THE CITY OF WINNIPEG

BID OPPORTUNITY

BID OPPORTUNITY NO. 492-2005

2005 OUTFALL GATE CHAMBER UPGRADES, CONTRACT NO. 36

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TABLE OF CONTENTS

PART B - BIDDING PROCEDURES

B1. PROJECT TITLE

B1.1 2005 OUTFALL GATE CHAMBER UPGRADES, CONTRACT NO. 36

B2. SUBMISSION DEADLINE

B2.1 The Submission Deadline is 12:00 noon Winnipeg time, September 9, 2005.

B2.2 Bid Submissions 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. ENQUIRIES

B3.1 All enquiries shall be directed to the Contract Administrator identified in D3.1.

B3.2 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.

B3.3 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.

B3.4 Responses to enquiries which, in the sole judgment of the Contract Administrator, do not require a correction to or a clarification of the Bid Opportunity will be provided by the Contract Administrator only to the Bidder who made the enquiry.

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

B4. ADDENDA

B4.1 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.

B4.2 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.

B4.2.1 Addenda will be available on the Bid Opportunities page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

B4.2.2 The Bidder is responsible for ensuring that he has received all addenda and is advised to check the Materials Management Branch internet site for addenda shortly before submitting his Bid.

B4.3 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.

B5. SUBSTITUTES

B5.1 The Work is based on the Plant, Materials and methods specified in the Bid Opportunity.

B5.2 Substitutions shall not be allowed unless application has been made to and prior approval has been granted by the Contract Administrator in writing.

B5.3 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.

B5.4 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.

B5.5 The Contract Administrator, after assessing the request for approval of a substitute, may in his 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.

B5.6 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.

B5.6.1 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 wishes to inform.

B5.7 If the Contract Administrator approves a substitute as an “approved equal”, any Bidder may use the approved equal in place of the specified item.

B5.8 If the Contract Administrator approves a substitute as an “approved alternative”, any Bidder bidding that approved alternative shall base his 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 B14.

B5.9 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. BID SUBMISSION

B6.1 The Bid Submission consists of the following components:

(a) Form A: Bid;

(b) Form B: Prices;

(c) Form G1: Bid Bond and Agreement to Bond, or
Form G2: Irrevocable Standby Letter of Credit and Undertaking, or
a certified cheque or draft;

B6.2 All components of the Bid Submission 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 in ink, to constitute a responsive Bid.

B6.3 The Bid Submission shall be submitted enclosed and sealed in an envelope clearly marked with the Bid Opportunity number and the Bidder's name and address.

B6.3.1 Samples or other components of the Bid Submission 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 Submission.

B6.4 Bid Submissions submitted by facsimile transmission (fax) or internet electronic mail (e-mail) will not be accepted.

B6.5 Bid Submissions shall be submitted to:

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

B7. BID

B7.1 The Bidder shall complete Form A: Bid, making all required entries.

B7.2 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 own name, his 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 own, the business name and the name of every partner or corporation who is the owner of such business name shall be inserted.

B7.2.1 If a Bid is submitted jointly by two or more persons, each and all such persons shall identify themselves in accordance with B7.2.

B7.3 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.

B7.4 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 own name, it shall be signed by the Bidder;

(b) if the Bidder is a partnership, it shall be signed by the partner or partners who have authority to sign for the partnership;

(c) if the Bidder is a corporation, it shall be signed by its duly authorized officer or officers and the corporate seal, if the corporation has one, should be affixed;

(d) if the Bidder is carrying on business under a name other than his 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.

B7.4.1 The name and official capacity of all individuals signing Form A: Bid shall be printed below such signatures.

B7.4.2 All signatures shall be original and shall be witnessed except where a corporate seal has been affixed.

B7.5 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 Submission and the Contract, when awarded, shall be both joint and several.

B8. PRICES

B8.1 The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices.

B8.2 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.

B8.3 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. QUALIFICATION

B9.1 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;

(b) be responsible and not be suspended, debarred or in default of any obligation to the City;

(c) be financially capable of carrying out the terms of the Contract;

(d) have all the necessary experience, capital, organization, and equipment to perform the Work in strict accordance with the terms and provisions of the Contract;

(e) have successfully carried out work, similar in nature, scope and value to the Work;

(f) employ only Subcontractors who:

(i) are responsible and not suspended, debarred or in default of any obligation 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 Branch internet site at http://www.winnipeg.ca/matmgt); and

(ii) have successfully carried out work similar in nature, scope and value to the portion of the Work proposed to be subcontracted to them, and are fully capable of performing the Work required to be done in accordance with the terms of the Contract;

(g) have a written workplace safety and health program in accordance with The Workplace Safety and Health Act (Manitoba);

B9.2 Further to B11.1(g), the Bidder shall, within three (3) Business Days of a request by the Contract Administrator, provide proof satisfactory to the Contract Administrator that the Bidder has a workplace safety and health program meeting the requirement of The Workplace Safety and Health Act (Manitoba), by providing:

(a) a valid COR certification number under the Certificate of Recognition (COR) Program - Option 1 administered by the Manitoba Heavy Construction Association's Safety, Health and Environment Program; or

(b) a valid COR certification number under the Certificate of Recognition (COR) Program administered by the Manitoba Construction Safety Association; or

(c) a report or letter to that effect from an independent reviewer acceptable to the City (A list of acceptable reviewers and the review template are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg,ca/mtmgt).

B9.3 The Bidder shall be prepared to 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.

B9.4 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.

B10. BID SECURITY

B10.1 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.

B10.1.1 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.

B10.2 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.

B10.2.1 Where the bid security provided by the successful Bidder is in the form of a certified cheque or draft pursuant to B10.1(c), it will be deposited and retained by the City as the performance security and no further submission is required.

B10.2.2 The City will not pay any interest on certified cheques or drafts furnished as bid security or subsequently retained as performance security.

B10.3 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.

B11. OPENING OF BIDS AND RELEASE OF INFORMATION

B11.1 Bid Submissions will be opened publicly, after the Submission Deadline has elapsed, in the office of the Corporate Finance Department, Materials Management Branch, or in such other office as may be designated by the Manager of Materials.

B11.1.1 Bidders or their representatives may attend.

B11.1.2 Bid Submissions determined by the Manager of Materials, or his designate, to not include the bid security specified in B10 will not be read out.

B11.2 After the public opening, the names of the Bidders and their Total Bid Prices as read out (un-evaluated, 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 Branch internet site at http://www.winnipeg.ca/matmgt.

B11.3 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 Branch, internet site at http://www.winnipeg.ca/matmgt.

B11.4 The Bidder is advised that any information contained in any Bid Submission 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.

B12. IRREVOCABLE BID

B12.1 The Bid(s) submitted by the Bidder shall be irrevocable for the time period specified in Paragraph 11 of Form A: Bid.

B12.2 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.

B13. WITHDRAWAL OF BIDS

B13.1 A Bidder may withdraw his Bid without penalty by giving written notice to the Manager of Materials at any time prior to the Submission Deadline.

B13.1.1 Notwithstanding GC:23.3, 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.

B13.1.2 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.

B13.1.3 If a Bidder gives notice of withdrawal prior to the Submission Deadline, the Manager of Materials shall:

(a) retain the Bid Submission until after the Submission Deadline has elapsed;

(b) open the Bid Submission 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 B13.1.3(b), declare the Bid withdrawn.

B13.2 A Bidder who withdraws his Bid after the Submission Deadline but before his Bid has been released or has lapsed as provided for in B12.2 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.

B14. EVALUATION OF BIDS

B14.1 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 (pass/fail);

(b) qualifications of the Bidder and the Subcontractors, if any, pursuant to B9 (pass/fail);

(c) Total Bid Price;

(d) economic analysis of any approved alternative pursuant to B5.

B14.2 Further to B14.1(a), the Award Authority may reject a Bid as being non-responsive if the Bid Submission 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 if the interests of the City so require.

B14.3 Further to B14.1(b), the Award Authority shall reject any Bid submitted by a Bidder who does not demonstrate, in his Bid Submission or in other information required to be submitted, that he is responsible and qualified.

B14.4 Further to B14.1(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.

B14.4.1 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. AWARD OF CONTRACT

B15.1 The City will give notice of the award of the Contract by way of a letter of intent, or will give notice that no award will be made.

B15.2 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.

B15.2.1 Without limiting the generality of B15.2, 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.

B15.3 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.

PART C - GENERAL CONDITIONS

C1. GENERAL CONDITIONS

C1.1 The *General Conditions for Construction Contracts* (Revision 2000 11 09) are applicable to the Work of the Contract.

C1.1.1 The *General Conditions for Construction Contracts* are available on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

PART D - SUPPLEMENTAL CONDITIONS

GENERAL

D1. GENERAL CONDITIONS

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

D1.2 The General Conditions are amended by striking out “The City of Winnipeg Act” wherever it appears in the General Conditions and substituting “The City of Winnipeg Charter”.

D1.3 The General Conditions are amended by striking out “Tender Package” wherever it appears in the General Conditions and substituting “Bid Opportunity”.

D1.4 The General Conditions are amended by striking out “Tender Submission” wherever it appears in the General Conditions and substituting “Bid Submission”.

D1.5 The General Conditions are amended by deleting GC:6.16 and GC:6.17. The City of Winnipeg is now within the jurisdiction of the Manitoba Ombudsman pursuant to The Ombudsman Act.

D2. SCOPE OF WORK

D2.1 The Work to be done under the Contract shall consist of the construction of cast-in-place and pre-cast concrete gate chambers for flood control purposes at various locations in the city of Winnipeg.

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

(a) Construction of a pre-cast concrete gate chamber on the La Verendrye Land Drainage Sewer Outfall including the supply and installation of cast iron gate valve and flap gate.

(b) Construction of a cast-in-place concrete gate chamber on the Evans Street Land Drainage Sewer Outfall including supply and installation of cast iron sluice and flap gates.

(c) Construction of a pre-cast concrete gate chamber on the St. Catherine Street Land Drainage Sewer Outfall including supply and installation of cast iron gate valve and flap gates.

(d) Construction of cast-in-place concrete gate chamber on the Kavanagh Street Land Drainage Sewer Outfall including supply and installation of cast iron sluice and flap gates.

(e) Construction of a pre-cast concrete gate chamber on the Deniset Street Combined Sewer Outfall including the supply and installation of a cast iron gate valve and flap gate.

D3. CONTRACT ADMINISTRATOR

D3.1 The Contract Administrator is:

Mr. Darcy Strandberg
849 Ravelston Avenue West
Winnipeg, MB R3W 1S8

Telephone No. (204) 986-4448
Facsimile No. (204) 986-5345

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

D4. CONTRACTOR'S SUPERVISOR

D4.1 At the pre-construction meeting, the Contractor shall identify his designated supervisor and any additional personnel representing the Contractor and their respective roles and responsibilities for the Work.

D5. NOTICES

D5.1 Except as provided for in GC:23.2.2, 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.

D5.2 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications to the City, except as expressly otherwise required in D5.3, D5.4 or elsewhere in the Contract, shall be sent to the attention of the Contract Administrator at the address or facsimile number identified in D3.1.

D5.3 All notices of appeal to the Chief Administrative Officer shall be sent to the attention of the Chief Financial Officer at the following address or facsimile number:

The City of Winnipeg
Chief Administrative Officer Secretariat
Administration Building, 3rd Floor
510 Main Street
Winnipeg MB R3B 1B9

Facsimile No.: (204) 949-1174

D5.4 All notices, requests, nominations, proposals, consents, approvals, statements, authorizations, documents or other communications required to be submitted or returned to the City Solicitor shall be sent to the following address or facsimile number:

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

Facsimile No.: (204) 947-9155

D6. FURNISHING OF DOCUMENTS

D6.1 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 at cost.

SUBMISSIONS

D7. SAFE WORK PLAN

D7.1 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 GC:4.1 for the return of the executed Contract.

D7.2 The Safe Work Plan should be prepared and submitted in the format shown in the City's template which is available on the Information Connection page at The City of Winnipeg,

Corporate Finance, Materials Management Branch internet site at http://www.winnipeg.ca/matmgt.

