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AAJV Ref: SYD16081

Dear Graham,

**RE: Windsor Bridge Replacement Project; Archaeological Management Strategy for Barrel Drain Relating to Construction of Water Pipelines**

This Archaeological Management Strategy (AMS) has been prepared by the Austral & AHMS Joint Venture (AAJV) on behalf of Transport for New South Wales (TfNSW) in order to manage potential impacts to a heritage item in accordance with the Unexpected Finds Procedure (UFP) outlined in Section 6.6 of *Appendix B5 Construction Heritage Management Sub Plan* of the overarching Construction Environmental Management Plan for the Windsor Bridge Replacement Project (WBRP) (Roads and Maritime Services 2018).

**1. Project Background**

The AAJV have assisted TfNSW with heritage requirements on this project from commencement of pre-construction in 2016. In terms of historical archaeology, the AAJV prepared a Historical Archaeological Research Design (HARD) which detailed a methodology for undertaking historical archaeological test excavations within the project area (AAJV 2016). As part of the archaeological testing program, 61 historical and Aboriginal test trenches and test pits were investigated within the project area, including at various locations designed to test the results of earlier geophysical investigations which suggested the alignment of the oviform brick drain (referred to in this document as the 'barrel drain') through the study area. While the archaeological investigations identified the remnants of a brick box drain in the Old Bridge Street road corridor, no evidence of the main brick barrel drain was identified (AAJV 2017a, p.iii). The AAJV subsequently prepared a Detailed Salvage Strategy (DSS) to manage impacts to historical archaeological features within the study area, and this included the requirement to undertake historical salvage excavations within large parts of Thompson Square and adjacent areas (AAJV 2017b).



During the course of the subsequent salvage excavations, the main alignment of the barrel drain was identified, although at a depth varying from 1 to 4 metres below the existing surface which was considerably below depths which it had been possible to reach during the testing program. Furthermore, the cut for the drain had been filled in shortly after its excavation using sand from the cut itself, which resulted in a soil profile which showed little evidence of the impact (AAJV 2020, pp.iii–v).

While the length of drain identified during the Stage 1 salvage excavations was substantially intact, subsequent salvage works undertaken by the AAJV identified that the drain had been previously breached during construction of the 1874 road alignment leading to the original low level bridge. This resulted in the void being filled with large river cobbles, which blocked the drain but allowed the road to be constructed. Plotting of the presumed continuation of the drain indicated that it was likely construction of the Bridge Street cutting in the 1930s had resulted in excavation works which would have removed the remainder of the drain within the road corridor (AAJV in prep). It was not possible to confirm this through archaeological investigations while Bridge Street remained in operation as a road closure permit could not be obtained.

Upon identification of the intact barrel drain during the salvage excavation, TfNSW undertook a voluntary commitment to preserve the core of the barrel drain intact and commissioned the production of a heritage assessment for the barrel drain (AAJV 2018). Preservation of the drain required a substantial redesign of the southern end of the bridge abutment and the movement of footings and piers on the western wall of the bridge to ensure the barrel drain could remain *in situ* (AAJV 2020, p.37).

## **2. Identification of Unexpected Find**

On Thursday 11 June 2020, trenching works were being undertaken at a depth of approximately 1.5 metres below the depth of the former Bridge Street cutting to allow for installation of two watermain and one recycled watermain. The AAJV was notified by phone at approximately 15:30 on Thursday 11 June 2020 that brick fragments had been identified in the bucket of the mechanical excavator and work had immediately ceased in accordance with Step 1 of the UFP. I attended site at approximately 16:30 on the same day and determined that further archaeological investigations were required in order to establish the nature of the find in accordance with Step 2 of the UFP.



