

# 355 Church Street, Fyansford Expert Witness Report

Contract No.: 17158-06

Prepared on behalf of: Kings Lawyers

Date: 6 November 2019

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## 1 Witness Statement & Qualifications

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### Name and Address

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**Name:** Leigh Prossor  
**Company:** CardnoTGM Pty Ltd  
Level 1, 27 – 31 Myers Street  
Geelong VIC 3220  
**Position:** Civil Engineering Manager

### Qualifications B. Eng (Hons)

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- 1.1 I have 17 years experience in civil engineering and urban development since graduating from Swinburne University with a Bachelor of Engineering in 2002.
- 1.2 I am currently employed as the Civil Engineering Manager of the CardnoTGM Geelong Office and have been employed with CardnoTGM since 2002. I am responsible for overseeing a team of approximately 30 professional staff undertaking master planning, project management, civil design and construction supervision roles on various project types for urban development and infrastructure projects within the Geelong and wider region.
- 1.3 I also work closely with CardnoTGM's survey and planning disciplines to provide civil design solutions for roads, drainage, sewerage, earthworks and water infrastructure for a variety of projects. These projects range from the initial, high level master planning, right through to the detailed design, project delivery and construction phases of projects.

### Areas of Expertise

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- 1.4 Managing the Civil Engineering unit of CardnoTGM Geelong office.
- 1.5 Engineering advice on infrastructure requirements for the planning, design and delivery on urban development and major infrastructure projects.
- 1.6 Provision of Civil engineering design solutions to urban developments, Local and State Government projects.
- 1.7 Stormwater Investigations, Site Stormwater Management Plans (SSMP) and Storm Water system design to Authority requirements
- 1.8 Preparation of development feasibility studies.
- 1.9 Provision and coordination of service authority infrastructure requirements for urban developments.
- 1.10 Contract administration and supervision.
- 1.11 Project management.

## 2 Introduction / Instructions

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- 2.1 CardnoTGM have been engaged by Kings Lawyers to provide engineering assessment and expert witness advice around the servicing and access of the proposed development at 355 Church Street, Fyansford (subject property). Specifically we have been asked to advise on;
- a) We request that you prepare an expert evidence report in accordance with Planning Panels Vic guidelines which are included in Attachment 5.
  - b) We ask that you consider the amendment documentation from the council website including reviewing the strategy, framework plan, minutes of Council's meeting and Councils Part A submission, together with all other relevant documents on Councils website.
  - c) Your evidence should address the ability of our clients site to be developed in the short to medium term rather than the long-term. In particular the evidence should address all servicing required and provide opinion on the lands ability to be properly service e.g. roads, water, wastewater, drainage, electricity , gas, telecommunications etc.

## 3 Scope of Works

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- 3.1 This evidence has been prepared by Leigh Prossor, at the request of Kings Lawyers to provide an independent assessment of the relevant documents and servicing opportunities for the land at 355 Church Street as instructed above in accordance with the assessment criteria listed.

## 4 Information Used and Relied Upon

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- 4.1 In responding to my instructions. I have relied primarily on;
- > The Northern and Western Geelong Growth Areas Framework Plan issued by the City of Greater Geelong in March 2019.
  - > The Western Geelong Growth Area flood impact assessment and stormwater management strategy, Volume 1 Existing Conditions Report prepared by Water Technology and issued in January 2019.
  - > The Western Geelong Growth Area Flood Impact Assessment and Stormwater Management Strategy, Volume 2 developed conditions, prepared by Water Technology and issued in May 2019.
  - > The Northern and Western Geelong Growth Areas, Utility Servicing Strategy prepared by GHD and issued in May 2019.
  - > The Northern and Western Growth Areas, Movement and Access Report, prepared by GTA Consultants.

