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Flood Impact and Risk Assessment

for

2-4 Brownlee Street, Ourimbah

for Chapter.pac Construction Management Pty Limited

Contents

Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
AR&R 2019	Australian Rainfall and Runoff 2019
FERP	Flood Emergency Response Plan
FFL	Finished Floor Level
FRMS&P	Flood Risk Management Study and Plan
FS	Flood Study
GPU	Graphics Processing Unit
HPC	Heavy Parallelised Computation
m	Measure of length / height / distance (metres)
m AHD	Meters above Australian High Datum
m/s	Measure of velocity (metres per second)
m^3/s	Measure of flow rate (cubic metres per second)
PMF	Probable Maximum Flood
TUFLOW	A 1D and 2D hydraulic modelling software

Introduction

Northrop Consulting Engineers have been engaged by Chapter.pac Construction Management Pty Limited to prepare a Flood Impact and Risk Assessment for the proposed development located at 2 and 4 Brownlee Street, Ourimbah, herein referred to as “the subject site” or “the site”.

This study has been prepared to review the potential effect the proposed development has on the existing flood behaviour on the subject site and general vicinity. The assessment has been prepared with consideration to the following documents:

- Australian Rainfall and Runoff 2019 (AR&R 2019).
- Flood Risk Management Manual (NSW Government 2023).
- Central Coast Council Local Environmental Plan 2022.
- Central Coast Council Development Control Plan 2022.
- Ourimbah Creek Floodplain Risk Management Study & Plan (WMAwater 2019).

This report should be read in conjunction with the following reports, documents and data:

- Flood Information Certificates for 2 & 4 Brownlee Street, Ourimbah provided by Central Coast Council and dated 26th of June 2023, included in **Appendix C**.
- Detailed topographical survey prepared by Everitt & Everitt Consulting Surveyors.
- Architectural Drawings prepared by Crawford Architects.
- Civil Drawings and design surface prepared by Northrop Consulting Engineers.

Contained herein is a description of the subject site, a summary of the available information used to inform the development of the study, an outline of the methodology used in undertaking this assessment, and a discussion of the results.

This report has been prepared to support a Development Application for submission to Central Coast Council.

Methodology

Central Coast Council has provided a copy of the Ourimbah Flood Study TUFLOW model for specific use on this project. The Ourimbah Flood Study model was prepared by WMAwater in 2013 and is, herein referred to as the “Ourimbah FS model (WMAwater, 2013)”.

Using the Ourimbah FS model (WMAwater, 2013), the following approach has been adopted for our assessment:

- Desktop review of available information including detailed survey, design plans, aerial imagery and LiDAR elevation data.
- Preparation of a site-specific version of the Ourimbah FS model (WMAwater, 2013) to include the detailed site survey.
- Run the site-specific model using latest TUFLOW version 2020-10-AD with HPC GPU solver for the 10%, 5%, 1%, 0.5% AEP and PMF existing case flood events. The HPC GPU solver has been used to reduce simulation time and improve a model stability.
- Amend the site-specific existing case TUFLOW model to include the proposed development (design surface and land use) and run for the aforementioned return intervals and compare the results.
- Assess the proposed development with respect to Council’s flood related Development Control Plan requirements.

Subject Site and Proposed Development

Subject Site Description

The subject site is contained within Lot 3 DP612071 and Lot 11 DP1201715 and is presented **Figure 1** overleaf.

The site has an approximate area of 1.86 hectares and is bound by Brownlee Street to the west, Shirley Street to the south, Blue Gum Park community sport oval to the north, and Bangalow Creek and floodplain to the east. Ourimbah train station is located approximately 100 metres south of the site.

The existing site is currently undeveloped and largely covered by dense vegetation. A few abandoned buildings are located in the southern section of the site and will be demolished as a part of the proposed development.

Terrain elevations on the site range approximately from 12.0m AHD (in the adjacent creek) and gradually increases to 18.30m AHD from the east to the west. The site has an approximate average slope, falling from Brownlee Street towards Bangalow Creek, in the order of two percent.

The site is subject to flooding from Bangalow Creek which traverses the eastern side of the site. Flood characteristics across the site are presented in the Council's Flood Information Certificates (refer to **Appendix C** of this report).

Proposed Development

The development proposes to construct a Food Manufacturing Hub comprised of the following infrastructure and services:

- Multi-unit industrial warehouse.
- Vehicular access roads and associated carparking spaces.
- Stormwater management network including below ground drainage and water quality devices.
- Connection to water, sewer and other essential services.

The proposed development, including the proposed landform is presented in **Figure 2** below. The development footprint covers a part of subject site and is typically located the upper reaches of the site, along the western portion of the lots.

Legend

- Subject Site
- TUFLOW Model Extent
- Cadastre
- Hydrolines

0 100 200 Metres

1:10,000

Figure 1

Locality

2 & 4 Brownlee Street
Ourimbah

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Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Legend

- Subject Site
- TUFLOW Model Extent
- Cadastre
- Hydrolines
- Proposed Building
- Carpark markings
- Bioretention Basin

Design Surface(mAHD)

- <= 15.7
- 15.7 - 16.6
- 16.6 - 17.4
- 17.4 - 18.2
- 18.2 - 19.0
- 19.0 - 19.9
- > 19.9

0 20 40 Metres

1:1,250

Figure 2

Proposed Development

2 & 4 Brownlee Street
Ourimbah

NORTHROP

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Flood Behaviour

Model Validation

A comparison of the modelled existing case flood levels with the levels presented in the Flood Information Certificates provided by Council is presented in **Table 1** below.

Table 1 – Flood Level Comparison

Property	Water Level	5% AEP		1% AEP		PMF	
		Council	Northrop	Council	Northrop	Council	Northrop
2 Brownlee St	Min Level (m AHD)	16.04	16.00	16.18	16.22	18.27	18.45
	Max Level (m AHD)	16.17	16.12	16.32	16.33	18.63	18.50
4 Brownlee St	Min Level (m AHD)	16.15	16.08	16.30	16.31	18.48	18.47
	Max Level (m AHD)	16.31	16.27	16.47	16.47	18.7	18.50

The comparison presented in Table 1 above suggests the site-specific modelling presented herein is approximately +/- 40-70mm during the 5% AEP, +/- 10-40mm during the 1% AEP and approximately +/- 10-200mm during the PMF event.

The above comparison suggests the site-specific modelling presented herein is similar to the flood levels provided in the Council's Flood Certificates. The results are considered acceptable for the purposes of the analysis (i.e. like for like comparison for flood impact purposes). The differences that are observed are expected to be due to the inclusion of the site-specific model elements, such as detailed survey, and the use of the latest TUFLOW solver (i.e. HPC GPU and 2020 version).

Existing and Developed Case

The existing and developed case site specific flood depth and elevation results for the 10%, 5%, 1%, 0.5% AEP and PMF flood events are presented in **Figures A1-1** to **A5-3** of **Appendix A**.

During events up to and including the 1% AEP, flood affectation across the extent of the proposed development remains relatively low under existing conditions. Flows in Bangalow Creek are expected to be back up behind Chittaway Road with low flood hazard, velocity and depths observed at the site as a result. Hazardous flow behaviour is expected to be limited to within the creek rather than the extents of the proposed development.

During less frequent events, flood water on the site begins to rise beyond the extents of the creek however, flood velocities remain low with generally less than 0.5m/s observed across the extent of the development during the PMF (as shown in Figure A5-2 of Appendix A). Hazard conditions in the vicinity of the proposed building also remain below the threshold of structural failure for standard construction with up to H4 expected around the proposed building during the PMF.

It is important to note that the PMF is an extremely rare event which is not expected to occur every time it rains. This event is typically analysed to understand the worst-case risk to life conditions on the site. In this case, opportunity exists to evacuate the site by vehicle or by foot to a location that is above the PMF. Brownlee Street, at the site frontage, is observed to be flood free during a PMF event and provides the proposed development a direct rising road evacuation path from the site as flood water rises.

Flood Effects

Pre to post development flood elevation for the 10%, 1% and 0.5% AEP flood events are presented in **Figures B1 to B3** of **Appendix B**. Similarly, pre to post development flood hazard differences for the 1% AEP and PMF events are shown in **Figures B4 to B5** of **Appendix B**.

Figures B1 to B3 shows only localised increases in flood elevation within the subject site boundary, up to approximately 39mm and 35mm for the 1% and 0.5% AEP, respectively. The increases are considered minor and are contained within the creek and the subject site. As such, these increases are not expected to create a significant adverse impact on existing flood behaviour on the site or within adjacent properties.

Similarly, the risk to life remains largely unchanged external to the site during less frequent events. A reduction in hazard conditions is observed on the site post development, with a change from H5 to H4 in the vicinity of the proposed development which is expected to be due to the proposed fill.

Discussion

Finished Floor Level

The proposed building Finished Floor Level of 17.0m AHD exceeds the minimum finished floor level stated in the Flood Information Certificate provided by Council (i.e. 16.97m AHD).

It is important to note that the maximum flood level presented in Council's Flood Information Certificate has been used for the purposes of setting the FFL. This level is located adjacent to Shirley Street and not necessarily the maximum flood level adjacent to the proposed building.

The modelled 1% AEP flood levels adjacent to the proposed building are presented in Figure A3-1 of Appendix A. The 1% AEP flood level adjacent to the site is shown to be 16.33m AHD, highlighting that approximately 670mm freeboard is expected to be available to the proposed building. This exceeds Council's requirement for 500mm.

Building Components

The building is sited above the 1% AEP + 500mm and as such, flood compatible building materials are not expected to be required.

Consideration for the building to withstand PMF forces may be reviewed at Construction Certificate phase to reduce the potential for building damage during more extreme flood events.

Driveway Access

The proposed driveway is located in the north-west corner of the development and ramps up to a level that is above the Probable Maximum Flood. Driveway access is expected to comply with Council policies.

Climate Change

The 0.5% AEP has been assessed herein as a proxy for increased rainfall intensities due to climate change. The 0.5% AEP corresponds to an increase in rainfall intensity in the order of approx. 19% when compared to the 1% AEP design storm event.

Levels adjacent to the site during the 0.5% AEP (as shown by Figure A4-1) range up to approximately 16.46-16.58m AHD. This corresponds to an increase in the order of 130mm in the vicinity of the site when compared to the 1% AEP.

In addition to the above, a review of the Ourimbah Creek Catchment Flood Study (CSS, 2013), in particular Appendix L, suggests maximum increases (i.e. 30% rainfall increase in rainfall intensity) at Shirley Street and Chittaway Road are in the order of 270mm and 330mm, respectively. Adding the maximum increase of 330mm to the current day flood level of 16.33m AHD observed in the creek, adjacent to site suggests a maximum flood level of 16.66m AHD is expected adjacent to the proposed building.

The proposed building is sited with a minimum FFL of 17.0m AHD and as such, 340mm freeboard is expected to remain available during potential worst case future climate conditions. This is only a minor reduction in available freeboard during future conditions and is not expected to warrant further design consideration.

Safety and Evacuation

As previously mentioned, a rising road evacuation path is expected to be available from the subject site during a worst case Probable Maximum Flood event. As such, the risk to life is expected to remain low on the site, post development, due to the low likelihood of the event and the availability of evacuation.

Similarly, up to H4 hazard conditions is expected around the proposed building during this worst-case event. Standard construction techniques are expected to be able to withstand these forces, as outlined in the AIDR classifications. As such, the risk to property is also expected to remain low.

A Flood Emergency Response Plan (FERP) is recommended to be prepared for the site to formalise the evacuation procedures and assist in reducing the risk to life and property on the site. The risk to life is expected to be reduced through enhanced awareness and education for the users of the facility. The FERP can also provide guidance on recommended flood emergency response procedures and likely opportunities for off-site refuge, if required.

Conclusion

A Flood Impact and Risk Assessment has been prepared for the proposed development at 2 and 4 Brownlee Street, Ourimbah NSW.

It was concluded that the proposed development is not expected to create a significant adverse impact to the existing flood behaviour on the subject site and on the properties surrounding the subject site.

Furthermore, the proposed development is expected to generally comply with Council's flood related development controls.

We commend our findings to Central Coast Council for their review.

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Chapter.pac Construction Management Pty Limited. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

Except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

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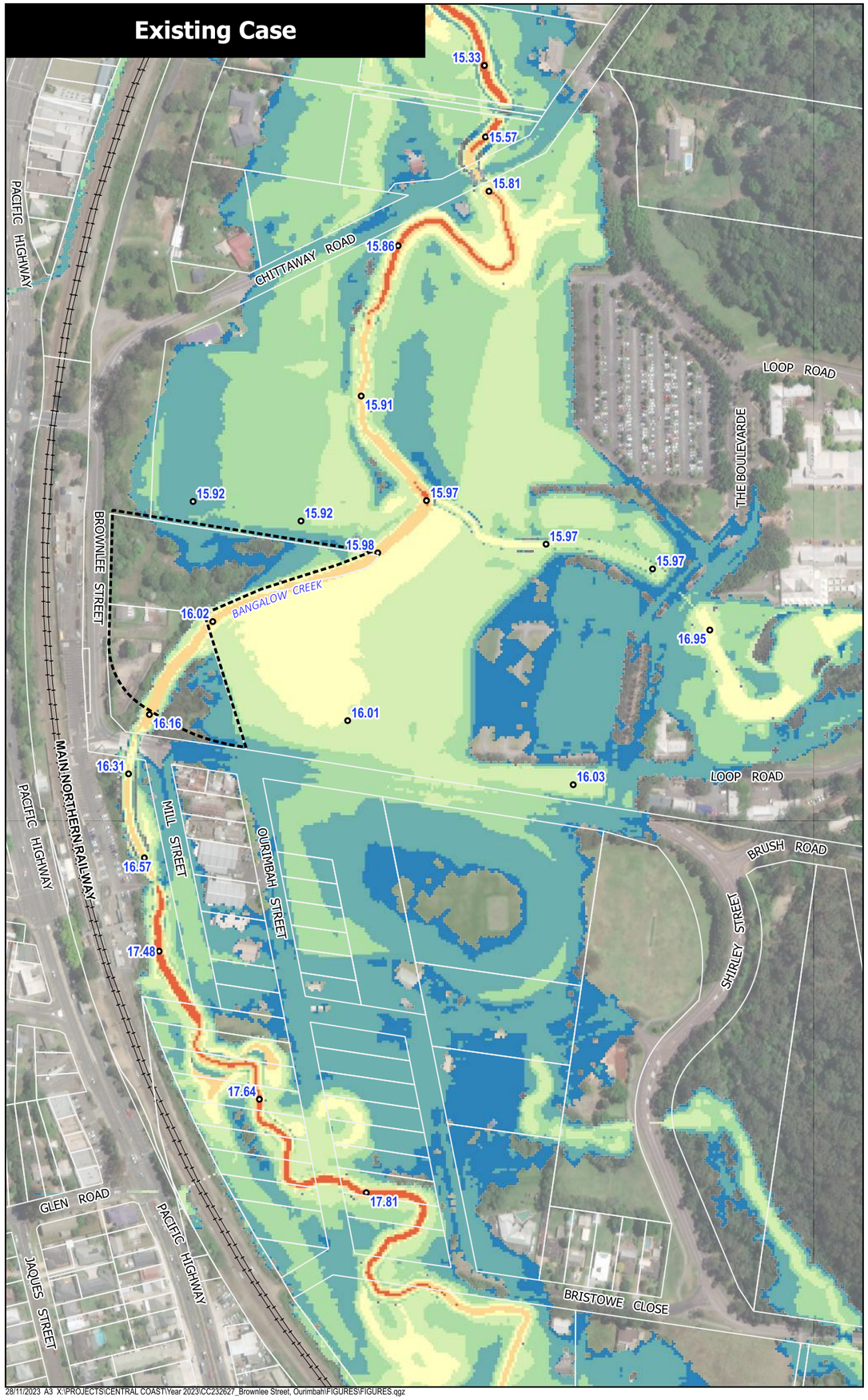
To the extent permitted by law, Northrop expressly excludes any liability for any loss, damage, cost, or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this report.