**Figure 1** West facing view showing condition of trench upon arrival at site. Note brick fragments circled in red.

A preliminary assessment and recording of the item was undertaken between Friday 12 June 2020 and Wednesday 18 June 2020 in accordance with Step 3 of the UFP. It was confirmed during the assessment that the brickwork formed part of the barrel drain. While not a formal requirement at this stage of the UFP, TfNSW requested that the Department of Planning, Industry and Environment (DPIE) be notified of the nature of the unexpected find once its nature was known and this was undertaken on Tuesday 17 June 2020. Preparation of this AMS represents Step 4 of the UFP.

### **3. Summary of Preliminary Assessment and Recording of the Item (Step 3 of UFP)**

By the completion of the archaeological investigations, a length of 7.42 metres of drain had been exposed, which is the length that will be affected by the installation of the two watermain plus an adjacent council recycled water main (Figure 2 and Figure 3). The barrel drain had been heavily impacted by construction of the Bridge Street cutting in the 1930s, which had truncated the upper courses of the drain with the exception of one section at the northern end where part of the upper curve remained (Figure 4).





**Figure 2** Preliminary plan showing location of barrel drain marked in red.





**Figure 3** South-west facing view looking along the length of exposed drain.



**Figure 4** East facing view showing the length of exposed drain. Note the remnant of the curve of the upper part of the eastern wall.





Construction of the drain was essentially similar to that of the previously recorded sections, with the current section having an internal width of 900 millimetres in comparison to an internal measurement of 970 millimetres in the original section (AAJV 2018, p.28).

As with the previous section, the drain structure consisted of a shallow inverted segmental arch forming the base (the invert). It was not possible to view the invert to determine whether it was a single skin of bricks, but as with the previous section, the invert was laid in stretcher bond. The walls were laid as two skins constructed using English bond; however, the stretcher courses present in the complete section of drain were missing from all except the northernmost part of the eastern wall (Figure 5). Whereas the walls on the originally identified section were straight battered with a receding slope (AAJV 2018, p.28), the side walls of the newly identified section of drain were almost vertical (Figure 6 and Figure 7). One structural element was noted which had not been seen elsewhere along the drain, and this related to several bricks which were keyed into the main drain at a right angle (Figure 6 and Figure 7). The feature consisted of two courses of bricks bonded with shell mortar laid directly on to the sand which was used to fill the cut of the drain. The purpose of these bricks is unknown, but it is assumed that it was potentially conceived of functioning as an engaged pier to provide structural support to the wall during the construction process or subsequent to it



**Figure 5** North-east facing view showing the south-facing section with curve of drain truncated by Bridge Street cutting.





**Figure 6** North-west facing view showing vertical section of wall and keyed-in brick feature.



**Figure 7** Roughly vertical view showing brick wall and keyed-in brick feature.





The interior of the drain was predominantly filled with a demolition deposit containing the bricks from the upper arch of the drain held in a clay matrix. This deposit would have formed following demolition of the drain in the 1930s, and it was capped in the section by various blue metal and bitumen deposits associated with construction of the Bridge Street road surface (Figure 8). However, at the northerly (downhill) end of the drain, a noticeable accumulation of silt was present in its base which measured 580 millimetres thick at the northern section (c.f. Figure 5). It is presumed that this related to the where the drain had previously been breached as part of the construction of the 1874 road alignment and where it had been filled up with large rocks, blocking the drain and causing the silt to back up.



**Figure 8** South-west facing view showing north-eastern section. Note rubble blocking the drain below layers associated with construction of the Bridge Street road.

#### **4. Significance Assessment for the Unexpected Find**

The significance of the barrel drain has been comprehensively explored and there is no evidence to suggest that this particular section of the barrel drain is in any way substantially different from the previously recorded sections of drain (AAJV 2018). Where the previous section of barrel drain resulted in an assessment that the drain system was of State significance (AAJV 2018, p.60), part of this determination was made on the basis that the exposed section of drain demonstrated that the overall system was well preserved. TfNSW subsequently undertook actions to conserve this section of the barrel drain beneath the new bridge.



