



THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 259-2014

BRADY ROAD LANDFILL ACCESS ROAD AND DISPOSAL CELL

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Appendix A

Brady Road 4R Depot Fill

PART B - BIDDING PROCEDURES

B1. CONTRACT TITLE

B1.1 BRADY ROAD LANDFILL ACCESS ROAD AND DISPOSAL CELL

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon, Winnipeg time, April 25, 2014.

B2.2 Bids determined by the Manager of Materials to have been received later than the Submission Deadline will not be accepted and will be returned upon request.

B2.3 The Contract Administrator or the Manager of Materials may extend the Submission Deadline by issuing an addendum at any time prior to the time and date specified in B2.1.

B3. SITE INVESTIGATION

B3.1 The Contract Administrator or an authorized representative will be hosting a Site Investigation at 1:00 pm Winnipeg Time on April 10, 2014 to provide Bidders access to the Site.

(a) Bidders are requested to register for the Site Investigation by contacting the Contract Administrator identified in D3.

(b) The meeting location shall be at the Brady Road Administration Building.

B3.2 The Site Investigation is not mandatory, but Bidders are strongly advised to attend.

B3.3 The Bidder shall not be entitled to rely on any information or interpretation received at the Site investigation unless that information or interpretation is the Bidder's direct observation, or is provided by the Contract Administrator in writing.

B4. ENQUIRIES

B4.1 All enquiries shall be directed to the Contract Administrator identified in D3.1.

B4.2 If the Bidder finds errors, discrepancies or omissions in the Bid Opportunity, or is unsure of the meaning or intent of any provision therein, the Bidder shall notify the Contract Administrator of the error, discrepancy or omission, or request a clarification as to the meaning or intent of the provision at least five (5) Business Days prior to the Submission Deadline.

B4.3 Responses to enquiries which, in the sole judgment of the Contract Administrator, require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator to all Bidders by issuing an addendum.

B4.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.

B4.5 The Bidder shall not be entitled to rely on any response or interpretation received pursuant to B4 unless that response or interpretation is provided by the Contract Administrator in writing.

B5. ADDENDA

B5.1 The Contract Administrator may, at any time prior to the Submission deadline, issue addenda correcting errors, discrepancies or omissions in the Bid Opportunity, or clarifying the meaning or intent of any provision therein.

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.

- B5.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/bidopp.asp>
- B5.2.2 The Bidder is responsible for ensuring that he/she has received all addenda and is advised to check the Materials Management Division website for addenda regularly and shortly before the Submission Deadline, as may be amended by addendum.
- B5.3 The Bidder shall acknowledge receipt of each addendum in Paragraph 10 of Form A: Bid. Failure to acknowledge receipt of an addendum may render a Bid non-responsive.
- B6. SUBSTITUTES**
- B6.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.
- 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, only to the Bidder who requested approval of the substitute.
- B6.6.1 The Bidder requesting and obtaining the approval of a substitute shall be entirely 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 B15.

- 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.
- B6.10 Notwithstanding B6.2 to B6.9, in accordance with B7.6, deviations inconsistent with the Bid Opportunity document shall be evaluated in accordance with B15.1(a).

B7. BID COMPONENTS

- B7.1 The Bid shall consist of the following components:
- (a) Form A: Bid;
 - (b) Form B: Prices;
 - (c) Bid Security;
 - (i) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;
- B7.2 Further to B7.1, the Bidder should include the written correspondence from the Contract Administrator approving a substitute in accordance with B6.
- B7.3 All components of the Bid shall be fully completed or provided, and submitted by the Bidder no later than the Submission Deadline, with all required entries made clearly and completely, to constitute a responsive Bid.
- B7.4 The Bid shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.
- B7.4.1 Samples or other components of the Bid which cannot reasonably be enclosed in the envelope may be packaged separately, but shall be clearly marked with the Bid Opportunity number, the Bidder's name and address, and an indication that the contents are part of the Bidder's Bid.
- B7.5 Bidders are advised not to include any information/literature except as requested in accordance with B7.1.
- B7.6 Bidders are advised that inclusion of terms and conditions inconsistent with the Bid Opportunity document, including the General Conditions, will be evaluated in accordance with B15.1(a).
- B7.7 Bids submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.
- B7.8 Bids shall be submitted to:
- The City of Winnipeg
Corporate Finance Department
Materials Management Division
185 King Street, Main Floor
Winnipeg MB R3B 1J1

B8. BID

- B8.1 The Bidder shall complete Form A: Bid, making all required entries.
- B8.2 Paragraph 2 of Form A: Bid shall be completed in accordance with the following requirements:
- (a) if the Bidder is a sole proprietor carrying on business in his/her own name, his/her name shall be inserted;
 - (b) if the Bidder is a partnership, the full name of the partnership shall be inserted;
 - (c) if the Bidder is a corporation, the full name of the corporation shall be inserted;

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

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, the Bidder shall identify a contact person who is authorized to represent the Bidder for purposes of the Bid.

B8.4 Paragraph 12 of Form A: Bid shall be signed in accordance with the following requirements:

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

B8.4.1 The name and official capacity of all individuals signing Form A: Bid should be printed 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.

B9.2 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).

B10. QUALIFICATION

B10.1 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.

B10.2 The Bidder and any proposed Subcontractor (for the portion of the Work proposed to be subcontracted to them) shall:

- (a) be responsible and not be suspended, debarred or in default of any obligations to the City. A list of suspended or debarred individuals and companies is available on the

Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgmt/debar.stm>

- B10.3** 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); and
 - (d) have demonstrated an ability to install flexible liners by having previously successfully installed, in landfill structures, a minimum of 465,000 square metres (5,000,000 square feet) of similar type flexible liners, and
 - (e) Submit to the City a list of completed liner installations for landfill structures including the client name, date of installation, size, and type of material installed, and
 - (f) Have an onsite liner supervisor assigned full time to this work who has directed the installation of a minimum of 93,000 square metres (1,000,000 square feet) of similar type flexible liner in landfill or pond structures.
- B10.4** Further to B10.3(c), the Bidder shall, within five (5) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder/Subcontractor has a workplace safety and health program meeting the requirements of The Workplace Safety and Health Act (Manitoba), by providing:
- (a) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association or by the Manitoba Heavy Construction Association's Safety, Health and Environment 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/matmgmt/>)
- B10.5** The Bidder shall submit, within three (3) Business Days of a request by the Contract Administrator, proof satisfactory to the Contract Administrator of the qualifications of the Bidder and of any proposed Subcontractor.
- B10.6** The Bidder shall provide, on the request of the Contract Administrator, full access to any of the Bidder's equipment and facilities to confirm, to the Contract Administrator's satisfaction, that the Bidder's equipment and facilities are adequate to perform the Work.

B11. BID SECURITY

- B11.1** The Bidder shall provide bid security in the form of:
- (a) a bid bond, in the amount of at least ten percent (10%) of the Total Bid Price, and agreement to bond of a company registered to conduct the business of a surety in Manitoba, in the form included in the Bid Submission (Form G1: Bid Bond and Agreement to Bond); or
 - (b) an irrevocable standby letter of credit, in the amount of at least ten percent (10%) of the Total Bid Price, and undertaking issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form included in the Bid Submission (Form G2: Irrevocable Standby Letter of Credit and Undertaking); or
 - (c) a certified cheque or draft payable to "The City of Winnipeg", in the amount of at least fifty percent (50%) of the Total Bid Price, drawn on a bank or other financial institution registered to conduct business in Manitoba.

- B11.1.1 If the Bidder submits alternative bids, the bid security shall be in the amount of the specified percentage of the highest Total Bid Price submitted.
- B11.1.2 All signatures on bid securities shall be original.
- B11.1.3 The Bidder shall sign the Bid Bond.
- B11.1.4 The Surety shall sign and affix its corporate seal on the Bid Bond and the Agreement to Bond.
- B11.2 The bid security of the successful Bidder and the next two lowest evaluated responsive and responsible Bidders will be released by the City when a Contract for the Work has been duly executed by the successful Bidder and the performance security furnished as provided herein. The bid securities of all other Bidders will be released when a Contract is awarded.
- B11.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B11.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.
- B11.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.
- B11.3 The bid securities of all Bidders will be released by the City as soon as practicable following notification by the Contract Administrator to the Bidders that no award of Contract will be made pursuant to the Bid Opportunity.

B12. OPENING OF BIDS AND RELEASE OF INFORMATION

- B12.1 Bids will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Division, or in such other office as may be designated by the Manager of Materials.
 - B12.1.1 Bidders or their representatives may attend.
 - B12.1.2 Bids determined by the Manager of Materials, or his/her designate, to not include the bid security specified in B11 will not be read out.
- B12.2 Following the submission deadline, the names of the Bidders and their Total Bid Prices (unevaluated, and pending review and verification of conformance with requirements) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B12.3 After award of Contract, the name(s) of the successful Bidder(s) and the Contract amount(s) will be available on the Closed Bid Opportunities (or Public/Posted Opening & Award Results) page at The City of Winnipeg, Corporate Finance, Materials Management Division website at <http://www.winnipeg.ca/matmgt/>
- B12.4 The Bidder is advised that any information contained in any Bid may be released if required by City policy or procedures, by The Freedom of Information and Protection of Privacy Act (Manitoba), by other authorities having jurisdiction, or by law.

B13. IRREVOCABLE BID

- B13.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.
- B13.2 The acceptance by the City of any Bid shall not release the Bids of the next two lowest evaluated responsive Bidders and these Bidders shall be bound by their Bids on such Work until a Contract for the Work has been duly executed and the performance security furnished as herein provided, but any Bid shall be deemed to have lapsed unless accepted within the time period specified in Paragraph 11 of Form A: Bid.

B14. WITHDRAWAL OF BIDS

- B14.1 A Bidder may withdraw his/her Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.
- B14.1.1 Notwithstanding C23.3, the time and date of receipt of any notice withdrawing a Bid shall be the time and date of receipt as determined by the Manager of Materials.
- B14.1.2 The City will assume that any one of the contact persons named in Paragraph 3 of Form A: Bid or the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid, and only such person, has authority to give notice of withdrawal.
- B14.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials will:
- (a) retain the Bid until after the Submission Deadline has elapsed;
 - (b) open the Bid to identify the contact person named in Paragraph 3 of Form A: Bid and the Bidder's authorized representatives named in Paragraph 12 of Form A: Bid; and
 - (c) if the notice has been given by any one of the persons specified in B14.1.3(b), declare the Bid withdrawn.
- B14.2 A Bidder who withdraws his/her Bid after the Submission Deadline but before his/her Bid has been released or has lapsed as provided for in B13.2 shall be liable for such damages as are imposed upon the Bidder by law and subject to such sanctions as the Chief Administrative Officer considers appropriate in the circumstances. The City, in such event, shall be entitled to all rights and remedies available to it at law, including the right to retain the Bidder's bid security.

