

CITY OF RICHMOND INVITATION TO TENDER

Contract T.2863

Contract: River Road Re-Routing – Bridge over Hollybridge Way Canal

The City of Richmond invites tenders for construction work at the above-mentioned location. Work under the Contract generally comprises:

Construction of a 28.4m wide by 17.5m long pre-cast concrete bridge with a steel pipe hanger for a 300mm diameter watermain. Construction of approximately 70m of watermain (150dia. to 300dia.).

The *Contract Documents* are available on or after Monday, June 5, 2006 during normal business hours at Front of House of the Richmond City Hall at:

6911 No. 3 Road, Richmond, BC, V6Y 2C1

on payment of a **non-refundable** amount of \$50.00 including GST payable to:

City of Richmond

The *Contract Documents* are available for viewing at:

Front of House, Richmond City Hall, 6911 No. 3 Road, Richmond and Vancouver Regional Construction Association, 3636 East 4th Avenue, Vancouver.

Tenders are scheduled to close at:

Tender Closing Time: 3:00 PM local time

Tender Closing Date: Thursday, June 15, 2006 and will be opened publicly immediately thereafter in Richmond City Hall

Tender Submission Address: Manager – Purchasing & Insurance
Front of House, Richmond City Hall
6911 No. 3 Road, Richmond, BC, V6Y 2C1

A valid tender consists of a submission delivered on time complete with the required Bid Bond, Undertaking of Surety and Undertaking of Liability Insurance. The lowest or any tender will not necessarily be accepted.

Manager – Purchasing & Risk

June 8, 2006
File: 02-0775-50-2863/Vol 01

Major Projects
Telephone: (604) 276-4179
Fax: (604) 276-4277

TO THOSE WHO HAVE RECEIVED COPIES OF T.2863

Dear Sir/Madam:

Re: Contract T.2863
Addendum No. 1
Bridge Construction
River Road Re-Routing – Bridge over Hollybridge Way Canal

This addendum forms part of the Contract Documents and shall be read, interpreted and coordinated with all other parts. The costs of all work contained herein shall be included in the Contract Price. The following revisions supersede the information contained in the original Contract Document to the extent referenced and shall become part thereof.

Tenderers shall acknowledge receipt of this addendum by:

1. Inserting its number and date where provided for on the Form of Tender.
2. **TENDER DOCUMENTS**
 - 2.1 INSTRUCTIONS TO TENDERERS (IT) – PART 1

Under section 3.1 please amend the **Tender Closing Date** to be:

Tender Closing Date: June 22, 2006

The Tender is hereby extended one week.

Yours truly,

Scott Groves, P.Eng.
Project Engineer, Major Projects

June 16, 2006
File: 02-0775-50-2863/Vol 01

Major Projects
Telephone: (604) 276-4179
Fax: (604) 276-4277

TO THOSE WHO HAVE RECEIVED COPIES OF T.2863

Dear Sir/Madam:

**Re: Contract T.2863
Addendum No. 2
Bridge Construction
River Road Re-Routing – Bridge over Hollybridge Way Canal**

This addendum forms part of the Contract Documents and shall be read, interpreted and coordinated with all other parts. The costs of all work contained herein shall be included in the Contract Price. The following revisions supersede the information contained in the original Contract Document to the extent referenced and shall become part thereof.

Tenderers shall acknowledge receipt of this addendum by:

1. Inserting its number and date where provided for on the Form of Tender.
2. **TENDER DOCUMENTS**
 - 2.1 SECTION G – GEOTECHNICAL INFORMATION

Add the omitted Memorandum dated March 8, 2006 as referred to on the Contract Drawings to the other geotechnical information included in Section G of the Tender Documents.

3. DRAWINGS

- 3.1 Make the following changes to the drawings:
 - 3.1.1 On Drawing Bc-9, Sheet 2 of 6, the following notes shall replace the “geotechnical consideration” notes on those pages:

GEOTECHNICAL CONSIDERATIONS

1. *THE FOUNDATIONS OF THE BRIDGE STRUCTURE HAVE BEEN DESIGNED AS RECOMMENDED IN THE MEMORANDA DATED 23 DECEMBER 2005, 8 MARCH 2006, AND 29 MAY 2006 BY THURBER*

ENGINEERING. THE PILES ARE DESIGNED FOR A MAXIMUM ALLOWABLE VERTICAL CAPACITY (FOR DEAD + LIVE UNDER SERVICE LOADING CONDITIONS) OF 900 Kn.