Document Register

Rev	Status	Prepared	Approved	Date
1	Draft for Client Review	RB	LG	29 November 2023
A	Approval	LG	LG	15 December 2023

Appendix A – Flood Maps

Existing Case



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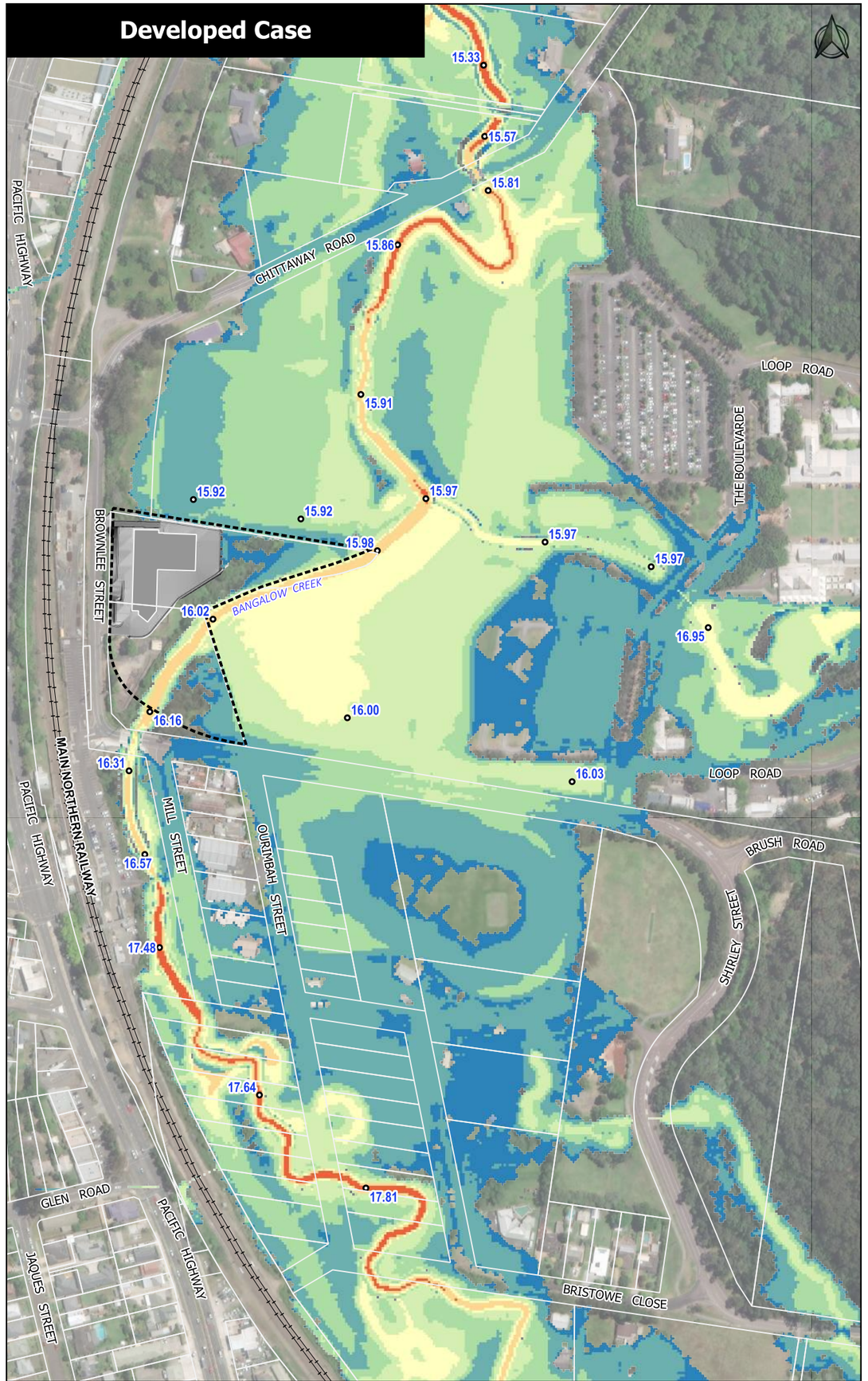


Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface
- Spot Water Level(mAHD)

Depth(m)

- <= 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- 4.00 - 6.00
- 6.00 >

0 70 140 Metres

1:4,000

Figure A1-1

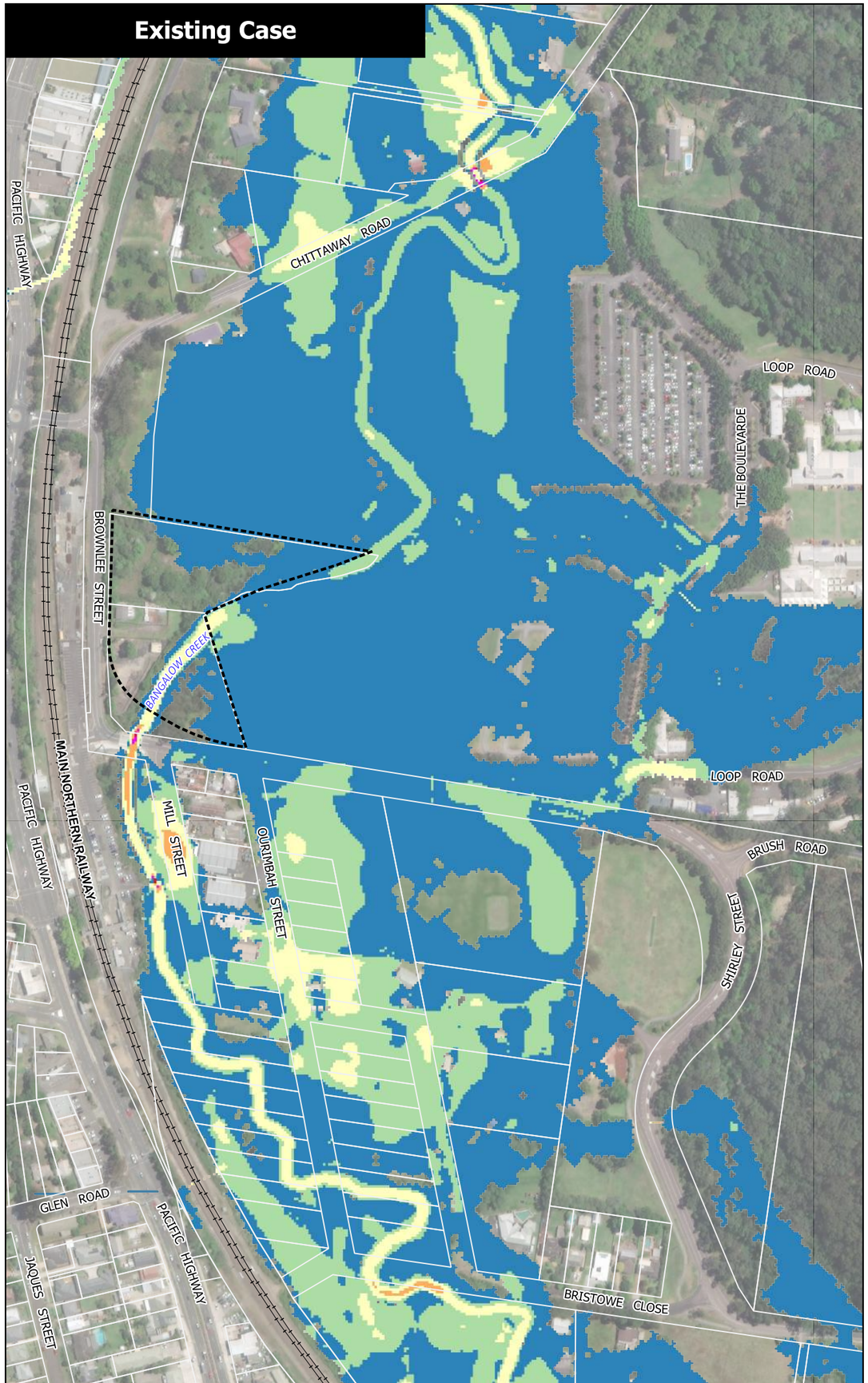
10% AEP Flood Depth and Elevation

2 & 4 Brownlee Street
Ourimbah

NORTHROP

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case



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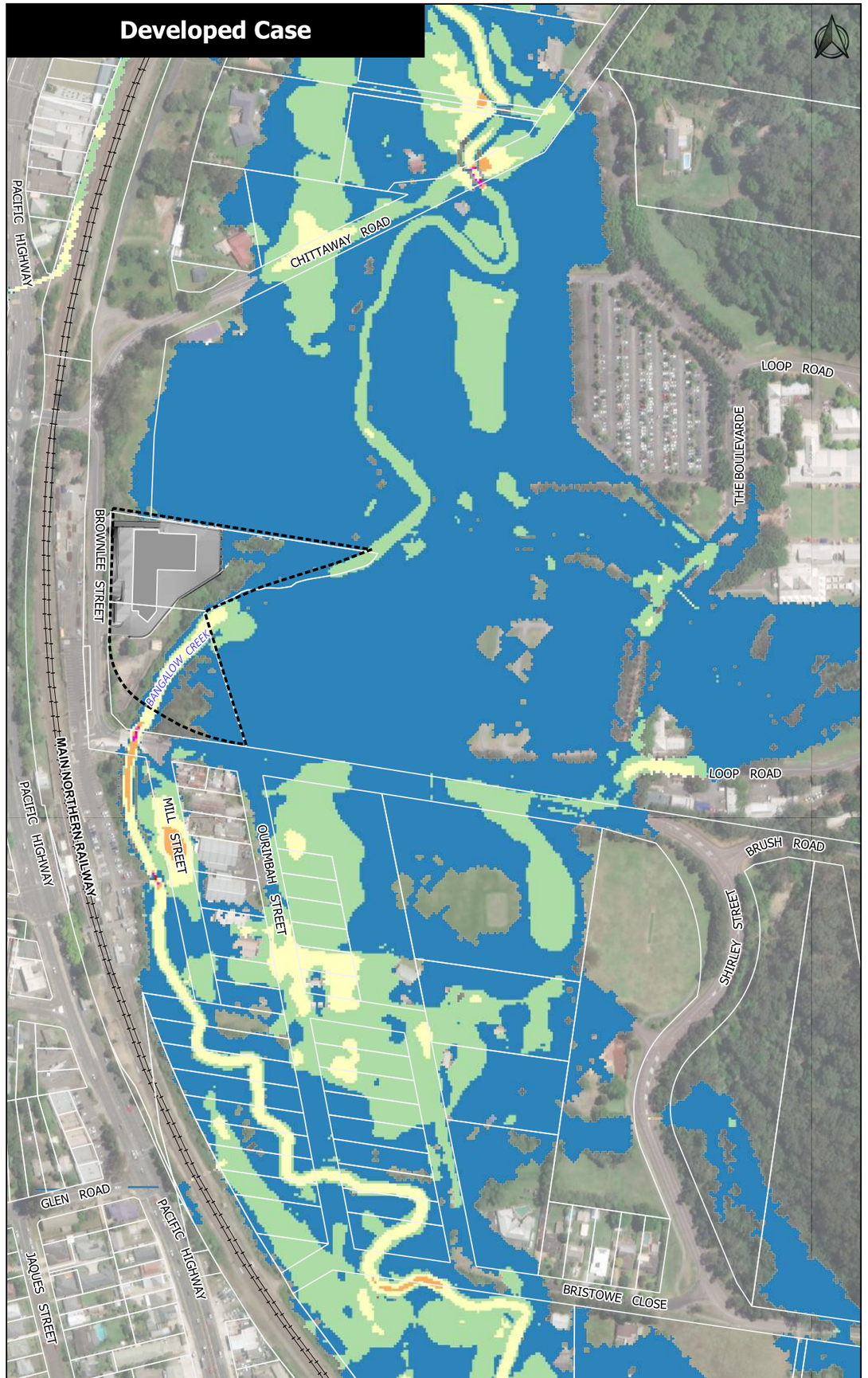

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

0 70 140 Metres

1:4,000

Figure A1-2

10% AEP Flood Velocity

2 & 4 Brownlee Street
Ourimbah

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Data Source: NSW LPI - cadastre, Virtual Earth - aerial

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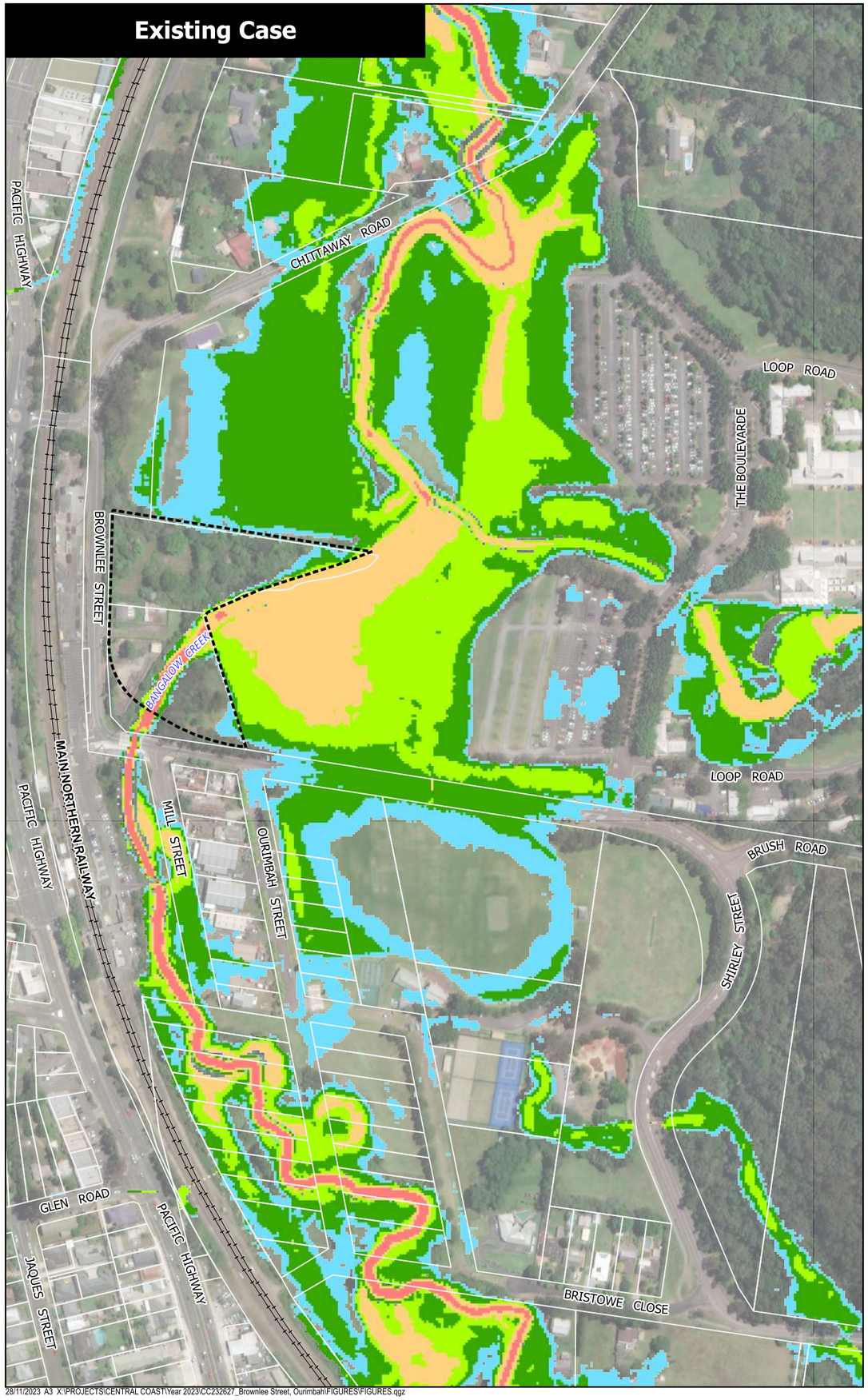

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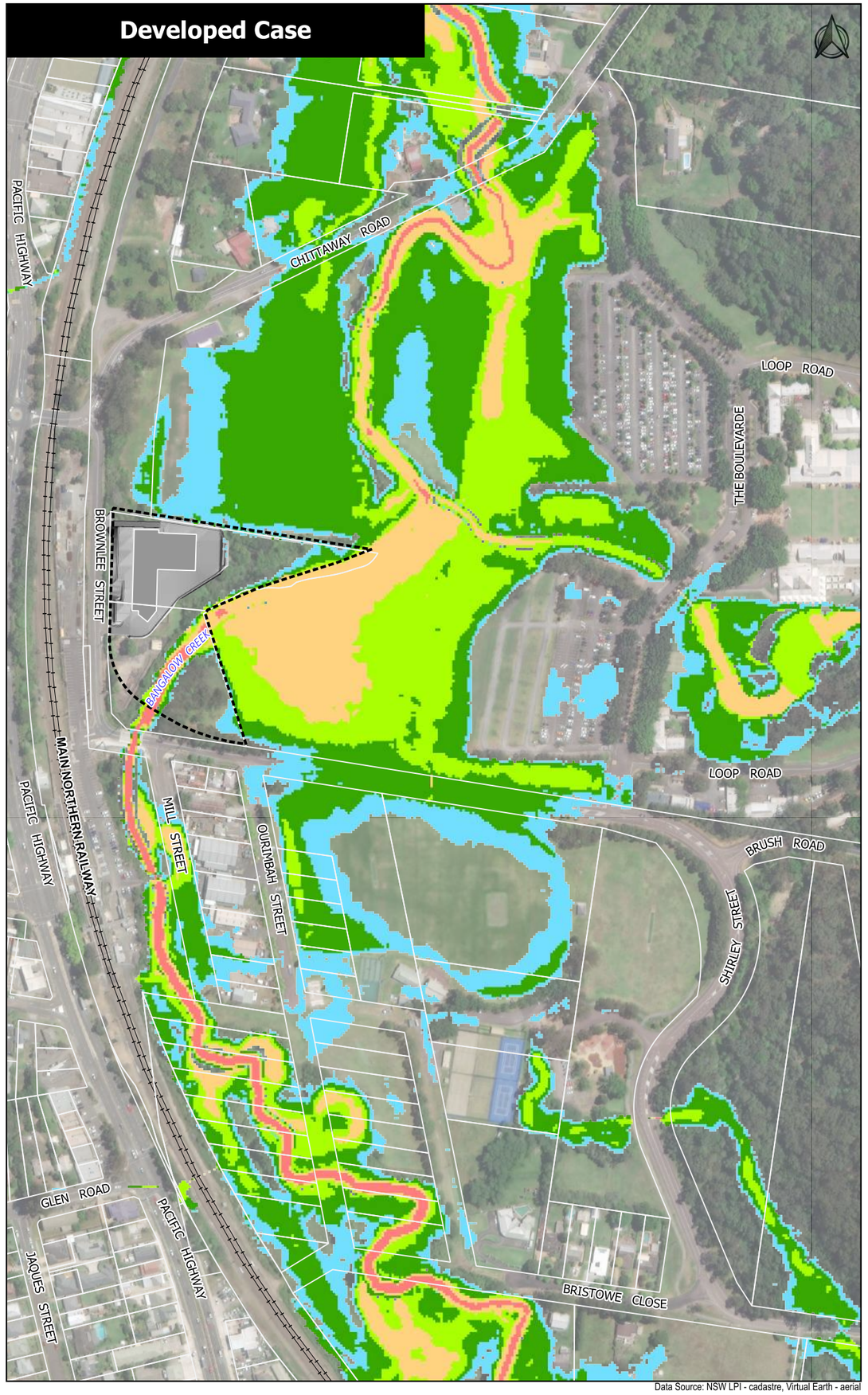