B15. EVALUATION OF BIDS

- B15.1 Award of the Contract shall be based on the following bid evaluation criteria:
- (a) compliance by the Bidder with the requirements of the Bid Opportunity, or acceptable deviation therefrom (pass/fail);
 - (b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B10 (pass/fail);
 - (c) Total Bid Price;
 - (d) economic analysis of any approved alternative pursuant to B6.
- B15.2 Further to B15.1(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.
- B15.3 Further to B15.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his/her Bid or in other information required to be submitted, that he/she is responsible and qualified.
- B15.4 Further to B15.1(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 adjusted, if necessary, as follows:
- (a) if the lowest evaluated responsive Bid submitted by a responsible and qualified Bidder is within the budgetary provision for the Work, no adjustment will be made to the Total Bid Price; or
 - (b) if the lowest evaluated responsive Bid submitted by a responsible and qualified Bidder exceeds the budgetary provision for the Work, the Total Bid Prices of all responsive Bids submitted by responsible and qualified Bidders will be adjusted by progressively deducting item(s) A.12, A.11, A.8.1 A.7.1, and A.7.2 in the order listed, until a Total Bid Price within the budgetary provision is achieved.

B15.4.1 If there is any discrepancy between the Total Bid Price written in figures, the Total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.

B15.4.2 Further to B15.1(a), in the event that a unit price is not provided on Form B: Prices, the City will determine the unit price by dividing the Amount (extended price) by the approximate quantity, for the purposes of evaluation and payment.

B16. AWARD OF CONTRACT

B16.1 The City will give notice of the award of the Contract or will give notice that no award will be made.

B16.2 The City will have no obligation to award a Contract to a Bidder, even though one or all of the Bidders are determined to be responsible and qualified, and the Bids are determined to be responsive.

B16.2.1 Without limiting the generality of B16.2, 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.

B16.3 Where an award of Contract is made by the City, the award shall be made to the responsible and qualified Bidder submitting the lowest evaluated responsive Bid, in accordance with B15.

B16.3.1 Following the award of contract, a Bidder will be provided with information related to the evaluation of his/her Bid upon written request to the Contract Administrator.

PART C - GENERAL CONDITIONS

C0. GENERAL CONDITIONS

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

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

D1.1 In addition to the General Conditions for Construction, these Supplemental Conditions are applicable to the Work of the Contract.

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of:

- (a) Access road construction:
 - (i) An approximately 1,535 metre long by 10 metre wide gravel access road and associated works (ditches and dike).
- (b) Disposal cell construction:
 - (i) 230,000 Cubic metres of excavation and fill placement.
 - (ii) 62,650 Square metres of 1.5mm HDPE Geomembrane.
 - (iii) 2,447 Metres of leachate piping.
 - (iv) 20,500 Square metres of Geocomposite.
 - (v) 22,000 Cubic metres of sand drainage layer.

D2.2 The major components of the Work are as follows:

- (a) Access road works:
 - (i) Excavation
 - (ii) Compacting of existing subgrade
 - (iii) Placement of geotextiles
 - (iv) Placement of subbase and base course materials
 - (v) Shaping shoulders / ditch to accommodate water drainage
- (b) Disposal cell works:
 - (i) Clearing and grubbing
 - (ii) Soil stripping and stock piling
 - (iii) Excavating, embankment and backfilling
 - (iv) Recompacted subgrade layer installation
 - (v) Supply and installation of 60mil HDPE Geomembrane
 - (vi) Supply and installation of Geocomposite
 - (vii) Leachate collection system and drainage layer
 - (viii) Recovered glass liner and leachate collection system protection layer
 - (ix) Strip vegetation and subsoil from 4R Depot site and place on landfill cover
 - (x) Place and compact fill to grade at 4R Depot site
 - (xi) Placement of excess excavated soil for final landfill cover

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is Tetra Tech, represented by:

Brian McIntosh, P.Eng.
Civil Engineer

Telephone No. 204-954-6876
Facsimile No. 204-988-0546

D3.2 At the pre-construction meeting, Brian McIntosh, P.Eng. will identify additional personnel representing the Contract Administrator and their respective roles and responsibilities for the Work.

D3.3 Bid Submissions must be submitted to the address in B7.8

D4. CONTRACTOR'S SUPERVISOR

D4.1 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.

D4.2 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 D4.1 or an alternate can be contacted twenty-four (24) hours a day to respond to an emergency.

D5. OWNERSHIP OF INFORMATION, CONFIDENTIALITY AND NON DISCLOSURE

D5.1 The Contract, all deliverables produced or developed, and information provided to or acquired by the Contractor are the property of the City and shall not be appropriated for the Contractors own use, or for the use of any third party.

D5.2 The Contractor shall not make any public announcements or press releases regarding the Contract, without the prior written authorization of the Contract Administrator.

D5.3 The following shall be confidential and shall not be disclosed by the Contractor to the media or any member of the public without the prior written authorization of the Contract Administrator;

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

D5.4 A Contractor who violates any provision of D5 may be determined to be in breach of Contract.

D6. NOTICES

D6.1 Except as provided for in C23.2.2, all notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the Contractor shall be sent to the address or facsimile number identified by the Contractor in Paragraph 2 of Form A: Bid.

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 at the facsimile number identified in D3.1.

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 five (5) complete sets of the Bid Opportunity. If the Contractor requires additional sets of the Bid Opportunity, they will be supplied to him/her at cost.

SUBMISSIONS

D8. AUTHORITY TO CARRY ON BUSINESS

- D8.1 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.

D9. SAFE WORK PLAN

- D9.1 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.
- D9.2 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. INSURANCE

- D10.1 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.
- D10.2 Deductibles shall be borne by the Contractor.
- D10.3 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.
- D10.4 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.

D11. PERFORMANCE SECURITY

- D11.1 The Contractor shall provide and maintain performance security until the expiration of the warranty period in the form of:
- (a) a performance bond of a company registered to conduct the business of a surety in Manitoba, in the form attached to these Supplemental Conditions (Form H1: Performance Bond), in the amount of fifty percent (50%) of the Contract Price; or
 - (b) an irrevocable standby letter of credit issued by a bank or other financial institution registered to conduct business in Manitoba and drawn on a branch located in Winnipeg, in the form attached to these Supplemental Conditions (Form H2: Irrevocable Standby Letter of Credit), in the amount of fifty percent (50%) of the Contract Price; or
 - (c) a certified cheque or draft payable to "The City of Winnipeg", drawn on a bank or other financial institution registered to conduct business in Manitoba, in the amount of fifty percent (50%) of the Contract Price.
- D11.1.1 Where the performance security is in the form of a certified cheque or draft, it will be deposited by the City. The City will not pay any interest on certified cheques or drafts furnished as performance security.
- D11.2 If the bid security provided in his/her Bid was not a certified cheque or draft pursuant to B11.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site and in no event later than the date specified in the C4.1 for the return of the executed Contract.

D12. SUBCONTRACTOR LIST

- D12.1 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.

D13. DETAILED WORK SCHEDULE

- D13.1 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.
- D13.2 The detailed work schedule shall consist of a Gantt chart for the Work acceptable to the Contract Administrator.
- D13.3 Further to D13.2, 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.

SCHEDULE OF WORK

D14. COMMENCEMENT

- D14.1 The Contractor shall not commence any Work until he/she is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.
- D14.2 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 D8;
 - (ii) evidence of the workers compensation coverage specified in C6.15;

- (iii) the twenty-four (24) hour emergency response phone number specified in D4.2.
 - (iv) the Safe Work Plan specified in D9;
 - (v) evidence of the insurance specified in D10;
 - (vi) the performance security specified in D11;
 - (vii) the subcontractor list specified in D12; and
 - (viii) the detailed work schedule specified in D13.
- (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.

D14.3 The Contractor shall commence the Work on the Site within seven (7) Working Days of receipt of the letter of intent.

D14.4 The City intends to award this Contract by June 20, 2014.

D15. RESTRICTED WORK HOURS

D15.1 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.

D16. WORK BY OTHERS

D16.1 Work by others on or near the Work Site will include but not necessarily be limited to:

- (a) Daily operations of Brady Road Landfill will be ongoing during construction. Vehicle traffic and heavy machinery operation may be encountered adjacent to the project site.

D17. SUBSTANTIAL PERFORMANCE

D17.1 The Contractor shall achieve Substantial Performance by November 15, 2014.

D17.2 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.

D17.3 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.

D18. TOTAL PERFORMANCE

D18.1 The Contractor shall achieve Total Performance by November 30, 2014.

D18.2 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.

D18.3 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.

D19. LIQUIDATED DAMAGES

- D19.1 If the Contractor fails to achieve 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) Substantial Performance – one thousand dollars (\$1,800);
 - (b) Total Performance – five hundred dollars (\$500).
- D19.2 The amounts specified for liquidated damages in D19.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not achieve Substantial Performance or Total Performance by the days fixed herein for same.
- D19.3 The City may reduce any payment to the Contractor by the amount of any liquidated damages assessed.

CONTROL OF WORK

D20. JOB MEETINGS

- D20.1 Regular weekly job meetings will be held at the Site. These meetings shall be attended by a minimum of one representative of the Contract Administrator, one representative of the City and one representative of the Contractor. Each representative shall be a responsible person capable of expressing the position of the Contract Administrator, the City and the Contractor respectively on any matter discussed at the meeting including the Work schedule and the need to make any revisions to the Work schedule. The progress of the Work will be reviewed at each of these meetings.
- D20.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he/she deems it necessary.

D21. OFFICE FACILITIES

- D21.1 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, one table 3m x 1.2m, one four drawer legal size filing cabinet, and a minimum of 8 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.
 - (i) The building shall be supplied with high speed internet connections.
- D21.2 The Contractor shall be responsible for all installation and removal costs, all operating costs, and the general maintenance of the office facilities.

D21.3 The office facilities will be provided from the date of the commencement of the Work to the date of Total Performance.

D22. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D22.1 Further to C6.24, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

MEASUREMENT AND PAYMENT

D23. PAYMENT

D23.1 Further to C12, the City may at its option pay the Contractor by direct deposit to the Contractor's banking institution.

WARRANTY

D24. WARRANTY

D24.1 Notwithstanding C13.2, the warranty period shall begin on the date of Total Performance and shall expire one (1) year thereafter for associated underground works, and one (1) year road and dike construction and one (1) year liner geomembrane, unless extended pursuant to C13.2.1 or C13.2.2, in which case it shall expire when provided for thereunder.

FORM H1: PERFORMANCE BOND
(See D11)

KNOW ALL MEN BY THESE PRESENTS THAT

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

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

_____ dollars (\$_____)

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

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

BID OPPORTUNITY NO. 259-2014

BRADY ROAD LANDFILL ACCESS ROAD AND DISPOSAL CELL

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

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

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

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

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

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

_____ day of _____, 20_____ .

SIGNED AND SEALED
in the presence of:

(Witness as to Principal if no seal)

(Name of Principal)

Per: _____ (Seal)

Per: _____

(Name of Surety)

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

**FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)**
(See D11)

(Date)

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

RE: PERFORMANCE SECURITY – BID OPPORTUNITY NO. 259-2014

BRADY ROAD LANDFILL ACCESS ROAD AND DISPOSAL CELL

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

(Name of Contractor)

(Address of Contractor)

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

_____ Canadian dollars.

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

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

Partial drawings are permitted.

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

(Address)

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

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

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

(Date)

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

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

This credit is subject to the Uniform Customs and Practice for Documentary Credit (1993 Revision), International Chamber of Commerce Publication Number 500.

