyze data obtained during the baseline monitoring period, the results of such analysis, and presentation of the instrumentation baseline prior to dewatering, excavation, and/or initial launch of the Microtunnelling Boring Machine (MTBM).

(b) The Contractor shall provide the Contract Administrator with regular reports documenting the results of instrumentation monitoring. Reports shall be provided in intervals not to exceed once every month unless review or alert levels are reached, or otherwise noted. If review or alert levels are reached, the Contractor shall immediately provide the Contract Administrator with a report, with subsequent reporting intervals to be determined by the Contract Administrator.

(c) Instrumentation Close-Out Report: The Contractor shall provide monitoring instrumentation close-out report summarizing historical data for each instrument verifying monitoring frequencies in accordance with the drawings and monitoring results are consistent after removing calibration error, temperature effects, and other known external factors.

(d) The Contractor shall provide the Contract Administrator with a summary report documenting the combined results of instrumentation monitoring for the project. The summary report shall be compiled, signed and stamped by a Professional Engineer registered in the Province of Manitoba.

E42.4 Tolerances

E42.4.1 Tolerances specified herein may be modified by the Contract Administrator at any time, depending on location, construction progress, scheduling and efficiency of temporary Works, construction rates of movement, and other factors affecting earth structures that are subject to monitoring.

E42.4.2 Install BMPs, SMPs, SMMs within 1.5 metres of the horizontal locations shown on the Drawings, unless otherwise approved in writing by the Contract Administrator.

E42.4.3 Notify the Contract Administrator if actual field conditions prohibit installation at the location and elevations specified on the Drawings.

E42.5 Project Conditions

E42.5.1 Secure applicable permits and approvals for the installation of monitoring systems.

E42.5.2 Applicable ground conditions are described in the Geotechnical Data Report (GDR) and Geotechnical Baseline Report (GBR).

E42.5.3 Both the Contractor and the Contract Administrator will monitor the instruments. The Contractor must allow the Contract Administrator to access and measure all monitoring instrumentation at all times.

E42.6 Products

E42.6.1 Building Movement Monitoring Points (BMPs)

(a) BMPs shall be installed at the locations specified on the Drawings or as directed by the Contract Administrator.

(b) BMPs shall consist of a typical survey rod welded to a machined bolt, as indicated on the Drawings, which will be inserted into a female threaded anchor sleeve during surveys. The anchor sleeve shall conform to the dimensions shown on the Drawings and be installed using a two-component vinyl ester blend resin.

(c) The Contractor shall place BMPs directly on structural column or wall and not on architectural element such as door, gate or window frame, etc.

(d) Protect the BMPs by installing a carriage bolt, as indicated on the Drawings, into the anchor sleeve when not in use.

(e) Prisms/Targets may be considered as a substitute, subject to approval by the Contract Administrator.

(f) Readings from the BMPs shall be accurate to ±1 mm.

E42.6.2 Surface Monitoring Points (SMPs)

(a) SMPs shall be installed at the locations specified in the Drawings or as directed by the Contract Administrator.

(i) SMPs shall consist of 15M rebar with a hemispherical top point installed inside of a 19 mm internal diameter (I.D.) polyvinyl chloride (PVC) sleeve, as shown on the Drawings. The bottom of the rebar shall be embedded a minimum of 200 mm into concrete and the PVC sleeve shall rest 50 mm above the top of the concrete plug. The SMPs shall be installed to a depth below grade of 1.5 metres unless otherwise noted on the Contract drawings. Protect SMPs with a 150 mm minimum dimension cast iron lockable valve box installed flush with the ground surface and extending at least 250 mm below grade. Sand shall be used to fill the hole from the top of the concrete plug to the base of the valve box. The annular space behind the valve box shall be grouted.

(ii) Readings from SMPs shall be accurate to ±1 mm.

E42.6.3 Settlement Monitoring Markers (SMMs)

(a) SMMs shall be installed at the locations specified in the Drawings or as directed by the Contract Administrator.

(i) SMMs may only be used to monitor ground movement due to tunnelling when the tunnelling work affecting the SMMs occurs between the start of April and the end of October, where ground movement due to freeze and thaw effects will not affect the readings. Otherwise, SMPs will be required to monitor ground movement due to tunnelling.

(ii) SMMs shall consist of a 6.25 mm diameter x 50 mm long masonry nail embedded into the top of a railroad tie, pavement, concrete, or masonry surface, as shown on the Drawings. Top of nail to be set at the surface's elevation.

(iii) A 25 mm diameter metal identification tag with a unique number must be installed and held in place by the nail head on each settlement monitoring marker.

(iv) Alternatively, SMMs can be 15M rebar with a hemispherical top point, installed in a minimum 110 mm diameter borehole and embedded at least 200 mm into concrete, as shown on the Drawings. The SMMs shall be installed to a depth of 600 mm below grade unless otherwise noted on the Contract Drawings. Protect SMMs with a cast iron lockable valve box, with a minimum dimension of 150 mm, installed flush with the ground surface and extending at least 250 mm below grade.

(v) Readings from SMMs shall be accurate to ±1 mm.

E42.6.4 Vibrating Wire Piezometers (VWP)

(a) VWPs shall be installed as required by the ground water control plan developed by the Contractor as required.

(i) VWPs shall consist of 32 mm nominal diameter Schedule 40 PVC riser pipe with a vented cap and a slotted Schedule 40 PVC well screen. The well screen shall meet the following requirements:

i Length: 3.048 m

ii Slot width: 0.25 mm

iii Number of rows of slots: 3

iv Spacing between slots: 4.76 mm

v Outside slot length: 34.93 mm

vi Slots per row per foot: 61

vii Riser pipe shall have flush joints.

(ii) Filter sand shall conform to ASTM C778, Standard Specification for Standard Sand, 20-30 sand.

(iii) Granular bentonite shall be Enviroplug Medium, as manufactured by Wyo-Ben, Inc., Billings, Montana, or Holeplug, as manufactured by Baroid Industrial Drilling Products, Houston, Texas, or equivalent product.

(iv) Water level indicator shall be an electrical indicator cable of appropriate length with graduations at 6.1 mm or smaller intervals. Provide two indicators to enable independent readings by the Contractor and the Contract Administrator.

(v) The Contractor shall temperature correct readings from strain gauges.

(vi) Readings shall be accurate to ±0.1% of full scale.

E42.6.5 Inclinometers (INCs)

(a) INCs shall be installed at the locations specified in the Drawings or as directed by the Contract Administrator.

(i) INCs shall consist of 70 mm diameter PVC casing installed in a 100 mm to 140 mm diameter borehole. The borehole and the casing must extend below the base of excavation, to the depths indicated on the Drawings.

(ii) Protect INCs with a cast iron lockable valve box, with a minimum dimension of 150 mm minimum, installed flush with the ground surface and extending at least 600 mm below grade. The valve box should be embedded at minimum 150 mm into compacted sand, as shown on the Drawings.

(iii) The Contractor shall grout the entire subsurface assembly with non-shrink cement/bentonite grout conforming to the manufacturer's recommendations.

(iv) INCs shall have an overall resolution of ±0.025 mm / 500 mm (±10 arc seconds) and total system accuracy of ±6 mm / 30 m.

E42.6.6 Utility Monitoring Points (UMPs)

(a) UMPs shall be installed at the locations specified in the Drawings or as directed by the Contract Administrator.

(i) UMPs shall consist of 15M rebar with a hemispherical top point installed inside of a 19 mm internal diameter (I.D.) polyvinyl chloride (PVC) sleeve, as shown on the Drawings. The bottom of the rebar shall be embedded at least 200 mm into concrete, and the PVC sleeve shall rest 50 mm above the top of the concrete plug. The SMPs shall be installed to the bottom of the invert of the utility to be monitored, with a minimum 300 mm and maximum 600 mm clear distance from the utility, unless otherwise noted on the Contract Drawings.

(ii) Alternatively, hydro-excavators (hydrovacs) can be used to install the SMPs directly above the utility crown. The hydrovacs shall be performed within 1 m of the utility until the utility is adequately exposed (daylighted). The bottom of the rebar shall touch the utility crown and embedded in at least 200 mm of epoxy, grout bladder, or sandbag plug. The PVC sleeve shall rest 50 mm above the epoxy, grout bladder, or sandbag plug.

(iii) Protect SMPs with a cast iron lockable valve box, with a minimum dimension of 150 mm, installed flush with the ground surface and extending at least 250 mm below grade.

(iv) Sand shall be used to fill the hole from the top of the concrete plug to the base of the valve box. The annular space behind the valve box shall be grouted.

(v) Readings from UMPs shall be accurate to ±1 mm

E42.7 Execution

E42.7.1 General Requirements

(a) Instrumentation shall be installed at the locations shown on the Drawings, prior to start of any tunnelling, shaft excavation, or dewatering work, and as approved by the

Contract Administrator. Instruments shall be installed in accordance with the instrument installation schedule.

(b) Existing Conditions: Locate conduits and underground utilities in all areas where instrumentation is to be installed. Notify all Utility owners prior to instrumentation installation below ground surface. Instrument locations shall be modified, as approved by the Contract Administrator, to avoid interference with the existing conduits and utilities. The Contractor shall protect and repair any damage to existing utilities resulting from instrument installations at no additional cost to the City of Winnipeg and in accordance with the utility Owner's requirements.

(c) All instruments shall be clearly marked, labeled, and protected to avoid being covered, obstructed, or otherwise damaged by construction operations or the general public. Both protective housing and box or vault covers shall be marked. Any instruments damaged during the construction and monitoring period shall be replaced by the Contractor at no additional cost to the City of Winnipeg.

(d) Drilling from the Ground Surface: Boreholes drilled from the ground surface for geotechnical instrumentation, as described in this section, are subject to the same permitting and drilling requirements as those for geotechnical exploration boreholes. Obtain the necessary permits for each such instrument and conform to the permit requirements during drilling and installation.

(e) Where instrumentation is located within 1.5 m horizontally of existing underground utilities, vacuum excavation methods shall be used to excavate and clear utilities within the maximum anticipated depth below ground surface.

E42.7.2 Installation Schedule

(a) Install SMMs, SMPs, BMPs, and UMPs a minimum of 15 Working Days prior to starting shaft excavation at instrumentation site or before the tunnel face reaches the instrumentation location.

(b) Install piezometers at least 15 Working Days before starting dewatering or excavation operations at the instrumentation site.

(c) Install inclinometers during the installation of vertical members of the excavation support system.

E42.7.3 Baseline Schedule

(a) Baseline readings for an instrument shall be taken after initial installation effects (such as grout setting) have dissipated. A baseline reading is considered acceptable if the readings are shown to be reasonably consistent after removing calibration errors, temperature effects, and other known external factors.

(b) Take three sets of readings of SMMs, SMPs, BMPs, and UMPs on different days before starting shaft excavation at instrumentation site or tunnelling activities affecting the instruments.

(c) Take three sets of readings from Inclinometers (INCs) on different days within one week of installation and prior to start of shaft excavation.

E42.7.4 Monitoring Schedule

(a) The Contractor shall retain a surveyor registered in Manitoba (Manitoba Land Surveyors (MLS)) for establishing and surveying the surface instrumentation (SMPs, SMMs, BMPs, and UMPs) throughout construction.

(b) The Contractor shall establish 3 temporary benchmarks and submit the proposed locations to the Contract Administrator for review. Before construction, coordinate all surface monitoring points to a tolerance of 10 mm and determine the elevations to a tolerance of 2 mm.

(c) Start monitoring at least 5 days before shaft excavation or tunnel installation begins. Monitor surface instrumentation within 50 m of a shaft weekly during shaft excavation until backfilling is completed. After backfilling, monitor bi-weekly for two months, then monthly for four months. For tunnel and microtunnel installations, survey all surface

instrumentation points behind the excavation face or within 50 m in front of it daily for at least 10 days after the excavation face has passed, then weekly until contact grouting (microtunnel installations) or annulus grouting (TBM tunnelling installations) is complete. After contact grouting or annulus grouting, monitor bi-weekly for two months, then monthly for four months.

(d) Provide preliminary results within 2 hours of any measurement completion to the Contract Administrator and finalized results within 24 hours of completion of the survey.

