



THE CITY OF WINNIPEG

TENDER

TENDER NO. 5-2022

**2022 LOCAL STREET RENEWAL PROGRAM – CHURCH AVENUE AND VARIOUS
OTHER LOCATIONS**

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PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 2022 Local Street Renewal Program – Church Avenue and Various Other Locations

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, April 14, 2022.

B2.2 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. ENQUIRIES

B3.1 All enquiries shall be directed to the Contract Administrator identified in D4.1.

B3.2 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.

B3.3 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.

B3.4 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.

B3.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B3 unless that response or interpretation is provided by the Contract Administrator in writing.

B3.6 Any enquiries concerning submitting through MERX should be addressed to:
MERX Customer Support
Phone: 1-800-964-6379
Email: merx@merx.com

B4. CONFIDENTIALITY

B4.1 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.

B4.2 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.

B5. ADDENDA

B5.1 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.

- B5.2 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.
- B5.3 Addenda will be available on the MERX website at www.merx.com.
- B5.4 The Bidder is responsible for ensuring that he/she has 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.
- B5.5 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.
- B5.6 Notwithstanding B3, enquiries related to an Addendum may be directed to the Contract Administrator indicated in D4.

B6. SUBSTITUTES

- B6.1 The Work is based on the Plant, Materials and methods specified in the Tender.
- B6.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.
- B6.3 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.
- B6.4 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.
- B6.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his/her sole discretion grant approval for the use of a substitute as an “approved equal” or as an “approved alternative”, or may refuse to grant approval of the substitute.
- B6.6 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.
- B6.6.1 The Contract Administrator will issue an Addendum, disclosing the approved materials, equipment, methods and products to all potential Bidders. The Bidder requesting and obtaining the approval of a substitute shall be responsible for disseminating information regarding the approval to any person or persons he/she wishes to inform.

- B6.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.
- B6.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative may base his/her Total Bid Price upon the specified item but may also indicate an alternative price based upon the approved alternative. Such alternatives will be evaluated in accordance with B17.
- B6.9 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.

B7. BID COMPONENTS

- B7.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;
 - (c) Form G1: Bid Bond and Agreement to Bond.
- B7.2 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.
- B7.3 The Bid shall be submitted electronically through MERX at www.merx.com.
- B7.3.1 Bids will **only** be accepted electronically through MERX.
- B7.4 Bidders are advised that inclusion of terms and conditions inconsistent with the Tender document, including the General Conditions, will be evaluated in accordance with B17.1(a).

B8. BID

- B8.1 The Bidder shall complete Form A: Bid/Proposal, making all required entries.
- B8.2 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 his/her own name, his/her name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;
 - (d) if the Bidder is carrying on business under a name other than his/her own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.
- B8.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B8.2.
- B8.3 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.
- B8.4 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 his/her own name, it shall be signed by the Bidder;
 - (b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;
 - (c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers;

- (d) if the Bidder is carrying on business under a name other than his/her own, it shall be signed by the registered owner of the business name, or by the registered owner's authorized officials if the owner is a partnership or a corporation.

B8.4.1 The name and official capacity of all individuals signing Form A: Bid/Proposal should be entered below such signatures.

B8.5 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.

B9. PRICES

B9.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B9.1.1 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 D33. Any such costs shall be determined in accordance with D33.

B9.2 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.

B9.3 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.

B9.4 Payments to Non-Resident Contractors are subject to Non-Resident Withholding Tax pursuant to the Income Tax Act (Canada).

B9.5 The Bidder shall enter the Total Bid Price from Form B: Prices into the Total Bid Price field in MERX.

B9.5.1 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

B10. DISCLOSURE

B10.1 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.

B10.2 The Persons are:

- (a) NA

B11. CONFLICT OF INTEREST AND GOOD FAITH

B11.1 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.

B11.2 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 its 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.

B11.3 In connection with its Bid, each entity identified in B11.2 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.

B11.4 Without limiting B11.3, the City may, in its 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 its 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 its sole discretion, to avoid or mitigate the impact of such Conflict of Interest.

B11.5 Without limiting B11.3, 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 its sole discretion:

- (a) disqualify a Bidder that fails to disclose a perceived, potential or actual Conflict of Interest of the Bidder or any of its 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 its 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 B11.4 to avoid or mitigate a Conflict of Interest; and
- (d) disqualify a Bidder if the Bidder, or one of its 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.

B11.6 The final determination of whether a perceived, potential or actual Conflict of Interest exists shall be made by the City, in its sole discretion.

B12. QUALIFICATION

B12.1 The Bidder shall:

- (a) undertake to be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba; and
- (b) be financially capable of carrying out the terms of the Contract; and

- (c) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract.
- B12.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <https://www.winnipeg.ca/matmgt/Templates/files/debar.pdf>
- B12.3 The Bidder and/or any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:
- (a) have successfully carried out work similar in nature, scope and value to the Work; and
- (b) be fully capable of performing the Work required to be in strict accordance with the terms and provisions of the Contract; and
- (c) have a written workplace safety and health program if required pursuant to The Workplace Safety and Health Act (Manitoba);
- (d) have completed the Accessible Customer Service online training required by the Accessibility for Manitobans Act (AMA) (see B12.5 and D8)
- B12.4 Further to B12.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:
- (a) 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, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>).
- B12.5 Further to B12.3(d), the Bidder acknowledges they and all Subcontractors have obtained training required by the Accessibility for Manitobans Act (AMA) available at <http://www.accessibilitymb.ca/training.html> for anyone that may have any interaction with the public on behalf of the City of Winnipeg.
- B12.6 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.
- B12.7 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.

B13. BID SECURITY

- B13.1 The Bidder shall include in its 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, Materials Management Division website at <https://www.winnipeg.ca/MatMgt/templates/files/eBidsecurity.pdf>.
- B13.2 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 B13.2(a).
- B13.3 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 B17.1(a).
- B13.4 Bonds passing the verification process will be treated as original and authentic.
- B13.4.1 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.
- B13.5 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.
- B13.6 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.

B14. OPENING OF BIDS AND RELEASE OF INFORMATION

- B14.1 Bids will not be opened publicly.
- B14.2 Following the submission deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the MERX website at www.merx.com.
- B14.3 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.
- B14.4 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).
- B14.4.1 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.

B15. IRREVOCABLE BID

- B15.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid/Proposal.
- B15.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly 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.

B16. WITHDRAWAL OF BIDS

- B16.1 A Bidder may withdraw his/her Bid without penalty prior to the Submission Deadline.

B17. EVALUATION OF BIDS

- B17.1 Award of the Contract shall be based on the following bid evaluation criteria:
- (a) compliance by the Bidder with the requirements of the Tender, or acceptable deviation therefrom (pass/fail);
 - (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B12 (pass/fail);
 - (c) Total Bid Price;
 - (d) economic analysis of any approved alternative pursuant to B6.
- B17.2 Further to B17.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid is incomplete, obscure or conditional, or contains additions, deletions, alterations or other irregularities. The Award Authority may reject all or any part of any Bid, or waive technical requirements or minor informalities or irregularities, if the interests of the City so require.
- B17.3 Further to B17.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is qualified.
- B17.4 Further to B17.1(c), the Total Bid Price shall be the sum of the quantities multiplied by the unit prices for each item shown on Form B: Prices.
- B17.4.1 Further to B17.1(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.
- B17.4.2 Bidders are advised that the calculation indicated in B17.4 will prevail over the Total Bid Price entered in MERX.

B18. AWARD OF CONTRACT

- B18.1 The City will give notice of the award of the Contract or will give notice that no award will be made.
- B18.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be qualified, and the Bids are determined to be responsive.
- B18.2.1 Without limiting the generality of B18.2, the City will have no obligation to award a Contract where:
- (a) the prices exceed the available City funds for the Work;
 - (b) the prices are materially in excess of the prices received for similar work in the past;
 - (c) the prices are materially in excess of the City's cost to perform the Work, or a significant portion thereof, with its own forces;

- (d) only one Bid is received; or
- (e) in the judgment of the Award Authority, the interests of the City would best be served by not awarding a Contract.

- B18.3** 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 D33 shall immediately take effect upon confirmation of such funding, regardless of when funding is confirmed.
- B18.4** 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 B17.
- B18.4.1** Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

- C0.1 The *General Conditions for Construction* (Revision 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, Materials Management 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:

- (a) Concrete Pavement Reconstruction and Associated Works
 - (i) Church Avenue from Sinclair Street to Arlington Street
- (b) Asphalt Pavement Reconstruction and Associated Works
 - (i) Lansdowne Avenue from Salter Street to Main Street
- (c) Concrete Pavement Rehabilitation and Associated Works
 - (i) Forest Park Drive from Airlies Street North to Sinclair Street
 - (ii) Kingsbury Avenue from 56.5m West of Airlies Street North to Sinclair Street
 - (iii) Perth Avenue from Main Street to Scotia Street
 - (iv) Rupertsland Boulevard from Main Street to Jones Street
 - (v) Semple Avenue from Salter Street to Main Street
- (d) Sewer Repairs and Associated Works
 - (i) Kingsbury Avenue from 56.5m West of Airlies Street North to Sinclair Street

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

- (a) Concrete Pavement Reconstruction and Associated Works
 - (i) Removal of existing sidewalk;
 - (ii) Planing of existing asphalt and at intersections as required;
 - (iii) Renewal of concrete sidewalks as required;
 - (iv) Installation of detectable warning surface tiles;
 - (v) Removal of existing pavement;
 - (vi) Removal of existing curb;
 - (vii) Installation of catch basins and sewer service pipe;
 - (viii) Installation of subdrains;
 - (ix) Abandon existing catch basins and drainage inlets;
 - (x) Excavation;
 - (xi) Compaction of existing sub-grade;
 - (xii) Adjustment of existing pavement and boulevard structures;
 - (xiii) Placement of geotextile fabric and geogrid;
 - (xiv) Placement of sub-base material;
 - (xv) Placement of base course material;
 - (xvi) Construction of 150mm concrete pavement (plain-dowelled, slip-form paving) with barrier curb (integral);

- (xvii) Construction of 150mm concrete pavement(reinforced);
 - (xviii) Construction of modified barrier curb;
 - (xix) Construction of barrier curb;
 - (xx) Construction of curb ramp;
 - (xxi) Renewal of existing curb as required;
 - (xxii) Placement of asphalt pavement tie-ins (Type 1A);
 - (xxiii) Boulevard restoration and sod.
- (b) Asphalt Pavement Reconstruction and Associated Works
- (i) Removal of existing sidewalk;
 - (ii) Planing of existing asphalt and at intersections as required;
 - (iii) Renewal of existing concrete sidewalk;
 - (iv) Installation of detectable warning surface tiles;
 - (v) Regrading of existing sidewalk blocks as required;
 - (vi) Regrading of existing interlocking paving stones as required;
 - (vii) Removal of existing pavement;
 - (viii) Removal of existing curb;
 - (ix) Installation of catch basins and sewer service pipe;
 - (x) Installation of subdrains;
 - (xi) Abandon existing catch basins and drainage inlets;
 - (xii) Excavation;
 - (xiii) Compaction of existing sub-grade;
 - (xiv) Adjustment of existing pavement and boulevard structures;
 - (xv) Insulation of water services;
 - (xvi) Placement of geotextile fabric and geogrid;
 - (xvii) Placement of sub-base material;
 - (xviii) Construction of barrier curb for asphalt pavement utilizing slip-form paving equipment;
 - (xix) Construction of modified barrier curb for asphalt pavement;
 - (xx) Construction of curb ramp for asphalt pavement;
 - (xxi) Construction of 150mm concrete pavement (reinforced);
 - (xxii) Construction of modified barrier curb;
 - (xxiii) Construction of barrier curb;
 - (xxiv) Construction of curb ramp;
 - (xxv) Renewal of existing curb as required;
 - (xxvi) Placement and compaction of 50mm sub-base material as backfill behind barrier curb for asphalt pavement within excavated area;
 - (xxvii) Placement and compaction of suitable site material as backfill behind barrier curb for asphalt pavement within excavated area;
 - (xxviii) Placement of base course material;
 - (xxix) Boulevard restoration and sod;
 - (xxx) Placement of asphalt pavement (Type III, 70mm thickness); and
 - (xxxi) Placement of asphalt pavement (Type 1A, 50mm thickness).
- (c) Concrete Pavement Rehabilitation and Associated Works
- (i) Planing of existing asphalt and at intersections as required;
 - (ii) Milling of existing integral curb as required;
 - (iii) Renewal of existing sidewalks as required;
 - (iv) Installation of detectable warning surface tiles;

- (v) Regrading of existing sidewalk blocks as required;
 - (vi) Regrading of existing interlocking paving stones as required;
 - (vii) Renewal of monolithic curb and sidewalk;
 - (viii) Construction of concrete sidewalk;
 - (ix) Complete required sewer repairs;
 - (x) Abandon existing drainage inlets;
 - (xi) Abandon existing catch pit;
 - (xii) Installation of catch pits and drainage connection pipes;
 - (xiii) Relocation of existing catch basin (Perth Avenue);
 - (xiv) Full depth concrete repairs of existing slabs and joints;
 - (xv) Adjustment of existing pavement and boulevard structures;
 - (xvi) Renewal of existing curb as required;
 - (xvii) Construction of modified barrier curb;
 - (xviii) Construction of curb ramp;
 - (xix) Boulevard restoration and sod;
 - (xx) Installation of pavement repair fabric; and
 - (xxi) Construction of asphalt overlay (average thickness 80mm).
- (d) Sewer Repairs and Associated Works
- (i) Sewer service renewals and reconnections;
 - (ii) Replace pre-cast concrete risers;
 - (iii) Patching pre-cast concrete risers; and
 - (iv) Remove and replace benching of existing manhole.

D4. CONTRACT ADMINISTRATOR

D4.1 The Contract Administrator is:

Richard Weibel
Project Coordinator
Public Works, Engineering
Telephone No. 204-805-0104
Email Address rweibel@winnipeg.ca

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

D5. CONTRACTOR'S SUPERVISOR

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

D5.2 At least two (2) Business Days prior to the commencement of any Work on the site, the Contractor shall provide the Contract Administrator with a phone number where the supervisor identified in D5.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D6. NOTICES

- D6.1 Except as provided for in C22.4, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid/Proposal.
- D6.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D6.3 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator identified in D4.
- D6.3 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following facsimile number:
- The City of Winnipeg
Legal Services Department
Attn: Director of Legal Services
Facsimile No.: 204-947-9155

D7. FURNISHING OF DOCUMENTS

- D7.1 Upon award of the Contract, the Contractor will be provided with 'issued for construction' Contract Documents electronically, including Drawings in PDF format only.

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.

SUBMISSIONS

D9. AUTHORITY TO CARRY ON BUSINESS

- D9.1 The Contractor shall be in good standing under The Corporations Act (Manitoba), or properly registered under The Business Names Registration Act (Manitoba), or otherwise properly registered, licensed or permitted by law to carry on business in Manitoba, or if the Contractor does not carry on business in Manitoba, in the jurisdiction where the Contractor does carry on

business, throughout the term of the Contract, and shall provide the Contract Administrator with evidence thereof upon request.

D10. SAFE WORK PLAN

- D10.1 The Contractor shall provide the Contract Administrator with a Safe Work Plan at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in C4.1 for the return of the executed Contract Documents, if applicable.
- D10.2 The Safe Work Plan shall be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/safety/default.stm>
- D10.3 Notwithstanding B12.4 at any time during the term of the Contract, the City may, at its 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.

D11. INSURANCE

- D11.1 The Contractor shall provide and maintain the following insurance coverage:
- (a) commercial general liability insurance, in the amount of at least two million dollars (\$2,000,000.00) inclusive, with The City of Winnipeg added as an additional insured, with a cross-liability clause, such liability policy to also contain contractual liability, unlicensed motor vehicle liability, non-owned automobile liability, broad form property damage cover and products and completed operations, to remain in place at all times during the performance of the Work and throughout the warranty period;
 - (b) if applicable, 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 \$2,000,000 inclusive for loss or damage including personal injuries and death resulting from any one accident or occurrence;
 - (c) an all risks Installation Floater carrying adequate limits to cover all machinery, equipment, supplies and/or materials intended to enter into and form part of any installation.
- D11.2 Deductibles shall be borne by the Contractor.
- D11.3 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 the C4.1 for the return of the executed Contract Documents, as applicable.
- D11.4 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.

D12. CONTRACT SECURITY

- D12.1 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.

- D12.1.1 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 D12.1(b).
- D12.1.2 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 its discretion, exercised reasonably, allows.
- D12.1.3 Digital bonds passing the verification process will be treated as original and authentic.
- D12.2 The Contractor shall provide the City Solicitor 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.
- D12.3 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 D12.1(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.

D13. SUBCONTRACTOR LIST

- D13.1 The Contractor shall provide the Contract Administrator with a complete list of the Subcontractors whom the Contractor proposes to engage (Form J: Subcontractor List) at or prior to a pre-construction meeting, or 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 C4.1 for the return of the executed Contract Documents, if applicable.

D14. DETAILED WORK SCHEDULE

- D14.1 The Contractor shall provide the Contract Administrator with a detailed work schedule at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in the General Conditions for the return of the executed Contract Documents, as applicable.
- D14.2 The detailed work schedule shall consist of the following:
- (a) a critical path method (C.P.M.) schedule for the Work; and
 - (b) a Gantt chart for the Work based on the C.P.M. schedule;
- all acceptable to the Contract Administrator.

D14.3 Further to D14.2(a), the C.P.M. schedule shall clearly identify the start and completion dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path:

D14.4 Further to D14.2(b), the Gantt chart shall show the time on a weekly basis, required to carry out the Work of each trade, or specification division. The time shall be on the horizontal axis, and the type of trade shall be on the vertical axis.

D15. REQUIREMENTS FOR SITE ACCESSIBILITY PLAN

D15.1 The Contractor shall provide the Contract Administrator with an Accessibility Plan at least five (5) Business Days prior to the commencement of any Work on Site. For further information refer to E19.

SCHEDULE OF WORK

D16. COMMENCEMENT

D16.1 The Contractor shall not commence any Work until he/she is in receipt of an award letter from the Award Authority authorizing the commencement of the Work.

D16.2 The Contractor shall not commence any Work on the Site until:

- (a) the Contract Administrator has confirmed receipt and approval of:
 - (i) evidence of authority to carry on business specified in D9;
 - (ii) evidence of the workers compensation coverage specified in C6.15;
 - (iii) the twenty-four (24) hour emergency response phone number specified in D5.2.
 - (iv) the Safe Work Plan specified in D10;
 - (v) evidence of the insurance specified in D11;
 - (vi) the contract security specified in D12;
 - (vii) the subcontractor list specified in D13;
 - (viii) the detailed work schedule specified in D14;
 - (ix) the Requirements for Site Accessibility Plan specified in D15; and
 - (x) the direct deposit application form specified in D30.
- (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.

D16.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the award letter, or within (7) days of the Contract Administrator determining that seasonal conditions are satisfactory for construction to commence.

D16.4 The City intends to award this Contract by May 31, 2022.

D17. WORKING DAYS

D17.1 Further to C1.1(tt);

D17.1.1 The Contract Administrator will determine daily if a Working Day has elapsed and will record his/her assessment. On a weekly basis the Contract Administrator will provide the Contractor with a record of the Working Days assessed for the preceding week. The Contractor shall sign each report signifying that he/she agrees with the Contract Administrator's determination of the Working Days assessed for the report period.

D17.1.2 Work done to restore the Site to a condition suitable for Work, shall not be considered "work" as defined in the definition of a Working Day.

D17.1.3 When the Work includes two or more major types of Work that can be performed under different atmospheric conditions, the Contract Administrator shall consider all major types

of Work in determining whether the Contractor was able to work in assessing Working Days.

D18. RESTRICTED WORK HOURS

D18.1 Further to clause 3.10 of CW 1130, the Contractor shall require written permission forty-eight (48) hours in advance from the Contract Administrator for any work to be performed between 2000 hours and 0700 hours, or on Saturdays, Sundays, Statutory Holidays and or Civic Holidays.

D19. WORK BY OTHERS

D19.1 Further to C6.25, the Contractor's attention is directed to the fact that other Contractors, the personnel of Utilities and the staff of the City may be working within the project limit, approach roadway, adjacent roadways or right-of-way. The activities of these agencies may coincide with the Contractors execution of work and it will be the Contractor's responsibility to cooperate to the fullest extent with other personnel working in the area, and such cooperation is an obligation of the Contractor under the terms of Contract.

D19.2 Work by others on or near the Site will include but not necessarily be limited to:

- (a) City of Winnipeg Traffic Services – traffic diversion signing;
- (b) City of Winnipeg Geomatics Branch – various works on survey monuments;
- (c) Manitoba Hydro Gas Division – lowering and/or rock wrapping of gas main and services;
- (d) MTS – adjusting MTS manhole with lifter ring on Semple Avenue;
- (e) City of Winnipeg, Water & Waste Department – Construction of New 900mm/600m Combined Sewer Relief System - Semple Street at Main Street intersection, expected completion by end of June 2022, weather permitting;
- (f) City of Winnipeg, Water & Waste Department – Construction of New 900mm/600m Combined Sewer Relief System - Semple Street at Aikins Street intersection, expected completion by end of August 2022, weather permitting.

D19.3 Further to D19.1 the Contractor shall cooperate and coordinate all activities with all parties performing required Work by Others. The Contractor must include and accommodate Work by Others identified in D19.1, or additional parties, in their construction schedule as per D14 and accommodate the necessary area on Site required for the Work by Others to complete the Work.

D20. SEQUENCE OF WORK

D20.1 Further to C6.1, the sequence of work shall comply with the following:

D20.1.1 Providing that the Work on each street is completed in a similar order to the order that the Work was commenced in, the Contractor will be permitted to have a maximum of three (3) streets under construction at any one time. Completion of a street means that all of the necessary concrete, asphalt including approaches and landscaping Work is completed to the satisfaction of the Contract Administrator.

D20.1.2 Where the Contractor utilizes two (2) or more crews that work independently on the same major component of the Work as identified in D3, the Contract Administrator may approve an increase to the maximum number of streets under construction at any time.

D20.1.3 Placing the topsoil and finished grading of all boulevard and median areas shall be completed prior to commencing construction of asphaltic concrete overlays, including scratch courses.

D20.1.4 At the end of the day, there shall be no drop-off along any longitudinal joint, except the longitudinal joint between the gutter and approaches.

- D20.1.5 Immediately following the completion of asphaltic concrete works, the Contractor shall clean up the site and remove all plant, surplus material, waste and debris, other than that left behind by the city or other contractors.
- D20.1.6 Construction activity on Semple Avenue from Salter Street to Main Street shall not commence until construction of the New 900mm/600mm Combined Sewer Relief System at the Main Street intersection is complete. The Contract Administrator for this work is Jordan Thompson at 204-477-5381 with AECOM and construction is expected to be completed by end of June, 2022, weather permitting.
- D20.1.7 Construction activity on Semple Avenue from Salter Street to Main Street shall not commence until construction of the New 900mm/600mm Combined Sewer Relief System at the Aikins Street intersection is complete. The Contract Administrator for this work is Jordan Thompson at 204-477-5381 with AECOM and construction is expected to be completed by end of August, 2022, weather permitting.

D21. CRITICAL STAGES

- D21.1 The Contractor shall achieve critical stages of the Work in accordance with the following requirements:
- (a) Perth Avenue from Main Street to Scotia Street
- (i) The Contractor shall not commence the Work on the Site before July 2, 2022 and shall complete all Work on Site as outlined in D2.5(c) no later than August 31, 2022, as directed by the Contract Administrator.
- D21.2 When the Contractor considers the Work associated with D21.1 to be completed, the Contractor shall arrange, attend and assist in the inspection of the Work with the Contract Administrator for purposes of verifying Completion. 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 re-inspected.
- D21.3 The date on which the D21.1 Work has been accepted by the Contract Administrator as being completed to the requirements of the Contract is the date on which completion of D21.1 has been achieved.

D22. SUBSTANTIAL PERFORMANCE

- D22.1 The Contractor shall achieve Substantial Performance within 80 (eighty) consecutive Working Days of the commencement of the Work as specified in D16.
- D22.2 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 re-inspected.
- D22.3 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.

D23. TOTAL PERFORMANCE

- D23.1 The Contractor shall achieve Total Performance within 85 (eighty-five) consecutive Working Days of the commencement of the Work as specified in D16.
- D23.2 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 re-inspected.

- D23.3 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.

D24. LIQUIDATED DAMAGES

- D24.1 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: Perth Street from Main Street to Scotia Street – four thousand dollars (\$4000.00);
- (b) Substantial Performance – four thousand dollars (\$4000.00);
- (c) Total Performance – one thousand dollars (\$1000.00).

- D24.2 The amounts specified for liquidated damages in D24.1 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.

- D24.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

D25. COVID-19 SCHEDULE DELAYS

- D25.1 The City acknowledges that the schedule for this Contract may be impacted by the COVID-19 pandemic. Commencement and progress of the Work shall be performed by the Contractor with due consideration to the health and safety of workers and the public, directives from health authorities and various levels of government and in close consultation with the Contract Administrator.

- D25.2 If the Contractor is delayed in the performance of the Work by reason of the COVID-19 pandemic, 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.

- D25.3 A minimum of seven (7) Calendar Days prior to the commencement of Work, the Contractor shall declare whether COVID-19 will affect the start date. The Contractor shall provide sufficient evidence that the delay is directly related to COVID-19, including but not limited to evidence related to availability of staff, availability of Material or work by others.

- D25.4 For any delay related to COVID-19 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 D25.3. Failure to provide this notice will result in no additional time delays being considered by the City.

- D25.5 The Work schedule, including the durations identified in D18 to D23 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.

- D25.6 Where Work not previously identified is being carried over solely as a result of delays related to COVID-19, 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 COVID-19, a partial consideration of the cost of temporary works will be considered by the Contract Administrator.

D25.7 Any time or cost implications as a result of COVID-19 and in accordance with the above, as confirmed by the Contract Administrator, shall be documented in accordance with C7.

D26. SCHEDULED MAINTENANCE

D26.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

- (a) Sod Maintenance as specified in CW 3510-R10; and
- (b) Reflective Crack Maintenance as specified in CW 3250-R7.

D26.2 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

D27. JOB MEETINGS

D27.1 Regular weekly job meetings will be held at the site or location agreed to by the Contract Administrator and the Contractor. These meetings shall be attended by a minimum of one representative of the Contract Administrator and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, 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.

D27.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

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

D28.1 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).

D29. THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA) – QUALIFICATIONS

D29.1 Further to B12.4, the Contractor/Subcontractor must, throughout the term of the Contract, have a Workplace Safety and Health Program meeting the requirements of The Workplace Safety and Health Act (Manitoba). At any time during the term of the Contract, the City may, at its sole discretion and acting reasonably, require updated proof of compliance, as set out in B12.4.

MEASUREMENT AND PAYMENT

D30. PAYMENT

D30.1 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.

WARRANTY

D31. WARRANTY

D31.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire one (1) years thereafter for pavement rehabilitation works , and two (2) years thereafter for pavement reconstruction works, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

DISPUTE RESOLUTION

D32. DISPUTE RESOLUTION

D32.1 The entire text of C21.4 is deleted, and amended to read: “Intentionally Deleted”

D32.2 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 his written Appeal Form, in the manner and format set out on the City’s Materials Management 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 his Appeal Form.

D32.3 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;
 - (iii) Department Head.

D32.3.1 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.

D32.3.2 As these negotiations are not an adjudicative hearing, neither party may have legal counsel present during the negotiations.

D32.3.3 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.

D32.3.4 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 D32.3.3, 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.

THIRD PARTY AGREEMENTS

D33. FUNDING AND/OR CONTRIBUTION AGREEMENT OBLIGATIONS

- D33.1 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.
- D33.2 Further to D33.1, in the event that the obligations in D33 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.
- D33.3 For the purposes of D33:
- (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.
- D33.4 Modified Insurance Requirements
- D33.4.1 If not already required under the insurance requirements identified in D11, 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 its Ministers, officers, employees, and agents shall be added as additional insureds.
- D33.4.2 If not already required under the insurance requirements identified in D11, 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.
- D33.4.3 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.
- D33.4.4 Further to D11.3, 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.
- D33.4.5 All policies must be taken out with insurers licensed to carry on business in the Province of Manitoba.
- D33.5 Indemnification By Contractor
- D33.5.1 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.

- D33.5.2 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.

D33.6 Records Retention and Audits

D33.6.1 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.

D33.6.2 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 D33.6.1 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.

D33.7 Other Obligations

D33.7.1 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.

D33.7.2 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.

D33.7.3 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.

D33.7.4 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.

D33.7.5 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.

D33.7.6 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 D12)

KNOW ALL MEN BY THESE PRESENTS THAT

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

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

_____ dollars (\$_____.)

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

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

TENDER NO. 5-2022

2022 Local Street Renewal Program – Church Avenue and Various Other Locations
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 D12)

KNOW ALL MEN 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. 5-2022

2022 Local Street Renewal Program – Church Avenue and Various Other Locations

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
 - (i) 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;

- (ii) 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;
 - (iii) 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)

FORM J: SUBCONTRACTOR LIST
(See D13)

2022 Local Street Renewal Program – Church Avenue and Various Other Locations

<u>Portion of the Work</u>	<u>Name</u>	<u>Address</u>
<u>SURFACE WORKS:</u>		
<u>Supply of Materials:</u>		
Geotextile Fabric		
Geogrid		
Sub-base Material		
Base Course Material		
Concrete		
Asphalt		
Pavement Repair Fabric		
Topsoil and Sod		
Joint Sealant		
<u>Installation and Placement:</u>		
Geotextile Fabric		
Geogrid		
Sub-base Material		
Base Course Material		
Concrete		
Asphalt		
Pavement Repair Fabric		
Topsoil and Sod		
Joint Sealant		

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

- E1.1 These Specifications shall apply to the Work.
- E1.2 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.
- E1.2.1 *The City of Winnipeg Standard Construction Specifications* is available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/Spec/Default.stm>
- E1.2.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.
- E1.2.3 Further to C2.4(d), Specifications included in the 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 B6. 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 B6.
- E1.4 The following are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>	<u>Drawing (Original) Sheet Size</u>
	Cover Sheet	
SE-22-49	Church Avenue from Sta. 1+00 to Sta. 2+00	A1
SE-22-50	Church Avenue from Sta. 2+00 to Sta. 2+80	A1
SE-22-51	Forest Park Drive from Sta. 1+00 to Sta. 2+10	A1
SE-22-52	Forest Park Drive from Sta. 2+10 to Sta. 3+00	A1
SE-22-53	Forest Park Drive from Sta. 3+00 to Sta. 3+48	A1
SE-22-54	Lansdowne Avenue from Sta. 1+00 to Sta. 2+10	A1
SE-22-55	Lansdowne Avenue from Sta. 2+10 to Sta. 3+30	A1
SE-22-56	Lansdowne Avenue from Sta. 3+30 to Sta. 4+50	A1
SE-22-57	Lansdowne Avenue from Sta. 4+50 to Sta. 5+41.3	A1
SE-22-58	Perth Avenue from Sta. 1+00 to Sta. 2+10	A1
SE-22-59	Perth Avenue from Sta. 2+10 to Sta. 3+30	A1
SE-22-60	Perth Avenue from Sta. 3+30 to Sta. 4+50	A1
SE-22-61	Perth Avenue from Sta. 4+50 to Sta. 4+94	A1
SE-22-62	Rupertsland Boulevard from Sta. 1+00 to Sta. 2+00	A1
SE-22-63	Rupertsland Boulevard from Sta. 2+00 to Sta. 3+00	A1
SE-22-64	Semple Street from Sta. 1+00 to Sta. 2+00	A1
SE-22-65	Semple Street from Sta. 2+00 to Sta. 3+20	A1
SE-22-66	Semple Street from Sta. 3+20 to Sta. 4+40	A1
SE-22-67	Semple Street from Sta. 4+40 to Sta. 5+10	A1
SE-22-68	Kingsbury Avenue from Sta 1+00 to 2+20	A1
SE-22-69	Kingsbury Avenue from Sta 2+20 to 3+00	A1
SE-22-70	Kingsbury Avenue from Sta 3+00 to 4+17	A1

E2. MOBILIZATION AND DEMOBILIZATION PAYMENT

DESCRIPTION

- E2.1 This Specification shall cover all operations relating to the mobilization and demobilization of the Contractor to the project location(s).

E2.2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E2.3 The inclusion of a payment item for the Work under this Specification shall not release or reduce the responsibilities of the Contractor under any other specification in this Contract.

SCOPE OF WORK

E2.4 Further to C12 of the General Conditions, where Mobilization and Demobilization is included as a bid item, it shall consist of the following, as applicable:

(a) Mobilization shall include, but not be limited to:

- (i) All activities and associated costs for transportation of the Contractor's personnel, equipment, and operating supplies to the site, and/or sites, and/or between sites;
- (ii) Establishment of offices, buildings, other necessary general facilities and equipment parking/staging areas for the Contractor's operations at the site or sites;
- (iii) Premiums paid for performance and payment bonds including coinsurance and reinsurance agreements as applicable;
- (iv) General cleanup and housekeeping needed maintain a neat and orderly project site(s);
- (v) Development and implementation of the Accessibility Site Plan as per E19;
- (vi) Other job related items.