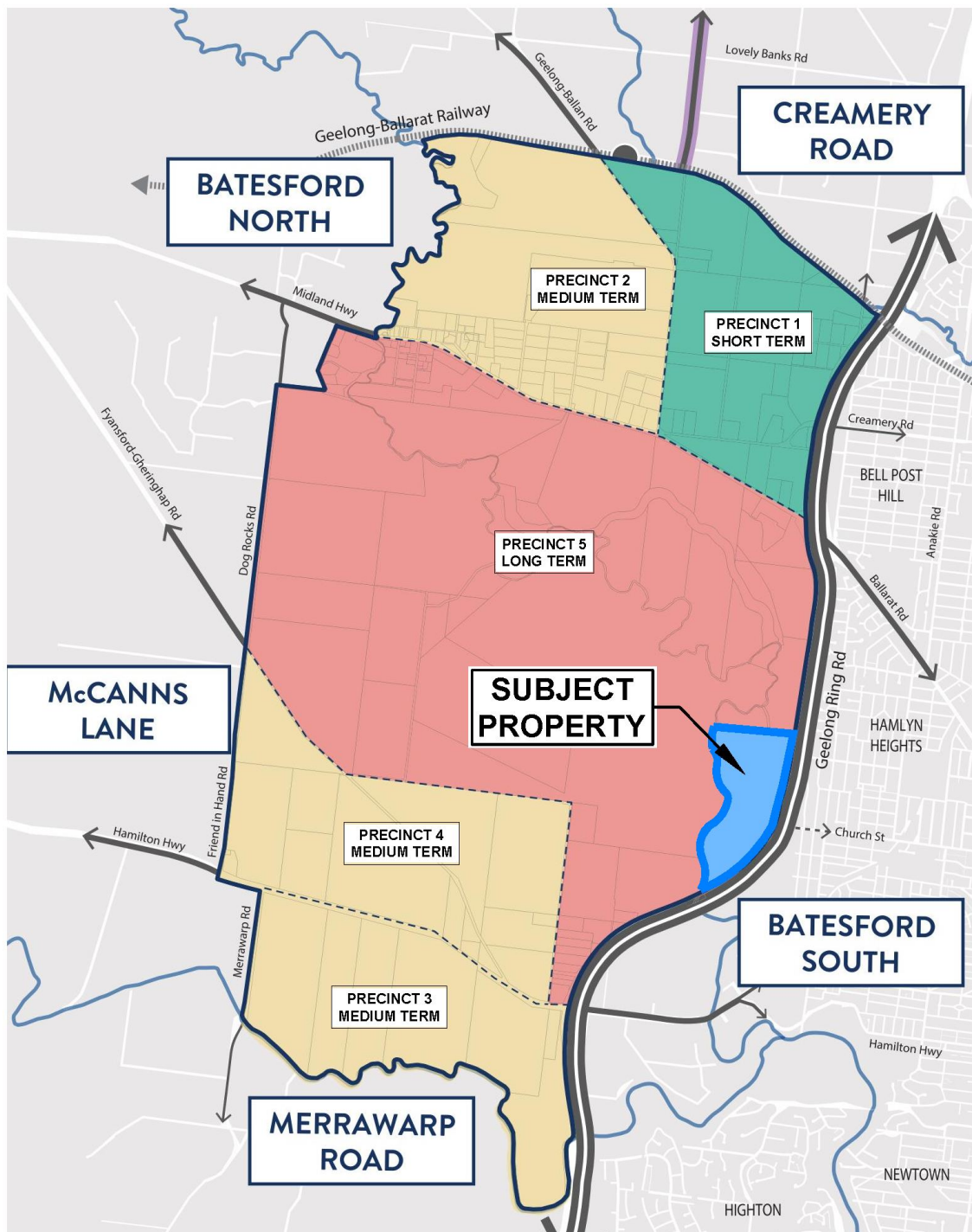
- > Agenda, Ordinary Meeting of Council, Tuesday, 24 September 2019, Amendment C395 – Settlement Strategy & Northern and Western Geelong Growth Areas Framework Plan – Consideration of Submissions.
- > Greater Geelong Planning Scheme, Amendment C395 Part A Submission to the independent panel.
- > Response to planning scheme C395 prepared by CardnoTGM (Chris Marshall) on behalf of Riverlee / Asset 1, dated 29 July 2019.

## **5.0 355 Church Street, Fyansford**

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- 5.0.1 355 Church Street, Fyansford (The subject property) is located within the eastern area of the proposed Batesford South Precinct of the City of Greater Geelong's Western Geelong Growth Area (WGGC).
- 5.0.2 The subject property is bordered on its north side by 370 Church Street Hamlyn Heights. Both properties share very similar characteristics and will essentially be serviced in a similar and combined fashion. Accordingly, this report has generally considered both properties as combined in a servicing sense, and refers to 355 Church Street Fyansford and 370 Church Street Hamlyn Heights as 'the properties'.
- 5.0.3 The subject properties are bordered by the Moorabool River along their western boundaries, and the Geelong Ring Road along the eastern boundary. At their southern boundary, the Moorabool River and the Geelong Ring Road confluence and the Geelong Ring Road crosses over the Moorabool River.
- 5.0.4 The northern boundary of the subject properties is bordered by a rural property that ultimately fronts to the Midland Highway. There is somewhat disconnection between these properties as there is limited space between the Moorabool River and the toe of the Moorabool Valley escarpment to the east.
- 5.0.5 The property locations with respect to the greater Western Geelong Growth Area (WGGA) are detailed in Figure 1 below.

