Job No: 871003.1000
14 November 2018

Network Tasman
52 Main Road Hope
Richmond 7020

Attention: Kerry Haycock

Dear Kerry

Stormwater assessment - 68 Main Road Hope, Richmond

This letter report presents the results of our flood assessment for the Network Tasman Limited (NTL) site at 68 Main Road Hope, Richmond. Authority to proceed with the assessment was provided in writing by you on 11 July 2018. Tonkin & Taylor Ltd's (T+T) proposal dated 9 July 2018 sets out the scope of work and conditions of engagement.

1 Background

An assessment of flood hazard at the NTL site is required to support of NTL's application for a private plan change. NTL is seeking the change to allow for further development of a new site adjacent to their existing site to meet future development needs.

Refer Figure 1 below for a plan of the site including legal boundaries for the applicant site. The site which the plan change application relates is located at 68 Main Road Hope, Richmond in Nelson, with legal descriptions of Lot 1 DP 19736 and Lot 1 20392.

The applicant site is currently zoned Rural 1 as defined in Map 127 of the Tasman District Council (TDC's) Tasman Resource Management Plan (TRMP), as are some of the surrounding sites. The rules for Schedule 17.5A (Activities on Network Tasman Limited Site at Main Road, Hope) set out in the TRMP apply to NTL's existing site at 52 Main Road Hope, and also to sites to the north-east which are used for a range of light industrial, commercial and residential purposes.

As the land use pattern of the applicant site does not match the underlying zoning (Rural 1), NTL proposes to extend the Schedule 17.5A over the property containing the applicant site.

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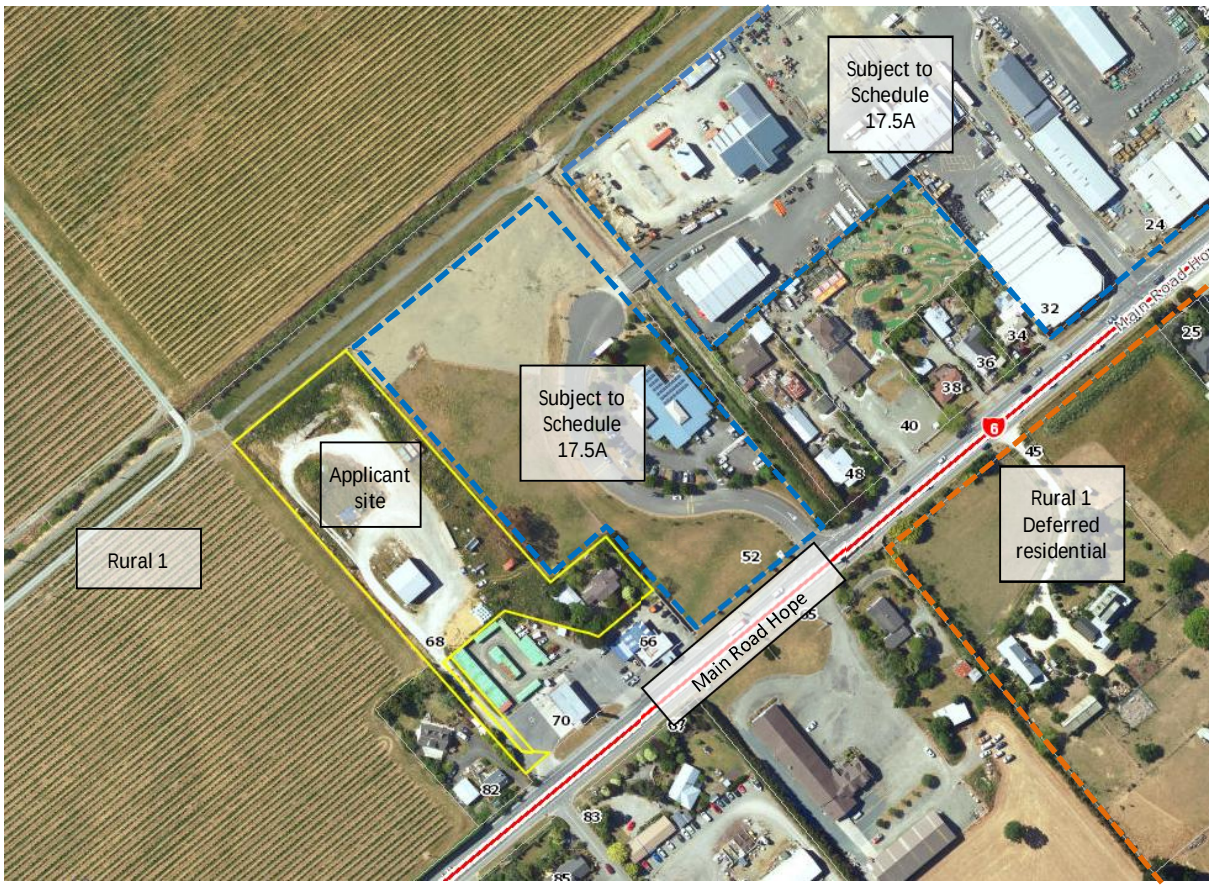