(b) Demobilization shall include, but not be limited to:

- (i) All activities and costs for transportation of personnel, equipment, and supplies not used in the project from the site, and/or sites, and/or between sites;
- (ii) Disassembly, removal, and site cleanup and restoration of offices, buildings, and other facilities assembled on the site and/or sites;
- (iii) Repair of access roads, temporary haul roads, and equipment parking areas leaving the project site in the same or better condition than at the start of the project;
- (iv) General cleanup and housekeeping needed to restore a neat and orderly project site;
- (v) Monitoring maintenance, and reporting of the Accessibility Site Plan as per E19.

E2.5 Access to the site, equipment parking, and staging areas are limited to that shown on the drawings or as approved by the Contract Administrator.

MEASUREMENT AND PAYMENT

E2.6 The lump-sum price for the Mobilization and Demobilization bid item shall not exceed five percent (5.00%) of the total bid price for the Contract.

E2.6.1 Further to B9, B17, C12 and E2.6, should the lump sum price exceed 5% of the Total Bid Price the lump sum price will be reduced to 5% of the Total Bid Price, the Total Bid Price will be determined using the reduced lump sum price and payment will be based on the reduced lump sum price.

E2.7 Payment for Mobilization:

- (a) 60% of the lump-sum price will be paid to the contractor for Mobilization on the first Progress Estimate for the Contract.

E2.8 Payment for Demobilization:

- (a) The remaining 40% of the lump-sum price will be paid upon:
 - (i) Restoration of the site and/or sites to the satisfaction of the Contract Administrator;
 - (ii) Distribution of the Declaration of Total Performance.

E2.9 Pay Reduction for Accessibility Plan

- (a) The Demobilization payment will be reduced by the number of pay adjustments incurred in accordance with D15 and as determined by the Contract Administrator.

E2.10 Mobilization and Demobilization will be paid only once (to a maximum of 100%), regardless of the number of times the Contractor mobilizes to the site and/or sites.

E3. GEOTECHNICAL REPORT

E3.1 Further to C3.1, the geotechnical report is provided to aid the Contractor's evaluation of the pavement structure and/or existing soil conditions. The geotechnical report is contained in Appendix 'A'.

E4. OFFICE FACILITIES

E4.1 The Contractor shall supply office facilities meeting the following requirements:

- (a) The field office shall be for the exclusive use of the Contract Administrator.
- (b) The building shall be conveniently located near the site of the Work.
- (c) The building shall have a minimum floor area of 25 square metres, a height of 2.4m with two windows for cross ventilation and a door entrance with a suitable lock.
- (d) The building shall be suitable for all weather use. It shall be equipped with an electric heater and air conditioner so that the room temperature can be maintained between either 16-18°C or 24-25°C.
- (e) The building shall be adequately lighted with fluorescent fixtures and have a minimum of three wall outlets.
- (f) The building shall be furnished with one desk, two 3m x1.2m tables and a minimum of 10 chairs[(one, two) desk, one drafting table, table 3m X 1.2m, one stool, one four drawer legal size filing cabinet, and a minimum of (5,6,8,12,15) chairs].
- (g) A portable toilet shall be located near the field office building. The toilet shall have a locking door and be for the exclusive use of the Contract Administrator and other personnel from the City.
- (h) The field office building and the portable toilet shall be cleaned on a weekly basis immediately prior to each site meeting. The Contract Administrator may request additional cleaning when he/she deems it necessary.

E4.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

E4.3 The office facilities will be provided from the date of the commencement of the Work to the date of Substantial Performance.

E4.4 On a one time basis, where directed by the Contract Administrator, the Contractor shall relocate the office facilities to a location more convenient for the remaining Work.

E5. PROTECTION OF EXISTING TREES

E5.1 The Contractor shall take the following precautionary steps to prevent damage from construction activities to existing boulevard trees within the limits of the construction area:

- (a) The Contractor shall not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.
- (b) Trees identified to be at risk by the Contract Administrator are to be strapped with 25 x 100 x 2400mm wood planks, or suitably protected as approved by the Contract Administrator.
- (c) Excavation shall be performed in a manner that minimizes damage to the existing root systems. Where possible, excavation shall be carried out such that the edge of the

excavation shall be a minimum of 1.5 times the diameter (measured in inches), with the outcome read in feet, from the closest edge of the trunk. Where roots must be cut to facilitate excavation, they shall be pruned neatly at the face of excavation.

- (d) Operation of equipment within the dripline of the trees shall be kept to the minimum required to perform the work required. Equipment shall not be parked, repaired, refuelled; construction materials shall not be stored, and earth materials shall not be stockpiled within the driplines of trees. The dripline of a tree shall be considered to be the ground surface directly beneath the tips of its outermost branches. The Contractor shall ensure that the operations do not cause flooding or sediment deposition on areas where trees are located.
- (e) Work on-site shall be carried out in such a manner so as to minimize damage to existing tree branches. Where damage to branches does occur, they shall be neatly pruned.

E5.2 All damage to existing trees caused by the Contractor's activities shall be repaired to the requirements and satisfaction of the Contract Administrator and the City Forester or his/her designate.

E5.3 No separate measurement or payment will be made for the protection of trees.

E5.4 Except as required in clause E5.1(c) and E5.1(e), Elm trees shall not be pruned at any time between April 1 and July 31.

E6. TRAFFIC CONTROL

E6.1 Further to clauses 3.6, 3.7 and 3.8 of CW 1130:

- (a) Where directed by the Contract Administrator, the Contractor shall construct and maintain temporary asphalt ramps to alleviate vertical pavement obstructions such as manholes and planing drop-offs to the satisfaction of the Contract Administrator. Payment shall be in accordance with CW3410.
- (b) The Contractor shall be designated as the Authorized Construction Agency for this Contract.
- (c) In accordance with the Manual of Temporary Traffic Control on City Streets (MTTC), 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. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by their own forces or subcontractor.
- (d) Restoration and/or installation of permanent signage will be completed by the Traffic Services Branch of the City of Winnipeg.

E6.2 Further to E6.1(b) and E6.1(c), in accordance with the MTTC, as the Authorized Construction Agency the Contractor shall be responsible for and bear all costs associated with supplying, placing, maintaining and removing the regulatory signage indicated on the Construction Staging plans approved by the Traffic Management Branch. The Contractor is authorized and responsible to supply, place, maintain and remove the traffic control in the following situations for the Contract (as identified in Section 2.04 of the MTTC):

- (a) Parking restrictions;
- (b) Stopping restrictions;
- (c) Turn restrictions;
- (d) Full or directional closures on a Regional Street;
- (e) Traffic routed across a median or a divided street; and
- (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.

E6.3 The Contractor shall remove and stockpile any signage not required during construction, such as, but not limited to parking restrictions, turn restrictions and loading restrictions.

- E6.4 Further to E6.1 and E6.2, 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.
- E6.5 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.
- E6.6 Any proposed changes to the approved construction staging and traffic management must be submitted to the Contract Administrator a minimum of five (5) Working Days prior to the required change for approval.
- E6.7 If the Contract Administrator determines that the Contractor is not performing Traffic Control in accordance with this specification, Traffic Services may be engaged to perform the Traffic Control and the Contractor shall bear the costs associated by Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E7. TRAFFIC MANAGEMENT

E7.1 Further to clause 3.7 of CW 1130:

E7.1.1 The Contractor shall schedule construction activities to meet the following:

- (a) Church Avenue from Sinclair Street to Arlington Street:
 - (i) Closed to all traffic. The Contractor shall sign the street "Road Closed – No Exit" in accordance with the Manual of Temporary Traffic Control.
- (b) Forest Park Drive from Airlies Street North to Sinclair Street:
 - (i) A minimum of one lane for local access traffic shall be maintained along this street during construction;
 - (ii) Intersecting streets shall be maintained at all times.
- (c) Kingsbury Avenue from 56.5m West of Airlies Street North to Sinclair Street:
 - (i) A minimum of one lane for local access traffic shall be maintained along this street during construction;
 - (ii) Intersecting streets shall be maintained at all times.
- (d) Lansdowne Avenue from Salter Street to Main Street:
 - (i) Closed to all traffic. The Contractor shall sign the street "Road Closed – No Exit" in accordance with the Manual of Temporary Traffic Control.
- (e) Perth Avenue from Main Street to Scotia Street:
 - (i) A minimum of one lane for local access traffic shall be maintained along this street during construction;
 - (ii) Intersecting streets and back lane access shall be maintained at all times.
- (f) Rupertsland Boulevard from Main Street to Jones Street:
 - (i) A minimum of one lane for local access traffic shall be maintained along this street during construction;
 - (ii) During renewal of westbound lane, local access traffic westbound shall be maintained along westbound lane during construction;
 - (iii) Maintain one lane of one-way traffic(westbound) during eastbound construction;
 - (iv) Intersecting streets and back lane access shall be maintained at all times.
- (g) Semple Avenue from Salter Street to Main Street:
 - (i) A minimum of one lane for local access traffic shall be maintained along this street during construction;
 - (ii) Intersecting streets and back lane access shall be maintained at all times.

E7.1.2 Should the Contractor be unable to maintain an existing access to a residence or business, he/she shall review the planned disruption with the business or residence and the Contract

Administrator, and take reasonable measures to minimize the impact. The Contractor shall provide a minimum of 24 hours notification to the affected residence or business and the Contract Administrator, prior to disruption of access.

E7.1.3 Pedestrian and ambulance/emergency vehicle access must be maintained at all times.

E8. REFUSE AND RECYCLING COLLECTION

E8.1 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 E8.2 to permit the normal collection vehicles to collect the materials. Immediately following recycling collection the Contractor shall return recycling receptacles to the addresses marked on the receptacles.

E8.2 Collection Schedule:

Church Avenue.

Collection Day(s): **Thursday**
Collection Time: **7:00 am**
Common Collection Area: **Collection back lane.**

Forest Park Drive.

Collection Day(s): **Thursday**
Collection Time: **7:00 am**
Common Collection Area: **Collection front street, maintain access to accommodate or Contractor to move Refuse/Recycling/Yard Waste to common collection point. Need to allow access to intersecting streets. Allow access to Sweetwood Bay.**

Kingsbury Avenue.

Collection Day(s): **Thursday**
Collection Time: **7:00 am**
Common Collection Area: **Collection on Kingsbury Avenue, maintain access to accommodate or Contractor to move Refuse/Recycling/Yard Waste to common collection point.**

Lansdowne Avenue.

Collection Day(s): **Thursday**
Collection Time: **7:00 am**
Common Collection Area: **Collection back lane.**

Perth Avenue.

Collection Day(s): **Thursday**
Collection Time: **7:00 am**
Common Collection Area: **Collection back lane. Allow access to back lanes. Collection on Perth Avenue for #332 & #336 Scotia Street, maintain access to accommodate or Contractor to move Refuse/Recycling/Yard Waste to common collection point.**

Rupertsland Boulevard.

Collection Day(s): **Thursday**

Collection Time: **7:00 am**

Common Collection Area: **Collection back lane. Collection front street for #191A & #193 Rupertsland Boulevard, maintain access to accommodate or Contractor to move Refuse/Recycling/Yard Waste to common collection point.**

Semple Avenue.

Collection Day(s): **Thursday**

Collection Time: **7:00 am**

Common Collection Area: **Collection back lane.**

E8.3 No measurement or payment will be made for the work associated with this specification.

E9. WATER OBTAINED FROM THE CITY

E9.1 Further to clause 3.7 of CW 1120, the Contractor shall pay for all costs, including sewer charges, associated with obtaining water from the City in accordance with the Waterworks and Sewer By-laws.

E10. SURFACE RESTORATIONS

E10.1 Further to clause 3.3 of CW 1130, when Total Performance is not achieved in the year the Contract is commenced, the Contractor shall temporarily repair any Work commenced and not completed to the satisfaction of the Contract Administrator. The Contractor shall maintain the temporary repairs in a safe condition as determined by the Contract Administrator until permanent repairs are completed. The Contractor shall bear all costs associated with temporary repairs and their maintenance.

E11. INFRASTRUCTURE SIGNS

E11.1 The Contractor shall obtain infrastructure signs from the Traffic Services Sign Shop at 421 Osborne Street. 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. When the Contract Administrator considers the Work on the street complete, the Contractor shall remove and dispose of the signs and supports. No measurement for payment will be made for performing all operations herein described and all other items incidental to the work described

E12. SUPPLY AND INSTALLATION OF PAVEMENT REPAIR FABRIC

DESCRIPTION

E12.1 General

E12.1.1 This specification covers the supply and installation of pavement repair fabrics for reinforcement of asphalt layers, distribution of loads, and reducing reflective cracking distresses.

E12.2 Definitions

E12.2.1 Pavement Repair Fabric composed of fiberglass strands coated with an elastomeric polymer and formed into a grid structure.

- E12.2.2 Minimum Average Roll Value (MARV) is Property value calculated as typical minus two standard deviations. It shall yield a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed the value reported.
- E12.2.3 Apertures are the open spaces formed between the interconnected network of longitudinal and transverse ribs of a fabric.
- E12.2.4 Type A Pavement Repair Fabric is composed of fiberglass strands coated with an elastomeric polymer and formed into a grid structure. It will be used for either localized repair reinforcement (i.e. at joints and cracks) or full width asphalt reinforcement to minimize both thermal and stress related reflective cracking.
- E12.2.5 Type B Pavement Repair Fabric is high strength fabric in the cross-machine direction and will be used for localized repair reinforcement (i.e. at joints and cracks) where severe cracking conditions and heavy loadings are expected.
- E12.3 Referenced Standard Construction Specifications
- E12.3.1 CW 3110 – Sub-Grade, Sub-Base and Base Course Construction
- E12.3.2 CW 3410 – Asphaltic Concrete Pavement Works
- E12.3.3 Approved Products for Surface Works

MATERIALS

E12.4 Approved Products

- E12.4.1 Use only those materials listed as Approved Products for Surface Works. The Approved Products are available at the City of Winnipeg, Corporate Finance, Material Management Internet site at:

https://www.winnipeg.ca/finance/findata/matmgt/std_const_spec/current/Docs/Approved_Products_Surface_Works.pdf .

E12.5 Material Identification

- E12.5.1 Pavement Repair Fabric shall be labelled in accordance with ASTM D4873/D4873M, and must clearly show the manufacturer name, product style number and roll number. Products without proper identification or labelling, mislabelling, or misrepresentation of materials shall be rejected.

E12.6 Storage and Handling

- E12.6.1 Pavement Repair Fabric rolls shall be elevated off the ground and adequately covered to protect them from site construction damage, precipitation, any contamination of dirt or dust and any other deleterious materials.
- E12.6.2 Pavement Repair Fabric rolls shall be protected from extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, excess temperatures, and any other environmental conditions that may damage the physical properties of the fabric.
- E12.6.3 Store and handle the Pavement Repair Fabric in accordance with the manufacturer's recommendations. Manufacturer's data sheets shall include preparation instructions and recommendations as well as storage and handling requirements and recommendations.

E12.7 Certification

- E12.7.1 The Contractor shall provide Manufacturer's Mill Certificate and MARV Roll Data to the Contract Administrator prior to installation. The Certification shall state that the Pavement Repair Fabric meets MARV requirements as evaluated under the Manufacturer's quality control program. The Certification shall be attested to by a person having legal authority to bind the Manufacturer. The Pavement Repair Fabric shall be annually tested by accredited a third party testing facility.

E12.7.2 The Contractor shall provide a letter to the Contract Administrator stating the product name, manufacturer, style number, and other pertinent information to fully describe the Pavement Repair Fabric.

E12.7.3 All testing and data shall be in accordance with approved ASTM standards. Data reported in accordance with other standards will not be accepted.

E12.8 Pavement Repair Fabric Properties

E12.8.1 Pavement Repair Fabric shall consist of a high strength, fiberglass grid custom knitted and coated with an elastomeric polymer and self-adhesive glue with square or rectangular opening configurations.

E12.8.2 The axis with the least strength will be taken as the ultimate strength of the fabric for any given property.

E12.8.3 Type A Pavement Repair Fabric shall meet the requirements in Table CW 3140.1.

Table CW 3140.1 – Type A Pavement Repair Fabric Property Requirements

Physical Property	Machine Direction	Cross-Machine Direction	Test Method
Tensile Strength, Minimum	100 kN/m	100 kN/m	ASTM D 6637
Tensile Strength @ 2% Strain, Minimum	80 kN/m	80 kN/m	ASTM D 6637
Secant Stiffness EA at 2% Strain	4,000 kN/m	4,000 kN/m	ASTM D 6637
Elongation at Break, Maximum	3%		ASTM D 6637
Coating Softening Point, Minimum	150 °C		ASTM D 36
Coating Melting Point, Minimum	350 °C		ASTM D 276
Glass Melting Point, Minimum	820 °C		ASTM D 338
Mass/Unit Area, Minimum	420 g/m ²		ASTM D 5261

E12.8.4 Type B Pavement Repair Fabric shall meet the requirements in Table CW 3140.2.

Table CW 3140.2 – Type B Pavement Repair Fabric Property Requirements

Physical Property	Machine Direction	Cross-Machine Direction	Test Method
Tensile Strength, Minimum	100 kN/m	200 kN/m	ASTM D 6637
Tensile Strength @ 2% Strain, Minimum	80 kN/m	160 kN/m	ASTM D 6637
Secant Stiffness EA at 2% Strain	4,000 kN/m	8,000 kN/m	ASTM D 6637
Elongation at Break, Maximum	3%		ASTM D 6637
Coating Softening Point, Minimum	150 °C		ASTM D 36
Coating Melting Point, Minimum	350 °C		ASTM D 276
Glass Melting Point, Minimum	820 °C		ASTM D 338
Mass/Unit Area, Minimum	420 g/m ²		ASTM D 5261

E12.8.5 All physical property requirements are Minimum Average Roll Values (MARV) determined in accordance with ASTM 4759. Values not labelled as MARV will not be accepted.

E12.8.6 Aperture sizes shall be as follows:

- (i) Between 10 mm and 14 mm for pavement repair fabric immediately below or within Type 1A asphalt layer.
- (ii) Between 19 mm and 25.4 mm for pavement repair fabric immediately below or within Type III asphalt layer.

E12.8.7 If the fabric has a rectangular aperture size, the smaller dimension shall be used to establish the suitable Pavement Repair Fabric.

CONSTRUCTION METHODS

- E12.9 Pavement Repair Fabric shall not be placed when weather conditions, in the opinion of the Contract Administrator, are not suitable for installation including heavy rainfall, extreme cold or frost conditions, or extreme heat.
- E12.10 Make all repairs as required prior to placement of Pavement Repair Fabric. Seal cracks and fill holes using a method that provides a proper level surface. Receiving surface shall be smooth, with the existing cracks pretreated.
- E12.11 Surfaces shall be mechanically cleaned by sweeping and vacuuming and be free of oil, vegetation, sand, dirt, water, gravel, and other contaminants prior to placement of Pavement Repair Fabric.
- E12.12 Pavement Repair Fabric placement should not be undertaken if rain is likely to fall prior to covering the fabric with an asphalt mat overlay. Pavement Repair Fabric that is placed and will not adhere due to moisture shall be removed and replaced at the Contractor's expense.
- E12.13 Pavement Repair Fabric shall be laid out by mechanical means or by hand using sufficient pressure to eliminate ripples. Remove any ripples by pulling the fabric tight. Cutting of the fabric may be permitted on tight radii to prevent ripples.
- E12.14 Transverse joints shall be overlapped 75 mm or as recommended by the manufacturer, whichever is greater. Longitudinal joints shall be overlapped 37.5 mm or as recommended by the manufacturer, whichever is greater.
- E12.15 Prior to the asphalt topping placement, the fabric shall be inspected by the Contract Administrator for damage during installation. Damaged fabric shall be removed and replaced at the Contractor's expense.
- E12.16 Activate self-adhesive glue by rolling with a rubber coated drum roller or a pneumatic tire roller. In no instance shall steel-wheeled or vibratory rollers be used. Rolling shall continue until the adhesive is activated and the fabric is bonded to the leveling course.
- E12.17 Roller tires shall be kept clean to the satisfaction of the Contract Administrator.
- E12.18 If bonding of the fabric is not readily achieved, it shall be removed and replaced at the Contractor's expense.
- E12.19 Pavement Repair Fabric shall be laid and rolled over ironworks (e.g., manhole covers). Once the fabric has been rolled, those portions covering the ironworks shall be removed by cutting the fabric with a utility knife or other methods approved by the Contract Administrator.
- E12.20 Protect the Pavement Repair Fabric until placement of the finished asphalt topping.
- E12.21 Where a tack coat or emulsified asphalt is specified, the approved tack coat/emulsion and dose should be used as recommended by the manufacturer in conjunction with the Pavement Repair Fabric. Tack coat or emulsified asphalts shall not be diluted. Unless otherwise recommended by the manufacturer, apply tack coat or emulsified asphalt at the rate of 0.35 liters per square meter of surface area.

- E12.22 Where tack coat or emulsified asphalt is placed prior to the fabric, it must fully cure prior to placement of the fabric. Where tack coat or emulsified asphalt is placed after the fabric, it must fully cure prior to construction traffic, including paving, travelling on the surface.
- E12.23 Prevent spattering of tack coat or emulsified asphalt when placed adjacent to curbs, gutters, structures and other adjacent surfaces. Clean any surfaces where it has been contaminated by the tack coat or emulsified asphalt.
- E12.24 Leveling course or overlay layer shall be a minimum thickness of 40 mm. Place and compact asphalt over the Pavement Repair Fabric in accordance with CW 3410.

QUALITY ASSURANCE TESTING

- E12.25 The Contract Administrator shall test the adhesion for pavement repair fabric in field during construction is as follows:
- E12.25.1 Place approximately 1 m² of fabric on a prepared surface that is representative of the project conditions.
- E12.25.2 Activate self-adhesive glue by rolling with a rubber-tired roller or by applying adequate pressure to fully activate the pressure-sensitive adhesive.
- E12.25.3 Use a calibrated spring balance by inserting the hook of the balance under the centre of the fabric and pulling upward until the fabric starts to pull away from the surface.
- E12.25.4 A 9 kg pull is required without pulling the grid free or creating ripples in the fabric.
- E12.26 The minimum frequency shall be one test, then test every 2000 square meters.

MEASUREMENT AND PAYMENT

- E12.27 Supply and installation of Pavement Repair Fabric will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Supply and Install Pavement Repair Fabric". The area to be paid for will be the total number of square metres of Pavement Repair Fabric, supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

- i. Type A
 - ii. Type B
- E12.28 Only material placed within the designated limits will be included in the payment for "Supply and Install Pavement Repair Fabric".
- E12.29 No measurement or payment will be made for Pavement Repair Fabric removed and replaced due to improper installation or damaged materials.
- E12.30 No measurement or payment will be made for transverse and longitudinal overlap.

E13. SUPPLY AND INSTALL WATERMAIN AND WATER SERVICE INSULATION

DESCRIPTION

- E13.1 Notwithstanding 3.12 of CW 2110, this specification covers the supply and installation of insulation in roadway excavations over watermains and water services.
- E13.2 Referenced Standard Construction Specifications
- (a) CW 2030 – Excavation Bedding and Backfill
 - (b) CW 3110 – Sub –grade, Sub-base and Base Course Construction

- E13.3 Referenced Standard Details
(a) SD-018 - Watermain and Water Service Insulation

MATERIALS

- E13.4 Acceptable insulation is:
(a) Extruded Polystyrene rigid foam insulation – Type 4, 4” in thickness.
DOW - Roofmate or Highload 40
Owen’s Corning - Foamular 350 or Foamular 400.
2” X 48” X 96”, 2” X 24” X 96”, 4” X 24” X 96”

- E13.5 Sand Bedding:
(a) In accordance with CW 2030

CONSTRUCTION METHODS

- E13.6 Prior to the installation of any sub-base material or geotextile material, locate all existing water services. Further to SD-018, where directed by the Contract Administrator, excavate the sub-grade to allow the top of the insulation to be installed flush with the surrounding sub-grade. Install the insulation on a level surface centered over the located watermain or water service for the full width of the roadway excavation. Install sand bedding if required to level the surface. Stockpile and dispose of excavated material in accordance with CW 3110.
- E13.7 Thickness of insulation is 100 mm (4”). If using 50 mm (2”) panels 2 layers are required. Total width of insulation to be as directed by the Contract Administrator. Place sufficient full width panels to meet or exceed the specified width.
- E13.8 Place insulation panels adjacent to each other over the specified area with no gaps between panels and less than 15mm of elevation difference along the adjoined edges. Where 2” thick panels are being used, offset the top layer to prevent the panel joints from aligning with the joints in the lower layer.
- E13.9 Use full panels of insulation where possible. Where necessary cut insulation panels to obtain coverage to specified lengths. Insulation pieces shall be a minimum of dimension of 300 mm in width or length.
- E13.10 Take appropriate measures to ensure panels are not displaced when installing geotextiles and during backfilling operations.

MEASUREMENT AND PAYMENT

- E13.11 Watermain and Water Service Insulation shall be measured on an area basis and paid for at the Contract Unit Price per square metre of “Watermain and Water Service Insulation”. The area to be paid for shall be the total square meters of watermain and water service insulation supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.
(a) Excavation of the roadway subgrade in accordance with E13.6 will not be measured for payment and will be included in the payment for “Watermain and Water Service Insulation”.

E14. EXISTING MANHOLE REPAIRS

- E14.1 Patching of existing manholes will be constructed in accordance with CW 2130.
- E14.2 Re-pointing brick of existing manholes will be constructed in accordance with CW 3130.
- E14.3 Patching around the perimeter of connecting sewer pipes at the manhole interface will be measured on a unit basis and paid for at the Contract Unit Price for “Patching of Pipe/MH Interface”.

E15. SUB-GRADE STRENGTH ANALYSIS

E15.1 Further to Clause 3.5 of CW 3130 and Clause 3.3 of CW 3135, a CBR Value of 2.0 is to be used for the calculation of overlap of Geotextile Fabrics and Geogrids.

E16. SOFT EXCAVATION TO EXPOSE UNDERGROUND UTILITIES

DESCRIPTION

E16.1 This Specification covers the soft excavation to expose underground utilities to determine the depth of the underground utility and whether it will interfere with installation of proposed Works on site.

E16.2 These underground utilities include, but are not limited to, City of Winnipeg Traffic Signal cables, Manitoba Hydro cables, Manitoba Hydro gas pipes, MTS cables, existing sewers, and existing watermains.

MATERIALS

E16.3 Backfill Material

(a) Backfill material for backfill of shafts after hydro-excavation has been completed shall consist of sand in accordance with Specification CW 2030.

CONSTRUCTION METHODS

E16.4 Prior to commencement of any construction Works adjacent to underground utilities, the Contractor shall use soft digging or hand excavation to expose underground utilities.

E16.5 Once the elevation of the top of pipe or duct has been determined the resulting excavation shall be backfilled with bedding sand to the elevation of existing ground.

MEASUREMENT AND PAYMENT

E16.6 Soft excavation to expose underground utilities will be considered incidental to the Work. No measurement and payment will be made within this section.

E17. CONCRETE CONSTITUENT MATERIALS, MIX DESIGN REQUIREMENTS, AND HOT AND COLD WEATHER CONCRETING

E17.1 This Specification covers Portland cement concrete constituent materials and design requirements for the preparation of Portland Cement Concrete for all concreting operations relating to the construction of pavements, curbs, gutters, private approaches, bull-noses, median slabs, median, safety median and boulevard splash strips, sidewalk and other related concrete works and is contained in Appendix 'C'.

E17.2 This Specification also covers hot and cold weather concreting.

E18. CONSTRUCTION OF BARRIER CURB FOR ASPHALT PAVEMENT

DESCRIPTION

E18.1 This Specification covers the construction of Barrier Curb for Asphalt Pavement on Lansdowne Avenue from Salter Street to Main Street.

GENERAL

E18.2 Referenced Standard Construction Specifications and Standard Detail Drawings:

- (a) CW 3110 – Sub-grade, Sub-base and Base Course Construction
- (b) CW 3310 – Portland Cement Concrete Pavement Works

- (c) CW 3240 – Renewal of Existing Curbs
- (d) Standard Detail Drawings SD-200A (Appendix 'B')

CONSTRUCTION METHODS

- E18.3 Further to CW 3310, the contractor shall construct the barrier curb for asphalt pavement as per Standard Detail Drawing SD-200A.
- E18.4 Construction of Barrier Curb for Asphalt Pavement - Standard Detail Drawing SD-200A
- E18.4.1 Place and compact 100mm sub-base material for roadway in accordance with the Standard Detail Drawing SD-200A and Specification CW 3110.
 - E18.4.2 Supply and install 20M tie-bars into sub-base material as shown on the Standard Detail Drawing SD-200A.
 - E18.4.3 Drill holes into the sub-base at a maximum depth of 150mm, with a drilling diameter of 2mm greater than the diameter of the tie bar.
 - E18.4.4 If 20M tie-bars are loose, a bonding agent shall be placed into the drilled hole to help secure the 20M tie-bars.
 - E18.4.5 Supply and install 2-10M longitudinal deformed bars for reinforcement as shown on the Standard Detail Drawing SD-200A.
 - E18.4.6 Supply and install 2-19.1mm dowels at transverse joints every 6.0 meters as shown on the Standard Detail Drawing SD-200A. All dowels shall be thoroughly lubricated with asphaltic cut-back.
 - E18.4.7 Provide a minimum of 40mm cover between reinforcing steel and the finished concrete surface.
 - E18.4.8 Transverse joints will be saw cut every 3.0 meters. Transverse joints are to be saw cut to a maximum depth of 25mm, so as to not saw cut into the 10M longitudinal deformed bars and 19.1mm dowels.
 - E18.4.9 Construct Barrier Curb for Asphalt Pavement (180mm ht) in accordance with Standard Detail Drawing SD-200A. Install 20M tie-bars into sub-base material, 2-10M longitudinal deformed bars for reinforcement and 2-19.1mm dowels at transverse joint.
 - E18.4.10 Construct Modified Barrier Curb for Asphalt Pavement (180mm ht) in accordance with Standard Detail Drawing SD-203B and SD-200A. Install 20M tie-bars into sub-base material, 2-10M longitudinal deformed bars for reinforcement and 2-19.1mm dowels at transverse joint.
 - E18.4.11 Construct Curb Ramp for Asphalt Pavement (8-12mm ht) at sidewalk ends in accordance with Standard Detail Drawing SD-229C. Install 1-10M longitudinal deformed bar for reinforcement and 1-19.1mm dowel only required for curb ramp for asphalt pavement at transverse joint.
 - E18.4.12 Place concrete utilizing slip-form paving equipment in accordance with Specification CW 3310 unless otherwise directed by the Contract Administrator.
 - E18.4.13 Place and compact 50mm sub-base material as backfill behind barrier curb for asphalt pavement within excavated area approximately 150mm deep or as directed by the Contract Administrator. Place and compact suitable site material as backfill behind barrier curb to allow for 100mm of topsoil and sod below top of barrier curb. Care must be taken so as to not disturb the new barrier curb for asphalt pavement during placing and compaction of 50mm sub-base material and suitable site material.

MEASUREMENT AND PAYMENT

- E18.5 Construction of barrier curb for asphalt pavement shall be measured on a length basis and paid for at the Contract Unit Price per metre of "Construction of Barrier Curb for Asphalt Pavement".

The length to be paid for shall be the total number of meters supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.

- E18.6 Construction of modified barrier curb for asphalt pavement shall be measured on a length basis and paid for at the Contract Unit Price per metre of "Construction of Modified Barrier Curb for Asphalt Pavement". The length to be paid for shall be the total number of meters supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.
- E18.7 Construction of ramp curb for asphalt pavement shall be measured on a length basis and paid for at the Contract Unit Price per metre of "Construction of Ramp Curb for Asphalt Pavement". The length to be paid for shall be the total number of meters supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.
- E18.8 The supply and installation of 20M tie-bars, 10M longitudinal deformed bars and 19.1mm dowels is incidental to "Construction of Barrier Curb for Asphalt Pavement", "Construction of Modified Barrier Curb for Asphalt Pavement", and "Construction of Ramp Curb for Asphalt Pavement." No measurement or payment will be made.
- E18.9 Supply and placement of 50mm sub-base material for backfill to be paid for as per payment item "50mm Granular C".
- E18.10 Supply and placement of suitable site material for backfill to be paid for as per payment item "Placing Suitable Site Material".