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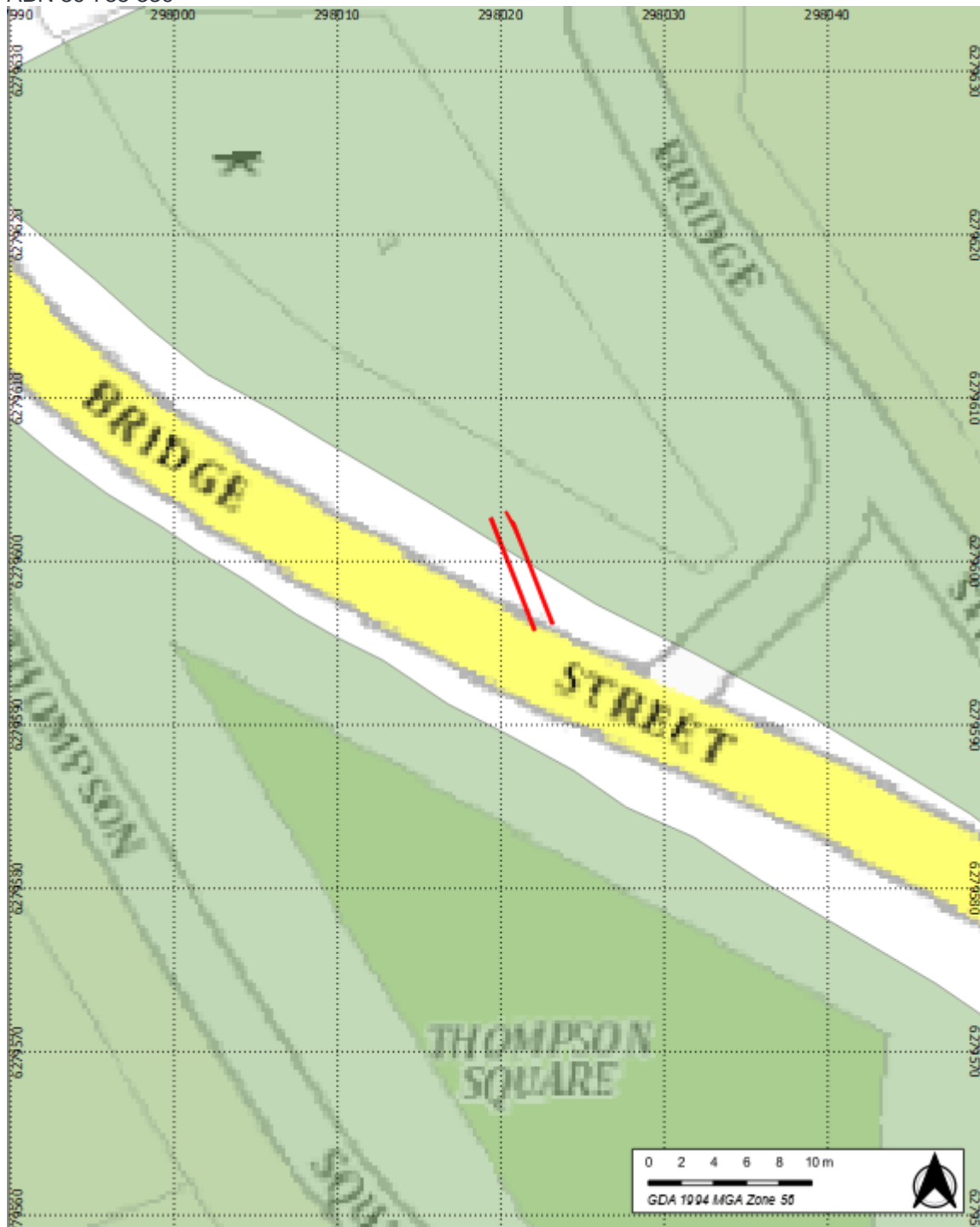
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The length of drain which forms the unexpected find has been heavily impacted by the construction of the Bridge Street cutting, which has removed at least half the circumference of the drain. While the recently identified section of drain meets the criteria for State significance, there are better preserved sections that illustrate the significance of the barrel drain to a higher degree. The condition of the portion within the study area has reduced significance due to its lack of intactness, which impacts its aesthetic, representative, and rarity values.