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 70 140 Metres

1:4,000

Figure A1-3

10% AEP Flood Hazard

2 & 4 Brownlee Street
Ourimbah

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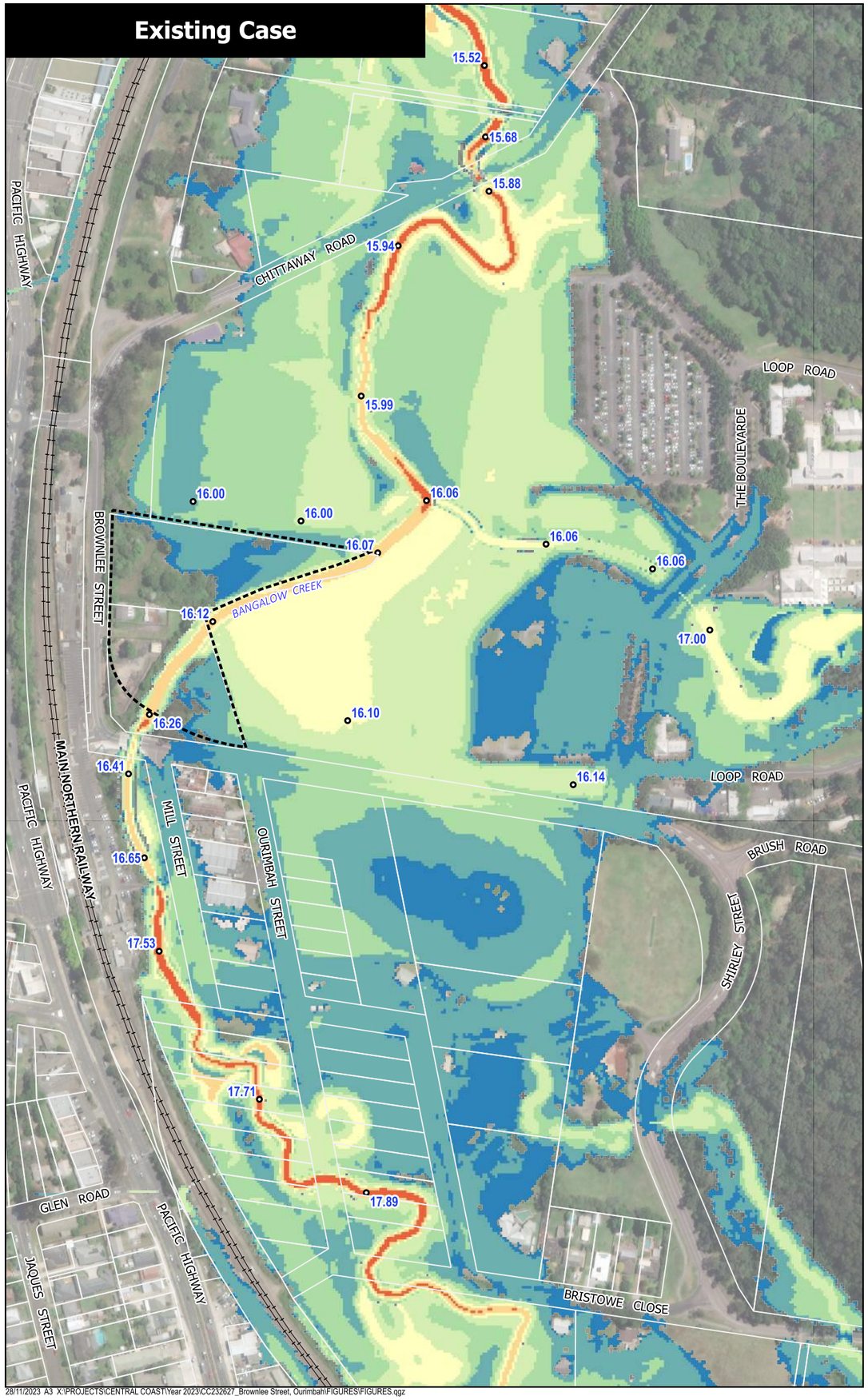
Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case



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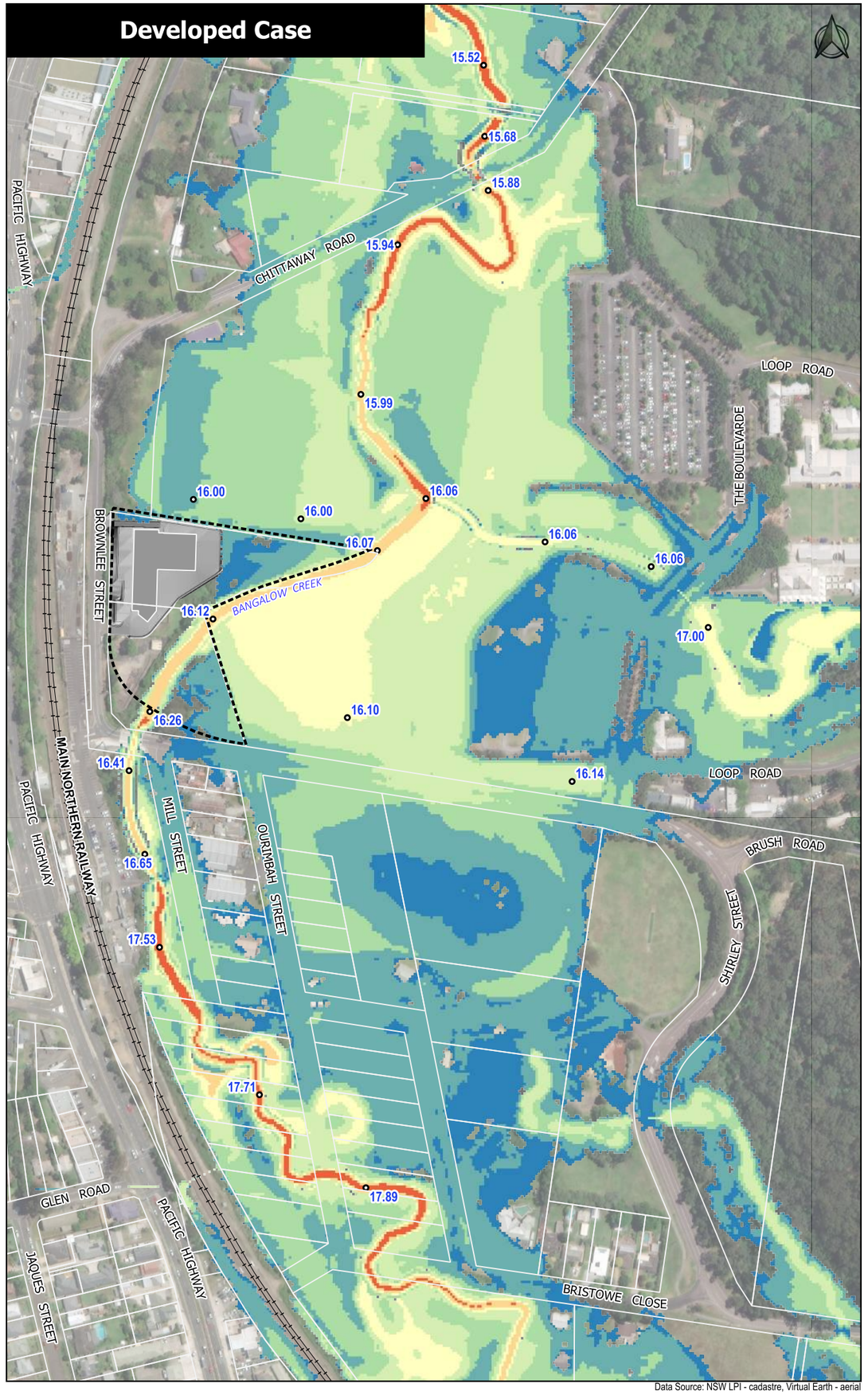

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface
- Spot Water Level(mAHD)

Depth(m)

- <= 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- 4.00 - 6.00
- 6.00 >

0 70 140 Metres

1:4,000

Figure A2-1

5% AEP Flood Depth and Elevation

2 & 4 Brownlee Street
Ourimbah

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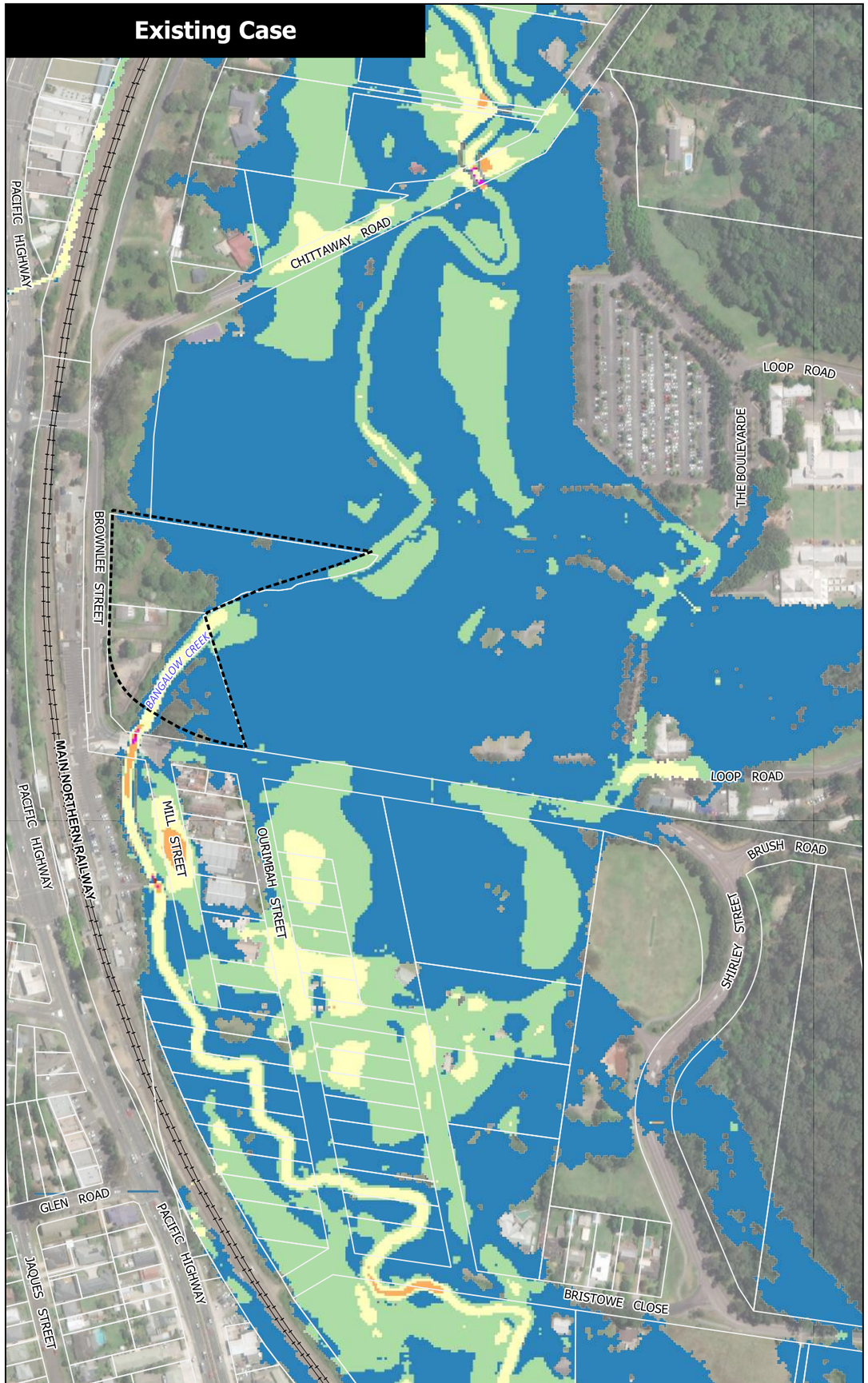

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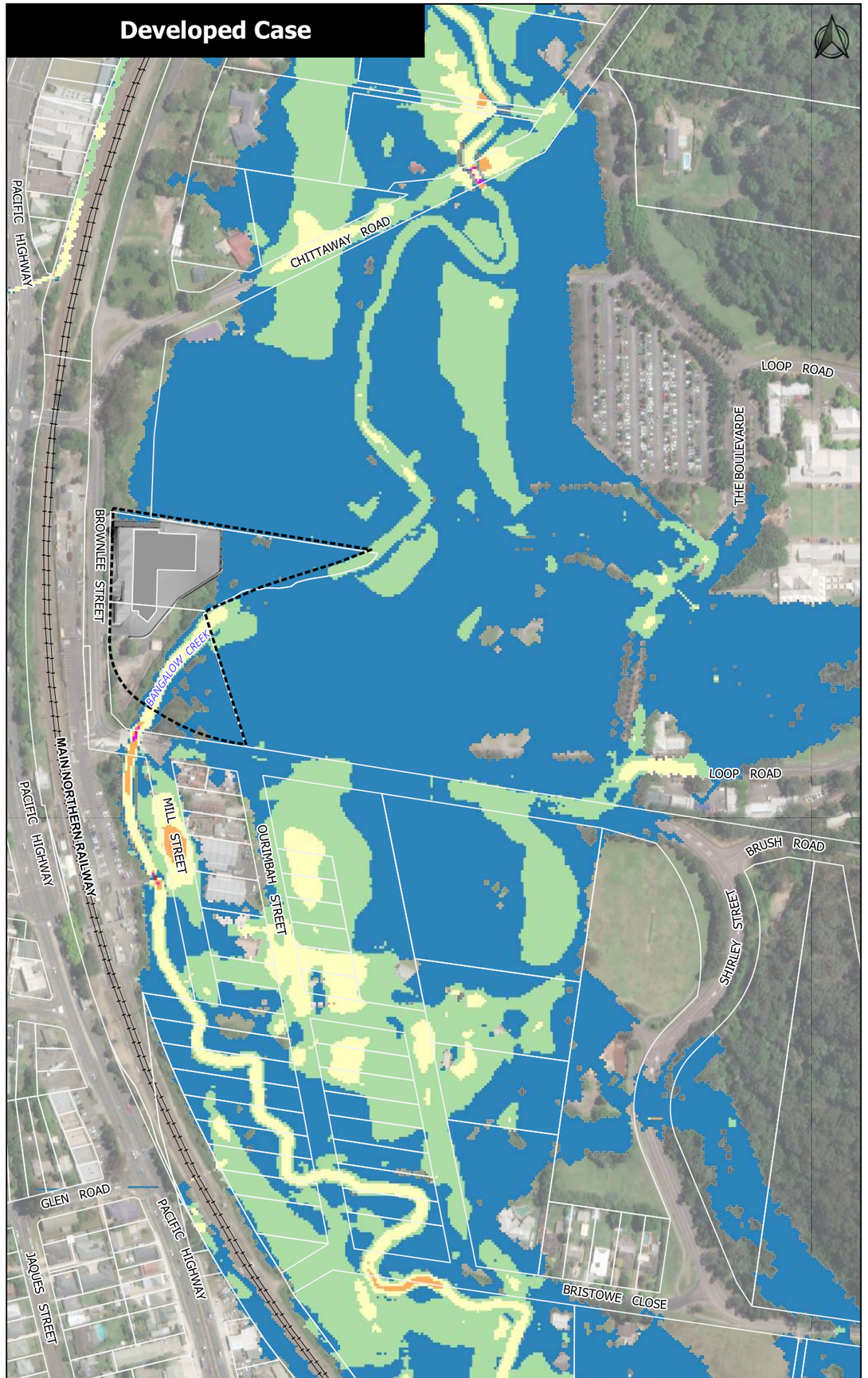

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

0 70 140 Metres

1:4,000

Figure A2-2

5% AEP Flood Velocity

2 & 4 Brownlee Street
Ourimbah

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Data Source: NSW LPI - cadastre, Virtual Earth - aerial