Figure 1 - Location plan (Aerial photograph source: Top of the South Maps)

1.1 Location

Figure 1 above shows the site and the stormwater network in the immediate area. The site is located in an area known as Richmond South, and sits at the confluence of the Reed/Andrews Drain and Borck Creek. The area is comprised of alluvial (floodplain) gravels and is generally flat, sloping to the north at an overall floodplain slope of approximately 1 m in 200 m. The site is bounded by State Highway Six (Main Road Hope) to the south-east, and a slightly raised cycleway to the north-west.

1.2 Scope of assessment

For the purposes of supporting the application for private plan change, this flood assessment contains details of:

- The assessment of future flooding at the site, due to overtopping of the Borck Creek and/or Reed/Andrews Drain channels;
- Design flood levels and minimum development levels to comply with the NZ Building Act, Nelson Tasman Land Development Manual (Draft 2018) and Schedule 17.5A of the Tasman Resource Management Plan (TRMP);
- The likely effects of development of the site on total runoff potential from the site during extreme rainfall events.

Note, all reduced levels (RLs) stated in this report are in terms of New Zealand Vertical Datum 2016 (NZVD-2016).

2 Flooding history and drainage improvements

The Richmond South area has historic flooding issues. Most notably, the area was subjected to widespread flooding during a storm event in January 1986. The event produced approximately 150 mm of rainfall within 24 hours, which gives it an average exceedance probability (AEP) of around 2 to 3%. Since that event, Council has undertaken various studies and drainage network improvements. The most comprehensive of these studies are:

a South Richmond Development Area Study – Stormwater Concept Design, MWH Jan 2006;

b Richmond Stormwater Land Designations – Stormwater Summary Report, MWH Sept 2009;

c Richmond Urban Stormwater Modelling, Stantec 2018.

In order to provide robust flood protection for existing and future development in the Richmond South and Richmond West areas, Council has undertaken some network improvement works already, and designated land for further improvements. Network improvements already undertaken which most directly affect the Network Tasman property are as follows:

a Construction of a culvert under SH6 and a new drain (extension of Reed/Andrews Drain) alongside the new Network Tasman building. This work was undertaken in 1998-99;

b Capacity improvements to Borck Creek, including a major channel realignment north of the White Road / Main Road Hope intersection.

Proposed future upgrade works are recommended in the MWH 2009 report, and allow for maximum probable development in the Richmond South/Richmond West areas, and the effects of climate change to the Year 2080. These works involve substantial widening of existing waterways. Land acquisition and widening of Borck Creek is currently scheduled for 2018-2028 in Council's 10 year Long Term Plan (LTP).

3 Review of available information

The basis for determining the depths and extents of flooding at the applicant site was stormwater flood modelling undertaken by TDC. TDC engaged Stantec to undertake this modelling, and provided modelling results to T+T in October 2018 for use in our assessment, after peer review and presentation of the information to TDC Councillors.