(e) After contact grouting (microtunnel installations) or annulus grouting (TBM tunnelling installations) is complete, the Contractor shall survey the surface instrumentation grid once every 3 days for 21 days, then once every two weeks for two months or until the data indicates that all movements have essentially ceased.

(f) The Contractor shall commence monitoring of piezometers no later than one week after installation. Monitor twice daily during the dewatering period.

(g) The Contract Administrator may, if in its sole opinion it is deemed necessary, require the Contractor to increase the monitoring frequency for all geotechnical instrumentation.

E42.7.5 Review and Alert Levels

(a) Both the Contractor and the Contract Administrator will monitor the instruments. Either party shall immediately inform the other when monitoring indicates review and alert levels are reached.

(b) Review and alert levels for the various instruments are shown on the Drawings.

(c) Piezometers:

(i) Review Level: Water level less than 300 millimetres below base of excavation or target groundwater elevation.

(ii) Alert Level: Water level at or above base of excavation or target groundwater elevation.

E42.7.6 Piezometers

(a) Piezometers shall be installed at the locations and depths required by the Contractor's ground water control plan.

(b) Bentonite drilling mud shall not be used in piezometer installation.

(c) A standard split spoon sample shall be taken at the top and bottom of the piezometer sensing zone and submitted to the Contract Administrator within 24 hours.

(d) Depth to the top of each increment of granular bentonite shall be checked using a cylindrical sounding hammer. The granular bentonite shall not be tamped.

E42.7.7 Instrument Protection, Maintenance, and Repair

(a) Protect the instruments from damage. Damaged instruments shall be replaced or repaired prior to continuing work, or as required by the Contract Administrator at no additional cost to the City of Winnipeg.

(b) Maintain the instruments by draining water and flushing debris from under protective covers and keeping covers locked and sealed at all times.

E42.7.8 Disposal of Instruments

(a) SMPs, SMMs, and UMPs: The Contractor shall remove all SMPs during the cleanup and restoration Work, or as required by the Contract Administrator. Fill open holes with cement grout and abandon shafts. Restore pavement, sidewalks and landscaped areas in kind or better than existing adjacent conditions.

(b) BMPs: The Contractor shall remove all BMPs during the cleanup and restoration Work, or as required by the Contract Administrator.

(c) Piezometers:

(i) After completion of the work, all piezometers, including piezometers installed as part of the project geotechnical and hydrogeological investigations must be abandoned by the Contractor in accordance with Manitoba Water Rights Act and the Groundwater and Water Well Act.

(ii) Locations and depths of piezometers installed as part of the project geotechnical and hydrogeological investigations to be removed by the Contractor are shown in the Contract Drawings. Additional piezometer construction details are provided on the logs of borings, contained in the Geotechnical Data Reports.

(iii) Notwithstanding item (i) above, remove piezometer riser pipe to a minimum depth of 1.0m below ground level.

(iv) Restore ground surface at all well locations to match adjacent ground surface.

E42.7.9 Quality Assurance

(a) Installation of instrumentation shall, at all times, be performed in the presence of the Contract Administrator.

(b) If utilizing any geotechnical instrumentation for monitoring within 1.5 m horizontally of existing underground utilities, vacuum excavation shall be performed prior to instrument installation to excavate and verify utilities for the full instrumentation depth in soils.

E42.8 Measurement and Payment

E42.8.1 Instrumentation and Monitoring shall be measured on a unit basis for each distinct type of monitor acceptably installed, maintained, and monitored for the project duration and accepted by the Contract Administrator. The distinct types of monitors include:

(a) Inclinometers (installed near shafts)

(b) Vibrating wire piezometers (installed near shafts)

(c) Utility monitoring points (placed on or near key buried infrastructure)

(d) Building monitoring points (installed on buildings)

(e) Surface monitoring points (measuring surface settlement or heave, along the tunnel alignment)

(f) Surface monitoring markers (measuring surface settlement or heave, along the tunnel alignment)

E42.8.2 Monitors damaged but not replaced or monitors foe which data is not provide shall not be measured for payment.

E42.8.3 Payment for instrumentation and monitoring shall be at the Contract Unit Price for “Tunnel Monitoring” for each type of monitor, including installation, maintenance, regular measurements during the execution of works, and removal or abandonment. Payment shall be according to the following schedule:

(a) Twenty-five percent (25%) following installation.

(b) Seventy-five percent (75%) following the completion of the maintenance and monitoring period.

SEWER, MANHOLE AND CHAMBER CONSTRUCTION

E43. EXCAVATION, BEDDING AND BACKFILL

E43.1 Disposal of Unsuitable or Surplus Excavated Material

E43.1.1 If the Contractor has not arranged for an approved disposal site, the City shall provide an optional disposal site for all surplus clean clay from the construction site. The material is not to include any refuse, concrete, metals, wood, organics, construction waste or any

other deleterious materials. Any surplus soil material not meeting these requirements shall not be considered clean clay and shall not be permitted.

E43.1.2 The disposal location provided by the City will be at the Brady Road Landfill Site. Clean fill may not be accepted every day, and the Contractor should view the following website to determine if fill material is being accepted: https://www.winnipeg.ca/services-programs/recycling-garbage/garbage/landfill-brady-road-resource-management-facility

E43.1.3 There will be no tipping fees charged at the landfill sites to the Contractor for the disposal of surplus soil material meeting the requirements of clean clay as specified.

E43.1.4 Surplus material not meeting the requirements of clean clay may be disposed of at the Brady Road Landfill Site although tipping fees will be charged.

E43.1.5 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.

E43.2 Foundation and Bedding

E43.2.1 Class A Bedding shall be used in all shafts with concrete pipe with Type 3 material for remainder of initial backfill.

E43.2.2 Class B Bedding with Type 3 material shall be used in all shafts with PVC piping.

E43.2.3 Class B Bedding with Sand material shall be used in all pipe installations in an Open Trench.

E43.3 Backfilling and Surface Restoration

E43.3.1 Initial backfilling of all excavations shall be carried out by the following methods:

(a) Class 3 backfill shall be used at all shafts for Trenchless installations.

(b) Class 3 backfill shall be used at Open Trenches. Class 2 backfill would also be acceptable but shall be undertaken at no additional cost or as indicated in E48.8.1. Class 2 and/or 3 backfill shall be placed and compacted in lifts not exceeding 300 mm.

(c) The Contractor shall have personnel available for immediate repairs of settlement at shaft locations from the start of construction until final restoration is complete.

E43.3.2 Final backfilling and surface restoration shall be as follows:

(a) If an excavation has been backfilled over the winter or if backfill material could be frozen, then the jetting and tamping process shall be repeated twice in the springtime as per CW 2030.

(b) If an excavation has been jetted and tamped the previous fall for temporary surface restoration, then the jetting and tamping process shall be repeated once in the springtime as per CW 2030.

(c) After the jetting and tamping operation is completed, the excavation is to be subcut to 1.5 m below final surface elevation and re-compacted in 300 mm lifts to the subgrade level using vibratory compaction methods in accordance with CW 2030 Class 2 Backfill.

(d) Pavement shall be completed in accordance with CW 3310 or CW 3410, depending on type of existing pavement surface.

(e) Boulevard restoration shall be completed in accordance with CW 3510.

E43.4 Measurement and Payment

E43.4.1 Further to CW 2130:

(a) Trenchless Installations and Catch Basin connections: All costs associated with backfilling shall be incidental to the Work, but final surface restoration including the

construction of Partial Slab Patches, Curb, and Sidewalk will be paid for at the Contract Unit Prices for these items of work.

(b) Open Trench Installation: Backfilling of trenches shall be incidental to the Work, but final surface restoration including the construction of Full or Partial Slab Patches, Curb, and Sidewalk will be paid for at the Contract Unit Prices for these items of work.

E44. EXISTING DRAINAGE INLET CLEANING AND INSPECTION

E44.1 Existing Catch Basins and Catch Pits to be connected to the new land drainage sewer system shall be inspected and cleaned as necessary in accordance with CW 2140. A visual inspection following cleaning will determine if the units need to be replaced or rehabilitated. This work should be performed on a street by street basis and must be completed before replacement units are ordered.

E44.2 If a Catch Basin or Catch Pit must be cleaned in order to assess its condition, the cleaning will be paid for even if the unit is found to be deteriorated and requires replacement.

E44.3 Measurement and Payment

E44.3.1 This work shall be measured on a unit basis for each Catch Basin or Catch Pit cleaned and paid for at the Contract Unit Price for “Catch Basin / Catch Pit Cleaning”.

E44.3.2 Cleaning and inspection of curb inlets and connecting leads shall be incidental to the Catch Basin or Catch Pit connects to.

E45. BOARD INSULATION

E45.1 Description

E45.1.1 This specification shall cover the installation of board insulation for watermain or water service freezing prevention, in addition to CW 2110 clause 3.12 and SD-018.

E45.2 Materials

E45.2.1 Moisture resistant closed cell extruded polystyrene insulation board designed for direct burial underground.

(a) Total insulation thickness as specified on drawings.

(b) Minimum compressive strength 410 kPa (60 psi) to ASTM D1621.

E45.2.2 Adhesive (for polystyrene insulation): to CGSB 71-GP-24.

(a) Type: One part Polyurethane.

(b) VOC emission: 0.

E45.3 Construction Methods

E45.3.1 Supply and install rigid insulation at locations identified on the Drawings or were directed by the Contract Administrator. Construct as noted on Detail Drawings.

E45.3.2 Insulation to be installed in an inverted U fashion in accordance with SD-018 as follows:

(a) Maintain a minimum width of 1200 mm for horizontal insulation.

(b) Minimum of 300 mm well packed specified fill between top of the pipe and bottom of horizontal insulation.

(c) Vertical insulation on either side must extend a minimum of 150 mm below bottom of pipe. Hand pack specified fill material on either side of vertical insulation sections to ensure no warping or misalignment of vertical insulation sections.

(d) Apply horizontal section after Contract Administrator has inspected and approved installation of vertical insulation legs.

E45.3.3 Horizontal insulation under roadway excavation or below the bottom of catch basin barrels overcrossing watermain or water service pipes in accordance with SD-018 and installed as follows:

(a) Place and compact the bedding material to provide a minimum 300 mm cover over the pipe.

(b) Place two layers of insulation to attain a thickness of 100 mm for the full trench width. Stagger joints.

(c) Place 150 mm of sand over the insulation and a minimum of 200 mm hand placed and compacted backfill prior to final backfill or installation of catch basin.

E45.3.4 Manhole or Catch basin sidewall insulation

(a) Install insulation board on exterior of manhole or catch basin structures with adhesive, extending to depth indicated below finished grade as indicated on drawings.

E45.3.5 Governed by the compaction equipment to be used, ensure that there is adequate cover on the insulation to prevent damage during compaction or subsequent construction operations.

E45.4 Measurement and Payment

E45.4.1 Board Insulation shall be measured on an area basis based on the actual number of square metres of board insulation installed in accordance with this Specification, drawings, and accepted by the Contract Administrator. Payment will be at the Contract Unit Price for “Board Insulation" per square meter of board insulation by thickness and shall include supply and installation of insulation, bedding, backfill, compaction, and all other associated works.

E46. DEFLECTION TESTING OF PVC SEWERS

E46.1 This specification amends Clause 3.22 of CW 2130 regarding the waiting time for deflection testing of PVC sewers following pipe installation.

E46.2 Deflection testing of PVC mainline sewers shall be undertaken as follows:

E46.2.1 Initial deflection testing for PVC mainline sewers shall not be performed sooner than 30 days following the installation of pipe and backfilling of shafts.

E46.2.2 Repeat deflection testing of PVC mainline sewers shall be performed at the end of the warranty period.

E46.3 Deflection testing is not required for catch basin leads.

E46.4 Measurement and Payment

E46.4.1 Measurement and payment for initial and repeat deflection testing will not be measured and paid separately but will be paid for as part of sewer inspection.

E47. VIDEO INSPECTION OF SEWERS

E47.1 Sewer and manhole inspection in accordance with CW 2145 will be conducted as follows:

E47.1.1 New mainline sewers

E47.1.2 Existing mainline combined sewers where catch basin leads have been abandoned in accordance with CW 2145.

E47.1.3 New catch basin leads of 15 m length or longer, or as directed by the Contract Administrator based on complicated configuration or from a private catch basin.