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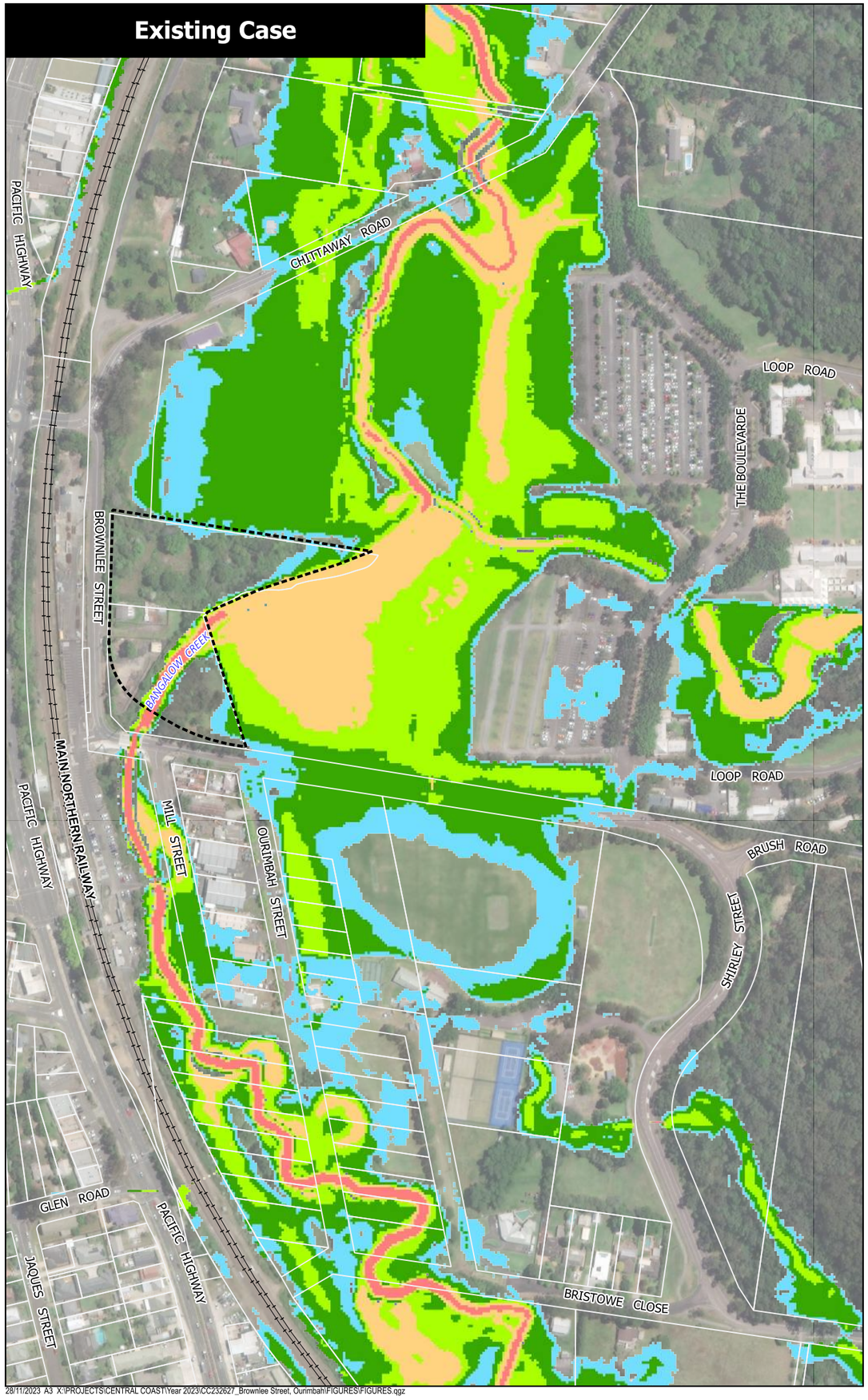

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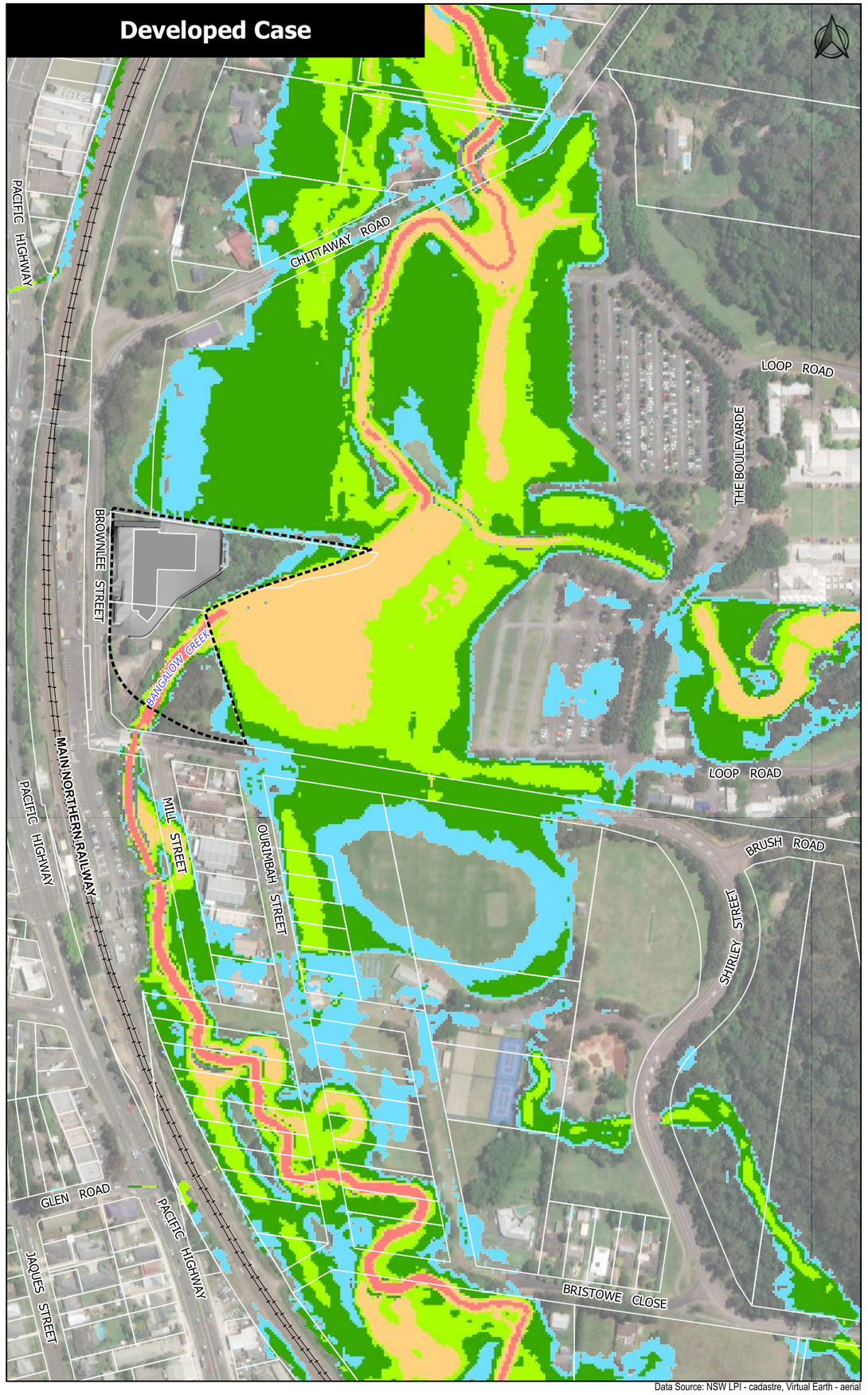

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 70 140 Metres

1:4,000

Figure A2-3

5% AEP Flood Hazard

2 & 4 Brownlee Street
Ourimbah

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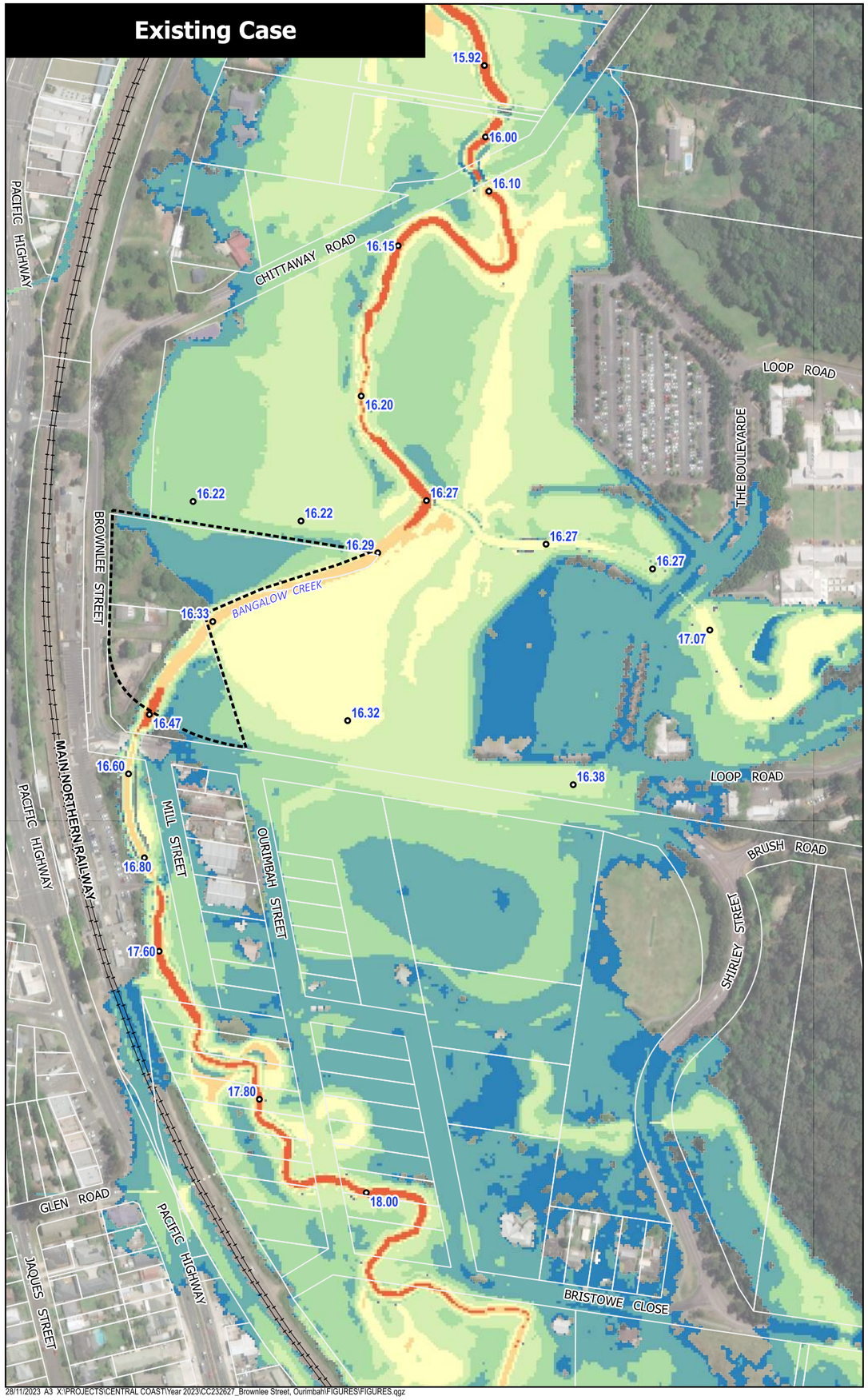
Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case



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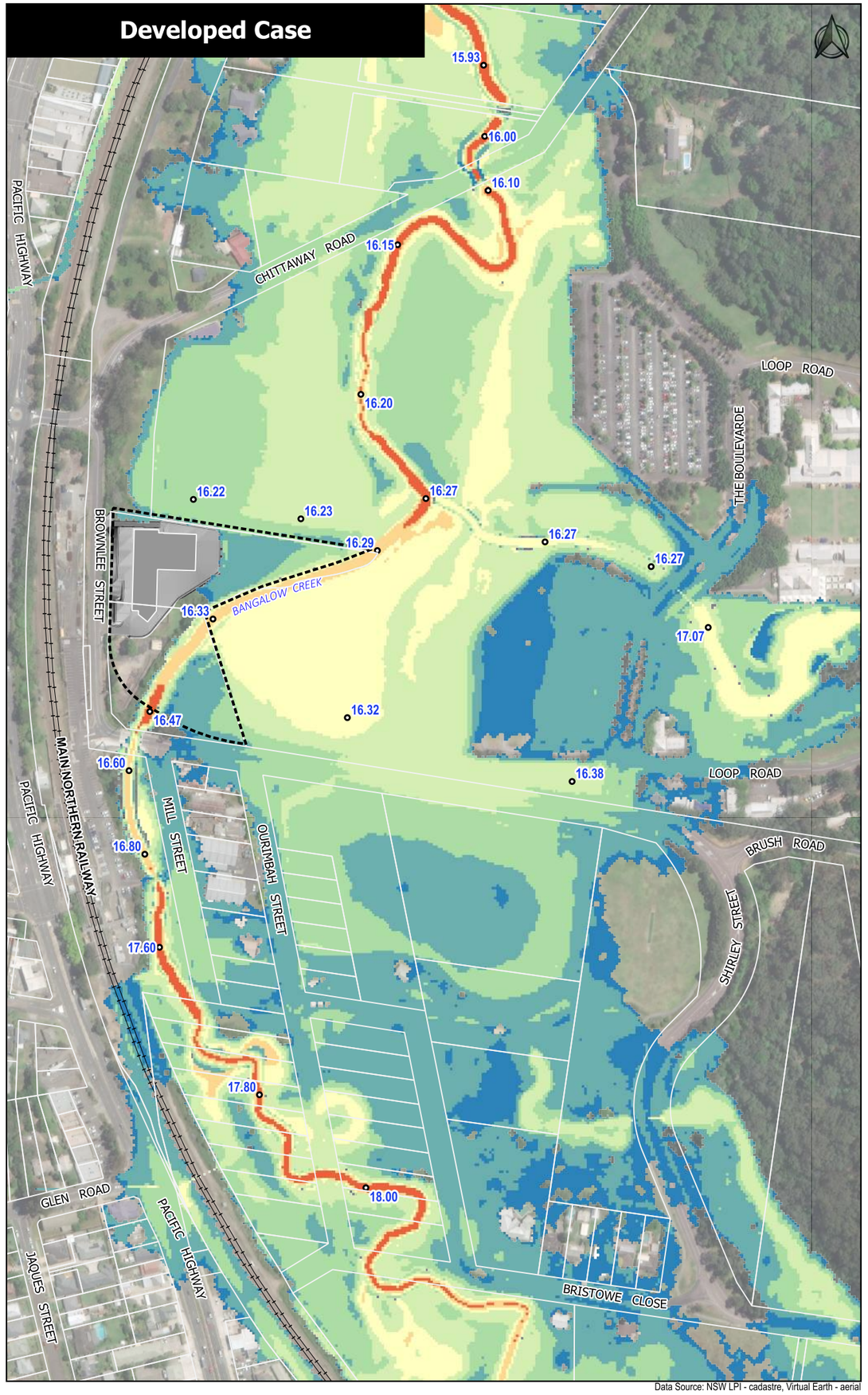


Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface
- Spot Water Level(mAHD)

Depth(m)

- <= 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- 4.00 - 6.00
- 6.00 >

0 70 140 Metres

1:4,000

Figure A3-1

1% AEP Flood Depth and Elevation

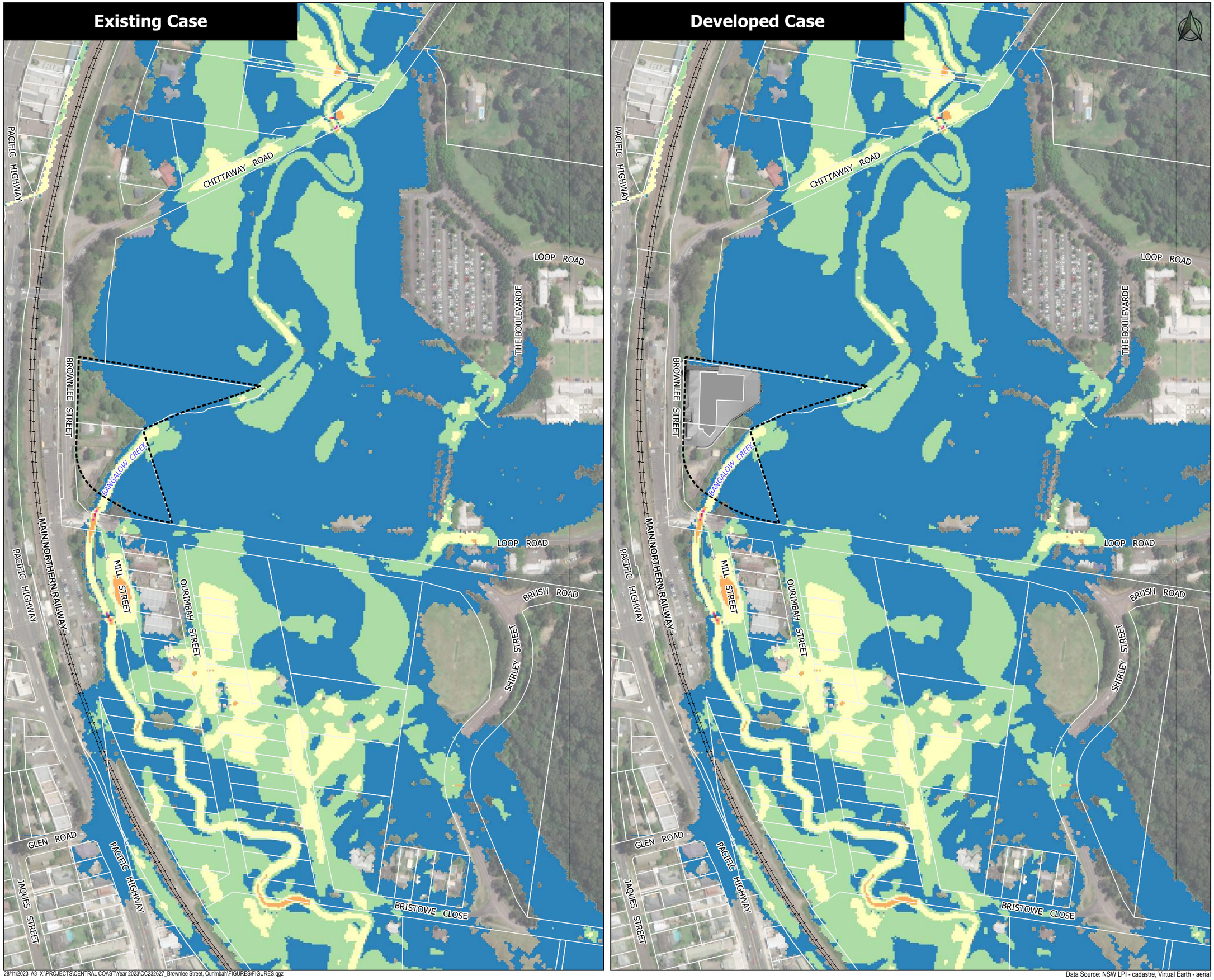
2 & 4 Brownlee Street
Ourimbah

NORTHROP

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case

Developed Case



Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

0 70 140 Metres

1:4,000

Figure A3-2

1% AEP Flood Velocity

2 & 4 Brownlee Street
Ourimbah

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Data Source: NSW LPI - cadastre, Virtual Earth - aerial