E19. SITE REQUIREMENTS FOR ACCESSIBILITY

- E19.1 The Contractor shall provide the Contract Administrator with an Accessibility 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.
- E19.2 The Accessibility Plan shall demonstrate how the Contractor will accommodate the safe passage of pedestrians and cyclists in accordance with the Manual of Temporary Traffic Control, the Contract Drawings, Staging Plans, and Streets By-Law No. 1481/77 at all times for the duration of the Construction. Unless noted in the Contract, the Accessibility Plan must include a written plan for the following:
- (a) How the Contractor will maintain at least one crossing in each direction for each intersection (one north/south crosswalk and one east/west crosswalk).
 - (b) How the Contractor will maintain access to bus stops within the site.
 - (c) How the Contractor will maintain access to pedestrian corridors and half signals.
 - (d) How the Contractor will maintain cycling facilities.
 - (e) How the Contractor will maintain access to residents and businesses unless otherwise noted in the Contract.
 - (f) Any required detour signage at adjacent crossings to facilitate sidewalk or active transportation pathway closures.
- E19.3 The Accessibility Plan may also include figures, sketches, or drawings to demonstrate the proposed plan.
- E19.4 The Accessibility Plan shall include written details on how the Contractor intends to review, maintain, and document all items related to the Accessibility Plan on-site during Construction, including, but not limited to:
- (a) Signage;
 - (b) Temporary Ramping;
 - (c) Transit Stops; and
 - (d) Detour Signage

- E19.5 At minimum, the Contractor shall review the site conditions on a daily basis to ensure that all features related to the Accessibility Plan are in place. The site review is intended to correct deficiencies as a result of unforeseen events such as wind, traffic, or the general public. Deficiencies that are direct result of the Contractors actions must be corrected immediately.
- E19.6 Any changes to the Accessibility Plan must be approved by the Contract Administrator.
- E19.7 Upon request from the Contract Administrator, the Contractor shall provide records demonstrating that the site has been maintained.
- E19.8 Failure to produce records that demonstrate that the site was maintained in compliance with the Accessibility Plan or deficiencies as a direct result of actions by the Contractor that are not immediately corrected may result in a pay adjustment. The rate of pay adjustment will be as per the following schedule:
- (a) First Offence – A warning will be issued and documented in the weekly site meeting.
 - (b) Second Offence - A field instruction to immediately correct the site will be issued by the Contract Administrator.
 - (c) Third and subsequent Offences – A pay reduction will be issued in the amount of \$250.00 per instance and per day.

APPENDIX 'A' - GEOTECHNICAL REPORT

GEOTECHNICAL REPORTS FOR:

Church Avenue from Sinclair Street to Arlington Street – Concrete Pavement Reconstruction
Lansdowne Avenue from Salter Street to Main Street – Asphalt Pavement Reconstruction

PAVEMENT CORES FOR:

Forest Park Drive from Airlies Street North to Sinclair Street - Rehabilitation
Perth Avenue from Main Street to Scotia Street – Rehabilitation
Rupertsland Boulevard from Main Street to Jones Street – Rehabilitation
Semple Avenue from Salter Street to Main Street – Rehabilitation

The geotechnical report is provided to aid in the Contractor's evaluation of the existing pavement structure and/or soil conditions. The information presented is considered accurate at the locations shown on the Drawings and at the time of drilling. However, variations in pavement structure and/or soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences.



Quality Engineering | Valued Relationships

City of Winnipeg

2022 Geotechnical Investigation / Coring Report 22-R-01B

Prepared for:

Erik Hansen
City of Winnipeg
Engineering Public Works
106-1155 Pacific Ave,
Winnipeg, MB R3E

Project Number: 1000-049-07

Date: January 10, 2022



Quality Engineering | Valued Relationships

January 10, 2022

Our File No. 1000-049-07

Erik Hansen
City of Winnipeg
Engineering Public Works
106-1155 Pacific Ave,
Winnipeg, MB R3E

RE: 2022 Geotechnical Investigation / Coring Report 22-R-01B

TREK Geotechnical Inc. is pleased to submit our Final Report for the geotechnical investigation for the above noted project.

Please contact the undersigned should you have any questions.

Sincerely,

TREK Geotechnical Inc.

Per:

A handwritten signature in blue ink, appearing to read "N. Ferreira", written in a cursive style.

Nelson John Ferreira, Ph.D., P.Eng.
Senior Geotechnical Engineer

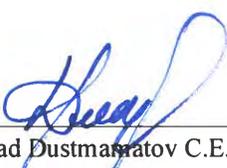
Encl.

Revision History

Revision No.	Author	Issue Date	Description
0	AD	January 10, 2022	Final Report

Authorization Signatures

Prepared By:

Prepared By: 
Asad Dustmanatov C.E.T.
Geotechnical Engineering Technologist

Reviewed By: 
Angela Fidler-Kliewer, C. Tech
Manager of Laboratory and Field
Services

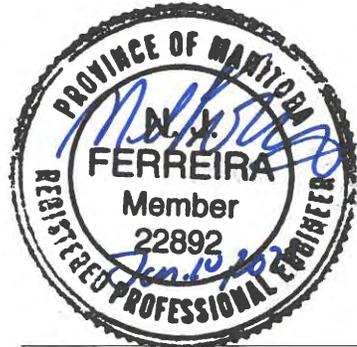
Senior Reviewed By: 
Nelson John Ferreira, Ph.D., P.Eng.
Senior Geotechnical Engineer



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Appendix E Summary Table, Pavement Core Photos, and Summary of Pavement Compressive Strength – Perth Ave.

Appendix F Summary Table, Pavement Core Photos, and Summary of Pavement Compressive Strength – Semple Ave.

1.0 Introduction

This report summarizes the results of the road investigation completed for the 2022 City of Winnipeg Geotechnical Investigation and Coring Program 22-R-01B. The core holes were located along Forest Park Drive, Rupertsland Blvd., Perth Ave., Semple Ave. and test holes along Church Ave. and Lansdowne Ave. The test hole information collected describes the pavement structure of the existing road as well as the soil stratigraphy beneath the pavement structure. The investigation was carried out following the City of Winnipeg public works street project requirements (Site Investigation Requirements For Public Works Street Projects, Effective Date: January 2021).

2.0 Road Investigation

The investigation included coring of pavement at 20 locations on 6 different local streets with drilling of test holes at 8 locations along two streets. City of Winnipeg selected the investigation locations as shown on Figure 01 to 06 (attached) and the table below summarizes the investigation program per street.

Table 1: Road Investigation Program

Street	# of Locations	Investigation
Church Ave. (Between Sinclair St. and Arlington St.)	3	Pavement Cores and Sub-surface
Lansdowne Ave. (Between Salter St. and Main St.)	5	Pavement Cores and Sub-surface
Forest Park Dr. (Between Airlies St. and Sinclair St.)	2	Pavement Cores
Rupertsland Blvd. (Between Jones St. and Main St.)	4	Pavement Cores
Perth Ave. (Between Scotia St. and Main St.)	3	Pavement Cores
Semple Ave. (Between Salter St. and Main St.)	3	Pavement Cores

The road investigation was conducted between December 14th to 20th, 2021. The pavement structure (asphalt and/or concrete) was cored by Naimu Mujiyambere and Asad Dustmamatov of TREK Geotechnical Inc. (TREK) using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. The test holes were drilled to a depth of 3.0 m below road surface by Maple Leaf Drilling Ltd. using a truck mounted drill rig equipped with 125 mm diameter solid stem augers. The sub-surface conditions were observed during drilling and visually classified by Asad Dustmamatov of TREK. Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation. Disturbed (auger cuttings) samples and bulk samples retrieved during the sub-surface investigation were transported to TREK’s material testing laboratory for further testing. Core samples were also retrieved and logged at TREK’s material testing laboratory

Core and test hole logs noted on the summary tables and test hole (core hole) locations are based on UTM coordinates obtained using a hand-held GPS, and their location relative to the nearest address or intersection, measured distance from the edge of pavement, or other permanent features.

The laboratory testing program consisted of moisture content determination on all samples, as well as Atterberg limits, and grain size analysis (hydrometer methods) on select samples between 0.6 and 0.8 m below pavement as well as Standard Proctor and CBR testing. Information gathered for each street package is included in separate appendices (Appendices A through F). The information provided in the Appendices includes test hole logs, laboratory testing summary tables and results, summary of pavement compressive strength and photos of the concrete cores.

Three CBR's were completed on bulk samples of the soil units present below the pavement. Only silt and clay were encountered within the prescribed sample depth for CBR testing and the results are shown in the table below.

Table 2: CBR Testing Summary

Sample Description	Street	Depth (m)	SPMDD (kg/m ³)	Opt. Moisture (%)	Percent Proctor (%)	Moisture Content (%)	CBR Value at 2.54 mm	CBR Value at 5.08 mm
Silt and Clay	Church Ave. (TH21-01, 02, 03)	0.3-1.5	1648	20.8	95.2	24.4	3.6%	3.1%
Silt and Clay	Lansdowne Ave. (TH21-04, 05, 06)	0.3-1.5	1550	24.0	95.2	27.0	5.7%	4.4%
Silt and Clay	Lansdowne Ave. (TH21-07, 08)	0.3-1.5	1526	25.4	95.6	28.7	4.8%	3.9%

* Testing completed on combined grab samples from the top 1.5 m of each test hole.

The test hole logs include a description of the soil units encountered during drilling and other pertinent information such as groundwater conditions and a summary of the laboratory testing results. The soils were classified in general accordance with the Unified Soil Classification System (USCS) and the AASHTO soil classification system (American Association of state highway and transportation officials). The AASHTO system classifies soils based on laboratory testing results from Atterberg Limits and grain size testing methods (hydrometer and mechanical sieve method). Where laboratory testing was not conducted, the AASHTO classification of the soils were interpreted based on a visual assessment as indicated with a (I) on the test hole logs and attached tables. For cohesive soils, the AASHTO system uses a combination of testing results to determine the Group Index of the soils and thus, were only determined where sufficient laboratory test data was available.

Four concrete cores were selected for concrete compressive strength breaks and the length to diameter ratio ranged between 1.04 to 1.18 for the cores collected. The core compressive strength tests were tested in accordance with CSA A23.2-14C – air dried condition. The measured compressive strengths were also corrected based on an adapted ACI 214.4R-03 Standard to estimate the in-place concrete strengths. The table below summarizes the compressive strength results while the compressive strength testing details and the correction factor methodology are included in Appendix D, E and F.

Table 3: Concrete Core Compressive Strength Results

Core ID	Uncorrected Comp. strength	L/D Corr.	Dia. Corr. Factor	Moisture Corr.	Damage Corr.	Rebar Corr. Factor	Corr. Comp. Strength (MPa)
PC21-11	57.9	.89	0.98	0.96	1.06	-	51.4
PC21-15	61.4	.92	0.98	0.96	1.06	-	56.4
PC21-17	56.2	.92	0.98	0.96	1.06	-	51.4
PC21-18	62.8	.90	0.98	0.96	1.06	-	56.3

3.0 Closure

The information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation, laboratory testing, geometries). Soil conditions are natural deposits that can be highly variable across a site. If sub-surface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

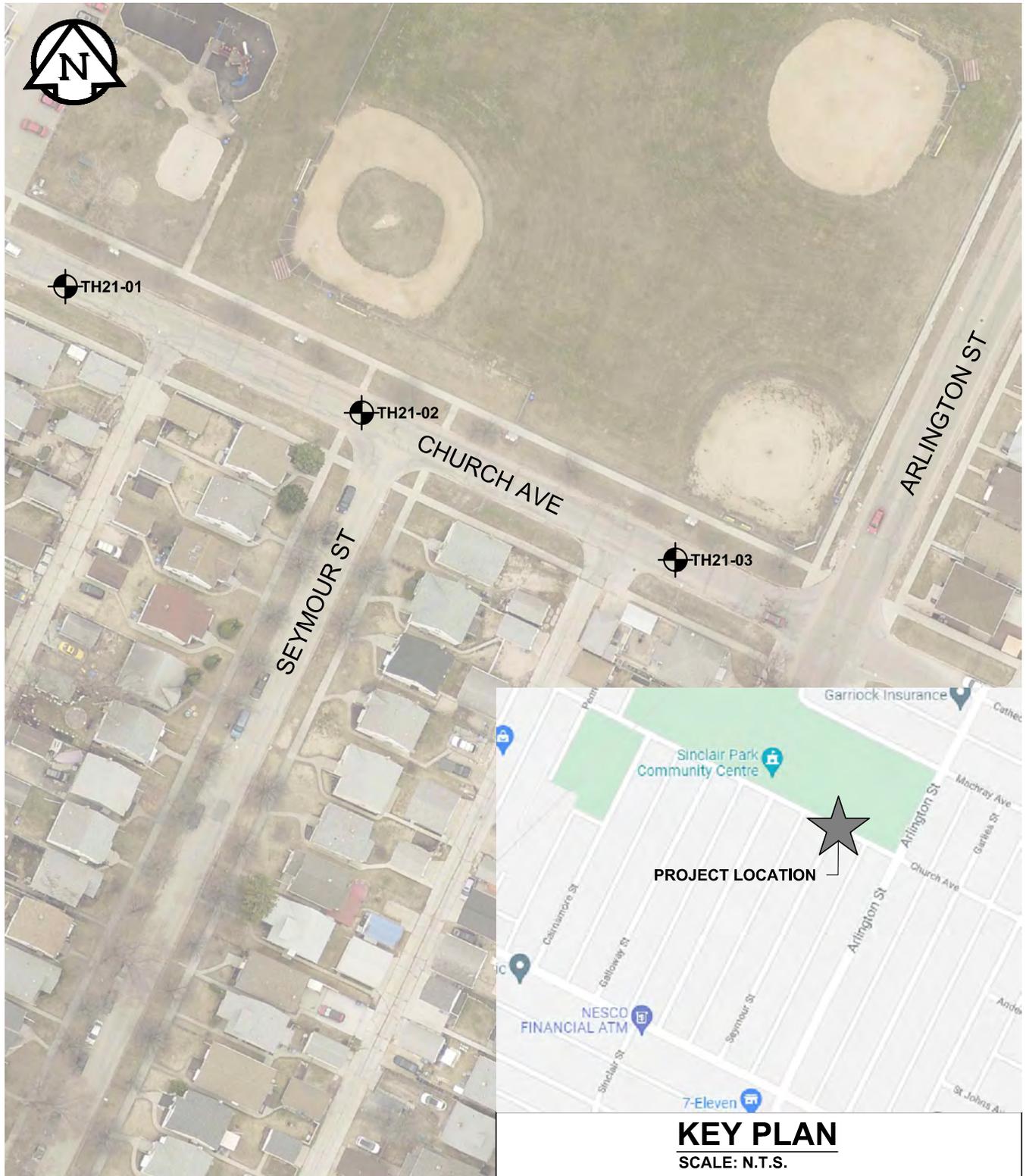
All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work, or a mutually executed standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of City of Winnipeg (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

Figures

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-06 10:47:43 AM



LEGEND:

TEST HOLE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).

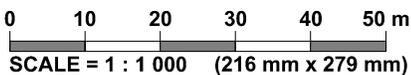
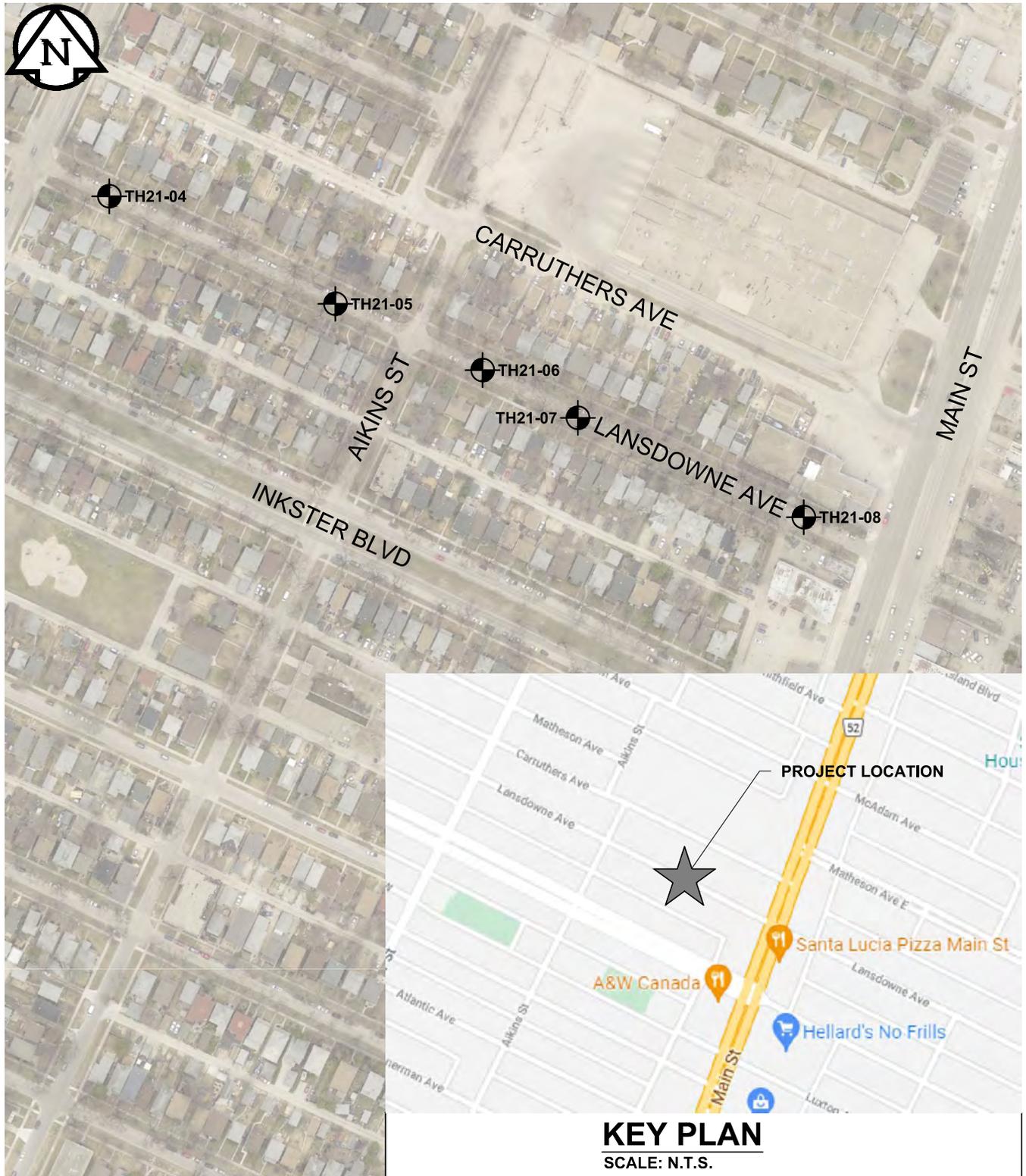


Figure 01
Test Hole Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:29:01 PM



LEGEND:

TEST HOLE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).

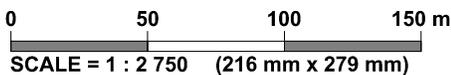
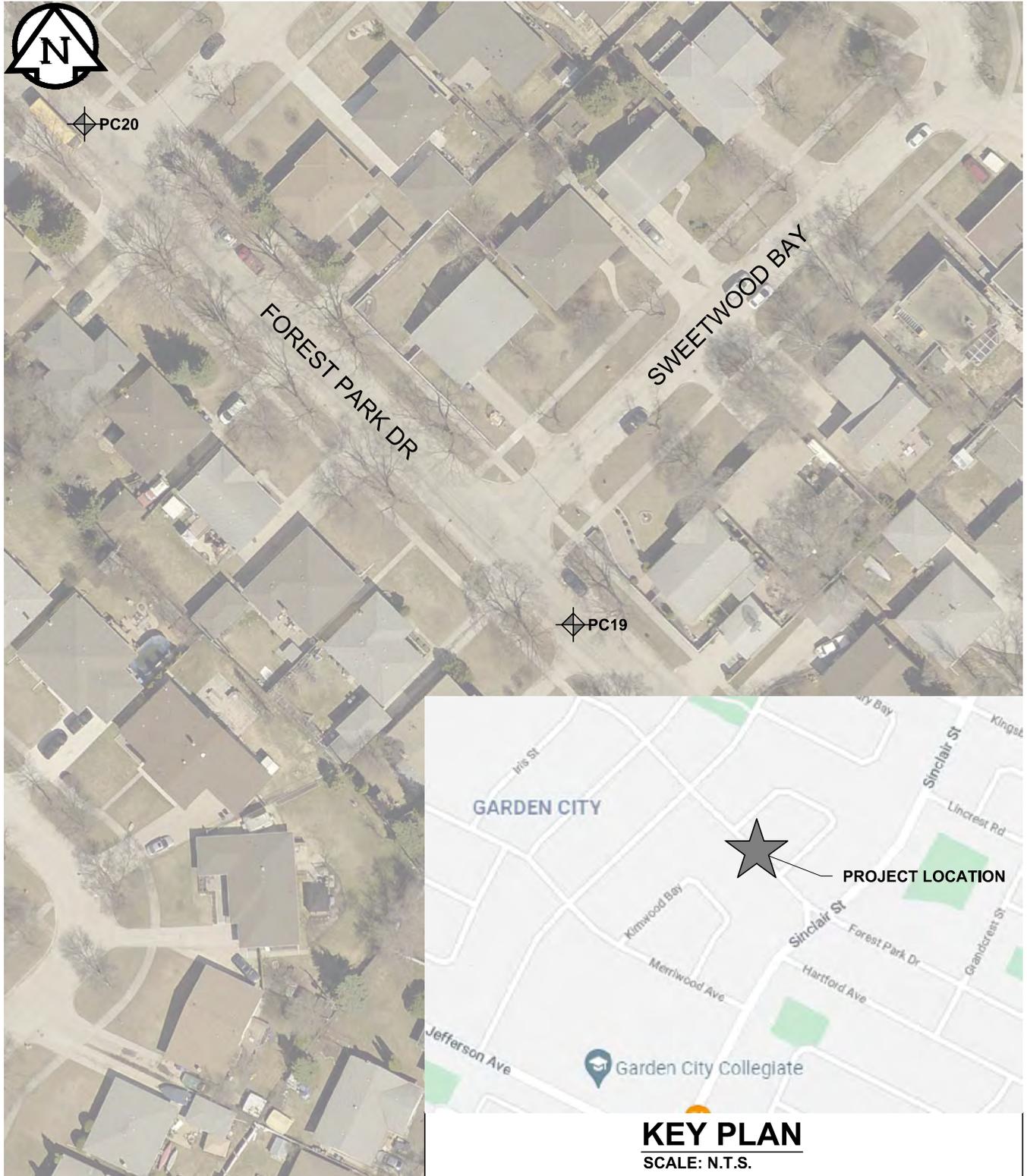


Figure 02
Test Hole Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:28:15 PM



LEGEND:

PAVEMENT CORE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).



KEY PLAN
SCALE: N.T.S.

Figure 03

Pavement Core Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:27:43 PM



LEGEND:

PAVEMENT CORE (TREK, 2021)

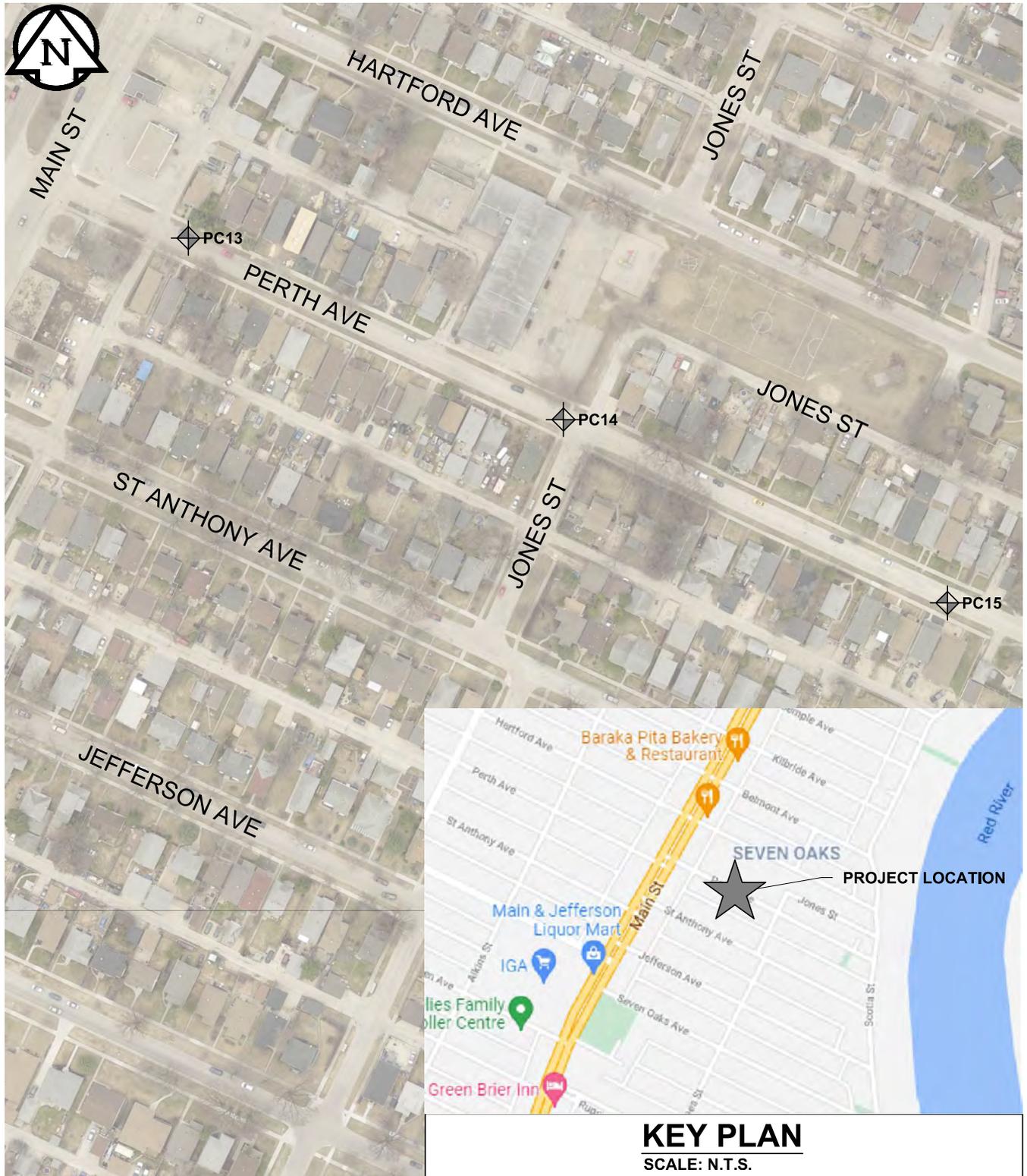
NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).



Figure 04
Pavement Core Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

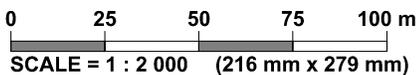


LEGEND:

PAVEMENT CORE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).

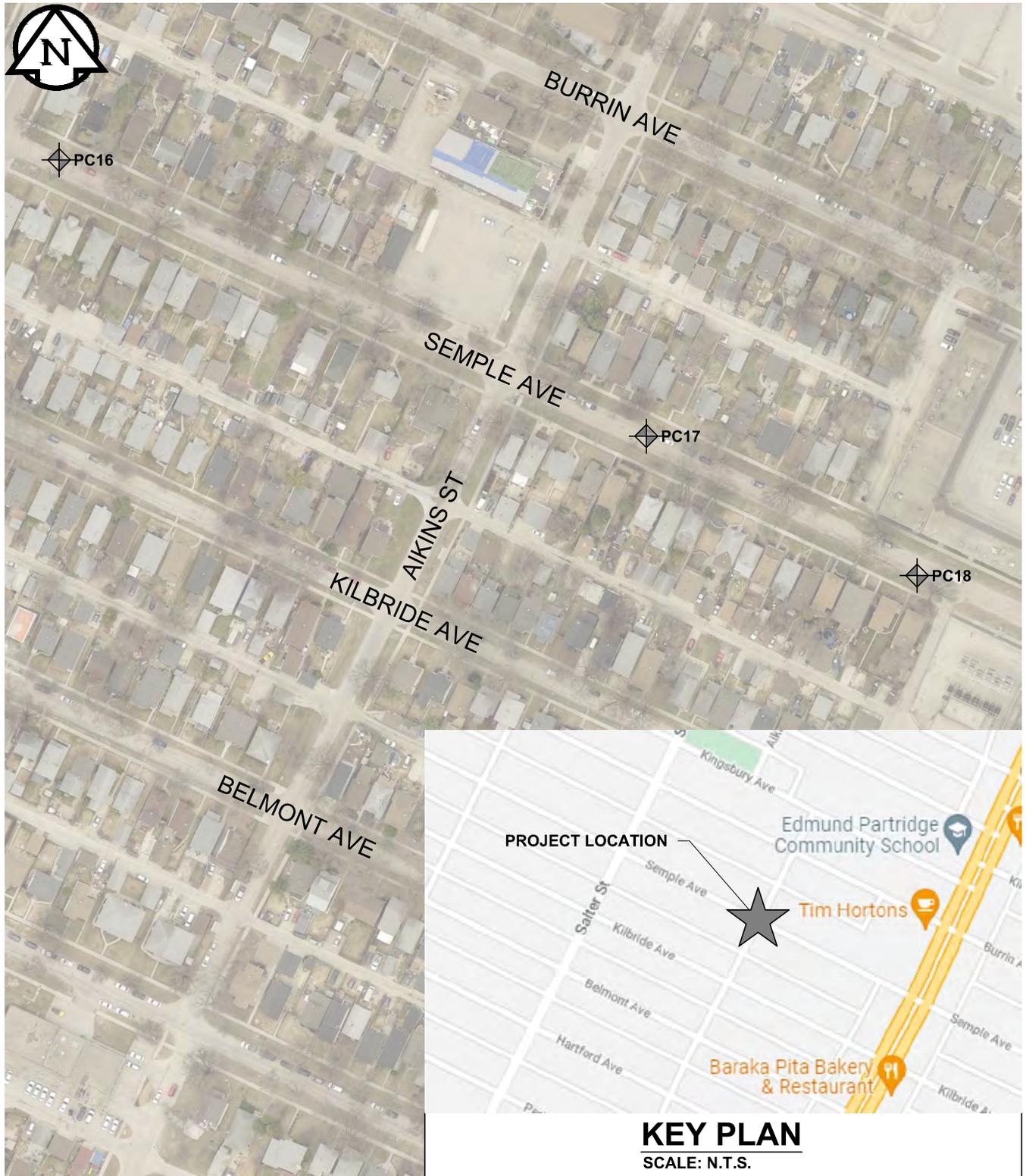


1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-06 10:50:59 AM

Figure 05
Pavement Core Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:24:31 PM

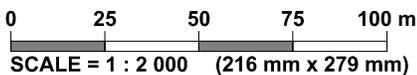


LEGEND:

PAVEMENT CORE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).



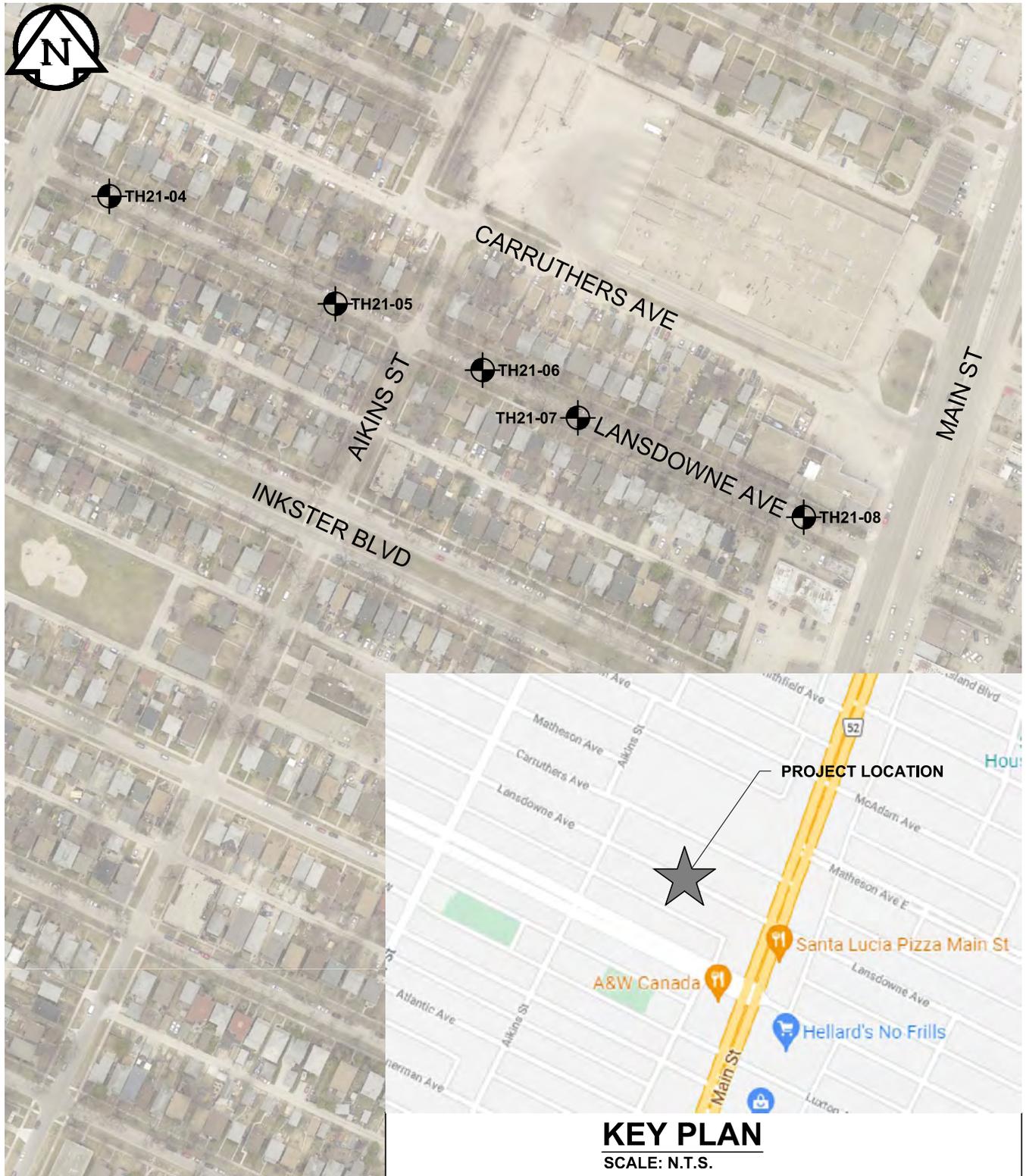
KEY PLAN
SCALE: N.T.S.