D8. INSURANCE

D8.1 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) all inclusive, with The City of Winnipeg and ND Lea Engineers & Planners Inc. being added as an additional insured, with a cross-liability clause, such liability policy to also contain a contractual liability, an unlicensed motor vehicle liability and a products and completed operations endorsement to remain in place at all times during the performance of the Work and throughout the warranty period;

(b) automobile liability insurance for owned and non-owned automobiles used for or in connection with the Work in the amount of at least two million dollars ($2,000,000.00) at all times during the performance of the Work and until the date of Total Performance;

(c) all risks course of construction insurance in the amount of one hundred percent (100%) of the total Contract Price, written in the name of the Contractor and The City of Winnipeg, at all times during the performance of the Work and until the date of Total Performance.

D8.2 Deductibles shall be borne by the Contractor.

D8.3 The Contractor shall provide the City Solicitor with a certificate of insurance of each policy, in a form satisfactory to the City Solicitor, at least two (2) Business Days prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D8.4 The Contractor shall not cancel, materially alter, or cause each policy to lapse without providing at least fifteen (15) Calendar Days prior written notice to the Contract Administrator.

D9. PERFORMANCE SECURITY

D9.1 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.

D9.1.1 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.

D9.2 If the bid security provided in his Bid Submission was not a certified cheque or draft pursuant to B10.1(c), the Contractor shall provide the City Solicitor with the required performance security within seven (7) Calendar Days of notification of the award of the Contract by way of letter of intent and prior to the commencement of any Work on the Site but in no event later than the date specified in GC:4.1 for the return of the executed Contract.

D10. DETAILED PRICES

D10.1 The Contractor shall provide the Contract Administrator with a detailed price breakdown (Form I: Detailed Prices) at least five (5) Business Days prior to the commencement of any Work on the Site but in no event later than the specified in GC:4.1 for the return of the executed Contract.

D10.2 The Contractor shall state a price for each item or sub-item of the Work identified on Form I: Detailed Prices. The detailed prices must be consistent with the price(s) provided in the Contractor's Bid.

D11. DETAILED WORK SCHEDULE

D11.1 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 GC:4.1 for the return of the executed Contract.

D11.2 The detailed work schedule shall consist of the following:

a) a Gantt chart for the Work acceptable to the Contract Administrator.

D11.3 Further to D11.2(a), the Gantt chart shall clearly identify dates of all of the following activities/tasks making up the Work as well as showing those activities/tasks on the critical path for each Gate Chamber.

(a) Flap gates, gate valves and sluice gates:
  (i) submit shop drawings;
  (ii) delivery;
  (iii) installation
  (iv) show separate tasks for wall thimbles, flap gate, and sluice gate, if different dates apply.

(b) Gate chamber excavation and shoring:
  (i) Mobilization.
  (ii) submit construction method submission;
  (iii) submit shoring shop drawings;
  (iv) dewatering (if required);
  (v) excavation and shoring.

(c) Gate chamber construction:
  (i) submit required shop drawings;
  (ii) construct hoarding;
  (iii) construct floor;
  (iv) install wall thimbles;
  (v) construct walls (indicate each separate pour)'
  (vi) construct roof;
  (vii) remove shoring and backfill;
  (viii) install miscellaneous metals;
  (ix) install gates (show separate tasks for wall thimbles, flap gate, and sluice gate, if different dates apply;
  (x) test gates;
  (xi) surface restoration and landscaping.

D11.4 Further to D11.2(a), the Gantt chart shall show the time on a weekly basis, required to carry out each Work activity. The time shall be on the horizontal axis, and the activity shall be on the vertical axis.

SCHEDULE OF WORK

D12. COMMENCEMENT

D12.1 The Contractor shall not commence any Work until he is in receipt of a letter of intent from the Award Authority authorizing the commencement of the Work.

D12.2 The Contractor shall not commence any Work on the Site until:

(a) the Contract Administrator has confirmed receipt and approval of:

(i) evidence that the Contractor is 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;

(ii) evidence of the workers compensation coverage specified in GC:6.14;

(iii) the Safe Work Plan specified in D7;

(iv) evidence of the insurance specified in D8;

(v) the performance security specified in D9;

(vi) the detailed prices specified in D10; and

(vii) the detailed work schedule specified in D11.

(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.

D12.3 Commencement of the Work shall be at the discretion of the Contractor provided the commencement date will allow the achievement of Substantial Performance of the work in accordance with D13.1.

D13. SUBSTANTIAL PERFORMANCE

D13.1 The Contractor shall achieve Substantial Performance by March 15, 2006.

D13.2 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.

D13.3 The date on which the Work has been certified by the Contract Administrator as being totally 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.

D14. TOTAL PERFORMANCE

D14.1 The Contractor shall achieve Total Performance by June 30, 2006.

D14.2 When the contractor 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.

D14.3 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.

D15. LIQUIDATED DAMAGES

D15.1 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 Calendar Day for each and every Calendar Day following the days fixed herein for same during which such failure continues:

(a) Substantial Performance - One Thousand Dollars ($1,000.00);

(b) Total Performance - Five Hundred Dollars ($500.00).

D15.2 The amounts specified for liquidated damages in D15.1 are based on a genuine pre-estimate of the City's losses in the event that the Contractor does not keep Substantial Performance or Total Performance by the days fixed herein for same.

D15.3 The City may reduce any payment to the contractor by the amount of any liquidated damages assessed.

D16. SCHEDULED MAINTENANCE

D16.1 The Contractor shall perform the following scheduled maintenance in the manner and within the time periods required by the Specifications:

(a) Landscaping maintenance is specified in CW3510.

D16.2 Determination of Substantial Performance and Total Performance shall be exclusive of scheduled maintenance identified herein. All scheduled maintenance shall be completed prior to the expiration of the warranty period. Where the scheduled maintenance cannot be completed during the warranty period, the warranty period shall be extended for such period of time as it takes the Contractor to complete the scheduled maintenance.

CONTROL OF WORK

D17. JOB MEETINGS

D17.1 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.

D17.2 The Contract Administrator reserves the right to cancel any job meeting or call additional job meetings whenever he deems it necessary.

D18. PRIME CONTRACTOR – THE WORKPLACE SAFETY AND HEALTH ACT (MANITOBA)

D18.1 Further to GC:6.26, the Contractor shall be the Prime Contractor and shall serve as, and have the duties of the Prime Contractor in accordance with The Workplace Safety and Health Act (Manitoba).

D19. TRAFFIC CONTROL AND MAINTENANCE OF ACCESS

D19.1 Comply with the requirements of CW 1130 for traffic control and maintenance of access.

D19.2 Do not park construction vehicles in a manner that will block traffic on streets adjacent to the Site.

D19.3 Provide flag persons to direct traffic around construction vehicles that are unloading equipment and materials at the Site.

D19.4 Do not stockpile materials in a location and manner that will obstruct the safe operation of motor vehicles past the Site.

D19.5 Maintain one lane of traffic on Kavanagh Street at all times.

MEASUREMENT AND PAYMENT

D20. PAYMENT SCHEDULE

D20.1 Further to GC:12.1, payment for the supply and installation of all materials and other items incorporated into the completed work for Construction of Gate Chambers shall be in accordance with the following payment schedule:

(a) Payment shall be pro-rated against the Unit Bid Prices based on percentage completion of each of the items of work identified on Form B: Prices, including percentage completion of major items of work identified on Form I: Detailed Prices.

FORM H1: PERFORMANCE BOND
(See D9)

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 dated the

_____ day of _____ , 20____ , for:

BID OPPORTUNITY NO. 492-2005

2005 OUTFALL GATE CHAMBER UPGRADES, CONTRACT NO. 36

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)

_____
(Name of Principal)

Per: _____ (Seal)

Per: _____

_____
(Name of Surety)

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

FORM H2: IRREVOCABLE STANDBY LETTER OF CREDIT
(PERFORMANCE SECURITY)
(See D9)

_____
(Date)

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

RE: PERFORMANCE SECURITY - BID OPPORTUNITY NO. 492-2005

2005 OUTFALL GATE CHAMBER UPGRADES, CONTRACT NO. 36

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 I: DETAILED PRICES
(See D10)

2005 OUTFALL GATE CHAMBER UPGRADES, CONTRACT NO. 36

ITEM NO.	DESCRIPTION	AMOUNT
	Evans Street LDS Outfall Gate Chamber	
1.	Excavation and shoring.	
2.	Chamber floor slab.	
3.	Chamber walls and roof slab.	
4.	Supply and installation of flap and sluice gates.	
5.	Miscellaneous metal fabrications	
	Total of items 1 thru 5 above (to equal Bid Price for Section C on Form B:Prices)	
	Kavanagh Street LDS Outfall Gate Chamber	
1.	Excavation and shoring.	
2.	Chamber floor slab.	
3.	Chamber walls and roof slab.	
4.	Supply and installation of flap and sluice gates.	
5.	Miscellaneous metal fabrications	
	Total of items 1 thru 5 above (to equal Bid Price for Section E on Form B:Prices)	

PART E - SPECIFICATIONS

GENERAL

E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.1.1 *The City of Winnipeg Standard Construction Specifications* is available in Adobe Acrobat (.pdf) format on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at http://www.winnipeg.ca/matmgt.

E1.1.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.1.3 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.2 The following Drawings are applicable to the Work:

Drawing No.	Drawing
	Cover Page
LD-3154	Rue La Verendrye LDS Outfall Gate Chamber - Site Plan
LD-3155	Rue La Verendrye LDS Outfall Gate Chamber - Details
LD-3156	Evans Street LDS Outfall Gate Chamber - Site Plan
LD-3157	Evans Street LDS Outfall Gate Chamber - Concrete Details
LD-3158	Evans Street LDS Outfall Gate Chamber - Reinforcing Details
LD-3159	St. Catherine Street LDS Outfall Gate Chamber - Site Plan
LD-3160	St. Catherine Street LDS Outfall Gate Chamber - Details
LD-3161	Kavanagh Street LDS Outfall Gate Chamber – Site Plan
LD-3162	Kavanagh Street LDS Outfall Gate Chamber – Concrete Details
LD-3163	Kavanagh Street LDS Outfall Gate Chamber - Reinforcing Details
LD-3164	Deniset Street CS Outfall Gate Chamber - Site Plan
LD-3165	Deniset CS Outfall Gate Chamber – Details
LD-3166	Evans Street and Kavanagh Street - Hatch Details
LD-3167	Evans Street and Kavanagh Street - Miscellaneous Details
SL-SF1	Silt Fence

E2. SOILS INVESTIGATION REPORT

E2.1 Further to GC:3.1, of the General Conditions, a geotechnical soils investigation has been done in the vicinity of the proposed works to determine the character of the subsurface soil to facilitate the design of the Work. The information is considered accurate at the locations indicated and at the time of the investigation. However, considerable variations in the soil conditions may exist between test holes and fluctuations in ground water levels can be expected seasonally. Test hole logs are included.

E2.2 Bidders are responsible for any interpretation they place on the supplied information and are expected to make such additional investigation of the soil as they feel necessary to satisfy themselves.

E2.3 Any test borings made by the bidder shall be done in accordance with the requirements of the appropriate authority of the City of Winnipeg. Bidders shall notify the contract Administrator prior to starting any soil boring operation.

E3. DANGEROUS WORK CONDITIONS

E3.1 Further to clause GC 6.26 of the General Conditions, the Contractor shall be aware that underground chambers, manholes, and sewers are considered a confined space and shall follow the "Guidelines for confined Entry Work" as published by the Manitoba Workplace Safety and Health Division.

E3.2 The Contractor shall be aware of the potential hazards that can be encountered in gate chambers, manholes and sewers such as explosive gases, toxic gases and oxygen deficiency.

E3.3 The air in a confined space must be tested before entry and continuously during the time that personnel are inside the space. Equipment for continuous monitoring of gases must be explosion-proof and equipped with a visible and audible alarm. The principal tests are for oxygen deficiency, explosion range and toxic gases. Testing equipment must be calibrated in accordance with manufacturer's specifications.

E3.4 The Contractor shall ventilate all confined spaces including underground chambers, tunnels, pipes and shafts as required and approved by the Manitoba Workplace Safety and Health Act (the “Act”). If no ventilation is supplied, a worker must wear a respirator or supplied air to enter the confined space.

E3.5 Workers must wear a respirator or supplied air at all times when entering a chamber, manhole or sewer where live sewage is present.

E3.6 The Contractor shall provide a photoionization detector (PID) on site at all times to monitor potential hydrocarbon vapours in the confined spaces. The gas detector and safety equipment conforming to the Act shall be made available to the Contract Administrator for his use during inspections. In addition, the Contract Administrator shall collect discrete air samples for laboratory analysis.