The main watercourses with the potential to produce flooding at the Network Tasman site are Borck Creek and the Reed/Andrews Drain.

4 Minimum development levels

4.1 Freeboard requirements

There are a number of relevant minimum standards for the development site with respect to flood hazard, which are considered separately below.

Firstly, the NZ Building Code requires that buildings must be built so that surface water during a 2% AEP flood event will not enter the building. To achieve this, Acceptable Solution E2/AS1 says that on near level sites like the applicant site, the floor level must be greater than 0.15 m above the crown of the road, or the lowest point of the boundary. Based on the topography of the applicant site, the lowest elevation at the northern corner of the site of RL 17 m governs. This would give a required minimum floor level of RL 17.15 m.

The Nelson Tasman Land Development Manual (NTLDM - draft August 2018, but expected to be approved shortly and therefore used as the basis of our advice in this assessment) gives guidance on minimum freeboard requirements between 1% AEP flood levels and floor level (refer Table 5-4 of

the NTLDM). The required freeboard height is 0.3 metres for commercial and industrial buildings, 0.5 m for habitable dwellings (including attached garages) and 0.6 metres for major community facilities related to supply of electricity, telecommunications, water supply or wastewater disposal.

The type of buildings proposed for the development of the applicant site are unknown. If major electricity supply facilities are proposed the 0.6 metre freeboard should apply. However, if non critical buildings are proposed, a lower freeboard is likely to be compliant, e.g. 0.3 m freeboard above the 1% AEP flood level for commercial buildings.

Lastly, Schedule 17.5A(c)(vii) of the TRMP states that any new building platform level must be no less than 0.5 metres above the estimated 2% AEP flood level, as assessed by a Chartered Professional Engineer.

In light of these differing requirements, it has been assessed that the more conservative NTLDM freeboard standard is likely to govern minimum development levels at the site.

4.2 Estimated 10% AEP flood levels

Refer to T+T Figure 871003.1000-F1 in Appendix A for a detailed plan of flood depths for the applicant site in the 10% AEP event. These range from 50 mm deep at the northern corner, to 300 mm in the eastern corner. The island with no flooding which was noted for the 1% AEP event in this case, with the area of no flooding extending across the property in a northeast-southwest direction adjacent to the existing shed.

Refer to Figure 2 below for a model output showing the predicted overland flowpath directions.