E47.1.4 Extended catch basin leads that result in a total lead length of 15 m or longer.

E47.1.5 PVC sewer will include deflection testing.

E47.1.6 PVC mainline sewers shall be reinspected including deflection testing at the end of the one year warranty period. Catch Basin leads will not require reinspection.

E47.2 Measurement and payment

E47.2.1 Sewer inspection shall be measured on a length basis for each size and type of pipe inspected in accordance with the specifications and accepted by the Contract Administrator. Measurement will be based on center of manhole to center of manhole lengths from surveys. Payment will be by the Contract Unit Price for "Sewer Inspection" and include video inspection of sewers, deflection testing of new PVC sewers, cleaning of sewers, and all other associated work incidental to sewer inspection.

E47.2.2 One-year warranty inspection of PVC sewers shall be measured on a length basis for each size and type of pipe inspected in accordance with the specifications and accepted by the Contract Administrator. Payment will be by the Contract Unit Price for "Sewer Inspection - Warranty" and include video inspection of sewers, deflection testing of PVC sewers, cleaning of sewers, and all other associated work incidental to sewer inspection.

RESTORATION

E48. STREET CONDITIONS AND PERMANENT PAVEMENT RESTORATION

E48.1 The Contractor shall follow the City of Winnipeg Street By-law No. 1481/77 and current revision of the City of Winnipeg "Street Cuts Manual" found at https://legacy.winnipeg.ca/publicworks/permitsApprovals/pdf/Street-Cuts-Manual.pdf and for all pavement restoration unless otherwise shown on the drawing or specifications or as directed by the Contract Administrator.

E48.2 The street material and condition within the project work area are classified as follows:

Street	Pavement Type	Condition
Rutland St. – Portage Ave. to Ness Ave.	Asphalt over Concrete	Fair
Rutland St. – Ness Ave. to Silver Ave.	Concrete	Poor
Rutland St. – Silver Ave. to End (100m North)	Asphalt	New (2011)
Portage Ave – Amherst St. to Inglewood St.	Asphalt over Concrete	New
Bruce Ave – Amherst St. to Inglewood St.	Asphalt over Concrete	Fair
Ness Ave – Amherst St. to Inglewood St.	Asphalt over Concrete	Good
Silver Ave – Amherst St. to Inglewood St.	Asphalt over Concrete	Good

E48.3 Permanent pavement restoration shall be in accordance with the City of Winnipeg Street Cuts Manual (2024) "Pavement Restoration Guidelines" pp. 22 (Asphalt or Asphalt over concrete) and pp. 25 (Portland cement concrete).

E48.4 Notwithstanding the restoration requirements identified in E48.8.1 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.

E48.5 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.

E48.6 Pavement settlement due to tunneling works will be assessed along the route. Given the general poor condition of Rutland Street, it is expected that settlement of less than 25 mm can be repaired sufficiently to restore gutter gradient with asphalt overlay. Repair of settlement greater than 25 mm or repair of pavement displacement using alternative methods such as mud jacking will be the Contractor's responsibility.

E48.7 Restoration at shafts in pavement area is expected to replace several full panels including curbs and boulevard restoration. The extents of restoration due to settlement around the shafts will be assessed on a per location basis.

E48.8 Measurement and Payment

E48.8.1 Measurement of permanent Pavement Restoration will be on the unit basis detailed below in accordance with the specifications and accepted by the contract administrator.

(a) Full Slab Patches of Concrete pavement shall be measured on an area basis for each thickness of concrete. Payment will be by the Contract Unit Price for "Full Slab Replacement - Reinforced Concrete Pavement" and include base preparation, reinforcement, concrete, finishing, grade control, and all other associated work. The Contract Administrator will measure area.

(b) Partial Slab Patches of Concrete pavement shall be measured on an area basis for each thickness of concrete. Payment will be by the Contract Unit Price for "Partial Slab Replacement - Reinforced Concrete Pavement" and include base preparation, reinforcement, concrete, finishing, grade control, and all other associated work. The Contract Administrator will measure area.

(c) Planing of Existing Asphalt overlay shall be measured on an are basis for the thickness of asphalt removed. Payment will be by the Contract Unit Price for "Planing Existing Asphalt Overlay" and include planing of asphalt, disposal of material, and all other associated work. Area will be measured by the Contract Administrator. Payment will exclude all asphalt pavement removed as required for underground construction works.

(d) Main Line Paving of asphalt shall be measured on a tonne basis for each type of asphalt mix. Payment will be by the Contract Unit Price for "Construction of Asphaltic Concrete Overlay - Main Line Paving" and include supply and placement of asphalt pavement using a paver machine, tac coat, vibratory compaction, grade control and all other associated work. Area will be measured by the Contract Administrator.

(e) Paving of asphalt tie-ins and approaches shall be measured on a tonne basis for each type of asphalt mix. Payment will be by the Contract Unit Price for "Construction of Asphaltic Concrete Overlay - Tie-ins and Approaches" and include supply and placement of asphalt pavement using a paver machine, tac coat, vibratory compaction, grade control and all other associated work. Area will be measured by the Contract Administrator.

(f) Asphalt Patches shall be measured on an area basis. Payment will be by the Contract Unit Price for "Construction of Asphaltic Concrete Overlay - Asphalt Patch" and include supply and placement of asphalt, tac coat, vibratory compaction, and all other associated work. Area will be measured by the Contract Administrator.

(g) Asphalt Pathway Renewal shall be measured on an area basis. Payment will be by the Contract Unit Price for "Asphalt Pathway Renewal" and include supply and placement of asphalt, tac coat, vibratory compaction, and all other associated work. Area will be measured by the Contract Administrator.

(h) Concrete Curbs shall be measured on a length basis by type of curb. Payment will be made by the Contract Unit Price for "Concrete Curb" and include reinforcement,

concrete, finishing, and all other associated work. Length will be measured by the Contract Administrator.

(i) Repair of excessive pavement settlement or pavement displacement due to tunneling will not be measured for payment.

E48.8.2 No payment will be made for restoration of pavement damaged by the contractor due to negligence, sloppy workmanship, or areas outside those designated by the contract administer.

E49. TEMPORARY SURFACE RESTORATIONS

E49.1 Further to clause 3.3 of CW 1130, where permanent surface restorations cannot be made due to cold weather or other reasons, the Contractor shall temporarily restore surfaces in accordance with current revision of the City of Winnipeg "Street Cuts Manual" found at https://legacy.winnipeg.ca/publicworks/permitsApprovals/pdf/Street-Cuts-Manual.pdf and summarized as follows:

E49.1.1 Backfill and level boulevards and grassed areas to match existing surface elevations and reduce to potential for trip hazards,

E49.1.2 Cap excavations in low volume approaches and back lanes with 300 mm of compacted crushed granular material and topped with either 75 mm of hot mix asphalt or 150 mm of non-reinforced concrete meeting the requirements of CW 3310 Clause 6.6 "Concrete for Temporary Restoration of Utility Pavement Cuts" to match the existing pavement grade.

E49.1.3 Cap excavations on Local Streets, Regional streets and high volume approaches in accordance with the "Street Cuts Manual" Sacrificial concrete pavement constructed of 600 mm of Cement Stabilized Backfill to CW 2160 and a 150 mm of non-reinforced concrete meeting the requirements of CW 3310 Clause 6.6 "Concrete for Temporary Restoration of Utility Pavement Cuts".

E49.1.4 Cap excavations in sidewalk pavement with 100 mm of compacted crushed granular material and 50 mm of cold mix asphalt to match the existing sidewalk grade.

E49.1.5 Insulate temporary concrete where required during 24 hr curing period,

E49.1.6 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.

E49.1.7 Remove all temporary pavements prior to permanent restorations.

E49.2 Backfill under temporary surface restorations to be as follows:

E49.2.1 Use Class 2 back fill in excavation under temporary street pavements and sidewalks where Class 3 backfill cannot be jetted and flooded due to cold weather.

E49.2.2 Class 2 backfill may be compacted in 500 mm lifts where backhoe operated pneumatic plate compactors are used.

E49.2.3 Jet and flood Class 2, Class 3 and Class 5 backfilled excavations in spring when ground is not frozen prior to permanent restoration in accordance with E43.

E49.2.4 Any Sacrificial Concrete Pavement, Cement Stabilized Backfill, or temporary cold mix asphalt shall be completely removed and the remaining backfill shall be flooded, tamped and topped up prior to performing permanent pavement restorations in accordance with E48.

E49.3 All temporary pavement restorations must be completed and continuously maintained until final surface restoration can be completed.

E49.4 Further to CW 3310, all concrete used for temporary pavement restoration shall have a minimum compressive strength of 20 MPa 24 hours after placement.

E49.5 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. All costs associated with the maintenance or reconstruction of temporary pavement incurred by the City shall be deducted from future payments to the Contractor.

E49.6 Measurement and Payment

E49.6.1 All temporary surface works shall be incidental to the work except for sacrificial concreted and cement stabilized fill.

E49.6.2 Full Slab Sacrificial Concrete Pavement shall be measured on an area basis for the of concrete installed in accordance with the specification and accepted by the Contract Administrator. Payment will be by the Contract Unit Price for “Full Slab Replacement - Sacrificial Concrete Pavement” and include base preparation, reinforcement, concrete, finishing, grade control, and all other associated work. Area will be measured by the Contract Administrator.

E49.6.3 Partial Slab Sacrificial Concrete Pavement shall be measured on an area basis for the of concrete installed in accordance with the specification and accepted by the Contract Administrator. Payment will be by the Contract Unit Price for “Partial Slab Replacement - Sacrificial Concrete Pavement” and include base preparation, reinforcement, concrete, finishing, grade control, and all other associated work. Area will be measured by the Contract Administrator.

E49.6.4 Cement Stabilized Fill shall be measured on a volume basis installed in accordance with the specification and accepted by the Contract Administrator. Payment will be made at the Contract Unit Price and include supply of cement stabilized fill, vibration, and all other associated works. Volume will be based on survey by the contract administrator. No payment will be made for excess fill ordered but not placed.

E50. PARKING LOT AND ACTIVE TRANSPORTATION PATHWAY RESTORATION AND RENEWAL

E50.1 Parking lot restorations shall match the existing structures. The Pavement type and structure for each parking lot in the job can be assumed as follows. Variations from the below structures should be brought to the attention of the Contract Administrator immediately. Change is unit cost would be considered but only for the difference in quantities between the actual structure and the structure detailed below.

E50.1.1 St James Rods Football Clubhouse Parking lot and access road

(a) 75 mm Asphalt to CW3410

(b) 75 mm Limestone Base Course to CW3110

(c) 350 mm 50 mm Sub-base to CW3110

E50.1.2 St James Rods Football Clubhouse Parking lot Approach

(a) 200 mm Reinforced Concrete Pavement to CW3110

(b) 75 mm Limestone Base Course to CW3110

(c) 350 mm 50 mm Sub-base to CW3110

E50.1.3 Bourkevale Park

(a) 75 mm Asphalt to CW3410

(b) 75 mm Limestone Base Course to CW3110

(c) 350 mm 50 mm Sub-base to CW3110

E50.2 Asphalt pathway restoration structure shall match SCD-648B.

E50.3 Elevation and grades of the parking lot and pathways shall be restored to pre-construction levels. Adjustment of grades to correct or re-establish drainage paths as required and directed by the Contract Administrator.

E50.4 Asphalt concrete pavement works shall be in accordance with CW 3410 and Subgrade, sub-base, and base coarse shall be in accordance with CW3110.

E50.5 Measurement and Payment

E50.5.1 Parking Lot and Active Transportation Pathway Restoration and Renewal will be measured on a unit basis as per E48.

E50.5.2 Repair of Contractor damage outside of Work areas shall no be measured and will be incidental to the cost of repair.

E51. PRIVATE DRIVEWAY, SIDEWALK AND WALKWAY RENEWALS

E51.1.1 Removal and replacement of concrete driveways shall be in accordance with CW 3234 and CW 3310, Measurement will be on a unit basis as per E48.

E51.1.2 Removal and replacement of concrete sidewalk or private walkway approaches in accordance with CW 3110 and CW 3325.

