Australian Clay Target Association

Flooding Impact Assessment Report

April 2017

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1. Introduction

GHD was engaged by the Australian Clay Target Association (ACTA) to assess flooding impacts associated with the proposed upgrade and construction of a new building within the property boundary of land owned by the ACTA for which this Development Application is being submitted to the City of Wagga Wagga Council ("Council"). The proposed building site is located at 72 Tasman Rd, East Wagga Wagga NSW 2650, approximately 760m south of the Murrumbidgee River.

The proposal includes the construction of a new clubhouse building with a total roof area of approximately 1740m^2, the provision of a ground level carpark providing 66 parking bays and an access road entering from Copland Street.

1.1 Objectives of Study

The main purpose of this assessment is to undertake the following:

- Assess the existing flooding conditions at the site
- Determine the potential flooding impacts associated with the proposed development

1.2 Limitations

This report has been prepared by GHD for Australian Clay Target Association and may only be used and relied on by Australian Clay Target Association for the purpose agreed between GHD and the Australian Clay Target Association as set out in this report.

GHD otherwise disclaims responsibility to any person other than Australian Clay Target Association arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Australian Clay Target Association and City of Wagga Wagga Council who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Available Data

The following data below was obtained for use in this study:

- WMAwater TUFLOW hydraulic model developed for modelling of the Murrumbidgee River floodplain at Wagga Wagga
- Proposed layout drawings of the design provided Lance Ryan Consulting Engineers Pty Ltd (dated March 2017) (See Appendix A)

3. Study Methodology

To conduct an assessment of flooding at the ACTA site, the terrain data set used for the TUFLOW flood modelling was updated by representing the current ACTA site using a topographic survey of the site undertaken by a qualified surveyor and provided to GHD. Incorporating this terrain information is considered most appropriate for representing the ground topography within the assessment property.

Flood modelling was firstly undertaken for existing (pre development) conditions. The two AEP events modelled (5% and 1% AEP events) were the two AEP event model files that were made available to GHD.

After simulation of the existing conditions scenario the proposed building and carpark was input into the TUFLOW model terrain and subsequently simulated to assess the impact of the development proposal for the 5 and 1% AEP events. The access road was assumed to remain at a similar level to the existing ground levels.

For post development conditions, the building floor level was assumed to be above the 1% AEP flood level. The floor level was specified on the proposed site layout drawing provide by Lance Ryan Consulting Engineers and was checked against the results presented in *Murrumbidgee River Flood Modelling – Wagga Wagga Local Government Area, WMA Water 2012 (*"The Wagga Wagga Flood Study"*)* prior to the simulation of the proposed development case.

Once modelling was completed for both existing and post development conditions, analysis of the model results was undertaken to check the following:

- If any flood level increases due to the development are greater than 15 mm beyond the property boundary
- If there are any significant changes to the existing velocities most notably for any area discharging beyond the property boundary
- If there is any change to the hazard category of the site