E3.7 The Contract Administrator may issue a stop work order to the Contractor if the above guidelines are not being followed. The Contractor shall not resume his operations until the Contract Administrator is satisfied the Contractor is following the appropriate procedures. The Contractor shall have no claim for extra time or costs due to the stop work order for not following these safety guidelines.

E4. MOBILIZATION AND DEMOBILIZATION

E4.1 Mobilization and demobilization will include but not be limited to start-up costs, equipment set-up and removal, field office and storage facilities set-up and removal and site cleanup.

E4.2 Mobilization and demobilization will be measured on a unit basis and paid for at the Contract Unit Price for “Mobilization and Demobilization” in accordance with this specification, accepted and measured by the Contract Administrator.

E4.3 50% of the Mobilization and Demobilization unit price will be paid on the first progress payment.

E4.4 The remaining 50% of the Mobilization and Demobilization unit price will be paid subsequent to the completion of the work and restoration and clean up of all sites.

E5. PROTECTION OF EXISTING TREES

E5.1 Do not remove existing trees and take the following precautionary steps to avoid damage from construction activities to existing boulevard trees within the limits of the construction area.

E5.1.1 Do not stockpile materials and soil or park vehicles and equipment on boulevards within 2 metres of trees.

E5.1.2 Strap mature tree trunks with 25 x 150 x 2400 wood planks. Smaller trees shall be similarly protected using appropriately sized wood planks.

E5.1.3 Excavations shall be carried out in a manner to minimize damage to existing root systems. Where roots must be cut to facilitate an excavation they shall be neatly pruned at the face of the excavation.

E5.1.4 Work on site shall be carried out in a manner to minimize damage to existing tree branches. Where damage to tree branches does occur, the Contractor shall neatly prune the damaged branch.

E5.1.5 American elm trees shall not be pruned between April 1st and August 1st and Siberian elm trees between April 1st and July 1st of any year under provisions of The Dutch Elm Disease Act.

E5.2 All damage to existing trees due to construction activities shall be repaired to the requirements and satisfaction of the City of Winnipeg, Parks and Recreation Department, Forestry Branch at the Contractor's expense.

E5.3 Costs for protection of trees will be included in gate chamber construction.

E6. WATERWAY BY-LAW

E6.1 The Contractor shall note that all works within 107 metres (350 feet) of a riverbank are within the jurisdiction of the Waterway By-law. The Contract Administrator will apply and pay for required Waterway Permits for the project. The Contractor shall adhere to restrictions imposed by the permit.

E6.2 Under no circumstances will stockpiling of any material be permitted on within 107 metres of a riverbank or dyke.

E7. SHOP DRAWINGS

E7.1 Description

(a) This Specification shall revise, amend and supplement the requirements of CW 1100.

(i) The term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, including site erection drawings which are to be provided by the Contractor to illustrate details of a portion of the work.

(ii) The Contractor shall submit specified shop drawings to the Contract Administrator for review. All submissions must be in metric units. Where data is in imperial units, the correct metric equivalent shall also be show on all submissions for Engineering review.

(b) Shop Drawings

(i) Original drawings are to be prepared by Contractor, Subcontractor, Supplier, Distributor, or Manufacturer, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate sections.

(ii) Shop drawings for the following structural components shall bear the seal of a registered Engineer of Manitoba.
(a) Shoring.
(b) Reinforcing steel.
(c) Metal Fabrications.

(c) Contractor's Responsibilities

(i) Review shop drawings, product data and samples prior to submission and stamp and sign drawings indicating conformance to the Contract requirements.

(ii) Verify:
  (a) Field measurements
  (b) Field construction criteria
  (c) Catalogue numbers and similar data

(iii) Coordinate each submission with requirements of work and Contract Documents. Individual shop drawings will not be reviewed until all related drawings are available.

(iv) Notify Contract Administrator, in writing at time of submission, of deviations from requirements of Contract Documents.

(v) Responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator's review of submission, unless Contract Administrator gives written acceptance of specified deviations.

(vi) Responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

(vii) The Contractor shall make any corrections required by the Contract Administrator and shall resubmit the required number of corrected copies of Shop Drawings. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Contract Administrator on previous submission.

(viii) After Contract Administrator's review and return of copies, distribute copies to sub-trades as appropriate.

(ix) Maintain one (1) complete set of reviewed shop drawings, filed by Specification Section Number, at the site of the work for use and reference of the Contract Administrator and Subcontractors.

(d) Submission Requirements

(i) Schedule submissions at least 14 Calendar days before dates reviewed submissions will be needed, and allow for a 14 Calendar day period for review by the Contract Administrator of each individual submission and re-submission, unless noted otherwise in the Contract Documents.

(ii) Submit five (5) paper prints of shop drawings. The Contractor is advised that the Contract Administrator will retain three (3) copies of all submittals and return two (2) copies to the Contractor.

(iii) Accompany submissions with transmittal letter, containing:
  (a) Date
  (b) Project title and Bid Opportunity number
  (c) Contractor's name and address
  (d) Number of each shop drawing, product data and sample submitted
  (e) Specification Section, Title, Number and Clause
  (f) Drawing Number and Detail/Section Number
  (g) Other pertinent data

(iv) Submissions shall include:
  (a) Date and revision dates.
  (b) Project title and Bid Opportunity number.
  (c) Name of:
    (i) Contractor
    (ii) Subcontractor
    (iii) Supplier
    (iv) Manufacturer
    (v) Separate detailer when pertinent
  (d) Identification of product of material.
  (e) Relation to adjacent structure or materials.

(f) Field dimensions, clearly identified as such.
(g) Specification section name, number and clause number or drawing number and detail/section number.
(h) Applicable standards, such as CSA or CGSB numbers.
(i) Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract Documents.

(e) Other Considerations

(i) Fabrication, erection, installation or commissioning may require modifications to equipment or systems to conform to the design intent. Revise pertinent shop drawings and resubmit.

(ii) Material and equipment delivered to the site of the works will not be paid for at least until pertinent shop drawings have been submitted and reviewed.

(iii) Incomplete shop drawing information will be considered as stipulated deductions for the purposes of progress payment certificates.

(iv) No delay or cost claims will be allowed that arise because of delays in submissions, re-submissions and review of shop drawings.

E7.2 Measurement and Payment

(i) Preparation and submittal of Shop Drawings will be included in gate chamber construction.

E8. FLOW CONTROL

E8.1 During winter months land drainage and storm relief sewers can receive flow of an undetermined amount from groundwater infiltration, watermain breaks, snow melt and other unforeseen sources.

E8.2 Provide flow control measures to contend with and maintain flow in the land drainage and storm relief sewers that are directed to the location where gate chambers are being constructed. Flow control measures shall include but not be limited to diversions, flumes and by-pass pumping.

E8.3 Discharge hoses for by-pass pumping shall not be laid across vehicle or pedestrian traffic areas and must be protected from freezing during winter months. Pumping equipment if used, shall be set-up in a location and in such a way to not be a noise problem for nearby residences

E8.4 Provide a flow control plan for each gate chamber location to the Contract Administrator for review before removing any existing sewer pipe.

E8.5 Costs for flow control will be included in gate chamber construction.

E8.6 In the event the river level becomes higher than the gate chamber activation level and flow in the sewer system is expected to exceed the sewer capacity due to spring runoff, the Contract Administrator may suspend work activities that require temporary by-pass pumping and temporary shutdown of the site. Suspension of these activities will continue until the river level drops below flood pumping activation level and the high flow diminishes in the sewer.

E8.7 If in the opinion of the Contract Administrator suspension of work activities that require temporary by-pass pumping and temporary shutdown of the site may cause a delay in completion of the Work through no fault of the Contractor, the completion date of the Work will be adjusted accordingly.

E9. CAST-IN-PLACE CONCRETE GATE CHAMBER CONSTRUCTION

E9.1 Description

E9.2 General

(a) This specification shall cover construction of cast-in-place concrete gate chambers and shall supplement, revise and amend CW 2160.

E9.3 Materials

(a) Concrete Mix Design
  (i) Concrete mix design shall be as indicated in the Construction Notes on the Drawings.

(b) Lean-Mix Concrete Design
  (i) Proportioning of fine aggregate, coarse aggregate, cement, and water for lean mix concrete shall be as follows:
    (a) Cement: Type 50
    (b) Minimum Compressive Strength @ 28 days: 15 MPa
    (e) Slump: 80 mm
    (f) Air Content: nil
    (g) Minimum Cement Content = 240 kg/m^3
    (h) Maximum Water/Cement Ratio = 0.49

(c) Grout
  (i) Grout shall be Sika Grout 212 or approved equal.

(d) Reinforcing Steel
  (i) Bar accessories:
    (a) To be made from a non-corroding material.
    (b) Shall not stain, blemish or spall the concrete surface for the life of the concrete.
    (c) Shall be approved by the Contract Administrator.
    (d) Bar chairs shall be PVC.

(e) Bonding Agent
  (i) Bonding agent shall be ACRYL-STIX or approved equal.

(f) Waterproofing
  (i) Waterproofing shall be in accordance with E13 of this specification.

(g) Cast Iron Sluice Gates
  (i) Cast iron sluice gates, wall thimbles, mechanical lift operator, stems and accessories shall be in accordance with E11 of this specification.

(h) Cast Iron Flap Gates
  (i) Cast iron flap gates and wall thimbles shall be in accordance with E12 of this specification.

(i) Miscellaneous Metals and Accessories
  (i) In accordance with E14 of this specification and as shown on the Drawings.

(j) Shop Drawings
  (i) Provide shop drawings in accordance with E7 of this specification.
  (ii) Submit shop drawings for reinforcing steel a minimum of two (2) weeks prior to the fabrication of any reinforcing steel.

(k) Backfill
  (i) In accordance with CW 2030. Class of backfill to be as shown on the Drawings.

E9.4 Construction Methods

(a) Construction Method Submission

(i) No work shall commence on construction of cast-in-place gate chambers until after the Contract Administrator's review of the Contractor's Construction Method submission.

(ii) Excavation for the construction of the gate chambers shall be by the shored excavation method.

(iii) The Contractor shall prepare for the Contract Administrator's review a Construction Method submission detailing:

(i) Construction sequence to be followed including all methods to be employed to ensure no damage occurs to existing structures or adjacent properties within or adjacent to an excavation.

(ii) Shoring system to be used.

(iii) Proposed method of chamber construction.

(iv) Specialized equipment to be used.

(v) Any design revisions proposed to accommodate the Contractor's proposed construction method.

(vi) Water control considerations including details on the Contractor's proposed method of groundwater and surface runoff control.

(iv) The Contractor shall respond to any concerns that may be raised by the Contract Administrator after review of Construction Method submission.

(b) Excavation

(i) Remove excavated material from the site immediately. Excavated material shall not be stockpiled on-site unless it will be used as backfill the same day it is excavated.

(ii) Place a minimum 75 millimetre thick lean mix concrete slab in the bottom of the excavation to provide a clean working base upon completion of the excavation to the required limits. Allow the concrete to set for twenty-four (24) hours before setting up forms or placing reinforcing steel.

(iii) Lean mix concrete shall be well-tamped and screed to give a level working platform for setting up forms and placing reinforcing steel. Allow the concrete to set for twenty-four (24) hours before setting up forms or placing reinforcing steel.

(iv) Supply and place lean mix concrete, as directed by the Contract Administrator, as backfill for any portions of the excavation, carried beyond the required limits of excavation. The limits of excavation shall be considered to be the inside face of the shoring system and the underside of the working base slab.

(v) All working areas below grade shall be kept adequately and securely supported during and after excavation until the shoring and bracing is in place to prevent loss of ground or injury to any person from falling material.

(c) Excavation Security Fence

(i) Further to Clause 3.1 of CW 1130, completely cover the excavation and provide a security fence to completely surround the excavation when unattended generally in accordance with the following.

(ii) Security fence shall be chain link fence or approved equal, a minimum 1.80 metres high with metal support posts embedded far enough into the ground and spaced close enough together so the fence will not sag or collapse.

(iii) Attach fencing securely to posts.

(iv) Secure the gate or end of the fencing to a post with chain and a padlock.

(v) Provide alternate security fence proposal to Contract Administrator for approval.

(d) Shoring

(i) The type, strength, and amount of shoring and bracing shall be such as the nature of the ground and attendance conditions may require, taking into account property lines, existing slopes, utilities and roadways.