E51.1.3 Sidewalk renewals shall be measured on an area basis for the type of sidewalk installed in accordance with the specification and accepted by the Contract Administrator. Payment will be by the Contract Unit Price for “Miscellaneous Concrete Slab Renewals” and include base preparation, reinforcement, concrete, finishing, grade control, and all other associated work. Area will be measured by the Contract Administrator.

E51.1.4 Removal and replacement of paving stone or concrete sidewalk block walkways in accordance with CW 3330.

E51.1.5 Replacement of Existing Private Sidewalk shall be measured on an area basis for the type of sidewalk installed in accordance with the specification and accepted by the Contract Administrator. Payment will be by the Contract Unit Price for “Replacement of Existing Private Sidewalk” and include base preparation, supply of paving stones, reinforcement, concrete, finishing, grade control, and all other associated work. Area will be measured by the Contract Administrator.

E52. CLEANUP AND RESTORATION CONSTRUCTION WORK AND LAYDOWN AREAS

E52.1 All Construction work areas and laydown areas shall be restored to pre-construction condition or better.

E52.2 Remove all fencing, equipment, material piles, temporary facilities, temporary access, and all other construction material from all work areas.

E52.3 St. Mathews Work Area

E52.3.1 Clear and re-level areas, topsoil and seed to E62.

E52.3.2 Replace wood bollards as per SCD-105B match existing bollards type, size, and spacing.

E52.4 St. James Football Clubs Work Area

E52.4.1 Remove existing asphalt to full depth and replace to E48 within work area.

E52.4.2 Remove and replace all damaged curb and gutter to nearest saw cut and replace to E48.

E52.4.3 topsoil and sod damaged grass areas in accordance with E62.

E52.4.4 Multi-use Path structure shall match SCD-648A.

E52.4.5 Replace wood bollards as per SCD-105B match existing bollards type, size, and spacing.

E52.4.6 Remove temporary access to parking lot and restore area to pre-construction condition.

E52.5 Bourkevale Park Work Areas

E52.5.1 Clear and re-level areas, topsoil and seed to E62.

E52.6 Work Area along Rutland Street

E52.6.1 Sweep and clean streets of dust dirt and other construction materials.

E52.6.2 Topsoil and sod damaged boulevard grass areas to E62.

E52.6.3 Replace all curb sections damaged due to construction activities and gutter in accordance with E48.

E52.6.4 Replace all sidewalk panels damaged due to construction activities in accordance o E48.

E52.7 Measurement and Payment

E52.7.1 Cleanup of construction work and laydown areas will not be measured for payment and will be incidental to the Site Development, Mobilization, and Demobilization.

E53. REPAIR OR RENEWAL TO EXISTING SEWER OR WATER SERVICES

E53.1 Repair or replacement of existing sewer or water services that conflict with the proposed sewer installation may be necessary. To minimize the potential for damaging existing services, shafts should be located near service locations such that the service locations can be found by exploratory digging. The Contractor shall attempt to adjust the water service pipe without cutting into the pipe to reroute it around the new sewer.

E53.2 The Contract Administrator must be notified immediately if a sewer or water service is damaged by the work, so that the home or building owner may be contacted and arrangements made for the provision of temporary servicing.

E53.3 The regrading or repair of existing 100 mm or 150 mm sewer services shall be done in accordance with CW 2130 and CW 2110.

E53.4 The repair of damaged water service pipes shall be undertaken in accordance with CW 2110. The repair shall comply with the standard City of Winnipeg practice of allowing only one union or per service, and fully renewing the remainder of the service to the main or to the curb stop (whichever is shorter). Existing corporation stops, curb stops and boxes may be reused if in good condition and if compatible with the service pipe.

E53.5 Relocation of existing water services encountered but not damaged by construction shall be incidental to the construction of sewers.

E53.6 The Contract Administrator must be notified if any of the water service piping encountered is not copper. If lead water services are encountered, these should be fully renewed with minimum 19 mm copper water services, including new saddle and corporation stop at the main, new curb stop and box. Connect new copper water service to existing lead service with a suitable flange copper to lead adapter.

E53.7 Measurement and Payment

E53.7.1 Renewal of the wastewater services to Relocated Combined Sewers shall be in accordance with CW2130.

(a) Wastewater Sewer Connection shall be measured on a unit basis for each type, long (West) and short (east), of sewer service connection installed in accordance with the specification and accepted by the Contract Administrator. Payment will be at the Contract Unit Price for “150 mm PVC SDR-35 WWS Service Connections” and include connection to the new sewer, connection to existing service, pipe, service riser, bends, tees, bedding backfill, and all other associated work.

E53.7.2 Repair or Renewal of wastewater sewers not associated with combined sewer relocation shall be in accordance CW2130.

(a) Wastewater Services shall be measured on a length basis for each size of sewer installed in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Sewer Services – 150 PVC SDR-35” and include excavation, pipe, fittings, bedding, backfill, and all other associated works.

(b) Sewer Service Risers shall be measured on a unit basis for each installed in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Sewer Services – Sewer Service Riser” and include connection to the new sewer, pipe, bends, tees, bedding backfill, and all other associated work.

(c) Connection to Existing Service shall be measured on a unit basis for each installed in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Sewer Services – Connection to Existing Service” and include connection to the new sewer, pipe, bends, tees, bedding backfill, and all other associated work.

E53.7.3 Renewal or Repair of water services shall be in accordance with CW2110.

(a) Water Services shall be measured on a length basis for each size of service installed in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Water Services – Water Service” and include excavation, pipe, fittings, bedding, backfill, and all other associated works.

(b) Corporation Stops shall be measured on a unit basis for each service size installed in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Water Services – Corporation Stop” and include connection to the corporation stop, connection to existing watermain, excavation, bedding, backfill, and all other associated work.

(c) Curb Stops and Box will be measured on a unit basis for each service size installed in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Water Services – Curb Stop and Box” and include connection to the curb stop, box, excavation, bedding, backfill, and all other associated work.

E53.7.4 No payment will be made for sewer or water service repair or renewal damaged by the contractor due to negligence or sloppy workmanship.

E54. WOOD BOLLARDS

E54.1 Description

E54.1.1 This Specification covers the removal and re-installation of existing wood bollards.

E54.1.2 The work to be done under this Specification shall include the furnishing of all labour, granular backfill, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work hereinafter specified.

E54.2 Materials

E54.2.1 Post

(a) 190 – 220mm Diameter, 1800 mm long rough post pressure treated alkaline copper quaternary (ACQ)

E54.2.2 Granular Backfill

(a) Crushed limestone base course to CW3310.

E54.3 Construction Methods

E54.3.1 Installation of the chain fence and post shall be carried out as per The City of Winnipeg, Planning, Property and Development Department – Planning and Land Use Division – Drawing SCD-105B Post Bollard.

E54.3.2 Removal of the existing wood bollards shall be carried out in a manor as not to damage the existing fence and post for re-installation before final restoration.

E54.3.3 Bollards to be placed in an augured hole with a minimum spacing on all sides including bottom of 50mm for granular 19mm down limestone.

E54.3.4 All bollards thoroughly tamped and granular mounded at each post for future settling and drainage away from post. Surplus earth to be legally disposed of.

E54.3.5 Bollards are to follow the natural contour of the land except for small undulations which would tend to reduce the aesthetic appearance of the finished product.

E54.4 Measurement and Payment

E54.4.1 Remove and Reinstall Wooden Bollards shall be measured on a unit basis for each bollard removed and reinstalled in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Removal and Reinstall Wooden Bollards” and include removing and storing existing bollard, auguring holes, limestone, reinstalling bollard, disposal of excess soil, and all other associated works. Payment shall be according to the following schedule

(a) Twenty-five percent (25%) following removal and storage of existing bollard.

(b) Seventy-five percent (75%) following the reinstallation of existing bollard.

E54.4.2 Replace Wooden Bollards shall be measured on a unit bases for each bollard supplied and installed in accordance with the specification and accepted by the contract administrator. Payment will be at the Contract Unit Price for “Replace Wooden Bollards” and include supply and installing wood bollard, auguring holes, limestone, disposal of excess soil, and all other associated works.

WORKS NEAR RIVERBANK

E55. PROTECTION OF WATERWAYS

E55.1 Description

E55.1.1 All work adjacent to or crossing waterways including creeks and ditches draining in waterways is regulated by Fisheries and Oceans Canada (DFO).

E55.1.2 Complete works in accordance with Fisheries and Oceans Canada “Measures to Avoid Causing Harm to Fish and Fish Habitat” available at: http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/index-eng.html.

E55.1.3 Works within 106 metres (350 feet) of the Assiniboine River are within the jurisdiction of the City of Winnipeg Waterway By-law. The Contract Administrator will apply for the required Waterway Permit for the project, with the City paying all permit application costs. The Contractor shall adhere to restrictions imposed by the permit.

E55.1.4 Under no circumstances will stockpiling of any material be permitted within the area between the Assiniboine River and rear (land) side of the dike.

E55.2 Construction Methods

E55.2.1 General

(a) Complete erosion control works to be in accordance with current Fisheries and Oceans Canada and Manitoba Environment guidelines.

(b) The following mitigation measures must be adhered to protect fish habitat:

(i) No in-channel construction activity shall be permitted during the time period between April 1 and June 15.

(ii) Use sediment and erosion control measures to prevent soil laden run off and silt from affecting downstream areas of the watercourse. Halt construction during periods of heavy rain or run off.

(iii) Monitor the work site to evaluate the effectiveness of erosion control measures and the physical stability of the creek bed and banks. Any problems are to be rectified immediately.

(iv) Conduct the cleaning, fuelling, and servicing of equipment a minimum of 100 m from any watercourse. Equipment operating near any watercourse should be free of external grease, oil, mud, or fluid leaks.

(v) Take necessary precautions to ensure deleterious substances, including silt, does not enter any watercourse. The deposit of deleterious substances into water frequented by fish is prohibited under the Fisheries Act.

(vi) Remove excess material from the excavation and place where it will not erode into any watercourse. Dispose all spoil materials above the high water mark and located such that they do not re-enter any watercourses.

(vii) Remove all dead vegetation, rubble, construction debris, and other materials from the river area following the completion or works and prior to the restoration of the vegetation.

E55.3 Measurement and Payment

E55.3.1 No measurement or payment shall be made for protection of waterways during or after construction. This work shall be incidental to the Work performed under this Contract and no separate measurement or payment will be made.

E56. RECONFIGURATION AND RESTORATION OF BOURKEVALE DOG PARK FENCING

E56.1 Chain link fence and drift control fence to be in accordance with CW 3550

E56.2 Remove existing chain link fence required for Outfall Construction. Remove mesh, rails, and posts with care to avoid damage and store off-site in a secure location for the duration of the outfall construction.

E56.3 Install temporary 1.8m high chain link fence and 1.2m high drift control fence in the location shown on the drawing to allow shut down of existing dog park during construction

E56.4 Once outfall construction is complete re-install fence in original location and remove temporary chain link fence and drift control fence.

E56.5 Measurement and Payment

E56.5.1 Reconfiguration and Restoration of Bourkevale Dog Park Fencing will be measured on a lump sum basis for work in accordance with the specifications and accepted by the Contract Administrator. Payment will be at a percentage of the lump sum cost for “Reconfiguration and Restoration of Bourkevale Dog Park Fencing” and include removal and storage of existing chain link fence, installation of temporary drift control fence, Reinstallation of fencing and gates, signage, padlock gates, flagging, and all other associated works. Payment shall be according to the following schedule

(a) Fifty percent (50%) following removal and storage of existing fence and installation of temporary fencing, signage, padlock gates and flagging.

(b) Fifty percent (50%) following the reinstallation of existing fence.

E57. OUTFALL WORKS

E57.1 Description

E57.1.1 This Specification describes the special requirements for outfall construction, and shall amend and supplement Standard Specifications CW 2130, CW 2610 and CW 3615.

E57.2 Materials

E57.2.1 Outfall Piping

(a) The following materials are specified for use as outfall piping and ballast block connections. Locations are noted on the Construction Drawings. In addition to the requirements noted on the Drawing, the following is required:

(i) Structural Plate Corrugated Steel Pipe (SPCSP) to be Helically Corrugated Lockseam Pipe with Polymer protective film coating or approved equivalent in accordance with in (i) with Diameter or cross-section, corrugation profile and wall thickness as specified on drawings. Step bevel end section to be shop constructed and to dimensions specified on drawings.

