

ADW JOHNSON PTY LIMITED

ABN 62 129 445 398

Sydney
Level 35 One International Towers
100 Barangaroo Avenue
Sydney NSW 2000
02 8046 7411
sydney@adwjohnson.com.au

Central Coast
5 Pioneer Avenue
Tuggerah NSW 2259
02 4305 4300

coast@adwjohnson.com.au

Hunter Region
7/335 Hillsborough Road
Warners Bay NSW 2282
02 4978 5100

hunter@adwjohnson.com.au

Civil Engineering Report

To accompany a Development Application for Stage 1 of Ivanhoe Estate - A State Significant Development

Property:

The land currently comprising Ivanhoe Estate,
Herring Road, Macquarie Park as well as a portion of
Shrimptons Creek and part of Lot 1 in DP 859537

Applicant:

Aspire Consortium on behalf of
NSW Land
and Housing Corporation

Date:6th September 2019

Document Control Sheet

Issue No.	Amendment	Date	Prepared By	Checked By
A	DRAFT	22 nd March 2018	BMJ	MO
B	Minor Wording	26 th March 2018	BMJ	MO
C	Minor Wording	3 rd October 2018	BMJ	MO
D	Image amended	5 th October 2018	BMJ	MO
E	Layout Amended	6 th September 2019	BMJ	MO

Limitations Statement

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Unless otherwise specified in this report, information and advice received from external parties during the course of this project was not independently verified. However, any such information was, in our opinion, deemed to be current and relevant prior to its use. Whilst all reasonable skill, diligence and care have been taken to provide accurate information and appropriate recommendations, it is not warranted or guaranteed and no responsibility or liability for any information, opinion or commentary contained herein or for any consequences of its use will be accepted by ADW Johnson or by any person involved in the preparation of this assessment and report.

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The Client should be aware that this report does not guarantee the approval of any application by any Council, Government agency or any other regulatory authority.

Executive Summary

This report supports a Development Application (DA) for Stage 1 of the Ivanhoe Estate redevelopment, a State Significant Development (SSD) submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). It has been prepared for Aspire Consortium on behalf of NSW Land and Housing Corporation.

This report provided an overview of the civil engineering design, with specific focus on the road design and earthworks for Stage 1 of the development. This report should be read in conjunction with the "Stormwater and Drainage Assessment", "Utility Services Report" and concept civil engineering drawings, all prepared by ADW Johnson, which form part of the DA.

The proposed road layout for the Stage 1 DA is consistent with the layout lodged as part of the Masterplan DA for the site.

The road cross sections are generally in accordance with the requirements of Ryde Council's DCP 2014, with some deviations from this standard for various reasons.

The horizontal and vertical geometry of all roads has been designed in accordance with Ryde Council's DCP 2014 and the relevant Austroads design guidelines.

As a part of the Stage 1 DA it is proposed to provide an extension of the internal road network to Lyonpark Road (LPR) to the south of the development. This road extension will include works on neighbouring land, for which consent has been obtained, and will provide a direct connection between Herring Road and Lyonpark Road, which is a key objective within the Macquarie Park Corridor DCP.

It is noted that due to various constraints on the existing lot, the proposed cross section of the road extension deviates slightly to the profile found in the DCP, however it is still considered to provide a safe and suitable outcome.

To facilitate the road extension to LPR, a bridge is proposed to span Shrimpton's Creek. The horizontal and vertical geometry of the road carriageway on the bridge has been designed in accordance with the Austroads design guidelines.

The Stage 1 DA proposes a road connection to Herring Road, which is the subject of an intersection upgrade currently being designed by the RMS. Coordination with the RMS has been undertaken to ensure the internal road network has been designed to tie in with the proposed intersection works. Further coordination will be undertaken with the RMS during the CC stage of works.

Proposed earthworks included with the Stage 1 DA, generally includes excavations to depths of approximately 5m in the road reserve and 15m in proposed lots A1 and C1. Small areas of fill are proposed in the lower portions of the site, closer to Shrimpton's Creek.