Figure 1: Precinct Structure Plan



5.0.6 The property locations with respect to their immediate environs are detailed in Figure 2 below.

Figure 2: Subject Properties

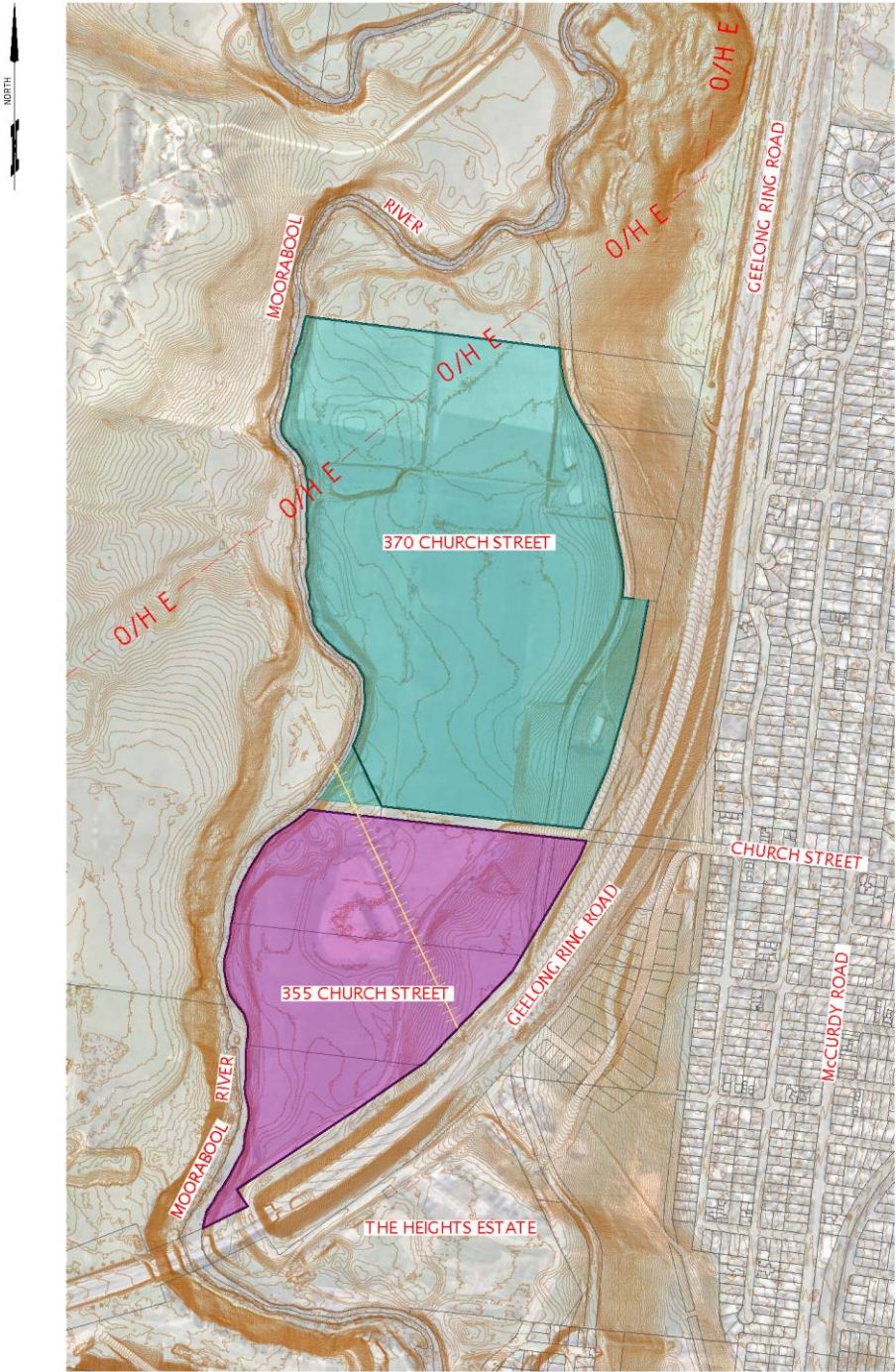
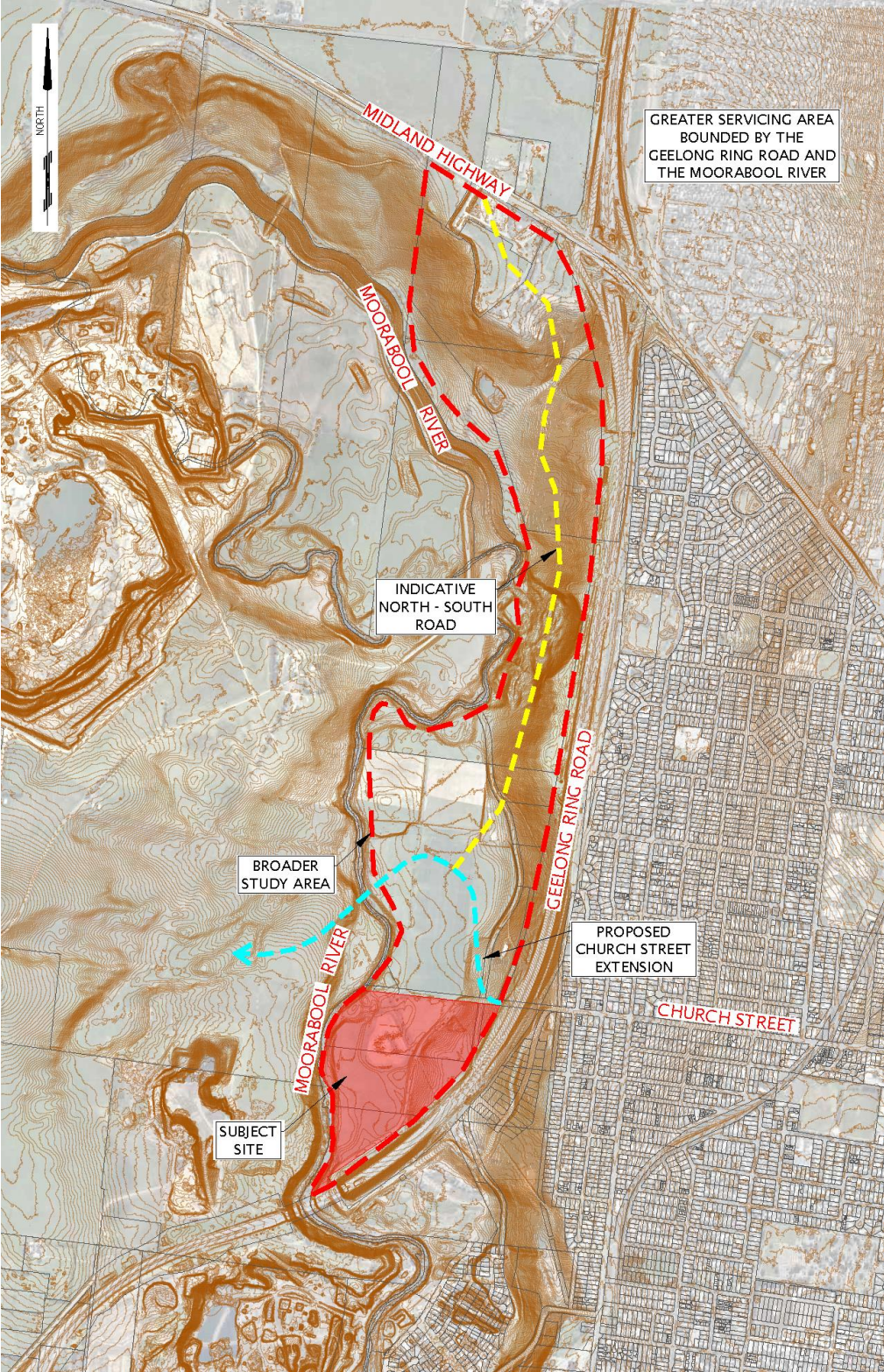