Irrespective of any final decision regarding its retention or otherwise, this newly exposed, damaged section of drain will be archaeologically investigated and recorded.

It is noted that the identified section of barrel drain is located within the Bridge Street cutting, and this is therefore predominantly outside of the State Heritage Register curtilage for Thompson Square Conservation Area (SHR #00126) (Figure 9).

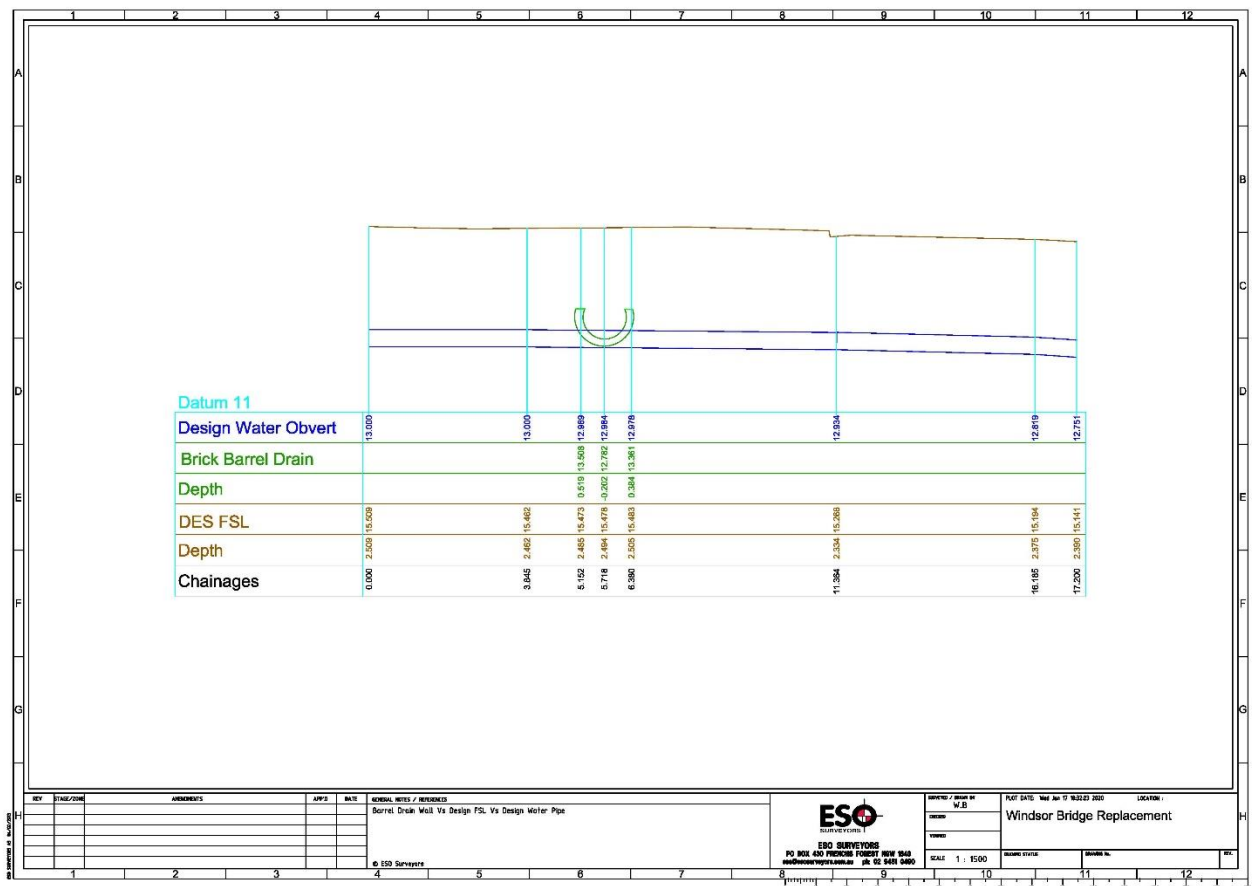


**Figure 9** Preliminary plan showing SHR curtilage (green) in relation to brick barrel drain (red)



## 5. Consideration of Feasibility of Alternate Strategies

Presently the three water mains cannot be installed as designed without the remnant barrel drain being damaged. This is because the water mains intersect with the lower part of the barrel drain; as detailed in the Figure 10 below:

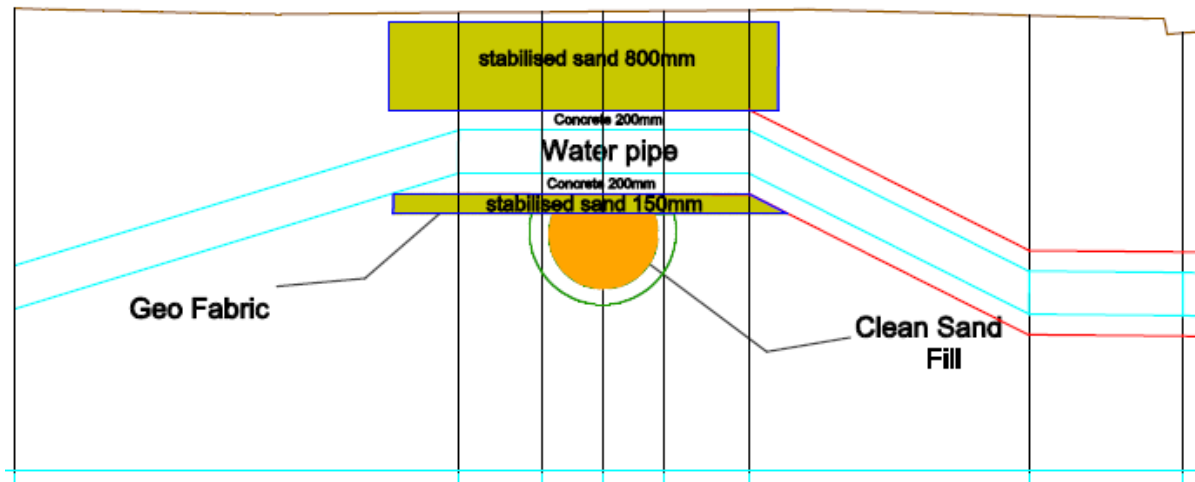


**Figure 10 Comparison of barrel drain (green) with proposed level of watermain (blue).**

A redesign option has been proposed which will realign the three water mains to be placed over the remains of the drain. The following discussion on the two options being considered is based on construction and engineering advice provided by TfNSW.

### Option 1 – Redesign of the water main alignments to avoid the barrel drain

Option 1 results in the water mains being redesigned to pass above the barrel drain. This requires the installation of additional bends and the concrete encasement of the mains as shown in the Figure 11 below.



**Figure 11** Detail from provided survey plan showing required clearances to allow for recommended depth of service.

Redesigning the pipes to go under the barrel drain was also considered for this option. However this has not been pursued as it would be more difficult and expensive than laying the mains over the barrel drain and it would not be possible to access the water mains for maintenance in the future. There is also an unacceptably high risk that the barrel drain would be damaged during construction if the ground underneath it was undermined. For these reasons discussion of the redesign option is limited to having the pipes pass over the barrel drain.

Regardless, Option 1 presents the following issues in relationship to feasibility:

- As detailed in Figure 11, the minimum gap between the base of the concrete encased watermain and the top of the remnant barrel drain would only be 150 millimetres. With only this gap, it is possible that the concrete encased watermain would place loading on the barrel drain and that some loads may be transferred during construction; and
- This redesign would have to be approved by Sydney Water before work could continue.

This option has the advantage of leaving all of remnant brickwork in place; however due to the limited space available it would not be possible to guarantee that the drain structure would be unaffected by construction and loading of the watermains.