Figure 06

Pavement Core Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:29:01 PM



LEGEND:

TEST HOLE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).

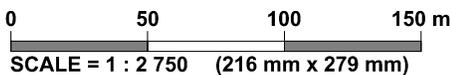
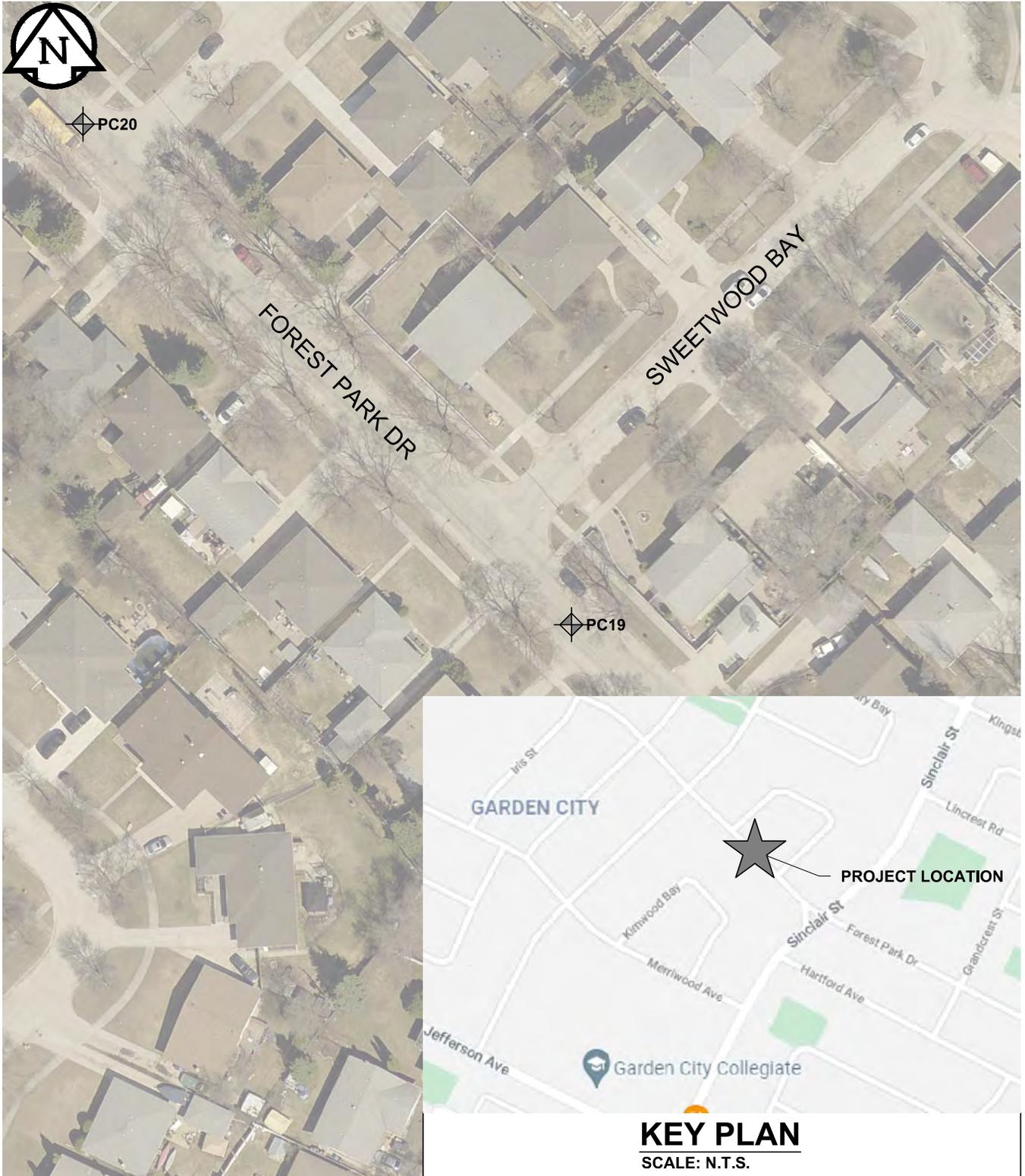


Figure 02
Test Hole Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:28:15 PM

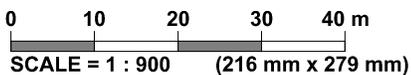


LEGEND:

PAVEMENT CORE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).



KEY PLAN
SCALE: N.T.S.

Figure 03
Pavement Core Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

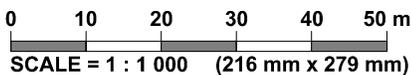


LEGEND:

PAVEMENT CORE (TREK, 2021)

NOTES:

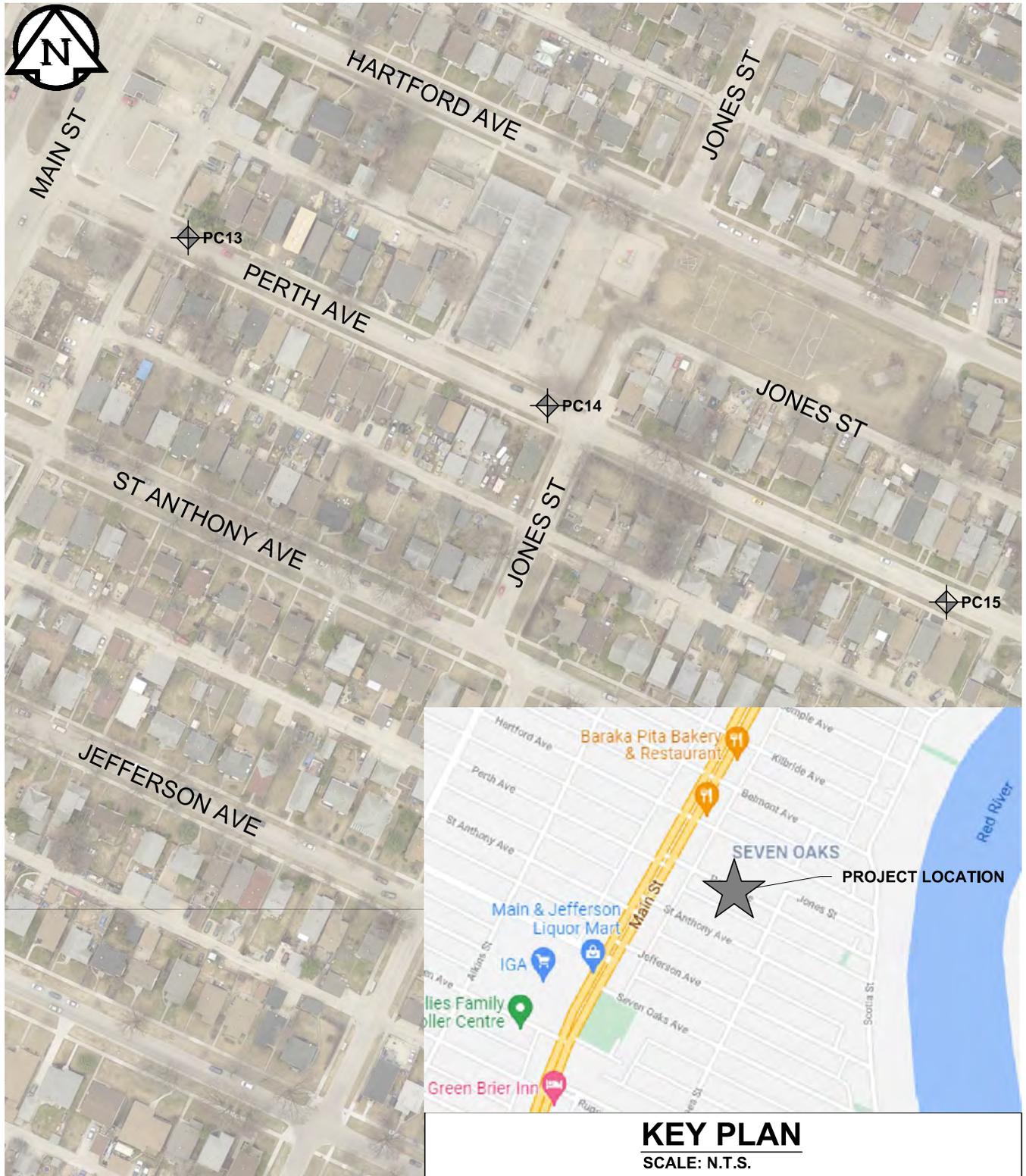
1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).



1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:27:43 PM

Figure 04
Pavement Core Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

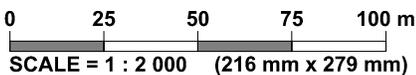


LEGEND:

PAVEMENT CORE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).

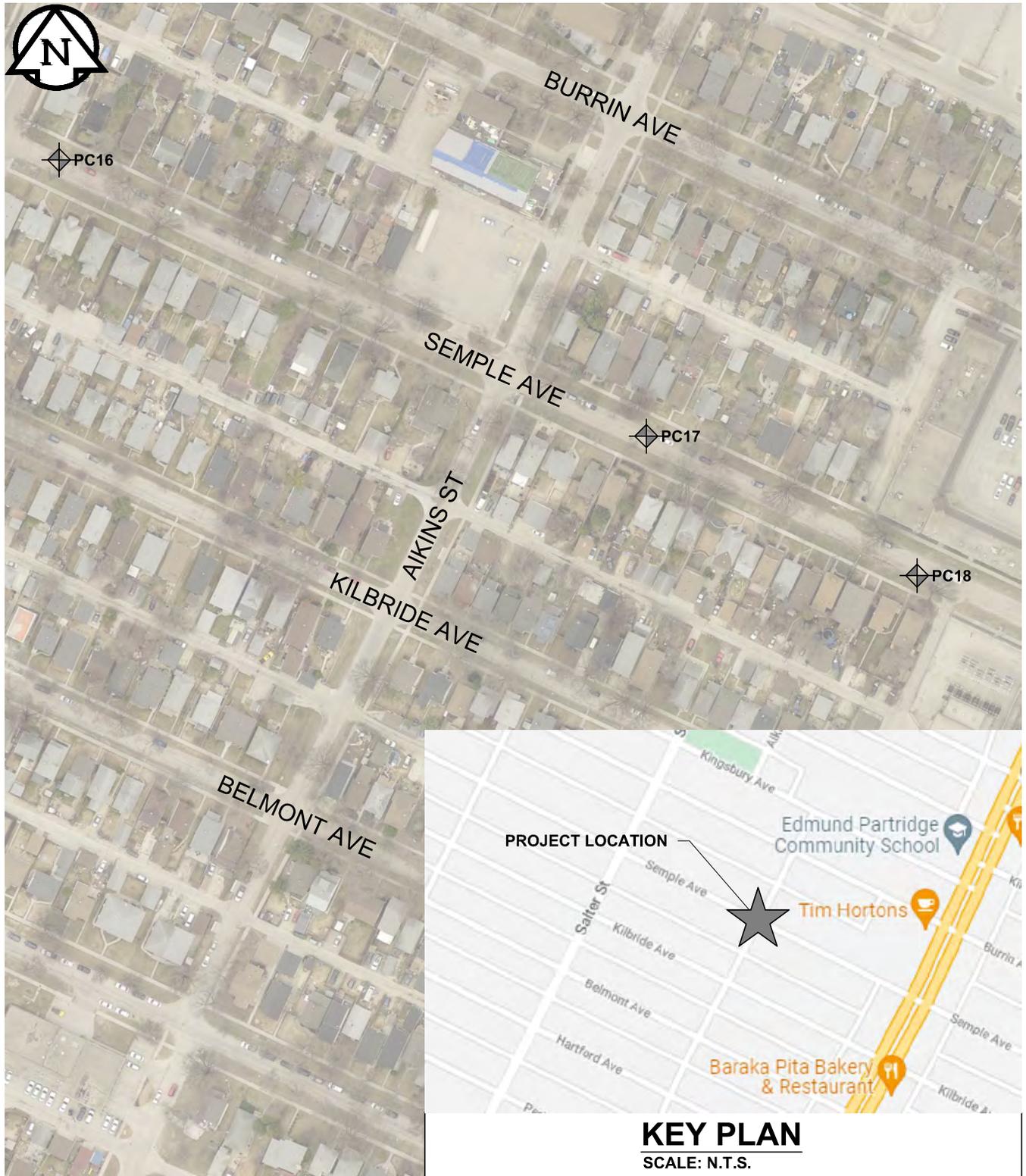


1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:25:51 PM

Figure 05
Pavement Core Location Plan

ANSI full bleed A (8.50 x 11.00 Inches)

1000-049-07 COW Geotech-Coring Fig 01 to 06 CT.dwg, 2022-01-04 4:24:31 PM

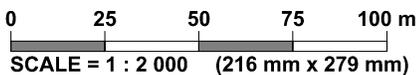


LEGEND:

PAVEMENT CORE (TREK, 2021)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2016).



KEY PLAN
SCALE: N.T.S.

Figure 06

Pavement Core Location Plan

Appendix A

Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – Church Ave.

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size			
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes #10 to #4 #40 to #10 #200 to #40 < #200			
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols			
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7				
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	mm 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075		
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols		
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
			Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)		Sils and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Particle Size ASTM Sieve Sizes mm > 300 75 to 300 19 to 75 4.75 to 19 3 in. to 12 in. 3/4 in. to 3 in. #4 to 3/4 in.
						CL	Inorganic clays of low to medium plasticity, gravelly clays, silty clays, lean clays		
OL	Organic silts and organic silty clays of low plasticity								
Sils and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts							
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity, organic silts							
Highly Organic Soils	Pt	Peat and other highly organic soils		Von Post Classification Limit	Strong colour or odour, and often fibrous texture	Material Boulders Cobbles Gravel Coarse Fine			

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH21-01

1 of 1

Client: City of Winnipeg Project Number: 1000-049-07
 Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B Location: UTM N-5532454, E-632709 (Church ave)
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0 - 0.05		ASPHALT - 90 mm thick															
0.05 - 0.15		CONCRETE - 130 mm thick		PC21-01													
0.15 - 0.95		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and firm to stiff when thawed - high plasticity - AASHTO: A-7-6 (I)		G01													
0.95 - 1.05		SILT - some clay, trace sand, trace organics - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-4 (5)		G03													
1.05 - 1.95		CLAY - silty - grey - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)		G04													
1.95 - 2.05				G05													
2.05 - 2.15				G06													
2.15 - 2.25				G07													
2.25 - 2.35				G08													
2.35 - 3.00																	

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located 22 m East of Church ave and Sinclair ave intersection, Eastbound lane, 2 m North of South curb.

Logged By: Asad Dustmamatov Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21_2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07 A_AD.GPJ TREK.GDT 1/5/22



Sub-Surface Log

Test Hole TH21-02

1 of 1

Client: City of Winnipeg Project Number: 1000-049-07
 Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B Location: UTM N-5532434, E-632765 (Church ave)
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 50 mm thick														
		CONCRETE - 170 mm thick		PC21-02												
0.5		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and firm to stiff when thawed - high plasticity - AASHTO: A-7-6 (36)		G09												
				G10												
1.0				G11												
		SILT - some clay, trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-4 (I)		G12												
				G13												
2.0		CLAY - silty, trace oxidation - grey - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)		G14												
				G15												
3.0				G16												

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located 3 m West of Church ave and Seymour st intersection, Westbound lane, 1.5 m South of North curb.

Logged By: Asad Dustmamatov Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21_2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07 A_AD.GPJ TREK.GDT 1/5/22



Sub-Surface Log

Test Hole TH21-03

1 of 1

Client: City of Winnipeg **Project Number:** 1000-049-07
Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B **Location:** UTM N-5532406, E-632816 (Church ave)
Contractor: Maple Leaf Drilling Ltd. **Ground Elevation:** Top of Pavement
Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount **Date Drilled:** December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 60 mm thick														
		CONCRETE - 130 mm thick		PC21-03												
0.5		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and firm to stiff when thawed - high plasticity - AASHTO: A-7-6 (I)		G17												
				G18												
1.0		SILT - some clay, trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-4 (I)		G19												
				G20												
				G21												
2.0		CLAY - silty - grey - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)		G22												
				G23												
3.0				G24												

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located 34 m West of Church ave and Arlington st intersection, Westbound lane, 1.5 m South of North curb.

Logged By: Asad Dustmamatov **Reviewed By:** Angela Fidler-Kliwer **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21, 2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07 A_AD.GPJ TREK.GDT 1/5/22



2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B
Sub-Surface Investigation
Church Avenue: between Sinclair Street and Arlington Street

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits				
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index		
TH20-01	UTM : 14U 5532454 N, 632709 E Located 22 m East of Church ave and Sinclair ave intersection, Eastbound lane, 2 m North of South curb.	Asphalt	90	Concrete	130	Clay; AASHTO: A-7-6 (I)	0.3	0.5	39									
						Clay; AASHTO: A-7-6 (I)	0.6	0.8	41									
						Silt; AASHTO: A-4 (5)	0.9	1.1	22	14	81	5	0	17	24	7		
						Silt; AASHTO: A-4 (5)	1.2	1.4	22									
						Silt; AASHTO: A-4 (5)	1.5	1.7	22									
						Clay; AASHTO: A-7-6 (I)	1.8	2.0	39									
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	43									
						Clay; AASHTO: A-7-6 (I)	2.7	2.9	49									
TH20-02	UTM : 14U 5532434 N, 632765 E Located 3 m West of Church ave and Seymour st intersection, Westbound lane, 1.5 m South of North curb.	Asphalt	50	Concrete	170	Clay; AASHTO: A-7-6 (36)	0.3	0.5	32									
						Clay; AASHTO: A-7-6 (36)	0.6	0.8	32									
						Clay; AASHTO: A-7-6 (36)	0.9	1.1	35	41	55	4	0	25	58	33		
						Silt; AASHTO: A-4 (I)	1.2	1.4	19									
						Silt; AASHTO: A-4 (I)	1.5	1.7	21									
						Clay; AASHTO: A-7-6 (I)	1.8	2.0	35									
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	42									
						Clay; AASHTO: A-7-6 (I)	2.7	2.9	51									
TH20-03	UTM : 14U 5532406 N, 632816 E Located 34 m West of Church ave and Arlington st intersection, Westbound lane, 1.5 m South of North curb.	Asphalt	60	Concrete	130	Clay; AASHTO: A-7-6 (I)	0.3	0.5	25									
						Clay; AASHTO: A-7-6 (I)	0.6	0.8	38									
						Silt; AASHTO: A-4 (I)	0.9	1.1	17									
						Silt; AASHTO: A-4 (I)	1.2	1.4	22									
						Silt; AASHTO: A-4 (I)	1.5	1.7	24									
						Clay; AASHTO: A-7-6 (I)	1.8	2.0	40									
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	45									
						Clay; AASHTO: A-7-6 (I)	2.7	2.9	50									

(I) - AASHTO classification was interpreted based on visual classification.



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Moisture Content Report ASTM D2216-10

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

Sample Date 20-Dec-21
Test Date 22-Dec-21
Technician AD

Test Hole	TH21-01	TH21-01	TH21-01	TH21-01	TH21-01	TH21-01
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	1.8 - 2.0
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	P31	Z40	N21	K33	E25	E121
Mass of tare	8.4	8.4	8.9	8.6	8.8	8.4
Mass wet + tare	244.8	241.8	443.0	226.0	221.7	247.9
Mass dry + tare	179.1	174.4	364.6	186.6	183.0	181.3
Mass water	65.7	67.4	78.4	39.4	38.7	66.6
Mass dry soil	170.7	166.0	355.7	178.0	174.2	172.9
Moisture %	38.5%	40.6%	22.0%	22.1%	22.2%	38.5%

Test Hole	TH21-01	TH21-01	TH21-02	TH21-02	TH21-02	TH21-02
Depth (m)	2.1 - 2.3	2.7 - 2.9	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	F124	N111	D11	F57	AB68	F142
Mass of tare	8.4	8.7	8.9	8.7	6.8	8.9
Mass wet + tare	227.2	237.6	229.6	231.0	446.3	224.6
Mass dry + tare	161.7	162.0	176.7	177.4	332.9	189.8
Mass water	65.5	75.6	52.9	53.6	113.4	34.8
Mass dry soil	153.3	153.3	167.8	168.7	326.1	180.9
Moisture %	42.7%	49.3%	31.5%	31.8%	34.8%	19.2%

Test Hole	TH21-02	TH21-02	TH21-02	TH21-02	TH21-03	TH21-03
Depth (m)	1.5 - 1.7	1.8 - 2.0	2.1 - 2.3	2.7 - 2.9	0.3 - 0.5	0.6 - 0.8
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	F44	N61	N16	AH18	F5	C3
Mass of tare	8.4	8.7	8.7	8.6	8.6	8.6
Mass wet + tare	246.2	252.7	260.1	192.4	290.8	176.0
Mass dry + tare	204.5	189.6	185.4	130.6	235.2	130.2
Mass water	41.7	63.1	74.7	61.8	55.6	45.8
Mass dry soil	196.1	180.9	176.7	122.0	226.6	121.6
Moisture %	21.3%	34.9%	42.3%	50.7%	24.5%	37.7%



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Moisture Content Report ASTM D2216-10

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

Sample Date 20-Dec-21
Test Date 22-Dec-21
Technician AD

Test Hole	TH21-03	TH21-03	TH21-03	TH21-03	TH21-03	TH21-03
Depth (m)	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	1.8 - 2.0	2.1 - 2.3	2.7 - 2.9
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	N48	W55	D43	P25	E117	C12
Mass of tare	8.4	8.5	8.5	8.6	8.4	8.6
Mass wet + tare	248.0	339.8	303.1	223.9	227.3	230.5
Mass dry + tare	213.5	280.4	245.9	162.4	159.6	156.9
Mass water	34.5	59.4	57.2	61.5	67.7	73.6
Mass dry soil	205.1	271.9	237.4	153.8	151.2	148.3
Moisture %	16.8%	21.8%	24.1%	40.0%	44.8%	49.6%



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

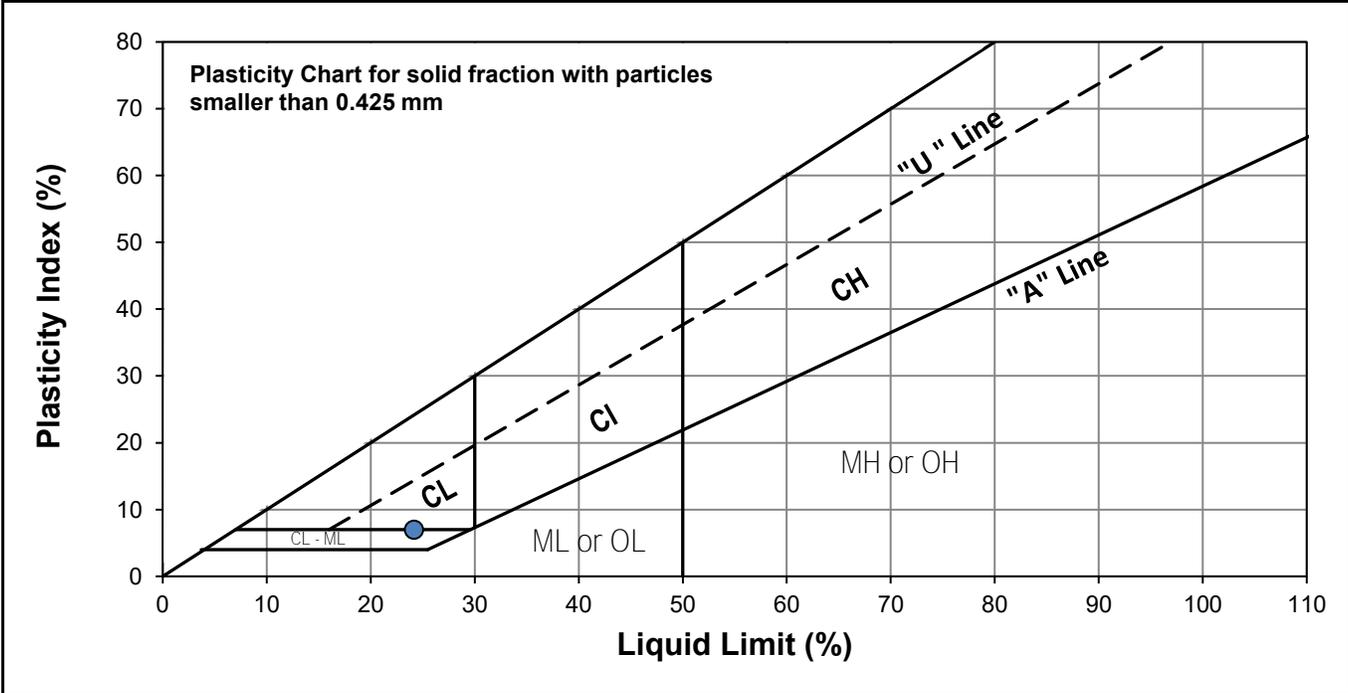
Test Hole TH21-01
Sample # G03
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 24-Dec-21
Technician HS



Liquid Limit	24
Plastic Limit	17
Plasticity Index	7

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	24	31
Mass Tare (g)	14.105	14.070	13.942
Mass Wet Soil + Tare (g)	27.786	29.767	27.888
Mass Dry Soil + Tare (g)	25.025	26.692	25.244
Mass Water (g)	2.761	3.075	2.644
Mass Dry Soil (g)	10.920	12.622	11.302
Moisture Content (%)	25.284	24.362	23.394



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.292	14.101			
Mass Wet Soil + Tare (g)	25.333	28.224			
Mass Dry Soil + Tare (g)	23.721	26.141			
Mass Water (g)	1.612	2.083			
Mass Dry Soil (g)	9.429	12.040			
Moisture Content (%)	17.096	17.301			



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-049-07
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Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

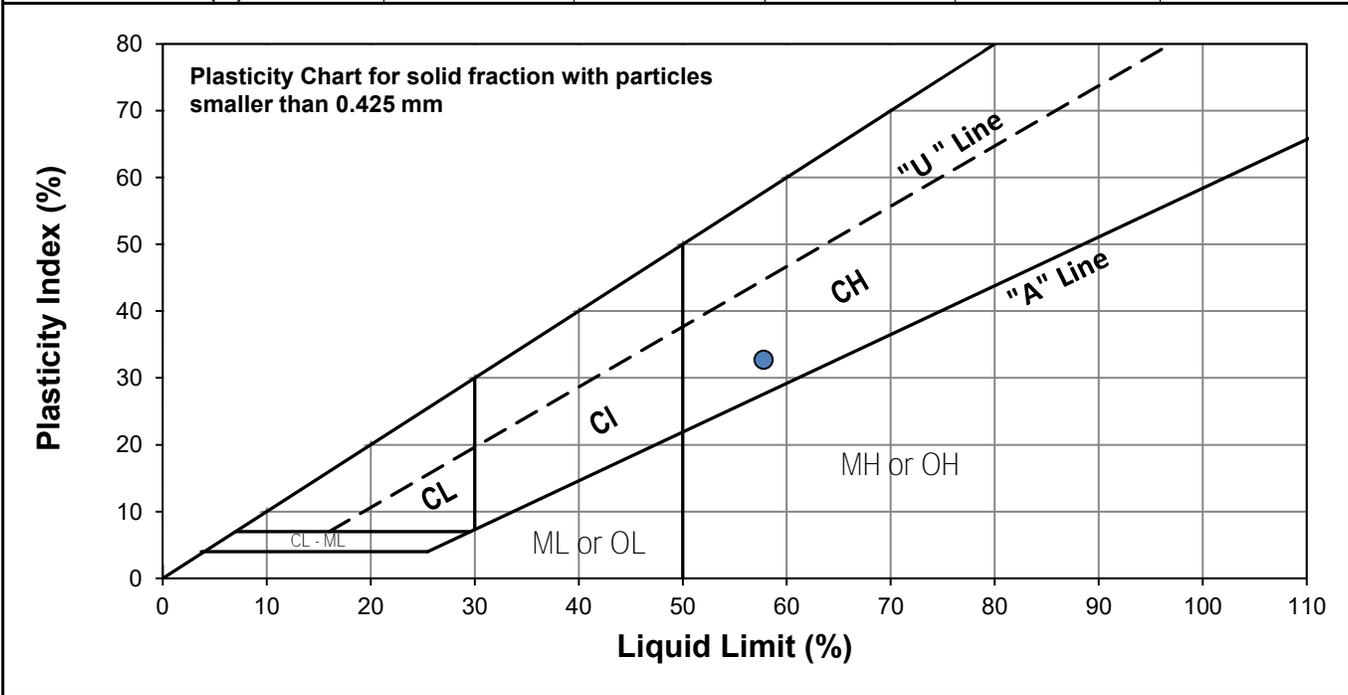
Test Hole TH21-02
Sample # G11
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 24-Dec-21
Technician HS



Liquid Limit	58
Plastic Limit	25
Plasticity Index	33

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	22	34
Mass Tare (g)	14.309	14.001	14.206
Mass Wet Soil + Tare (g)	24.809	25.010	26.975
Mass Dry Soil + Tare (g)	20.901	20.953	22.373
Mass Water (g)	3.908	4.057	4.602
Mass Dry Soil (g)	6.592	6.952	8.167
Moisture Content (%)	59.284	58.357	56.349



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.060	13.824			
Mass Wet Soil + Tare (g)	22.147	23.596			
Mass Dry Soil + Tare (g)	20.522	21.641			
Mass Water (g)	1.625	1.955			
Mass Dry Soil (g)	6.462	7.817			
Moisture Content (%)	25.147	25.010			



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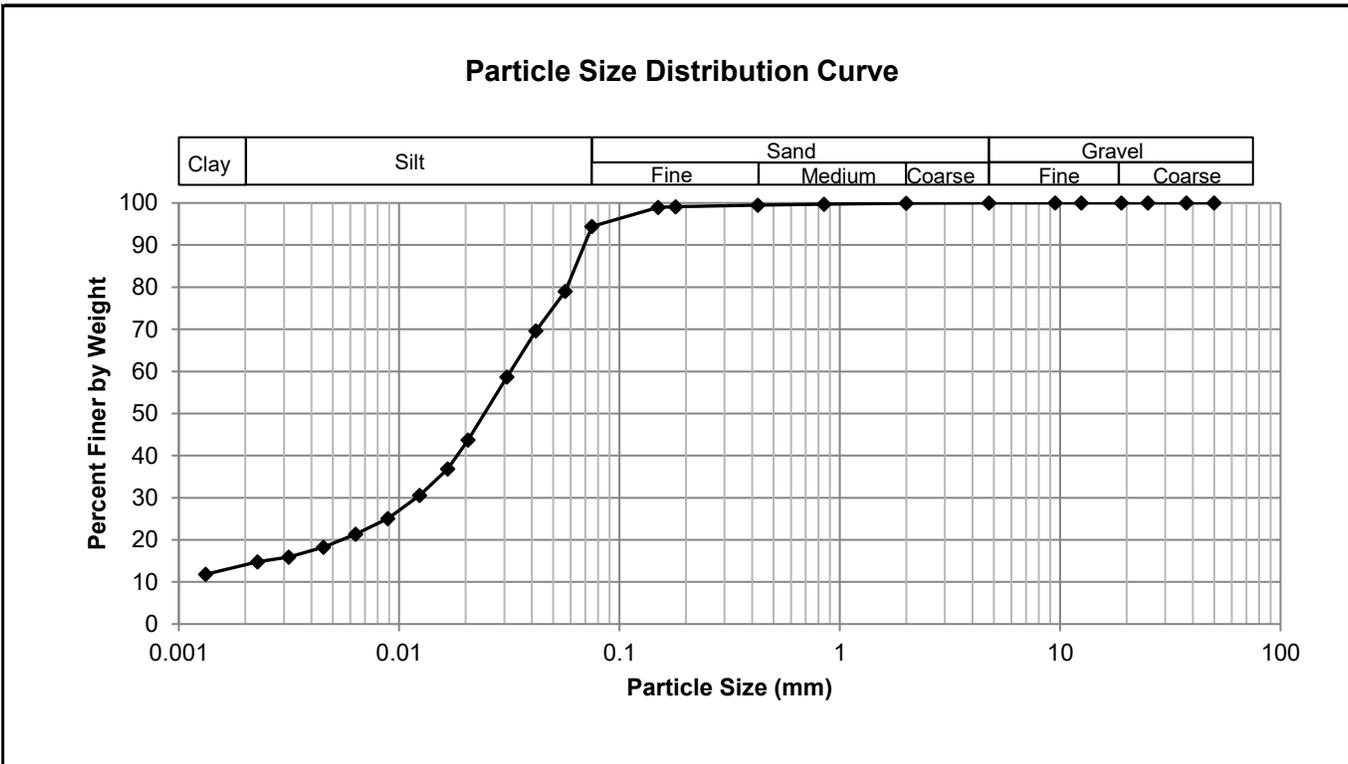
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B



Test Hole TH21-01
Sample # G03
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 24-Dec-21
Technician HS