FIGURE 1  
OVERALL LAYOUT

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- 5.0.7 The subject properties generally fall to the west towards the Moorabool River and within the western portion are generally flat and gradually rising to the east, then along the eastern boundary they rise more steeply up the Moorabool Valley escarpment towards the Geelong Ring Road.
- 5.0.8 The floodplain of the Moorabool River varies in its width along the western edge of the properties, with the floodplain extents along much of the subject properties generally constrained to quite close to the river channel, however there are several lower points where the floodplain “breaks out” into the subject properties.
- 5.0.9 A small portion of the 370 Church Street property has a section of constructed flood compensation storage located on it from the earlier “The Heights” development located immediately adjacent on the east side of the Geelong Ring Road.
- 5.0.10 Access to the site is currently via Beacon Avenue at the extreme South of site. Beacon Avenue passes under the Geelong Ring Road utilising the elevated bridge crossing of the Moorabool River. An unmade and section of the Church Street Road Reserve bisects the two properties, this section of road reserve is disconnected from the constructed section of Church Street to the east by the Geelong Ring Road.
- 5.0.11 The land to the immediate east of the Geelong Ring Road has previously been developed as general residential zoned land.
- 5.0.12 Much of the servicing advice for the subject site is also generally relevant to all of the land located between the Geelong Ring Road and the Moorabool River, this area is generally outlined in figure 3 below.

Figure 3: Greater Servicing Area bounded by the Geelong Ring Road and Moorabool River



***‘Your evidence should address the ability of our clients site to be developed in the short to medium term rather than the long-term. In particular the evidence should address all servicing required and provide opinion on the lands ability to be properly service e.g. roads, water, wastewater, drainage, electricity, gas, telecommunications etc.’***

- 5.0.13 A utility servicing strategy has previously been prepared for the City of Greater Geelong which encompasses the Northern and Western Geelong Growth Areas (GHD – Report for City of Greater Geelong – North and West Geelong Growth Area Service Report, 3136336, May 2019). The subject property is currently located within the south eastern corner of the Batesford South Precinct of the WGGA.
- 5.0.14 The Western Geelong Growth Area Flood Impact Assessment and Stormwater Management Strategy, Volume 2: Developed Conditions Report (May 2019) has been undertaken by Water Technology for the City of Greater Geelong, this report outlines the drainage strategy for the WGGA.
- 5.0.15 Additionally, CardnoTGM and I personally have previously and currently undertaken engineering design services on the directly adjoining “The Heights” and “Gen Fyansford” developments, located to the east and south of this land.