Should this option be pursued, protection measures can be implemented to reduce the impact of the water mains. These would include:

1. Filling of the barrel drain structure with clean sand to the level of the top of the structure;
2. Covering the filled structure with geotextile;
3. Placing a 150 millimetre layer of cement stabilised sand above the drain; and
4. Filling the water main trench with stabilised sand to eliminate the need for compaction above the barrel drain remains.

#### Option 2 – Removal of the remnant barrel drain section

Option 2 requires the removal of the remnant barrel drain for a distance of approximately 7.4 metres to facilitate the construction of the watermains to the current design. The bricks would be carefully removed, palletised and stored in the interim.



**Recommendation**

On the basis that the redesign of the pipes over the barrel drain is feasible from an engineering standpoint, and will allow for the greater retention of historic fabric *in situ*, it is recommended that Option 1 be selected.

**6. Management Strategy**

The following methodology is provided based on the recommendation that Option 1 is chosen as the preferred management strategy.

**Stage 1**

Stage 1 of the salvage works will involve preparation of the site for main construction works to be conducted. This will include:

- Any necessary mechanical or manual re-excavation and undertaking any additional detailed recording of sections of the drain which is required prior to preparation works commencing. Site recording is to be undertaken to the specification of the approved project methodology outlined in the DSS (AAJV 2017b) and the results will be included in the final salvage report to be prepared for the project.
- Laying of geofabric within the exposed length of barrel drain prior to filling in and around the exposed section of barrel drain with clean sand, with a second layer of geofabric placed over the clean sand.

**Stage 2**

Stage 2 will involve undertaking the construction works associated with the rerouting of the watermain. This will include:

- Pouring of 150 millimetre deposit of stabilised sand over the barrel drain.
- Construction of the main services and their encasement in concrete.
- Pouring of an additional 800 millimetres of stabilised sand over the encased services.

**Equipment**

Equipment and materials to be used when excavating, recording and/or removing bricks from structural elements:

- 5 Tonne Excavator – Assisting with any necessary earthmoving and moving of lengths of pipe.
- Concrete Truck – pouring of concrete and stabilised sand
- Hand tools (shovels, mattocks, trowels, chisels etc.) – For manual excavation work and aiding removal of bricks.
- Surveying equipment (automatic level for continuation of general archaeological recording; high precision spatial recording to be provided by a project surveyor) – For recording any additional archaeological remains identified as a result of the works.
- Recording equipment (cameras, drafting materials, forms etc.) – For undertaking additional archaeological works and archival recording of the barrel drain, box drains and sumps.

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Should you have any questions regard the above information, please contact me on 02 9555 4000.

Yours sincerely,

David Marcus

Heritage Manager

Austral Archaeology Pty Ltd

On behalf of the AAJV



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The logo for AAJV, consisting of the letters 'AAJV' in a bold, dark blue, sans-serif font.**REFERENCES**

AAJV in prep, Draft Windsor Bridge Replacement Project; Salvage Excavation Report Stage 1 to 5; Historical Archaeology.

AAJV 2016, Windsor Bridge Replacement Project; Historical and Maritime Archaeological Research Design.

AAJV 2017a, Windsor Bridge Replacement Project; Test Excavation Report - Historical Archaeology.

AAJV 2017b, Windsor Bridge Replacement Project; Detailed Salvage Strategy.

AAJV 2018, Thompson Square Brick Drain, Windsor, NSW; Heritage Mitigation and Options Report.

AAJV 2020, Draft Windsor Bridge Replacement Project; Salvage Excavation Report - Historical Archaeology.

Heritage Office 1998, How to prepare archival records of heritage items, Heritage Office, Sydney, viewed 30 January 2019, <[http://www.heritage.nsw.gov.au/docs/info\\_archivalrecords.pdf](http://www.heritage.nsw.gov.au/docs/info_archivalrecords.pdf)>.

Roads and Maritime Services 2018, Construction Environmental Management Plan; Windsor Bridge Replacement Project.