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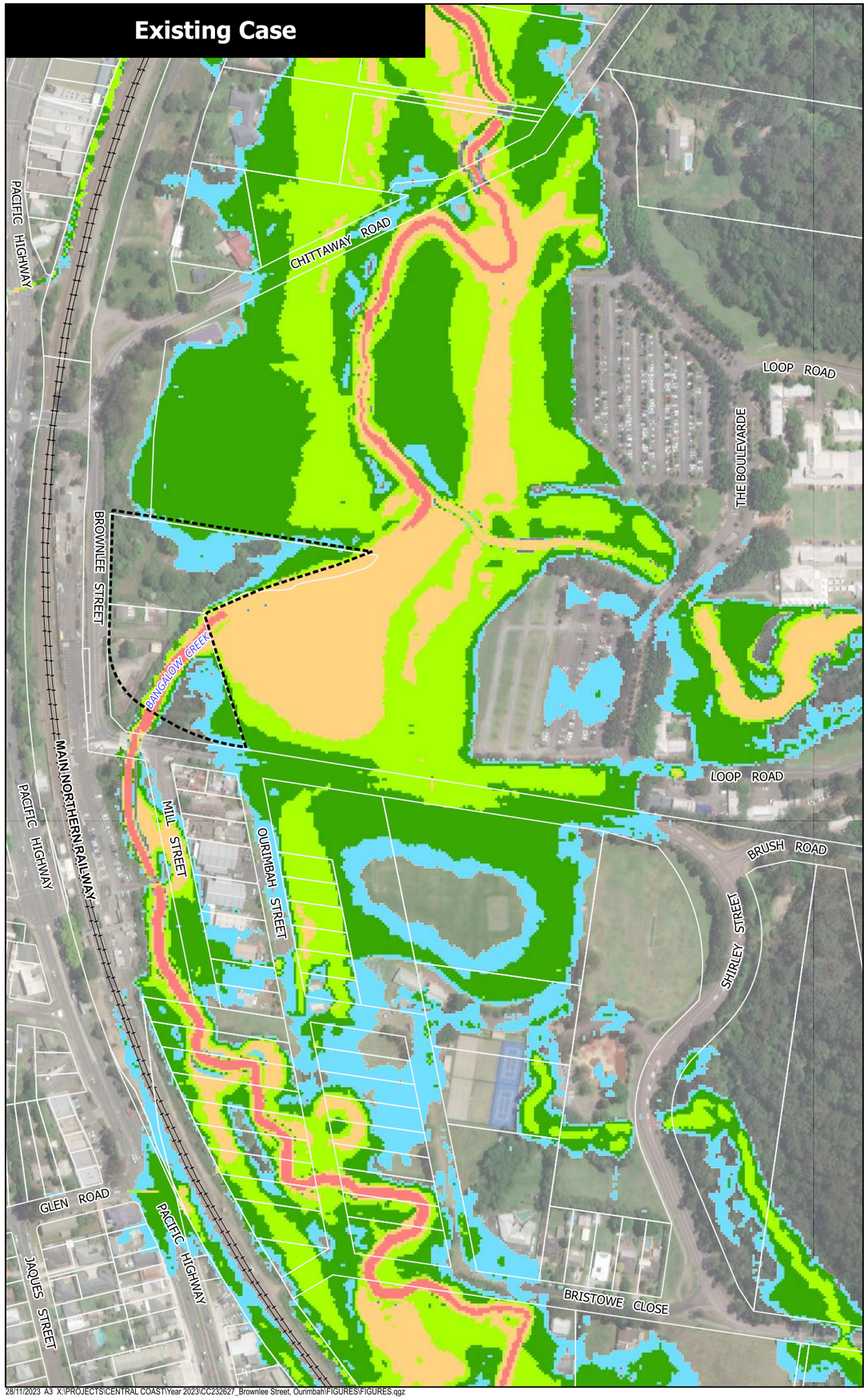

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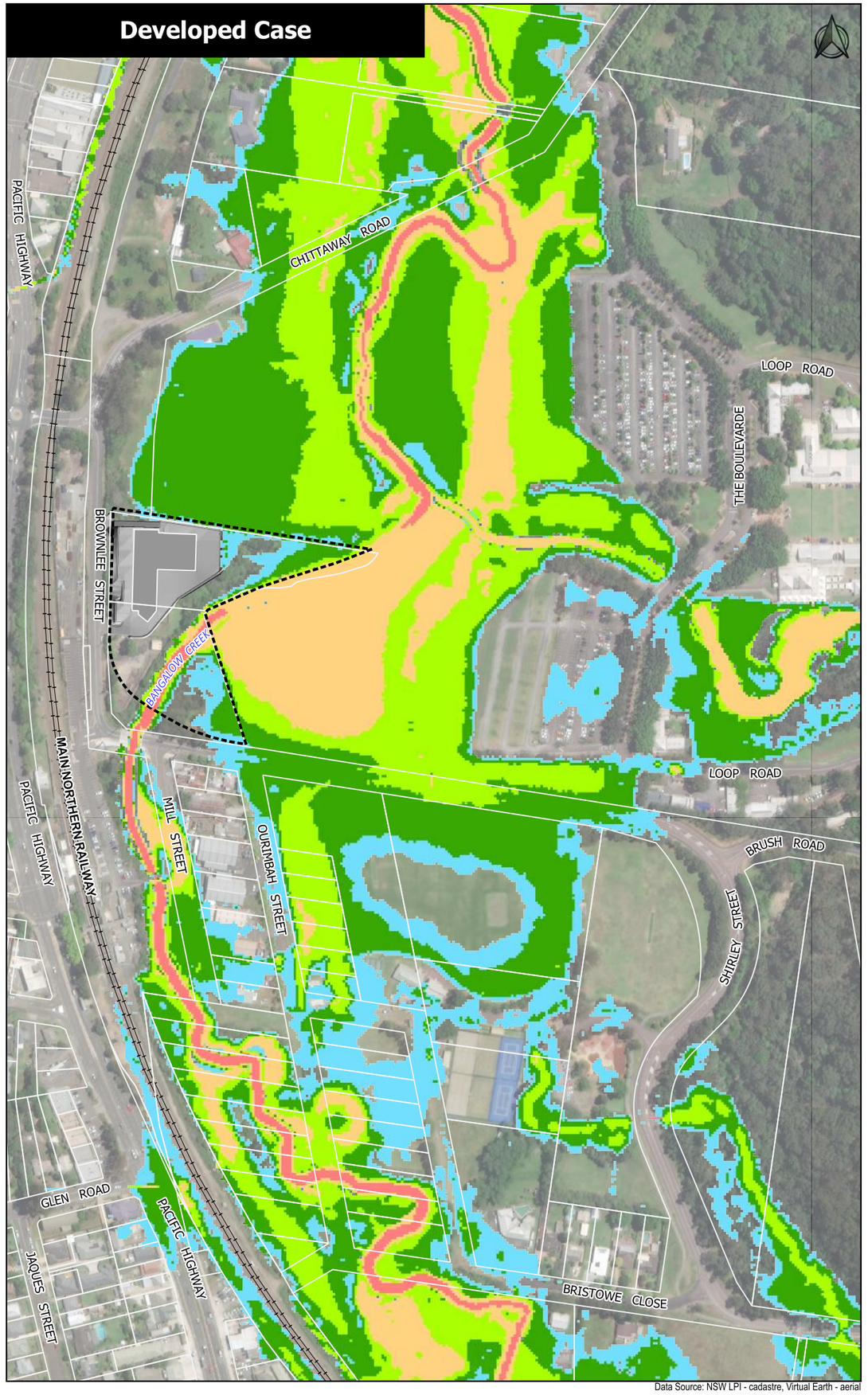

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 70 140 Metres

1:4,000

Figure A3-3

1% AEP Flood Hazard

2 & 4 Brownlee Street
Ourimbah

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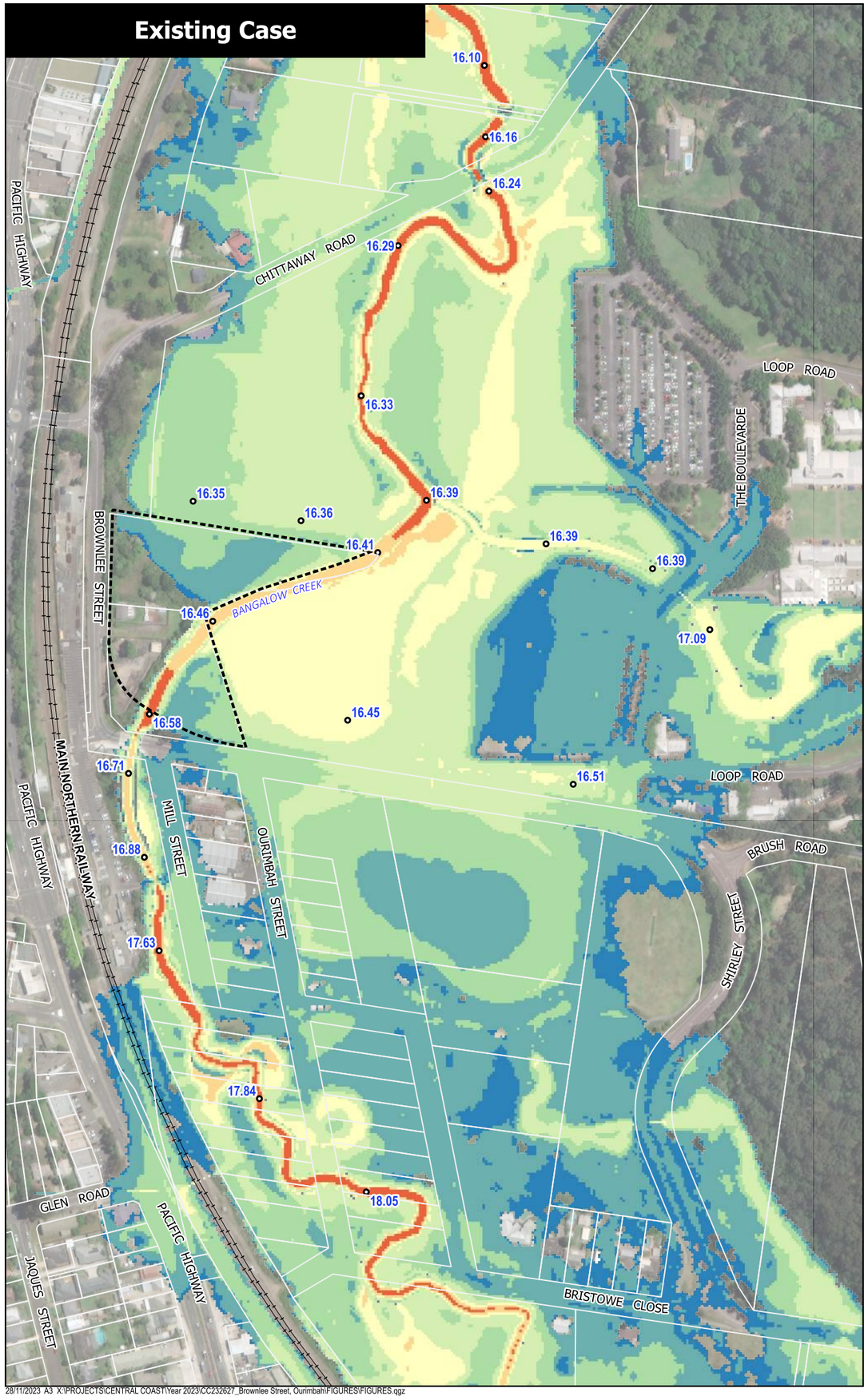

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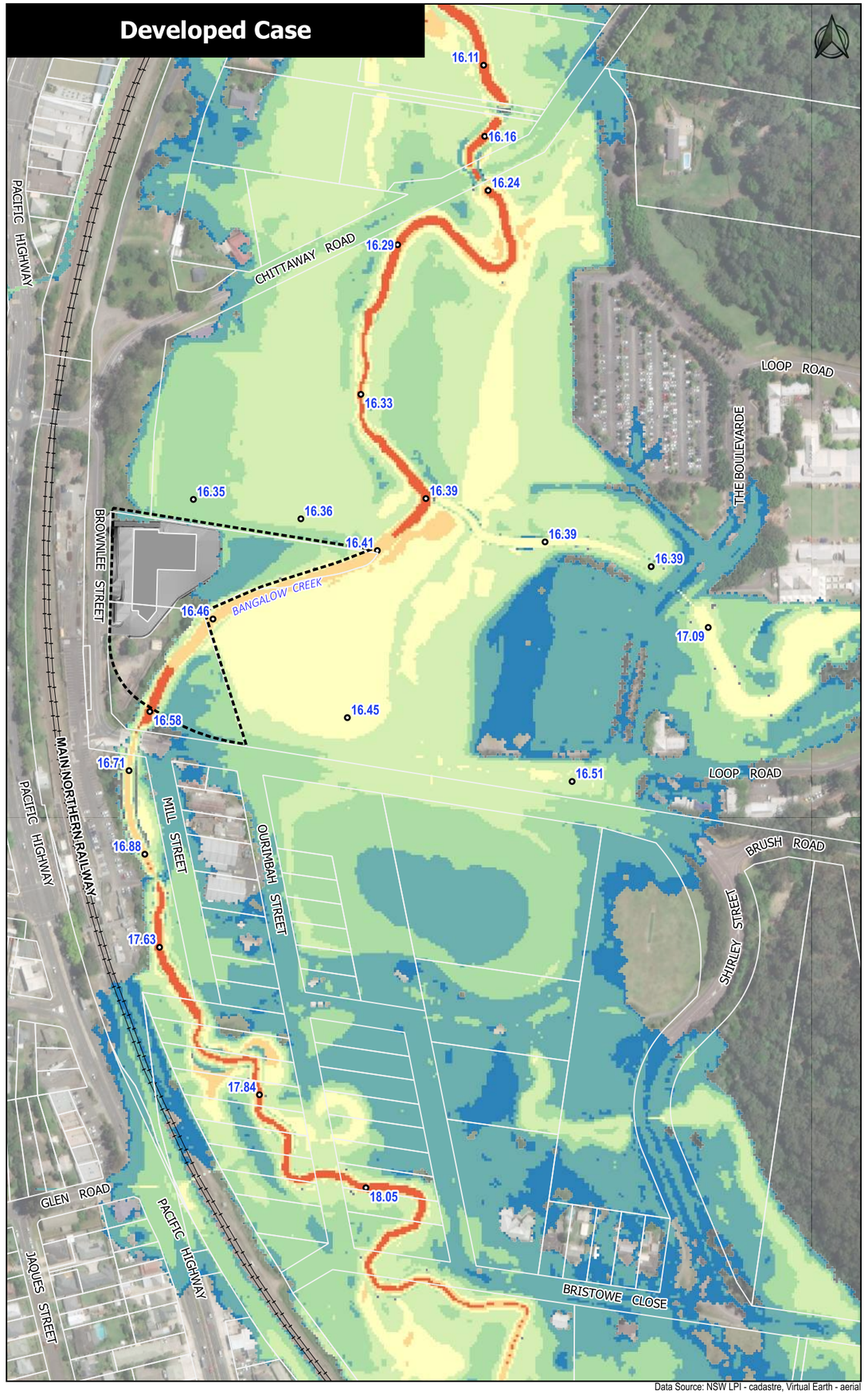


Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface
- Spot Water Level(mAHD)

Depth(m)

- <= 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- 4.00 - 6.00
- 6.00 >

0 70 140 Metres

1:4,000

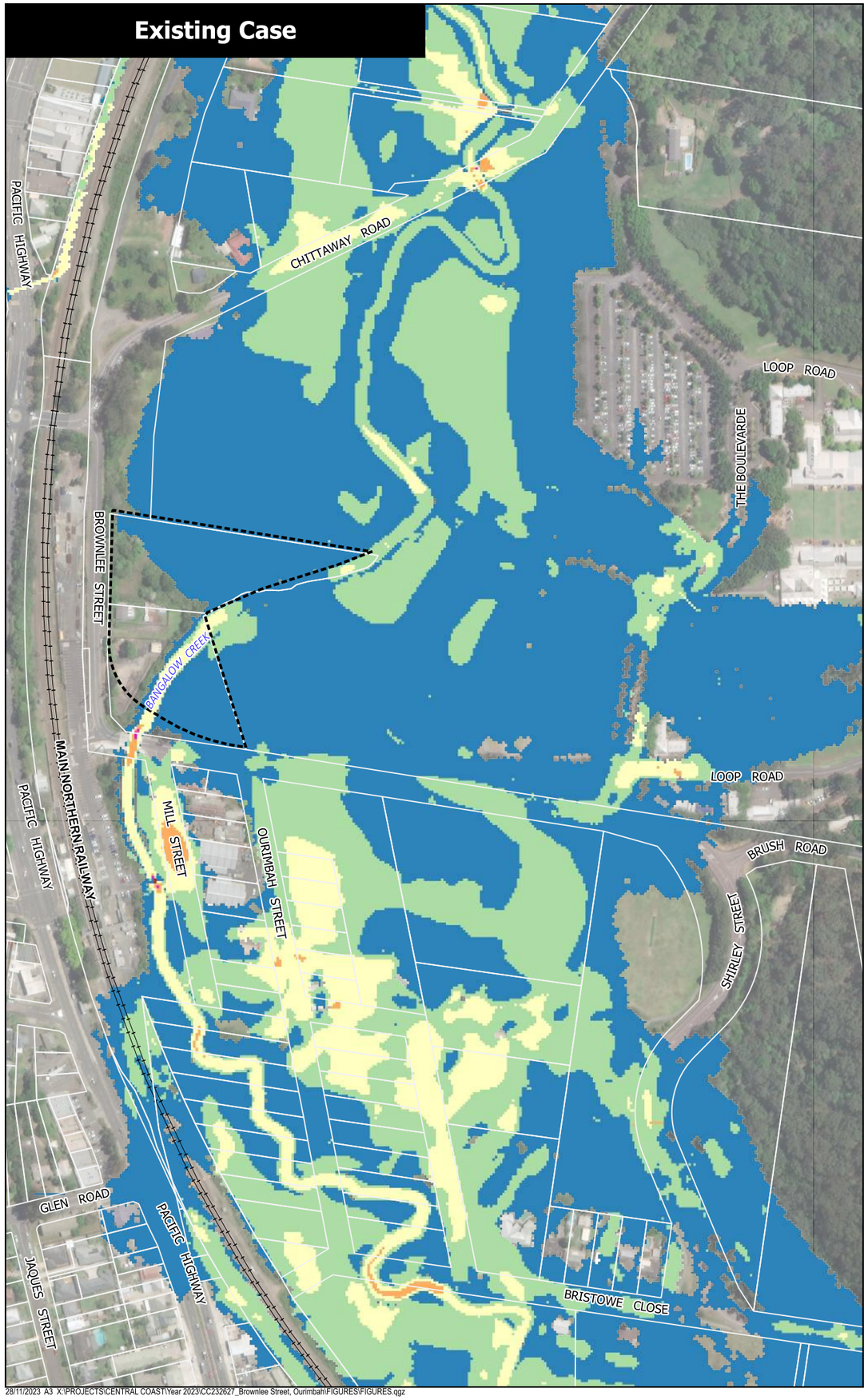
Figure A4-1

0.5% AEP Flood Depth and Elevation

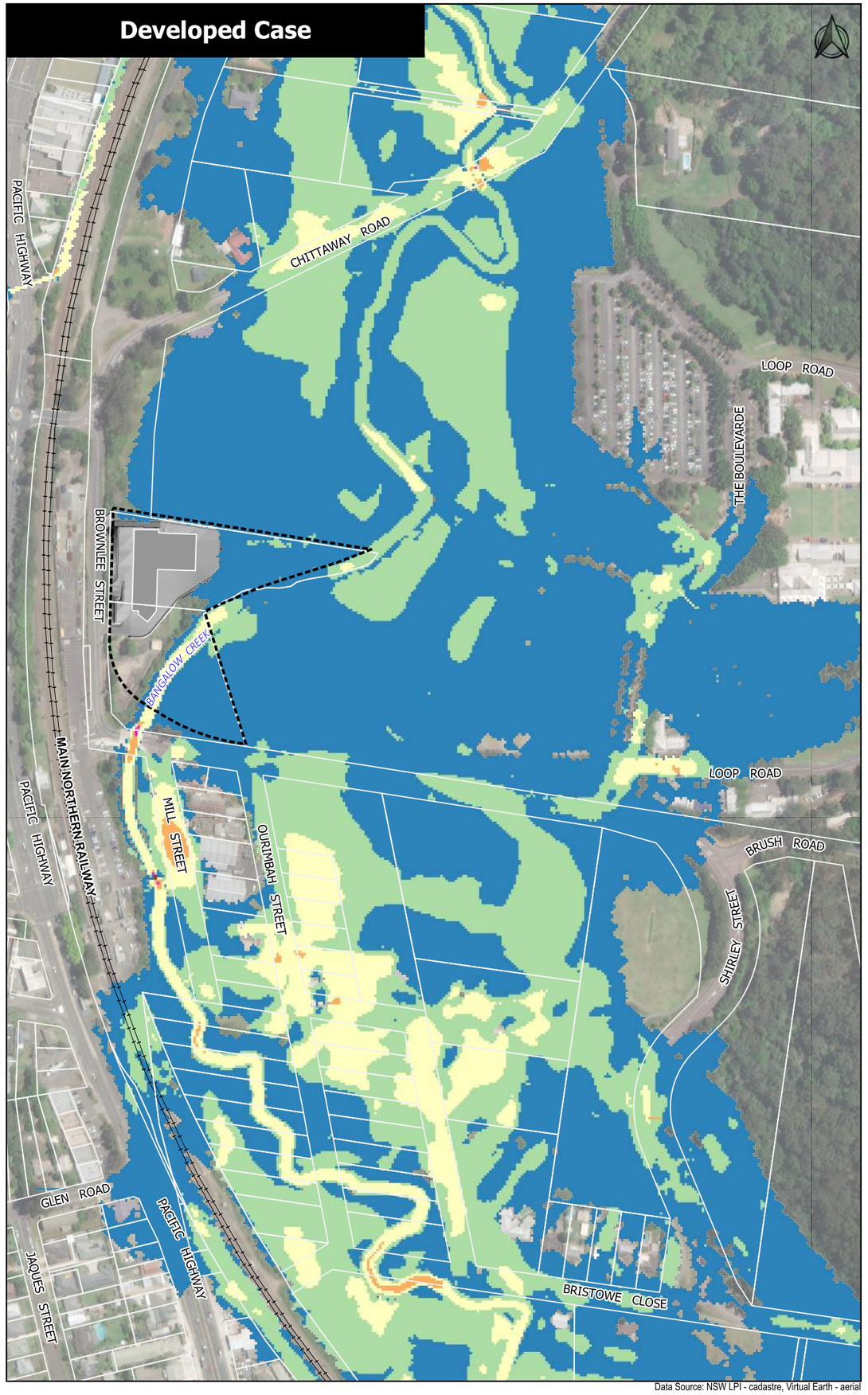
2 & 4 Brownlee Street
Ourimbah

NORTHROP

Existing Case



Developed Case



Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

0 70 140 Metres

1:4,000

Figure A4-2

0.5% AEP Flood Velocity

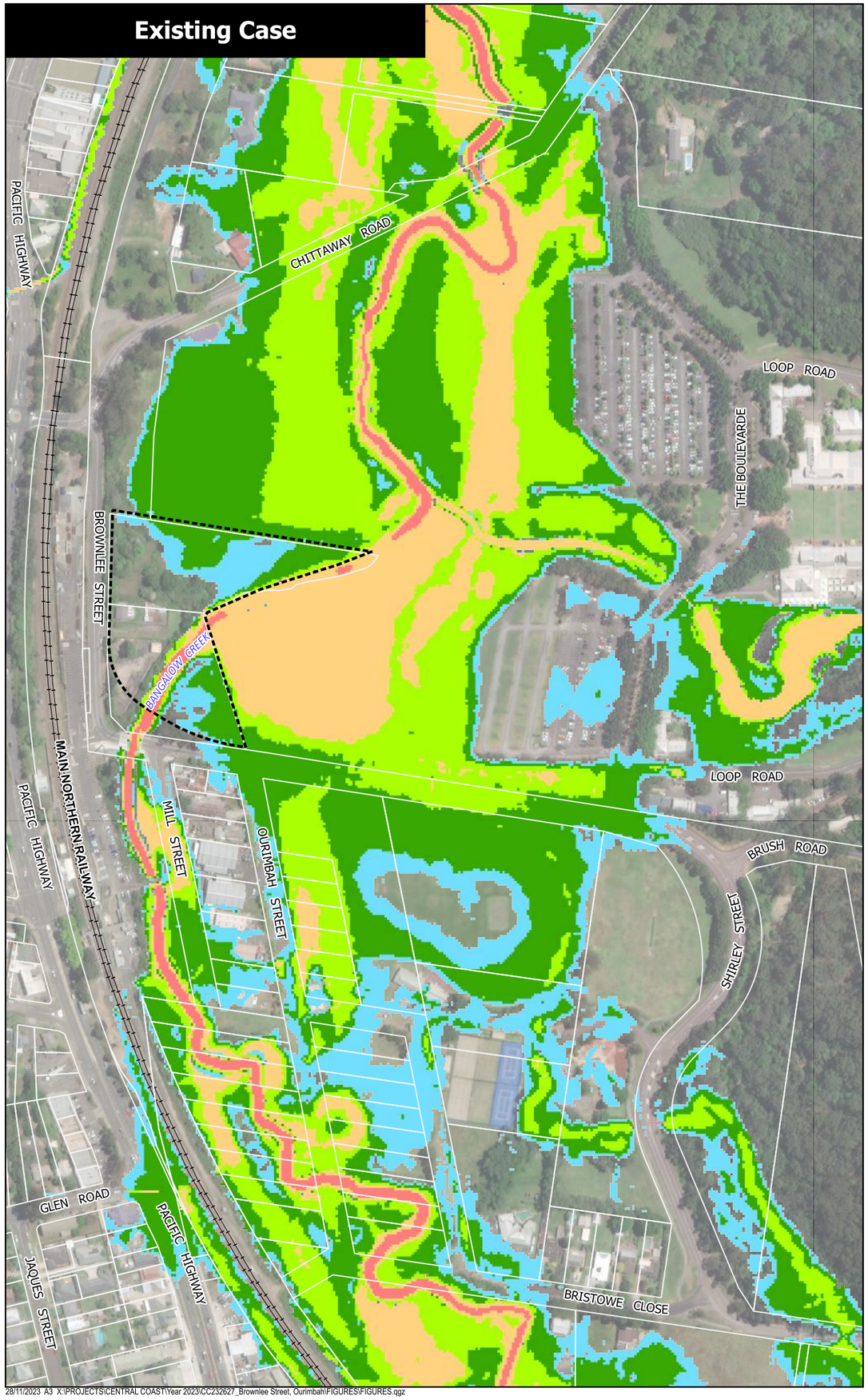
2 & 4 Brownlee Street
Ourimbah

NORTHROP

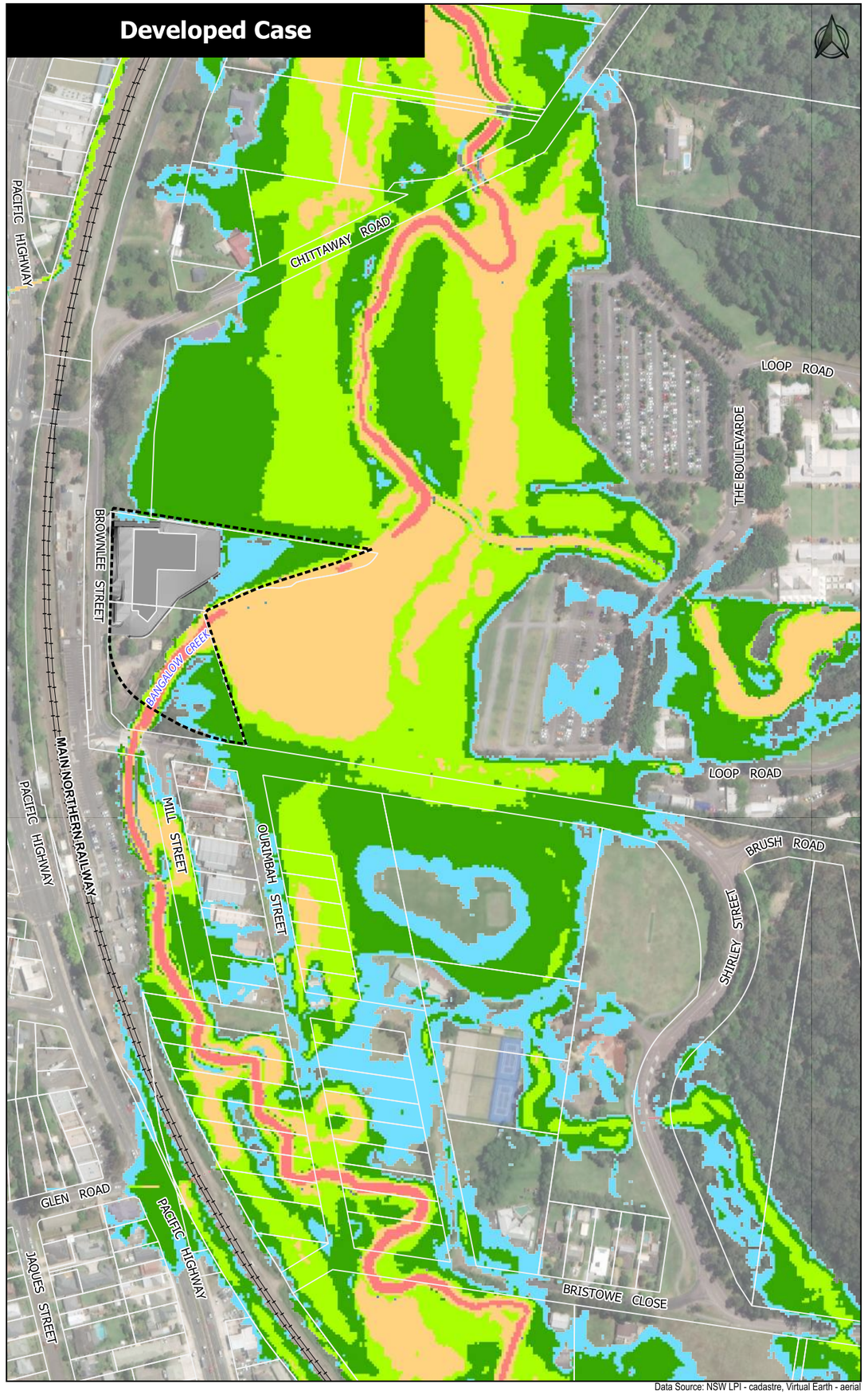
28/11/2023 A3 X:\PROJECTS\CENTRAL COAST\Year 2023\CC232627_Brownlee Street, Ourimbah\FIGURES\FIGURES.qgz