(ii) Coupling Systems for SPCSP to SPCSP connections to be Hugger Band type Couplers with Polymer protective film coating complete with O-ring Elastomeric or neoprene Gaskets, or approved equivalent in accordance with B7.

(iii) Touch-up sealant shall be a polymer protective film as recommended by supplier and compatible with pipe protective film coating.

E57.2.2 Bedding and Backfill Material for SPCSP

(a) A 300 mm thick layer of clean crushed limestone shall be installed beneath the pipe bedding to promote drainage of the riverbank in the vicinity of the pipe, conforming to Type 3 material from Table CW 2030.1.

(b) Bedding and backfill material for the pipe surround shall be Class B bedding and pipe bedding and backfill with Type 3 material from Table CW 2030.1. The material shall not be frozen at the time of placement and compaction. The Contractor shall take such measures as are necessary to ensure embedment material is not placed in a frozen state.

(c) Trench backfill material above pipe surround shall be Class 4 compacted excavated material conforming to CW 2030 clause 3.8.

(d) Representative samples of all granular materials proposed for use for bedding and backfilling shall be submitted to the Contract Administrator for review as per CW 2030 clause 5.2.

E57.2.3 Geotextile

(a) Geotextile shall be a non-woven geotextile fabric, meeting or exceeding the properties specified for Separation Geotextile Fabric of CW 3130 clause 2.5.

E57.2.4 Bar Screens, Slip Joints and Bolts

(a) Shop drawings shall be submitted for outfall bar screens and slip joints, for installation at locations indicated on the drawings.

(b) Galvanizing shall be hot-dip conforming to requirements of CSA G164-N1981 to a minimum net retention of 600 g/m2. All bolts and nuts shall be typical steel, conforming to ASTM A-320 Grade B8M. All welding shall be fully approved by the Canadian Welding Bureau in conformance with CSA Standard W47.1. Welding shall be done by currently licensed welders only. Welding splatter and other fabricator burrs, where exposed, shall be ground off and/or filed smooth, and left ready for subsequent operations. All miscellaneous metal, after fabrication, shall be hot dip galvanized. No separate measurement will be made for hot-dip galvanizing.

E57.2.5 Galvanized Primer

(a) Galvanized primer for repair of coating for E57.2.4 shall be zinc rich, ready mix to CGSB-1-GP-181M.

E57.2.6 Pipe Connection Collar

(a) Concrete for the pipe connection collar shall be Type B concrete in accordance with Table CW2160.1 of CW 2160.

(b) To limit heating and hoarding requirements during cold weather, cold weather concrete shall have a minimum compressive strength of 20 MPa 24 hours after placement and be maintained at a minimum temperature of 10°C for 3 days following installation.

(c) Reinforcing steel shall conform to the requirements of CSA Standard G30.18, Grade 400W, Billet-Steel Bars for concrete reinforcement. All reinforcing steel shall be straight and free from paint, oil, mill-scale, and injurious defects. Surface seams or surface irregularities will not be cause for rejection, provided that the minimum dimensions, cross section area, and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard G30.18. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibits flaws in manufacture or fabrication, such material shall be immediately removed from the Site and replaced with acceptable reinforcing steel.

(d) Bar accessories including bar chairs, spacers, clips, wire ties, wire (18 gauge minimum), or other similar devices shall be of a type approved by the Contract Administrator. They shall be made from a non-rusting material, and shall not stain, blemish, or spall the concreted surface for the life of the concrete.

E57.3 Construction Methods

E57.3.1 Shop Drawings

(a) The Contractor shall have a Shop Drawing submission prepared for the outfall pipe, slip joint and bar screen as per CW 1100 clause 3. The shop drawing submission shall be in sufficient detail to permit review of materials for compliance with this Specification and facilitate assembly in the field complete with connection details.

E57.3.2 Structural Plate Corrugated Steel Pipe (SPCSP)

(a) The SPCSP shall be installed as shown on the drawings and in accordance with CW 3610 and laid to the established line and grade.

E57.3.3 Bedding and Backfilling for SPCSP

(a) Construct the outfall underdrain layer and geotextile surround as indicated on drawings.

(b) Compact underdrain layer to 100% of Standard Proctor Maximum Dry Density.

(c) Bedding and backfill up to 300 mm above pipe crown to be hand tamped by mechanical means to a density sufficient to limit pipe deflection. Compaction to 95% of Standard Proctor Maximum Dry Density. Ensure that pipe bedding is tamped thoroughly in the haunch area.

(d) Backfill around pipe in maximum 300 mm lifts alternatively from side to side. At no time should the difference in backfill elevation on either side of the pipe be greater than 450 mm.

(e) The outfall piping may be braced internally in an approved manner to limit deflection during installation and backfilling. The struts must be removed subsequent to construction. If pipe deflects greater than 4% of internal diameter during construction or within the warranty period, the Contractor shall re-excavate to springline (or greater if required), re-establish sufficient side support and re-backfill as originally specified.

(f) Backfilling above 300 mm above the pipe shall be as per CW 2030 for Class 4 backfill. Contractor to ensure compaction equipment utilized is consistent with degree of compactive effort required and adequate protection against overloading pipe. Compact backfill over pipe perpendicular to trench. Any damage caused to the pipe as a result of construction operations will be rectified at the Contractor's expense. Only non-frozen material shall be used.

(g) The construction of clay plugs to isolate the pipe bedding from the riprap is not required for outfalls on this project.

E57.3.4 Geotextile Trench Wrap

(a) Install geotextile filter fabric to encase pipe surround above granular underdrain layer as indicated on the drawings. Install fabric between outer limits of excavation and granular bedding and backfill material. Ensure trench fully encased on top, bottom, sides, and at limits of excavation.

(b) Install long dimension of fabric perpendicular to trench overlapping joints a minimum of 600 mm.

(c) Place fabric such that the upstream or higher elevation layer overlaps the downstream or lower elevation layer.

E57.3.5 Concrete Connection Collar

(a) No “stay-in-place” formwork is permitted.

E57.4 Measurement and Payment

E57.4.1 Structural Plate Corrugated Steel Pipe shall be measured on a length basis, measured along the invert of the pipe from the specified connection point at the concrete transition collar chamber to the end of the step bevel section. Payment will be made at Contract Unit Price for "SPCSP" for each pipe diameter or cross-section and wall thickness indicated, and shall include the supply and installation of pipe couplers, excavation, bedding and backfill, underdrain layer, geotextile trench wrap, and associated works.

E57.4.2 Outfall Bar Screens shall be measured on a unit basis for each size and configuration of bar screen supplied and installed. Outfall bar screens shall be paid for at the Contract Unit Price for “Fittings and Specials – Bar Screen” per unit, measured as specified herein, 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.

E57.4.3 Outfall slip joints shall be measured on a unit basis for each size and configuration of slip joint supplied and installed. Supply and installation of outfall slip joints shall be paid for at the Contract Unit Price for “Fittings and Specials – Slip Joint” per unit, measured as specified herein, 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.

E57.4.4 Pipe connection collars between concrete pipe and corrugated steel pipe shall be measured on a unit basis for each size and configuration of collar constructed. Construction of concrete transition collars shall be paid for at the Contract Unit Price for “Fittings and Specials – Connection Collar” per unit, measured as specified herein, 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.

E58. RIVERBANK EXCAVATION

E58.1 Description

E58.1.1 This specification describes requirements for surface excavation near Assiniboine River including topsoil and vegetation removal and shall amend and supplement CW 3170.

E58.2 Materials

E58.2.1 Excavation and Fill

(a) Surplus excavated material required for backfilling the outfall pipe shall be stockpiled on site at a location away from the top of the Assiniboine Riverbank for later use on site.

E58.3 Construction Methods

E58.3.1 Excavation of the riverbank shall be to the lines and grades shown on the drawings or as required.

E58.3.2 Limited vegetation and topsoil removal may be required to facilitate the Works. Existing vegetation shall not be removed without prior approval from the Contract Administrator. The Contractor shall load and haul any removed vegetation and dispose of the material off site.

E58.3.3 Stockpiling will not be permitted near the top of the bank. Excavated material should be removed from the vicinity of the river immediately upon excavation. No temporary material piles may remain near the riverbank for longer than one hour during the excavation process, and the Contractor should pace the excavation to keep up with the removal from site.

E58.3.4 The contractor shall employ sediment control measures as outlined in E59 and E60 to control the release of sediment into the river.

E58.4 Measurement and Payment

E58.4.1 Stripping of vegetation and topsoil shall not be measured or paid for directly but shall be included in the cost of riverbank excavation.

E58.4.2 Riverbank Excavation shall be measured on a volume basis for the total volume of riverbank excavation completed in accordance with the specification and accepted by the Contract Administrator. Payment will be at the Contract Unit Price for “Riverbank Excavation” and include stripping of vegetation and topsoil, excavation for flattening existing slopes, subcutting for riprap installation, course grading of the impacted area for soil amendment and revegetation, and all other associated works. Volume will be measured based on survey by the Contract Administrator.

E59. SILT FENCE

E59.1 Description

E59.1.1 This specification covers the erection of temporary silt fencing, which shall be installed and maintained at the locations shown on the drawings (detail drawing is attached), to control runoff and minimize the release of detrimental silt loadings to watercourses. The scope of work included in this specification is as follows:

(a) Supply and Install temporary silt fencing at locations as indicated, in accordance with the detail drawing provided, prior to undertaking any other activities on the site where silt fencing is required.

(b) Maintain the silt fencing in serviceable condition throughout the entire duration of activities at the site where silt fencing is required, including final restoration and cleanup of the construction site.

(c) Remove the silt fencing and restore the area where the fencing was installed, without further disturbing the area and without releasing any deleterious substances to the adjacent watercourse.

E59.2 Materials

E59.2.1 Fence Posts

(a) Fence posts shall be 38x38 mm untreated wood posts, 41 mm steel Tee posts, or punched steel U posts, minimum length of 1.2 m or as specified on the drawings.

E59.2.2 Filter Fabric

(a) Filter Fabric Shall be a woven geotextile material specifically designed for a silt fence applications, meeting the following minimum requirements:

Property	Test Method	Value
Grab Tensile Strength	ASTM D4632	0.55 kN
Grab Tensile Elongation	ASTM D4632	15%
Mullen Burst	ASTM D3786	2060 kPa
Puncture	ASTM D4833	0.285 kN
Trapezoid Tear	ASTM D4533	0.285 kN
UV Resistance	ASTM D4355	80% @ 500 hrs
Apparent Opening Size (AOS)	ASTM D4751	0.60 mm
Flow Rate	ASTM D4491	405 l/min/m²

(b) The fabric shall be inert to commonly encountered soil chemicals, hydrocarbons, mildew and bacteria.

E59.2.3 Wire Mesh

(a) Wire mesh shall be galvanized or plain metal with 3.0 mm wire gauge and wire spacing @ 150 mm o/c.

E59.2.4 Fencing Material Fasteners

(a) Staples or wire ties of sufficient strength and spacing to withstand a 530N (120lbf) pull test at any point on the wire mesh.

E59.3 Construction Methods

E59.3.1 Ensure that no deleterious substances are discharged into the adjacent watercourse at any time during construction activities

E59.3.2 Silt Fence Installation

(a) Excavate 150 x 150 anchor trench along alignment of silt fence as indicated.

(b) Install fence posts as indicated. Ensure that fence posts are firmly driven into undisturbed soil or are completely and firmly backfilled if installed via auger methods.

(c) Attach wire mesh as support backing for silt fence filter fabric with specified fasteners. Attach silt fence filter fabric on top of wire mesh in similar fashion. Overlap any fence seams (wire mesh or filter fabric) by 450 mm minimum. Ensure that wire mesh and filter fabric are installed on the upslope side of the post and are fully laid in anchor trench as shown.

(d) Install and compact impermeable excavated materials into anchor trench and slope as indicated. Compact to 95% of maximum dry density (ASTM D-698).

E59.3.3 Silt Fence Maintenance

(a) Inspect silt fence daily, prior to starting any other construction activities. If fence posts are found loose or not upright, repair in accordance with specified installation procedure. If silt fence is found to be loose or torn, repair or replace as necessary to comply with installation procedure.