4. Existing Flood Behaviour

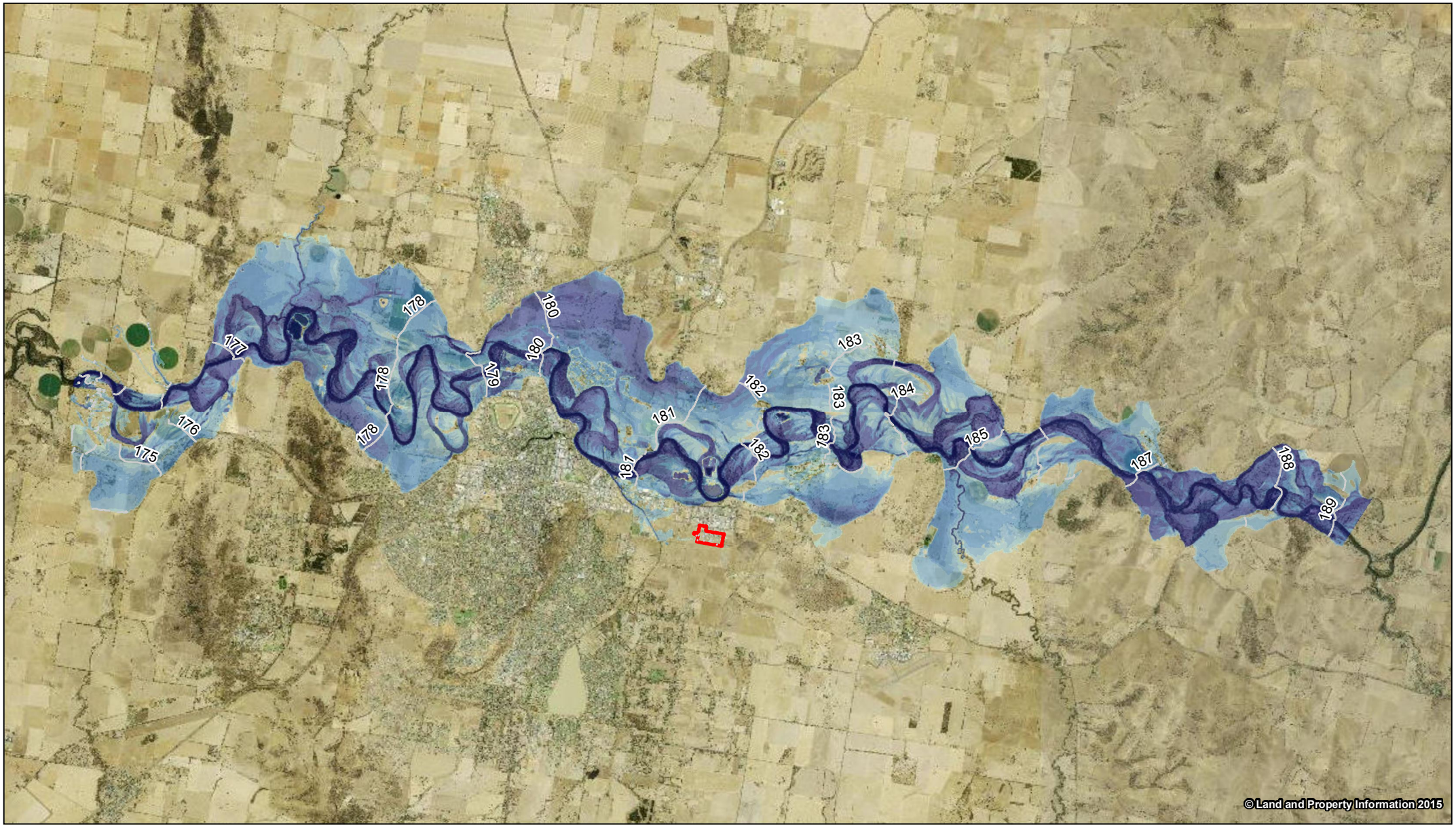
The assessment property is not subject to flooding from the Murrumbidgee River in a 5% AEP flood (refer to Figure 1). Localised inundation can occur on the property due to local runoff. These localised flooding effects do not inundate the proposed building site.

The assessment property is affected by Murrumbidgee River flooding in a 1% AEP flood (refer to Figure 2). During the 1% AEP event, the entire site becomes inundated due to river flooding. The Murrumbidgee River is seen to breach a levee around a bend in the river located approximately 4km north east of the ACTA site, this breaching causes flows to travel across the floodplain and across the ACTA site, eventually connecting up with Marshalls Creek further downstream.

During the existing flooding scenario the ACTA site is mostly designated as high hazard in a 1% AEP event except for a small area within the site that corresponds to the area around the proposed building and carpark which is designated low to medium hazard.

The 1% AEP flood levels across the assessment property fall from 182.7 to below 182.4 m AHD (refer to Figure 4). The flood depths across the site during the 1% AEP event vary from approximately 0.5m to 1m across the site.

Local runoff at the assessment site drains into open channels which are present. The southern boundary drainage channel discharges from the assessment site at the south west corner and ultimately drains into Marshalls Creek west of the site.



Paper Size A4

0 475 950 1,900 2,850 3,800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

Flood Level Contour (m AHD)

Site Boundary

Flood Depth (m)

0 - 0.10	1.00 - 1.50	2.50 - 4.00
0.10 - 0.50	1.50 - 2.00	4.00 - 5.00
0.50 - 1.00	2.00 - 2.50	