Whilst the Stage 1 DA seeks approval for the entire road network, it is proposed that the works will be constructed in multiple stages. It is proposed that the road network and associated infrastructure will be constructed in two (2) separate stages and as such temporary works will be required. All temporary works have been designed in accordance with council standards.

All of the works within the Stage 1 DA generally comply with Ryde Council's DCP 2014 and the relevant Austroads Guides and are consistent with the framework established under the masterplan. Where the works do deviate from these specifications, they are still considered to be safe and suitable for the proposed development.

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1.0 Introduction

This report supports a Development Application for Stage 1 of the Ivanhoe Estate redevelopment, a State Significant Development (SSD) submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). It has been prepared for Aspire Consortium on behalf of NSW Land and Housing Corporation.

The purpose of this report is to provide an overview of the civil engineering design, including roads and earthworks, proposed in the Stage 1 DA. This report should be read in conjunction with the "Stormwater and Drainage Assessment", "Utility Services Report", civil engineering drawings and the "Ivanhoe Estate Bridge Design" report, prepared by ADW Johnson and McGregor Coxall respectively and which all form part of the Stage 1 DA.

1.1 BACKGROUND

In September 2015 the Ivanhoe Estate was rezoned by DPE as part of the Macquarie University Station (Herring Road) Priority Precinct, to transform the area into a vibrant centre that benefits from the available transport infrastructure and the precinct's proximity to jobs, retail and education opportunities within the Macquarie Park corridor.

The Ivanhoe Estate is currently owned by NSW Land and Housing Corporation and comprises 259 social housing dwellings. The redevelopment of the Ivanhoe Estate is part of the NSW Government Communities Plus program, which seeks to deliver new communities where social housing blends with private and affordable housing, with good access to transport, employment, improved community facilities and open space.

The Communities Plus program seeks to leverage the expertise and capacity of the private and non-government sectors. As part of this program, Aspire Consortium, comprising Frasers Property Australia and Mission Australia Housing, were selected as the successful proponent to develop the site in July 2017.

In September 2017, DPE issued the Secretary's Environmental Assessment Requirements for a comprehensive Masterplan application that will establish the framework for the staged redevelopment of the site. This Development Application for Stage 1 of the Ivanhoe Estate redevelopment represents the first stage of detailed works pursuant to the Ivanhoe Estate Masterplan.

1.2 SITE DESCRIPTION

The Ivanhoe Estate site is located in Macquarie Park near the corner of Epping Road and Herring Road within the Ryde Local Government Area (LGA). The site is approximately 8.2 hectares and currently accommodates 259 social housing dwellings, comprising a mix of townhouse and four storey apartment buildings set around a cul-de-sac street layout. An aerial photo of the site is provided at **Figure 1** overleaf.

Immediately to the north of the site are a series of four storey residential apartment buildings. On the north-western boundary, the site fronts Herring Road and a lot that is currently occupied by four (4) former student accommodation buildings and is likely to be subject to redevelopment. Epping Road runs along the south-western boundary of the site and Shrimptons Creek, an area of public open space, runs along the south-eastern boundary. Vehicle access to the site is via Herring Road.

Ivanhoe Estate comprised of 17 individual lots owned and managed by the NSW Land and Housing Corporation. The Masterplan site also incorporates adjoining land, being a portion of Shrimptons Creek and part of the commercial site at 2-4 Lyonpark Road. This land is included to facilitate a bridge crossing and road connection to Lyonpark Road.



 The Site  To facilitate road extension to Lyonpark Road

Figure 1: Ivanhoe Estate Site

1.2.1 Site Topography

The site generally falls from the north western corner, at the intersection of Epping and Herring Roads towards Shrimpton's Creek in the south eastern corner. As indicated in **Figure 2** overleaf, there is approximately 30m of fall across the site at an average grade of 7.5%.

The topography of 2-4 Lyonpark Road is very gentle with the site generally falling towards Shrimpton's Creek at an average slope of 1-2%. This is also indicated in **Figure 2** overleaf.