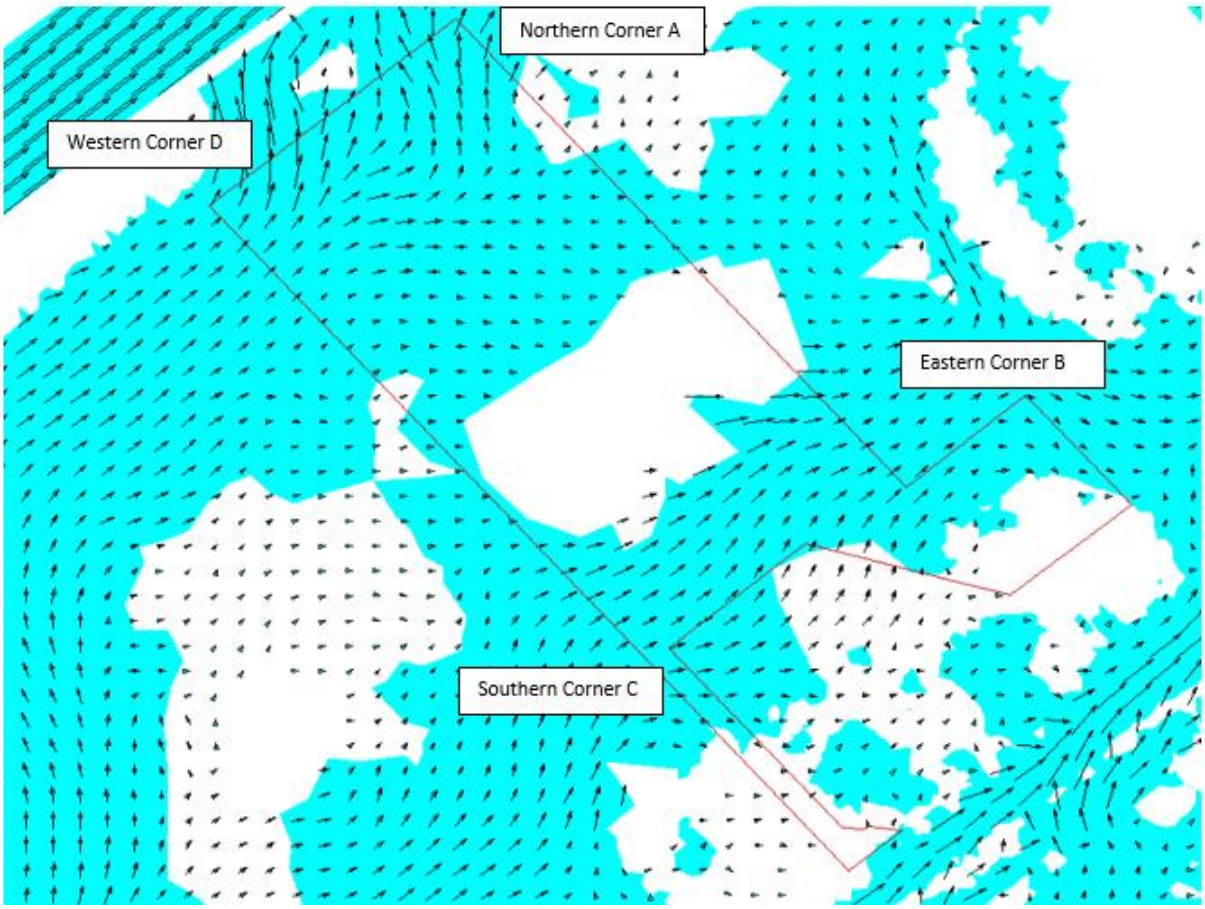

Figure 2 – Overland flow direction in 10% AEP event. Flow depths greater than 50 mm in blue.

4.3 Estimated 1% AEP flood levels

Refer to T+T Figure 871003.1000-F2 in Appendix A for a detailed plan of flood depths for the applicant site in the 1% AEP event. These depths are based on Stantec modelling. Depths below 50 mm are considered to be within the confidence limits of the modelling and underlying LiDAR data, and have been ignored, in line with standard practice. Depths affecting the site range from 50 mm deep at the northern corner, to greater than 300 mm in the eastern corner. Of note is an island at the centre of the site adjacent to the existing shed where no flooding is predicted.

Refer to Figure 2 2 below for a model output showing the predicted overland flow path directions in the vicinity of the site, at the peak of the storm event.