Australian Clay Target Association
Flooding Impact Assessment
Flood Maps

5% AEP Existing Flood Depths and Levels

Job Number 23-16005
Revision A
Date 24 Apr 2017

Figure 1

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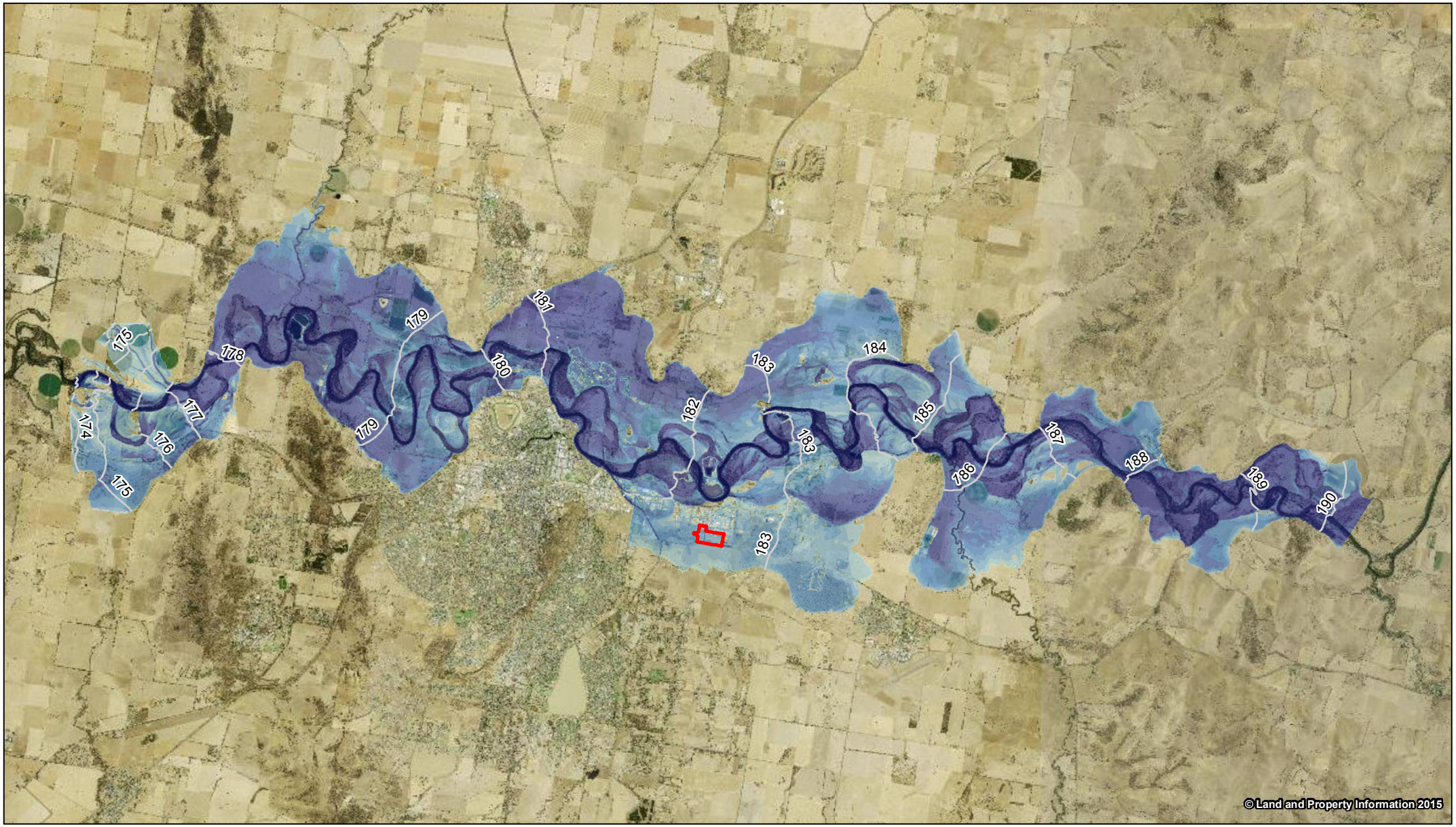
Suite 3, 161-169 Baylis Street, Wagga Wagga, NSW 2650, Australia **T** 61 2 6923 7432 **E** waggamail@ghd.com **W** www.ghd.com.au

Data source: Imagery - © Land and Property Information (Extracted: 24/04/17); Streets - NSW LPI 2012 DTDB. Proposal Layout: EJE Architecture Created by:mcakalci



Paper Size A4

0 475 950 1,900 2,850 3,800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

Flood Level Contour (m AHD)

Site Boundary

Flood Depth (m)