Figure 2: Existing Topography

1.3 PROPOSED DEVELOPMENT

The proposed Stage 1 Development Application seeks consent for the first stage of detailed works within the Ivanhoe Estate, pursuant to the Ivanhoe Estate Masterplan under Section 4.22 of the EP&A Act. The Masterplan establishes the planning and development framework against which this Stage 1 Development Application will be assessed.

The Stage 1 Development Application seeks approval for:

- site preparation works, including tree removal, demolition of roads, services, and earthworks across the Ivanhoe Estate;
- the provision and augmentation of utilities and services infrastructure across the Ivanhoe Estate;
- the construction of all internal roads including public domain within the road reserves, and the bridge crossing and road connection to Lyonpark Road;
- the consolidation of existing lots and subdivision of the Ivanhoe Estate to reflect the revised road layout, open space, and provide superblocks corresponding to the Masterplan;

- the construction and use of Buildings A1 and C1 comprising residential uses (including social housing), a childcare centre, and retail / community spaces.

Despite the Stage 1 DA seeking approval for works over the entire estate, it is proposed to deliver the works in accordance with the staging plan identified within the Masterplan DA.

An image of the masterplan, identifying Buildings A1 and C1 and illustrating the road network, is provided at **Figure 3** overleaf.



Figure 3: Ivanhoe Estate Masterplan (Stage 1)

2.0 Road Design

The proposed road layout for the development was developed during an extensive master planning process. The road layout within the Stage 1 DA is consistent with the layout submitted with the Ivanhoe Estate Masterplan.

2.1 INTERNAL ROAD DESIGN

The internal road network has generally been designed in accordance with Ryde Councils DCP 2014 and the relevant Austroads standards.

2.1.1 Cross Sections

The proposed road network consists of the following street types, which are generally in accordance with Ryde Councils DCP 2014:

- Collector Street – Road 1 (Main Street)
- Collector Street – Lyonpark Road Extension
- Local Street – Road 2

The local street, Road 2, complies with the overall road reserve width outlined within Ryde Council's DCP 2014, however the location of the pavement has been shifted slightly to allow for greater landscape opportunities within the verge area. Refer to the landscape architect's public domain plan for further details.

The Collector Streets are generally consistent with Ryde Council's DCP 2014, however minor amendments have been made in order to comply with a number of constraints.

In order to cater for bus movements along Main street to Lyonpark Road, the travel lanes along the Collector Streets have been widened to 3.5m in accordance with Austroads standards. This has resulted in the road reserve width being 1m wider than that noted in the DCP.

As a part of the Stage 1 DA it is proposed to provide an extension of the internal road network to Lyonpark road (LPR) to the south of the development. This road extension will include works on neighbouring land, for which consent has been obtained, and will provide a direct connection between Herring Road and Lyonpark Road, which is a key objective within the Macquarie Park Corridor DCP.

The cross section of this portion of road deviates from Ryde Council's DCP 2014 in order to cater for the existing structures on the adjoining lot, however it does comply with the Austroads design guidelines and is considered to be safe and suitable for purpose. Further details in regards to this road extension and the proposed bridge can be seen in section 2.2.

The geometry and layout of the section of Main Street between Road No.2 and Herring Road is entirely governed by the design of the future signalised intersection, which has been provided by the RMS.

The RMS has provided both kerb strings and land acquisition boundaries for the internal designs to tie in to. In consideration of this it has been adopted that Council's typical road reserve requirements are not applicable to this section of Main street.

It is noted that the pavement area in this location is sufficient to safely convey all vehicles required to use the internal development, whilst the verges provided are adequate to cater for all required services.

Details of the road cross sections can be seen in **Table 1** below, whilst typical sections can be seen in the civil engineering drawings.

Table 1 – Road Cross Section Details

Road Type	Pavement Width (m)	Road Reserve Width (m)
Collector	7.0	21.0
Collector – With Parking*	13.0	21.0
Lyonpark Road Extension	7.0	Varies
Herring Road Approach	Varies	Varies
Local	6.0	14.5
Local – With Parking*	8.5	14.5

* 2.5m wide parking bays are provided intermittently on both sides of the collector road and on one side of the local roads. Where bus parking bays are provided the pavement is 0.5m wider.