## **5.1 Stormwater**

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- 5.1.1 The Water Technologies Flood Impact Assessment and Stormwater Management Strategy outlines a very high level strategy for the treatment of stormwater along the “steep escarpment” and the otherwise ‘disconnected’ areas within the WGGA. This strategy identifies the subject properties as being located in Area 7 and Area 8. Apart from a small section of adjoining property immediately to the north, the entirety of these proposed stormwater areas identified in the Water Technology report are limited to the subject properties.
- 5.1.2 It is proposed by Water Technologies that these two catchments will be serviced by independent basins catering for these catchments only. As the report states, these basins have only had extremely preliminary consideration to their proposed sizing given, with a very general comparison of the nominated basin capacity versus the available storage capacity. It is unclear in the report how the available storage capacity was calculated.

- 5.1.3 It is considered that the topography of the subject property and the surrounds dictates that the stormwater treatment assets for these two properties and also for more generally all of the land located between the Geelong Ring Road and the Moorabool River will need to be treated independently of any other stormwater assets within the WGGA.
- 5.1.4 Accordingly, it is considered that the stormwater drainage for the subject properties can be planned and delivered independent of any other larger precinct development works.

## 5.2 Potable Water

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- 5.2.1 The Northern and Western Geelong Growth Areas, Utility Servicing Strategy prepared by GHD nominates that the subject sites will be serviced from the McCanns Lane precinct with the supply coming from a new pressure Reduction Valve (PRV) that is proposed to be constructed on the existing She Oaks-Montpellier transfer main near the intersection of the Geelong Ring Road and the Hamilton Hwy.
- 5.2.2 The GHD report shows a grid of watermains (225/150 dia.) extending north from this point and crossing the Moorabool River at multiple locations. Due to environmental, construction and maintenance issues, it is considered unlikely that a significant number of cross connections of the river in close proximity will be ultimately provided.
- 5.2.3 Little is shown in terms of connection at the northern end apart from a single 150 main. The northern escarpment is noted as being part of the Batesford South Northern pressure boosted zone, but it is considered more likely that this will be a continuation of the Creamery Rd precinct's Bell Post Hill pressure boosted zone given it's limited extent.
- 5.2.4 No connection is shown back to the existing network to the east of the Geelong Ring Road, however, it is considered likely that some cross connection will be provided and delivered ultimately where possible.
- 5.2.5 Given the proximity to the existing water main network in the Heights Estate, it is considered likely that an initial and potentially interim supply from the existing network to the east would be feasible, with the connection potentially providing an additional point of cross connection in the longer term, both northwards towards the Midland Highway and the Creamery Road precinct and westwards across the Moorabool River to the McCanns Lane precinct.

## 5.3 Sewer

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- 5.3.1 The Northern and Western Geelong Growth Areas, Utility Servicing Strategy prepared by GHD identifies an interim and ultimate sewer strategy for the development of the southern portion of the WGGA. The interim strategy requires two pump stations (BSPS1 & 2) to be constructed in the south east corner of the WGGA with a 6.7km outfall connection back to a transfer pump station constructed earlier in the Creamery Road Precinct. The ultimate strategy proposes that the outfall be connected to the south via a 14.5km pipe and 3 transfer pump stations generally along the Geelong Ring Road corridor to Waurn Ponds and ultimately the Barwon Water Main Outfall Sewer (MOS).
- 5.3.2 The sewer strategy suggest that the McCann's Lane and Merrawarp Road Precincts interim sewer works will require a pump station (BSPS2) to be constructed in the vicinity of the intersection between the Hamilton Highway and McCanns Lane connecting to a second pump station (BSPS1) located in the south east corner of the Batesford South Precinct, with the interim outfall connected to the north via the Geelong Ring Road corridor to the Creamery Road precinct.
- 5.3.3 Recent discussions with Barwon Water in October 2019 have advised that this strategy is still considered current, however the ongoing Integrated Water Management Plan investigation being led by Barwon Water may ultimately result in alterations to the current strategy. Were this to be the case, it is considered that any alterations to the strategy would be unlikely to impact on the ability to service the subject land at any point in the process.
- 5.3.4 The GHD report does not go into detail how the area located on the east side of the Moorabool River including the subject properties will be serviced by sewer, however it is considered likely that they will be serviced via localised sewer pump stations servicing their immediate surrounds and adjoining areas that can be serviced via gravity mains to them.
- 5.3.5 Options of the outfall from such localised sewer pump stations are considered to be;
- > Connection via rising main into the proposed Creamery Road precinct and or the southern sewer pump stations BSPS1 / BSPS2 in the McCanns Lane precinct, or;
  - > Connection directly into the proposed rising main between BSPS1 and Creamery Road, or;
  - > Connection eastwards under the Geelong Ring Road into the existing sewer network, such as at 'The Heights estate'.
- 5.3.6 It is unknown at this time on the capacity of the existing network on the east side of the Geelong Ring Road to take additional flows, however it is considered likely that there would be some capacity to take limited flows from the west, potentially as an interim measure and or with some minor system upgrades. If this is proven as the case, then this would allow servicing of the subject properties in the short term, independent of development of the greater WGGA precincts.