(ii) Shoring and bracing shall be so spaced and dimensioned as to prevent caving, loss of ground, surface settlement, or squeezing of the soil beyond the neat lines of excavation. It shall be free from defects that might impair its strength or suitability for the work. Sheeting/shoring and bracing shall conform to the latest revisions of the "Construction Safety Act" of the Department of Labour of the Government of Manitoba.

(iii) Supporting design calculations as required to facilitate review of the submission for conformance with the Contract Documents.

(iv) Submit Shop Drawings and design calculations for the shoring/excavation system designed and sealed by a Professional Engineer registered or licensed to practice in the Province of Manitoba and experienced in the structural design of shoring systems. The designer of the shorting system shall inspect the system during construction and certify, in writing to the Contract Administrator, that construction is in conformance with the approved design.

(v) Shoring and bracing shall be installed such that the structure size and wall thickness shown on the drawings can be obtained subsequent to installation of the shoring system.

(vi) Shoring and bracing shall remain in place until concrete has attained 75% of the design strength.

(e) Cast in place Concrete Chamber Construction

(i) Construct cast in place concrete chambers in accordance with CW 2160, except as supplemented, revised or amended in this specification and as indicated in the construction notes on the Drawings.

(ii) Adjust the location of reinforcing steel adjacent to openings to frame those openings in accordance with good practice, and maintain the bar spacing intent.

(iii) Do not use welded splices for reinforcing steel.

(iv) Order all wall reinforcing steel in lengths to best suit the spacing of walers so that reinforcing bars will not be bent or misformed in order to remove the walers.

(v) Install foundation waterproofing in accordance with E13 of this Specification.

(f) Backfill

(i) Place and compact backfill material as indicated on the Drawings in accordance with CW 2030. Do not place backfill material in a frozen state. Supply heating and hoarding in accordance with CW 2160 if required to ensure material does not freeze before compaction is complete.

(ii) Notify the Contract Administrator at least one (1) full working day in advance of any backfilling operation. No Backfill shall be placed against concrete until approved by the Contract Administrator and in no case before field cured test cylinders show the concrete strength to be 75% of that specified.

(g) Grout

(i) Mix and apply grout in accordance with the manufacturer's instructions. Consistency to be suitable for the intended application.

(h) Sluice Gate Installation

(i) Install sluice gates, wall thimbles, mechanical lift operator, stem and accessories as shown on the Drawings and in accordance with E11 of this specification.

(ii) Sluice gates shall be left in the open position at all times except when on site working on the gate.

(i) Flap Gate Installation

(i) Install flap gates, wall thimbles and lifting cable as shown on the Drawings and in accordance with E12 of this specification.

(j) Miscellaneous Metal Fabrications

(i) Install miscellaneous metal fabrications as shown on the Drawings and in accordance with E14 of this specification.

(k) Bollards

(i) Install removable steel bollards at the locations shown and as detailed on the Drawings.

E9.5 Measurement and Payment

(a) Construction of cast-in-place concrete gate chambers will be measured on a unit basis and paid for at the Contract Unit Price for "Cast-in-place Concrete Gate Chamber". The number of units to be paid for will be the total number of pre-cast concrete gate chambers constructed in accordance with this specification, accepted and measured by the Contract Administrator.

E10. PRE-CAST CONCRETE GATE CHAMBER CONSTRUCTION

E10.1 Description

(a) General

(b) This specification shall cover construction of pre-cast concrete gate chambers.

E10.2 Materials

(a) Pre-cast concrete manhole sections used for gate chambers shall be in accordance with section 2.7of CW 2130.

(b) Flexible Transition Pipe Couplings

(i) Flexible transition pipe couplings shall be in accordance with Clause 2.1 and 2.6 of CW 2130.

(c) Manhole Frames and Covers

(i) Cover: Unmarked Titan TF-114 cast iron solid cover.

(ii) Frame: 125 millimetre high cast iron frame.

(d) Cast Iron Flap Gates

(i) Cast iron flap gates and wall thimbles shall be in accordance with E12 of this specification.

(e) Cast Iron Gate Valves

(i) Gate Valves shall be bronze mounted, cast iron body with flanged ends equipped with:

(a) outside rising stem, screw and yoke

(b) bronze trimmed cast iron wedge

(c) bronze stem

(d) double O-ring stem seals

(ii) Flanges shall conform in dimension and drilling to ANSI/ASME B15.1, Class 150.

(iii) Direction of opening shall be counter clockwise and shall be clearly stamped or indicated with raised letters and arrow.

(iv) Manufacturer's nameplate shall be attached to the valve body with stainless steel fasteners.

(v) Gate valves shall be as manufactured by Crane, Jenkins, Kennedy, Mueller, Clow or approved equal.

(vi) Submit shop drawings of gate valves in accordance with E7 of this specification.

(f) Gate Valve Stem Extension

(i) Gate valve stem extension shall be 38 millimetre diameter ASTM A276 Type 304 stainless steel, schedule 40 pipe with a 50 mm square operating nut.

(ii) Submit shop drawings of the valve stem extension in accordance with E7 of this specification.

(g) Stem Extension Guide and Wall Brackets

(i) Stem extension guide and wall brackets to be ASTM A276, Type 304 stainless steel suitable for keeping the stem extension plumb and centered in the valve box while not interfering with the operation of the valve stem.

(ii) Submit shop drawings of the stem extension guides and wall brackets in accordance with E7 of this specification.

(h) Flange Adapter

(i) Vanstone Flange or approved equal.

(i) Miscellaneous Metals and Accessories

(i) In accordance with E14 of this specification and as shown on the Drawings.

E10.3 Construction Methods

(a) Install pre-cast concrete gate chambers as shown on the Drawings in accordance with Clause 3.8 and 3.9 of CW 2130.

(b) Gate Valve Installation

(i) Install gate valves, flange adapters and valve stems as shown on the Drawings.

(ii) Gate valves shall be left in the open position at all times except when on site working on the valve.

(c) Flap Gate Installation

(i) Install flap gates and wall thimbles as shown on the Drawings and in accordance with E of this specification.

(d) Miscellaneous Metal Fabrications

(i) Install miscellaneous metal fabrications as shown on the Drawings and in accordance with E14 of this specification.

E10.4 Measurement and Payment

(a) Construction of pre-cast concrete gate chambers will be measured on a unit basis and paid for at the Contract Unit Price for “Pre-cast Concrete Gate Chamber”. The number of units to be paid for will be the total number of pre-cast concrete gate chambers constructed in accordance with this specification, accepted and measured by the Contract Administrator.

E11. CAST IRON SLUICE GATES

E11.1 Description

(a) General

(i) This Specification shall cover the supply, delivery, installation and testing of cast iron sluice gates, wall thimbles, mechanical lift operator, stems, wall brackets and accessories.

(b) General Design:

(i) Specification Standard: AWWA C560

(ii) Type: Rising stem with stop nut, flange back with standard bottom closure.

(iii) Mounting: Type F wall thimble

(iv) Seating Head: Maximum design seating head for all sluice gates will be from centreline of the gate to the top of the gate chamber unless noted otherwise on the Drawings.

(v) Operator and Lift: Enclosed gear lift with pedestal.

Operator to be finished with a 50 millimetre x 50 millimetre square nut suitable for attachment of an electric portable drill for opening.

Operator shall turn counter clock wise to open.

(vi) Stem Cover: Gear lift to be complete with stem cover with acrylic window with gradations in suitable increments for the entire range of gate operation.

(vii) Stem Guides: Adjustable in both the horizontal and vertical directions.

E11.2 Materials

(a)	Frame, Slide, guides and yoke	ASTM A48 Cast Iron, Class 30
(b)	Seating Faces	ASTM B21 Naval Bronze, Alloy 482
(c)	Wall Thimble	ASTM A48 Cast Iron, Class 30
(d)	Wedges	ASTM B564 Manganese Bronze, Alloy 865
(e)	Wedge Blocks	ASTM A48 Cast Iron, Class 30
(f)	Fasteners & Anchors	ASTM A276 Type 316 Stainless Steel
(g)	Stem	ASTM A276 Type 304 Stainless Steel
(h)	Stem Couplings	ASTM A276 Type 304 Stainless Steel
(i)	Stem Guide	ASTM A48 Cast iron, Class 30 with Bronze bushings
(j)	Operator Pedestal	ASTM A48 Cast Iron, Class 30 or Steel
(k)	Stem cover	Aluminium or galvanized steel

(l) Shop Drawings

(i) Submit shop drawings of cast iron sluice gates, wall thimbles, mechanical lift operator, stems, wall brackets and accessories in accordance with E8 of this specification.

(m) Operating and Maintenance Manuals

(i) Provide five (5) copies of all the manufacturer's brochures and technical literature detailing correct installation procedure and recommended operating and maintenance instructions. Manuals shall be bound with the project title and gate description identified on the front cover. One set of manuals shall be provided for each size of gate. Final payment for sluice gates will not be made until the above information has been provided to the Contract Administrator.

(n) Delivery and Shipping

(i) The Contract Administrator will examine the sluice gate assemblies, thimbles, frames, stems, operators and accessories upon delivery and will reject any equipment that is found to be damaged to the extent that, in the Contract Administrator's opinion, it cannot be put to the use for which it was intended. The Contractor shall arrange with the gate supplier to repair any superficially damaged equipment to the satisfaction of the Contract Administrator.

(ii) It shall be the responsibility of the Contractor to negotiate any claims for damage with the carrier and to make arrangements to have any rejected equipment replaced as soon as possible at no extra expense to the City.

E11.3 Construction Methods

(a) Installation

(i) Install cast iron sluice gates, wall thimbles, mechanical lift operator, stems, wall brackets and accessories as shown on the drawings and in accordance with the manufacturer's recommendations.

(ii) Make arrangements to have a qualified field representative of the sluice gate supplier/manufacturer inspect the installation during and after completion and provide a Certificate of Satisfactory Installation to the Contract Administrator.

(b) Shop Testing

(i) The fully assembled gate shall be shop inspected, adjusted and tested for operation and leakage at the design head before shipping.

(ii) Provide the following information to the Contract Administrator prior to delivery of sluice gate and operator assemblies:

(i) A certified copy of the Chemical and Physical Analysis on all materials used in the manufacture of the sluice gate, wall thimble, stems, operator and accessories or certification that the materials used are in strict accordance with this specification.

(ii) Copies of the test reports for Performance and Leakage tests. Included on the report shall be the signature of the official who is responsible for the gate assembly and testing.

(c) Field Testing

(i) Perform leakage tests in the Contract Administrator's presence once sluice gates have been installed to ensure compliance with the allowable leakage rate indicated in AWWA C501-92.

(ii) Arrange for a qualified field representative of the sluice gate supplier/manufacturer to be present during field testing.

(iii) Generally, the test for seating head will be performed by closing the gate against high river levels in the spring and measuring the leakage rate through the gate.

(iv) If it is not possible to use high river level, install an inflatable plug in the outfall, fill the chamber with water to the specified head and measure the leakage rate through the gate. Inflatable plug shall be inflated from, anchored to and removable from the ground surface.

(v) The test for the unseating head will be performed by closing the sluice gate and flap gate, filling the chamber between the gates with water to the specified head and measuring the leakage rate through the gates.

(vi) The Contractor will be responsible to pump river water or supply water from a hydrant into the chamber for testing purposes.

(vii) If a gate fails the field leakage test, the Contractor shall undertake adjustments, replacements or other modifications recommended by the sluice gate supplier/manufacturer's field representative and repeat the test. The sequence shall be repeated until the gate passes the allowable leakage rate.

E11.4 Measurement and Payment

(a) Supply, installation and testing of cast iron sluice gates, wall thimbles, mechanical lift operator, stems, wall brackets and accessories will be included in gate chamber construction.

E12. CAST IRON FLAP GATES

E12.1 Description

(a) General

(i) This Specification shall cover the supply, delivery, installation and testing of cast iron flap gates and wall thimbles.

(b) General Design:

(i) Leakage rate Specification Standard: AWWA C560

(ii) Type: Flange Back for mounting on a wall thimble or flat concrete wall.

(iii) Mounting: Type F wall thimble

(iv) Seating Head: Maximum design seating head for all flap gates will be from centreline of the gate to the top of the gate chamber unless noted otherwise on the Drawings.

(v) Cover: One piece cast iron with lifting eye for manual operation

(vi) Seat: One piece cast iron, raised surface and inclined to assure positive closure.