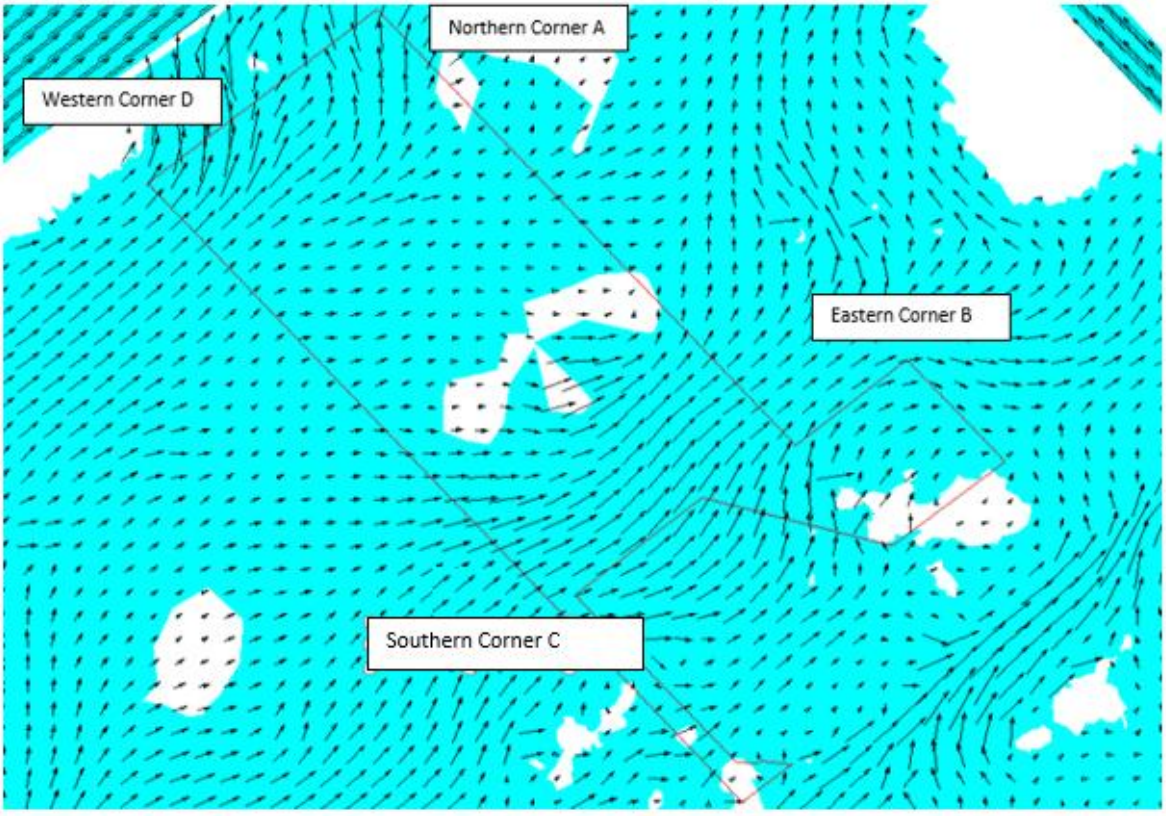

Figure 3 – Overland flow directions in 1% AEP event. Flow depths greater than 50 mm in blue.

Assuming the expected flooding mechanisms described above, and allowing for NTLDM freeboard requirements for new buildings, the estimated 1% AEP flood levels and minimum floor levels are presented in Table 1 below. Flood levels are generally higher in the southern and western corners of the site at RL 17.59 m and RL 17.62 m respectively, while the northern and eastern corners of the site are inundated to RL 17.14 m.

If the freeboard standard of 0.3 m is to be applied, minimum floor levels would range from RL 17.44 m to RL 17.92 m. alternatively, if the 0.6 m standard is to be required, they would range from RL 17.74 m to RL 18.22 m.

Note that flood and floor levels are presented only at selected locations across the site. Flood and floor levels for any particular proposed new building location would need to be assessed specifically during design.

Table 1 – Maximum 1% AEP flood water levels and minimum floor levels across applicant site

Location	Maximum flood depth (1% AEP) RL m (NZVD-2016)	Minimum floor level RL m (NZVD-2016)	
		Freeboard 0.3 m	Freeboard 0.6 m
Northern corner (A)	17.14	17.44	17.74
Eastern corner (B)	17.14	17.44	17.74
Southern corner (C)	17.59	17.89	18.19
Western corner (D)	17.62	17.92	18.22

5 Future development of the site

Existing buildings on the applicant site include a residence, garage and a large storage shed. The total impervious area of 420 square metres makes up approximately 4% of the site area. A large gravel hardstand area is also present, with the remainder of the lot currently grassed.

Any further development may involve an increase in impervious area which could lead to an increase in peak runoff and total runoff volume from the applicant site. The additional runoff would need to be captured by the existing Borck Creek and Reed/Andrews Drains that have been identified as having inadequate capacity.

In order to comply with the hydraulic neutrality requirements of the NTLDM, any development that increases the impervious area would therefore need to have a stormwater system designed to restrict peak runoff to existing, pre development levels. This could be through the management of stormwater runoff via low impact stormwater design (LIDS), e.g. sub-pavement stormwater attenuation tanks or similar.