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case



Developed Case



Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 70 140 Metres

1:4,000

Figure A4-3

0.5% AEP Flood Hazard

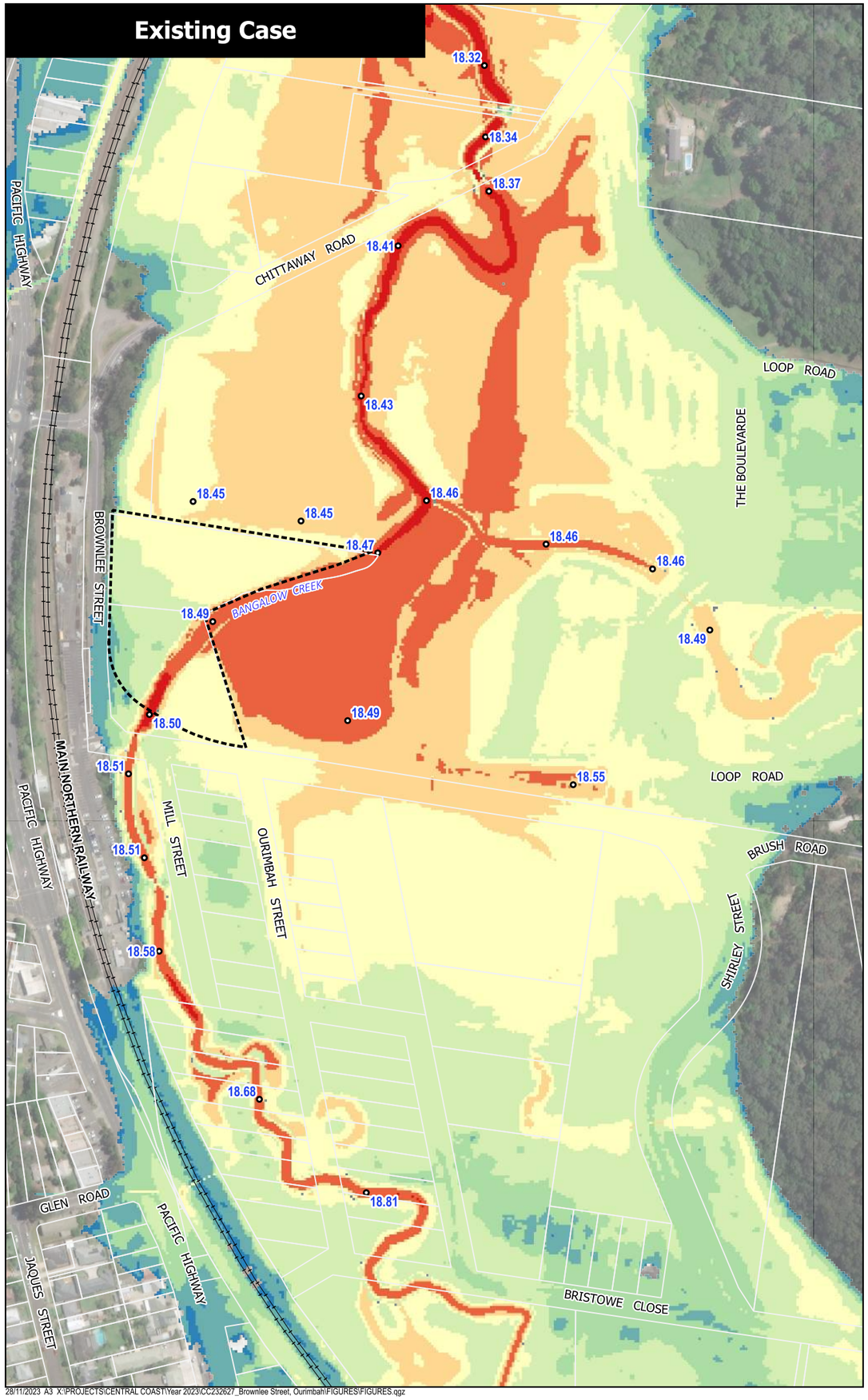
2 & 4 Brownlee Street
Ourimbah

NORTHROP

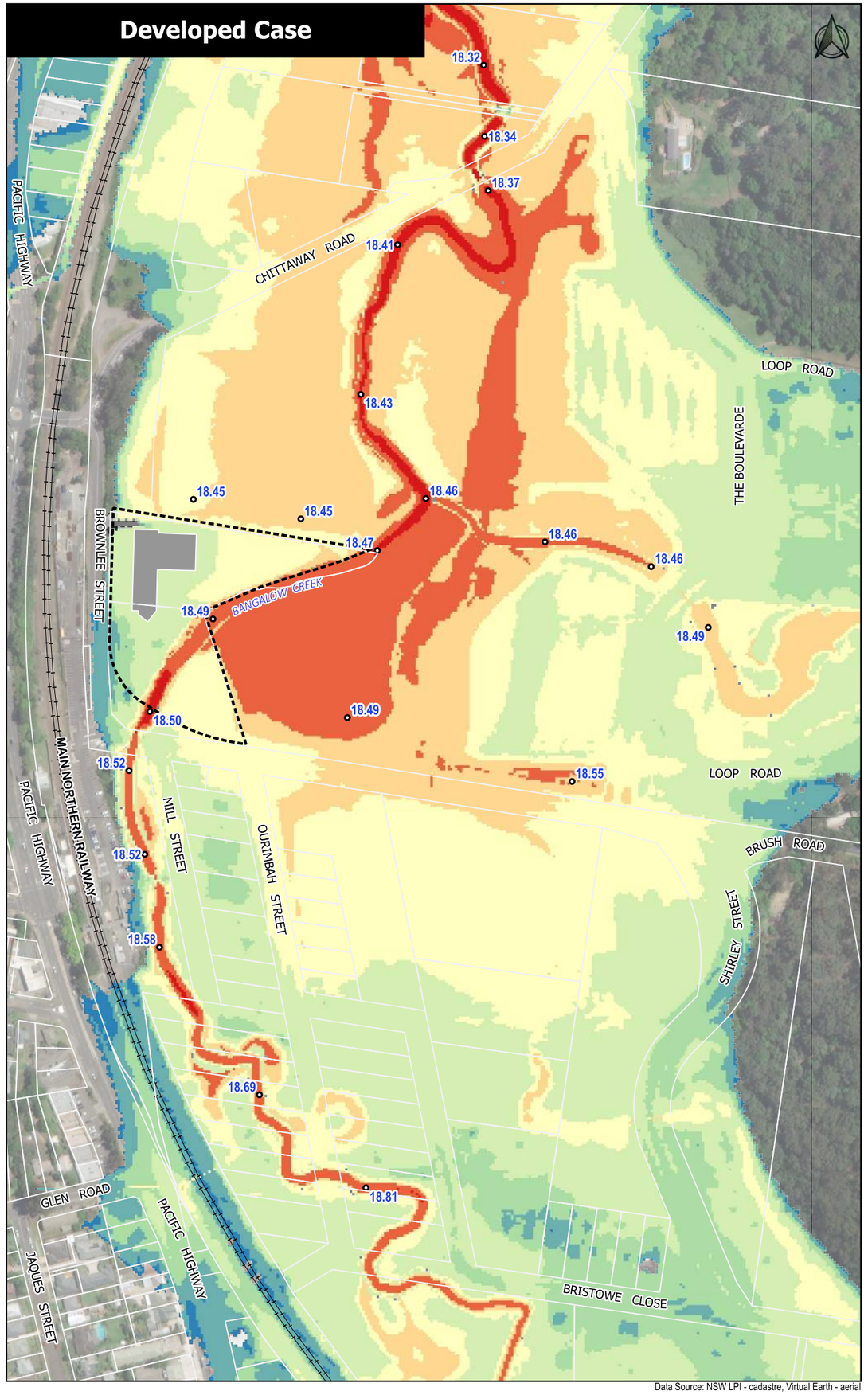
28/11/2023 A3 X:\PROJECTS\CENTRAL COAST\Year 2023\CC232627_Brownlee Street, Ourimbah\FIGURES\FIGURES.qgz

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case



Developed Case



Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface
- Spot Water Level(mAHD)

Depth(m)

- <= 0.10
- 0.10 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 3.00
- 3.00 - 4.00
- 4.00 - 6.00
- 6.00 >

0 70 140 Metres

1:4,000

Figure A5-1

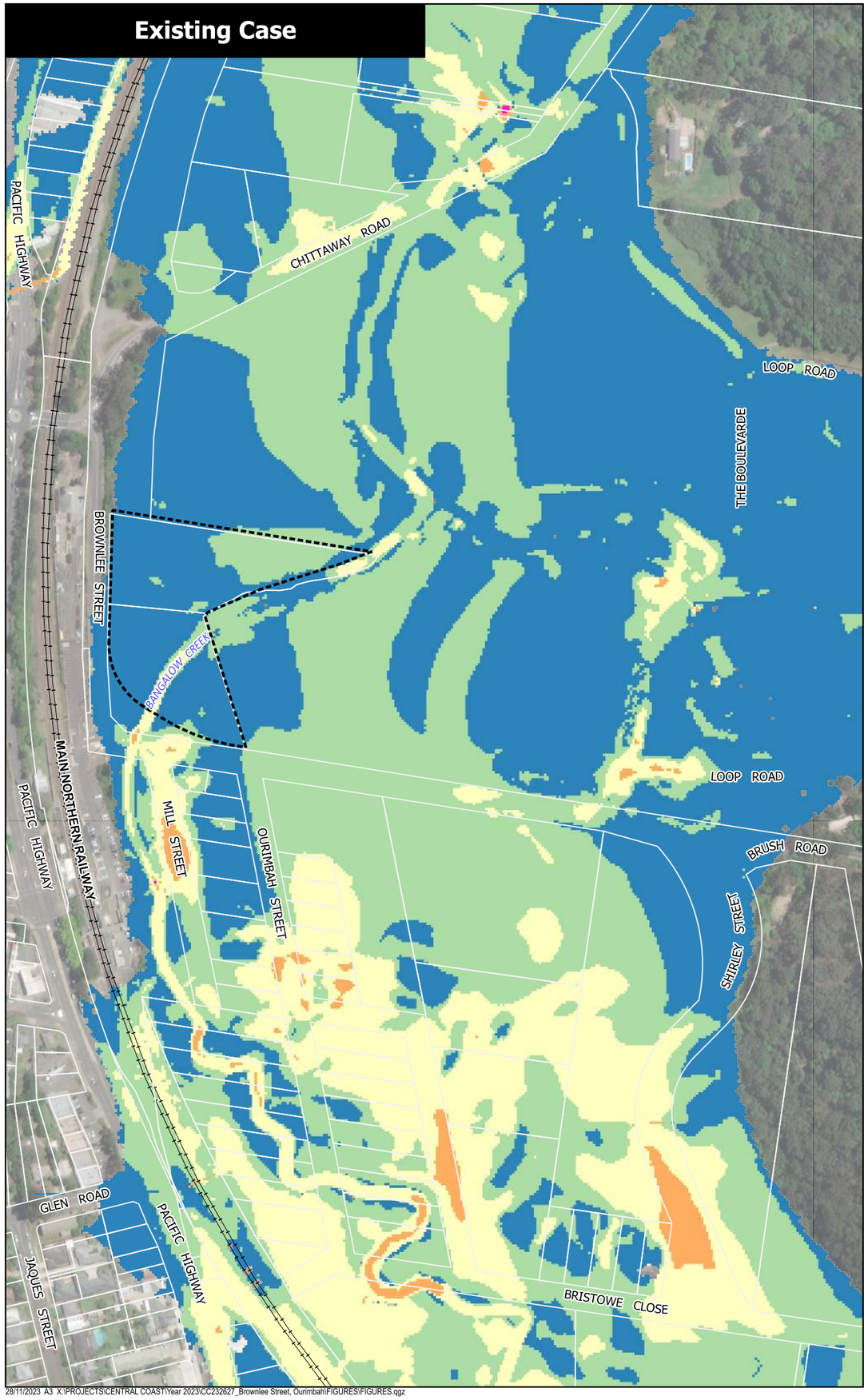
PMF Flood Depth and Elevation

2 & 4 Brownlee Street
Ourimbah

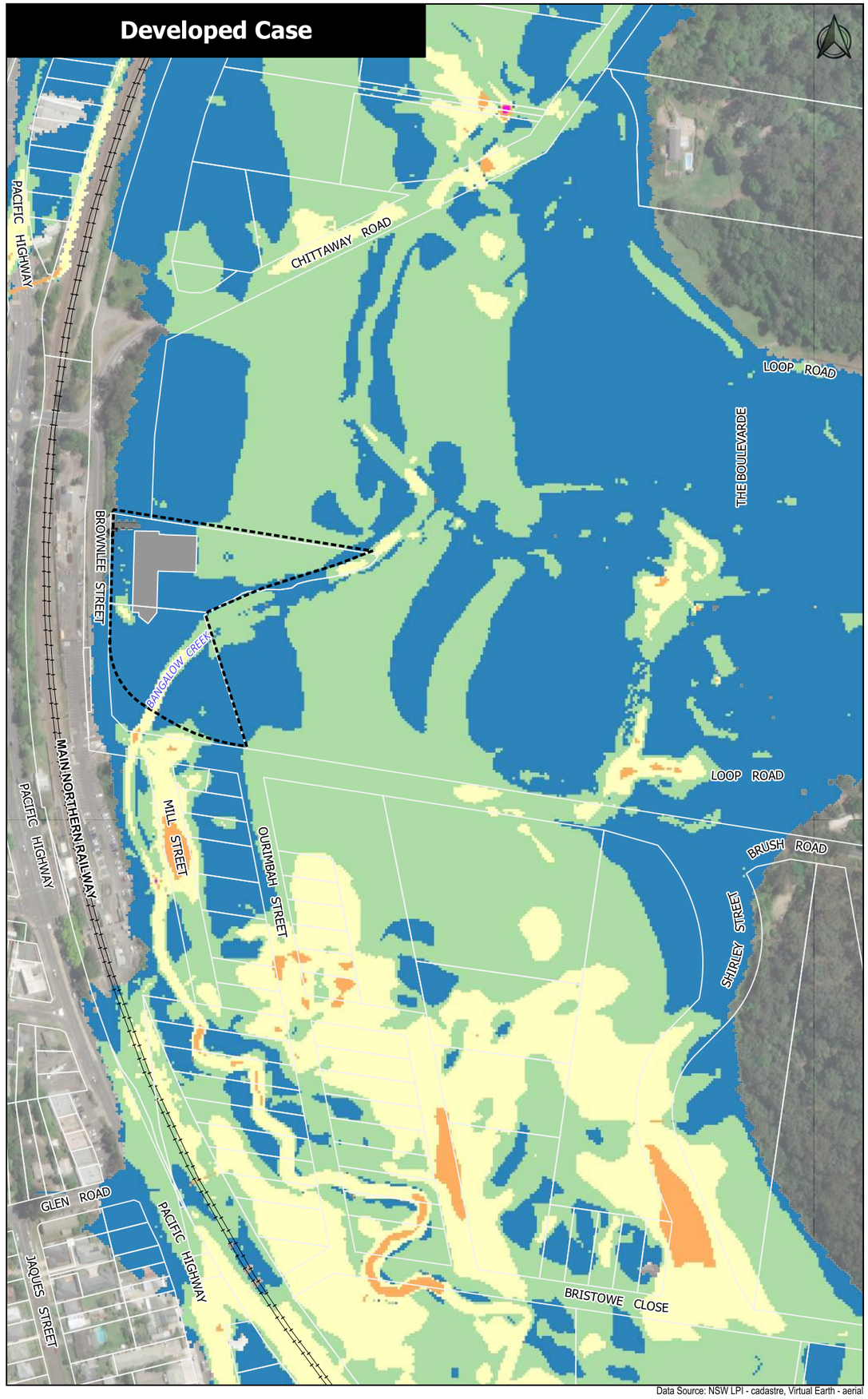
NORTHROP

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case



Developed Case



Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

0 70 140 Metres

1:4,000

Figure A5-2

PMF Flood Velocity

2 & 4 Brownlee Street
Ourimbah

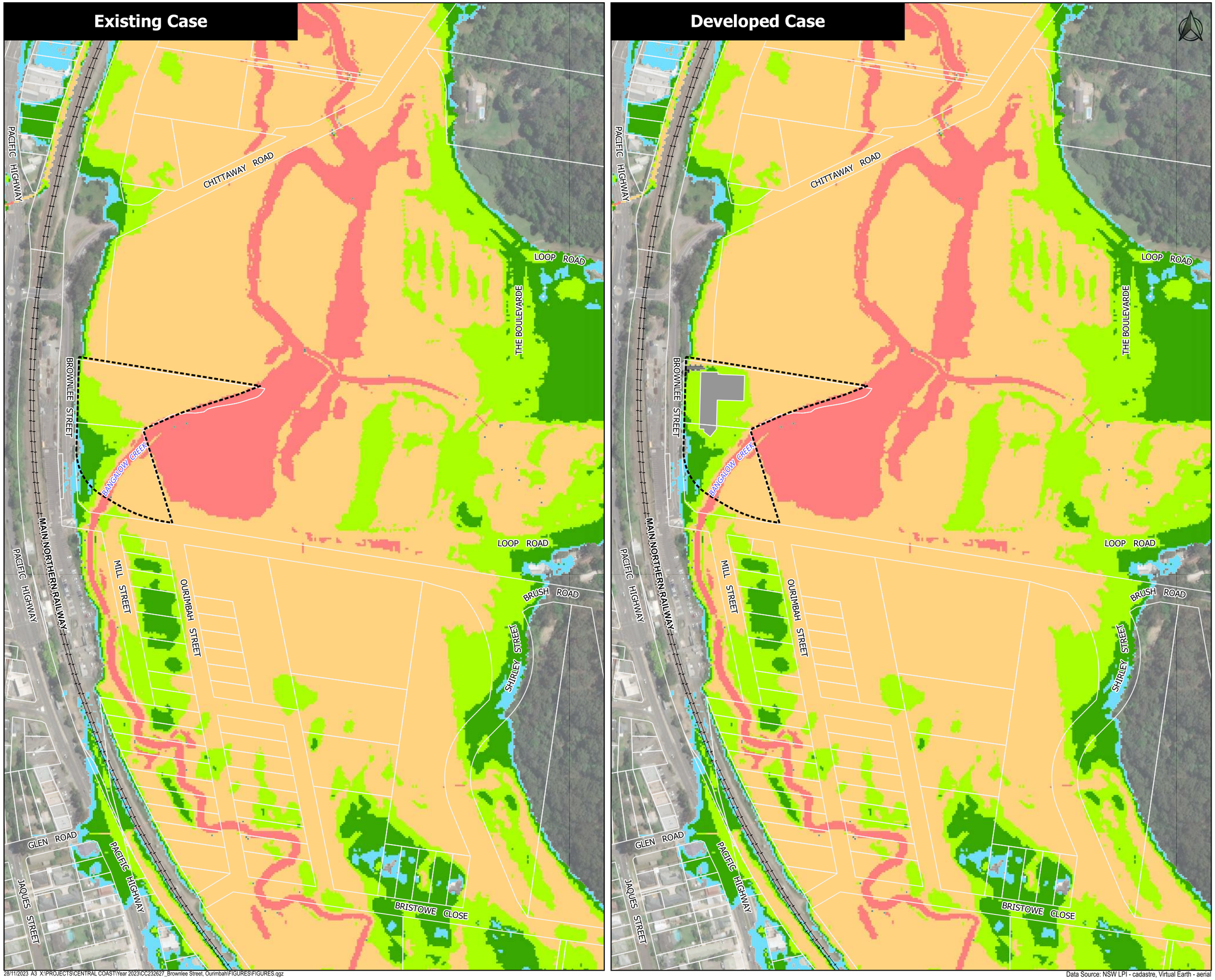
NORTHROP

28/11/2023 A3 X:\PROJECTS\CENTRAL COAST\Year 2023\CC232627_Brownlee Street, Ourimbah\FIGURES\FIGURES.qgz