(vii) Links: Complete with grease nipples at pivot pints and adjusting screws to align seating faces.

(viii) Pivot Lugs: One piece cast iron adjustable in the horizontal plane without removal of cover, complete with grease nipples.

(ix) Stem Guides: Adjustable in both the horizontal and vertical directions.

E12.2 Materials

(a) Cast Iron pieces: ASTM A48 Cast Iron, Class 30

(b) Seating Faces: ASTM B21 Bronze, Alloy 482

(c) Links: Cast iron or high tensile Bronze B584 – C865

(d) Bushings: Bronze B21, Alloy 482

(e) Hinge Pins: ASTM A276, Type 316 stainless steel or silicon Bronze B98-CA655

(f) Fasteners: ASTM A276, Type 316 stainless steel

(g) Shop Drawings

(i) Submit shop drawings of cast iron flap gates and wall thimbles in accordance with E9 of this specification.

(h) Operating and Maintenance Manuals

(i) Provide five (5) copies of all the manufacturer's brochures and technical literature detailing correct installation procedure and recommended operating and maintenance instructions. Manuals shall be bound with the project title and gate description identified on the front cover. One set of manuals shall be provided for each size of gate. Final payment for flap gates will not be made until the above information has been provided to the Contract Administrator.

E12.3 Construction Methods

(a) Installation

(i) Install cast iron flap gates and wall thimbles as shown on the drawings and in accordance with the manufacturer's recommendations.

(ii) Make arrangements to have a qualified field representative of the flap gate supplier/manufacturer inspect the installation during and after completion and provide a Certificate of Satisfactory Installation to the Contract Administrator

(b) Delivery and Shipping

(i) The Contract Administrator will examine the flap gate assemblies and wall thimbles upon delivery and will reject any equipment that is found to be damaged to the extent that, in the Contract Administrator's opinion, it cannot be put to the use for which it was intended. The Contractor shall arrange with the gate supplier to repair

any superficially damaged equipment to the satisfaction of the Contract Administrator.

(ii) It shall be the responsibility of the Contractor to negotiate any claims for damage with the carrier and to make arrangements to have any rejected equipment replaced as soon as possible at no extra expense to the City.

(c) Shop Testing

(i) The fully assembled gate shall be shop inspected, adjusted and tested for operation and leakage at the design head before shipping.

(ii) Provide the following information to the Contract Administrator prior to delivery of flap gate and wall thimble:

(i) A certified copy of the Chemical and Physical Analysis on all materials used in the manufacture of the flap gate and wall thimble or certification that the materials used are in strict accordance with this specification.

(ii) Copies of the test reports for Performance and Leakage tests. Included on the report shall be the signature of the official who is responsible for the gate assembly and testing.

(d) Field Testing

(i) Perform leakage tests in the Contract Administrator's presence once flap gates have been installed to ensure compliance with the allowable leakage rate of 1.24L/min per metre of seated perimeter at any head.

(ii) Arrange for a qualified field representative of the flap gate supplier/manufacturer to be present during field testing.

(iii) The test for seating head will be performed by closing the flap gate and sluice gate, filling the chamber between the gates with water to the specified head and measuring the leakage rate through the gates.

(iv) The Contractor will be responsible to pump river water or supply water from a hydrant into the chamber for testing purposes.

(v) If a gate fails the field leakage test, the Contractor shall undertake adjustments, replacements or other modifications recommended by the flap gate supplier/manufacturer's field representative and repeat the test. The sequence shall be repeated until the gate passes the allowable leakage rate.

E12.4 Measurement and Payment

(a) Supply, installation and testing of cast iron flap gates and wall thimbles will be included in gate chamber construction.

E13. FOUNDATION WATERPROOFING

E13.1 Description

(a) General

(i) This Specification shall cover the supply and placement of underground concrete gate chamber foundation waterproofing.

E13.2 Materials

(a) Waterproofing membrane: Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, reinforced with non-woven polyester weighing 180 g/m^2. Top surface polyethylene film. Bottom surface: thermofusible plastic film. Acceptable material: Soprema Sopralene Flam 180, IKO Aquabarrier TG.

(b) Primes, mastic sealant and accessories: as recommended by membrane manufacturer, applicable for substrate.

(c) Protection board: insulating fibreboard to CAN/CSA-A247, Type II, 12 millimetres thick.

E13.3 Construction Methods

(a) Quality Assurance

(i) Installation of waterproofing membrane shall be performed by workers approved and trained by manufacturer for application of its products. Applicators must have minimum 5 years proven experience. If requested, submit proof of experience, in writing, from manufacturer.

(b) Warranty

(i) Provide written warranty, signed and issued in the name of the Owner stating that the waterproofing is guaranteed against leaking, loss of adhesion, for a period of five (5) years from the date of acceptance

(c) Environmental Requirements

(i) Maintain air temperature and structural base temperature at installation area above membrane manufacturer's recommendations before, during and 72 hours after installation.

(ii) For applications in freezing weather do not commence application until authorized by membrane manufacturer.

(iii) For enclosed applications ensure adequate forced air circulation during curing period.

(iv) Install membrane on dry substrates, free of snow and ice. Use only dry materials and apply only during weather that will not introduce moisture beneath waterproofing membrane.

(d) Preparation

(i) Examine substrates and site conditions to ensure acceptability for application of waterproofing membranes. Notify Contract Administrator, in writing, of unsuitable surfaces or working conditions.

(ii) Do not commence application until all other work that will penetrate membrane is complete.

(iii) Clean substrates of all snow, ice, loose particles, oil, grease, dirt, curing compounds, or other foreign matter detrimental to application of primers and waterproofing membranes.

(iv) Ensure concrete surfaces are fully cured and dry using test methods recommended by membrane manufacture.

(v) Repair defects in concrete surfaces such as spalled or poorly consolidated concrete. Remove sharp protrusions, sharp edges and form lines.

(vi) Patch rough areas with a weld-adhered parge coat to provide smooth surface. Allow to fully cure and dry.

(e) Priming

(i) Apply primer in accordance with manufacturer's instructions at recommended rate of application.

(ii) Do not apply primer to frozen or damp surfaces.

(iii) Apply primer only when air and surface temperatures are within manufacturer's recommended limits.

(iv) Avoid pooling of primer and allow to cure until tack-free.

(v) Prime only the area to be covered with membrane in a working day. Re-prime areas not covered with waterproofing within 24 hours of application of primer.

(f) Membrane Application

(i) Apply membrane in accordance with manufacturer's instructions and with good construction practice to maintain continuity of waterproofing over building elements below finished grade elevation.

(ii) Place membrane in position without stretching, taking care to avoid trapped air, creases or fish mouths.

(iii) Ensure membrane is totally bonded to substrate.

(iv) Apply membrane vertically in longest possible lengths to reduce number of end joints.

(v) Overlap side laps minimum 75 millimetres and end laps minimum 150 millimetres. Stagger end laps minimum 300 millimetres in adjacent rows.

(vi) Seal horizontal and vertical terminations by applying heavy pressure to edges with a roller to ensure positive bond. Apply a continuous bead of mastic sealant to all terminations. Make watertight. Seal daily terminations with mastic sealant.

(vii) Terminate membrane 300 millimetres below finished grade.

(g) Membrane Application at Corners

(i) Remove sharp or protruding edges from external corners prior to application of membrane.

(ii) Reinforce external corners with cushion strip of membrane minimum 300 mm wide at each corner. Install cushion strip below main membrane.

(h) Membrane Application Over Protrusions and Penetrations

(i) Apply two layers of membrane flashing around protrusions, and extend at least 150 millimetres in all directions. Cut and fit membrane neatly and snug fitting, leave no gaps. Seal all terminations with mastic sealant. Flash protrusions with liquid mastic extending 150 millimetres along pipe or conduit.

(ii) Seal with liquid mastic all protrusions or difficult detail areas which do not allow easy installation of membrane. Make watertight.

(i) Inspection and Repair

(i) Inspect membrane thoroughly before covering and make corrections immediately.

(ii) Patch and repair misaligned or inadequately lapped seams, tears, punctures or fishmouths.

(iii) Patch with piece of waterproofing membrane and extend minimum 150 millimetres in all directions from fault and seal edges with mastic sealant.

(j) Protection Board

(i) Install protection board against all waterproofing membranes to protect against backfilling operations.

(ii) Install boards vertically without fasteners or adhesives.

(iii) Install protection board during backfilling operations to allow backfill materials to hold protection board tight to waterproofing membrane.

(iv) Terminate protection board 600 millimetres below grade.

E13.4 Measurement and Payment

(a) Supply and installation of waterproofing membrane and protection board will be included in gate chamber construction.

E14. METAL FABRICATIONS

E14.1 Description

(a) General

(i) This Specification shall cover the supply, fabrication, transportation, handling, delivery and placement of metal fabrications.

E14.2 Materials

(a) All materials shall be of a type acceptable to the Contract Administrator, and shall be subject to inspection and testing by the Contractor Administrator.

(b) Material intended for use in the various assemblies shall be new, straight, clean, with sharply defined profiles.

(c) Steel Sections and Plates:to CAN/CSA G40.20/G40.21, Grade 300 W, except W, HP and HSS sections, which shall be Grade 350 W.

(d) Steel Pipe: to ASTM A53/A53M, seamless, galvanized, as specified by item.

(e) Welding materials: to CSA W59.

(f) Hot dipped galvanized steel repair material: Galvalloy and Gal-Viz

(g) Stud Anchors: to ASTM A108, Grade 1020.

(h) Aluminum: to CAN/CSA S157 and the Aluminum Association 'Specifications for Aluminum Structures'. Aluminum for plates shall be Type 6061-T651. Aluminium plate shall have an approved raised oval or multi-grip pattern.

(i) Isolating sleeves shall be "Nylite" – headed sleeve as manufactured by SPAE-Naur of Kitchener, Ontario, or approved equal.

(j) Anchor bolts and fasteners: ASTM A276, Type 316 stainless steel, of ample section to safely withstand the forces created by operation of the equipment or the load to which they will be subjected.

E14.3 Construction Methods

(a) Submittals

(i) The Contractor shall submit the qualifications of the fabricator and welders to the Contractor Administrator for acceptance.

(ii) Submit shop drawings in accordance with E8 clearly indicating materials, core thickness, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and, accessories. Indicate field measurements on shop drawings.

(b) Fabrication

(i) Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured. Assemble work in such a way that no disfigurements will show in the finished work, or impair the strength.

(ii) Confirm measurements for all fabrications before fabricating.

(iii) Cut aluminium plate with edges straight and true, and as far as practical, maintain continuity of the pattern at abutting edges.

(iv) Pieces shall be of the sizes indicated on the Drawings and shall not be built up from scrap pieces. Confirm sizes with field measurements.

(v) Where possible, fit work and shop assemble, ready for erection.

(vi) Angle frames shall be of the same material as the cover plate, and cover plates shall be hinged and be supplied with lifting handles, as shown on the Drawings. Exterior covers shall be supplied with a hasp for a padlock.

(vii) Remove and grind smooth burrs, filings, sharp protrusions, and projections from metal fabrications to prevent possible injury. Correct any dangerous or potentially harmful installations as directed by Contract Administrator.

(viii) All steel welding shall conform to CSA Standard W.59. Fabricator shall be fully approved by the Canadian Welding Bureau, in conformance with CSA Standard W.47.1. Welding shall be done by currently licensed welders only.

(ix) All aluminium welding shall conform to Welding shall be in accordance with the requirements of CSA W59.2. The fabricator shall be fully certified in conformance with CSA Standard W47.2. All welding shall be done in a licensed welding shop, and no field welding will be permitted unless approved in writing, in advance, by the Contract Administrator.

(x) Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

(xi) All steel shall be hot-dip galvanizing after fabrication, in accordance with CAN/CSA-G164, to a minimum net retention of 600 gm/m^2.

(xii) Seal exterior steel fabrications to provide corrosion protection in accordance with CAN3-S16.1.

(xiii) Use self-tapping shake-proof flat-headed screws on items requiring assembly by screws.

(c) Erection

(i) Do steel welding work in accordance with CSA W59 and aluminium welding work in accordance with CSA W59.2

(ii) Erect metalwork in accordance with reviewed shop drawings, square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

(iii) Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles where not specifically indicated on the Drawings.

(iv) Provide components for building in accordance with shop drawings and schedule.