2. *SUBGRADE PREPARATION, BACKFILL METHODS AND OTHER RELATED GEOTECHNICAL WORK SHALL BE COMPLETED AS DIRECTED BY THURBER ENGINEERING AS RECOMMENDED IN THE MEMORANDA.*

3.1.2 On Drawing Bc-9, Sheet 2 of 6, note 2 of the STEEL PIPE PILE notes shall be amended to state:

*2. ALLOW FOR **EMBEDDED** LENGTH OF PILE 22.5m UNLESS OTHERWISE DIRECTED BY THURBER ENGINEERING*

3.1.3 On Drawing Bc-9, Sheet 2 of 6, in the notes specific to the retaining wall (on the bottom left center of the sheet), note 1 shall be amended as follows:

NOTES:

1. PRIOR TO COMMENCEMENT OF CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT A COMPLETE DESIGN (EXCLUDING GLOBAL STABILITY) SUPPORTED BY DETAILED CALCULATIONS AND SHOP DRAWINGS TO THE CITY'S ENGINEER FOR REVIEW. THE DESIGN AND SHOP DRAWINGS SHALL BE SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF BC AND RETAINED BY THE CONTRACTOR...

3.1.4 On Drawing Bc-9, Sheet 2 of 6, in the notes specific to the retaining wall (on the bottom left center of the sheet), the following notes shall be added:

4. AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, 17TH EDITION, 2002 SHALL BE THE GOVERNING CODE FOR ITEMS OTHER THAN STRUCTURAL DESIGN.

5. MECHANICAL STABILIZED EARTH (MSE) RETAINING WALLS COMPRISED OF MINIMUM 2.5m GEOGRID REINFORCED MODULAR BLOCK WITH A MECHANICAL CONNECTION BETWEEN THE GEOGRID AND BLOCK SUBJECT TO APPROVAL BY THE CITY'S GEOTECHNICAL ENGINEER.

6. FOUNDATION OF WALL TO BE INSPECTED BY THE CITY'S GEOTECHNICAL ENGINEER PRIOR TO THE PLACEMENT OF THE BOTTOM COURSE. GRANULAR BASE OF AT LEAST 300mm WILL BE REQUIRED. COMPACTION OF BACKFILL TO BE TESTED AND APPROVED BY CITY'S GEOTECHNICAL ENGINEER.

7. PVC PERFORATED PIPE AND 25mm CLEAR CRUSH DRAIN ROCK WILL BE REQUIRED BEHIND BASE OF WALL.

3.1.5 On Drawing Bc-9, Sheet 2 of 6, in the notes specific to the retaining wall (on the bottom left center of the sheet), delete reference to "Allan Block AB Original" product. Supply product that meets the requirements of the notes including those in this addenda.

Yours truly,

Scott Groves, Pen.
Project Engineer, Major Projects



M E M O R A N D U M

To: Scott Groves
City of Richmond

Date: March 8, 2006

From: David Tara / Charles Ng

File: 14-130-10

**ADDITIONAL GEOTECHNICAL INPUT
RIVER ROAD REALIGNMENT
BRIDGE CROSSING OVER HOLLYBRIDGE CANAL**

As requested, this memorandum provides additional geotechnical input for design of foundations for the permanent replacement bridge crossing over Hollybridge Canal in Richmond, BC. Our comments and recommendations are based on drawings, foundation loads and other information provided by RKTG.

1. GENERAL

RKTG's drawings indicate that the bridge will likely be about 28 m wide by 18 m long. The proposed maximum dead and live loads will likely be about 156 and 313 kN/m, respectively. Typical proposed pile spacing ranges from 2.8 to 3 m. Accordingly, the dead plus live load on each pile will likely range from about 1,300 to 1,400 kN. In addition, the abutment walls are typically 2.5 high.

2. VERTICAL COMPRESSION RESISTANCE

Due to the presence of compact to dense sand at about 25 m depth at SCPT 05-1, we believe that a close-ended, steel pipe pile with an outside diameter and a minimum wall thickness of 610 and 12.7 mm, respectively, driven to about 23 to 25 m depth will likely develop an allowable vertical compression resistance in the order of 1,300 to 1,400 kN. Assuming the pile head is at about El. -0.5, the embedded pile length will likely be about 20.5 to 22.5 m. However, where the compact to dense sand is absent, the allowable vertical compression resistance may be only about 800 to 900 kN per pile. To confirm the actual resistance in the field, Pile Driving Analyzer (PDA) tests should be conducted at end of initial drive (EIOD) and about 7 days after installation on several piles.