Gravel	0.0%
Sand	5.5%
Silt	80.5%
Clay	13.9%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	94.45
37.5	100.00	2.00	99.95	0.0568	79.01
25.0	100.00	0.850	99.74	0.0418	69.64
19.0	100.00	0.425	99.47	0.0308	58.70
12.5	100.00	0.180	99.10	0.0206	43.70
9.50	100.00	0.150	98.95	0.0166	36.83
4.75	100.00	0.075	94.45	0.0124	30.58
				0.0089	25.03
				0.0064	21.35
				0.0045	18.23
				0.0032	15.88
				0.0023	14.78
				0.0013	11.80



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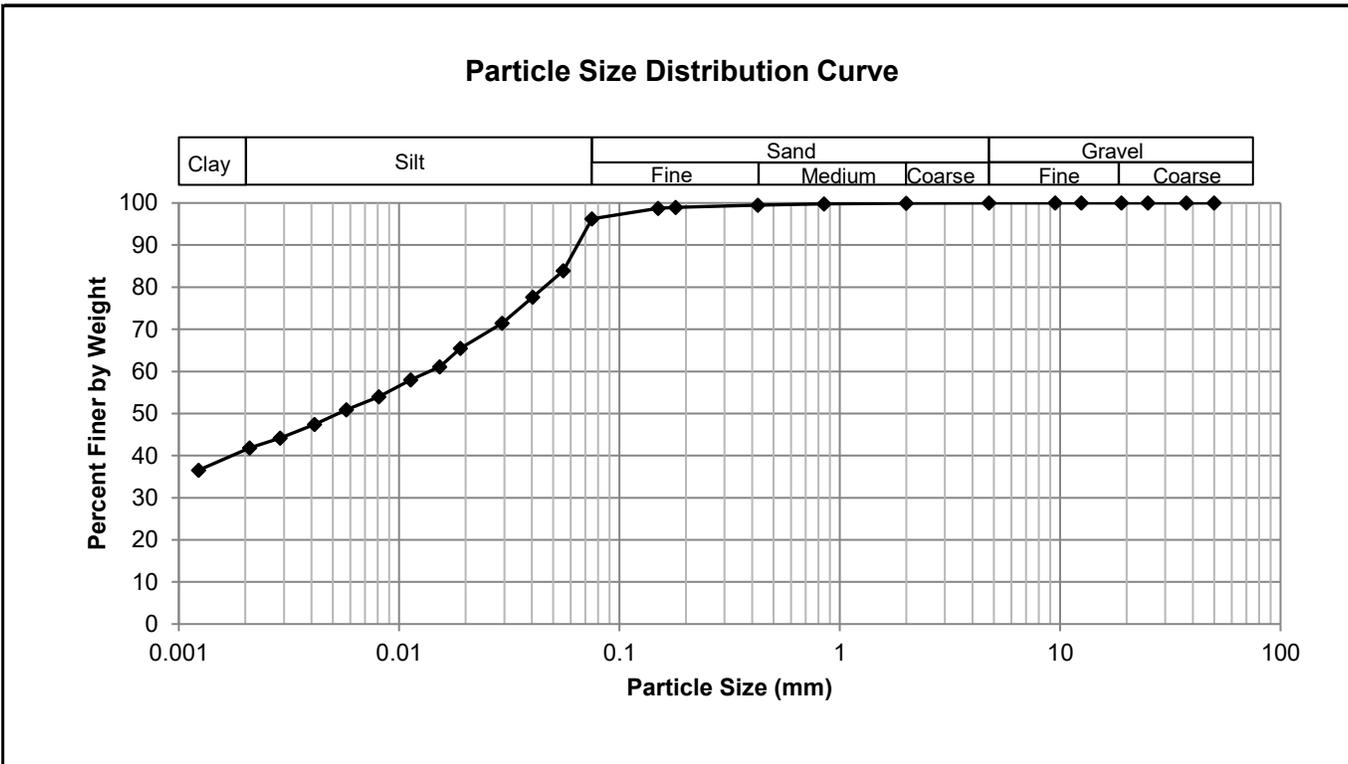
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B



Test Hole TH21-02
Sample # G11
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 24-Dec-21
Technician HS

Gravel	0.0%
Sand	3.7%
Silt	55.1%
Clay	41.2%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	96.26
37.5	100.00	2.00	99.91	0.0555	83.92
25.0	100.00	0.850	99.75	0.0404	77.67
19.0	100.00	0.425	99.48	0.0293	71.42
12.5	100.00	0.180	98.97	0.0190	65.49
9.50	100.00	0.150	98.70	0.0153	61.12
4.75	100.00	0.075	96.26	0.0113	57.99
				0.0081	53.99
				0.0058	50.93
				0.0041	47.43
				0.0029	44.18
				0.0021	41.79
				0.0012	36.54



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Standard Proctor Compaction Test
ASTM D698-12e2

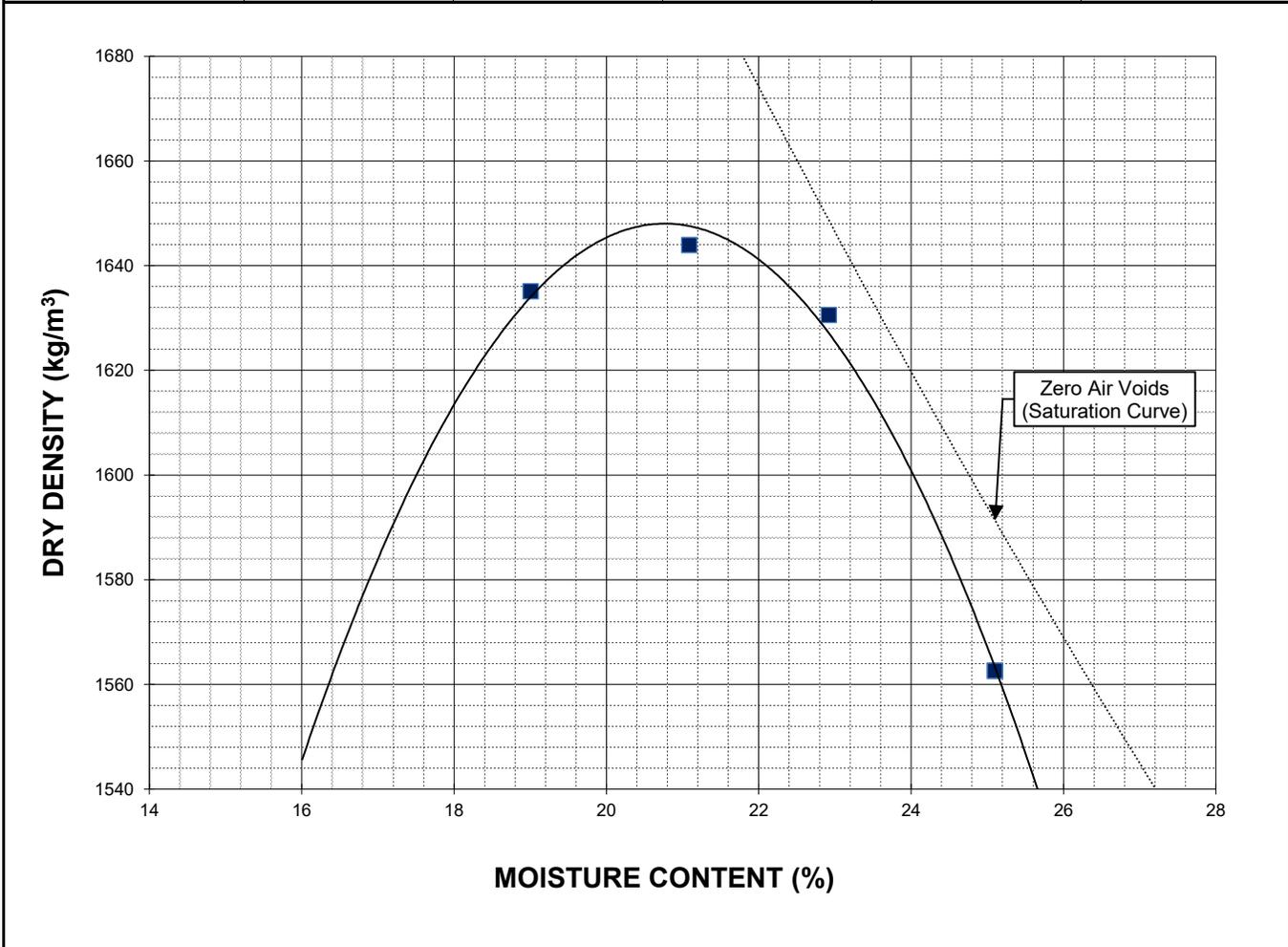
Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 1



Location Church Ave
Source TH21-01, TH21-02 and TH21-03 combined
Material Clay
Sample Date 20-Dec-21
Test Date 24-Dec-21
Technician HS

Maximum Dry Density (kg/m³)	1648
Optimum Moisture (%)	20.8

Trial Number	1	2	3	4
Wet Density (kg/m³)	1946	1991	2004	1955
Dry Density (kg/m³)	1635	1644	1631	1563
Moisture Content (%)	19.0	21.1	22.9	25.1





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California Bearing Ratio Test Data Sheet
ASTM D1883-16

Project No.	1000-049	Source	Church Ave
Client	City of Winnipeg	Material	Clay
Project	2022 COW Geotech/Coring Program	Sample Date	2021-12-12
Sample #	TH21-01,02,03 combined	Test Date	2021-12-27
		Technician	DJ

Proctor Results (ASTM D698)

Maximum Dry Density	1648 kg/m ³
Optimum Moisture Content	20.8 %
Material Retained on 19 mm Sieve	0.0 %

CBR Sample Compaction

Dry Density	1569 kg/m ³
Initial Moisture Content	24.4 %
Relative Density	95.2 % SPMD

Soaking Results

Surcharge	4.54 kg
Swell	0.1 %
Moisture Content in top 25 mm	26.3 %
Immersion Period	96 h

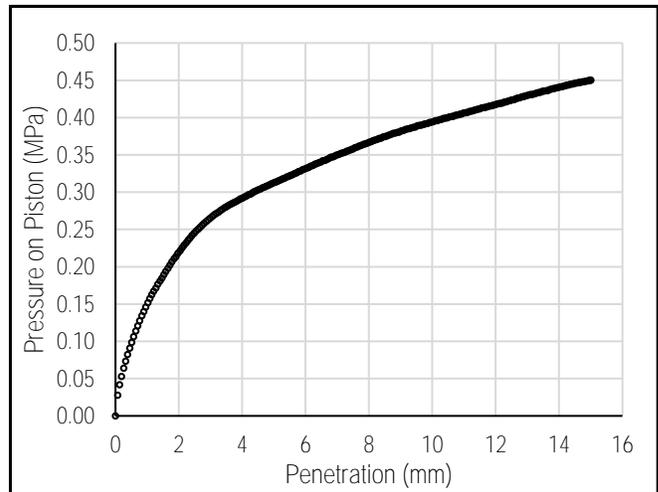
CBR Results

CBR at 2.54 mm	3.6 %
CBR at 5.08 mm	3.1 %
Zero Correction	0 mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.11	0.11
1.27	0.17	0.17
1.91	0.21	0.21
2.54	0.25	0.25
3.18	0.27	0.27
3.81	0.29	0.29
4.45	0.30	0.30
5.08	0.31	0.31
7.62	0.36	0.36
10.16	0.40	0.40
12.70	0.43	0.43

Load/Penetration Curve



Comments:



Photo 1: Pavement Core Sample at Test Hole TH21-01



Photo 2: Pavement Core Sample at Test Hole TH21-02



Photo 3: Pavement Core Sample at Test Hole TH21-03

Appendix B

Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – Lansdowne Ave.

GENERAL NOTES

- Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
- Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
- When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions	USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria		Particle Size			
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP More than 12 percent..... GM, GC, SM, SC 6 to 12 percent..... Borderline cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes #10 to #4 #40 to #10 #200 to #40 < #200			
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW				
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols			
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7				
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	mm 2.00 to 4.75 0.425 to 2.00 0.075 to 0.425 < 0.075		
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW			
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols		
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7			
			Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)		Sils and Clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity		Material Sand Coarse Medium Fine Silt or Clay
						CL	Inorganic clays of low to medium plasticity, gravelly clays, silty clays, lean clays		
OL	Organic silts and organic silty clays of low plasticity								
Sils and Clays (Liquid limit greater than 50)	MH	Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts							
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity, organic silts							
	Pt	Peat and other highly organic soils		Von Post Classification Limit	Strong colour or odour, and often fibrous texture				

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



Sub-Surface Log

Test Hole TH21-04

1 of 1

Client: City of Winnipeg Project Number: 1000-049-07
 Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B Location: UTM N-5532523, E-634289 (Lansdowne ave)
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0 - 0.05		ASPHALT - 70 mm thick															
0.05 - 0.1		CONCRETE - 150 mm thick		PC21-04													
0.1 - 0.9		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and firm to stiff when thawed - high plasticity - AASHTO: A-7-6 (I)	<input checked="" type="checkbox"/>	G25													
0.9 - 1.0	<input checked="" type="checkbox"/>	SILT - some clay, trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-4 (17)	<input checked="" type="checkbox"/>	G27													
1.0 - 1.9	<input checked="" type="checkbox"/>	CLAY - silty - brown - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)	<input checked="" type="checkbox"/>	G28													
1.9 - 2.0	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	G29													
2.0 - 2.1	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	G30													
2.1 - 2.2	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	G31													
2.2 - 2.3	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	G32													

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in front of #325 Lansdowne ave, Westbound lane, 1 m South of North curb.

Logged By: Asad Dustmamatov Reviewed By: Angela Fidler-Kliwer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21, 2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07 A_AD.GPJ TREK.GDT 1/5/22



Sub-Surface Log

Test Hole TH21-05

1 of 1

Client: City of Winnipeg Project Number: 1000-049-07
 Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B Location: UTM N-5532471, E-634398 (Lansdowne ave)
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)					Undrained Shear Strength (kPa)						
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL ----- MC ----- LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 100 mm thick														
		CONCRETE - 160 mm thick		PC21-05												
0.5		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and firm to stiff when thawed - high plasticity - AASHTO: A-7-6 (I)		G33			●						△	+		
				G34			●						+			
1.0				G35			●						△	+		
1.5		- grey, no organics below 1.2 m		G36			●						△	+		
				G37			●						△	+		

END OF TEST HOLE AT 1.7 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 1.7 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in front of #286 Lansdowne ave, Eastbound lane, 1.5 m North of South curb.

Logged By: Asad Dustmamatov Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21_2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07_A_AD.GPJ_TREK.GDT_1/5/22



Sub-Surface Log

Test Hole TH21-06

1 of 1

Client: City of Winnipeg Project Number: 1000-049-07
 Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B Location: UTM N-5532439, E-634469 (Lansdowne ave)
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 40 mm thick														
		CONCRETE - 180 mm thick		PC21-06												
0.5		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and stiff when thawed - high plasticity - AASHTO: A-7-6 (I)		G41			●									△+
				G42			●									△+
1.0		SILT - some clay, trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-4 (I)		G43			●									
				G44			●									
1.5		CLAY - silty - brown - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)		G45			●									△+
				G46			●									△+
2.0				G47			●									△+
				G48			●									△+

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in front of #261 Lansdowne ave, Westbound lane, 1.5 m South of North curb.

Logged By: Asad Dustmamatov Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21_2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07 A_AD.GPJ TREK.GDT 1/5/22



Sub-Surface Log

Test Hole TH21-07

1 of 1

Client: City of Winnipeg Project Number: 1000-049-07
 Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B Location: UTM N-5532416, E-634515 (Lansdowne ave)
 Contractor: Maple Leaf Drilling Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		ASPHALT - 160 mm thick														
0.1 - 0.2		CONCRETE - 140 mm thick		PC21-07												
0.2 - 0.9		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and firm to very stiff when thawed - high plasticity - AASHTO: A-7-6 (38)		G49												
0.9 - 1.5		- grey, no organics below 0.9 m		G50												
1.5 - 2.0		- brown below 1.5 m		G51												
2.0 - 2.5				G52												
2.5 - 2.7		SILT - some clay, trace sand - light brown - moist, soft, low to intermediate plasticity - AASHTO: A-4 (I)		G53												
2.7 - 3.0		CLAY - silty - light brown - moist, stiff - high plasticity - AASHTO A-7-6 (I)		G54												
3.0				G55												
3.0				G56												

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in front of #248 Lansdowne ave, Eastbound lane, 1.5 m North of South curb.

Logged By: Asad Dustmamatov Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21, 2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07 A_AD.GPJ TREK.GDT 1/5/22



Sub-Surface Log

Test Hole TH21-08

1 of 1

Client: City of Winnipeg Project Number: 1000-049-07
 Project Name: 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B Location: UTM N-5532368, E-634624 (Lansdowne ave)
 Contractor: Maple Leaf Drilling Ground Elevation: Top of Pavement
 Method: 125mm Solid Stem Auger, B40 Mobile Truck Mount Date Drilled: December 20, 2021

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C)

Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 50 mm thick														
		CONCRETE - 150 mm thick		PC21-08												
0.5		CLAY - silty, trace sand, trace organics - black - frozen to 0.9 m depth, moist and firm to stiff when thawed - high plasticity - AASHTO A-7-6 (I)		G57												
				G58												
1.0				G59												
1.5		SILT - some clay, trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO A-4 (I)		G60												
				G61												
2.0		CLAY - silty - light brown - moist, firm to stiff - high plasticity - AASHTO A-7-6 (I)		G62												
				G63												
3.0				G64												

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located 41 m West of Lansdowne ave and Main ave intersection, Westbound lane, 1.5 m South of North curb.

Logged By: Asad Dustmamatov Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2021-12-21_2022 COW GEOTECHNICAL PROGRAM 1_1000-049-07 A_AD.GPJ TREK.GDT 1/5/22



2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B
Sub-Surface Investigation
Lansdowne Avenue: between Salter Street and Main Street

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits			
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index	
TH20-04	UTM : 14U 5532523 N, 634289 E Located in front of #325 Lansdowne ave, Westbound lane, 1 m South of North curb.	Asphalt	70	Concrete	150	Clay; AASHTO: A-7-6 (I)	0.3	0.5	36								
						Clay; AASHTO: A-7-6 (I)	0.6	0.8	33								
						Silt; AASHTO: A-4 (I)	0.9	1.1	23	17	81	2	0	19	29	10	
						Silt; AASHTO: A-4 (I)	1.2	1.4	24								
						Silt; AASHTO: A-4 (I)	1.5	1.7	23								
						Clay; AASHTO: A-7-6 (I)	1.8	2.0	30								
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	44								
				Clay; AASHTO: A-7-6 (I)	2.7	2.9	48										
TH20-05	UTM : 14U 5532471 N, 634398 E Located in front of #286 Lansdowne ave, Eastbound lane, 1.5 m North of South curb.	Asphalt	100	Concrete	160	Clay; AASHTO: A-7-6 (I)	0.3	0.5	40								
						Clay; AASHTO: A-7-6 (I)	0.6	0.8	33								
						Clay; AASHTO: A-7-6 (I)	0.9	1.1	29								
						Clay; AASHTO: A-7-6 (I)	1.2	1.4	31								
						Clay; AASHTO: A-7-6 (I)	1.5	1.7	32								
TH20-06	UTM : 14U 5532439 N, 634469 E Located in front of #261 Lansdowne ave, Westbound lane, 1.5 m South of North curb.	Asphalt	40	Concrete	180	Clay; AASHTO: A-7-6 (I)	0.3	0.5	35								
						Clay; AASHTO: A-7-6 (I)	0.6	0.8	35								
						Silt; AASHTO: A-4 (I)	0.9	1.1	19								
						Silt; AASHTO: A-4 (I)	1.2	1.4	20								
						Clay; AASHTO: A-7-6 (I)	1.5	1.7	42								
						Clay; AASHTO: A-7-6 (I)	1.8	2.0	44								
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	41								
				Clay; AASHTO: A-7-6 (I)	2.7	2.9	52										

(I) - AASHTO classification was interpreted based on visual classification.



2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B
Sub-Surface Investigation
Lansdowne Avenue: between Salter Street and Main Street

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH21-07	UTM : 14U 5532416 N, 634515 E Located in front of #248 Lansdowne ave, Eastbound lane, 1.5 m North of South curb.	Asphalt	160	Concrete	140	Clay; AASHTO: A-7-6 (38)	0.3	0.5	32							
						Clay; AASHTO: A-7-6 (38)	0.6	0.8	27							
						Clay; AASHTO: A-7-6 (38)	0.9	1.1	26	67	30	3	0	28	76	48
						Clay; AASHTO: A-7-6 (38)	1.2	1.4	29							
						Clay; AASHTO: A-7-6 (38)	1.5	1.7	38							
						Clay; AASHTO: A-7-6 (38)	1.8	2.0	42							
						Silt; AASHTO: A-4 (I)	2.1	2.3	23							
						Clay; AASHTO: A-7-6 (I)	2.7	2.9	45							
TH21-08	UTM : 14U 5532368 N, 634624 E Located 41 m West of Lansdowne ave and Main ave intersection, Westbound lane, 1.5 m South of North curb.	Asphalt	50	Concrete	150	Clay; AASHTO: A-7-6 (I)	0.3	0.5	38							
						Clay; AASHTO: A-7-6 (I)	0.6	0.8	34							
						Clay; AASHTO: A-7-6 (I)	0.9	1.1	30							
						Silt; AASHTO: A-4 (I)	1.2	1.4	25							
						Silt; AASHTO: A-4 (I)	1.5	1.7	25							
						Clay; AASHTO: A-7-6 (I)	1.8	2.0	42							
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	43							
						Clay; AASHTO: A-7-6 (I)	2.7	2.9	52							

(I) - AASHTO classification was interpreted based on visual classification.



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Moisture Content Report ASTM D2216-10

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

Sample Date 20-Dec-21
Test Date 22-Dec-21
Technician AD

Test Hole	TH21-04	TH21-04	TH21-04	TH21-04	TH21-04	TH21-04
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	1.8 - 2.0
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	AW18	H41	K26	AB33	C7	A19
Mass of tare	8.5	8.4	8.7	8.7	8.5	8.5
Mass wet + tare	190.3	264.7	433.2	216.1	240.8	206.0
Mass dry + tare	142.0	201.3	353.6	176.6	198.0	160.2
Mass water	48.3	63.4	79.6	39.5	42.8	45.8
Mass dry soil	133.5	192.9	344.9	167.9	189.5	151.7
Moisture %	36.2%	32.9%	23.1%	23.5%	22.6%	30.2%

Test Hole	TH21-04	TH21-04	TH21-05	TH21-05	TH21-05	TH21-05
Depth (m)	2.1 - 2.3	2.7 - 2.9	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	W70	F115	Z93	Z47	N35	W35
Mass of tare	8.5	8.6	8.5	8.6	8.5	8.3
Mass wet + tare	235.6	198.1	258.2	244.5	169.1	208.0
Mass dry + tare	166.7	137.1	186.9	186.7	133.1	160.8
Mass water	68.9	61.0	71.3	57.8	36.0	47.2
Mass dry soil	158.2	128.5	178.4	178.1	124.6	152.5
Moisture %	43.6%	47.5%	40.0%	32.5%	28.9%	31.0%

Test Hole	TH21-05	TH21-06	TH21-06	TH21-06	TH21-06	TH21-06
Depth (m)	1.5 - 1.7	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7
Sample #	G37	G41	G42	G43	G44	G45
Tare ID	Z13	E22	Z114	W10	H17	D45
Mass of tare	8.7	8.9	8.3	8.5	8.4	8.5
Mass wet + tare	184.6	190.7	226.1	274.2	247.0	237.7
Mass dry + tare	142.0	144.1	170.0	231.5	206.9	170.5
Mass water	42.6	46.6	56.1	42.7	40.1	67.2
Mass dry soil	133.3	135.2	161.7	223.0	198.5	162.0
Moisture %	32.0%	34.5%	34.7%	19.1%	20.2%	41.5%



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Moisture Content Report ASTM D2216-10

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

Sample Date 20-Dec-21
Test Date 22-Dec-21
Technician AD

Test Hole	TH21-06	TH21-06	TH21-06	TH21-07	TH21-07	TH21-07
Depth (m)	1.8 - 2.0	2.1 - 2.3	2.7 - 2.9	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1
Sample #	G46	G47	G48	G49	G50	G51
Tare ID	D50	H16	N113	P34	AB65	A3
Mass of tare	8.5	8.6	8.6	8.5	6.8	8.5
Mass wet + tare	206.9	258.7	186.9	234.7	237.2	410.0
Mass dry + tare	146.1	185.9	126.3	179.6	188.2	327.4
Mass water	60.8	72.8	60.6	55.1	49.0	82.6
Mass dry soil	137.6	177.3	117.7	171.1	181.4	318.9
Moisture %	44.2%	41.1%	51.5%	32.2%	27.0%	25.9%

Test Hole	TH21-07	TH21-07	TH21-07	TH21-07	TH21-07	TH21-08
Depth (m)	1.2 - 1.4	1.5 - 1.7	1.8 - 2.0	2.1 - 2.3	2.7 - 2.9	0.3 - 0.5
Sample #	G52	G53	G54	G55	G56	G57
Tare ID	D19	W26	F16	Z22	Z36	AC35
Mass of tare	8.6	8.3	8.4	8.5	8.4	6.9
Mass wet + tare	246.8	261.4	181.3	261.9	201.3	158.1
Mass dry + tare	193.9	192.0	130.2	214.4	141.6	116.9
Mass water	52.9	69.4	51.1	47.5	59.7	41.2
Mass dry soil	185.3	183.7	121.8	205.9	133.2	110.0
Moisture %	28.5%	37.8%	42.0%	23.1%	44.8%	37.5%

Test Hole	TH21-08	TH21-08	TH21-08	TH21-08	TH21-08	TH21-08
Depth (m)	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	1.8 - 2.0	2.1 - 2.3
Sample #	G58	G59	G60	G61	G62	G63
Tare ID	W15	W74	AB84	Z85	F100	E87
Mass of tare	8.6	8.4	6.7	8.4	8.5	8.6
Mass wet + tare	198.7	276.0	191.4	174.6	236.3	231.4
Mass dry + tare	150.2	215.0	154.3	141.4	169.5	164.9
Mass water	48.5	61.0	37.1	33.2	66.8	66.5
Mass dry soil	141.6	206.6	147.6	133.0	161.0	156.3
Moisture %	34.3%	29.5%	25.1%	25.0%	41.5%	42.5%



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Moisture Content Report ASTM D2216-10

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

Sample Date 20-Dec-21
Test Date 22-Dec-21
Technician AD

Test Hole	TH21-08					
Depth (m)	2.7 - 2.9					
Sample #	G64					
Tare ID	F104					
Mass of tare	8.6					
Mass wet + tare	188.7					
Mass dry + tare	127.4					
Mass water	61.3					
Mass dry soil	118.8					
Moisture %	51.6%					



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Atterberg Limits
ASTM D4318-10e1

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

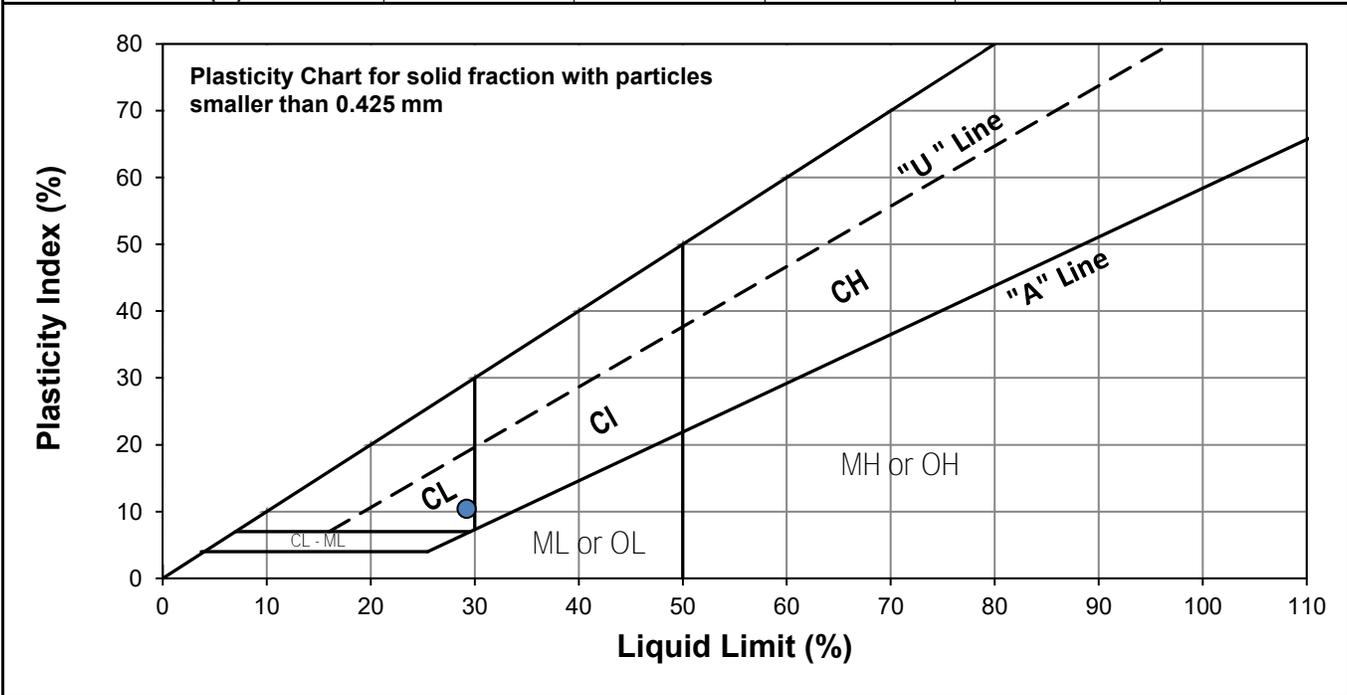
Test Hole TH21-04
Sample # G27
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 24-Dec-21
Technician HS



Liquid Limit	29
Plastic Limit	19
Plasticity Index	10

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	19	23	34
Mass Tare (g)	13.987	14.137	14.146
Mass Wet Soil + Tare (g)	26.704	31.061	30.098
Mass Dry Soil + Tare (g)	23.780	27.197	26.571
Mass Water (g)	2.924	3.864	3.527
Mass Dry Soil (g)	9.793	13.060	12.425
Moisture Content (%)	29.858	29.587	28.386



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.245	14.050			
Mass Wet Soil + Tare (g)	22.189	23.953			
Mass Dry Soil + Tare (g)	20.932	22.385			
Mass Water (g)	1.257	1.568			
Mass Dry Soil (g)	6.687	8.335			
Moisture Content (%)	18.798	18.812			



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Atterberg Limits
ASTM D4318-10e1

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Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

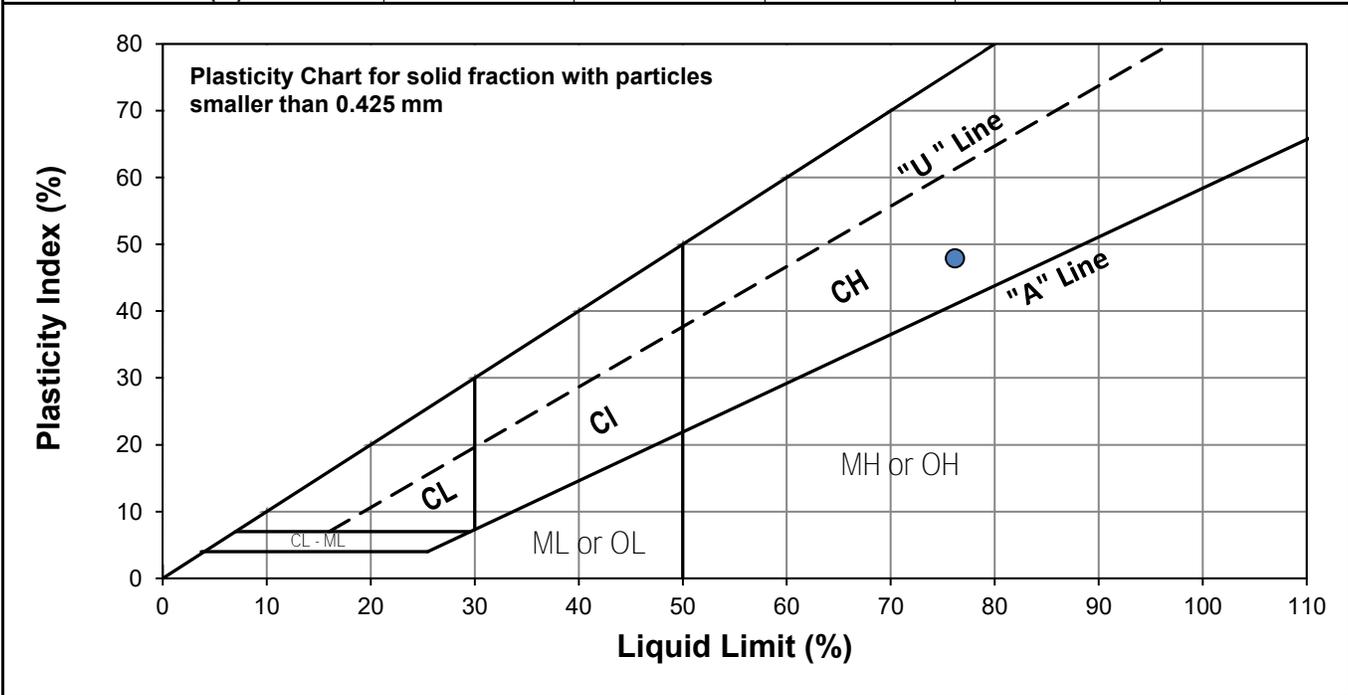
Test Hole TH21-07
Sample # G51
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 26-Dec-21
Technician HS