(b) If silt deposition at the fence is 300 mm or more in depth, carefully remove and dispose of silt offsite without disturbing silt fence.

E59.3.4 Silt Fence Removal

(a) Remove silt fences following completion of all site construction activities (including final restoration and cleanup) and after installation of all permanent erosion control measures and satisfactory establishment of permanent vegetation.

(b) Restore areas disturbed, without releasing any deleterious substances to the adjacent watercourse.

E59.4 Measurement and Payment

E59.4.1 Silt fencing will be measured on a length basis and paid for at the Contract Unit Price for per lineal meter for “Supply, Install and Maintain Silt Fence”. The length of silt fencing to be paid for will be the total length of silt fencing installed and maintained in accordance

with this Specification as computed from measurements verified by the Contract Administrator. Payment for silt fencing shall be in accordance with the following schedule:

(a) Sixty percent (60%) of the quantity shall be paid following supply and installation.

(b) Forty percent (40%) shall be paid following final removal.

E59.4.2 Removal of accumulated sediment from the silt fence is considered incidental to the Work and no separate measurement or payment will be made.

E60. SEDIMENT CONTROL MEASURES

E60.1 Description

E60.1.1 This Specification covers the supply, implementation and maintenance of erosion control measures to control the release of sediments into the river during and following construction.

E60.1.2 The work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work hereinafter specified.

E60.2 Materials

E60.2.1 The Contractor shall maintain a supply of erosion control products such as erosion control blankets, silt fencing, straw bales, booms or mulch on site at all times suitable for trapping and preventing sediments from entering the river.

E60.3 Construction Methods

E60.3.1 Contractor shall be responsible for maintaining sediment control measures at the site to prevent sediment releases into the river from areas disturbed as a result of his work during and following construction

E60.3.2 Sediment control measures shall be implemented to meet Fisheries and Oceans Canada guidelines identified in E55.

E60.3.3 The Contractor shall monitor his work and implement appropriate sediment control measures as site conditions warrant. Such measures may include installation of silt fences, straw bales or other measures as required in the event that there is runoff from the site.

E60.3.4 As a minimum, temporary silt fences or straw booms shall be installed along the down-slope edges of all areas where the vegetation has been disturbed, soils are exposed, or fills have been placed.

E60.3.5 The silt fences and booms shall be attached to secure stakes and trenched in to the ground such that there are no gaps and the fencing will not be undermined.

E60.3.6 The silt fences shall be inspected, maintained and repaired as required.

E60.3.7 During rain storms the Contractor shall inspect the silt fences and booms at least daily and more frequently if required. Trapped sediments shall be removed as required, during or immediately following each rainstorm. All trapped sediments shall be removed from the site.

E60.3.8 Upon completion of the construction work, all surplus or waste materials, and materials containing fine-grained sediments shall be removed from the site.

E60.3.9 The Contractor shall monitor, maintain, repair, etc. the sediment control measures until vegetation has established in restored areas and there no longer is a potential for sediment releases due to construction.

E60.4 Measurement and Payment

E60.4.1 No measurement or payment shall be made for sediment control measures during or after construction. This work shall be incidental to the Work performed under this Contract and no separate measurement or payment will be made.

E61. RIPRAP

E61.1 Description

E61.1.1 This Specification covers all operations necessary for placing riprap as shown on the drawings or determined by the Contract Administrator. This Specification amends and supplements Standard Specification CW 3615.

E61.2 Materials

E61.2.1 Random Stone Riprap

(a) Hard, durable crushed rock that is resistant to the action of water and frost and suitable in all respects for the purpose intended, and in accordance with CW 3615.

(b) Rock for use in random stone riprap shall be well graded with rock as specified on the drawings.

(c) Rock shall be comprised of crushed limestone, granite, or other quality dense rock. Limestone shall be durable white crystalline limestone. Softer buff to yellow dolomite or dolostone will not be acceptable. Crushed rock will not be acceptable.

(d) Riprap must conform to the following physical requirements:

(i) minimum bulk specific gravity of 2.6 (ASTM C127)

(ii) maximum Los Angeles abrasion loss of 35% (ASTM C131)

(iii) maximum soundness loss of 13% (ASTM C88)

(e) Rock samples shall either be submitted to the Contract Administrator for approval ten (10) days prior to their use, or the Contract Administrator shall visit the quarry for inspection a minimum of ten (10) days prior to use. No rockfill will be permitted without providing the source and supplier. The Contract Administrator shall perform the necessary tests to determine compliance with the specified properties.

E61.2.2 Riprap Gradation

(a) Gradation to meet following size distribution for use intended:

Stone Size smaller than (mm)	**Class 450**	**Class 900***
900		100%
600		15-50%
450	100%	
250	25-50%	0-15%
100	0-15%	

*Non-standard gradation to Manitoba Transportation and Infrastructure (MTI) Specification No. 1297 ‘Specifications for Stone Rip-Rap’.

E61.2.3 Boulders

(a) Select large boulders to 900mm diameter matching properties of random stone riprap. Boulders encountered on site, fieldstone or crushed rock are all suitable since boulders will be below the Assiniboine River NSWL.

E61.2.4 Geotextile Underlay

(a) Geotextile shall be a non-woven geotextile fabric, meeting or exceeding the properties specified for Separation Geotextile Fabric of CW 3130 clause 2.5.

E61.3 Construction Methods

E61.3.1 Riprap shall be installed to the elevations, grades, thickness and dimensions as shown on the Drawings, or as directed by the Contract Administrator.

E61.3.2 Install geotextile underlay where shown on the drawings. Overlap layers a minimum of 600 mm.

E61.3.3 Riprap shall be placed in a manner that prevents damage to geotextile underlay.

E61.3.4 Riprap shall be placed in a manner such that larger pieces are uniformly distributed, smaller rocks fill the spaces between the larger rocks, and that excessive segregation of the various rock sizes does not occur.

E61.3.5 Locations requiring segregated riprap or the placement of select large stones for fish passage, sediment passage or energy dissipation as indicated on the drawings.

E61.3.6 Existing large boulders on site will be relocated onto the new riprap as directed by the Contract Administrator

E61.4 Measurement and Payment

E61.4.1 Supply and installation of riprap will be measured on a volume basis, based on the total number of cubic metres for each specified depth of riprap supplied, delivered and placed in accordance with this Specification and as accepted by the Contract Administrator. Payment shall be at the Contract Unit Price for “Supply and Install Riprap” for each class of riprap.

E61.4.2 Placement of select large boulders will be paid on a unit basis for “Install Large Diameter Boulders in Riprap – (900mm)”.

E61.4.3 Reuse of existing large boulder riprap, including excavation, stockpiling, and replacement will not be measured or paid for directly, but shall be included in the cost of “Supply and Install Riprap”.

E61.4.4 Geotextile underlay will be measured on an area basis. Based on the total number of square metres of geotextile coverage area supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator. Payment shall be at the Contract Unit Price “Riprap Geotextile Underlay”.

REVEGETATION

E62. NATIVE GRASS SEEDING

E62.1 Description

E62.1.1 This specification shall amend and supplement City of Winnipeg Standard Construction Specification CW 3520 “Seeding” and shall cover all aspects of supply and installation of native grass seed, including preparation of finish grade, hydro mulching, and maintenance.

E62.2 Materials

E62.2.1 Provide the Contract Administrator with Certificates of Analysis and mix compositions for all seed mixes. Include supplier’s name and telephone contact information, and percentages of each species and cultivar in each mix.

E62.2.2 Obtain Contract Administrator’s approval for any proposed adjustments to the seed mix species or cultivars.

E62.2.3 Native Grass seed mix for the partly shaded riverbank area shall be a mixture of the following species and cultivars, at the percentage by weight indicated:

(a) 20% Big bluestem (Andropogon gerardii)

(b) 20% Canada wild rye (Elymus canadensis)

(c) 20% Switch grass (Panicum virgatum)

(d) 10% Awned wheatgrass (Agropyron trachycaulum)

(e) 10% Streambank wheatgrass (Elymus lanceolatus)

(f) 10% Fowl blue grass (Poa palustris)

(g) 10% Prairie cord grass (Spartina pectinata)

E62.2.4 Cover crop (Nurse Crop) shall be Oats in all seeded areas.

E62.2.5 Hydro Mulch, water and tackifier shall be in accordance with CW 3520, clause 5.6

E62.3 Construction Methods

E62.3.1 Seed Native Grass mix with a Brillion Seeder, or equal, on 100 mm compacted depth of topsoil.

E62.3.2 Sow Native Grass seed mix at a rate of 28 kg/ha.

E62.3.3 Sow cover crop at 54 kg/ha.

E62.4 Maintenance Methods

E62.4.1 Immediately after the completion of the seeding operation, to the satisfaction of the Contract Administrator, the Contractor shall commence and pay for continuous maintenance of the seeded area until the criteria specified for Termination of the Maintenance Period listed herein.

E62.4.2 Any deficient, damaged or vandalized areas shall be reseeded by the Contractor within three working days after receiving notification from the Contract Administrator and the area so reseeded, shall be further maintained until it meets the Termination of the Maintenance Period criteria.

E62.4.3 In situations where commencement of the Maintenance Period is not granted by the Contract Administrator before the end of a growing season, the Maintenance Period will commence on May 15 of the following year or such date as is mutually agreed upon by all parties.

E62.4.4 The Contractor shall water hydro mulched areas as required to obtain optimum soil moisture levels for germination and continued growth of plants. Control the watering to prevent seed washouts. Water shall be applied in sufficient quantities to saturate seeded area to a minimum depth of 100 mm. All costs to provide water for seeded areas shall be borne by the Contractor.

E62.4.5 The Contractor shall mow Native Grass areas when grasses exceed 300 mm in height, mow to 150 mm height.

E62.4.6 Additional mowing, to a height of 100 mm, shall be completed upon the direction of the Contract Administrator, as required to remove extensive weed growth and/or to maintain healthy growth of native grasses.

E62.4.7 The Contractor shall use chemical weed control, 2-4 D or Dicamba, only as required to spot remove weeds in localized areas and in accordance with E64. Use only chemicals approved by Agriculture Canada.

E62.4.8 The maintenance period shall be terminated after the following criteria have been met:

(a) The certified seed sowed meets the requirements of E63;

(b) The seeded area is free of debris, including leaves and other plant material;

(c) The seeded area has a firm, uniform and even surface;

(d) Seeded grasses or plants show healthy, vigorous growth;

(e) The area is free of bare and dead spots and with less than 10 noxious weeds per 50 square metres;

(f) The seeded area has sufficient growth density that bare spots do not exceed 5% of total surface area, and

(g) Seeded areas are free of damaging insects.

E62.5 Measurement and Payment

E62.5.1 Measurement and Payment for Native Grass seeding by hand or hydroseed methods shall be to E63.

E62.5.2 There will be no separate measurement for cover crop (nurse crop) seeding. Seeding of a nurse crop will be included in payment for other seeding operations.

E62.5.3 There will be no separate measurement for materials, equipment and operations related to the use of herbicides and insecticides.

E63. RESTORATION OF GRASS AREAS

E63.1 Description

E63.1.1 Restoration of grass areas impacted by project works or for new swale construction using topsoil and grass seeding in parkland or topsoil and sodding on boulevards.

E63.1.2 Restoration of settlement along the shallow cover tunnel route between the Assiniboine River dike and Station 0+675 using soil fill, followed by topsoil and seeding.

E63.2 Methods

E63.2.1 Excavate swales at locations shown on drawings and to grades provided by Contract Administrator. Ensure all slope transitions have smooth, rounded transitions.

E63.2.2 Scarify or roto-till areas that have been subjected to vehicle loads or compaction by equipment to a depth of 100 mm.

E63.2.3 Preparation of existing grade, placement of topsoil and application of fertilizer to CW 3540.

E63.2.4 Grade to eliminate rough spots and low spots and to maintain positive drainage.

E63.2.5 Loosen topsoil and roll with mechanical roller to CW 3540. Leave surfaces smooth, uniform and firm against deep foot-printing.

E63.2.6 Install grass seed to CW 3520 using the seed mixes shown below. Hydro mulching may be used for larger areas. Sow at recommended rates in specifications.