(Name of bank or financial institution)

Per: _____
(Authorized Signing Officer)

Per: _____
(Authorized Signing Officer)

FORM J: SUBCONTRACTOR LIST
(See D12)

BRADY ROAD LANDFILL ACCESS ROAD AND DISPOSAL CELL

<u>Portion of the Work</u>	<u>Name</u>	<u>Address</u>
ROAD WORKS:		
Supply of Materials:		
Geotextile		
Surfacing Material & Sub-Base		
Installation/Placement:		
Geotextile		
Surfacing Material & Sub-Base		
DISPOSAL CELL WORKS:		
Supply of Materials:		
Geotextile		
Geomembrane		
Installation/Placement:		
Geotextile		
Geomembrane		

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS AND DRAWINGS

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

<u>Drawing No.</u>	<u>Drawing Name/Title</u>	<u>Drawing (Original) Sheet Size</u>
-----	Cover	A1
C1000	Overall Site Plan	A1
C2001	New Perimeter Landfill Road - Charette Road to Station 2+70	A1
C2002	New Perimeter Landfill Road – Station 2+70 to Station 5+50	A1
C2003	New Perimeter Landfill Road – Station 5+50 to Station 8+30	A1
C2004	New Perimeter Landfill Road – Station 8+30 to Station 11+10	A1
C2005	New Perimeter Landfill Road – Station 11+10 to Station 13+70	A1
C2006	New Perimeter Landfill Road – Station 13+70 to Station 15+35	A1
C3001	New Collector Ditch – Station 7+34 to Station 9+80	A1
C3002	New Collector Ditch – Station 9+80 to Station 12+60	A1
C3003	New Collector Ditch – Station 12+60 to Station 15+40	A1
C3004	New Collector Ditch – Station 15+40 to Station 18+20	A1
C4001	New Disposal Cell Site Plan	A1
C4002	Disposal Cell Details	A1
C4003	Disposal Cell Details	A1
C4004	Disposal Cell Details	A1
C4005	Leachate Pipe Plan / Profile	A1
C4006	Leachate Pipe Plan / Profile	A1
C4007	Disposal Cell Cross Sections	A1
C4008	Disposal Cell Cross Sections	A1
C4009	Fill Distribution	A1

E2. TRAFFIC CONTROL

- E2.1 Further to clauses 3.6 and 3.7 of CW 1130:
- (a) In accordance with the Manual of Temporary Traffic Control in Work Areas on City Streets, the Contractor (“Agency” in the manual) shall make arrangements with the Traffic Services Branch of the City of Winnipeg to place all temporary regulatory signs. The Contractor shall bear all costs associated with the placement of temporary traffic control devices by the Traffic Services Branch of the City of Winnipeg in connection with the works undertaken by the Contractor.

E3. TRAFFIC MANAGEMENT

E3.1 Further to clause 3.7 of CW 1130:

E3.1.1 Maintain a minimum of one lane of traffic eastbound and one lane of traffic westbound on Charette Road for the duration of the Project.

E3.1.2 Access to the existing gravel road used by the on-site Contractor that intersects the new access road shall be maintained at all times while the on-site Contractor is working.

E3.1.3 Pedestrian and ambulance/emergency vehicle access to the site must be maintained at all times.

E3.1.4 No interference to vehicles accessing the active landfill site will be allowed.

E4. PEDESTRIAN SAFETY

E4.1 During the project, as directed by the Contract Administrator, a temporary snow fence shall be installed around any deep excavations or similar conditions that present danger to the public. The Contractor shall be responsible for maintaining the snow fence in a proper working condition. No measurement for payment shall be made for this work. It is not anticipated that fencing will be required around the proposed cell excavation as long as design slopes are maintained during construction.

E5. WATER OBTAINED FROM THE CITY

E5.1 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.

E6. EXCAVATION FILL PLACEMENT AND ROADWAY CONSTRUCTION

E6.1 Description

E6.1.1 Further to Specification CW 3110-R17, this Specification shall cover the excavation of in-situ material to facilitate road and dike construction, fill placement at the 4R Depot, stockpile construction and the placement of landfill cover material.

E6.2 Construction Methods

E6.2.1 Strip topsoil from under proposed roadway and dike locations. Strip root zone and organic material from the 4R Depot site and the disposal cell. Load, haul and place road, dike disposal cell and 4R Depot site top soil in one 100 mm layer at location shown on the Drawing F1 in Appendix A.

E6.2.2 Sub-grade compaction required under roadway and dikes constructed on native soil.

E6.2.3 Excavated material from landfill cells shall be used as:

- (a) Suitable material used to construct roadway sub-grades and dike.
- (b) Stockpile approximately 3,000 m³ stockpile of suitable material at location south of disposal cells as shown on the Drawings.
- (c) Load, haul and place approximately 19,000 cubic metres of suitable material at 4R Depot site.
- (d) Surplus excavated material, after roadway, dike, 4R Depot fill and stockpiling shall be used as cover material for existing landfill as shown on the Drawings.
 - (i) Roadway sub-grade (on native soil) and dike shall be constructed with suitable site material placed in maximum lifts of 200mm and compacted to a minimum 95% Standard Proctor.
 - (ii) Roadway sub-grade over existing landfill to be constructed by placing geotextile over landfill. A geogrid to be placed over geotextile as directed by the Contract Administrator. Place and

compact an initial 600mm lift of suitable site material to bridge the landfill. Construct subsequent lifts in accordance with E6.2.3.i

- (iii) Place individual granular sub-base and granular surfacing materials in one lift. Compact 100mm sub-base material in accordance with CW3110. Compact 50mm sub-base and granular surfacing material to 100% Standard Proctor.
- (iv) Excavated material stockpile to be constructed at locations shown on the Drawing.
- (v) Excavated material used as landfill cover material to be placed to a thickness of 900mm. No compaction standard is specified; however, placed material to be compacted and consolidated to provide surface capable of shedding water to the satisfaction of the Contract Administrator.
- (vi) Place suitable site material at 4R Depot site in 200mm lifts and compact to 95% Standard Proctor.

E6.2.4 Stockpile Construction with Excavated Material

- (a) Stockpile will be located on-site as shown on the drawings.
- (b) Stockpile shall be constructed with two access points, one at each end, and with side slopes no steeper than 2 to 1 slopes.
- (c) Stockpile, must have the topsoil removed from the footprint of the stockpile prior to stockpile construction.
- (d) Stockpile must be free of trees and roots and other clearing and grubbing debris
- (e) Clearing and grubbing debris will be created separately from the stockpile and shall not be mixed into the stockpile. Adequate clearing and grubbing piles will be determined by the Contract Administrator.
- (f) Stockpile shall be regraded before completion of the work.

E6.3 Measurement and Payment

E6.3.1 Excavation and Fill Placement

E6.3.1 Excavation will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for the "items of work" listed below. The volume of excavation will be measured by cross-sections of the original ground surface and computed by the method of Average End Areas. Only material excavated within the limits of excavation will be included in the payment for "Excavation".

- (a) Items of Work:
 - i. Roadway and dike construction.
 - ii. Stockpile.
 - iii. 4R Depot site.
 - iv. Landfill cover.

E6.3.2 No additional payment will be made for loading, hauling, placing and compacting the excavated material.

E7. GENERAL REQUIREMENTS

E7.1 Related Work

E7.1.1 Section E14 – Clay Subgrade Preparation

E7.2 Execution

E7.2.1 Unloading of Geosynthetic Materials when Delivered to Site

- (a) Supply of equipment and labour for the offloading of geosynthetic materials as they arrive at site, including geomembrane, geocomposite, geotextile, and HDPE leachate pipes and elbows. Care must be taken not to damage material while offloading. During delivery and storage, protect geotextiles from rainfall, direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents. Materials to be stored at location to be determined for ease of access and minimal impact to site traffic and other activities. Materials must be stored so that they are elevated from the ground at least 200 mm. Work under this section will not be measured.

E7.2.2 Seeding

Further to Specification CW 3520-R7, this Specification shall apply to and be part of this Specification

- (a) Notify Contract Administrator 48 hours prior to start of Work.
- (b) Inspect site with Contract Administrator.

E7.2.3 Temporary Haul/Access Road Construction

- (a) Work including materials and labour to construct and remove haul roads from the Work to the stockpiles will not be measured.
- (b) Temporary haul roads will be removed upon completion of the Work. The areas of the temporary roads shall be restored to better or equal than existing condition before the construction and approved by the Contract Administrator.

E8. NON-WOVEN GEOTEXTILES

E8.1 General

This section describes the requirements for the supply and installation of the non-woven geotextile within the leachate collection trench and sump of the disposal cell, and forms part of the installation of the leachate collection piping system requirements.

E8.1.1 Related Work

- (a) Section E9 – Geocomposite
- (b) Section E10 – Geomembrane
- (c) Section E11 – Leachate Collection System

E8.1.2 Mill Certificates

- (a) At least two weeks prior to start of work, furnish Contract Administrator with copies of mill test data and certificate that geotextile delivered to job site meets requirements of this section.

E8.1.3 Delivery and Storage

- (a) During delivery and storage, protect geotextiles from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents.

E8.1.4 Measurement for Payment

- (a) Work under this section is to include all direct costs for all labour, materials and equipment required for the supply and installation of the non-woven geotextile, including all work necessary and incidental thereto for which separate payment is not elsewhere provided. Supply and installation of non-woven geotextile shall be measured and paid on a square metre basis.
- (b) No allowance will be made for overlap or wastage.

E8.2 Products

E8.2.1 Material

- (a) Geotextile for use under this contract shall be a non-woven, needle-punched polypropylene such as GSE NW8, or approved equal in accordance with B6, meeting the following minimum requirements:

Tested Property	Test Method	Minimum Roll Value ¹ (English)	Minimum Roll Value ¹ (Metric)
Unit Weight	ASTM D-5261	8 oz/yd ²	271 g/m ²
Tensile Grab Strength	ASTM D-4632	220 lbs	0.975 KN
Tensile Elongation	ASTM D-4632	50 %	50 %
Apparent Opening Size ²	ASTM D-4751	80 sieve	0.18 mm

E8.3 Execution

E8.3.1 Installation

- (a) Non-woven geotextile is to be placed for separation, protection, and drainage within the leachate pipe trench and sump, and the cleanout riser pipe trenches as indicated on the design drawings.
- (b) Place non-woven geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- (c) Place non-woven geotextile so that end overlaps are not oriented across the base or sides of the leachate collection trench.
- (d) Overlap each strip of non-woven geotextile 300 mm over previously laid strip and heat bond to prevent displacement.
- (e) Protect the non-woven geotextile material from displacement and damage until final placement of the leachate piping and drainage aggregate can be completed.
- (f) Wrap the non-woven geotextile over the drainage aggregate to provide a minimum of 150 mm of overlap at all trench and sump locations. The overlap is to be heat bonded together at all locations, using methods approved by the Contract Administrator.

E8.3.2 Protection

- (a) Do not permit passage of any vehicle directly, other than a light ground pressure ATV, without protective soil cover on geotextile and geosynthetic liner system at any time.
- (b) Any damage to the geosynthetic liner system caused by the installation of the geotextile shall be repaired by the Contractor on his own cost.

E9. GEOCOMPOSITE

E9.1 General

This section describes the requirements for the supply and installation of the geocomposite leachate collection layer placed directly over the geomembrane liner on the floor and slopes of the leachate collection system sump at the southwest corner of the new disposal cell.