- 5.3.7 The advantage of this approach would also be a net reduction in the number of crossings of the Moorabool River by sewers, be they gravity or rising mains, which is considered to lead to environmental and initial and ongoing economic benefits.
- 5.3.8 Accordingly, it is considered that the subject properties, and also for more generally all of the land located between the Geelong Ring Road and the Moorabool River will be able to be serviced by sewer either independently or in conjunction with the Creamery Road precinct.

## **5.4 Electricity**

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- 5.4.1 The existing overhead electrical supply servicing the existing Batesford South quarry crosses the subject properties within the Church Street alignment.
- 5.4.2 The Northern and Western Geelong Growth Areas, Utility Servicing Strategy prepared by GHD identifies that the existing GL zone HV electrical lines “could be used to supply the WGGGA if significant new line infrastructure were installed”.
- 5.4.3 It is considered that the electricity supply to the subject property and also for more generally all of the land located between the Geelong Ring Road and the Moorabool River, can be provided from the existing network to the east with some upgrades, and or additionally be serviced in the medium to longer term in conjunction with the Creamery Road and or McCanns Lane precincts.

## **5.5 Gas**

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- 5.5.1 The Northern and Western Geelong Growth Areas, Utility Servicing Strategy prepared by GHD identifies that the gas for the WGGGA will ultimately be supplied by augmentation of the existing network from both the north and south.
- 5.5.2 No connection is shown back to the existing network to the east of the Geelong Ring Road, however, it is considered likely that some cross connection will be required and delivered ultimately.
- 5.5.3 Given the proximity to the existing gas main network in the Heights Estate, it is considered likely that an initial and potentially interim supply from the existing network to the east would be feasible, with the connection potentially providing an additional point of cross connection in the medium to longer term, both northwards towards the Midland Highway and westwards across the Moorabool River.
- 5.5.4 Should this not be feasible, it is considered that the subject properties and the also for more generally all of the land located between the Geelong Ring Road and the Moorabool River, will be able to be serviced with gas in the short term in conjunction with the Creamery Road precinct.

## 5.6 Telecommunications

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- 5.6.1 The Northern and Western Geelong Growth Areas, Utility Servicing Strategy prepared by GHD identifies that the WGGA will be serviced by an extension of the existing NBN fibre network westwards from the existing network.
- 5.6.2 It is considered likely that NBN would be extended from the existing residential areas in the Heights Estate on the east of the Geelong Ring Road to serve the subject properties, rather than from the west across the Moorabool River, therefore independent of the greater WGGA. This connection potentially could then provide an additional point of cross connection in the medium to longer term, both northwards towards the Midland Highway and the Creamery Road precinct, and westwards across the Moorabool River towards the McCanns Lane precinct.

## 5.7 Access / Movement Corridor

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- 5.7.1 It is acknowledged that this area falls beyond my professional expertise. Please see the separate statement from Chris Butler.

## 5.8 Church Street Connection

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- 5.8.1 The WGGA framework plan proposes that a new arterial road be constructed that links from the west side of the Moorabool River to the east connecting with the Geelong Ring Road and Church Street. The WGGA framework plan proposes that a half diamond interchange with the Geelong Ring Road and a public transport only connection to Church Street be constructed to service the WGGA.
- 5.8.2 As outlined in the Council summary of responses to the submissions received and also from direct and anecdotal discussions with Council officers and others, it is understood that Council considers that there is still a level of uncertainty about how this connection will be delivered in its final form and has identified that they wish to retain flexibility for future investigation of this transport connection.
- 5.8.3 In July 2019 CardnoTGM prepared and issued a technical document that were issued to Tract Consultants and were enclosed as appendices to the submission to the City of Greater Geelong Amendment C395 – Settlement Strategy and Northern and Western Geelong Growth Areas Framework Plan that was prepared by Tract Consultants on behalf of the McCann Family.
- 5.8.4 This document was titled the 'Western Geelong Growth Area Church Street Arterial Road Connection Options Analysis', a copy of this document is enclosed as Appendix A.

- 5.8.5 This report was largely prepared by Stephen Hundt who is a Senior Design Engineer with CardnoTGM. Stephen has some 21 years' experience as a Civil Engineer, working in a variety of projects and roles as a Designer, Manager and Senior Engineer. I oversaw, contributed to, reviewed and approved this report. I confirm that I adopt this report.
- 5.8.6 This high-level report investigated several options for the alignment of the proposed Church Street connection, including the on and off ramp arrangement with the northbound lanes on the Geelong Ring Road.
- 5.8.7 As detailed in the CardnoTGM report the alignment of the Church Street extension in a direct east west arrangement as outlined in the current framework plan (Option 1 in the CardnoTGM report) was identified as having significant issues including;
- > extremely high constructed embankments and or bridges (20 – 25m high);
  - > an extensively long bridge over the Moorabool River;
  - > high aesthetic impost on the surrounds, and;
  - > significant impact on the adjoining properties.
- 5.8.8 Three alternative alignment options were considered in the CardnoTGM report, with the recommended alignment being Option 4 which initially runs in a north westerly direction across the existing escarpment batter to allow the road to achieve the maximum permissible bus route grades whilst also minimising the creation of large embankments. It then loops back to arrive at approximately the same location as detailed in the framework plan on the west side of the Moorabool River.
- 5.8.9 Whilst the earlier high-level investigation is by no means considered to be sufficiently detailed, consider all impacts or provide confirmation of a final alignment, it is considered that it sufficiently details that flexibility needs to be retained on the alignment of this link in the structure plan until it is examined in more detail at the precinct Structure Plan (PSP) stage.
- 5.8.10 It is considered that there is no engineering reason why this more detailed analysis cannot be undertaken within a PSP process that is undertaken in isolation of the greater Batesford South precinct on the west side of the Moorabool River.
- 5.8.11 Accordingly, it is recommended that the Church Street alignment between the Geelong Ring Road and the west side of the Moorabool River be noted as preliminary and subject to further investigation at the PSP stage.