0 - 0.10	1.00 - 1.50	2.50 - 4.00
0.10 - 0.50	1.50 - 2.00	4.00 - 5.00
0.50 - 1.00	2.00 - 2.50	

Australian Clay Target Association
Flooding Impact Assessment
Flood Maps

1% AEP Existing Flood Depths and Levels

Job Number 23-16005
Revision A
Date 24 Apr 2017

Figure 2

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Data source: Imagery - © Land and Property Information (Extracted: 24/04/17); Streets - NSW LPI 2012 DTDB. Proposal Layout: EJE Architecture Created by:mcakalci

5. Potential Impacts of Proposal

The TUFLOW model was used to simulate flooding conditons coinciding with existing conditions and post development conditions as described in the preceding Section 4.

Central to the assessment of flood impacts was the magnitude of any modelled increase in flood level on adjoining properties.

The modelled increase in the 1% AEP flood level is shown on Figure 4. The new building and carpark works result in a localised increase in flood level within the development site. Figure 4 shows the area affected where the modelled flood level increase exceeds 15 mm.

The modelled increase in the 1% AEP flood level outside the assessment property is less than 10 mm.

The site is not subject to Murrumbidgee River flooding in a 5% AEP event. There will therefore be no river flooding impacts in a 5% AEP event.

The hazard categorisation of the site remains unchanged for post development conditions, that is medium to low hazard around the proposed building and carpark area and high hazard around the drainage channels towards the southern boundary of the site.

The peak 1% AEP modelled velocities outside the assessment property do not significantly increase as a result of the development. During the 1% AEP event increases of 0.02m/s were noted around the site boundary (in the vicinity of the drainage channel along the southern boundary).

Paper Size A4

0 12.525 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Flood Level Contour (m AHD)
- Site Boundary
- Flood Extent

Flood Level Difference (positive equals increase - metres)

< -0.7	-0.4 to -0.2	-0.05 to -0.03	0.015 to 0.03	0.1 to 0.2
-0.7 to -0.5	-0.2 to -0.1	-0.03 to -0.015	0.03 to 0.05	0.2 to 0.4
-0.5 to -0.4	-0.1 to -0.05	Limit of model accuracy	0.05 to 0.1	0.4 to +0.5

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Flooding Impact Assessment
Flood Difference