(v) Make field connections with bolts to CAN/CSA-S16, or weld.

(vi) Touch-up rivets, bolts and burnt or scratched surfaces that are to receive paint finish, with zinc primer after completion of erection.

(vii) Repair damaged galvanized surfaces and field welds with self-fluxing, low temperature, zinc-based alloy rods in accordance with ASTM A780, Repair of Damaged Hot Dip Galvanizing Coatings. The general procedure shall be to allow a small amount of the repair alloy to flow then spread by brushing briskly with a wire brush. Brushing shall be sufficient to obtain a bright finish. Repeat process three times to ensure a proper thickness is achieved. Temperatures shall be kept below 177ºC (350ºF) at all times. All heating of structural steelwork shall be done in the presence of the Contract Administrator.

(viii) Install access hatch frames square and level at the locations show on the Drawings. Embed anchors in concrete as shown on the Drawings. Install covers and adjust hardware to proper function.

(ix) All aluminium surfaces in contact with concrete shall be isolated using alkali-resistant bituminous paint meeting the requirements of CGSB 31-GP-3M.

(x) Install electrochemical isolation gaskets and sleeves to electrically isolate dissimilar metals.

E14.4 Measurement and Payment

(a) Supply, fabrication, transportation, handling, delivery and placement of metal fabrications will be included in gate chamber construction.

E15. TEMPORARY SURFACE RESTORATION AND MAINTENANCE

E15.1 Further to CW 1130, if the Contractor fails to maintain disturbed surfaces as directed and within the time period given by the Contract Administrator, the City or its designate may perform the work required and the cost may be deducted from payments owed.

E15.2 Costs for temporary restoration and maintenance of disturbed surfaces will be included in gate chamber construction.

E16. SURFACE RESTORATION

E16.1 Restoration of all existing surface areas disturbed by construction activities including but not limited to areas disturbed by; construction equipment, placement of field office or equipment trailer, snow clearing and where construction materials were stockpiled, shall be restored as follows.

(a) Grassed areas: sodding using imported topsoil in accordance with CW 3510.

(b) Gravel surfaces: in accordance with CW 3150.

(c) Asphalt surfaces: match existing base course and asphalt thickness or a minimum of 150 millimetres of base course and 75 millimetres of Type 1A Asphaltic concrete whichever is greater, in accordance with CW 3410.

(d) Pavement slabs (including private approaches): in accordance with CW 3230.

(e) Miscellaneous concrete slabs (median slab, sidewalk, bullnose: in accordance with CW3235

(f) Concrete curb and gutter: in accordance with CW 3240.

E16.2 Restore berms constructed around finished gate chambers with sod using imported topsoil in accordance with CW 3510.

E16.3 Costs for permanent surface restoration will be included in gate chamber construction.

E17. SILT FENCE

E17.1 Description

E17.1.1 This specification covers the erection of temporary silt fencing, which shall be installed and maintained at the locations shown on the drawings (detail drawing is attached), to control runoff and minimize the release of detrimental silt loadings to watercourses. The scope work included in this specification is as follows:

(a) Supply and Install temporary silt fencing at locations as indicated, in accordance with the detail drawing provided, prior to undertaking any other activities on the site where silt fencing is required.

(b) Maintain the silt fencing in serviceable condition throughout the entire duration of activities at the site where silt fencing is required, including final restoration and cleanup of the construction site.

(c) Remove the silt fencing and restore the area where the fencing was installed, without further disturbing the area and without releasing any deleterious substances to the adjacent watercourse.

E17.2 Materials

E17.2.1 Fence Posts

(a) Fence posts shall be 100 mm untreated wood posts or 50 mm steel posts, minimum length of 1.1 m.

E17.2.2 Filter Fabric

(a) Filter Fabric Shall be a woven geotextile material specifically designed for a silt fence applications, meeting the following minimum requirements:

Property	**Test Method**	**Value**
Grab Tensile Strength	ASTM D 4632	0.55 kN
Grab Tensile Elongation	ASTM D 4632	15%
Mullen Burst	ASTM D 3786	2060 kPa
Puncture	ASTM D 4833	0.285 kN
Trapezoid Tear	ASTM D 4533	0.285 kN
UV Resistance	ASTM D 4355	80% @ 500 hrs
Apparent Opening Size (AOS)	ASTM D 4751	0.60 mm
Flow Rate	ASTM D 4491	405 l/min/m²

Acceptable Product: “Amoco 2130 Silt Fence Fabric” or approved equal.

E17.2.3 Wire Mesh

(a) Wire mesh shall be galvanized or plain metal with wire gauge=3.0 mm, wire spacing @ 150 mm o/c.

E17.2.4 Fencing Material Fasteners

(a) Staples or wire ties of sufficient strength and spacing to withstand a 530N (120lbf) pull test at any point on the wire mesh.

E17.3 Construction Methods

E17.3.1 Ensure that no deleterious substances are discharged into the adjacent watercourse at any time during construction activities

E17.3.2 Silt Fence Installation

(a) Excavate 150 x 150 anchor trench along alignment of silt fence as indicated. Install fence posts as indicated. Ensure that fence posts are firmly driven into undisturbed soil, or are completely and firmly backfilled if installed via auger methods. Attach wire mesh as support backing for silt fence filter fabric with fasteners as specified in E:17.2.4. Attach silt fence filter fabric on top of wire mesh in similar fashion. Overlap any fence seams (wire mesh or filter fabric) by 450 mm minimum. Ensure that wire mesh and filter fabric are installed on the upslope side of the post and are fully laid in anchor trench as shown.

(b) Install and compact impermeable excavated materials into anchor trench and slope as indicated. Compact to 95% of maximum dry density (ASTM D-698).

E17.3.3 Silt Fence Maintenance

(a) Inspect silt fence daily, prior to starting any other construction activities. If fence posts are found loose or not upright, repair in accordance with installation procedure as specified in E17.3.2. If silt fence is found to be loose or torn, repair or replace as necessary to comply with E17.3.2.

(b) If silt deposition at the fence is 300 mm or more in depth, carefully remove and dispose of silt offsite without disturbing silt fence.

E17.3.4 Silt Fence Removal

(a) Following completion of all site construction activities (including final restoration and cleanup), remove all fence posts, wire mesh, fabric and fasteners from site.

(b) Restore areas disturbed, without releasing any deleterious substances to the adjacent watercourse.

E17.4 Method of Measurement and Basis of Payment

(a) Supply, installation, maintenance and removal of temporary silt fencing for control of runoff and deleterious material discharge to adjacent water curses will be included in gate chamber construction.

KGS GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
CONSULTING ENGINEERS & PROJECT MANAGERS

July 20, 2005

File No. 05-0107-07

City of Winnipeg
Water and Waste Department
1500 Plessis Road
Winnipeg, Manitoba
R3C 5G6

ATTENTION: Mr. Darcy Strandberg, C.E.T.
Project Manager

RE: Geotechnical Investigation
Proposed Gate Chamber – Evans Street

Dear Mr. Strandberg:

KGS Group was authorized by the City of Winnipeg Water and Waste Department to undertake a geotechnical site investigation for the proposed gate chamber construction at the existing Evans Street Outfall on the Seine River. This letter report details the results of our investigation including a summary of soil and groundwater conditions at the site plus geotechnical design considerations for temporary shoring, lateral earth pressure, foundations and backfill. Comments received from the City with respect to our draft letter report are included with this letter.

1.0 BACKGROUND

It is our understanding the proposed gate chamber will consist of cast-in-place concrete and be located on the riverbank approximately 5 m west of the existing manhole on Evans Street. The base of the chamber will be situated approximately 6.0 m below grade and a braced or strutted excavation will be used for construction.

2.0 SITE INVESTIGATION

On June 13, 2005 KGS Group supervised the drilling of one (1) test hole to 6.7 m depth below existing ground surface in the vicinity of the proposed gate chamber. The test hole was advanced using 125 mm diameter solid stem augers with representative soil samples collected directly off the auger flights at 1.5 m intervals or at changes in stratigraphy. Drilling services were provided by Paddock Drilling Ltd. of Brandon, MB. with continuous KGS Group supervision. Laboratory testing was performed on select soil samples and included moisture content analysis and Atterberg limit testing.

STRUCTURAL■GEOTECHNICAL■ENVIRONMENTAL■HYDRAULICS■HYDROGEOLOGY■MUNICIPAL■MECHANICAL■ELECTRICAL
3RD FLR. – 865 WAVERLEY ST., WINNIPEG, MANITOBA, R3T 5P4 PH: (204) 896-1209 FAX: (204) 896-0754
560 SQUIER PLACE, THUNDER BAY, ONTARIO, P7B 6M2 PH: (807) 345-2233 FAX: (807) 345-3433

3.0 SITE CONDITIONS

3.1 Stratigraphy

In general, the stratigraphy at the site consisted of a clay fill over a native silty clay. The clay fill extended to a depth of 1.1 m below ground surface and consisted of intermediate plasticity clay. Underlying the clay fill, native silty clay extended to a depth of 6.7 m below ground surface with a layer of silt located between depths of 2.9 and 3.1 m. The silty clay was brownish tan in colour above the depth of 1.7 m and greyish brown below. In general, the silty clay was of low to high plasticity, soft to stiff in consistency, contained trace gypsum pockets, and trace silt pockets throughout the deposit. The natural moisture content of the silty clay ranged from 23.4% to 46.1%, with an overall average of 37%. The undrained shear strength of the silty clay ranged from 35 to 63 kPa, with an overall average of 46 kPa as measured from the field Torvane. A summary soil log for the site is attached.

3.2 Groundwater Conditions

No groundwater infiltration or caving of the test hole side walls was observed during the test hole drilling. KGS Group is in the process of completing an additional test hole at the site, which will include installation of a standpipe piezometer in the underlying glacial till. The measured groundwater level from the piezometer will be reported to the City in a supplemental letter when available.

Groundwater levels vary seasonally and in response to precipitation such that future groundwater conditions at the site may vary from those observed at the time of this site investigation.

4.0 GEOTECHNICAL CONSIDERATIONS

4.1 Temporary Shoring

It is our understanding that temporary shoring will be used to support the side walls of the gate chamber excavation. Due to the depth of the excavation, space limitations, and close vicinity of the Seine River strutted or braced walls are considered a suitable type of shoring for construction. The detailed design of the temporary shoring depends upon the final geometry of the excavation, the type of shoring utilized, and construction details. Design considerations should include the following:

- The shoring should be designed to resist the lateral earth pressure of the clay fill and silty clay soils, groundwater pressures, and the surcharge load from construction equipment.

- An assessment of the potential for basal heave and blowout at the base of the excavation. Groundwater monitoring information from the standpipe piezometer that will be installed at the site shortly will be provided when available. Depending on the actual groundwater levels at the time of construction measures may be to counteract the risk of blowout, such as by temporary construction dewatering below the base of the proposed excavation.

- The design of any required temporary construction dewatering measures should include an evaluation of the potential settlement implications below the adjacent structures which are likely supported by shallow foundations. This includes the adjacent manhole and underground piping.

- The vertical spacing of the internal struts should be designed and installed to minimize the potential for lateral and vertical soil movement, which could be detrimental to the existing infrastructure at the site.

- The removal of the temporary shoring and backfilling between the existing ground and the new gate chamber should be completed to minimize the potential for lateral and vertical ground movements.

- No stockpiling of excavated materials should be permitted adjacent to the excavation.

A registered professional engineer who is experienced with the design of braced excavations and the related soil and groundwater considerations should complete the shoring design.

4.2 Backfill

Free draining granular backfill should be placed around the chamber walls for a minimum width of 0.6 m and covered with a low permeability clay cap at ground surface. All backfill should be placed in maximum 150 mm thick lifts and compacted to a minimum of 95% Standard Proctor maximum dry density (SPMDD).