6 Future stormwater improvements

Once TDC's proposed channel improvements are implemented, the Network Tasman site will be protected from flooding during a 1% AEP event affecting Borck Creek and the Reed/Andrews Drain, and so long as suitable on-site drainage is provided, there is expected to be no flood hazard at the site in up to the 1% AEP event.

Council plans to implement the Borck Creek improvements over the next twenty years, and the Reed/Andrews Drain improvements between 2021 and 2045. Therefore, by 2045 the applicant site is expected to be outside the 1% AEP floodplain, and remain that way until at least 2080, depending on the rate of climate change and effects on rainfall.

Between present day and when the stormwater network improvements are complete (expected by 2045), the site is expected to be prone to some degree of flooding in events that exceed the capacity of the Reed/Andrews Drain and Borck Creek watercourses. Based on current understand of rainfall patterns and assessment of catchment runoff potential, these events are expected to occur once every 3 to 5 years on average.

7 Conclusions and recommendations

The conclusions and recommendations of our flood assessment are summarised as follows:

1 The site is shown by latest modelling held by TDC to be subject to overland flooding during a present-day 1% AEP flood event due to the inadequate capacity of Borck Creek and the Reed/Andrews Drain;

2 The applicant site is currently 4% impervious by area. Any development that increases the impervious area beyond this has the potential to increase runoff to downstream property, and therefore may need to have a stormwater system designed to restrict peak runoff to existing, pre development levels. This could be through the management of stormwater runoff via low impact stormwater design (LIDS), e.g. sub-pavement stormwater attenuation tanks or similar;

3 Once implemented, the drainage improvement works proposed in Council's LTP are expected to be sufficient to protect the site from 1% AEP flows. The Borck Creek upgrade is programmed in the current LTP, to be completed by 2028. Advice from Council staff is that the Reed/Andrews Drain upgrade is in their current 20 year plan for completion by 2045.

8 Applicability

This report has been prepared for the exclusive use of our client Network Tasman, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

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Authorised for Tonkin & Taylor Ltd by:

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Mark Foley

Project Director

Report reviewed by Damian Velluppillai, Senior Water Resources Engineer

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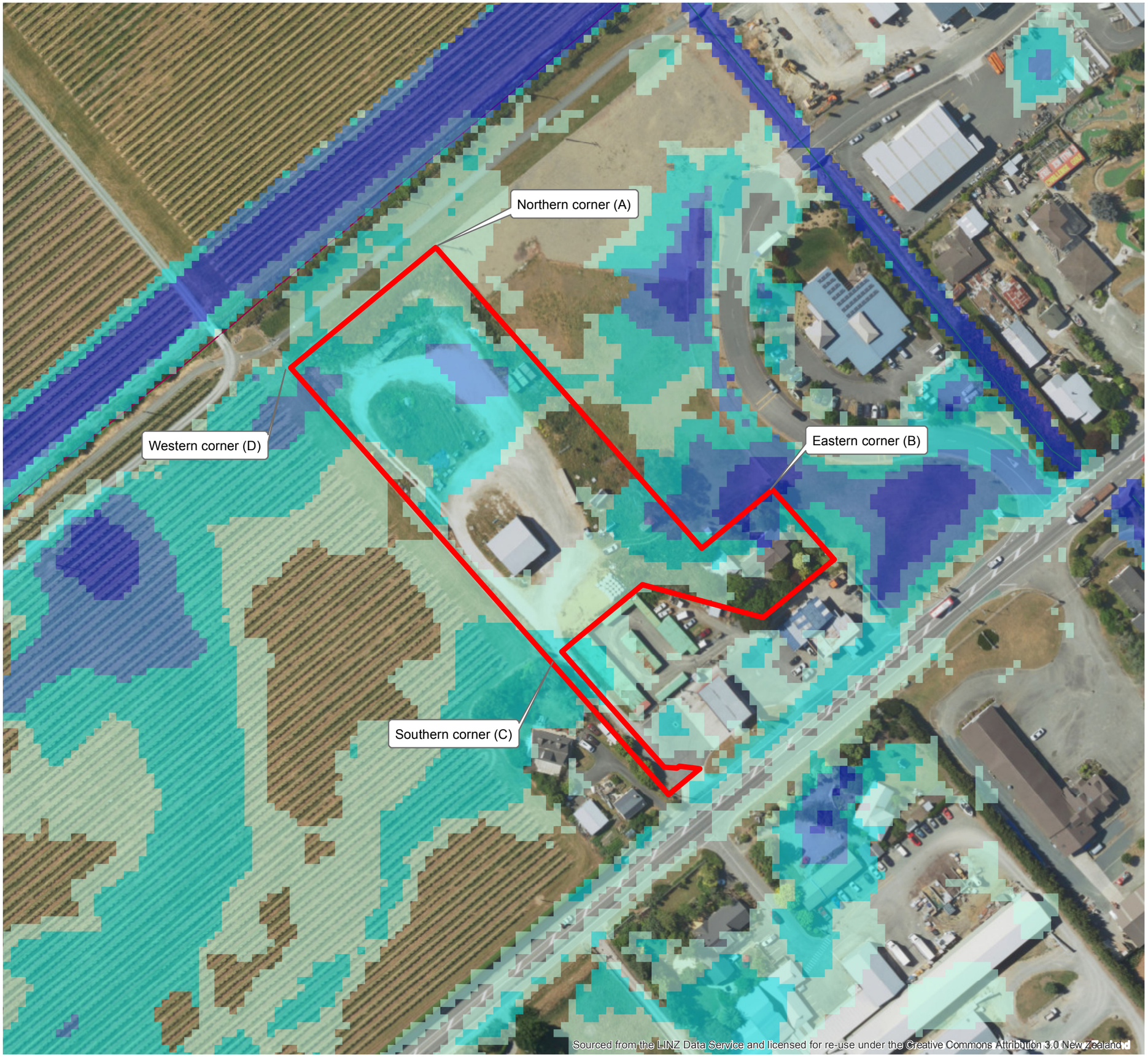
Appendix A: Modelled flood depths