In accordance with Ryde Council's DCP 2014, upright kerb and gutter is proposed on both sides of all roads, pavement cross falls are 2.5% and the verges grade back towards the road at 3%.

At the approaches to the external site intersections, the proposed road cross sections vary in order to connect into the proposed intersection configurations. Further details can be seen in section 2.3.

2.1.2 Longitudinal Grading

Internal road grading has been developed with both the building and landscape architects to provide the most suitable grading for the proposed development.

A maximum road grade of 12.5% has been adopted in accordance with Ryde Council's DCP 2014, whilst the majority of the roads have a longitudinal grade of less than 5%. The 12.5% section of Road 1 extends from Herring Road into the site for approximately 60m and was provided in order to suit proposed building levels that are constrained by DCP height plans and to allow the provision of an accessible route for aged care residents to the retail centre.

A minimum road grade of 0.75% has been adopted on the approach to the proposed bridge over Shrimpton's Creek and was provided in order to locate the low point within Road 1 as close as possible to the creek without adversely affecting the bridge design.

All changes of grade have adequate vertical curves, designed in accordance with Austroads standards.

2.1.3 Intersections

In accordance with Austroads design guidelines, all internal intersections within the site have been designed to ensure that a 12.5m single unit truck can adequately negotiate turns without mounting the kerb.

2.2 LYONPARK ROAD EXTENSION

As discussed in section 2.1.1 above, as a part of the Stage 1 DA it is proposed to provide a road connection from the internal road layout to Lyonpark Road to the South of the estate. Details of the design of this road connection through the adjoining property are provided below.

2.2.1 Road Design

The road extension is to be provided through Lot 1 DP 859537 (2-4 Lyonpark Road), an existing private commercial property. Owners consent has been obtained for these works and will form part of the Stage 1 DA. As such, the design of the road has taken into account multiple constraints that exist within the property, including the existing multi story building, associated basement carpark entries and a retaining wall on the North Eastern boundary (to which the proposed road adjoins).

As discussed in section 2.1.1 above, the cross section for this portion of road deviates from Ryde Council's DCP in order to cater for the constraints on the site. Whilst the overall road reserve width is less than that provided in the DCP, the road pavement provides adequate width for two-way traffic and complies with all relevant Austroads standards. It is noted that the verge widths were adopted to ensure a smooth transition between the proposed bridge and the road extension.

The dimensions of the proposed road extension can be seen above in Table 1, whilst a typical section can be seen in the concept civil engineering plans.

The existing retaining wall on the North Eastern boundary of the 2-4 Lyonpark Road site currently supports the adjoining property and as such is proposed to remain in place. Accordingly, the proposed road has been designed to be higher than the toe of the existing wall to minimize the impact on it's structural adequacy. Further details regarding the existing wall can be found in the Geotechnical Assessment prepared by Douglas Partners.

To offset the loss of existing carparks within the site, it is proposed to provide a new carpark within 2-4 Lyonpark Road to service the existing building on the site. The proposed carpark will provide the same number of parking spaces and the same amenity as previously available within the site.

The new carpark and associated driveways have been designed in accordance with AS 2890.1 – Off Street Car Parking.

The road extension is to connect to Lyonpark Road through the provision of a standard 'T' intersection that has been designed in accordance with Council and Austroads requirements.

2.2.2 Shrimpton's Creek Bridge

To facilitate the road extension through to Lyonpark Road, a bridge is required to span Shrimpton's Creek. The proposed bridge cross section continues the same amenity as the proposed road through 2-4 Lyonpark Road and all geometrical aspects of the bridge have been designed in accordance with the relevant Austroads standards.

Further details of the bridge design can be found in the "Ivanhoe Bridge Design" report prepared by McGregor Coxall.

2.3 EXTERNAL INTERSECTIONS

As mentioned in section 2.1 the development is to provide a new road connection to Herring Road to the North of the site. Concept design work has been undertaken on the intersection, in conjunction with the RMS to ensure a smooth tie in with the internal road network.