(a) General park areas – Park seed mix to CW 3520 Clause 5.3.2

(b) Athletic grounds where specified on drawings – Athletic ground mix to CW 3520 Clause 5.3.1

(c) Riverbank areas above riprap to limits shown on drawings – Native Grass Seed mix to E62.

E63.2.7 Maintain seeded areas to CW 3520, using chemical weed control where warranted to E64. Do not use chemical weed control for the native grass seeded area within 6 m of water's edge. Do not apply sprayed chemicals when winds could blow into the Assiniboine River.

E63.2.8 Termination of the maintenance period for seeded areas shall be in accordance with CW 3520 Clause 9.10.

E63.2.9 Install turf grass sod in boulevard areas to CW 3510.

E63.2.10 Maintain sod to CW 3510.

E63.2.11 Termination of the maintenance period for sod shall be in accordance with CW 3510 Clause 3.10.

E63.3 Measurement and Payment

E63.3.1 Measurement of topsoil and grass seeding will be done on an area basis based on the area of topsoil and grass seeding installed and maintained within work areas, designated travel routes or areas designated for significant regrading including swale construction. Different seed mix areas will be measured separately including general park seed mix, athletic ground mix or native grass mix. Payment will be at the Contract Unit Price for "Topsoil and Grass Seeding" per square meter of topsoil and grass seeding by seed mix type.

E63.3.2 Payment for grass seeding and maintenance will be according to the following schedule.

(a) Sixty-five percent (65%) following placement of seed.

(b) Thirty-five percent (35%) following the completion of the maintenance period.

E63.3.3 Measurement of topsoil and turf grass sodding in boulevard areas will be incidental to the work and will not be measured.

E63.3.4 Measurement of soil fill to restore settlement in the shallow cover tunnel section in Bourkevale Park will be done on a volume basis based on topographic surveys and design finished grades. Payment will be at the Contract Unit Price for "Soil Fill" per cubic meter of soil fill.

E63.3.5 There will be no separate measurement for materials, equipment and operations related to the use of herbicides and insecticides.

E63.3.6 Areas damaged by construction outside of the designated work and laydown areas and access routes will be the Contractors responsibility and will not be measured or paid for.

E64. CHEMICAL CONTROL OF VEGETATION

E64.1 Description

E64.1.1 This specification covers the requirements for the application of herbicides for broad area weed control prior to seeding operations, or spot control of herbaceous weed species from Native Grass seeded areas.

E64.1.2 The need for broad area weed control will be assessed following soil amendment and prior to seeding and may be omitted at the Contract Administrator's discretion.

E64.2 Safety Requirements

E64.2.1 Comply with Federal, Provincial, pesticide control regulations. Provide Material Safety Data sheets (MSDS) for all chemicals to be used.

E64.2.2 Obtain Provincial Pesticide Applications License and any other permits and licenses necessary to complete work.

E64.2.3 Comply with label directions on the use of herbicide products.

E64.2.4 Comply with label directions as to ambient temperature ranges for application.

E64.3 Materials

E64.3.1 Delivery and Storage

(a) Deliver, store and maintain packaged materials with manufacturer's seals and labels intact.

(b) Prevent damage, adulteration and soiling of material during delivery, handling and storage.

(c) Store material in accordance with label directions, including those on maximum and minimum storage temperatures.

(d) Store herbicide products in original containers as supplied by manufacturer and keep sealed until used.

(e) Store herbicide products in sheltered, well ventilated, controlled access location.

(f) Do not store herbicides near feeds and food stuffs, agricultural plants, seeds, fungicides, insecticides, fertilizers or other agricultural chemicals.

(g) Identify storage area as pesticide storage facility for fire protection purposes.

(h) Post in a prominent place a list of medical and fire department telephone numbers.

(i) Post in a prominent location on the outside of the storage area a list of products stored. Provide a copy of this list to fire department. Keep list up to date.

E64.3.2 Herbicides

(a) Select appropriate herbicides to achieve specified control requirement. Refer to Manitoba Guide to Chemical Weed Control.

(b) Herbicide products used must be registered for such use by Agriculture Canada under Pest Control Products Act.

(c) Do not use herbicides containing sodium chlorate.

E64.3.3 Adjuvants

(a) Adjuvants shall be compatible with herbicide product used.

E64.3.4 Spray Equipment

(a) Tank Spray: Do not use air-blast, mist or fog sprayer. Sprayer unit to meet the following requirements:

(i) Sprayer shall have adjustable height boom, hose and handgun for spot treatments, strainers and nozzles to produce spray pattern compatible with job.

(ii) Tank shall be equipped with continuous agitation device.

(iii) Pressure gauge and regulator shall be capable of maintaining uniform pressure between 100 and 450 kPa (15 and 65 psi).

(b) Backpack Sprayer: Sprayer shall have hose and handgun for spot treatment.

(c) Equip spray tank loading pipe with check valve located within one metre of pump or hydrant to prevent siphoning from spray tank resulting in contamination of water source.

E64.4 Construction Methods

E64.4.1 Notice of Spray Operation

(a) Post areas to be treated with signs placed at each road access and 100 m intervals around perimeter.

(b) Indicate on signs that spray program is being implemented.

(c) Put signs in place prior to commencement of spray operation and retain in place for 24 hours after spray operation is completed for each particular area.

E64.4.2 Environmental Protection

(a) Application may continue only when wind velocities range between 2 and 10 km/h.

(b) Do not spray when air turbulence will prevent uniform application.

(c) In case of herbicide spill, notify Contract Administrator and Provincial Ministry of Environment verbally immediately and subsequently in writing.

(d) Do not allow drifting beyond target area. Use mechanical method to minimize herbicide drift.

(e) When spraying adjacent to desirable vegetation, use sprayer fitted with protective hood suitable to prevent contamination or provide protective covering for such vegetation while spray is in progress.

(f) Do not apply sterilant to slopes greater than 3 to 1 where killing vegetation would lead to erosion problems.

E64.4.3 Application of Herbicides

(a) Treat areas as indicated with appropriate herbicides.

(b) Calibrate equipment to achieve manufacturer's recommended application rates.

(c) Confine herbicide application to areas as indicated to achieve specified control requirements.

(d) Space successive passes to provide uniform coverage of treated area.

(e) Use flagmen or other aids as necessary to indicate successive passes.

(f) Where roots of desirable vegetation run under treatment area, use contact herbicides.

(g) Ensure formulation and rate of sterilant will not lead to leaching outside treatment area.

(h) Retreat areas in accordance with label directions until specified control requirements are achieved.

(i) Use flags or other aids as necessary to indicate successive passes.

E64.4.4 Given the need for weed control, the Contractor shall have in his possession a Pesticide Applicator’s License and a Pesticide Use Permit for pesticide applications related to this Specification.

E64.4.5 The Contractor shall apply herbicide with spot spraying when broadleaf weeds start developing in competition with grasses. Apply herbicide in accordance with the City of Winnipeg Weed Control Standards and Procedures, manufacturer's instructions and the Manitoba Agriculture Guide to Crop Protection and Herbicide Recommendations for Landscape Applicators, latest editions and the following criteria:

(a) Use 2,4-D Amine or MCPA Amine herbicide for susceptible broadleaf weeds.

(b) Use a mixture containing 2,4-D Amine or MCPA Amine, Mecoprop and Dicamba for 2,4-D resistant plants.

(c) Do not apply to newly seeded areas.

(d) Do not water within one working day after application.

(e) Apply when winds are less than 20 km/h and air temperature is above 10° (degrees) Celsius.

(f) Avoid use of pure Dicamba solutions near trees and shrubs.

E64.4.6 The Contractor shall inform the Contract Administrator immediately of any dangerous occurrence.

E64.4.7 Control Requirements

(a) For weed control, achieve within 30 days of treatment, minimum of 90% kill of target plants without damaging installed plant material.

(b) For soil sterilization, achieve within 12 months of treatment, 100% kill of vegetation.

E64.4.8 Waste Disposal

(a) Triple rinse empty herbicide containers with dilutent and add rinsate to spray mixture in tank.

(b) Puncture and crush glass, plastic, and metal containers making them unsuitable for further use.

(c) Dispose of containers in accordance with Provincial requirements.

(d) Do not rinse or wash spray tanks and equipment on site.

E64.5 Measurement and Payment

E64.5.1 Chemical Control of Vegetation: Broad scale application of chemical herbicides following soil amendment will be incidental and part of Seeding.

E64.5.2 Spot Weed Control: Application of chemical herbicides to control excessive weed growth in seeded areas following completion of planting operations will be incidental to Seeding.

E65. TREE AND SHRUB PLANTING

E65.1 Description

E65.1.1 General

(a) This specification covers the supply and installation of nursery-grown trees and shrubs plantings in areas to be determined by the Contract Administrator, including preparation, digging, transport and planting, and maintenance.

E65.1.2 Nomenclature

(a) Nomenclature of specified nursery stock shall conform to the International Code of Nomenclature for Cultivated Plants and shall be in accordance with the approved scientific names given in the latest edition of Standardized Plant Names. The names of varieties not named therein are generally in conformity with the names accepted in the nursery trade.

E65.1.3 Source Quality Control

(a) All nursery stock supplied shall be nursery grown and of species and sizes as indicated on the Drawings. Nursery stock shall be No. 1 Grade material in accordance with the current edition of Landscape Canada's (CNTA) "Guide Specifications for Nursery Stock".

(b) Any nursery stock dug from native stands, wood lots, orchards, or neglected nurseries, which have not received proper cultural maintenance, shall be designated as "collected plants". Obtain permission of the Contract Administrator to use collected plants.

(c) The Contractor shall notify Contract Administrator of source of plant material at least seven (7) days in advance of shipment.

(d) Acceptance of plant material at source does not prevent rejection of same plant material on site prior to or after planting operations.

(e) Imported plant material must be accompanied with necessary permits and import licenses. Conform to federal and provincial regulations.

E65.1.4 Shipment and Pre-Planting Care

(a) Coordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.

(b) Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire, which would damage bark, break branches or destroy natural shape of plant. Give full support to root balls, especially of large trees, during lifting.

(c) Cover plant foliage with tarpaulin, and protect bare roots by means of dampened straw, peat, saw dust or other acceptable material to prevent loss of moisture during transit and storage.

(d) Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 50 mm diameter with wound dressing.

(e) Keep roots moist and protect from sun and wind. Heel-in trees and shrubs that cannot be planted immediately in shaded areas and water well.

E65.1.5 Replacement

(a) During the first year following completion of planting operations, remove from site any plants that have died or failed to grow satisfactorily, as determined by the Contract Administrator. As an example, plant material installed in 2025 that has failed to grow

satisfactorily and has not been replaced by October 31, 2025, would be required to be replaced in the spring of 2026.

E65.2 Materials

E65.2.1 Water

(a) Water shall be potable and free of minerals that may be detrimental to plant growth.

E65.2.2 Fertilizer

(a) Fertilizer shall be slow release organic. Fertilizer shall contain N-P-K in ratio as recommended by soil test results from an approved agricultural soil testing laboratory.

E65.2.3 Root Ball Burlap

(a) Root ball burlap shall be 150 g Hessian burlap.

E65.2.4 Anti-desiccant

(a) Anti-desiccant shall be wax-like emulsion to provide film over plant surfaces reducing evaporation but permeable enough to permit transpiration.

E65.2.5 Wound Dressing

(a) Wound dressing shall be horticultural accepted non-toxic, non-hardening emulsion.

E65.2.6 Plant Material

(a) All plant material specified for this project shall be containerized and/or ball and burlap nursery stock. All plants shall be from the Winnipeg area.

(b) Comply with latest edition of the “Guide Specification for Nursery Stock”, produced by Landscape Canada (CNTA), referring to quality, size and development of nursery grown plant material and root balls.

(c) Nursery stock shall be No. 1 grade trees, shrubs and vines.

(d) All plant material shall be measured when branches are in their natural position. Height and spread dimensions specified in the Plant List in this specification, refer to the main body of the plant, and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by calliper (cal.), reference is made to the diameter of the trunk measured at 300 mm above ground as the tree stands properly planted in the nursery.

(e) Material sources are to be approved by Contract Administrator prior to ordering. The Contractor shall provide all the necessary nursery certificates to ensure that the plant species comply with this specification.