## 6 Conclusion

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- 6.1 It is my opinion that the servicing of the subject property at 355 Church Street, Fyansford, along with its neighbouring property of 370 Church Street, Hamlyn Heights and also for more generally all of the land located between the Geelong Ring Road and the Moorabool River, can be serviced independently of the Batesford South Precinct, and potentially in isolation.
- 6.2 It is my opinion that;
- > The subject land is able to be serviced independently of the Batesford South Precinct.
  - > Further, it can be serviced if included in either the Creamery Road Precinct and or the McCanns Lane precinct and potentially independently of both of those precincts.
  - > There are no engineering servicing reasons why the subject site and the additional area identified in Figure 3 should be included in the Batesford South Precinct and is physically separated from this precinct by the Moorabool River. From an engineering perspective, a more logical approach would result in the subject site being included in an earlier sequencing precinct.

## 7 Declaration

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I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance which I regard as relevant have to my knowledge been withheld from the Panel.

Yours sincerely,



**Leigh Prossor**  
CardnoTGM  
Manager – Civil Engineering

## APPENDIX A – CardnoTGM Church Street Options Analysis

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Our Ref: 15410-99  
Contact: Leigh Prossor

23 July 2019

Tract Consultants Pty Ltd  
39 Gheringhap Street  
GEELONG VIC 3220

**Att: Mr Nick Clements**

Dear Nick,

**WESTERN GEELONG GROWTH AREA  
CHURCH STREET ARTERIAL ROAD CONNECTION  
OPTIONS ANALYSIS**

**1 Background**

CardnoTGM had previously been requested by Tract Consultants Pty Ltd to prepare a high-level concept design for potential options to connect Church Street to the Western Geelong Growth Area (WGGA) as indicated in the proposed framework plan for the area. The connection from the WGGA to Church Street is constrained by a number of significant factors, including the steep topography at the western end of Church Street, the freeway standard Geelong Ring Road (GRR) crossing the alignments, and the Moorabool River also bisecting the area. Adding to this is the requirement that the proposed route shall accommodate public transport (buses), which stipulate a maximum gradient of 9%, well below the natural terrain of the area. This letter provides a brief description of the 4 options assessed, and a more in-depth review of the two most suitable options, being the option matching the framework plan, and the most engineering efficient option.

The four options that were identified were:

**OPTION 1** – Direct (straight) connection from Church Street, across the GRR, down the escarpment with large fill batters and then crossing the Moorabool River.

**OPTION 2** – Provision of a 900m tunnel from approximately Vines Rd to the western side of the GRR to avoid the steep terrain (running at maximum tunnel grade 5%), then deviating north to allow for a more favourable Moorabool River crossing.

**OPTION 3** – Alignment sweeping south-westerly from the end of Church Street to run parallel with the GRR alignment, taking advantage of the existing earthworks on the common boundary between the two roads. Then turning north west to cross the Moorabool River upstream of the GRR bridge crossing.

**OPTION 4** – Alignment sweeping to the north-west from Church Street, crossing the existing escarpment batter at an angle to provide for maximum bus grades. Then turning south west to cross the Moorabool River in a more favourable location.

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Following on from early review of the options, Option 2 was discarded due to the extremely high construction costs associated with tunnelling and the impact of the tunnel entrance at the eastern end on existing houses and environment, and Option 3 was discarded due to the costs associated with a long curved bridge required to serve this option over the GRR and the extensive impact on the adjoining properties.

## 2 Preferred Option

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Following the initial review of the options, further work was undertaken in the refinement of the two remaining options (Option 1 & 4) to provide for a more detailed understanding of the engineering issues with their construction and an indication of construction costs was able to be obtained.

Based on this further refinement, the option that most suited the existing terrain, without providing large impediment to the usage of land in the WGGGA, and with lower construction costs was identified to be Option 4. Therefore, we have recommended that Option 4 is the preferred option for the Church Street connection link.