E9.1.1 Related Work

- (a) E8 – Non-woven Geotextile
- (b) E10 – Geomembrane
- (c) E11 – Leachate Collection System

E9.1.2 Definitions

- (a) Anchor Trench: An excavated trench, typically with vertical walls, at the top of the side slopes of the cell at which point the geosynthetic materials terminate.

- (b) Runout: The portion of geosynthetic material that extends horizontally from the side slope of the inside edge of the cell to the anchor trench.

E9.1.3 Mill Certificates

- (a) At least two weeks prior to start of work, furnish Contract Administrator with copies of mill test data and certificate that geocomposite delivered to job site meets requirements of this section.

E9.1.4 Delivery and Storage

- (a) During delivery and storage, protect geocomposite from direct sunlight, ultraviolet rays, excessive heat, mud, dirt, dust, debris and rodents. Do not place the geocomposite in direct contact with the ground.

E9.1.5 Measurement for Payment

- (a) Geocomposite will be measured in square metres of surface area covered by material, including runout and anchor trenches. The surface area covered must be surveyed by the Contractor and confirmed by the Contract Administrator. Payment shall include all direct costs for all labour, materials and equipment required to complete the installation of the geocomposite drainage layer, placed directly over the geomembrane liner on the floor and slopes of the new landfill cell.
- (b) No allowance will be made for overlap or wastage.

E9.2 Products

E9.2.1 Material

- (a) GSE FabriNet (geotextile on both sides) or equivalent
 - i. Geonet core: high density polyethylene with inhibitors added to base plastic to resist deterioration by ultra-violet light and heat exposure.
 - ii. Attached Geotextile: non-woven synthetic fibre fabric, polyester and/or polypropylene with inhibitors added to base plastic to resist deterioration by ultra-violet light and heat exposure.
 - iii. Geocomposite Properties:

Tested Property	Test Method	Minimum Roll Value ¹ (English)	Minimum Roll Value ¹ (Metric)
Transmissivity	ASTM D-4716	0.48 gal/min-ft	1.0 x10 ⁻⁴ m ² /sec
Ply Adhesion	ASTM D-7005	1.0 lb/in	178 g/cm

(b) Component Properties

(i) Geonet Physical Properties:

Tested Property	Test Method	Minimum Roll Value ¹ (English)	Minimum Roll Value ¹ (Metric)
Density	ASTM D-1505	-	0.94 g/cm ³
Thickness	ASTM D-5199	200 mil	5.08 mm
Carbon Black Content	ASTM D-1603*4218	2.0 %	2.0%
Tensile Strength	ASTM D-5035	45 lb/in	7.9 kN/m

(ii) Geotextile Physical Properties:

Tested Property	Test Method	Minimum Roll Value ¹ (English)	Minimum Roll Value ¹ (Metric)
Unit Weight	ASTM D-5261	8 oz/yd ²	270 g/m ²
Grab Strength	ASTM D-4632	220 lb	975 N
Puncture Strength	ASTM D-4833	120 lb	525 N

Apparent Opening Size	ASTM D-4751	80 sieve	0.180 mm
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E9.3 Execution

E9.3.1 Installation

- (a) Geocomposite for use in the Leachate Collection and Removal System (LCRS) is to be placed directly above the HDPE geomembrane liner on the slopes as shown on the Drawings. The geocomposite is to be placed below the LCRS sand drainage layer and geotextile wrapped around the perforated LCRS sand and piping stone backfill at the trench locations as shown on the design Drawings.
- (b) Place geocomposite material by unrolling onto the geomembrane liner and retain in position with a sufficient number of sandbags, or other approved material, to prevent displacement of the geocomposite by wind or water.
 - i. Any damage to the geomembrane liner caused by equipment used to install the geocomposite material shall be repaired by the Contractor at his own cost.
- (c) Place geocomposite materials smooth and free of tension stress, folds, wrinkles and creases.
- (d) Place geocomposite so that all seams are oriented in the slope direction.
- (e) Seams shall be overlapped 150 mm and tied with suitable white plastic ties. These ties shall be placed at a maximum spacing of 1.5 metres along the roll length and at a maximum spacing of 300 mm across the roll width, or as specified by the Contract Administrator.
- (f) Overlapped geotextile shall be secured by heat bonding along the full length of all geocomposite connections.

E9.3.2 E12.3.2 Protection

- (a) Do not permit passage of any vehicle directly, other than a light ground pressure ATV, directly on geocomposite at any time.
- (b) Sufficient ballast (sandbags or protective sand) should be left in place following completion of the installation to protect the LCRS geocomposite from uplift due to wind or water damage.
- (c) Any required end-of-roll overlaps or geocomposite tie-ins should be secured with sufficient ballast (sandbags or protective sand) to prevent wind or water displacement.

E10. GEOMEMBRANE

E10.1 General

This specification describes the requirements for supply and installation of geomembrane for the construction of the geomembrane liner.

E10.1.1 Related Work

- (a) Section E8 – Non-woven Geotextiles
- (b) Section E9 - Geocomposite
- (c) Section E11 – Leachate Collection System

E10.1.2 Definitions

- (a) Anchor Trench: An excavated trench, typically with vertical walls, at the top of the side slopes of the cell at which point the geosynthetic materials terminate.

- (b) Runout: The portion of geosynthetic material that extends horizontally from the side slope of the inside edge of the cell to the anchor trench.

E10.1.3 Measurement for Payment

- (a) Geomembrane will be measured in square metres of surface covered by material, including runout and anchor trenches.
- (b) No allowance will be made for seams and overlap
- (c) Include all direct costs associated with the supply, installation and the provision of Construction Quality Control (CQC) testing for the installation of the geomembrane.
- (d) The surface area covered shall must be surveyed by the Contractor and confirmed by the Contract Administrator.

E10.2 Special Requirements

E10.2.1 Guarantee of Geomembrane Material

- (a) Notwithstanding D25, the HDPE liner material shall be guaranteed, in writing, by the manufacturer or supplier on a pro rata basis for a period of 20 years. The guarantee shall be against manufacturing defects of workmanship and against deterioration due to ozone, ultraviolet, or other normal weather aging.

E10.2.2 Samples and Specifications of Material

- (a) Prior to ordering any materials, the Contractor shall submit the manufacturer's certification stating that the material proposed for use for this project has physical properties equal to the certified values.

E10.2.3 Workmanship Guarantee

- (a) Notwithstanding D24, the Contractor shall guarantee the liner installation to be free of defects in materials and workmanship for a period of 1 year following the date of acceptance by the City or its representative.
- (b) The Contractor shall agree to make, at his expense, any repairs or replacements made necessary by defects in materials or workmanship in the work that became evident within said guarantee period.
- (c) The Contractor shall make repairs and replacements promptly upon receipt of written order from the City or its authorized representative. If the Contractor fails to make repairs and replacements promptly, the City may do so and the Contractor shall be liable for the cost of such repairs and replacements.

E10.3 Materials

E10.3.1 General

- (a) All materials arriving on site are subject to inspection. Replacement or repair of damaged material will be at no cost to the City.
- (b) The liner material produced shall be free of blisters, holes, undispersed raw materials, or any sign of contamination by foreign matter. Any such defect shall be repaired using welding techniques in accordance with manufacturer's recommendations. Excessive defects, as determined by the Contract Administrator, may be grounds for rejection of entire rolls of liner.
- (c) Geomembrane sheet that contains 10 or more defects per 450 square metres (5,000 square feet) shall be rejected; at the discretion of the Contract Administrator the rejected portion may be limited to the affected area.
- (d) Geomembrane sheet with less than 10 defects per 450 square metres (5,000 square feet) shall be replaced, or repaired, at the discretion of the Contractor; repairs will be completed in accordance with this Specification.

E10.3.2 Material Property

- (a) The HDPE liner material supplied under these Specifications shall be new, first quality products. The liner is specified to be designed and manufactured specifically for the purposes of this work and shall have been satisfactorily demonstrated, by prior use, to be suitable and durable for such purposes.
- (b) The material for the disposal cell shall be a smooth high density polyethylene (HDPE) geomembrane
- (c) The geomembranes shall meet the specifications listed in GRI-GM13 as published by the Geosynthetics Research Institute (GRI) and summarized below:

High Density Polyethylene (HDPE) Geomembrane

Tested Property	Test Method	Test Value	
		English	Metric
Thickness (min. avg.)	D -5994	60 mils	1.5 mm
Asperity Height (min. avg.)	GM12	10 mil	0.25 mm
Density (min avg.)	D-1505/D-792	-	0.94 g/cm ³
Tensile Properties (min. avg.)			
- yield strength	D-6693 Type IV	126 lb./in	22 kN/m
- break strength		90 lb./in	16 kN/m
- yield elongation		12%	12%
- break elongation		100%	100%
Tear Resistance (min. avg.)	D-1004	42 lb.	187 N
Puncture Resistance (min. avg.)	D-4833	90 lb.	400 N
Carbon Black Content (range)	D-1603	2.0 % - 3.0 %	2.0 % - 3.0%
Carbon Black Dispersion	D-5596	10 different views, 9 in Categories 1 or 2 and 1 in Category 3	10 different views, 9 in Categories 1 or 2 and 1 in Category 3

- (d) Extrusion resin used for extrusion joining of sheets and for repairs shall be HDPE from the same resin as the sheet resin. Physical properties shall be the same as the liner sheets.
- (e) Extrudate rod shall be solid core rod free of voids and free of contamination by moisture or foreign matter.

E10.4 Installation

E10.4.1 General

- (a) During installation of the liner, the Contract Administrator shall have complete authority to order a stop work due to inclement weather, the use of improper installation procedures, or for any reason that in his sole opinion may result in a defective liner.
- (b) Geomembrane shall be free of holes, pinholes, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.
- (c) The geomembrane liners shall be installed in accordance with a panel layout plan recommended by the Contractor and approved by the Contract Administrator.
- (d) Horizontal seams on slopes shall not be permitted, unless no other option is available and only as approved by the Contract Administrator.
- (e) Tie-in seams shall be a minimum of 1.5 m from the toe of slope on the landfill base.

- (f) Tie-in seams shall be placed a minimum of 1.5 m from collection trenches that they run near parallel to.

E10.4.2 Material Transportation and Storage

- (a) Labelling - Each roll of geomembrane delivered to the site shall be labelled by the manufacturer. The label shall clearly state the manufacturer's name, product identification, thickness, length, and width and roll number. The label shall be found on either of the endcaps, an inside edge of the core, and outside the core.
- (b) Delivery - The rolls of liner shall be packaged and shipped by appropriate means to prevent damage to the material and to facilitate off-loading.
 - i. Transport geosynthetic on open trailers and support during transportation to eliminate external mechanical damage.
- (c) Storage - The on-site storage location for geomembrane material should be level, smooth, elevated and dry (not wooden pallets). The Contractor shall provide a suitable storage site that will protect the geomembrane from punctures, abrasions, excessive moisture and dirt.
- (d) Handling - The materials are to be handled so as to prevent damage. Use equipment that does not contact the material itself when handling. Slings or other lifting devices shall provide adequate support without damaging the material. Instructions for moving geomembrane rolls shall be provided by the Manufacturer upon request.