Liquid Limit 76
Plastic Limit 28
Plasticity Index 48

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	17	23	32
Mass Tare (g)	14.235	13.817	14.025
Mass Wet Soil + Tare (g)	31.372	27.411	30.012
Mass Dry Soil + Tare (g)	23.841	21.520	23.168
Mass Water (g)	7.531	5.891	6.844
Mass Dry Soil (g)	9.606	7.703	9.143
Moisture Content (%)	78.399	76.477	74.855



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.117	14.168			
Mass Wet Soil + Tare (g)	20.864	20.461			
Mass Dry Soil + Tare (g)	19.397	19.055			
Mass Water (g)	1.467	1.406			
Mass Dry Soil (g)	5.280	4.887			
Moisture Content (%)	27.784	28.770			



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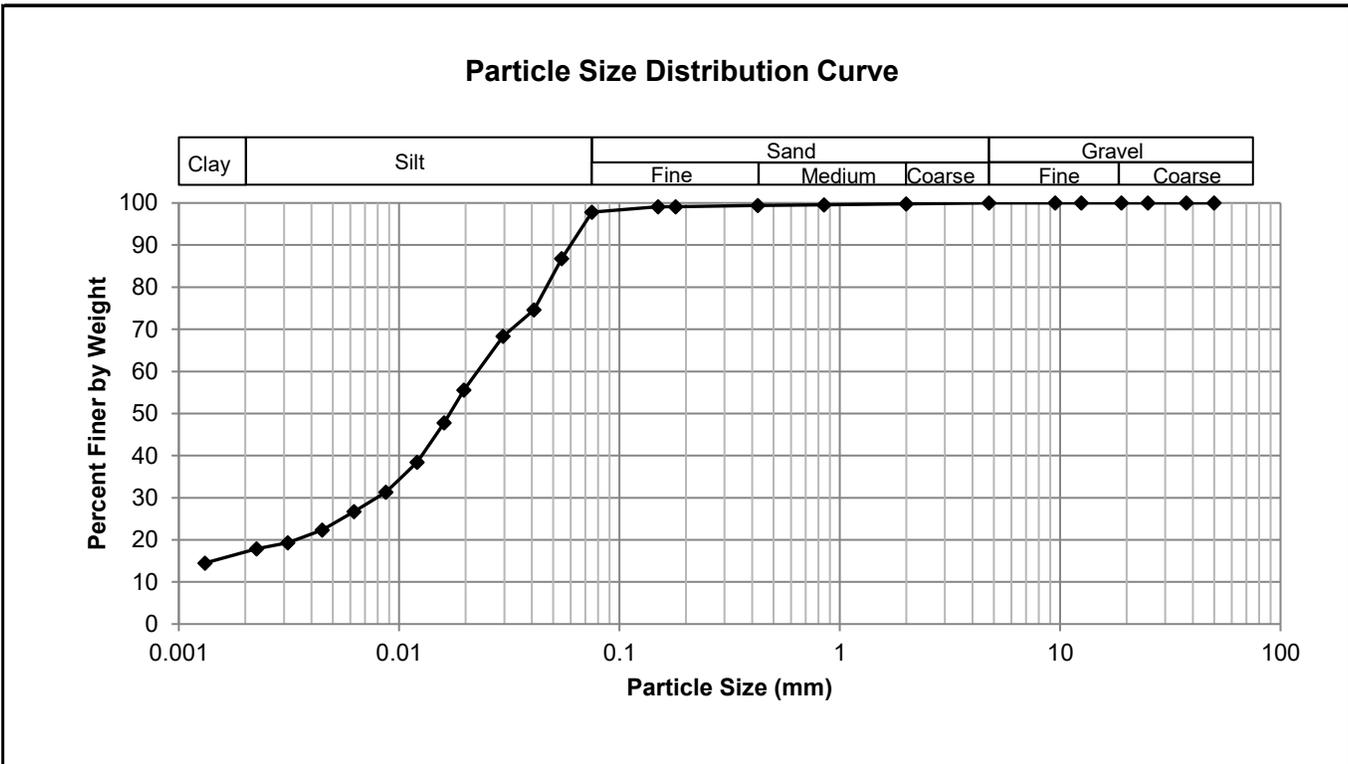
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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Test Hole TH21-04
Sample # G27
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 24-Dec-21
Technician HS

Gravel	0.0%
Sand	2.2%
Silt	80.9%
Clay	17.0%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	97.84
37.5	100.00	2.00	99.79	0.0548	86.79
25.0	100.00	0.850	99.52	0.0409	74.62
19.0	100.00	0.425	99.38	0.0297	68.38
12.5	100.00	0.180	99.11	0.0197	55.59
9.50	100.00	0.150	99.11	0.0160	47.79
4.75	100.00	0.075	97.84	0.0121	38.44
				0.0087	31.32
				0.0063	26.69
				0.0045	22.33
				0.0031	19.32
				0.0023	17.87
				0.0013	14.49



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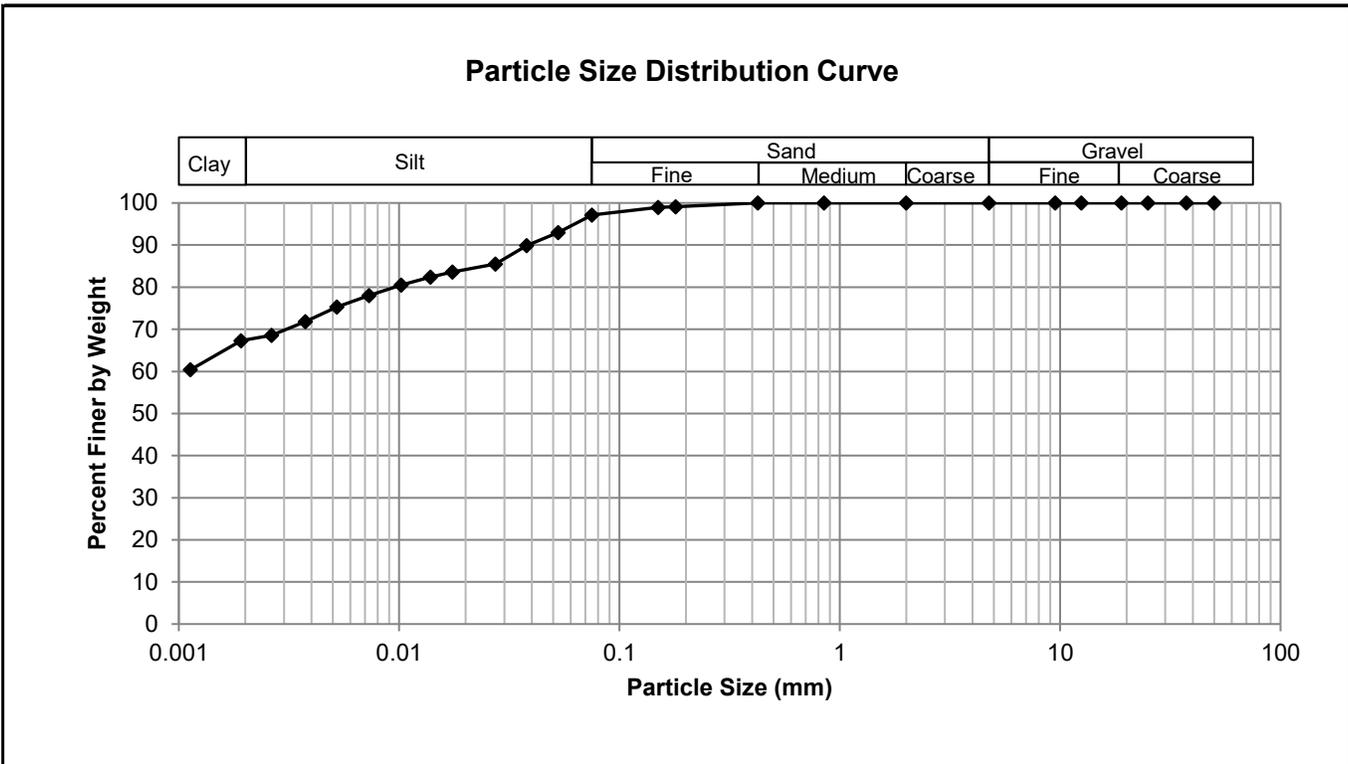
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B



Test Hole TH21-07
Sample # G51
Depth (m) 0.9 - 1.1
Sample Date 20-Dec-21
Test Date 26-Dec-21
Technician HS

Gravel	0.0%
Sand	2.9%
Silt	29.6%
Clay	67.5%



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	97.12
37.5	100.00	2.00	100.00	0.0528	93.02
25.0	100.00	0.850	100.00	0.0379	89.89
19.0	100.00	0.425	99.99	0.0274	85.52
12.5	100.00	0.180	99.13	0.0175	83.64
9.50	100.00	0.150	98.92	0.0139	82.39
4.75	100.00	0.075	97.12	0.0102	80.51
				0.0073	78.01
				0.0052	75.27
				0.0037	71.83
				0.0026	68.57
				0.0019	67.32
				0.0011	60.39



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Standard Proctor Compaction Test

ASTM D698-12e2

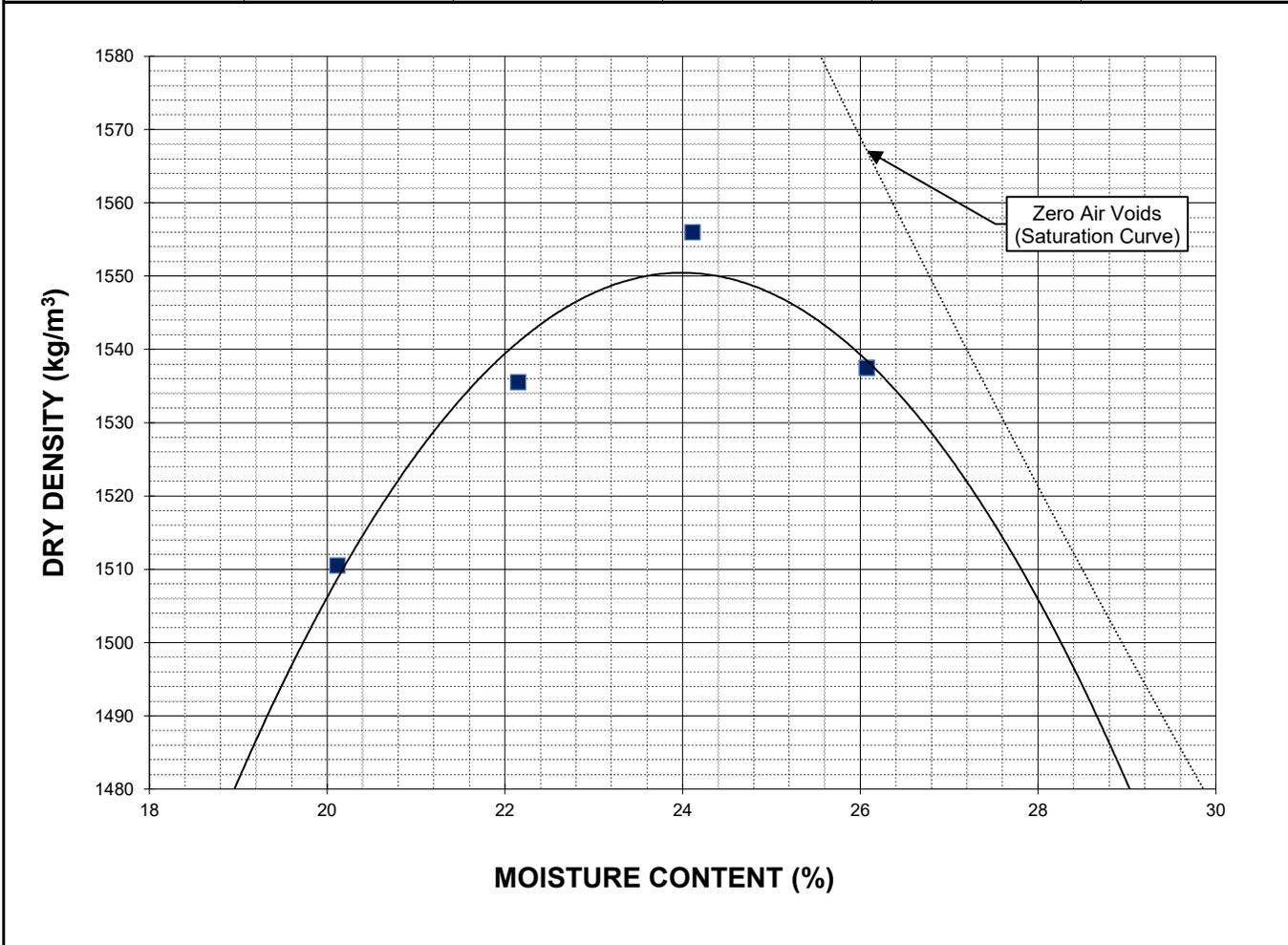
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Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 1



Sample # TH21-04,05 and 06 - combined
Source Lansdowne Ave
Material Clay
Sample Date 20-Dec-21
Test Date 23-Dec-21
Technician NM

Maximum Dry Density (kg/m³)	1550
Optimum Moisture (%)	24.0

Trial Number	1	2	3	4	
Wet Density (kg/m ³)	1814	1876	1931	1938	
Dry Density (kg/m ³)	1511	1536	1556	1537	
Moisture Content (%)	20.1	22.2	24.1	26.1	





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Standard Proctor Compaction Test

ASTM D698-12e2

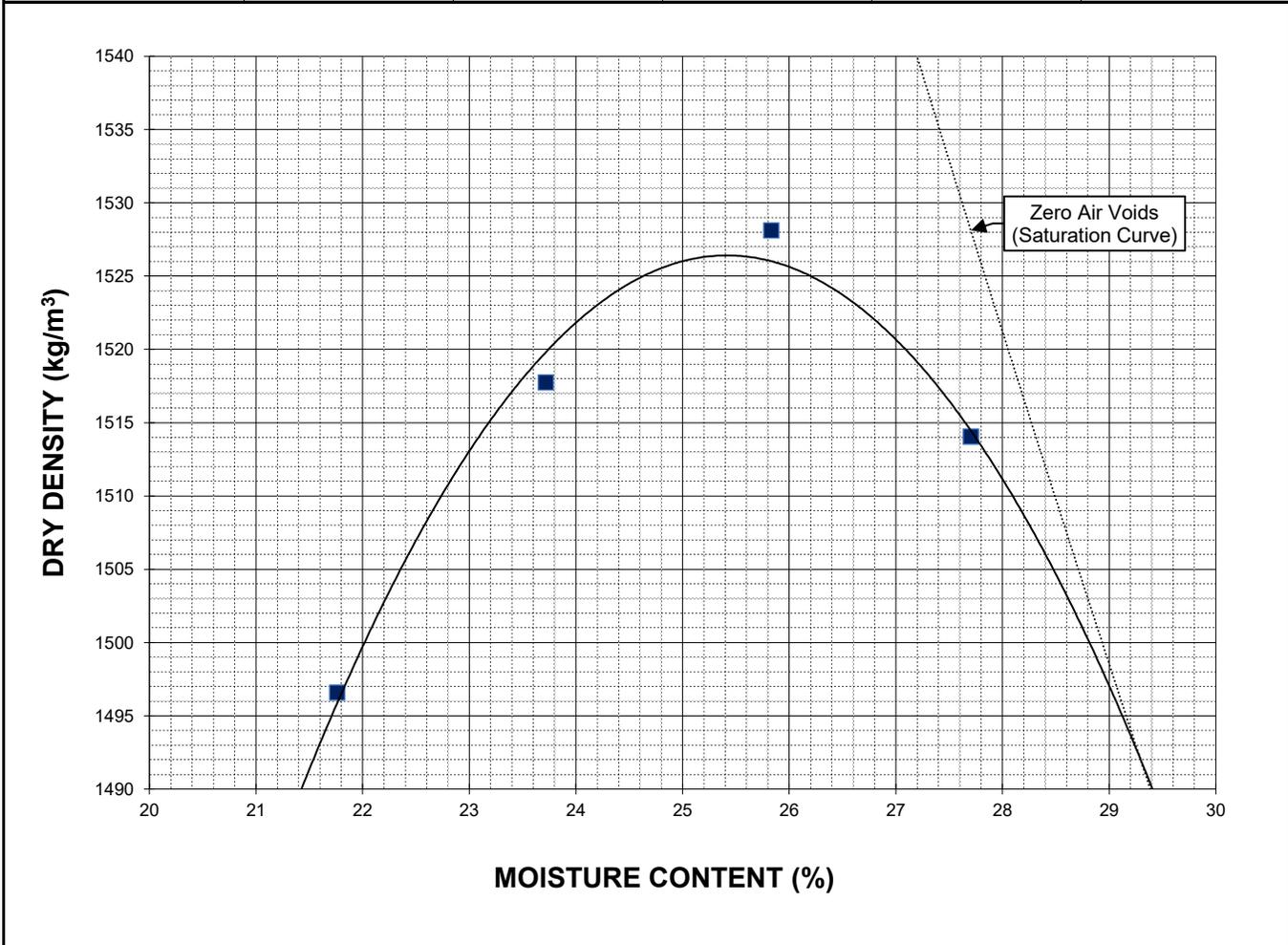
Project No. 1000-049-07
Client City of Winnipeg
Project 2022 City of Winnipeg Geotechnical/Coring Program 1



Sample # TH21-07 and 08 - combined
Source Lansdowne Ave
Material Clay
Sample Date 20-Dec-21
Test Date 22-Dec-21
Technician NM

Maximum Dry Density (kg/m³)	1526
Optimum Moisture (%)	25.4

Trial Number	1	2	3	4
Wet Density (kg/m³)	1822	1878	1923	1934
Dry Density (kg/m³)	1497	1518	1528	1514
Moisture Content (%)	21.8	23.7	25.8	27.7





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California Bearing Ratio Test Data Sheet
ASTM D1883-16

Project No.	1000-049	Source	Lansdowne Ave
Client	City of Winnipeg	Material	Clay
Project	2022 COW Geotech/Coring Program	Sample Date	2021-12-12
Sample #	TH21-04, 05 and 06 - combined	Test Date	2021-12-27
		Technician	DJ

Proctor Results (ASTM D698)

Maximum Dry Density	1550 kg/m ³
Optimum Moisture Content	24.0 %
Material Retained on 19 mm Sieve	0.0 %

CBR Sample Compaction

Dry Density	1475 kg/m ³
Initial Moisture Content	27.0 %
Relative Density	95.2 % SPMD

Soaking Results

Surcharge	4.54 kg
Swell	0.3 %
Moisture Content in top 25 mm	31.7 %
Immersion Period	96 h

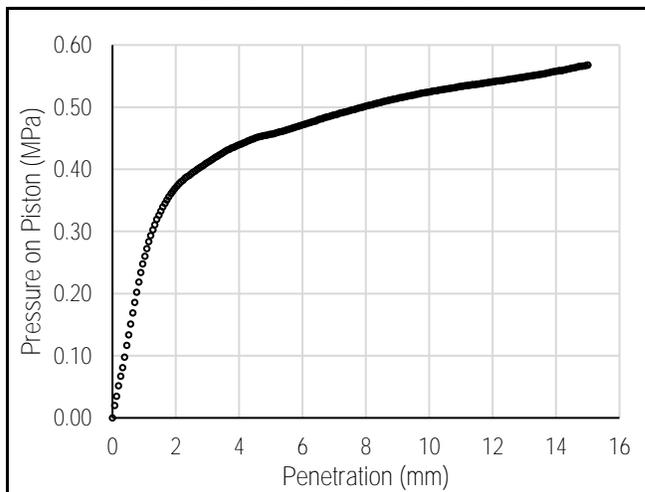
CBR Results

CBR at 2.54 mm	5.7 %
CBR at 5.08 mm	4.4 %
Zero Correction	0 mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.17	0.17
1.27	0.30	0.30
1.91	0.37	0.37
2.54	0.40	0.40
3.18	0.42	0.42
3.81	0.44	0.44
4.45	0.45	0.45
5.08	0.46	0.46
7.62	0.50	0.50
10.16	0.53	0.53
12.70	0.55	0.55

Load/Penetration Curve



Comments:



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California Bearing Ratio Test Data Sheet
ASTM D1883-16

Project No.	1000-049	Source	Lansdowne Ave
Client	City of Winnipeg	Material	Clay
Project	2022 COW Geotech/Coring Program	Sample Date	2021-12-12
Sample #	TH21-06 and 07 - combined	Test Date	2021-12-27
		Technician	DJ

Proctor Results (ASTM D698)

Maximum Dry Density	1526 kg/m ³
Optimum Moisture Content	25.4 %
Material Retained on 19 mm Sieve	0.0 %

CBR Sample Compaction

Dry Density	1458 kg/m ³
Initial Moisture Content	28.7 %
Relative Density	95.6 % SPMD

Soaking Results

Surcharge	4.54 kg
Swell	0.3 %
Moisture Content in top 25 mm	30.6 %
Immersion Period	96 h

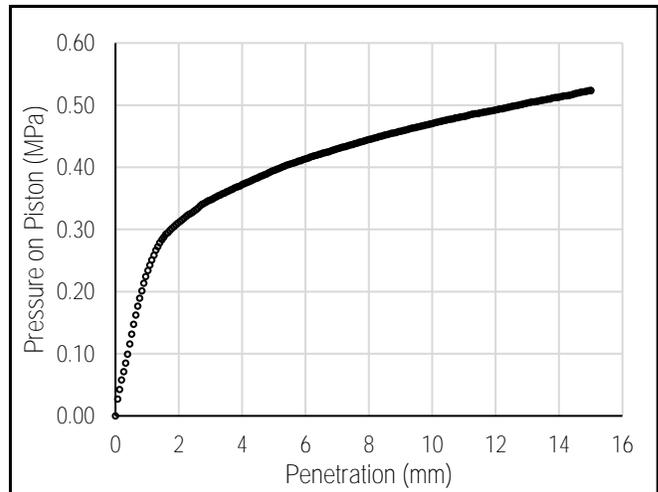
CBR Results

CBR at 2.54 mm	4.8 %
CBR at 5.08 mm	3.9 %
Zero Correction	0 mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.16	0.16
1.27	0.27	0.27
1.91	0.31	0.31
2.54	0.33	0.33
3.18	0.35	0.35
3.81	0.37	0.37
4.45	0.38	0.38
5.08	0.40	0.40
7.62	0.44	0.44
10.16	0.47	0.47
12.70	0.50	0.50

Load/Penetration Curve



Comments:



Photo 1: Pavement Core Sample at Test Hole TH21-04



Photo 2: Pavement Core Sample at Test Hole TH21-05



Photo 3: Pavement Core Sample at Test Hole TH21-06



Photo 4: Pavement Core Sample at Test Hole TH21-07



Photo 5: Pavement Core Sample at Test Hole TH21-08

Appendix C

Summary Table and Pavement Core Photos – Forest Park Dr.



2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B
 Forest Park Drive: between Airlies Street and Sinclair Street

Pavement Core No.	Pavement Core Location	Pavement Surface		Pavement Structure Material		
		Type	Thickness (mm)	Type	Thickness (mm)	Corrected Compressive Strength (Mpa)
PC21-19	UTM : 5534106 m N, 633398 m E; : Located in front of #169 Forest Park Dr., Northbound lane, 4 m West of East curb.	Asphalt	50	Concrete	140	-
PC21-20	UTM : 5534185 m N, 633321 m E; : Located in front of #197 Forest Park Dr., Northbound lane, 3.5 m West of East curb.	Asphalt	40	Concrete	150	-

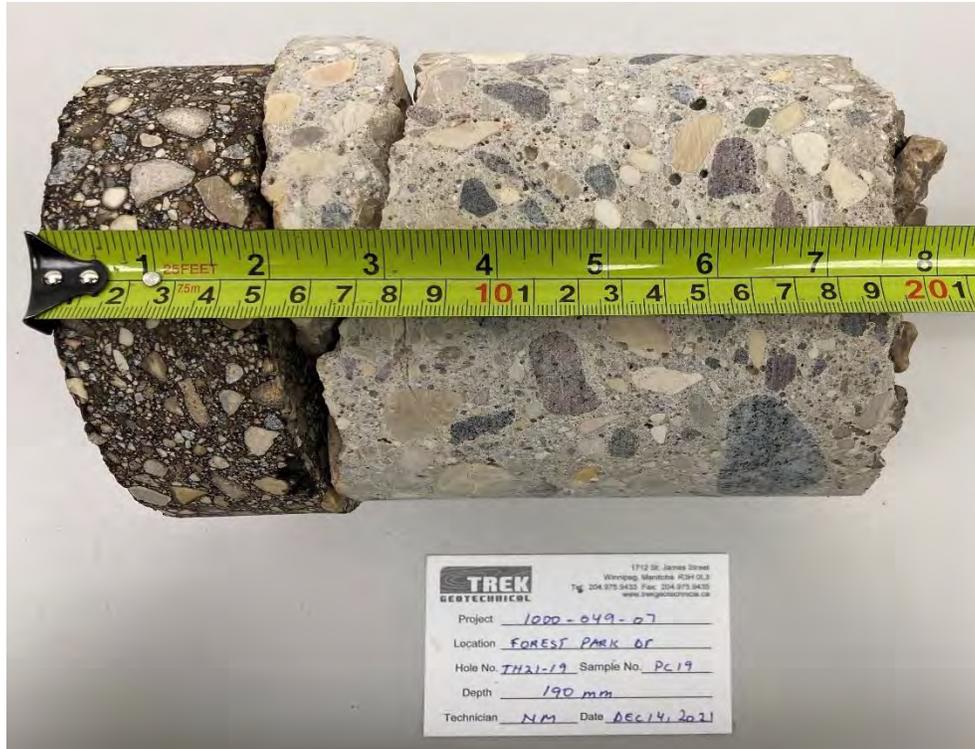


Photo 1: Pavement Core Sample at PC21-19



Photo 2: Pavement Core Sample at PC21-20

Appendix D

Summary Table, Pavement Core Photos, and Summary of Pavement Compressive Strength – Rupertsland Blvd.



2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B
Rupertsland Blvd: between Jones Street and Main Street

Pavement Core No.	Pavement Core Location	Pavement Surface		Pavement Structure Material		
		Type	Thickness (mm)	Type	Thickness (mm)	Corrected Compressive Strength (Mpa)
PC21-09	UTM : 5532718 m N, 634857 m E; : Located in front of #192 Rupertsland Blvd, Eastbound lane, 4 m North of South curb.	Asphalt	50	Concrete	120	-
PC21-10	UTM : 5532678 m N, 634976 m E; : Located in front of #175 Rupertsland Blvd, Westbound lane, 4.5 m South of North curb.	Asphalt	30	Concrete	140	-
PC21-11	UTM : 5532673 m N, 634959 m E; : Located in front of #174 Rupertsland Blvd, Eastbound lane, 2 m North of South curb.	Asphalt	30	Concrete	170	51.36
PC21-12	UTM : 5532726 m N, 634872 m E; : Located in front of #191A Rupertsland Blvd, Westbound lane, 2 m South of North curb.	Asphalt	40	Concrete	140	-



Photo 1: Pavement Core Sample at PC21-09



Photo 2: Pavement Core Sample at PC21-10



Photo 3: Pavement Core Sample at PC21-11

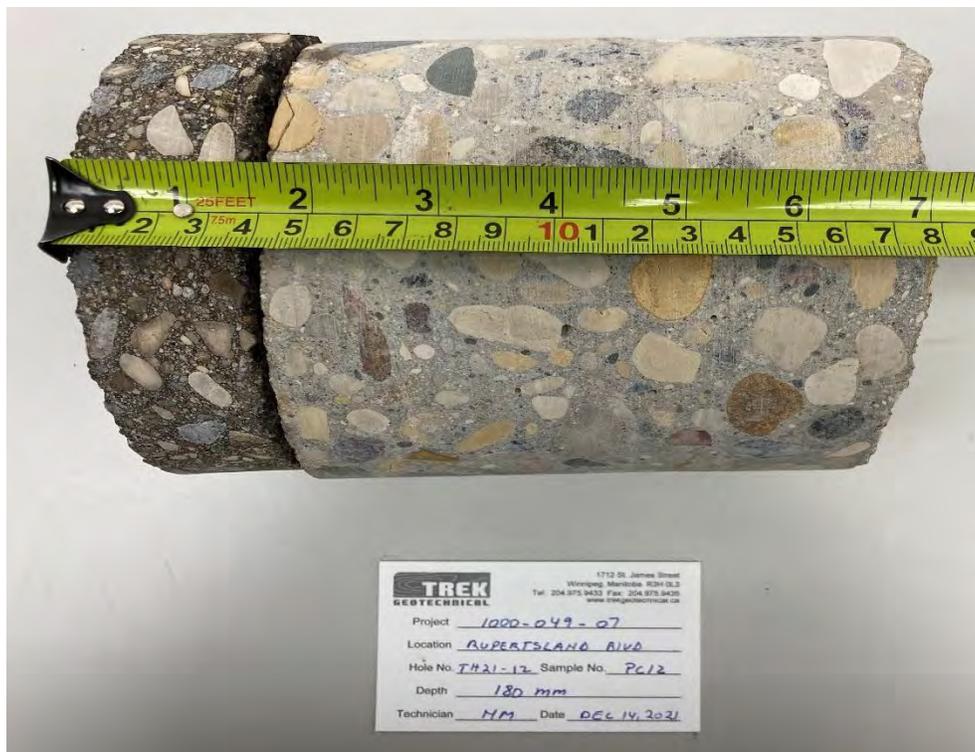


Photo 4: Pavement Core Sample at PC21-12

Project No. 1000-049-07

Date January 5, 2022

Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

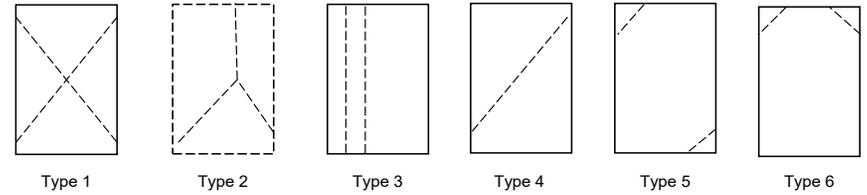
Technician NM

Client City of Winnipeg

Core Location	Core ID	Date Received	Date of Break	Age at Break	Diam. (mm)	Length (mm)	Moisture Conditioning	Compressive Strength (MPa)		Break Type	Correction Factors*				
								Uncorrected f_{conc}	Corrected* f_c		$F_{l/d}$	F_{dia}	F_{mc}	F_D	F_{reinf}
Rupertsland Blvd	PC11	2021-12-14	2021-12-21	-	144	149	Air dried	57.91	51.36	1	0.89	0.98	0.96	1.06	1.00

Comments

*Correction factors $F_{l/d}$, F_{dia} , F_{mc} , and F_D calculated as per ACI 214.4R-03, and correction factor F_{reinf} calculated as per Khoury et al. (2014): $f_c = f_{conc}F_{l/d}F_{dia}F_{mc}F_DF_{reinf}$



Reviewed by (print): Angela Fidler-Kliwer, C.Tech. Signature: Angela Fidler-Kliwer

Table 1 Factors involved in interpretation of core results by different codes.

List	Code/standard	Edition	Factors Considered					
			Aspect ratio	Diameter	Reinforcing	Moisture	Damage	Direction
1	Egyptian Code/Standard Specification	2008	✓		✓			✓
2	British Code/Standard Specification	2003	✓		✓			✓
3	American Concrete Institute ACI	1998	✓					
		2012	✓	✓		✓	✓	
4	European Standard Specification	1998	✓	✓	✓		✓	
		2009	✓		✓			
5	Japanese Standard	1998	✓					
6	Concrete Society	1987	✓		✓		✓	✓

In addition, for core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of $(\Phi_r * d)$ is considered. If the bars are further apart, their combined effect should be assessed by replacing the term $(\Phi_r * d)$ by the term $(\sum \Phi_r * d)$.

It should be pointed out that above equations used to interpret the core concrete strength to the in-situ concrete cube strength have been developed based on a set of assumptions and through many converting process. It is also of interest to note that the damage effect is considered in the development of the formulas in indirect way. The subject derivation and detailed formulas may be seen elsewhere [14].

3.2. American Concrete Institute (ACI)

3.2.1. Former ACI Code (2002) & Current ASTM (2009)

The methodology of core interpretation given in the former ACI code was remained without changes for decades and up to Year (2003). The in-place strength of concrete cylinder at the location from which a core test specimen was extracted can be computed using the equation:

$$f_{cy} = F_{l/d} \cdot f_{core} \tag{4}$$

where f_{cy} is the equivalent in-place concrete cylinder strength, f_{core} is concrete core strength, and $F_{l/d}$ is the strength correction factor for aspect ratio.

The former ACI code does not include any equation to calculate the correction factor ($F_{l/d}$); however, the code gives different values for this term that is associated with different aspect ratios (l/d) as given in Table 2. It should also be noted that the approach of current ASTM is similar to that mentioned above. The only considered variable is the aspect ratio (l/d). It should be noted that identical approach to that mentioned above is still effective in ASTM C42/C42M-03 [10].