3. LIQUEFACTION INDUCED LATERAL SPREAD

Based on our analyses, we believe that liquefaction will likely induce lateral spread at the abutments in the design seismic event. Without ground improvement, we assume that the bridge structure, abutments and



the pile foundations will be required to resist the lateral load due to liquefaction induced lateral spread. According to RKTG, we understand that the bridge structure, which will likely act as a strut providing lateral restraint, will have a compressive resistance of about 40,000 kN. To assess the lateral loads on the piles, the 610 mm diameter steel pipe piles with 12.7 and 17.5 mm wall thicknesses were considered. The assumed yield moments are 987 and 1370 kN-m, respectively.

A simplified, pseudo-static analysis was conducted to predict the soil-pile-structure interaction under the design seismic loading condition without ground improvement. Our model assumes that a passive pressure with an equivalent fluid density of 60 kN/m³ will act on the abutment walls from ground surface to about 2.5 m depth (i.e. the top of pile head). We also assume that the potential liquefiable soils will tend to flow around the piles.

We estimated the maximum lateral loads per pile using the computer program LPILE Plus 5.0. Based on the load-deflection curve(s) developed from the assumed soil profiles and the proposed yield moments, we believe that the maximum lateral loads per pile can be approximated using an inverted triangular load distribution of 45 and 55 kN/m at the pile head reduced to zero at about 17.5 m below the pile head for piles with 12.7 and 17.5 mm wall thicknesses, respectively.

In our opinion, the proposed structure and foundations should be designed to resist the above-described loads, especially at the connection between the piles and the abutments. To model the pile structurally, we suggest that the toe of the pile be modelled as a pinned connection.

If the estimated lateral loads cannot be structurally tolerated, we believe that in situ densification will be required to limit post-liquefaction movements and loads on the structure and foundations. Based on the site conditions and configuration, we believe that densification using timber compaction piles and vibro-replacement (stone columns) are potentially feasible options. Additional details can be provided if required.

4. SUPPLEMENTARY INVESTIGATION

Our experience at the Richmond Speedskating Oval site indicates that the soil and groundwater conditions in the vicinity of the proposed site vary significantly. To reduce the uncertainty with respect to design pile capacity, we recommend that at least one additional test hole and CPT be conducted at the east abutment prior to construction.



THURBER ENGINEERING LTD.

Consideration could be given to conducting a detailed dynamic analysis to further evaluate the soil-pile-structure interaction during and after the design seismic event using the program FLAC (Fast Lagrangian Analysis of Continua), a two-dimensional finite difference numerical program. This analysis would likely be able to better define the loading conditions that could be imposed on the bridge with and without in situ densification. Unfortunately, due to scheduling constraints, we would not be able to perform this work until late May at the earliest.

We believe the above information is sufficient for your current needs. Please do not hesitate to contact us if you have any questions.

The image shows a handwritten signature in black ink, which appears to be "D. J. Tara". To the right of the signature is a circular professional seal. The seal contains the text: "PROFESSIONAL ENGINEER", "PROVINCE OF BRITISH COLUMBIA", and "D. J. TARA". The seal is partially obscured by the signature.

June 21, 2006
File: 02-0775-50-2863/Vol 01

Major Projects
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TO THOSE WHO HAVE RECEIVED COPIES OF T.2863

Dear Sir/Madam:

**Re: Contract T.2863
Addendum No. 3
Bridge Construction
River Road Re-Routing – Bridge over Hollybridge Way Canal**

This addendum forms part of the Contract Documents and shall be read, interpreted and coordinated with all other parts. The costs of all work contained herein shall be included in the Contract Price. The following revisions supersede the information contained in the original Contract Document to the extent referenced and shall become part thereof.

Tenderers shall acknowledge receipt of this addendum by:

1. Inserting its number and date where provided for on the Form of Tender.
2. **CONTRACT DOCUMENTS**
 - 2.1 SUPPLEMENTARY SPECIFICATIONS (SSP)

The Supplementary Specifications are amended as follows:

- 2.1.1 Add new clause Road Closures and Traffic Control SSP 12 as per the attached page.

3. ADDITIONAL INFORMATION

There will be no requirement for asphalt paving under this contract except where the Works impact the existing asphalt on Hollybridge Way. Asphalt paving of the new road and bridge will be by others.

Yours truly,

Scott Groves, P.Eng.
Project Engineer, Major Projects