E10.4.3 Panel Deployment

- (a) Deploy materials using methods that prevent handling damage and contamination during installation.
 - i. Sufficient protection should be placed between the ground surface and the underside of the geomembrane in order to prevent scoring, scratching or other damage to the underside of the geomembrane during deployment.
 - ii. No equipment or tools shall be allowed to damage the geomembrane by handling, trafficking, or other means.
 - iii. No personnel working on the geomembrane shall engage in activities that could potentially damage the geomembrane.
- (b) Provide sufficient anchorage against uplift due to wind.
- (c) Adequate thermal slack will be incorporated in all layers of geomembrane, to the approval of the Contract Administrator.
 - i. Slack should be relatively evenly distributed across the lined area and kept small enough so that wrinkles will not fold over.
 - ii. The Contractor shall repair any "bridged" or "trampoline" areas that develop during the installation of the geomembrane to the satisfaction of the Engineer.
 - iii. Welding of tie-in seams in corners, grade breaks from slope to base, pipe penetrations, and cross seams shall be completed during the coolest part of the day.
 - iv. Information to be documented on the liner throughout the installation, shall be clearly visible to such point that the material is covered or construction is complete, and will include:
 - v. On each panel the panel number and material roll number. A panel number will be a simple and logical identifying code. The coding system shall be subject to approval and shall be determined at the job site.
 - vi. At the beginning of each fusion seam, regardless of length, record, the operator, welding machine number, wedge temperature, welding speed and start time using a white paint marker or other suitable means.
 - vii. At the end of each fusion seam record the finish time.

- viii. All repairs shall be given an identification number, the welder, welder operator and date of repair shall be recorded with the identification number on or near the repair.
- ix. All destructive sample locations will be identified and the identifying number and date removed will be recorded near the sample location.
- x. All non-destructive test data and date of test.
- xi. The Contractor shall deploy the geomembrane completely down the side and across the base of the anchor trench as shown on the Drawings.
- xii. Do not allow heavy vehicular traffic directly on geomembrane. Rubber-tired ATVs and trucks are acceptable if wheel contact is less than 6 psi.
- xiii. Protect geomembrane in areas of heavy traffic by placing protective cover (geotextile) over the geomembrane, at no cost to the City.

E10.5 Seams and Joints

E10.5.1 General

- (a) Joints between liner panels shall be field welded using the manufacturer's recommended procedures and equipment. Only repairs and detail welds shall be extrusion welded.
- (b) The weld area shall be free of all dirt, dust, moisture, or other foreign material. Surfaces to be welded shall be wiped with oil free rags when required to remove any contamination by oil, grease, or excessive dirt.
- (c) If necessary, grinding of the liner material prior to welding shall be per manufacturer's recommendations. The weld shall be made immediately after preparation and cleaning is complete. The temperature of the welding apparatus shall be checked a minimum of once every hour during welding.
- (d) The liner panels shall be wedge welded together through the anchor trench. Wooden planks or similar materials will be used to bridge the trench and allow the full welding of the seam to the back of the anchor trench, at the end of the panels, as shown on the drawings.
- (e) An overlap line a minimum of 150 mm (6 inches) from the edge of the underlying sheet will be clearly identified on the underlying panel of every fusion seam.
- (f) The overlap shall be sufficient to leave a loose flap of geomembrane at least 25 mm (1 inch) wide adjacent to both sides of the seam.
- (g) Cross and toe seams shall be staggered a minimum of one (1) metre (3 feet).
- (h) The completed field seams shall meet the specifications summarized in GRI GM19 as published by the Geosynthetic Research Institute (GRI) and as summarized below and based on testing conducted as per the methods specified in ASTM D6392:

Geomembrane 60 mil

Seam Type	Tested Parameter	English Value	Metric Value
Hot Wedge Seams	Peel Strength	91 lb/in	398 N/25 mm
	Peel Separation	< 25%	< 25%
	Shear Strength	120 lb/in	525 N/25 mm
	Shear Elongation at Break	> 50%	> 50%
Extrusion Fill Seams	Peel Strength	78 lb/in	340 N/25 mm
	Peel Separation	< 25%	< 25%
	Shear Strength	120 lb/in	525 N/25 mm
	Shear Elongation at Break	> 50%	> 50%

- (i) Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. The installer shall demonstrate that acceptable seaming can be performed by completing acceptable trial welds.

E10.5.2 Defects and Repairs

- (a) Examine all seams and non-seam areas of the geomembrane for defects, holes, blister, undispersed raw materials, and any sign of contamination by foreign matter.
- (b) Repair and non-destructively test each suspect location in both seam and non-seam areas. Do not cover geomembrane at locations that have been repaired until test results with passing values have been achieved.
- (c) Seaming and repairs will not be completed without the presence of the Contract Administrator.

E10.5.3 Welding

- (a) General
 - i. All welds will be completed according to the Contractor's appropriate welding procedure.
 - ii. Deviation from the written weld procedures in any manner may be cause for rejection of the affected welds by the Contract Administrator.
 - iii. Any welds that have been rejected shall be remedied to the satisfaction of the Contract Administrator, at no additional cost to the City.
 - iv. Welding equipment and accessories shall meet the following requirements.
 - v. Gauges showing operating temperatures and or travel speed of the specific equipment shall be operational and clearly visible. Preheat and barrel temperature on extrusion welders and wedge temperature and travel speed on double wedge fusion welders.
 - vi. An adequate number of operating welding machines shall be made available to prevent work delays. There should at all times be an additional wedge welder and extrusion welder not in use, in case of a malfunction of those in use.
 - vii. A power source (portable generator) capable of providing constant voltage under combined line load shall be used.
- (b) Qualification of Welders
 - i. Perform trial, or qualification welds, in the presence of the Contract Administrator, on geomembrane samples to verify welding equipment is operating properly.
 - ii. No welding equipment or welder shall be allowed to perform production welds until equipment and welders have successfully completed a trial weld.
 - iii. Trial welds shall be performed and tested for each machine and/or operator as follows:
 - i. At the start of each shift of production seaming;
 - ii. When a new operator or new machine starts welding;
 - iii. When any welder settings are changed or maintenance is required other than routine cleaning;
 - iv. When welding operations have stopped for two (2) hours or more; and
 - v. When there is a meaningful change in ambient conditions including a temperature change of 10°C or greater, any precipitation, wind speed greater than 30 kph.
- (c) Trial Welds

- i. Make trial welds under the same surface and environmental conditions as the production welds, i.e., in contact with subgrade and similar ambient temperature.
- ii. Trial welds of existing material from representative locations, to new material will be required as directed by the Contract Administrator.
- iii. Each trial weld shall be a minimum of 1.5 m (5 feet) in length.
- iv. Cut seven, one-inch wide by approximately six-inch long test coupons from the trial weld, using a purpose built coupon cutter. Quantitatively test five (5) specimens for peel adhesion (both tracks), and then two (2) for bonded seam strength (shear).
- v. Repeat the trial weld (for wedge welds), in its entirety, when any of the trial weld samples fail in either peel or shear. A trial seam is considered to have failed if the amount of seam separation exceeds 25% of the welded area or the force exerted is below the values specified.

(d) Hot Wedge Welding

- i. Welding apparatus shall be a self-propelled device equipped with an electronic controller that displays applicable temperatures.
- ii. Protect against moisture build-up between sheets.
- iii. Continuously clean seam area of dust, mud, moisture, and debris immediately ahead of the hot wedge welder.
- iv. Welding operations will be ceased if there is any indication that a mechanical or setup problem exists with a wedge welder. The Contract Administrator has the right to stop welding operations if in his or her opinion a problem exists with a piece of welding equipment.

(e) Extrusion Welding

- i. Hot-air bond (leister) adjacent pieces of geomembrane material together using procedures that do not damage the geomembrane, or underlying material.
- ii. Scuff the surface of the geomembrane at the locations to be covered by the extrusion bead, using an appropriate sanding disk. Care must be taken during the sanding operation to scuff the full width of the extrusion bead while preventing excessive damage to the geomembrane material.
- iii. Purge welding apparatus of heat-degraded extrudate before welding.
- iv. Purged extrudate rod shall not be discarded on any geosynthetic surface while still hot, and shall not be left discarded on or below the liner.
- v. Clean geomembrane surfaces according to the appropriate manufacturer approved procedures before welding, and weld shortly after.

E10.5.4 Repair Procedures

(a) General

- i. Any liner area showing injury due to excessive scuffing, puncture, or distress from any cause, shall, as directed by the Contract Administrator, be replaced or repaired with an additional piece of HDPE liner welded over the defective area. All patches shall extend a minimum of 100 mm (4 inches) from the affected area.
- ii. Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.
- iii. All repairs shall be completed within 24 hours from when they are identified, except by approval of the Contract Administrator.
- iv. Repair any portion of unsatisfactory geomembrane or seam area failing a destructive or non-destructive test. Installer shall be responsible for repair of damaged or defective areas. Agreement upon the appropriate

repair method shall be decided between the Contract Administrator and the Installer. Procedures available include the following:

- (i) Patching - Used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter.
 - (ii) Abrading and Re-welding - Used to repair small seam sections.
 - (iii) Spot Welding - Used to repair pinholes or other minor, localized flaws or where geomembrane thickness has been reduced.
 - (iv) Capping - Used to repair large lengths of failed seams.
 - (v) Flap Welding - Used to extrusion weld the flap (excess outer portion) of a fusion weld in lieu of a full cap.
 - (vi) Removing the unacceptable seam and replace with new material.
- v. In addition, the following procedures shall be observed:
- (i) Areas to be covered with a patch shall be prepared by rounding the corners of the damaged area to remove all damage to the liner, to the satisfaction of the Contract Administrator.
 - (ii) Surfaces of the geomembrane that are to be repaired by extrusion welds shall be lightly abraded according to the appropriate manufacturer approved procedures, to assure cleanliness.
 - (iii) All geomembrane surfaces shall be clean and dry at the time of repair.
 - (iv) Extend patches or caps at least 100 mm (4 inches) for extrusion welds and 150 mm (6 inches) for wedge welds beyond the edge of the defect, and round all corners of the patch material.

(b) Repair Verification

- i. Number and log each patch repair.
- ii. Non-destructively tests each repair using methods identified in this Specification.

E10.5.5 Contractor Construction Quality Control

(a) General

- i. The Contract Administrator will act independently from the Quality Control (QC) provided by the Contractor and shall in no way relieve the Contractor of any obligation to complete the required Quality Control testing in accordance with the specifications.
- ii. The Contractor shall coordinate his activities with the Contract Administrator and shall provide access to all construction and quality control procedures and results.
- iii. The Contractor shall test all joints and repairs in the geomembrane liner by vacuum testing or pressurized dual seams testing (for double hot wedge welds only). All testing shall be done in the presence of or with knowledge of the Contract Administrator. All defective areas detected shall be repaired to the satisfaction of the Contract Administrator.

(b) Vacuum Testing

- i. The Contractor shall perform a vacuum test on all extrusion welded seams and repairs, in the following manner:
 - (i) The area to be tested shall be cleaned of all dirt, debris, and other foreign matter and then a soap and water solution shall be applied.
 - (ii) A gasket vacuum box (American Parts and Service Company, Alhambra, California, Series #A100 or approved equal) assembly consisting of a rigid housing, a clean transparent viewing window, and a vacuum gauge shall be immediately placed, in a manner to ensure a seal over the area of the liner to be tested.
 - (iii) A vacuum of 3 to 6 psi shall be induced and held for a minimum of 5 seconds or long enough for the area to be thoroughly examined.