3.2.2. Current ACI Code (2012) [15]

Starting from Year 2003, significant changes have been made to the relevant ACI Code provisions regarding the interpreta-

Table 2 Mean values for factor $F_{l/d}$ according to ACI Code (1998) and ASTM.

	Specimen length-to-diameter ratio, l/d			
	1.00	1.25	1.50	1.75
$F_{l/d}$	0.87	0.93	0.96	0.98

tion of core strength test results. New factors have been considered. These include core diameter, moisture content of core sample, core damage associated with drilling, in addition to the effect of aspect ratio that was previously considered in the former ACI edition (1998). According to the ACI 214.4R-03, the in-place concrete strength can be computed using the equation:

$$f_c = F_{l/d} \cdot F_{dia} \cdot F_{mc} \cdot F_D \cdot f_{core} \cdot \text{Front} \tag{5}$$

cc. 12 or cc. 15

where f_c is the equivalent in-place concrete cylinder strength, f_{core} is concrete core strength, $F_{l/d}$ is strength correction factor for aspect ratio, F_{dia} is strength correction factors for diameter, F_{mc} is strength correction factor for moisture condition of core sample, and F_D is the strength correction factor that accounts for effect of damage sustained during core drilling including micro-cracking and undulations at the drilled surface and cutting through coarse-aggregate particles that may subsequently pop out during testing.

The ACI committee considered the correction factors presented in Table 3 for converting core strengths into equivalent in-place strengths based on the work reported by Bartlett and MacGregor [6]. It should be noted that the magnitude of

Table 3 Strength correction factors according to ACI 214.4R-03.

List	Factors	Mean values
(1) ^b	$F_{l/d}$: l/d ratio	
	As-received	$1 - \{0.130 - \alpha f_{core}\} (2 - \frac{1}{d})^2$
	Soaked 48 h	$1 - \{0.117 - \alpha f_{core}\} (2 - \frac{1}{d})^2$
	Air dried ^a	$1 - \{0.144 - \alpha f_{core}\} (2 - \frac{1}{d})^2$
(2)	F_{dia} : core diameter	
	50 mm	1.06
	100 mm	1.00
	150 mm	0.98
(3)	F_{mc} : core moisture content	
	As-received	1.00
	Soaked 48 h	1.09
	Air dried ^a	0.96
(4)	F_D : damage due to drilling	1.06

^a Standard treatment specified in ASTM C 42/C 42M.

^b Constant α equals $4.3(10^{-4})$ 1/MPa for f_{core} in MPa.

Table 6 List of comparisons between tested cores to determine.

	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1
A1	●	●	●	●	●		●				●			▲	▲	■	▲	
A2																		
A3						■	●			■	●							
A4																		
A5																		
A6								■	▲	●		■	▲					
A7								■	▲	●			■	▲				
A8		●	◆	●	●													
A9																		
A10								■	▲	●								
A11																		
A12		●		●	●													
A13																		
A14		●		●														
A15		●																
A16	●	◆																
A17	◆																	
A18																		

- Diameter of steel bar.
- ▲ Distance of steel bar from nearly end of core.
- Number of steel bars and spacing between bars.
- ◆ Distance of steel bar from vertical axis of specimen.

This brief review indicated that the various proposed relationships for correction factors are all nonlinear. It should be noted that the equations given by the Egyptian Code takes into account most variables that may affect the interpretation of the results; however, the code ignores the deterioration of steel-concrete bond that may occur and also the position of the reinforcement from vertical axis of core specimens.

Weighted nonlinear regression analysis has been performed to determine the factor (F_{reinf}) with the use of the software "SAS" package and "Data Fit." This shows that the correction factor for reinforcement (F_{reinf}) is given by the following expression:

● For cores containing a single bar:

$$F_{reinf} = \left[1 + 1.5 \frac{[\Phi_r \times r + \Phi_r \times (S/10)]}{\Phi_c * L} \right] \times \frac{1.13}{f_{core}^{0.015}} \quad (12)$$

- For core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of ($\Phi_r * d$) is considered. If the bars are further apart, their combined effect is assessed by replacing the term ($\Phi_r * r$) by ($\sum \Phi_r * r$) as follows:

multiple bars

$$F_{reinf} = \left[1 + 1.5 \frac{\sum [\Phi_r \times r + \Phi_r \times (S/10)]}{\Phi_c * L} \right] \times \frac{1.13}{f_{core}^{0.015}} \quad (13)$$

where F_{reinf} is the correction factor for reinforcement, Φ_r is the diameter of the reinforcement, Φ_c is the diameter of the concrete specimen, r is the distance of axis of bar from nearer end of specimen, S is the distance of axis of bar from axis of core specimen, L is the length of the specimen after end preparation by grinding or capping, and f_{core} is the concrete core strength (kg/cm^2).

6.1.6. Effect of moisture condition of core

Results of about 100 cores indicate that the strength of cores left to dry in air for 7 days is on average 13% greater than that of cores soaked at least 40 h before testing. The strength of cores with negligible moisture gradient and tested after cutting is found to be 7–9% larger than that of soaked cores as shown in Fig. 20. The authors strongly recommend to use a correction factor accounting for moisture condition (F_m) equals to 1.09 and 0.96, respectively, for cores tested after 48 h soaked in water and for those tested after 7 days dry in air.

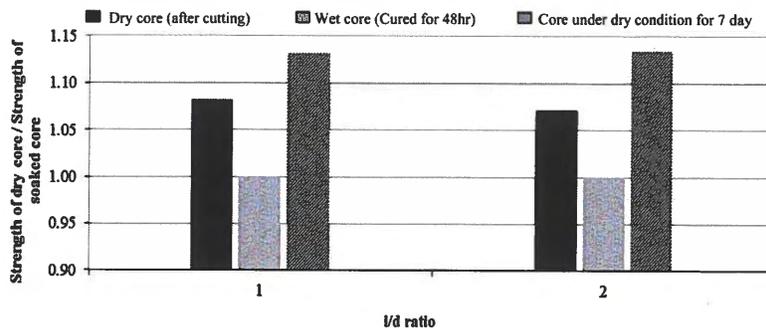


Figure 20 Effect of core moisture condition on core strength for different aspect ratios (l/d).

Appendix E

Summary Table, Pavement Core Photos, and Summary of Pavement Compressive Strength – Perth Ave.



2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B
Perth Avenue: between Scotia Street and Main Street

Pavement Core No.	Pavement Core Location	Pavement Surface		Pavement Structure Material		
		Type	Thickness (mm)	Type	Thickness (mm)	Corrected Compressive Strength (Mpa)
PC21-13	UTM : 5533136 m N, 635065 m E; : Located in front of #190 Perth Avenue, Westbound lane, 5 m North of South curb.	Asphalt	50	Concrete	150	-
PC21-14	UTM : 5533077 m N, 635191 m E; : Located in front of #152 Perth Avenue, Westbound lane, 2 m South of North curb.	Asphalt	N/A	Concrete	140	-
PC21-15	UTM : 5533008 m N, 635331 m E; : Located in front of #122 Perth Avenue, Eastbound lane, 2.5 m North of South curb.	Asphalt	N/A	Concrete	190	56.39



Photo 1: Pavement Core Sample at PC21-13



Photo 2: Pavement Core Sample at PC21-14



Photo 3: Pavement Core Sample at PC21-15

Project No. 1000-049-07

Date January 5, 2022

Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

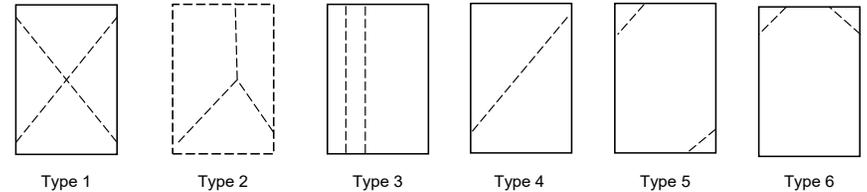
Technician NM

Client City of Winnipeg

Core Location	Core ID	Date Received	Date of Break	Age at Break	Diam. (mm)	Length (mm)	Moisture Conditioning	Compressive Strength (MPa)		Break Type	Correction Factors*				
								Uncorrected f_{conc}	Corrected* f_c		$F_{l/d}$	F_{dia}	F_{mc}	F_D	F_{reinf}
Perth Avenue	PC15	2021-12-14	2021-12-21	-	144	170	Air dried	61.37	56.39	1	0.92	0.98	0.96	1.06	1.00

Comments

*Correction factors $F_{l/d}$, F_{dia} , F_{mc} , and F_D calculated as per ACI 214.4R-03, and correction factor F_{reinf} calculated as per Khoury et al. (2014): $f_c = f_{conc}F_{l/d}F_{dia}F_{mc}F_DF_{reinf}$



Reviewed by (print): Angela Fidler-Kliewer, C.Tech.

Signature: Angela Fidler-Kliewer

Table 1 Factors involved in interpretation of core results by different codes.

List	Code/standard	Edition	Factors Considered					
			Aspect ratio	Diameter	Reinforcing	Moisture	Damage	Direction
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2	British Code/Standard Specification	2003	✓		✓			✓
3	American Concrete Institute ACI	1998	✓					
		2012	✓	✓		✓		
4	European Standard Specification	1998	✓	✓			✓	
		2009	✓		✓			
5	Japanese Standard	1998	✓					
6	Concrete Society	1987	✓		✓		✓	✓

In addition, for core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of $(\Phi_r * d)$ is considered. If the bars are further apart, their combined effect should be assessed by replacing the term $(\Phi_r * d)$ by the term $(\sum \Phi_r * d)$.

It should be pointed out that above equations used to interpret the core concrete strength to the in-situ concrete cube strength have been developed based on a set of assumptions and through many converting process. It is also of interest to note that the damage effect is considered in the development of the formulas in indirect way. The subject derivation and detailed formulas may be seen elsewhere [14].

3.2. American Concrete Institute (ACI)

3.2.1. Former ACI Code (2002) & Current ASTM (2009)

The methodology of core interpretation given in the former ACI code was remained without changes for decades and up to Year (2003). The in-place strength of concrete cylinder at the location from which a core test specimen was extracted can be computed using the equation:

$$f_{cy} = F_{l/d} \cdot f_{core} \tag{4}$$

where f_{cy} is the equivalent in-place concrete cylinder strength, f_{core} is concrete core strength, and $F_{l/d}$ is the strength correction factor for aspect ratio.

The former ACI code does not include any equation to calculate the correction factor ($F_{l/d}$); however, the code gives different values for this term that is associated with different aspect ratios (l/d) as given in Table 2. It should also be noted that the approach of current ASTM is similar to that mentioned above. The only considered variable is the aspect ratio (l/d). It should be noted that identical approach to that mentioned above is still effective in ASTM C42/C42M-03 [10].

3.2.2. Current ACI Code (2012) [15]

Starting from Year 2003, significant changes have been made to the relevant ACI Code provisions regarding the interpreta-

Table 2 Mean values for factor $F_{l/d}$ according to ACI Code (1998) and ASTM.

	Specimen length-to-diameter ratio, l/d			
	1.00	1.25	1.50	1.75
$F_{l/d}$	0.87	0.93	0.96	0.98

tion of core strength test results. New factors have been considered. These include core diameter, moisture content of core sample, core damage associated with drilling, in addition to the effect of aspect ratio that was previously considered in the former ACI edition (1998). According to the ACI 214.4R-03, the in-place concrete strength can be computed using the equation:

$$f_c = F_{l/d} \cdot F_{dia} \cdot F_{mc} \cdot F_D \cdot f_{core} \cdot \text{Front} \tag{5}$$

cc. 12 or cc. 15

where f_c is the equivalent in-place concrete cylinder strength, f_{core} is concrete core strength, $F_{l/d}$ is strength correction factor for aspect ratio, F_{dia} is strength correction factors for diameter, F_{mc} is strength correction factor for moisture condition of core sample, and F_D is the strength correction factor that accounts for effect of damage sustained during core drilling including micro-cracking and undulations at the drilled surface and cutting through coarse-aggregate particles that may subsequently pop out during testing.

The ACI committee considered the correction factors presented in Table 3 for converting core strengths into equivalent in-place strengths based on the work reported by Bartlett and MacGregor [6]. It should be noted that the magnitude of

Table 3 Strength correction factors according to ACI 214.4R-03.

List	Factors	Mean values
(1) ^b	$F_{l/d}$: l/d ratio	
	As-received	$1 - \{0.130 - \alpha f_{core}\} (2 - \frac{l}{d})^2$
	Soaked 48 h	$1 - \{0.117 - \alpha f_{core}\} (2 - \frac{l}{d})^2$
	Air dried ^a	$1 - \{0.144 - \alpha f_{core}\} (2 - \frac{l}{d})^2$
(2)	F_{dia} : core diameter	
	50 mm	1.06
	100 mm	1.00
	150 mm	0.98
(3)	F_{mc} : core moisture content	
	As-received	1.00
	Soaked 48 h	1.09
	Air dried ^a	0.96
(4)	F_D : damage due to drilling	1.06

^a Standard treatment specified in ASTM C 42/C 42M.

^b Constant α equals $4.3(10^{-4})$ 1/MPa for f_{core} in MPa.

Table 6 List of comparisons between tested cores to determine.

	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1
A1	●	●	●	●	●		●				●			▲	▲	■	▲	
A2																		
A3						■	●			■	●							
A4																		
A5																		
A6								■	▲	●			■	▲				
A7								■	▲	●								
A8		●	◆	●	●													
A9																		
A10								■	▲	●								
A11																		
A12		●		●	●													
A13																		
A14		●		●														
A15		●																
A16	●	◆																
A17	◆																	
A18																		

- Diameter of steel bar.
- ▲ Distance of steel bar from nearly end of core.
- Number of steel bars and spacing between bars.
- ◆ Distance of steel bar from vertical axis of specimen.

This brief review indicated that the various proposed relationships for correction factors are all nonlinear. It should be noted that the equations given by the Egyptian Code takes into account most variables that may affect the interpretation of the results; however, the code ignores the deterioration of steel-concrete bond that may occur and also the position of the reinforcement from vertical axis of core specimens.

Weighted nonlinear regression analysis has been performed to determine the factor (F_{reinf}) with the use of the software "SAS" package and "Data Fit." This shows that the correction factor for reinforcement (F_{reinf}) is given by the following expression:

● For cores containing a single bar:

$$F_{reinf} = \left[1 + 1.5 \frac{[\Phi_r \times r + \Phi_r \times (S/10)]}{\Phi_c * L} \right] \times \frac{1.13}{f_{core}^{0.015}} \quad (12)$$

- For core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of ($\Phi_r * d$) is considered. If the bars are further apart, their combined effect is assessed by replacing the term ($\Phi_r * r$) by ($\sum \Phi_r * r$) as follows:

multiple bars

$$F_{reinf} = \left[1 + 1.5 \frac{\sum [\Phi_r \times r + \Phi_r \times (S/10)]}{\Phi_c * L} \right] \times \frac{1.13}{f_{core}^{0.015}} \quad (13)$$

where F_{reinf} is the correction factor for reinforcement, Φ_r is the diameter of the reinforcement, Φ_c is the diameter of the concrete specimen, r is the distance of axis of bar from nearer end of specimen, S is the distance of axis of bar from axis of core specimen, L is the length of the specimen after end preparation by grinding or capping, and f_{core} is the concrete core strength (kg/cm^2).

6.1.6. Effect of moisture condition of core

Results of about 100 cores indicate that the strength of cores left to dry in air for 7 days is on average 13% greater than that of cores soaked at least 40 h before testing. The strength of cores with negligible moisture gradient and tested after cutting is found to be 7–9% larger than that of soaked cores as shown in Fig. 20. The authors strongly recommend to use a correction factor accounting for moisture condition (F_m) equals to 1.09 and 0.96, respectively, for cores tested after 48 h soaked in water and for those tested after 7 days dry in air.

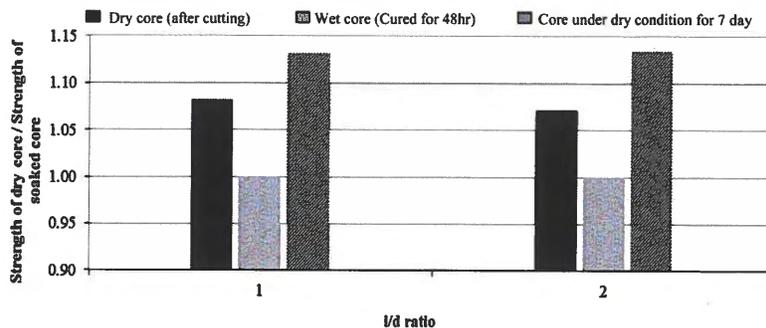


Figure 20 Effect of core moisture condition on core strength for different aspect ratios (l/d).

Appendix F

Summary Table, Pavement Core Photos, and Summary of Pavement Compressive Strength – Semple Ave.



2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B
Semple Avenue: between Salter Street and Main Street

Pavement Core No.	Pavement Core Location	Pavement Surface		Pavement Structure Material		
		Type	Thickness (mm)	Type	Thickness (mm)	Corrected Compressive Strength (Mpa)
PC21-16	UTM : 5533634 m N, 634795 m E; : Located in front of #299 Semple Avenue, Westbound lane, 3 m South of North curb.	Asphalt	50	Concrete	130	-
PC21-17	UTM : 5533537 m N, 635001 m E; : Located in front of #241 Semple Avenue, Westbound lane, 3 m South of North curb.	Asphalt	70	Concrete	200	51.36
PC21-18	UTM : 5533488 m N, 635096 m E; : Located in front of #212 Semple Avenue, Eastbound lane, 2.5 m North of South curb.	Asphalt	60	Concrete	160	56.3

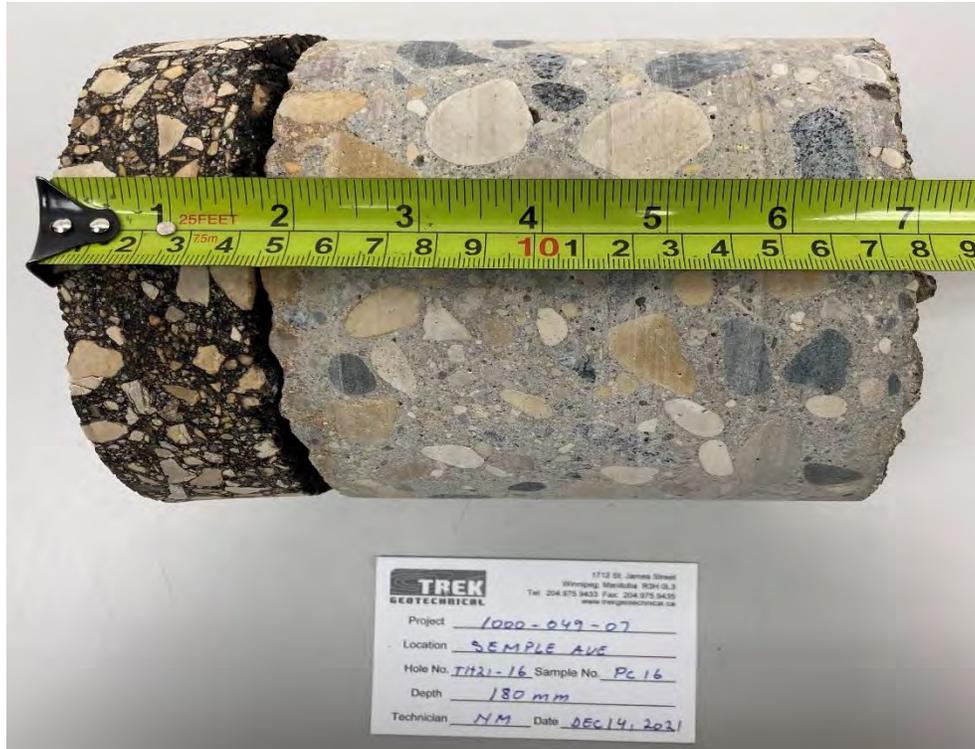


Photo 1: Pavement Core Sample at PC21-16



Photo 2: Pavement Core Sample at PC21-17



Photo 3: Pavement Core Sample at PC21-18

Project No. 1000-049-07

Date January 5, 2022

Project 2022 City of Winnipeg Geotechnical/Coring Program 22-R-01B

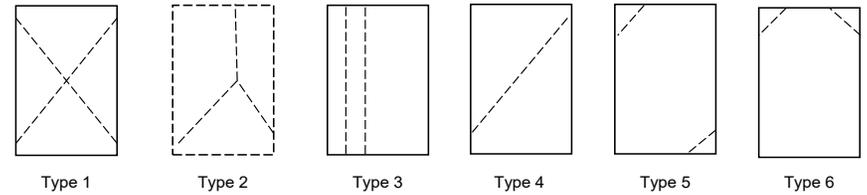
Technician NM

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Core Location	Core ID	Date Received	Date of Break	Age at Break	Diam. (mm)	Length (mm)	Moisture Conditioning	Compressive Strength (MPa)		Break Type	Correction Factors*				
								Uncorrected f_{conc}	Corrected* f_c		$F_{l/d}$	F_{dia}	F_{mc}	F_D	F_{reinf}
Sample Avenue	PC17	2021-12-14	2021-12-21	-	144	168	Air dried	56.16	51.36	1	0.92	0.98	0.96	1.06	1.00
Sample Avenue	PC18	2021-12-14	2021-12-21	-	144	154	Air dried	62.80	56.30	1	0.90	0.98	0.96	1.06	1.00

Comments

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4	European Standard Specification	1998	✓	✓			✓	
		2009	✓		✓			
5	Japanese Standard	1998	✓					
6	Concrete Society	1987	✓		✓		✓	✓

In addition, for core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of $(\Phi_r * d)$ is considered. If the bars are further apart, their combined effect should be assessed by replacing the term $(\Phi_r * d)$ by the term $(\sum \Phi_r * d)$.

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A4																		
A5																		
A6								■	▲	●		■	▲					
A7								■	▲	●			■	▲				
A8		●	◆	●	●													
A9																		
A10								■	▲	●								
A11																		
A12		●		●	●													
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where F_{reinf} is the correction factor for reinforcement, Φ_r is the diameter of the reinforcement, Φ_c is the diameter of the concrete specimen, r is the distance of axis of bar from nearer end of specimen, S is the distance of axis of bar from axis of core specimen, L is the length of the specimen after end preparation by grinding or capping, and f_{core} is the concrete core strength (kg/cm^2).

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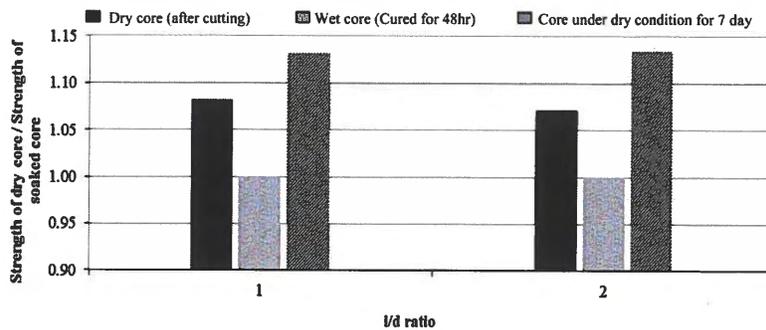
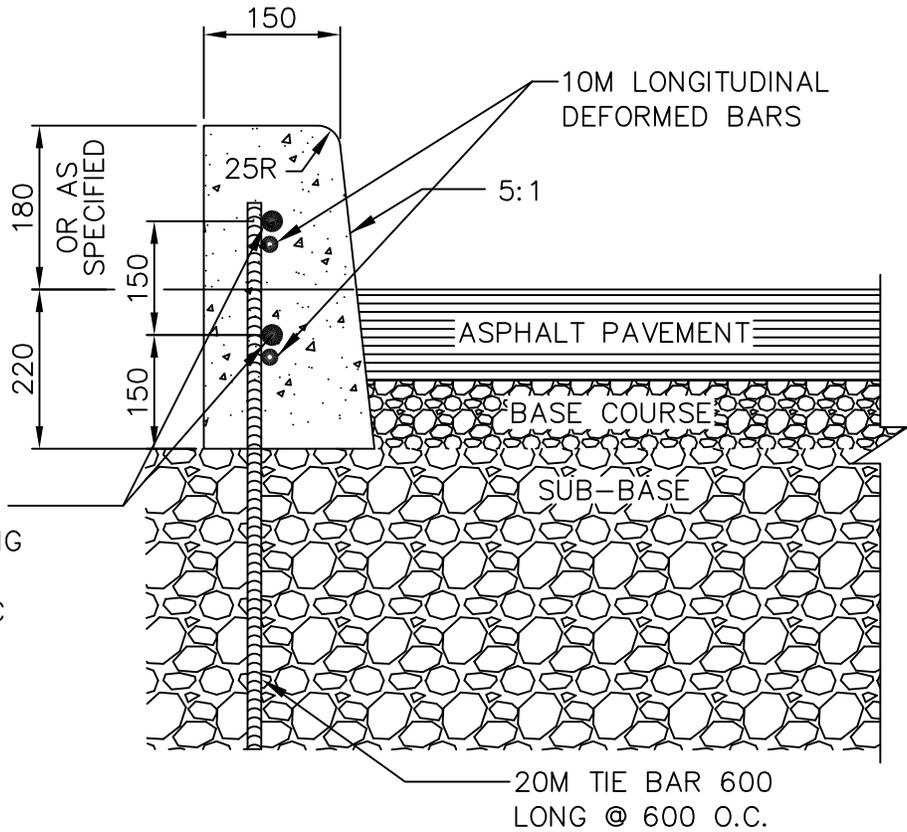


Figure 20 Effect of core moisture condition on core strength for different aspect ratios (l/d).

**APPENDIX 'B' – BARRIER CURB FOR ASPHALT PAVEMENT STANDARD DETAIL
SD-200A**



FOR CONSTRUCTION JOINTS:
 2-19.1mm DOWELS 450 LONG
 PLACED EVERY 6m;
 LUBRICATED WITH ASPHALTIC
 CUT-BACK.

- NOTE: 1. REDUCE CURB HEIGHT TO 40.
 APPLICABLE FOR PRIVATE
 APPROACHES ON LOCAL RESIDENTIAL
 STREETS. REF SD-202B
2. TRANSVERSE SAW CUT EVERY 3m OR AT PAVEMENT JOINTS.
3. TRANSVERSE SAW CUTS ARE TO BE A MAXIMUM DEPTH OF 25mm.



THE CITY OF WINNIPEG
 PUBLIC WORKS DEPARTMENT

Reference Spec. No.
 CW 3240

DIMENSIONS ARE IN MILLIMETRES

BARRIER CURB FOR ASPHALT
 PAVEMENT

Designed By:

Drawn By:
 A.P.

Scale :
 N.T.S.

Checked By:

Date:
 20-02-26

Drawing No.

Approved:
 ASSET MANAGEMENT BRANCH

SD-200A

**APPENDIX 'C' – CONCRETE CONSTITUENT MATERIALS, MIX DESIGN
REQUIREMENTS, AND HOT AND COLD WEATHER CONCRETING**

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1.0 DESCRIPTION

1.1 General

- 1.1.1 PORTLAND CEMENT CONCRETE PAVEMENT WORKS shall be in accordance with CW3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS, except as otherwise specified herein.
- 1.1.2 This specification covers Portland cement concrete constituent materials and design requirements for the preparation of Portland Cement Concrete for all concreting operations relating to the construction of pavements, curbs, gutters, private approaches, bull-noses, median slabs, median, safety median and boulevard splash strips, sidewalk and other related concrete works.
- 1.1.3 This specification also covers hot and cold weather concreting.
- 1.1.4 Replace 2.0 Definitions of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 1.2 of this specification.
- 1.1.5 Replace 5.3 Portland Cement Concrete Constituent Materials of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 2.0 MATERIALS of this specification.
- 1.1.6 Replace 6.0 Design Requirements of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 3.0 DESIGN REQUIREMENTS of this specification.
- 1.1.7 Replace 9.8. Weather Conditions of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 4.0 HOT AND COLD WEATHER CONCRETING of this specification.
- 1.1.8 Replace 13.0 Basis of Payment of CW 3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS with 5.1 BASIS OF PAYMENT FOR CW 3310-R17 of this specification.
- 1.1.9 Replace 13.0 Basis of Payment of CW 3230-R8, FULL-DEPTH PATCHING OF EXISTING PAVEMENT SLABS AND JOINTS with 5.2 BASIS OF PAYMENT FOR CW 3230-R8 of this specification.
- 1.1.10 Replace 13.0 Measurement and Payment for CW 3235-R9, RENEWAL OF EXISTING MISCELLANEOUS CONCRETE SLABS with 5.3 MEASUREMENT AND PAYMENT FOR CW 3235-R9 of this specification.
- 1.1.11 Replace 4.0 Measurement and Payment for CW 3240-R10, RENEWAL OF EXISTING CURBS with 5.4 MEASUREMENT AND PAYMENT FOR CW 3240-R10 of this specification.
- 1.1.12 Replace 13.0 Basis of Payment for CW 3325-R5, PORTLAND CEMENT CONCRETE SIDEWALK with 5.5 BASIS OF PAYMENT FOR CW 3325-R5 of this specification.
- 1.1.13 This specification also replaces 2.0 Definitions, 5.3 Portland Cement Concrete Constituent Materials, 6.0 Design Requirements, 9.8. Weather Conditions, and 13.0 Basis of Payment of CW3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS where other specifications (e.g. CW3230-R8, CW3235-R9, CW3240-R10, CW3325-R5) reference CW3310-R17, PORTLAND CEMENT CONCRETE PAVEMENT WORKS.
- 1.1.14 All requirements and tests shall be in accordance with the latest edition of CSA A23.1-19/CSA A23.2-19, except as otherwise specified herein.

1.2 Definitions

- 1.2.1 Reinforced Concrete Pavement - A Portland Cement Concrete pavement with distributed steel reinforcement in the pavement slab and with deformed tie bars across longitudinal joints and smooth dowels across transverse contraction joints. Distributed steel reinforcement consists of smooth or deformed bars.
- 1.2.2 Plain-Dowelled Pavement - A Portland Cement Concrete pavement with no reinforcing steel in the pavement slab and with deformed tie bars across longitudinal joints and smooth dowels across transverse contraction joints.
- 1.2.3 Type 1 Concrete shall be used for expressways, major arterials, minor arterials, industrial/commercial collectors, residential major collectors, residential minor collectors, and industrial/commercial local pavements.
- 1.2.4 Type 2 Concrete shall be used for residential roads and alleys, curb and gutter sections, curbs, commercial approaches, residential approaches, miscellaneous concrete slab and splash strips. Type 1 Concrete can be used instead of Type 2 Concrete.
- 1.2.5 Type 3 is early opening concrete and shall be used for 24 hours early opening after placement.
- 1.2.6 Type 4 is early opening concrete and shall be used for 72 hours early opening after placement.
- 1.2.7 Type 5 Concrete shall be used for Sidewalks. Type 1 or Type 2 Concrete can be used instead of Type 5 Concrete.
- 1.2.8 Type 6 Concrete is cold weather concreting and shall replace all other concrete types for all applications when cold weather exists, except Type 8.
- 1.2.9 Type 7 is concrete for restoration of utility pavement cuts.
- 1.2.10 Type 8 is concrete for temporary restoration.
- 1.2.11 Coarseness Factor - A measure of the coarseness of the combined aggregate materials being incorporated into the concrete mix, defined as the percentage of all plus 2 500 sieve particles, which are also retained on the 10 000 sieve. Coarseness Factor = $100 \text{ (cumulative \% retained on 10 000 Sieve divided by the cumulative \% retained on 2 500 Sieve)}$.
- 1.2.12 Hot weather is defined as one or a combination of the ambient air temperature being at or above 27 °C, or when there is a probability of the temperature rising above 27 °C during the concrete placing period (as forecast by the nearest official meteorological office), or the evaporation rate that exceeds 0.75 kg/m²/h due to high concrete temperature (maximum temperature of 32 °C for fresh concrete), low relative humidity and high wind speed that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration, or otherwise causing detrimental results.
- 1.2.13 Cold weather is defined as a period when there is a probability of the ambient air temperature falling below 5 °C within 24 hours of placing or the average daily temperature for three consecutive days has fallen to, or is expected to fall, below 5°C as forecast by the nearest official meteorological office. The daily temperature is the mean temperature which is the average of the maximum and minimum temperature during the period from midnight to midnight.
- 1.2.14 The protection period is the time required to prevent concrete from being affected by exposure to cold weather and to develop a minimum compressive strength of 24 MPa. Concrete compressive strength shall be determined by maturity meters and field cured cylinders. In no case shall the protection period be less than seven (7) days.

2.0 MATERIALS

2.1 Concrete Constituent Materials

2.1.1 Aggregates

2.1.1.1 Aggregate shall consist of crushed stone or gravel or a combination of these materials conforming to the requirements of this Specification.

2.1.1.2 Each of the fine- and coarse-fractions of the combined aggregate shall meet all the requirements of CSA A23.1, Table 10 (FA1) and Table 11, respectively and shall be handled and weighed separately to maintain uniformity. The supplier shall provide the City of Winnipeg, Research and Standards Engineer with test data in accordance with CSA A23.2-30A to demonstrate that the material will produce concrete of acceptable quality that meets all the relevant requirements of this Specification.