(f) All trees shall have one, only, sturdy, reasonably straight and vertical trunk, and a well-balanced crown with fully developed leader, unless designated “multi-stem”. All evergreens shall be symmetrically grown and branched from ground level, up.

(g) Use trees and shrubs with structurally sound, strong fibrous root systems, and free of disease, insects, defects or injuries, including rodent damage, sun scald, frost cracks, abrasions or scars to the bark. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site.

(h) All parts of the plants shall be moist and show live, green cambium tissue when cut. (i) At least one (1) plant of each variety supplied shall bear a tag showing both the botanical and common name of the plant.

E65.2.7 Additional Plant Material Qualifications:

(a) Imported Plant Material

(i) Plant material obtained from areas with milder climatic conditions from those of site acceptable only when moved to site prior to the breaking of buds in their original location and heeled-in in a protected area or placed in cold storage until conditions suitable for planting. Obtain Contract Administrator’s approval to use imported plant material.

(b) Cold Storage

(i) Approval required for plant material that has been held in cold storage.

(c) Container-Grown Stock

(i) Acceptable if containers large enough for root development. Trees and shrubs must have grown in container for minimum of one growing season but not longer than two. Root system must be able to hold soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.

(d) Balled and Burlapped Plant Material

(i) Deciduous trees greater than 3 m in height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with burlap, heavy twine and rope. For large trees: wrap ball in double layer of burlap and drum lace with minimum 10 mm diameter rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.

(e) Tree Spade Dug Material

(i) Obtain approval of the Contract Administrator for digging plant material with mechanized digging equipment, hydraulic spade or clam-shell type. This type of digging is typically not acceptable for boulevard tree plantings. Dig root balls to satisfy Landscape Canada (CNTA) standards. Lift root ball from hole, place in wire basket designed for purpose, line with burlap. Tie basket to ball with heavy rope. Take care not to injure trunk of tree with wire basket ties or rope.

(f) Substitutions

(i) Substitutions to plant material as indicated on the Plant List will not be permitted unless written approval has been obtained as to type, variety and size prior to award of Contract. Plant substitutions must be of similar species and of equal size to those originally specified.

E65.2.8 Plant List

(a) Trees to be compliant with City of Winnipeg Parks and Open Spaces the latest revision of “Acceptable Tree Species for Boulevards” available at https://legacy.winnipeg.ca/publicworks/parksopenspace/UrbanForestry/PDF/Acceptable_Tree_Species.pdf

E65.3 Construction Methods

E65.3.1 Workmanship

(a) The Contract Administrator shall stake out location of trees prior to excavating.

(b) The Contractor shall obtain clearances from all utilities, with respect to underground lines located in the areas to be excavated, prior to commencing planting operations.

(c) The Contractor shall apply anti-desiccant in accordance with material manufacturer's instructions.

(d) The Contractor shall coordinate planting operations; keep the site clean and planting holes drained, and immediately remove soil or debris spilled onto pavement.

E65.3.2 Planting Time

(a) The Contractor shall plant deciduous plant material during dormant period before buds have broken. Plant material noted for spring planting only must be planted in dormant stage.

(b) Plant material imported from region with warmer climatic conditions may only be planted in early spring.

(c) When permission has been obtained to plant deciduous plant material after buds have broken, spray plants with anti-desiccant to slow down transpiration prior to transplanting.

(d) When permission has been obtained, trees, shrubs and ground covers growing in containers may be planted throughout growing season.

(e) Plant only under conditions that are conducive to health and physical conditions of plants.

(f) The Contractor shall advise the Contract Administrator about the planting schedule at least three (3) days prior to planting operations.

E65.3.3 Excavations

(a) Trees: excavate to depth such that the top of the root ball is even with existing grade, with a surface width of two times the diameter of the root ball. Backfill around trees with planting soil mixture.

(b) The sides of all tree pits shall be scarified to the depth of one shovel blade.

(c) Provide drainage for planting holes in heavy soil if natural drainage does not exist. Have method approved by Contract Administrator.

(d) Protect the bottoms of excavations against freezing.

(e) Remove water that enters excavations prior to planting. Ensure source of water is not ground water.

E65.3.4 Planting

(a) Trees shall be placed on undisturbed soil and to a depth equal to that at which they were originally growing at the nursery.

(b) For shrubs, loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum of 150 mm of planting soil mixture.

(c) Plant trees and shrubs vertically, with roots placed straight out in hole. Orient plant material to give best appearance in relation to structures, roads and walkways.

(d) Place plant material to depth equal to depth they were originally growing in nursery or in locations collected.

(e) Ball and burlap root balls: loosen burlap and cut away minimum top 1/3 without disturbing root ball. Do not pull burlap or rope from under root ball. With container stock, remove entire container without disturbing root ball. Non-biodegradable wrappings must be removed.

(f) Tree spade excavated materials:

(i) Tree spade planting shall be permitted only by approval of the Contract Administrator.

(ii) Dig tree pit with same mechanical equipment as used to dig plant material. Ensure hole dug is upright as possible. Place in hole a mixture of 40 L of planting soil and fertilizer mixed with water to soupy consistency. This will be forced up sides of ball as root ball is placed in hole.

(iii) Loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum 150 mm topsoil mixture.

(g) Tamp planting soil mixture around root system in layers of 150 mm eliminating air voids. Frozen or saturated planting soil is unacceptable. When 2/3 of planting soil has been placed, fill hole with water. After water has been completely penetrated into soil, complete backfilling.

(h) Excavate 200 mm depth an additional 600 mm beyond planting pits around the perimeter of all tree planting pits and fill with planting soil mixture.

(i) Construct 100 mm deep saucers around the outer edge of planting pits to assist with maintenance watering.

(j) When planting is completed apply slow release organic fertilizer at minimum rate of 12 kg/100 m for shrub beds or 50 g/mm of calliper for trees, or as recommended by the soil analysis. Mix fertilizer thoroughly with top layer of planting soil and water in well.

E65.3.5 Pruning

(a) Prune trees, shrubs and groundcover after planting, as indicated. Postpone pruning of those trees where heavy bleeding may occur, until in full leaf. Employ clean sharp tools and make cuts flush with main branch, smooth and sloping as to prevent accumulation of water. Remove projecting stumps on trunks or main branches. Remove dead and injured branches and branches that rub causing damage to bark. Trim trees and shrubs without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches.

E65.3.6 Standards

(a) All roots shall be cleanly cut; split roots are not acceptable.

(b) Branches and trunks shall be tied and protected; broken or abraded branches or trunks are not acceptable.

(c) Planting shall be protected from drying conditions, desiccated material not acceptable.

(d) All plants shall be free of insects and disease: galls, blight and other manifestations of insect infestation or disease not acceptable.

E65.3.7 Wood Chip Mulch

(a) Wood chip mulch shall extend under all tree limbs but shall not be installed within 150 mm of the tree trunk.

(b) The saucers of all trees not planted in beds shall be covered with a 100 mm depth of wood chip mulch.

E65.3.8 Maintenance

(a) Watering

(i) Plant material shall be watered once a week for first four weeks following installation, and once every second week, thereafter. Ensure adequate moisture in root zone at freeze-up.

(b) Weeding

(i) Keep mulched shrub beds and tree saucers weed-free by manually removing weeds during the maintenance period.

(c) Insects and Diseases

(i) Spray plants to combat pests and diseases. Use organic chemical insecticides approved by Agriculture Canada.

(d) Adjustments

(i) Make adjustments requested by the Contract Administrator, including straightening trees, tightening guy wires and removing tree stakes.

(e) Maintenance Period

(i) Maintain plant material for a period of two years following acceptance to start maintenance period of planting operations, as determined by the Contract Administrator.

E65.4 Measurement and Payment

E65.4.1 Trees and Shrubs

(a) Supply and installation of trees and shrubs will be measured on a unit price basis for each tree and shrub listed on the Plant List and paid for at the Contract Unit Price for “Tree Planting”. The number of trees and shrubs to be paid for will be the total number of trees and shrubs installed in accordance with this specification and accepted by the Contract Administrator, as computed by the Contract Administrator.

E65.4.2 Supply and installation of fertilizer for plant material will be included in payment for the plant material.

E66. EROSION CONTROL BLANKET

E66.1 Description

E66.1.1 This Specification covers supply, installation and maintenance of the biodegradable erosion control blanket for use as long-term erosion protection for the revegetated portion of the riverbank.

E66.1.2 This Specification shall amend and supplement Standard Specification CW 3130.

E66.1.3 The Work to be done under this Specification shall include the furnishing of all superintendence, overhead, labour, materials equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work hereinafter specified.

E66.2 Materials

E66.2.1 The geotextile shall be a 100% coconut fibre matrix with top and bottom net, and long-term (3 year) biodegradable net, thread and matrix and meeting or exceeding the following properties:

Erosion Control Blanket Properties			
	ASTM Test Method	**Units**	**Minimum Average Value**
PHYSICAL			
Mean Tensile Strength	D-6818	kN/m	6.5 kN/m at 10% elongation
Transverse Tensile Strength	D-6818	KN/m	4.0 kN/m at 15% elongation
Mass/Unit Area	D-6475	g/m2	300
Thickness	D-6525	mm	6.6
Light Penetration	D-6567	%	10%
Functional Longevity		years	3

Example: Erosion Control Blanket C32BD.

E66.3 Construction Methods

E66.3.1 Installation, handling and storage of blanket shall conform to the manufacturer's recommendations and specifications, and the above requirements.

E66.3.2 Spread and roto-till growing medium materials into the bank prior to installation of erosion control blanket.

E66.3.3 Erosion control blanket shall be installed on all exposed areas of the graded riverbank at or exceeding 1:2.5 (rise/run slopes) above the riprap.

E66.3.4 The geotextile shall be securely held in place in conformance with the manufacturer’s recommendations and specifications.

E66.3.5 The geotextile shall be placed in accordance with CW 3130, with following exceptions:

(a) The joints shall be overlapped 0.6m in a shingle pattern, with the up-slope pieces overlapping the down-slope pieces.

E66.3.6 Tears or other damage in the geotextile erosion control blanket shall be repaired with a piece of geotextile fabric placed over the damaged area and extending 1.0 m in all directions beyond the damaged area.

E66.3.7 Geotextile erosion control blanket shall be installed following the spring thaw and flooding and shall be maintained until the end of the vegetation maintenance period.

E66.4 Measurement and Payment

E66.4.1 Geotextile erosion control blanket will be measured on an area basis and measured as the area covered by erosion control blanket. The area to be paid for shall be the total number of square metres of erosion control blanket supplied and installed in accordance with this Specification as computed from measurements made by the Contract Administrator. Payment shall be at the Contract Unit Price for “Supply, Install and Maintain Biodegradable Erosion Control Blanket”.

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;

(iii) performing inspections of buildings on private property.

(c) communicating with residents and homeowners in person or by telephone;

F1.1.1 Each Individual shall be required to obtain a Police Information Check from the police service having jurisdiction at their place of residence. Or

(a) Sterling BackCheck – for existing account holders, log into your account to send individual invitations to employees requiring security clearance. For those that do not have an account, click on the following link to open an account: https://forms.sterlingbackcheck.com/partners/platform2-en.php?&partner=winnipegcity; or

(b) Commissionaires (Manitoba Division), forms to be completed can be found on the website at: https://www.commissionaires.ca/en/manitoba/home; or .

(c) FASTCHECK Criminal Record & Fingerprint Specialists, forms to be completed can be found on the website at: https://myfastcheck.com

F1.2 The following is a link to information for obtaining the Police Information Check from the City of Winnipeg Police Service. http://winnipeg.ca/police/pr/PIC.stm

F1.2.1 The original Police Information Check (Form P–612) 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 Police Information Check (Form P–612) to the Contract Administrator.

F1.3 Prior to the award of Contact, and during the term of the Contract if additional or replacement individuals are proposed to perform Work, the Bidder/Contractor shall supply the Contract Administrator with a Police Information Check 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 Police Information Check is not provided, or for whom a Police Information Check 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 Police Information Check 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 their sole discretion and acting reasonably, require an updated Police Information Check. Any individual who fails to provide a satisfactory Police Information Check as a result of a repeated Police Information Check will not be permitted to continue to perform any Work specified in F1.1.