- (iv) Examine the geomembrane through the viewing window for the presence of soap bubbling, all areas where leaks are identified shall be marked and repaired.
 - ii. Any portion of an extrusion seam or repair that cannot be vacuum tested, must be pick tested.
 - (c) Air Pressure Testing
 - i. The Contractor shall perform pressurized testing of all double wedge weld seams, regardless of length, in the following manner.
 - (i) Both ends of the seam to be tested shall be sealed.
 - (ii) A needle with pressure gauge, or other approved pressure feed device equipped with a pressure gauge, shall then be inserted into the channel produced in the middle of the double wedge weld.
 - (iii) The channel shall be pressurized to 40 psi to allow the seam to stretch and stabilize before beginning the test.
 - (iv) The pressure is to be held for a period of no shorter than five (5) minutes.
 - (v) If the loss of pressure exceeds 10% of the initial pressure or does not stabilize, then the seam will either be repaired entirely or the faulty area will be located and marked for repair.
 - (vi) If blockage is present, locate and test seam on both sides of blockage.
 - (d) Destructive Seam Testing
 - i. The Contractor will be responsible for completing the destructive seam testing, as described below.
 - (i) Each Seam:
 - i. For each welder in use, the Contractor will cut-out a single coupon from the end of each completed seam and test it, as described below, prior to starting the next seam.
 - ii. The Contractor will perform a manual peel test on both tracks of the weld using two vice-grip hand clamps. This test is to be completed in the presence of the Contract Administrator.
 - iii. Welding of the next seam will only continue if a passing result is achieved. A Film Tear bond with less than 25% peel incursion is considered a pass for this manual test.
 - iv. The test coupon is to be left beside the cut-out for further examination if required.
 - ii. Every 150 m of Seam:
 - (i) A sample for full destructive testing is to be collected on a frequency of no less than one (1) per 150 m (495 feet) of completed seam. More frequent samples may be required if problems are encountered during seaming operations or if welding is conducted during adverse weather conditions.
 - i. The location of each sample is to be determined by the Contract Administrator in consultation with the Contractor as the installation progresses.
 - ii. Samples shall be a minimum of 200 mm (8 inches) in width and a minimum of 500 mm (20 inches) in length, with the seam centred lengthwise. The sample shall be cut in two pieces with a minimum 400 mm (16 inches) long piece going to the Contract Administrator and the remaining piece to be tested by the Contractor, as described below.
 - iii. Number each seam sample and mark the sample number on the geomembrane adjacent to the sample cut-out location.

- iv. Where possible destructive seam samples will be taken from locations that will not affect the integrity of the liner, for example, at the end of seams in the anchor trench or at tie-in locations where excess material is to be trimmed off.
 - v. A total of three (3) coupons are to be cut out of the Contractor's piece of the sample for testing on the Contractor's field tensiometer. The three (3) coupons are to be tested for peel adhesion (both tracks). The testing is to be completed by the Contractor and observed by the Contract Administrator.
 - vi. The sampling and testing is to be completed immediately following the completion of the subject seam. Welding can continue while the testing is being completed. Authorization to delay this testing may be approved by the Contract Administrator if special circumstances are encountered.
- (e) Geomembrane Leak Location Survey
- i. The Contract Administrator will conduct leak location surveying of the liner system following installation of the geomembrane, installation of the leachate collection piping network and leachate sump, and placement of the sand drainage blanket over the geomembrane in accordance with ASTM D7007 – Standard Practices for Locating Leaks in Geomembranes Covered with Water or Earth Materials.
 - ii. Contractor shall ensure that the earth materials above and below the geomembrane contain sufficient moisture to conduct a leak location survey. A moisture content of the sand of up to two percent by weight may be required in order to conduct the survey. If the moisture content of the earth materials layer is not sufficient per the requirements of the Contract Administrator, the Contractor shall add sufficient water to the earth materials as required.
 - iii. Contractor shall provide electrical isolation around the perimeter of the area being surveyed for leaks. Electrical isolation is achieved by leaving approximately a one-foot wide area of dry geomembrane exposed around the perimeter of the survey area or leaving a minimum of 150 mm of bare geomembrane protruding from the back-filled anchor trench. Any other electrically conducting paths through the geomembrane such as metal pipes, battens, or concrete structures should be likewise isolated.
 - iv. Contractor will be required to provide labour to lay out a grid for the leak location survey as per the schedule indicated by the Contract Administrator.
 - v. Leak Location Contractor shall inform CQA Consultant and mark the locations of all identified or indicated leaks with markers, flags, spray paint, or written coordinates. The Contract Administrator will provide Contractor with a written report within 14 calendar days of completion of the leak location survey field work as described in ASTM D7007.
 - vi. Contractor shall expose the geomembrane at identified leak locations and effect repairs to the satisfaction of the Contract Administrator, and will reinstate the sand drainage blanket and shall not permit passage of any vehicle directly over the geosynthetic liner system, other than a light ground pressure ATV, without protective soil cover on geotextile at any time, or as otherwise approved by the Engineer.
 - vii. Seaming and repairs will not be completed without the presence of the Contract Administrator.

E10.5.6 Failed Seam Procedures

- (a) The following procedure shall be used when there is a destructive test failure on either the Contractor's or the Contract Administrator's test samples.
 - i. Reconstruct the seam, or seams between any two passed test locations; or

- ii. Track the poor weld by extracting additional samples from either side of the failed sample. These samples must be taken a minimum of three (3) metres from the failed sample in both directions from the location of the failed test.
- iii. Check the next seam welded using same welding device if the subject seam is less than three (3) metres (10 feet) long.
- iv. If any subsequent sample fails, the process shall be repeated to establish the zone in which the seam shall be reconstructed.
- v. Acceptable seams shall be bounded by two locations from which samples have passed destructive tests.

E10.6 Submissions

- E10.6.1 With the bid, identify the material selected for use.
- E10.6.2 With the bid, identify name of proposed installation supervisor and provide list of project experience.
- E10.6.3 With the bid provide details of the Quality Control program to be followed during the liner systems installation.
- E10.6.4 With delivery of material, provide written certification from the manufacturer (Mill Certifications) of the material properties for each lot of material supplied.

E10.7 As-Built Records

- E10.7.1 The Contractor shall provide a written and signed report on the completed installation which shall certify that the geomembrane is installed in accordance with the manufacturer's recommendations, is ready for operation, and that the warranty is in effect.
- E10.7.2 The report is to include all of the Contractor's quality control test records and a record drawing indicating panel and seam numbers.
- E10.7.3 A draft copy of report is to be submitted for review by the Contract Administrator. A minimum of three (3) copies of the final report will be required.

E11. LEACHATE COLLECTION SYSTEM

E11.1 General

This section describes the requirements for the supply and installation of the leachate collection systems placed on the disposal cell floor, and east and west side slopes of the disposal cell. The system includes the leachate collection trench, sump, clean-out and riser pipes; perforated and solid collector pipe, surrounded by drainage aggregate encased in a non-woven geotextile and including all fittings and connections.

E11.1.1 Related Work

- (a) Section E8 – Non-Woven Geotextiles
- (b) Section E9 – Geocomposite
- (c) Section E10 – Geomembrane

E11.1.2 Definitions

- (a) Prepared Subgrade: prepared surface of native recompacted clay material upon which the geosynthetic liner system is installed.
- (b) Geomembrane: high density polyethylene (HDPE) geosynthetic liner material placed directly above the recompacted subgrade layer of the base and side slopes of the landfill cell whose function is for containment.
- (c) Geocomposite: geosynthetic material consisting of a geonet core with non-woven geotextile fused on either side; this is placed in the leachate sump at the southwest corner of the new disposal cell and on the sideslopes of the disposal cell.

- (d) Non-woven Geotextile: non-woven, needle punched polypropylene placed with the leachate collection/leak detection trench on the floor, sump and slope of cell; used to encase drainage aggregate.
- (e) Recompacted subgrade layer: select clay material placed on base and side slopes of landfill cell at the specified thickness, and moisture content and density.
- (f) Leachate Collection Trench: excavated area on the floor of the landfill cell that contains all components of the leachate collection and leak detection piping systems.
- (g) Leachate Sump: excavated area on the floor of the landfill cell to extract the leachate accumulated in the landfill cell.
- (h) Drainage Aggregate: imported free-draining granular material placed in both the leachate collection trench and sump locations surrounding the perforated collector pipes.

E11.2 Measurement and Payment

- (a) Payment will be based upon a measurement of the pipe length installed for each size and type of pipe measured along the centre line of the pipe, through fittings from end to end.
- (b) Payments shall include the supply and installation of all materials required to install the leachate collection and extraction system as specified in the construction drawings and tender documents.
- (c) No payment will be made for fittings, couplings and valves.
- (d) Payment for header pipe installation shall include trench excavation, sand backfill and disposal of excavated material as landfill cover material.
- (e) Payment for the leachate collection system shall include the collection trench granular material and geotextile wrap.
- (f) Collection system cleanout pipe shall include placement and compaction of the common excavated material pipe support as shown in the Drawings.
- (g) Supply and installation of the bentonite plug, as shown on the Drawings, shall be incidental to the header pipe installation.

E11.3 Products

E11.3.1 Materials

- (a) Drainage Blanket Sand
 - i. Drainage aggregate shall be a washed or screened 2.5 mm maximum particle size, uniformly graded aggregate with less than 2% passing the 80um sieve size, or as approved by the Contract Administrator.
 - ii. Drainage blanket sand material to be capable of providing a minimum permeability of 1×10^{-2} m/sec.
- (b) Aggregate for Leachate Collection Trench:
 - i. Drainage aggregate shall be a washed or screened 40 mm maximum particle size, uniformly graded aggregate with less than 2% passing the 80um sieve size, or as approved by the Contract Administrator.
 - ii. Aggregate quality: rounded, non-fractured, sound, hard, durable, free-draining material, free from soft, thin, elongated or laminated particles, organic matter or other deleterious substances.
 - iii. Drainage material to be capable of providing a minimum permeability of 1×10^{-2} m/sec.
 - iv. Drainage aggregate to be approved for use by Contract Administrator prior to delivery to site.
- (c) Leachate Collection Pipe:

- i. Leachate collection piping shall be a 200 mm diameter SDR 11 smooth wall high density polyethylene (HDPE) pipe as specified on the design drawings.
 - ii. Piping shall either be solid wall or perforated depending on the application. See Drawings for pipe type and perforation pattern.
 - (d) Leachate Extraction Pipe:
 - i. Leachate extraction piping shall be 200 mm diameter, 250 mm diameter and 450 mm diameter SDR 11 smooth wall high density polyethylene (HDPE) pipe as specified on the design drawings.
 - (e) Non-woven Geotextile Wrap
 - i. Geotextile wrap shall be a non-woven, needle-punched polypropylene such as GSE NW8, or an approved equivalent meeting the minimum requirements stated in Section E8-Non-Woven Geotextiles.
 - ii. Installation of the non-woven geotextile wrap to be in accordance with the requirements states in Section E8 – Non-Woven Geotextiles.