4.3 Lateral Earth Pressure

Providing the gate chamber is constructed using the backfill recommendations outlined above the permanent walls of the chamber may be designed using an at-rest earth pressure coefficient of 0.7 and the following expression, which assumes a triangular pressure distribution:

$$P_o = K_o (\gamma' H + q) + u$$

where:

P_o = Lateral earth pressure at-rest condition for restrained wall at a given depth (kPa)

K_o = Coefficient of earth pressure at-rest (assume 0.7)

γ' = Effective unit weight of retained soil (below water table $\gamma' = \gamma_{bulk} - \gamma_{water}$, above water table $\gamma' = \gamma_{bulk}$)

γ_{bulk} = Bulk unit weight of soil (for silts and clays assume γ_{bulk} = 19 KN/m^3, for sands and gravels assume γ_{bulk} = 21 KN/m^3)

γ_{water} = Unit weight of water (9.81 KN/m^3)

H = Depth of wall below final grade (m)

q = Any surcharge pressure at ground surface (kPa)

u = net porewater pressure acting on wall (kPa)

4.4 Mat Slab

A mat slab foundation bearing on the native clay is suitable to support the proposed gate chamber. A design net allowable bearing capacity of 85 kPa may be used for a mat slab located at approximately 6.0 m below ground surface. Excessive wetting or drying of the clay subgrade in the base of the excavation should be avoided during construction to reduce the potential for swelling and shrinkage of the soil. In this regard placement of a lean mix concrete slab (mud slab) over the exposed bearing surface should be considered immediately following excavation.

4.5 Uplift

Taking into account the proposed embedment depth of the gate chamber and anticipated weight of the structure we do not anticipate there will be any special requirements to resist potential hydraulic uplift forces acting on the base slab. However we are currently in the process of verifying groundwater levels at the site by installing a standpipe piezometer. The additional groundwater monitoring information may be used to verify potential uplift pressures will be forwarded in a supplemental letter report when available.

5.0 SUMMARY

We have completed a geotechnical site investigation for the proposed gate chamber expansion at the Evans Street Outfall. The stratigraphy at the site consisted of clay fill overlying silty clay. Geotechnical design considerations for temporary shoring, backfill, lateral earth pressure, and foundations are included.

We thank you for the opportunity to provide engineering services on this project. If you have any questions please contact the undersigned at 896-1209 or Dr. Rob Kenyon, P. Eng. of our office.

Yours truly,

PROVINCE OF MANITOBA
C. W. CARROLL
Member
21416
REGISTERED PROFESSIONAL ENGINEER

Chris Carroll, P. Eng.
Geotechnical Engineer

July 20/05

CC/jr
cc: Mr. Kas Zurek, P. Eng., Design and Construction Engineer

KGS GROUP

SUMMARY LOG

HOLE NO.
TH-09 Evans St.

SHEET 1 of 1

CLIENT CITY OF WINNIPEG
PROJECT 2005 OUTFALL GATE CHAMBER UPGRADES - GEOTECHNICAL INVESTIGATIONS
SITE EVANS STREET
LOCATION ±13 m west of centreline of existing manhole
DRILLING METHOD 125 mm ø Solid Stem Auger (Truck Mounted)

JOB NO. 05-107-07
GROUND ELEV.
WATER ELEV.
DATE DRILLED 13-Jun-05
UTM N 5526818
E 636466

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.30 m ▲ 40 80 120	Cu TORVANE (kPa) ◆ 20 40 60 80 / PL MC LL % 20 40 60 80
	1			**CLAY FILL** - Greyish-black, damp, intermediate plasticity, some coarse grained sand, some fine grained gravel, trace coarse grained gravel, trace organic matter.		1			
		5		**CLAYEY SILT** - Brownish-tan, damp, soft, low to intermediate plasticity, trace fine grained sand, trace organic matter.		2			
	2			**CLAY (CH)** - Greyish-brown, damp, stiff, high plasticity, trace silt pockets and nodules.		3			
	3	10		**MIXED SILT AND CLAY** - Brown, damp, firm, trace silt pockets in clay.		4			
				CLAY (CH) - Greyish-brown, damp, firm, high plasticity, trace gypsum pockets (1 to 2 mm thick).					
	4					5			
		15							
	5			- Trace silt pockets below 5.18 m.					
	6	20				6			
				END OF HOLE AT 6.71 m					
	7			Notes: 1. No water in test hole at completion of drilling. 2. Test hole backfilled with cuttings and bentonite to surface.					
		25							
	8								
	9	30							

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR B. P. ARPIN
APPROVED
DATE 20-07-05

SPT & TORVANE P:\PROJECTS\2005\05-0107-07\GEOLOGS\05-107-07 LOGS.GPJ

2.0 GROUNDWATER CONDITONS

A summary of the groundwater levels measured at each site is shown in Table 1 below. This information is submitted to supplement the groundwater information included in our original July 20, 2005 letter reports.

TABLE 1
SUMMARY OF MEASURED GROUNDWATER LEVELS
2005 OUTFALL GATE CHAMBER UPGRADING PROGRAM

SITE	Rowandale Crescent	LeMaire Street	Rue Notre Dame	Kavanagh Street	Evans Street	Falconer Bay	Blackmore Avenue
TEST HOLE	TH-01A	TH-02A	TH-04A	TH-06A	TH-09A	TH-10A	TH-11A
STRATUM	Till	Till	Till	Till	Till	Till	Till
DATE	Measured Groundwater Level (m) [1]						
26-Jul-05	-	-	10.67	-	-	-	-
2-Aug-05	4.88	6.72	11.55	5.44	Dry	7.31	4.67

Notes:
"-" = No Data
1. All measured groundwater levels are below existing grade at test hole locations.

Groundwater levels vary seasonally and in response to precipitation such that future groundwater conditions at the site may vary from those reported herein.

3.0 SUMMARY

Standpipe piezometer installations and groundwater level monitoring has been performed at seven (7) sites for the 2005 Gate Chamber Upgrading Program. Measured groundwater levels are reported herein and supplement our original geotechnical letter reports dated July 20, 2005.

We thank you for the opportunity to provide engineering services on this project. If you have any questions please contact the undersigned at 896-1209 or Dr. Rob Kenyon, P. Eng. of our office.

Yours truly,

Chris Carroll, P. Eng.
Geotechnical Engineer

CC/jr
Attachment

cc: Mr. Kas Zurek, P. Eng., Design and Construction Engineer

KGS GROUP

SUMMARY LOG

HOLE NO.
TH-09A Evans St.

CLIENT CITY OF WINNIPEG

PROJECT 2005 OUTFALL GATE CHAMBER UPGRADES - GEOTECHNICAL INVESTIGATIONS

SITE EVANS STREET

LOCATION ±13 m west of centreline of existing manhole

DRILLING METHOD 125 mm ø Solid Stem Auger (Truck Mounted)

JOB NO. **05-107-07.02.1000**
GROUND ELEV.
WATER ELEV.
DATE DRILLED **28-Jul-05**
UTM N **5526823**
E **636467**

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.30 m ▲ (40 80 120)	Cu TORVANE (kPa) ◆ (20 40 60 80) PL MC LL % (20 40 60 80)
	0			**CLAY FILL** - Greyish-black, damp, intermediate plasticity, some coarse grained sand, some fine grained gravel, trace coarse grained gravel, trace organic matter.		0.3	1			
	1	5		**CLAYEY SILT** - Brownish-tan, damp, soft, low to intermediate plasticity, trace fine grained sand, trace organic matter.			2			
	2			**CLAY (CH)** - Greyish-brown, damp, stiff, high plasticity, trace silt pockets and nodules.			3			
	3	10		**MIXED SILT AND CLAY** - Brown, damp, firm, trace silt pockets in clay.			4			
				CLAY (CH) - Greyish-brown, damp, firm, high plasticity, trace gypsum pockets (1 to 2 mm thick).						
	4	15					5			
	5			- Trace silt pockets below 5.18 m.						
	6	20		**SILTY CLAY (CH)** - Brown, damp, high plasticity, trace silt pockets.			6			
	7	25					7			
	8			- Grey below 8.08 m.						
	9	30					8			
				- Trace fine to coarse grained gravel below 9.60 m.						

SAMPLE TYPE Auger Grab

CONTRACTOR **Paddock Drilling Ltd.**

INSPECTOR **B. P. ARPIN**

APPROVED

DATE 09-08-05

SPT & TORVANE P:\PROJECTS\2005\05-0107-07\GEO\LOGS\05-107-07 LOGS (EXPANDED).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO.
TH-09A Evans St.

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.30 m ▲	Cu TORVANE (kPa) ◆
	11	35						9			
	12	40		- Trace fine to coarse grained sand below 12.65 m.				10			
	13	45						11			
	14										
	15	50						12			
	16			**SILTY CLAY (CI-CH)** - Grey, wet, soft, intermediate to high plasticity, trace fine to coarse grained sand and gravel, trace silt pockets.		15.8		13			
				TILL - Mixture of silt and fine to coarse grained sand and gravel. Tan, dry to damp, compact to dense.		16.0 16.2		14			
		55				16.5 16.6					
	17			**AUGER REFUSAL AT 16.61 m**							
	18	60		Notes: 1. Soil stratigraphy from 0 to 6.71 m depth based on previous TH-09 completed on June 13, 2005. 2. No water in test hole after completion of drilling. 3. Installed Casagrande standpipe to a depth of 16.46 m. Top of pipe is 0.83 m below ground surface elevation. 4. Standpipe was dry when monitored on August 2, 2005.							
	19										
	20	65									
	21	70									

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.

INSPECTOR B. P. ARPIN

APPROVED

DATE 09-08-05

SPT & TORVANE P:\PROJECTS\2005\05-0107-07\GEO\LOGS\05-107-07 LOGS (EXPANDED).GPJ

KGS GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
CONSULTING ENGINEERS & PROJECT MANAGERS

July 20, 2005 File No. 05-0107-07

City of Winnipeg
Water and Waste Department
1500 Plessis Road
Winnipeg, Manitoba
R3C 5G6

ATTENTION: Mr. Darcy Strandberg, C.E.T.
Project Manager

RE: Geotechnical Investigation
Proposed Gate Chamber – Kavanagh Street

Dear Mr. Strandberg:

KGS Group was authorized by the City of Winnipeg Water and Waste Department to undertake a geotechnical site investigation for the proposed gate chamber construction at the existing Kavanagh Street Outfall on the Seine River. This letter report details the results of our investigation including a summary of soil and groundwater conditions at the site plus geotechnical design considerations for temporary shoring, lateral earth pressure, and backfill. Comments received from the City with respect to our draft letter report are included with this letter.

1.0 BACKGROUND

It is our understanding the proposed gate chamber will consist of cast-in-place concrete and be located approximately 11 m northwest of the existing manhole at the end of Kavanagh. The base of the chamber will be situated approximately 6.0 m below grade and a braced or strutted excavation will be used for construction.

2.0 SITE INVESTIGATION

On June 13, 2005 KGS Group supervised the drilling of one (1) test hole to 7.9 m depth below existing ground surface at the approximate location of the proposed chamber. The test hole was advanced using 125 mm diameter solid stem augers with representative soil samples collected directly off the auger flights at 1.5 m intervals or at changes in stratigraphy. Drilling services were provided by Paddock Drilling Ltd. of Brandon, MB. with continuous KGS Group supervision. Laboratory testing was performed on select soil samples and included moisture content analysis and Atterberg limit testing.

STRUCTURAL■GEOTECHNICAL■ENVIRONMENTAL■HYDRAULICS■HYDROGEOLOGY■MUNICIPAL■MECHANICAL■ELECTRICAL
3RD FLR.–865 WAVERLEY ST., WINNIPEG, MANITOBA, R3T 5P4 PH: (204) 896-1209 FAX: (204) 896-0754
560 SQUIER PLACE, THUNDER BAY, ONTARIO, P7B 6M2 PH: (807) 345-2233 FAX: (807) 345-3433

3.0 SITE CONDITIONS

3.1 Stratigraphy

In general, the stratigraphy at the site consisted of clay fill over native silty clay. The clay fill extended to a depth of 0.5 m below ground surface and consisted of intermediate plasticity clay. Underlying the clay fill, native silty clay extended to a depth of 7.9 m below ground surface. The silty clay was greyish brown in colour to 6.8 m depth and grey below. In general, the silty clay was of intermediate to high plasticity, very soft to firm in consistency, contained a trace of medium to coarse grained sand, and trace silt pockets throughout the deposit. The natural moisture content of the silty clay ranged from 32.1% to 50.4%, with an overall average of 42%. The undrained shear strength of the silty clay ranged from 30 to 43 kPa, with an overall average of 38 kPa as measured from the field Torvane. A summary soil log for the site is attached.

3.2 Groundwater Conditions

No groundwater infiltration or caving of the test hole side walls was observed during the test hole drilling. The brown-grey transition in the clay was observed at approximately 6.8 m below existing grade and is indicative of the lowest groundwater level that has occurred at the site in the past. KGS Group is in the process of completing an additional test hole at the site, which will include installation of a standpipe piezometer in the underlying glacial till. The measured groundwater level from the piezometer will be reported to the City in a supplemental letter when available.