2.3.1 Herring Road

The Herring Road intersection is to be a fully signalised RMS intersection that will cater for multiple traffic movements in and out of the proposed site. In order to cater for the intersection, widening of Main Street has been undertaken on the approach to Herring Road and the longitudinal grades have been designed to comply with RMS standards.

As the Herring Road intersection is to be designed by the RMS the configuration may change once further work has been undertaken. It is noted that preliminary consultation has been had with the RMS and the Main Street approach has been designed to tie in with the current RMS design. The widening of Main Street up to the site boundary can be seen in the Civil Engineering drawings prepared by ADW Johnson.

3.0 Earthworks

The stage 1 development application seeks approval for all works within the road reserve and lots A1 and C1 only and as such all earthworks within this application will be limited to these areas, with the exception of temporary road batters.

The majority of the proposed earthworks on site is cut with some small areas of fill being proposed closer to Shrimpton's Creek. The deepest excavations occur within lots A1 and C1 where excavation depths reach approximately 15m to cater for the building basements, whilst the deepest excavations within the road reserve are in the order of 5m.

The earthworks volumes can be seen in the concept civil engineering drawings, whilst a summary can also be seen below:

Stage 1A

- Cut – 212,000 m³
- Fill – 50 m³
- Excess Material – 211,950 m³

Stage 1B

- Cut – 12,000 m³
- Fill – 5,000 m³
- Excess Material – 7,000 m³

It is anticipated that the excess material will be carted off site to an approved dump site or development site that requires material. All material will be tested and classified prior to be taken from site.

The proposed earthworks can be found in the Concept Civil Engineering drawings.

4.0 Staging / Temporary Works

Whilst the Stage 1 development application seeks approval for the entire road network, it is proposed that the works will be constructed in multiple stages. It is proposed that the road network and associated infrastructure will be constructed in two (2) separate stages and as such temporary works will be required.

4.1 STAGE 1A

Stage 1A will involve the construction of roads 1 and 2, from Herring Road into the development site and the construction of all works associated with lots A1 and C1.

Temporary turning heads will be provided at the termination of roads 1 and 2 at the stage 1A/1B boundary. Temporary works for both the utility services and stormwater are detailed in their respective reports. A summary of the temporary works for stage 1A can be seen in **Figure 4** below, whilst a larger version can be seen in the civil engineering drawings.