E11.4 Execution

E11.4.1 Leachate Collection and Removal System (LCRS)

- (a) Commence the installation of the LCRS components following the installation of the geomembrane liner system in accordance with Section E10 – Geomembrane.
- (b) Procedures to be followed during the installation of the LCRS must be approved by the Contract Administrator prior to commencing with the work. The procedures must be such that no damage to the underlying geomembrane liner will occur.
- (c) Any damage to the geomembrane liner system caused by equipment used to install the leachate collection and extraction system shall be repaired by the Contractor at his own cost.
- (d) Prepare the sections of the leachate collection and removal system in accordance with the construction drawings and connect the individual sections of pipe according to the manufacturers recommended directions.
- (e) Place the pipe surround stone with the specified drainage aggregate to the level indicated on the design drawings. Ensure that the aggregate is placed under the haunches of the pipe. Mound the aggregate to the minimum depth indicated on the drawings above the trench and sump sides to allow for settlement.
- (f) Install leachate collection and extraction pipe according to construction drawings.
 - i. Supply and install all pipe fittings at location shown in design drawings.
 - ii. Cover riser pipe with sand as shown on design drawings.

E12. ANCHOR TRENCH, SAND DRAINAGE LAYER AND PROTECTIVE GLASS LAYER

E12.1 General

This section covers the requirements for the disposal cell sand drainage layer and temporary berm, anchor trench and recovered glass protection layer.

E12.1.1 Related Work

- (a) Section E6 – Excavation, Fill Placement and Roadway Construction

E12.1.2 Definitions

- (a) Common excavation: excavation of materials of whatever nature, which are not, included under definitions of solid rock, including dense tills, hardpan,

frozen materials and partially cemented materials which can be ripped and excavated with heavy construction equipment.

- (b) Waste material: material unsuitable for use in work including solid waste materials or surplus to requirements.
- (c) Recompacted subgrade layer: select clay material placed on base, side slopes and run on berms of landfill cell at the specified thickness, and moisture content and density.
- (d) Embankment: selected material derived from useable excavation and placed above original ground or prepared subgrade to the requirements for density and moisture required by these Specifications.
- (e) Sand Drainage Layer: approved materials placed above geosynthetic lining system for the purposed of protection.
- (f) Excavated Clay Material: material excavated from below the topsoil and subsoil layers within the limits of the area and to the specified base grades for the construction of the new landfill disposal cell

E12.1.3 Measurement and Payment

- (a) Sand Drainage Layer:
 - i. Sand Drainage Layer, will be measured in place and will be paid at the contract unit price per cubic metre, which shall be full compensation for all labour, materials and equipment required to place a 500 mm thick sand layer across the base of the disposal cell on top of the geosynthetic liner.
 - ii. Temporary berm: will be measured in place and paid at the contract unit price per cubic metre.
- (b) Anchor trench will be measured in place and will be paid at the contract unit price per metre and shall include excavation of the anchor trench and backfilling and compaction after installation of the geosynthetic liner for each of the items of work listed below:
 - i. In dyke or embankment section.
 - ii. In temporary berm.
- (c) Recovered Glass Protection Layer shall be measured on a cubic metre basis. Payment shall include loading the glass from the City's stockpile, hauling and placing the glass in accordance with this specification and the Drawings.

E12.2 Excavation

E12.2.1 Excavation of Geosynthetic Liner System Anchor Trenches

- (a) Excavate the anchor trenches for the geosynthetic liner system to the size and limits shown in the construction drawings.
- (b) Coordinate the excavation of the anchor trenches with the installation of the geosynthetic liner system.

E12.2.2 Backfill and Compaction of Geosynthetic Liner System Anchor Trenches

- (a) For the backfill of geosynthetic liner system anchor trenches, use only backfill materials approved by the Contract Administrator..
- (b) Material for trench backfill shall be placed in horizontal layers not exceeding 200 mm in thickness prior to compaction.
- (c) Backfill 900 mm wide section in 200 mm lifts and compact to 90% Standard Proctor density using equipment approved by the Contract Administrator. Remainder of backfill material shall be compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D 698 (Standard Proctor) between 2% and 4% of optimum moisture content.

- (d) During backfill and compaction of the trench, always take precaution about the geosynthetic liner system.
- (e) Any damage to the geosynthetic liner system caused by the equipment during the backfill of the anchor trench shall be repaired by the Contractor on his own cost.

E12.2.3 Placement of Sand Drainage Layer and Temporary Berm

- (a) Place the sand drainage layer over the geosynthetic liner system, as shown on the Drawings.
- (b) Use only materials approved by the Contract Administrator.
- (c) The thickness of the sand layer shall be uniformly spread over the liner system to provide a 500 mm (+/- 25mm) cover over the base of the landfill cell liner.
- (d) During the placement of sand always take precaution to protect the geosynthetic liner system.
- (e) Any damage to the geosynthetic liner system caused by equipment during the placement of the sand drainage layer shall be repaired by the Contractor on his own cost.
- (f) Construct temporary berm to dimensions shown on the Drawings following acceptance of the sand drainage layer.

E12.2.4 Placement of Recovered Glass Protection Layer

- (a) Placement of the recovered glass protection layer over the sand drainage layer of the leachate collection system synthetic liner system and side slopes of the cell is not to proceed until the leak detection survey of the geomembrane and any required repairs to the geomembrane have been completed to the satisfaction of the Contract Administrator.
- (b) The recovered glass material will be provided by the City and will be available from stockpiles located at the landfill site.
- (c) The thickness of the recovered glass protective layer shall be uniformly spread over the liner system to provide a 400 mm (+/- 40mm) cover over the base of the landfill cell liner.
- (d) During the placement of glass appropriate precaution shall be taken not to damage or disturb the complete sand drainage layer and leachate collection piping network.
- (e) Any damage to any component of the leachate collection system and geosynthetic liner system caused by equipment during the placement of the sand drainage layer shall be repaired by the Contractor on his own cost.

E13. SOIL STRIPPING AND STOCKPILING

E13.1 General

Further to CW3110, topsoil stripped from the roadway, dike, 4R Depot site and disposal cell locations shall be placed in a 100mm thickness over area shown on the Drawings.

E14. CLAY SUBGRADE PREPARATION

E14.1 General

Further to CW3110, this section covers the requirements for the construction of the engineered clay liner within the disposal cell.

E14.1.1 Definitions

- (a) Subgrade: original ground surface or prepared surface upon which clay liner or embankments are constructed.

- (b) Recompacted clay: scarify existing subgrade clayey soil to a depth of 150 mm below design elevations for base of geomembrane and leachate collection system on the base and sideslopes of the disposal cell and compact with moisture content to achieve specified density.

E14.1.2 Measurement and Payment

- (a) Excavation of unsuitable in-situ subgrade material as directed by the Contract Administrator, and replacement with suitable site material and compaction, shall be measured on a cubic metre basis.
- (b) Clay subgrade preparation will be measured in place and will be paid at the Contract Unit Price per square metre, which shall be full compensation for all labour, materials and equipment required for benching, watering, drying, mixing to a uniform consistency, and compacting to specified density including all other work necessary for incidental thereto for which separate payment is not elsewhere provided.
- (c) No additional payment will be made for over-excavation of soil removed to ensure that the minimum depth of recompacted clay liner is achieved.
- (d) No additional payment will be made for the separation and disposal of the rocks and boulders encountered during the completion of this project.

E14.1.3 Buried Services

- (a) Check with utility companies to locate or advise regarding buried pipes, cables, ducts or services.

E14.2 Products

- (a) Materials
 - i. Subgrade material using native in-situ material.

E14.3 Execution

- (a) Compaction Equipment
 - i. Compaction equipment must be heavy, footed with feet that fully penetrate a loose lift of soil and must be capable of obtaining required densities in materials on project.
 - ii. Compaction equipment shall, at a minimum, meet the below criteria:
 - (i) Minimum weight: 18,000 kg (40,000 lbs.)
 - (ii) Minimum foot length: 180 – 200 mm
 - (iii) Minimum number of passes before testing: 5
 - iii. Compaction equipment not specified herein is to be efficiency proved at no extra cost or time to the schedule and written approval must be received from Engineer before use.
- (b) Water Distributors
 - i. Apply water with equipment capable of uniform distribution.
- (c) Clay Liner Installation
 - i. The base of recompacted clay subgrade elevation and the condition of the subgrade must be approved by the Contract Administrator prior to installation of the geomembrane.
 - ii. Scarification to completely disturb in-situ material to a depth of 150mm.
 - iii. Remove rocks and boulders larger than 75 mm in size from the scarified subgrade material to compaction.
 - iv. Add water or dry materials, as necessary, to obtain a moisture content of between 2% and 4% above the optimum moisture content for the specific material as determined by the Contract Administrator.

- v. Compact to a density of not less than 95% maximum dry density in accordance with ASTM D698-91 (Standard Proctor) as determined by the Contract Administrator.
- vi. Bench all side slopes to ensure a proper bond between the recompacted subgrade layer and the embankment (berm) surfaces. Obtain prior approval from the Contract Administrator for method to be used.
- vii. Maintain a crowned surface during construction to ensure ready run-off of surface water.
- viii. The depth of recompacted subgrade layer is to be a minimum of 150 mm in thickness at all locations.
- ix. The minimum thickness of 150 mm is to be confirmed and approved by the Contract Administrator prior to installation of the geosynthetic lining system.
- x. Clay liner to be built up in a uniform fashion that will prevent the development of seepage pathways.
- xi. Saturated material shall be removed or scarified, dried and recompacted.
- xii. During construction, sections of recompacted subgrade layer shall be kept wet to prevent desiccation of the clay liners surface.
- xiii. Upon completion of the clay liner installation, the surface shall be tight bladed to provide a smooth uniformly graded surface.
- xiv. The cell floor and side-slopes will then be moisture conditioned and sealed by rolling with a smooth drum roller.
- xv. The completed liner shall not be allowed to freeze.

E14.4 Leachate Collection System Trench Construction

- E14.4.1 Localized area to be deepened to provide a 150 mm minimum thickness of recompacted clayey soil on the East and West sides of the leachate collection header pipe trench and the slopes and floor of the leachate collection sump.
- E14.4.2 Leachate trench excavation to be surveyed prior to placement of clay liner material within the thickened areas. Same areas required to be surveyed after excavation to the design grade and elevations.
- E14.4.3 Construct and grade leachate collection trench and sump to slopes, elevations and grades shown in the construction drawing, ready for the installation of the leachate collection system.

E14.5 Engineered Clay Liner Survey Requirements

- E14.5.1 The minimum thickness of 150 mm is to be confirmed and approved by the Contract Administrator prior to installation of the geosynthetic lining system.
- E14.5.2 The as-built top of clay liner survey data is to be made available to the Contract Administrator for review and approval prior to the installation of the synthetic liner system.

E14.6 Field Testing Frequency

E14.6.1 Recompacted Subgrade Material

- (a) Quality Assurance field personnel will be required to take a minimum of thirteen (13) field density and moisture content tests per hectare of recompacted subgrade layer construction. Cooperation and providing assistance, with equipment, to the Quality Assurance field personnel is essential.
- (b) The field density and moisture content tests will be compared to a line of optimums to determine if it is above or below 95% compaction and 2% to +4% over optimum moisture content. If the test result fails, the Contract

Administrator may require additional compaction and/or moisture conditioning prior to acceptance of the subgrade. Additional field confirmatory testing will be required to confirm passing results.