Groundwater levels vary seasonally and in response to precipitation such that future groundwater conditions at the site may vary from those observed at the time of this site investigation.

4.0 GEOTECHNICAL CONSIDERATIONS

4.1 Temporary Shoring

It is our understanding that temporary shoring will be used to support the side walls of the gate chamber excavation. Due to the depth of the excavation, space limitations, and close vicinity of the Seine River strutted or braced walls are considered a suitable type of shoring for construction. The detailed design of the temporary shoring depends upon the final geometry of the excavation, the type of shoring utilized, and construction details. Design considerations should include the following:

- The shoring should be designed to resist the lateral earth pressure of the clay fill and silty clay soils, groundwater pressures, and the surcharge load from construction equipment.

- An assessment of the potential for basal heave and blowout at the base of the excavation. Groundwater monitoring information from the standpipe piezometer that will be installed at the site shortly will be provided when available. Depending on the actual groundwater levels at the time of construction measures may be to counteract the risk of blowout, such as by temporary construction dewatering below the base of the proposed excavation.

- The design of any required temporary construction dewatering measures should include an evaluation of the potential settlement implications below the adjacent structures which are likely supported by foundations bearing directly on the silty clay. This includes the adjacent manhole and underground piping.

- The vertical spacing of the internal struts should be designed and installed to minimize the potential for lateral and vertical soil movement, which could be detrimental to the existing infrastructure at the site.

- The removal of the temporary shoring and backfilling between the existing ground and the new gate chamber should be completed to minimize the potential for lateral and vertical ground movements.

- No stockpiling of excavated materials should be permitted adjacent to the excavation.

A registered professional engineer who is experienced with the design of braced excavations and the related soil and groundwater considerations should complete the shoring design.

4.2 Backfill

Free draining granular backfill should be placed around the chamber walls for a minimum width of 0.6 m and covered with a low permeability clay cap at ground surface. All backfill should be placed in maximum 150 mm thick lifts and compacted to a minimum of 95% Standard Proctor maximum dry density (SPMDD).

4.3 Lateral Earth Pressure

Providing the gate chamber is constructed using the backfill recommendations outlined above the permanent walls of the chamber may be designed using an at-rest earth pressure coefficient of 0.7 and the following expression, which assumes a triangular pressure distribution:

$$P_o = K_o (\gamma' H + q) + u$$

where:

P_o = Lateral earth pressure at-rest condition for restrained wall at a given depth (kPa)

K_o = Coefficient of earth pressure at-rest (assume 0.7)

γ' = Effective unit weight of retained soil (below water table $\gamma' = \gamma_{bulk} - \gamma_{water}$, above water table $\gamma' = \gamma_{bulk}$)

γ_{bulk} = Bulk unit weight of soil (for clays assume γ_{bulk} = 19 KN/m^3, for sands and gravels assume γ_{bulk} = 21 KN/m^3)

γ_{water} = Unit weight of water (9.81 KN/m^3)

H = Depth of wall below final grade (m)

q = Any surcharge pressure at ground surface (kPa)

u = net porewater pressure acting on wall (kPa)

4.4 Mat Slab

A mat slab foundation bearing on the native clay is suitable to support the proposed gate chamber. A design net allowable bearing capacity of 85 kPa may be used for a mat slab located at approximately 6.0 m below ground surface. Excessive wetting or drying of the clay subgrade in the base of the excavation should be avoided during construction to reduce the potential for swelling and shrinkage of the soil. In this regard placement of a lean mix concrete slab (mud slab) over the exposed bearing surface should be considered immediately following excavation.

4.5 Uplift

Based on the observed brown-grey interface within the clay soil at the site and our previous geotechincal engineering experience with subsurface conditions in the Winnipeg area it is likely that the piezometric level within the clay soil is the ranges from approximately 5 to 7 m below ground surface. Taking into account the proposed embedment depth of the gate chamber and anticipated weight of the structure we do not expect there will be any special requirements to resist potential hydraulic uplift forces acting on the base slab. However we are currently in the process of verifying groundwater levels at the site by installing a standpipe piezometer. The additional groundwater monitoring information may be used to verify potential uplift pressures will be forwarded in a supplemental letter report when available.

5.0 SUMMARY

We have completed a geotechnical site investigation for the proposed gate chamber expansion at the Kavanagh Street Outfall. The stratigraphy at the site consisted of clay fill overlying silty clay. Geotechnical design considerations for temporary shoring, backfill, lateral earth pressure, and foundations are included.

We thank you for the opportunity to provide engineering services on this project. If you have any questions please contact the undersigned at 896-1209 or Dr. Rob Kenyon, P. Eng. of our office.

Yours truly,

PROVINCE OF MANITOBA
C. W. CARROLL
Member
21416
REGISTERED PROFESSIONAL ENGINEER

Chris Carroll, P. Eng.
Geotechnical Engineer

July 20/05

CC/jr
cc: Mr. Kas Zurek, P. Eng., Design and Construction Engineer

KGS GROUP

SUMMARY LOG

HOLE NO.
TH-06 Kavanagh St.

SHEET 1 of 1

CLIENT CITY OF WINNIPEG
PROJECT 2005 OUTFALL GATE CHAMBER UPGRADES - GEOTECHNICAL INVESTIGATIONS
SITE KAVANAGH STREET
LOCATION ±11 m northwest of curb
DRILLING METHOD 125 mm ø Solid Stem Auger (Truck Mounted)

JOB NO. 05-107-07
GROUND ELEV.
WATER ELEV.
DATE DRILLED 13-Jun-05
UTM N 5527606
E 636128

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.30 m ▲	Cu TORVANE (kPa) ◆
	0	0		**CLAY FILL** - Greyish-black, damp, intermediate plasticity, some coarse grained sand, some fine grained gravel, trace silt pockets, trace organic matter.		1			
	1	5		**SILTY CLAY (CI)** - Greyish-brown, damp, firm, intermediate plasticity, some coarse grained sand, trace fine grained gravel, trace silt pockets, trace organic matter.		2			
	2			- Brownish-grey, moist, very soft, trace medium grained sand below 1.7 m.		3			
	3	10		**SILTY CLAY (CH)** - Greyish-brown, damp, firm, high plasticity, trace medium grained sand, trace silt pockets, trace oxidation.		4			
	4					5			103.5
	5	15							
	6	20				6			
	7			- Brownish-grey, trace fine grained gravel, trace silt nodules below 6.81 m.		7			
	8	25		**END OF HOLE AT 7.92 m**					
	9	30							

SPT (N) blows/0.30 m ▲: 40 80 120
Cu TORVANE (kPa) ◆: 20 40 60 80
PL MC LL
%: 20 40 60 80

Notes:
1. No water in test hole at completion of drilling.
2. Test hole backfilled with cuttings and bentonite to surface.

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.
INSPECTOR B. P. ARPIN
APPROVED
DATE 20-07-05

SPT & TORVANE P:\PROJECTS\2005\05-0107-07\GEOLOGS\05-107-07 LOGS.GPJ

2.0 GROUNDWATER CONDITONS

A summary of the groundwater levels measured at each site is shown in Table 1 below. This information is submitted to supplement the groundwater information included in our original July 20, 2005 letter reports.

TABLE 1
SUMMARY OF MEASURED GROUNDWATER LEVELS
2005 OUTFALL GATE CHAMBER UPGRADING PROGRAM

SITE	Rowandale Crescent	LeMaire Street	Rue Notre Dame	Kavanagh Street	Evans Street	Falconer Bay	Blackmore Avenue
TEST HOLE	TH-01A	TH-02A	TH-04A	TH-06A	TH-09A	TH-10A	TH-11A
STRATUM	Till	Till	Till	Till	Till	Till	Till
DATE	Measured Groundwater Level (m) [1]						
26-Jul-05	-	-	10.67	-	-	-	-
2-Aug-05	4.88	6.72	11.55	5.44	Dry	7.31	4.67

Notes:
"-" = No Data
1. All measured groundwater levels are below existing grade at test hole locations.

Groundwater levels vary seasonally and in response to precipitation such that future groundwater conditions at the site may vary from those reported herein.

3.0 SUMMARY

Standpipe piezometer installations and groundwater level monitoring has been performed at seven (7) sites for the 2005 Gate Chamber Upgrading Program. Measured groundwater levels are reported herein and supplement our original geotechnical letter reports dated July 20, 2005.

We thank you for the opportunity to provide engineering services on this project. If you have any questions please contact the undersigned at 896-1209 or Dr. Rob Kenyon, P. Eng. of our office.

Yours truly,

Chris Carroll, P. Eng.
Geotechnical Engineer

CC/jr
Attachment

cc: Mr. Kas Zurek, P. Eng., Design and Construction Engineer

KGS GROUP

SUMMARY LOG

HOLE NO.
TH-06A Kavanagh St.

CLIENT CITY OF WINNIPEG

PROJECT 2005 OUTFALL GATE CHAMBER UPGRADES - GEOTECHNICAL INVESTIGATIONS

SITE KAVANAGH STREET

LOCATION ±11 m northwest of curb

DRILLING METHOD 125 mm ø Solid Stem Auger and 200 mm ø Hollow Stem Auger (Truck Mounted)

JOB NO. 05-107-07.02.1000
GROUND ELEV.
WATER ELEV.
DATE DRILLED 28-Jul-05
UTM N 5527613
E 636120

ELEVATION (m)	DEPTH (m)	DEPTH (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.30 m ▲	Cu TORVANE (kPa) ◆
										40 80 120	20 40 60 80
				CLAY FILL - Greyish-black, damp, intermediate plasticity, some coarse grained sand, some fine grained gravel, trace silt pockets, trace organic matter.		0.3		1			PL MC LL; % 20 40 60 80
	1	5		**SILTY CLAY (CI)** - Greyish-brown, damp, firm, intermediate plasticity, some coarse grained sand, trace fine grained gravel, trace silt pockets, trace organic matter.				2			
	2			- Brownish-grey, moist, very soft, trace medium grained sand below 1.7 m.				3			
	3	10		**SILTY CLAY (CH)** - Greyish-brown, damp, firm, high plasticity, trace medium grained sand, trace silt pockets, trace oxidation.				4			
	4							5			103.5
	5	15									
	6	20						6			
	7			- Brownish-grey, trace fine grained gravel, trace silt nodules below 6.81 m.				7			
	8	25		- Brown below 7.62 m.							
	9	30		- Grey, moist below 9.60 m.				8			

SAMPLE TYPE Auger Grab

CONTRACTOR Paddock Drilling Ltd.

INSPECTOR B. P. ARPIN

APPROVED

DATE 09-08-05

SPT & TORVANE P:\PROJECTS\2005\05-0107-07\GEO\LOGS\05-107-07 LOGS (EXPANDED).GPJ

KGS GROUP

SUMMARY LOG

HOLE NO.
TH-06A Kavanagh St.

ELEVATION (m)	DEPTH (m)	(ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	PIEZ. LOG	DEPTH (m)	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.30 m ▲	Cu TORVANE (kPa) ◆
	11	35								40 80 120	20 40 60 80
	12	40									PL MC LL
	13	45									% 20 40 60 80
	14							9			
				SILT AND CLAY - Wet, very soft to soft, low plasticity. - Putty till zone below 14.63 m. More silty than coarse.							
	15	50						10			
				TILL - Tan, dry to damp, loose to compact, low to non plastic, trace fine to coarse grained sand and gravel.		15.7					
						15.8					
	16					16.0		11			
						16.3					
						16.5					
		55		**HOLLOW STEM AUGER REFUSAL AT 16.46 m**							
	17			Notes: 1. Soil stratigraphy from 0 to 7.92 m depth based on previous TH-06 completed on June 13, 2005. 2. Standpipe could not be installed with solid stem auger due to sloughing at a depth of 10.36 m. Moved 1 m east and installed standpipe using hollow stem auger. Tip at 16.31 m depth. Top of pipe is 0.1 m below ground surface elevation. 3. Water level measured at 5.43 m below top of pipe when monitored on August 2, 2005.				12			
	18	60									
	19							13			
	20	65									
	21	70									

SAMPLE TYPE Auger Grab

CONTRACTOR **Paddock Drilling Ltd.**

INSPECTOR **B. P. ARPIN**

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