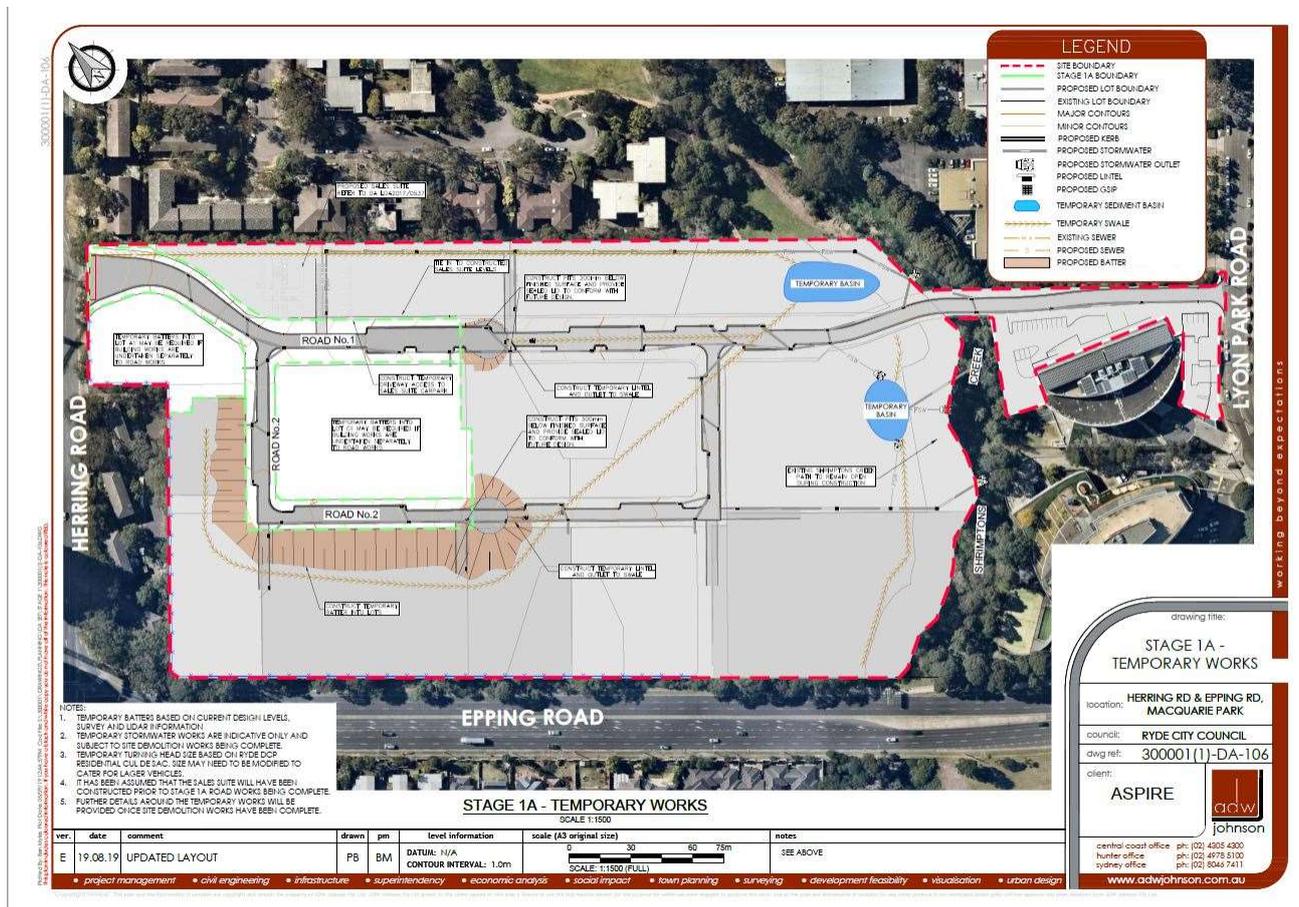


Figure 4: Stage 1A Temporary Works

4.2 STAGE 1B

Stage 1B will involve the completion of roads 1 and 2 and will also involve the construction of the Shrimpton's Creek Bridge and the road extension to Lyonpark Road.

As the road network is completed in Stage 1B, no temporary works will be required for the road network. Temporary works for both the utility services and stormwater are detailed in their respective reports. A summary of the temporary works for Stage 1B can be seen in **Figure 5** below, whilst a larger version can be seen in the civil engineering drawings.