- Figure 871003.1000-F1 – Modelled flood depths in 10% AEP flood event
- Figure 871003.1000-F2 – Modelled flood depths in 1% AEP flood event



LEGEND

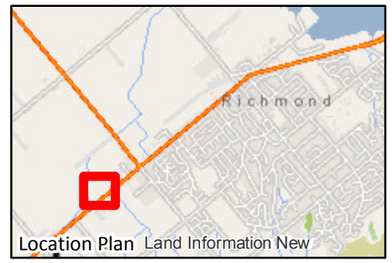
Applicant site

Flood depth (m)

- Less than 0.05
- 0.05 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- Greater than 0.3

A3 SCALE: 1:1,250

0 0.01 0.02 0.03 0.04 0.05 (km)



Notes: Results from Stantec Richmond Urban (2018) flood model.
New Zealand Vertical Datum (2016)

DRAWN	EMCF	Oct.18
CHECKED	DNV	Nov 18
APPROVED	MRF	Nov 18

ARCFILE: 871003.1000-F1.mxd

SCALE (AT A3 SIZE): 1:1,250

PROJECT No.: 871003.1000

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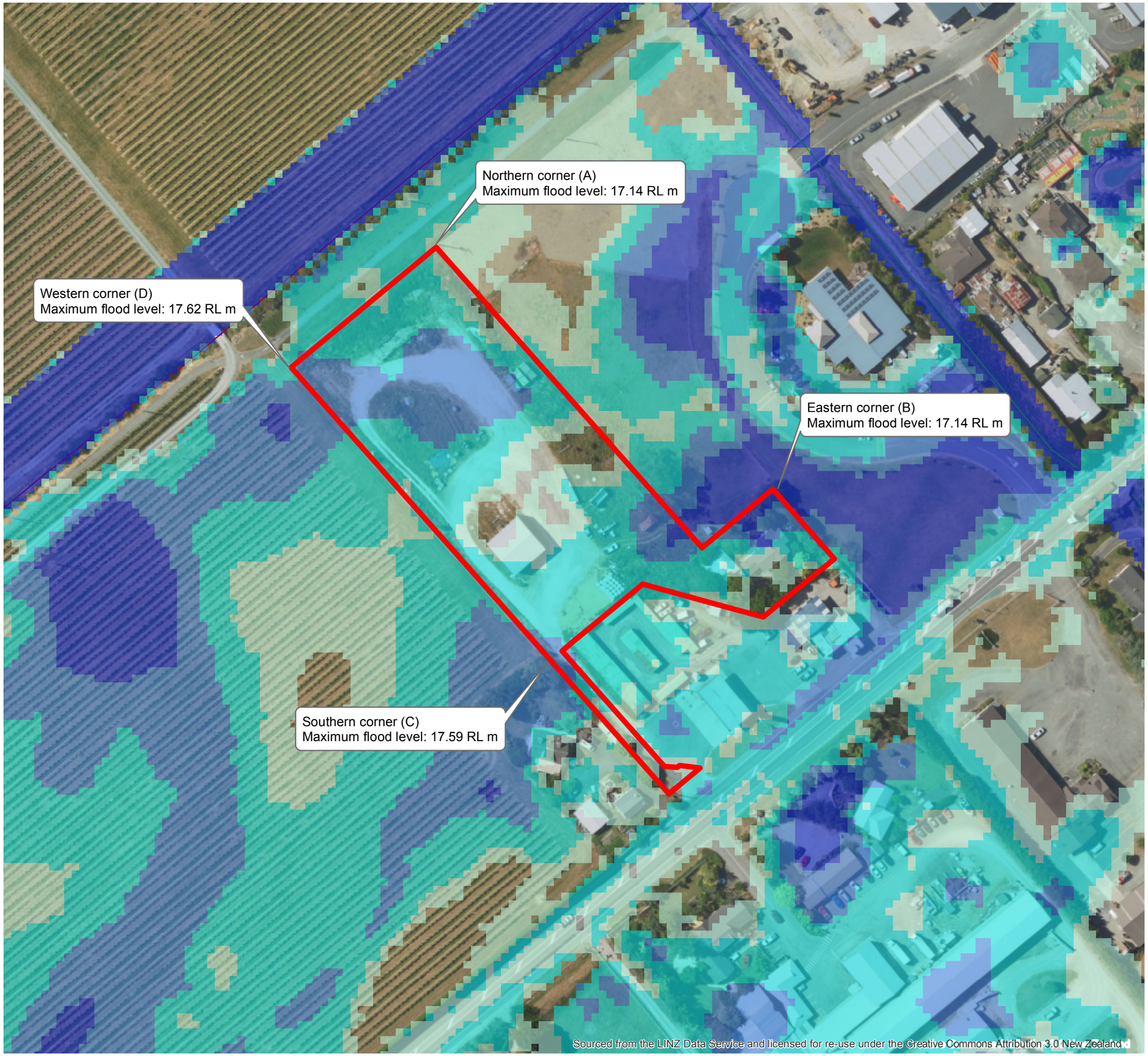
NETWORK TASMAN

68 MAIN ROAD HOPE

10% AEP Climate Change Flood Depth

871003.1000-F1



LEGEND

Applicant site

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A3 SCALE: 1:1,250

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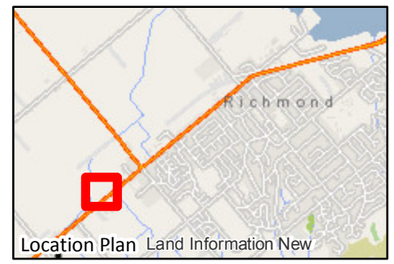

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New Zealdand Vertical Datum (2016)

DRAWN	EMCF	Oct.18
CHECKED	OLWH	Nov 18
APPROVED	MRF	Nov 18

ARCFILE
871003.1000-F2.mxd

SCALE (AT A3 SIZE)
1:1,250

PROJECT No.
871003.1000

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NETWORK TASMAN

68 MAIN ROAD HOPE

1% AEP Climate Change Flood Depth

871003.1000-F2