## 3 Further Discussion Points

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Further to additional refinements that could occur with the option(s) proposed, we note that just prior to the western ends of both Options 1 and 4, both road alignments are crossed by the existing 220kV extra high voltage transmission lines that run from the Geelong Terminal Station in Anakie Road around the periphery of the Geelong urban area to Point Henry (former ALCOA smelter). These lines in their current location will form a significant constraint on the land use and the road network layout for the immediate area of the WGGGA. It is recommended that consideration be given to the relocation / undergrounding of these lines. Discussions will need to be held with the asset owner (Ausnet Services) as to the suitability for the undergrounding or realigning of these transmission lines.

These lines formerly served the now closed Alcoa Aluminium smelter at Point Henry, there may no longer be a need for these transmission lines at all. This would also need to be confirmed or otherwise with the asset owner.

Given the above, it is considered that flexibility be maintained in the framework plan to revert the current transmission easement to developable land.

Yours sincerely,  
**CardnoTGM**



**Leigh Prossor**  
Manager – Civil Engineering

APPENDIX A



Figure 1: Preferred Options – With Framwork plan underlaid

## APPENDIX B

### OPTION 1 – Direct (westerly) link from Church Street to Western Geelong Growth Area

#### Description

Option 1 of the Church Street connection alignments from the Western Geelong Growth Area (WGGA) to the existing road reserve at the western end of Church Street most closely follows the framework plan. A 82m long bridge crosses the Geelong Ring Road, before the connection runs along a high (up to 25m high) batter between the escarpment and the Moorabool River. A 239m long bridge then provides for the connection across the Moorabool River.

#### Estimated Construction Cost:

\$80M inclusive of Construction, Consultants, Fees, Contingencies and GST

#### Advantages

- Meets the requirements of the Framework plan and most closely follows the alignment;
- Has the shortest length bridge across the Geelong Ring Road;
- Provides the most conventional entry/ exit ramp connections to the Geelong Ring Road if required, either as part of the WGGA works, or at a later date.
- Provides for a standard T-intersection for the Church Street connection and the newly constructed Heights Estate entry road - Monier Way.

#### Disadvantages

- Requires the longest bridge over the Moorabool River as the road alignment crosses on a diagonal where the existing flood plain is wider. The associated construction cost is therefore significantly higher than Option 4.
- Extremely high earthen embankment (up to 25m high, typically 20m high) due to the existing topography falling away from Church Street steeper than the maximum allowable grade for a bus route (9%). This high embankment then creates a 230m wide (at the base, based on 1 in 5 slopes) barrier separating the northern side of the connector road from the south;
- The impact of the high embankment creates a visually intrusive barrier within the WGGA and the Moorabool River floodplain, and notably when viewed from the Geelong Ring Road.
- The steep deck grade of the bridge over the Geelong Ring Road (5%) may require additional abutment works/ costs compared to flatter bridge deck grades.
- Has a significantly higher estimated construction cost than Option 4, especially in the bridge construction costs (40% higher due to additional length) which is likely to contain the most uncertainty in costs at this point in time.

## **OPTION 4 – North-westerly connection link running across the existing escarpment batter from Church Street to Western Geelong Growth Area**

### **Description**

Option 4 makes use of running across the existing escarpment batter to allow the road to achieve the maximum bus route grades whilst also minimising the creation of large embankments. A 121m long bridge conveys traffic over the Geelong Ring Road, then running down the batter slope to the toe of the existing slope, then turning south-west to head across the Moorabool River via a 106m long bridge at a favourable location

### **Estimated Construction Cost:**

\$50M inclusive of Construction, Consultants, Fees, Contingencies and GST

### **Advantages**

- Meets the requirements of the Framework plan and ultimately joins back onto the framework alignment;
- Has the shortest length bridge across the Moorabool River due to locating the crossing at a more favourable point along the river and where the topography suits the bridge abutments better than Option 1;
- The proposed bridge deck longitudinal grades are typically less than 2.4%, therefore more likely to require less abutment foundation works compared to Option 1.
- Provides entry/ exit ramp connections to the Geelong Ring Road if required, either as part of the WGGA works, or at a later date.
- Provides for an intersection for the Church Street connection and the newly constructed Heights Estate entry road - Monier Way.
- Has no large earthen embankments. The large cut batter required runs at basically the same grade as existing, and can be re-vegetated to marry into the existing topography to minimise visual intrusion once vegetation establishment has occurred.
- Provides the cheaper estimated construction cost, with the reduced cost of Bridge construction and earthworks compared to Option 1 more than offsetting the increased length of road (and associated works).
- Provides a road that is generally in vertical alignment with the existing surface levels on the east side of the river, this will facilitate connection to the proposed adjoining development at this location.

### **Disadvantages**

- The entry/ exit ramps from the Geelong Ring Road if required vary from conventional ramps and may require additional requirements to achieve VicRoads acceptance prior to design compared to Option 1. We note either option would require VicRoads approval early in the planning process.
- A larger degree of re-work of the intersection with the new Monier Way (Heights Estate) connection would be required compared to Option 1
- Has a longer bridge across the Geelong Ring Road, therefore construction costs of this bridge are higher than Option 1.
- The length of road is increased compared to Option 1 in order to achieve the bus grade requirements without needing large fill embankments.