2.1.1.3 The combined aggregate gradation and allowable deviations shall comply with the requirements in Table CW 3310.1.

TABLE CW 3310.1 - Combined Aggregate Gradation Limits and Allowable Deviations

Sieve Size	Percent of Total Dry Weight Passing Each Sieve	Allowable Deviation From The Job Mix Formula, % By Mass Passing Sieve
28 000	100%	-
20 000	90% - 100%	± 2%
14 000	75% - 95%	± 2%
10 000	60% - 75%	± 3%
5 000	35% - 50%	± 3%
2 500	27% - 35%	± 2%
1 250	20% - 30%	± 2%
630	10% - 20%	± 2%
315	5% - 10%	± 2%
160	1% - 4%	± 1%
80	0% - 2%	± 1%

2.1.1.4 The fineness modulus of fine aggregate shall be not less than 2.3 nor more than 3.1.

2.1.1.5 Aggregates shall conform to CSA-A23.1, Clauses 4.2.3.1 to 4.2.3.6. Each of the fine- and coarse-fractions shall comply with the physical requirements in Table CW 3310.2 and the test results shall be provided with the mix design submittal.

TABLE CW 3310.2 - Limits for Deleterious Substances and Physical Properties of Aggregates

Material	Parameter	Test Method	Maximum Limits	Frequency of Test
coarse aggregate	Clay lumps	CSA A23.2-3A	0.25%	2 years
	Low density granular material	CSA A23.2-4A	0.5%	2 years
	Material finer than 80 µm	CSA A23.2-5A	1.0%	1 year
	Relative density and absorption	CSA A23.2-12A	Note*	1 year

	Flat and elongated particles			
	- Flat particles	CSA A23.2-13B	25%	1 year
	- Elongated particles		40%	
	Petrographic examination** – PN	CSA A23.2-15A	125	1 year
	Unconfined freeze-thaw	CSA A23.2-24A	6%	Twice per season
	Alkali-silica reactivity	CSA A23.2-25A	0.15%	2 years
	Alkali-carbonate reactivity	CSA A23.2-26A	Note*	1 year
	Micro-Deval	CSA A23.2-29A	17%	Twice per season
fine aggregate	Clay lumps	CSA A23.2-3A	1%	2 years
	Low density granular material	CSA A23.2-4A	0.5%	2 years
	Material finer than 80 µm	CSA A23.2-5A	3.0%	1 year
	Organic impurities	CSA A23.2-7A	free from injurious amounts	2 years
	Petrographic examination**	CSA A23.2-15A	Note**	1 year
	Micro-Deval	CSA A23.2-23A	20%	1 year
	Alkali-silica reactivity	CSA A23.2-25A	0.15%	2 years

- *No acceptance/rejection values; however, the results shall be submitted.
- **Petrographic examinations shall be used to calculate the petrographic number (PN), to provide an appraisal of the physical-mechanical quality of coarse aggregate. Determination of PNs applies solely to coarse aggregates and should not be used for fine aggregates. The petrographic report for the fine aggregate shall include a comment on the suitability of the material for use in the production of concrete mix.
- The Coarseness Factor of the combined aggregate shall be between 45 and 65.
- Quarried limestone and dolomite shall not be acceptable as concrete aggregate materials.

2.2 Hydraulic Cement

2.2.1 Hydraulic Cement shall be either General Use (GU) or General Use Limestone (GUL) conforming to the requirements of the latest edition of CSA A3001. High-early-strength Portland cement (HE) may also be used for cold weather concreting only. Cement shall be kept in weather tight storage that will protect it from moisture and contamination, and in such a manner as to permit inspection, sampling and identification, where required, of each lot.

2.3 Supplementary Cementing Materials

2.3.1 Fly ash shall conform to the requirements of CSA A3001 Class F. Fly ash shall be added to concrete mixtures as a separate constituent material. The use of blended hydraulic cement is not permitted.

2.4 Water

2.4.1 Potable water, which is water suitable for human consumption, is permitted to be used as mixing water in concrete without testing. Non-potable water and combined water shall conform to ASTM C1602M, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete. The concrete supplier shall maintain documentation on the characteristics of the mixing water in compliance with the requirements of Tables 1 and 2 in

ASTM C1602M. Testing to verify compliance with the requirements in Table 1 shall be conducted on the Type 1 hand placement paving mix with fly ash. The testing frequency for mixing water shall be in accordance with Appendix X1 of ASTM C1602M. Information on the testing frequency of the concrete mixing water shall be included in the concrete suppliers' quality control program. The source(s) of concrete mixing water and test data indicating compliance with ASTM C1602M shall be provided with the Mix Design Statement submitted to the City of Winnipeg, Research and Standards Engineer.

2.5 Admixtures

2.5.1 Air-Entraining Admixture

2.5.1.1 The air-entraining admixture shall conform to the requirements of ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.

2.5.2 Chemical Admixtures

2.5.2.1 Chemical admixtures shall conform to the requirements of ASTM C494, Standard Specification for Chemical Admixtures for Concrete. Chloride-based chemical admixtures will not be permitted under any circumstances.

2.5.3 Cold-Weather Admixture Systems

2.5.3.1 Cold-weather admixture systems shall conform to the requirements of ASTM C1622, Standard Specification for Cold-Weather Admixture Systems.

3.0 DESIGN REQUIREMENTS

3.1 Concrete Suppliers

3.1.1 The City of Winnipeg, Research and Standards Engineer will maintain a list of approved concrete suppliers. To obtain approval, concrete suppliers must annually submit the following information to the Research and Standards Engineer prior to April 1st:

3.1.1.1 Concrete suppliers Approval Guidelines and Application is available at the City of Winnipeg, Corporate Finance, Material Management Division website at:
<https://www.winnipeg.ca/matmgt/Spec/Default.stm>

3.1.1.2 Names of suppliers and sources for all materials and admixtures

3.1.1.3 Concrete mix designs with unique mix design codes signed and dated by person selecting the mix proportions

3.1.1.4 Copy of valid Concrete Manitoba certificate for concrete batch plant

3.1.1.5 Copies of valid scale calibration reports for the concrete batch plant

3.1.1.6 Test data for aggregates (in accordance with clause 2.1.1)

3.1.1.7 The mill certificate for the cement and fly ash including chemical and physical composition and analysis, fly ash source and name of supplier.

3.1.1.8 Sieve analysis test reports for the individual aggregates and the combined aggregate gradations to be used in the concrete. The sieve analysis test reports shall be

representative of the material to be used during concrete production.

- 3.1.1.9 Performance data from trial batches prior to construction to demonstrate the concrete mix will achieve the performance criteria in Table CW 3310.3.

Table CW 3310.3: Performance Criteria and Testing

	Time (day)	Type 1	Type 2	Type 3, and Type 6	Type 4	Type 5	Type 7**	Type 8
A minimum of one (1) set* of concrete compressive strength tests for the slipform paving mix with and without fly ash according to CSA A23.2-9C	@ 1	--	--	20 MPa	--	--	--	--
	@ 3	15 MPa	15 MPa	--	20 MPa	--	--	--
	@ 7	20 MPa	20 MPa	--	--	--	--	--
	@ 28	35 MPa	32 MPa	35 MPa	35 MPa	--	--	--
A minimum of two (2) sets* of concrete compressive strength tests for the hand placement paving mix with and without fly ash according to CSA A23.2-9C	@ 1	--	--	20 MPa	--	--	--	--
	@ 3	15 MPa	15 MPa	24 MPa	20 MPa	12 MPa	20 MPa	12 MPa
	@ 7	20 MPa	20 MPa	--	--	--	--	--
	@ 28	35 MPa	32 MPa	35 MPa	35 MPa	30 MPa	35 MPa	30 MPa
Air-void test according to ASTM C457	@ 28	See Note***						
Rapid chloride penetrability test (RCPT) according to CSA A23.2-23C	@ 56	See Note ****						

*Each set contains at least three (3) cylinders at each specified date. The average of each set shall be equal to or greater than the specified strength, with no single result less than 85% of the specified strength.

** Type 7 is concrete for restoration of utility pavement cuts and shall be adjusted to meet the specified strength for

other types based on the application and shall include set retarders or hydration stabilizers to extend the discharge time to 150 min.

***A minimum of one sample for air-void test at 28 days shall be performed for each cement for Type 1, Type 2, and Type 3 with fly ash, and Type 6. The air-void test shall meet the following requirements:

- Spacing factor shall not exceed 230 μm , with no single value greater than 260 μm ; and,
- Air content shall be greater than or equal to 5.0% and less than 8.0%.

****A minimum of two samples for rapid chloride penetrability test shall be performed for Type 1, Type 2 and Type 3 for mixes with and without fly ash. For Type 1 and Type 3, the average penetrability shall be equal to or less than 1250 coulombs at 56 days based on the charge passed, with no single result greater than 1500 coulombs for mixes with and without fly ash. For Type 2, the average of chloride ion penetrability shall be equal to or less than 1500 coulombs at 56 days based on the charge passed, with no single result greater than 1750 coulombs.

3.1.1.10 Quality control program for all materials, including a proposed sampling and testing plan with minimum sampling and testing frequencies;

3.1.1.11 The laboratory(s) to be used and its credentials;

3.1.1.12 The quality control personnel and their qualifications; and,

3.1.1.13 Frequency of production equipment inspection, verification of calibration, and any certification of the production facility.

3.1.2 The City of Winnipeg, Research and Standards Engineer will conduct inspections at least once a year during production. Samples of materials may be taken and tested.

3.1.3 Testing for qualification or acceptance purposes shall be done in accordance with this Specification and the applicable test procedures and standard practices of CSA A23.2. There shall be no charge for any materials taken for testing purposes.

3.1.4 Changes in the source of any concrete constituent materials will not be permitted without approval of the City of Winnipeg, Research and Standards Engineer. For new sources, all materials shall be tested.

3.1.5 Once approved, all concrete shall be supplied in accordance with the approved Mix Design Statement. No changes in the concrete mix designs will be permitted without written permission from the City of Winnipeg, Research and Standards Engineer.

3.2 Concrete Properties

3.2.1 The Mix Design Statements for all concrete types shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval. The concrete mix shall be proportioned such as to yield concrete having the required workability, strength and durability in Table CW 3310.4.

Table CW 3310.4: Concrete Properties

	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8
Minimum Cementitious Content (kg/m ³)	360	340	360	360	320	400	340	300
Maximum Supplementary Cementing Materials – Fly Ash** (%) (see Note 2)	20%	20%	15%	20%	15%	0%	20%	20%
Maximum Water/Cementitious Ratio								
- Slip form paving	0.4	0.4	0.4	0.4	-	0.35	-	-
- Hand placement	0.42	0.42	0.42	0.42	0.42	0.36	0.42	0.45
Slump (mm)								
- Slip form paving	50 ± 20	50 ± 20	50 ± 20	50 ± 20	-	50 ± 20	-	-
- Hand placement	70 ± 20	70 ± 20	70 ± 20	70 ± 20	80 ± 20	70 ± 20	100 ± 20	100 ± 20
Nominal Maximum Aggregate Size (mm)	20	20	20	20	20	20	20	20
Air Content (%)	5-8	5-8	5-8	5-8	5-8	5-8	5-8	5-8
Minimum Compressive Strength (MPa)								
- @ 1 days	-	-	20	-	-	20	Note 1*	-
- @ 3 days	15	15	-	20	-	24		-
- @ 7 days	-	-	-	-	-	-		-
- @ 28 days	35	32	Note 1*	Note 1*	30	Note 1*		30
Maximum Rapid Chloride Penetrability Test*** (coulombs) @ 56 days. (see Note 3)	1500	1750	Note 1*	Note 1*	-	Note 1*	-	-

*The concrete shall meet Type 1 or Type 2 based on the application.

**The use of fly ash in concrete mix will be permitted. The Contractor will have the option to replace cement up to but not exceeding the above limits, by weight of total cementitious materials, depending on the concrete type. The use of fly ash will be permitted when the average daily temperature is 10°C and rising for the next five (5) consecutive days of placement as forecast by the nearest official meteorological office. The use of fly ash will not be permitted when the average daily temperature is below 10°C and the average daily temperature for more than five (5) consecutive days has fallen to, or is expected to fall, below 10°C within fourteen (14) days of placement as forecast by the nearest official meteorological office unless authorized in writing by the City of Winnipeg, Research and Standards Engineer.

***The concrete supplier shall develop and submit maturity relationships for Type 1 and Type 6 mixes.

***Rapid chloride penetrability test will be required where there is evidence of concrete damage as a result of inadequate curing and adverse weather conditions, including hot weather, wind, rain, sleet, snow and cold weather. The Contract Administrator shall be allowed access to all sampling locations and reserves the right to take samples for testing at any time.

3.3 Plant Quality Control

- 3.3.1 The concrete supplier shall provide quality control for the plant to ensure all materials meet the approved mix designs. This information shall be submitted bi-weekly and will be monitored by the City of Winnipeg, Research and Standards Engineer. Failure to submit the quality control results shall be cause for immediate suspension of the concrete supplier.
- 3.3.2 A new mill certificate for cement and fly ash shall be provided monthly during production.
- 3.3.3 Check tests of any concrete constituent materials may be undertaken by a Testing Laboratory designated by the City of Winnipeg, Research and Standards Engineer. The concrete supplier shall be equipped with a suitable means or device for obtaining a representative sample of the cement and fly ash. The device shall enable the sample to be readily taken in proximity to the cement or fly ash weigh hopper and from a container or conveyor holding only cement or fly ash to prevent contamination. Any materials which fails to comply with the requirements of CSA A3001 will be rejected, notwithstanding any certificate of acceptance that may have been previously given. Materials that has been rejected must be removed immediately by the concrete supplier.

4.0 HOT AND COLD WEATHER CONCRETING

- 4.1 The Contractor shall be responsible for taking all necessary measures to protect freshly laid concrete from adverse weather conditions, including hot weather, wind, rain, sleet, snow and cold weather, except as otherwise specified herein.
 - 4.1.1 Hot weather concreting
 - 4.1.1.1 When the ambient air temperature is at or above 27 °C, or when there is a probability of the temperature rising above 27 °C during the placing period (as forecast by the nearest official meteorological office), the Contractor shall provide protection for the concrete from the effects of hot and/or drying weather conditions.
 - 4.1.1.2 When drying conditions are greater than or equal to 0.75 kg/m²/hr as estimated by use of Figure D1, Appendix D, Guidelines for Curing and Protection of CSA A23.1, the plastic concrete surface shall be protected from drying by application of an evaporation retardant. The evaporation retardant shall be applied according to the manufacturer's recommendations.
 - 4.1.2 Cold weather concreting
 - 4.1.2.1 When there is a probability of the air temperature falling below 5 °C within 24 h of placing or the average daily temperature for more than three successive days is fallen to, or is expected to fall, below 5°C as forecast by the nearest official meteorological office, cold weather concreting requirements shall apply.
 - 4.1.2.2 Concrete shall be placed on unfrozen base material, free of water, snow, and ice. Frozen base material will be identified by measuring the surface temperature using infrared thermometers or similar devices. If the surface temperature is less than or equal to 0°C, the base will be considered frozen. The Contractor shall use suitable heating methods to maintain the base temperature above 0°C. Salt shall not be used to thaw ice, snow, or frost.
 - 4.1.2.3 Type 6 Concrete shall be used for cold weather concreting.
 - 4.1.2.4 Where less than 30 cubic meters of concrete will be placed, the Contractor shall protect the concrete using a minimum of one layer of insulated tarp with R-value more than 5 for a minimum of seven (7) days after completion of placing operations unless otherwise specified

by the Contract Administrator.

- 4.1.2.5 Where 30 cubic meters of concrete or more will be placed, a minimum of three maturity meters shall be used. One maturity meter shall be placed in the final 4 m of paving, and the two other maturity meters shall be placed at locations designated by the Contract Administrator. Each maturity meter shall be capable of recording the time and temperature at three depths, ½ inch below the surface, mid slab and ½ inch above the bottom of the pavement. Locations where the maturity meters are placed shall be protected in the same manner as the rest of the concrete.
- 4.1.2.6 The Contract Administrator shall provide all necessary wires and connectors for maturity meters. The Contractor shall be responsible for the placement, protection, and maintenance of all wires and connectors. No additional measurement or payment will be made for the placement, protection, and maintenance of all wires and connectors.
- 4.1.2.7 The Contractor shall maintain the internal concrete temperature above 10 °C during the protection period, a minimum of seven (7) days after completion of placing operations, and until the concrete has developed a minimum compressive strength of 24 MPa. Temperature and concrete compressive strength shall be determined by maturity meters and field cured cylinders. A minimum of four (4) readings for temperature shall be collected in the first three (3) days and then two times daily thereafter.
- 4.1.2.8 The Contractor shall provide suitable protection methods to the Contract Administrator for approval such as insulation (blankets and boards), heating systems such as electric blankets and hydronic heating systems, unheated or heated enclosures, or a combination of the methods to maintain the internal concrete temperature above 10 °C. In no case shall the protection method be less than one layer of insulated tarp with R-value more than 5.
- 4.1.2.9 If the internal concrete temperature at any location in the concrete falls below 10 °C but not less than 5°C during the curing period, supplemental heat shall be introduced immediately.
- 4.1.2.10 If the internal concrete temperature at any location in the concrete falls below 5 °C during the curing period, cores shall be collected and tested at 28 days. The cores will be tested in accordance with ASTM C856, Standard Practice for Petrographic Examination of Hardened Concrete and CSA A23.2-14C, Obtaining and testing drilled cores for compressive strength testing. Concrete damaged by frost, as determined by the compressive strength test or Petrographic analysis, shall be removed and replaced at the Contractor's expense. All costs associated with coring, transmittal of cores, and petrographic examination and compressive testing shall be borne by the Contractor regardless of the outcome of the examination.
- 4.1.2.11 If the internal concrete temperature at any location in the concrete falls below 0 °C during the curing period, concrete shall be removed and replaced by the Contractor at his own expense.
- 4.1.2.12 The protection method shall not be completely removed until the concrete has cooled to the temperature differential given in CSA A23.2, Table 20. The Contractor shall provide suitable methods for gradual cooling to the Contract Administrator for approval such as loosening the forms while maintaining cover with plastic sheeting or insulation, gradual decrease in heating inside an enclosure, or turning off the heat and allowing the enclosure to slowly equilibrate to ambient temperature. If the concrete cracks due to a sudden temperature change, concrete shall be removed and replaced by the Contractor at his own expense.
- 4.1.2.13 Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at his own expense.
- 4.1.2.14 No additional measurement or payment will be made for cold weather concreting

5.0 BASIS OF PAYMENT

5.1 BASIS OF PAYMENT FOR CW 3310-R17

5.1.1 Concrete Pavements, Median Slabs, Bull-noses and Safety Median

- 5.1.1.1 Construction of concrete pavements, median slabs, bull-noses and safety median will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification. The unit price shall be reduced for deficiencies in pavement thickness as per Clause 5.3 of this Specification.

Items of Work:

- i. "Construction of 250 mm Type (*) Concrete Pavement (**)(**)"
- ii. "Construction of 230 mm Type (*) Concrete Pavement (**)(**)"
- iii. "Construction of 200 mm Type (*) Concrete Pavement (**)(**)"
- iv. "Construction of 150 mm Type (*) Concrete Pavement (**)(**)"
- v. "Construction of Type (*) Concrete Median Slabs (****)"
- vi. "Construction of Monolithic Type (*) Concrete Median Slabs (****)"
- vii. "Construction of Type (*) Concrete Safety Medians (****)"
- viii. "Construction of Monolithic Type (*) Concrete Curb and Sidewalk (****)"
- ix. "Construction of Monolithic Type (*) Concrete Bull-noses"

* Specify the Concrete Type

** Specify either Reinforced or Plain-Dowelled

*** Specify Slip Form Paving if required

**** Specify referenced Standard Detail

5.1.2 Concrete Pavements for Early Opening

- 5.1.2.1 Construction of concrete pavements for early opening will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification. The unit price shall be reduced for deficiencies in pavement thickness as per Clause 5.3 of this Specification.

Items of Work:

- i. "Construction of 250 mm Type (*) Concrete Pavement for Early Opening (**)(**)"
- ii. "Construction of 230 mm Type (*) Concrete Pavement for Early Opening (**)(**)"
- iii. "Construction of 200 mm Type (*) Concrete Pavement for Early Opening (**)(**)"
- iv. "Construction of 150 mm Type (*) Concrete Pavement for Early Opening (**)(**)"

* Specify either Type 3 or Type 4

** Specify either Reinforced or Plain-Dowelled

*** Specify Slip Form Paving if required

5.1.3 Pavement Thickness Tolerances

- 5.1.3.1 At the option of the Contract Administrator, pavement thickness may be determined by coring pavement sections representing each day's pour and determining the pavement thickness by averaging the depth of the cores.

- 5.1.3.2 Pavement found deficient in thickness by more than five (5%) percent shall be paid for at the reduced price. The reduced price = P_R x contract price;

P_R is in % and T_D is in %

Where: $P_R = 100 - [(T_D - 5) / 5] \times 25$

Where: T_0 = thickness deficiency greater than or equal to 5%, up to 10%.

5.1.3.3 When the pavement thickness is deficient by more than ten (10%) percent and the judgement of the Contract Administrator is that the area of such deficiency should not be removed and replaced, payment will be fifty (50%) percent of Contract Unit Price.

5.1.3.4 The cost of initial cores will not be paid for by the Contractor. Additional cores requested by the Contractor to determine the extent of areas deficient in thickness, shall be paid for by the Contractor.

5.1.4 Concrete Curbs, Curb and Gutter, and Splash Strips

5.1.4.1 Construction of concrete curbs, curb and gutter, and splash strips will be paid for at the Contract Unit Price per metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work:

- i. "Construction of Type (*) Concrete Barrier Curb (**)"
- ii. "Construction of Type (*) Concrete Modified Barrier Curb (**)"
- iii. "Construction of Type (*) Concrete Curb and Gutter (**)"
- iv. "Construction of Type (*) Concrete Mountable Curb (**)"
- v. "Construction of Type (*) Concrete Lip Curb (**)"
- vi. "Construction of Type (*) Concrete Curb Ramp (**)"
- vii. "Construction of Type (*) Concrete Safety Curb (**)"
- viii. "Construction of Type (*) Concrete Splash Strips (***)"

* Specify the Concrete Type

** Specify height, type and Referenced Standard Detail

***Specify height, monolithic or separate, type, width, and referenced Standard Detail

5.1.4.2 No measurement or payment shall be made for supply or placement of bonding grout for concrete curbs.

5.1.4.3 Drilled curb ramp tie bars are to be paid in accordance with CW 3230.

5.1.5 Dowel Assemblies

5.1.5.1 Supply and installation of dowel assemblies will be paid for at the Contract unit Price per metre for "Supply and Installation of Dowel Assemblies", measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

5.1.6 Drilled Tie Bars and Dowels

5.1.6.1 Supply and installation shall be in accordance with clause 9.2.3 of CW 3310-R17.

5.2 BASIS OF PAYMENT FOR CW 3230-R8

5.2.1 Full Slab Replacement

5.2.1.1 Replacement of complete slabs will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, 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.

Items of Work: Slab Replacement

- i. 250mm Type (*) Concrete Pavement (**)
- ii. 230mm Type (*) Concrete Pavement (**)
- iii. 200mm Type (*) Concrete Pavement (**)
- iv. 150mm Type (*) Concrete Pavement (**)

* Specify the Concrete Type

** Specify either Reinforced or Plain-Dowelled

5.2.2 Full Depth Partial Slab Patches

5.2.2.1 Full-depth partial slab patches will be paid for at the Contract Unit Price per square metre for "Items of Work", listed here below, 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.

Items of Work: Partial Slab Patches

- i. 250mm Type (*) Concrete Pavement (**)
- ii. 230mm Type (*) Concrete Pavement (**)
- iii. 200mm Type (*) Concrete Pavement (**)
- iv. 150mm Type (*) Concrete Pavement (**)

* Specify the Concrete Type

** Specify class of patch

5.2.3 Dowels in Drilled Holes

5.2.3.1 Installation of dowels into hardened concrete will be paid for at the Contract Unit Price for "Drilled Dowels", 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.

*Specify diameter(s) of dowels

5.2.4 Tie Bars in Drilled Holes

5.2.4.1 Installation of tie bars into hardened concrete will be paid for at the Contract Unit Price for "Drilled Tie Bars" 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.

*Specify size(s) of tie bars.

5.3 MEASUREMENT AND PAYMENT FOR CW 3235-R9

5.3.1 Removal of Miscellaneous Concrete Slabs

5.3.1.1 Removal of miscellaneous concrete slabs will be measured on an area basis and paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below. The area to be paid for will be the total number of square metres of existing miscellaneous concrete slabs removed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Miscellaneous Concrete Slab Removal

- i.) Median Slab
- ii.) Monolithic Median Slab
- iii.) Safety Median
- iv.) 100mm Sidewalk
- v.) 150mm Reinforced Sidewalk
- vi.) Bullnose
- vii.) Monolithic Curb and Sidewalk

5.3.2 Installation of Miscellaneous Concrete Slabs

- 5.3.2.1 Installation of miscellaneous concrete slabs will be measured on an area basis and paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below. The area to be paid for will be the total number of square metres of miscellaneous concrete slabs installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Miscellaneous Concrete Slab Installation

- i.) Type (*) Concrete Median Slab**
- ii.) Type (*) Concrete Monolithic Median Slab**
- iii.) Type (*) Concrete Safety Median**
- iv.) Type (*) Concrete 100mm Sidewalk**
- v.) Type (*) Concrete 150mm Reinforced Sidewalk***
- vi.) Type (*) Concrete Bullnose**
- vii.) Type (*) Concrete Monolithic Curb and Sidewalk**

* Specify the Concrete Type

** referenced Standard Detail to be specified

*** renewal area to be specified

- 5.3.2.2 All costs for installing sign support clamps and constructing isolations for boulevard and median appurtenances will be included in the payment for the "Items of Work" listed for miscellaneous concrete slab installation.
- 5.3.2.3 All costs for excavation, sub-grade compaction, placement of sub-base, placement of leveling course and backfill materials, slabs installation and boulevard grading to the limits as identified in Section 3.2 of this specification will be included in the payment for the "Items of Work" listed for Installation of Miscellaneous Concrete Slabs.
- 5.3.2.4 Additional base course over and above leveling course material will be paid in accordance with CW 3110.

5.3.3 Miscellaneous Concrete Slab Renewal

- 5.3.3.1 Miscellaneous concrete slab renewal will be measured on an area basis and paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below. The area to be paid for will be the total number of square metres of existing miscellaneous concrete slabs removed and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Miscellaneous Concrete Slab Renewal

- i.) Type (*) Concrete Median Slab**
- ii.) Type (*) Concrete Monolithic Median Slab**
- iii.) Type (*) Concrete Safety Median**
- iv.) Type (*) Concrete 100mm Sidewalk* (***)

- v.) Type (*) Concrete 150mm Reinforced Sidewalk (***)
- vi.) Type (*) Concrete Bullnose**
- vii.) Type (*) Concrete Monolithic Curb and Sidewalk**

* Specify the Concrete Type

** referenced Standard Details to be specified.

*** renewal area to be specified.

- a.) Less than 5 sq. m
- b.) 5 sq. m to 20 sq. m
- c.) Greater than 20 sq. m

5.3.3.2 All costs for the slab removal, excavation, sub-grade compaction, placement of leveling course and backfill materials, slabs installation and boulevard grading to the limits as identified in Section 3.3 of this specification will be included in the payment for the "Items of Work" listed for Miscellaneous Concrete Slab Renewal.

5.3.3.3 Additional base course over and above leveling course material will be paid in accordance with CW 3110.

5.3.3.4 All costs for installing sign support clamps and constructing isolations for boulevard and median appurtenances will be included in the payment for the "Items of Work" listed for Miscellaneous Concrete Slab Renewal.

5.3.4 Adjustment of Precast Concrete Sidewalk Blocks

5.3.4.1 Adjustment of precast concrete sidewalk blocks will be measured on an area basis and paid at the Contract Unit Price per square metre for "Adjustment of Precast Sidewalk Blocks". The area to be paid for will be the total number of square metres of precast concrete sidewalk blocks adjusted to grade in accordance with this specification, accepted and measured by the Contract Administrator.

5.3.4.2 No measurement or payment will be made for any precast sidewalk blocks damaged or lost during replacement.

5.3.5 Supply of Precast Concrete Sidewalk Blocks

5.3.5.1 Supply of precast concrete sidewalk blocks will be measured on an area basis and paid at the Contract Unit Price per square metre for "Supply of Precast Sidewalk Blocks". The area to be paid for will be the total number of square metres of precast concrete sidewalk blocks supplied in accordance with this specification, accepted and measured by the Contract Administrator.

5.3.6 Removal of Precast Concrete Sidewalk Blocks

5.3.6.1 Removal of precast concrete sidewalk blocks will be measured on an area basis and paid at the Contract Unit Price per square metre for "Removal of Precast Sidewalk Blocks". The area to be paid for will be the total number of square metres of precast concrete sidewalk blocks removed in accordance with this specification, accepted and measured by the Contract Administrator.

5.4 **MEASUREMENT AND PAYMENT FOR CW 3240-R10**

5.4.1 Concrete Curb Removal

5.4.1.1 Concrete curb removal will be measured on a length basis and paid for at the Contract Unit Price per metre for the "Items of Work" listed here below. The length to be paid for will be the total number of metres of concrete curb removed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Concrete Curb Removal

- i.) Barrier*
- ii.) Modified Barrier*
- iii.) Curb and Gutter
- iv.) Mountable Curb
- v.) Lip Curb
- vi.) Modified Lip Curb
- vii.) Curb Ramp
- viii.) Safety Curb
- ix.) Splash Strips**

* Integral or Separate to be specified.

** Monolithic or Separate.

5.4.1.2 Removal of existing asphalt material immediately in front of the curb that is required for installation will be included in the payment for the "Items of Work" listed for Concrete Curb Removal when the asphalt overlay is not identified to be removed.

5.4.2 Concrete Curb Installation

5.4.2.1 Concrete curb installation will be measured on a length basis and paid for at the Contract Unit Price per metre for the "Items of Work" listed here below. The length to be paid for will be the total number of metres of concrete curb or splash strip installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Concrete Curb Installation

- i.) Type (*) Concrete Barrier**
- ii.) Type (*) Concrete Modified Barrier**
- iii.) Type (*) Concrete Curb and Gutter**
- iv.) Type (*) Concrete Mountable Curb**
- v.) Type (*) Concrete Lip Curb**
- vi.) Type (*) Concrete Modified Lip Curb**
- vii.) Type (*) Concrete Curb Ramp**
- viii.) Type (*) Concrete Safety Curb**
- ix.) Type (*) Concrete Splash Strips***

* Specify the Concrete Type

** reveal height, type and reference to Standard Detail to be specified.

*** reveal height, monolithic or separate, type, width and reference to Standard Detail to be specified.

5.4.2.2 The placement and compaction of asphalt material immediately in front of the curb will be included in the payment for the "Items of Work" listed for Concrete Curb Installation when the asphalt overlay is not identified to be removed.

5.4.2.3 No payment will be made for leveling course.

5.4.2.4 Base course will be paid in accordance with CW 3110.

5.4.2.5 Supply and placement of bonding grout for concrete curbs will not be measured for payment.

5.4.3 Concrete Curb Renewal

5.4.3.1 Concrete curb renewal will be measured on a length basis and paid for at the Contract Unit Price

per metre for the "Items of Work" listed here below. The length to be paid for will be the total number of metres of concrete curb or splash strip removed and installed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Concrete Curb Renewal

- i.) Type (*) Concrete Barrier** (***)
- ii.) Type (*) Concrete Modified Barrier**
- iii.) Type (*) Concrete Curb and Gutter** (***)
- iv.) Type (*) Concrete Mountable Curb**
- v.) Type (*) Concrete Lip Curb**
- vi.) Type (*) Concrete Modified Lip Curb**
- vii.) Type (*) Concrete Curb Ramp**
- viii.) Type (*) Concrete Safety Curb**
- ix.) Type (*) Concrete Splash Strips (***) (****)

* Specify the Concrete Type

* reveal height, type and referenced Standard Detail to be specified.

** renewed length to be specified.

- a.) Less than 3 m
- b.) 3 m to 30 m
- c.) Greater than 30 m

*** reveal height, monolithic or separate, type, width and reference to Standard Detail to be specified.

- 5.4.3.2 All costs for removal, excavation, sub-grade compaction, leveling course and backfill materials, curb installation and boulevard grading to the limits as identified in Section 3.4 of this specification will be included in the payment for the "Items of Work" listed for Concrete Curb Renewal.
- 5.4.3.3 Base course will be paid in accordance with CW 3110.
- 5.4.3.4 For installation lengths greater than 30 metres, the length will include breaks for approaches, isolations or fixed obstacles such as light standards or poles.
- 5.4.3.5 Curb ramp tie bars are to be paid in accordance with CW 3230.
- 5.4.3.6 Supply and placement of bonding grout for concrete curbs will not be measured for payment.

5.5 BASIS OF PAYMENT FOR CW 3325-R5

5.5.1 Concrete Sidewalks

- 5.5.1.1 Construction of concrete sidewalks will be paid for at the Contract Unit Price per square metre for "100 mm Type (*) Concrete Sidewalk", 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.

5.5.2 Leveling Course

- 5.5.2.1 No payment shall be made for leveling course.

5.5.3 Excavation, Sub-grade Compaction, and Base Course

- 5.5.3.1 Excavation, sub-grade compaction, and additional base course shall be paid for in accordance with Specification CW 3110.