- (c) At or near completion of the recompacted subgrade layer, the Contractor is required to provide assistance to the Contract Administrator to collect undisturbed Shelby tube samples of the recompacted subgrade layer for laboratory confirmation of permeability.
- (d) A reasonable period of time shall be allowed by the Contractor for the Contract Administrator to complete field testing.

E14.7 Finishing

- E14.7.1 Remove soft or other unstable material that will not compact properly and fill resulting depressions with approved material. Remove rocks or stones in excess of 50 mm from surface.
- E14.7.2 Shape and compact cell floor portion of the recompacted subgrade layer to be within 0 mm and 30 mm above the design elevation at all surveyed locations.
- E14.7.3 Finish side slopes to be within 0 mm and 30 mm above the design elevation at all surveyed locations.
 - (a) Remove boulders encountered in cut slopes and fill resulting cavities with recompacted subgrade layer material.
 - (b) Hand finish slopes that cannot be finished satisfactorily by machine.
 - (c) Finish recompacted subgrade layer surface to the requirements for the installation of the HDPE geomembrane.

E14.8 Protection of Finished Work

- E14.8.1 Maintain finished surface of recompacted subgrade layer in a condition conforming to this section until acceptance.
- E14.8.2 Completed recompacted subgrade layer surface to be watered as required in order to prevent drying and shrinkage of the liner surface.

E15. EXISTING SERVICES, UTILITIES AND STRUCTURES

E15.1 Description

- E15.1.1 This Specification shall amend and supplement standard Specification CW 1120-R1.

E15.2 Construction Methods

- E15.2.1 The Contractor is responsible for locating existing services, utilities and structures at the time of construction.

E16. SOIL AMENDMENTS AND FINISH GRADING

E16.1 Description

- E16.1.1 This specification will cover the initial grading of the existing access road ditch (east side of access road) and collector ditch (west side of access road) amending the surface soil on the ditch bottom and slopes with compost and sand and the final grading of the ditches prior to seeding.
- E16.1.2 This specification shall amend and supplement City of Winnipeg Standard Construction Specification CW 3540 "Topsoil and Finish Grading for Establishment of Turf Areas", and shall cover supply and installation of soil amendments including preparation of existing grade and finish grading.

E16.2 Materials

- E16.2.1 Compost material shall be supplied by the City the Contractor shall load and haul the material from stockpiles on site at Brady Road Landfill, as directed by the Contract Administrator.
- E16.2.2 Sand shall be hard, granular, sharp sand to CSA A82.56-M1976, well-washed and free of impurities, chemicals and organic matter.
- E16.2.3 Chemical Application of Roundup or similar chemical herbicides approved by Agriculture Canada shall be used only with the approval of the Contract Administrator.
- E16.3 Construction Methods
- E16.3.1 Grade ditch bottoms and side slopes to within 50 mm of grade. Remove and/or add material as required to meet grades.
- E16.3.2 Spoil surplus materials as directed by the Contract Administrator. Additional material shall be obtained from soil stripping or cell excavation.
- E16.3.3 Begin preparation of existing Grade after Contract Administrator reviews and accepts initial grading.
- E16.3.4 Soil amendment for grass seeding shall consist of a mix of 60% compost and 40% sand, loose by volume.
- E16.3.5 Cultivate the entire area of soil base that is to receive soil amendments to a depth of 100 mm. Re-work areas where equipment used for hauling and spreading has re-compacted sub-grade.
- E16.3.6 Mix and spread 50 mm of a 30 mm of compost and 20 mm sand mixture over the area of soil amendments.
- E16.3.7 Roto-till or disc the compost and sand into the top 100 mm of base material and mechanically roll to obtain a level surface.
- E16.3.8 Finish grade to eliminate rough spots and low spots and to maintain positive drainage.
- E16.3.9 Consolidate seedbed to required bulk density using equipment approved by the Contract Administrator. Leave surfaces smooth, uniform and firm against deep foot-printing.
- E16.4 Measurement and Payment
- E16.4.1 Initial grading, prior to the addition of soil amendments shall be measured in an area basis for the total number of square metres constructed in accordance with this specification and accepted by the Contract Administrator.
- E16.4.2 Soil Amendments and Finish Grading shall be measured on an area basis for the number of square metres of soil base incorporating compost and sand in accordance with the Drawings and this specification, and accepted by the Contract Administrator, as computed by the Contract Administrator. The area paid for shall be the total number of square metres in accordance with this specification and accepted by the Contract Administrator, as computed by the Contract Administrator.

E17. CLEAN STONE AGGREGATE

E17.1 General

This specification covers the supply and placement of clean stone aggregate to be used for the leachate collection trench and in the leachate sump.

E17.1.1 Related Work

- (a) Section E11 Leachate Collection System

E17.1.2 Measurement and Payment

- (a) Leachate Collection sump drainage bed stone shall be measured in place and paid at the Contract unit price per cubic metre which shall be payment in full

for all labour, materials, and equipment required to place the clean stone drainage bed in the leachate sump.

- (b) No separate measurement shall be made for clean stone or washed gravel drainage aggregate used for the leachate collection trench surrounding the leachate collection piping. Supply and installation of the stone shall be incidental to the pipe installation.

E17.2 Materials

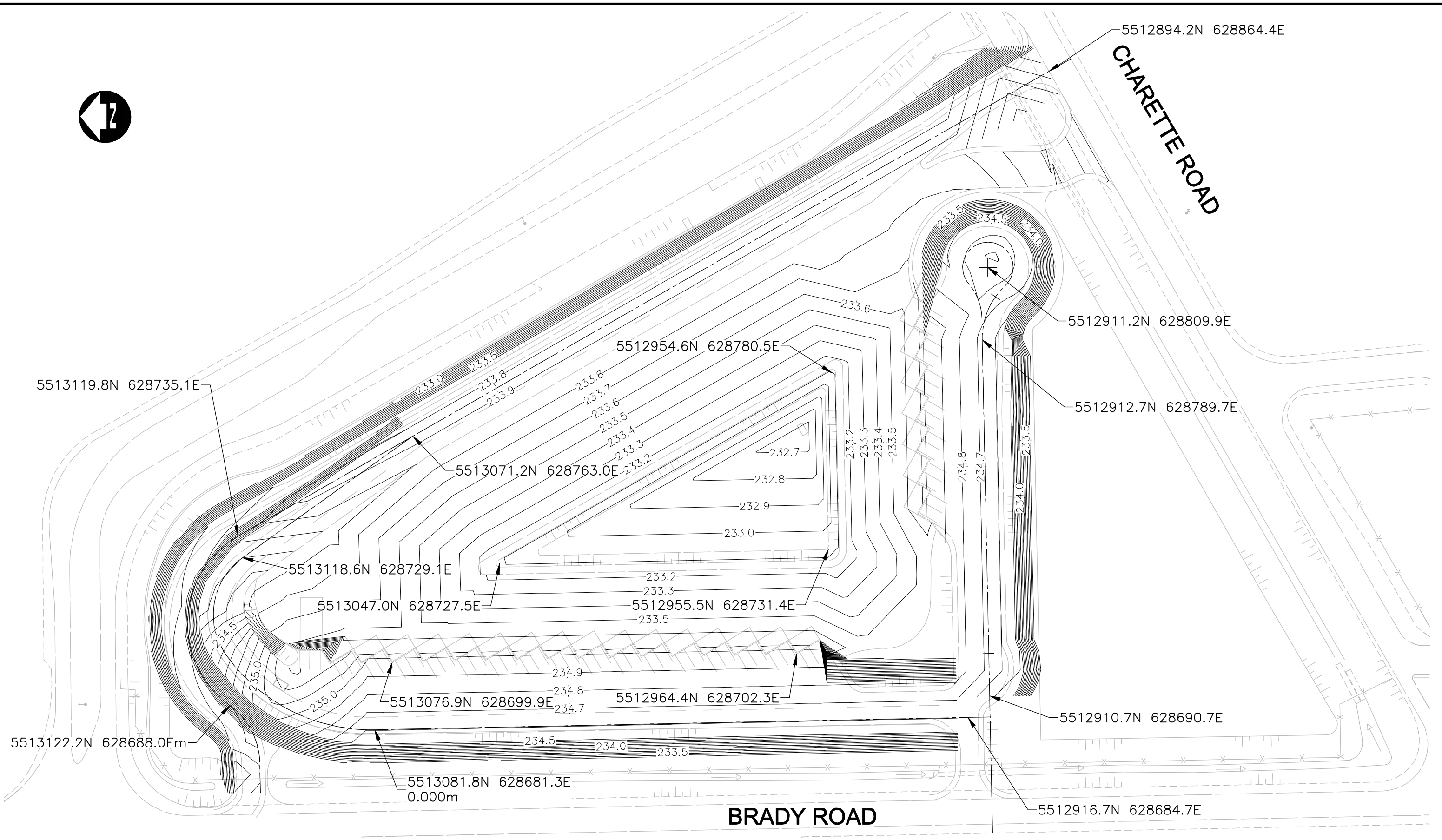
- (a) Aggregate for Leachate Collection Trench:
- i. Clean stone to be placed between the leachate collection system and the washed gravel for the drainage aggregate surrounding the 200 mm perforated leachate collection system piping installed on the floor of the disposal cell shall have a D85 (85% passing) of not less than 31.5 millimetres, a D10 of not less than 18 millimetres, a uniformity coefficient (D60/D10) of less than 2.0, and less than 2% passing the 80um sieve size, or as approved by the Contract Administrator.
 - ii. Washed gravel drainage aggregate to be installed between the clean stone surrounding the 200 mm perforated leachate collection piping and the sand drainage blanket at the base of the disposal cell shall be a washed or screened with a D85 of not less than 18 millimetres, a D10 of not less than 6.5 millimetres, a uniformity coefficient (D60/D10) of less than 2.0 or as approved by the Contract Administrator.
 - iii. Clean stone for the disposal cell leachate sump drainage bed shall be a washed or screened 50 mm maximum particle size, uniformly graded aggregate with a D85 of not less than 40 millimetres, a D10 of not less than 18 millimetres, a uniformity coefficient (D60/D10) of less than 2.0 and less than 2% passing the 80um sieve size, or as approved by the Contract Administrator.
 - iv. Aggregate quality: rounded, non-fractured, sound, hard, durable, free-draining material, free from soft, thin, elongated or laminated particles, organic matter or other deleterious substances.
 - v. Drainage aggregate to be approved for use by Contract Administrator prior to delivery to site.

E17.3 Construction Methods

- E17.3.1 Place stone directly over geomembrane or geotextile to the width and thickness shown on the drawing in a manner that will not damage the geomembrane. Drop height not to exceed 300 mm.
- E17.3.2 Prevent damage to geomembrane during placement operations.
- E17.3.3 Repair damages to geomembrane in accordance with Section E10 "Geomembrane," at no cost to City.

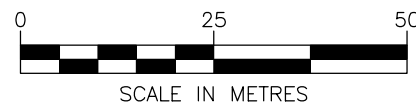
APPENDIX A

BRADY ROAD 4R DEPOT FILL



NOTE:

1. FILL CONTOURS BASED ON 50% DESIGN SUBMISSION TO CITY OF WINNIPEG.
2. BASE SURVEY DATA SUPPLIED BY THE CITY OF WINNIPEG.
3. INFORMATION SUPPLIED FOR CONVENIENCE ONLY.



TITLE

**BRADY ROAD 4R DEPOT
FILL**

DRAWING NO.

F-1