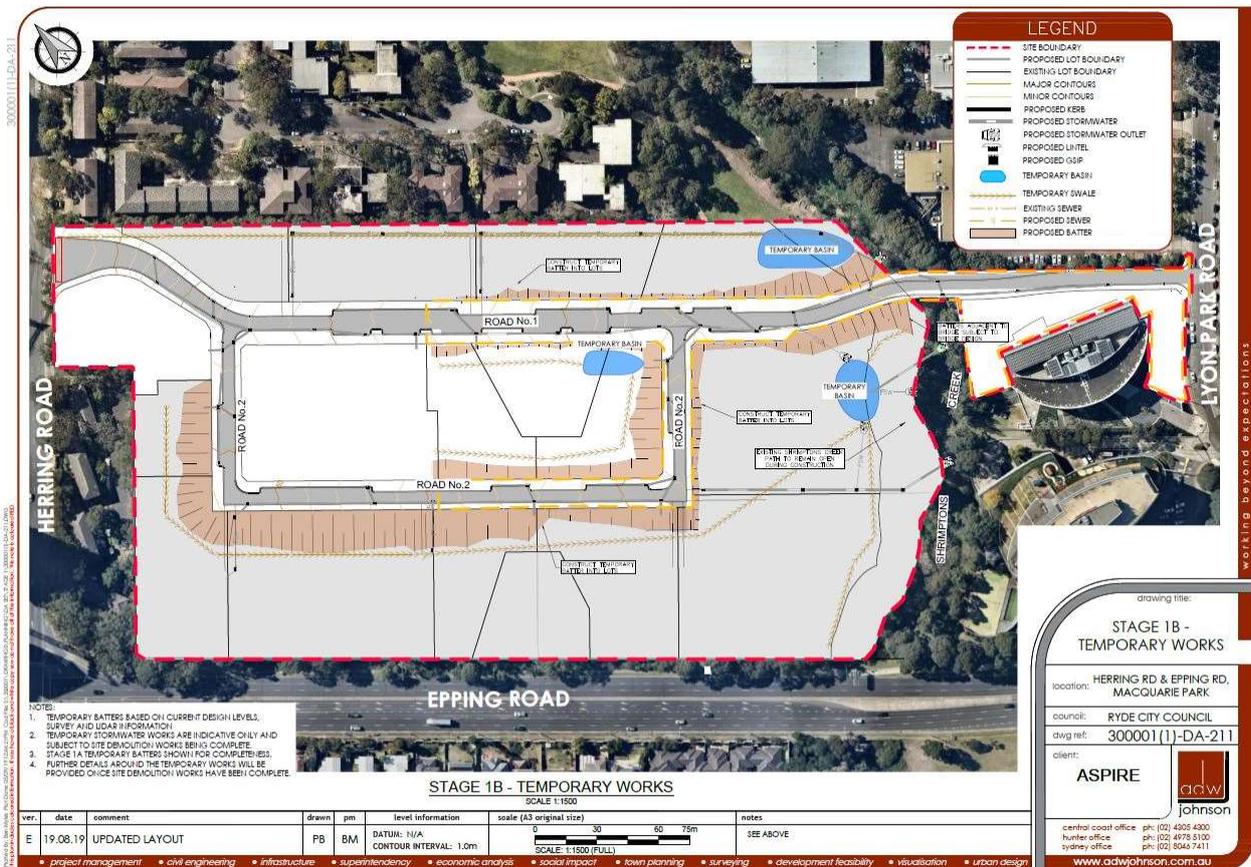


Figure 5: Stage 1B Temporary Works

5.0 Conclusion

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The road cross sections are generally in accordance with the requirements of Ryde Council's DCP 2014, with some deviations from this standard for various reasons.

The horizontal and vertical geometry of all roads has been designed in accordance with Ryde Council's DCP 2014 and the relevant Austroads design guidelines.

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It is noted that due to various constraints on the existing lot, the proposed cross section of the road extension deviates slightly to the profile found in the DCP, however it is still considered to provide a safe and suitable outcome.

To facilitate the road extension to LPR, a bridge is proposed to span Shrimpton's Creek. The horizontal and vertical geometry of the road carriageway on the bridge has been designed in accordance with the Austroads design guidelines.

The Stage 1 DA proposes a road connection to Herring Road through a signalised intersection. The internal road network, on approach to these intersections, has been designed to cater for the proposed intersection configurations. Further detailed design will be done in accordance with the RMS, following approval of the Stage 1 DA.

Proposed earthworks included with the Stage 1 DA, generally includes excavations to depths of approximately 5m in the road reserve and 15m in proposed lots A1 and C1. Small areas of fill are proposed in the lower portions of the site, closer to Shrimpton's Creek.

Whilst the Stage 1 DA seeks approval for the entire road network, it is proposed that the works will be constructed in multiple stages. It is proposed that the road network and associated infrastructure will be constructed in two (2) separate stages and as such temporary works will be required. All temporary works have been designed in accordance with Council standards.

All of the works within the Stage 1 DA generally comply with Ryde Council's DCP 2014 and the relevant Austroads Guides and are consistent with the framework established under the masterplan. Where the works do deviate from these specifications, they are still considered to be safe and suitable for the proposed development.