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Date 24 Apr 2017

5% AEP Flood Impact

Figure 3

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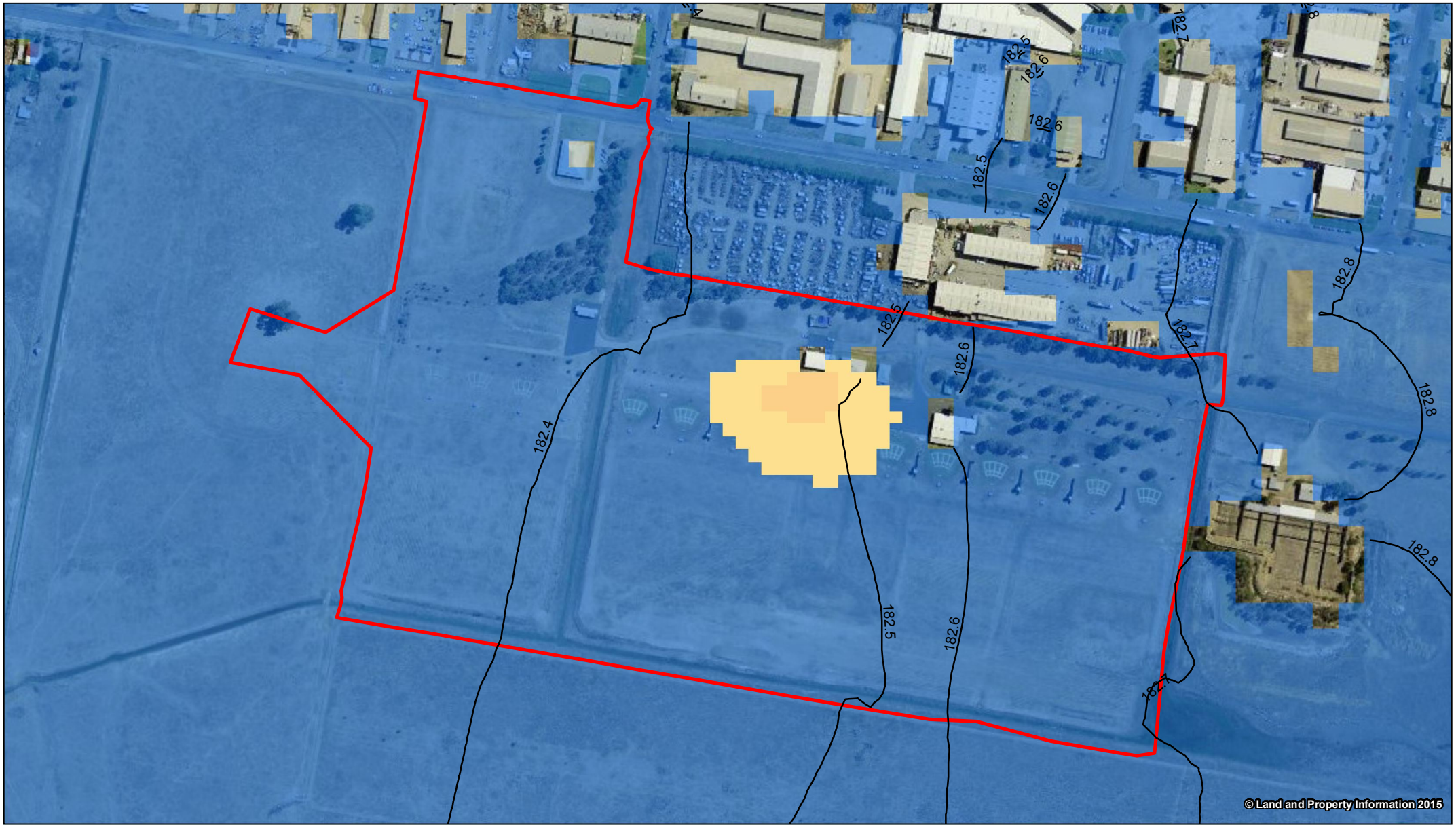
Data source: Imagery - © Land and Property Information (Extracted: 24/04/17); Streets - NSW LPI 2012 DTDB. Proposal Layout: EJE Architecture Created by:mcakalci



Paper Size A4

0 12.525 50 75 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Flood Level Contour (m AHD)
- Site Boundary
- Flood Extent

Flood Level Difference (positive equals increase - metres)

< -0.7	-0.4 to -0.2	-0.05 to -0.03	0.015 to 0.03	0.1 to 0.2
-0.7 to -0.5	-0.2 to -0.1	-0.03 to -0.015	0.03 to 0.05	0.2 to 0.4
-0.5 to -0.4	-0.1 to -0.05	Limit of model accuracy	0.05 to 0.1	0.4 to +0.5

Australian Clay Target Association
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1% AEP Flood Impact

Figure 4

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Data source: Imagery - © Land and Property Information (Extracted: 24/04/17); Streets - NSW LPI 2012 DTDB. Proposal Layout: EJE Architecture Created by:mcakalci

6. Conclusions

GHD was engaged by Australian Clay Target Association to assess flooding aspects of the proposed new building, carpark and access road. This included:

- Assessing the existing conditions flooding behaviour for the 5% and 1% AEP events
- Determining the potential impacts on flooding conditions associated with the proposed development

The assessment found that the development will have no impact on river flooding conditions in a 5% AEP event given that the assessment property is not subject to Murrumbidgee River flooding.

In a 1% AEP event, the assessment found that there will be some localised increase in flood levels within the assessment site as depicted in Figure 4. Importantly the modelled increase in the 1% AEP flood level outside the assessment property is less than 10 mm.

A check on the flood hazard categisation was undertaken for the proposed development scenario. This check found that flood hazard remains medium to low hazard around the proposed building and carpark works and remains high hazard around the southern boundary of the site.

On the basis of the modelling results, impacts on off-site flooding conditions due to the proposed development are assessed to be negligible and within the tolerances of the model accuracy. Given this, the assessed impacts on flooding are considered acceptable without the need for any flood mitigation measures.

7. References

Australian Rainfall and Runoff: A Guide to Flood Estimation 1987, *Volume 1*

Wagga Wagga Development Control Plan 2010, *Section 4–Environmental Hazards and Management V15.0*

WMA Water 2009, Wagga Wagga City Council, *Floodplain Risk Management Study*

WMA Water 2012, Wagga Wagga City Council, *Murrumbidgee River Flood Modelling*

Appendices