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Existing Case

Developed Case



Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 70 140 Metres

1:4,000

Figure A5-3

PMF Flood Hazard

2 & 4 Brownlee Street
Ourimbah

NORTHROP

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Appendix B – Flood Impact Maps

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Difference(m)

- <-0.10
- -0.10 - -0.05
- -0.05 - -0.03
- -0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 70 140 Metres

1:4,000

Figure B1

10% AEP Flood Elevation Difference
Developed minus Existing

2 & 4 Brownlee Street
Ourimbah

NORTHROP

28/11/2023 X:\PROJECTS\CENTRAL COAST\Year 2023\CC232627_Brownlee Street, Ourimbah\FIGURES\FIGURES.qgz

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Difference(m)

- <-0.10
- -0.10 - -0.05
- -0.05 - -0.03
- -0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 70 140 Metres

1:4,000

Figure B2

1% AEP Flood Elevation Difference
Developed minus Existing

2 & 4 Brownlee Street
Ourimbah

NORTHROP

28/11/2023 X:\PROJECTS\CENTRAL COAST\Year 2023\CC232627_Brownlee Street, Ourimbah\FIGURES\FIGURES.qgz

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Difference(m)

- <-0.10
- -0.10 - -0.05
- -0.05 - -0.03
- -0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 70 140 Metres

1:4,000

Figure B3

0.5% AEP Flood Elevation Difference
Developed minus Existing

2 & 4 Brownlee Street
Ourimbah

NORTHROP

28/11/2023 X:\PROJECTS\CENTRAL COAST\Year 2023\CC232627_Brownlee Street, Ourimbah\FIGURES\FIGURES.qgz

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Hazard Category

Increase/Decrease

- <-4
- -3
- -2
- -1

No Changes

- 1
- 2
- 3
- >4

0 70 140 Metres

1:4,000

Figure B4

1% AEP Flood Hazard Difference
Developed minus Existing

2 & 4 Brownlee Street
Ourimbah

NORTHROP

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Legend

- Subject Site
- Cadastre
- Proposed Building
- Design Surface

Hazard Category

Increase/Decrease

- <-4
- -3
- -2
- -1

No Changes

- 1
- 2
- 3
- >4

0 70 140 Metres

1:4,000

Figure B5

PMF Flood Hazard Difference
Developed minus Existing

2 & 4 Brownlee Street
Ourimbah

NORTHROP

28/11/2023 X:\PROJECTS\CENTRAL COAST\Year 2023\CC232627_Brownlee Street, Ourimbah\FIGURES\FIGURES.qgz

Data Source: NSW LPI - cadastre, Virtual Earth - aerial

Appendix C – Flood Information Certificates

Flood Information Certificate

Property Address:	2 Brownlee St, OURIMBAH
Lot /DP:	3/DP612071
Date Prepared:	26 June 2023
Source of information:	Ourimbah Creek Floodplain Risk Management Study & Plan, 2019

This Flood Certificate provides advice furnished in good faith by the council relating to the likelihood of the land identified above being flooded and to the nature or extent of any such flooding ("flood risk") .

Flood level and flood planning advice is provided in the tables below and as maps in the Appendix. This advice regarding flood risk has been derived from the flood study listed above. Should you have any enquiries concerning this certificate, please do not hesitate to contact Andrew Dewar on 1300 463 954 during the hours of 8.00am to 4.15pm Monday to Friday

Flood Level Information Table

Flood Event	Minimum Level (m AHD)	Maximum Level (m AHD)
PMF	18.27	18.63
1% AEP	16.18	16.32
5% AEP	16.04	16.17

Planning Information Table

Flood Control Lot	☒
Minimum Habitable Floor Level	16.82m AHD
Complying Development: Flood Exclusionary Categories	
(a) Flood Storage Area	☒
(b) Floodway Area	☒
(c) Flow Path	☐
(d) High Hazard Area (H3, H4, H5, H6 Hazard Categorisation)	☒
(e) High Risk Area	☐

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Flood Information Certificate

Minimum Habitable Floor Level in the Planning Information Table above is also known as the Flood Planning Level. It is derived from the maximum 1% AEP Flood Level plus 0.5m freeboard and an allowance for sea level rise if applicable. For large lots the maximum 1% AEP flood level may vary across the lot; as such the Minimum Habitable Floor Level would vary at different locations on the lot, which may result in a lower Minimum Habitable Floor Level than the one quoted in the Planning Information Table. Note that Minimum Habitable Floor Levels are based on a flood size that has a 1% chance each year of either being reached or exceeded. Larger floods still have a small chance of occurring. For this reason, Council recommends that property owners consider the merits of choosing a floor level above the minimum floor level if practical to do so.

Flood Mapping related to this address is included in the Appendix. On the Environmental Layers you can choose to view 1% AEP (1 in 100y) flood extents, as well as Flood Precincts, which are referred to in the Development Control Plan.
https://maps.centralcoast.nsw.gov.au/public/

Development Controls set appropriate floor levels, construction materials, pedestrian and vehicular access, car parking and impacts on surrounding property for a proposed development; either complying development (fast tracked - see below) or a DA. Council's development controls vary depending on the location:

- Former Gosford: LEP 2014 Clauses 5.21 & 7.3, DCP 2013 Chapter 6.7
- Former Wyong: LEP 2013 Clauses 5.21 & 7.3, DCP 2013 Chapter 3.3

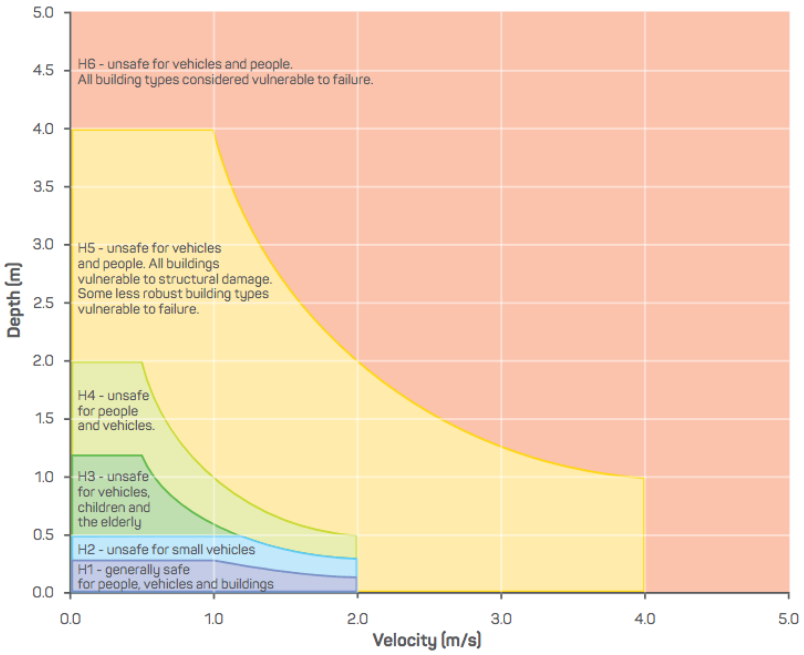
https://www.centralcoast.nsw.gov.au/plan-and-build/planning-controls-and-guidelines

Complying Development is a fast-track approval process for straightforward residential, commercial and industrial development (e.g. Granny Flats). From 1 July 2021, all Complying Development Certificate (CDC) applications must be lodged through the online NSW Planning Portal. If the application meets specific criteria it can be determined by a registered certifier. Under Clause 3A.38 of the Codes SEPP 2008 Development must not be carried out on any part of a *flood control lot* that is considered to be in one of the following exclusionary categories: (a) flood storage area, (b) floodway area, (c) flow path, (d) high hazard area, (e) high risk area. Complying Development may be allowable at this address if none of the five flood exclusionary categories in the Planning Information Table above are marked "Yes".
https://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Planning-Approval-Pathways/Complying-development

Flood Hazard: Flooding has the potential to cause loss: loss of life, injury or economic loss. The degree of hazard varies with the severity of flooding and is affected by flood behaviour (extent, depth, velocity, isolation, rate of rise of floodwaters, duration), topography and emergency management.

Council classifies flood hazard using thresholds related to the stability of people as they walk or drive through flood waters, or shelter in a building during a flood. This method classifies hazard on a spectrum of H1 to H6 as described by the hazard vulnerability curves below. For further information refer to: Flood Hazard: Guideline 7.3, Australian Institute for Disaster Resilience 2017 https://knowledge.aidr.org.au/media/3518/adr-guideline-7-3.pdf

Flood Information Certificate



Source – Australian Institute for Disaster Resilience 2017. Hydraulic Hazard: refer also to Australian Rainfall and Runoff Section 7.2.7 General Flood Hazard Curves (Figure 6.7.9) http://book.arr.org.au.s3-website-ap-southeast-2.amazonaws.com/

Disclaimers

a. This certificate is based on Council's relevant flood study, which covers a large area and utilises *airborne laser scanning* ground level data. Flood depths as shown on the maps at specific locations may not accurately account for localised changes in ground topography; the accuracy of flood depth information at a specific location may be improved by taking the flood level and subtracting the accurate ground level at a particular location, which could be established by a Registered Surveyor.

b. Without limiting s.733 of the *Local Government Act* 1993, Council expressly disclaims all and any liability and responsibility in respect of loss, damage or injury to person or property arising from anything done or omitted to be done by any person in reliance, whether wholly or in part, upon any part of this information. Any person having regard to the information contained in this document is encouraged to seek, at their discretion, all other sources of information on the subject matter as they consider appropriate, which may include local knowledge and/or professional advice.

c. Council does not, and cannot, warrant that it will, in its capacity as a consent authority under the *Environmental Planning and Assessment Act 1979*, grant consent to a DA that seeks to erect or use dwellings or other structures on the above property that conform with the levels set out in the above information. Council assesses DAs based on merit, which must consider various development controls as set out in the LEP and DCP. For any development proposal on a *Flood Control Lot* Council recommends the applicant to engage the services of a professional engineer who specialises in Flood Risk Management.

Flood Information Certificate

Glossary

AEP	*Annual Exceedance Probability*: The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage. For example, the 1% AEP flood has a 1% probability of occurring in any given year. This flood is sometimes referred to as 1 in 100, 100yr ARI or Q100
AHD	*Australian Height Datum* is the reference level for defining ground levels in Australia. The level of 0.0m AHD is approximately mean sea level.
Airborne Laser Scanning	A ground level measurement system in which a laser is emitted from an instrument in an aircraft and directed to the ground in a scanning pattern
DA	Development Application
DCP	Development Control Plan
Flood Control Lot	A land parcel that is subject to flood related development controls
Flood Hazard	Flooding which has the potential to cause loss: loss of life, injury or economic loss. The degree of hazard varies with the severity of flooding and is affected by flood behaviour (extent, depth, velocity, isolation, rate of rise of floodwaters, duration), topography and emergency management.
Flood Storage Area	Areas that are important for the temporary storage of floodwaters during the passage of flood.
Floodway Area	Those areas where a significant volume of water flows during floods.
Flow Path	Those areas where a flow path is identified in the relevant flood study, generally associated with velocities greater than 1 metre per second in the 1% AEP flood.
Freeboard	A factor of safety used in relation to the setting of floor levels. The typical freeboard set by the NSW Government is 0.5m, unless Council can demonstrate a different freeboard can apply as defined in an adopted Floodplain Risk Management Plan.
Ground Levels	Highest and lowest ground levels on the property, predominately based on ground level information databases created by *Airborne Laser Scanning*. A Registered Surveyor can confirm exact ground levels.
High Hazard Area	Those areas where flooding has the potential to be unsafe or cause damage. Council considers those areas that are Hazard Category H3 or above in a 1% AEP flood to be high hazard. Refer to Section on Flood Hazard below.
High Risk Area	Those areas of high flood risk as identified in a flood study or Floodplain Risk Management Plan.
LEP	Local Environment Plan
PMF	The *Probable Maximum Flood* is an extreme flood deemed to be the largest flood that could conceivably occur at a specific location. It is generally not physically or economically possible to provide complete protection against this flood event but should be considered for emergency response. The PMF defines the extent of flood prone land (i.e. the floodplain).

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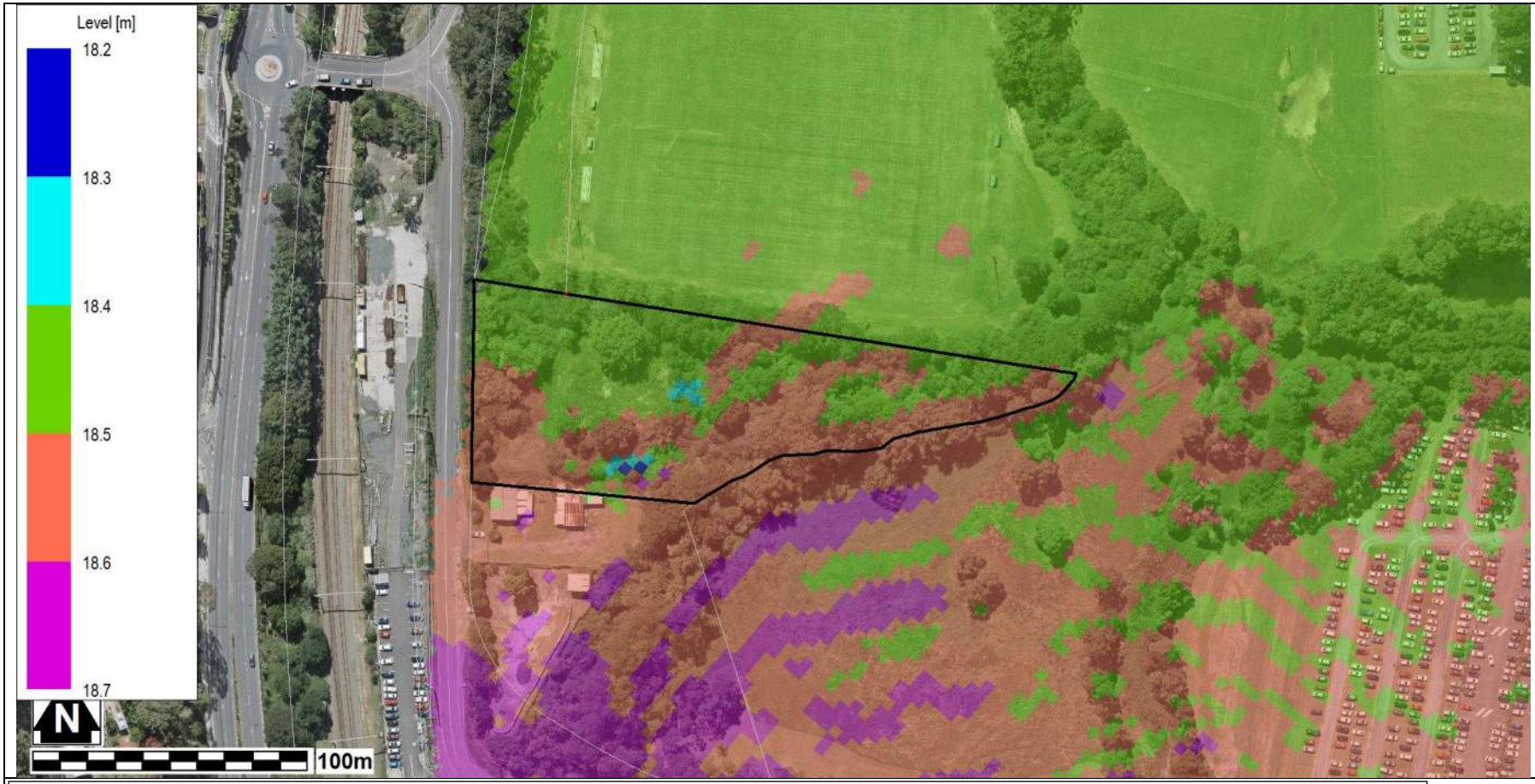
Flood Information Certificate

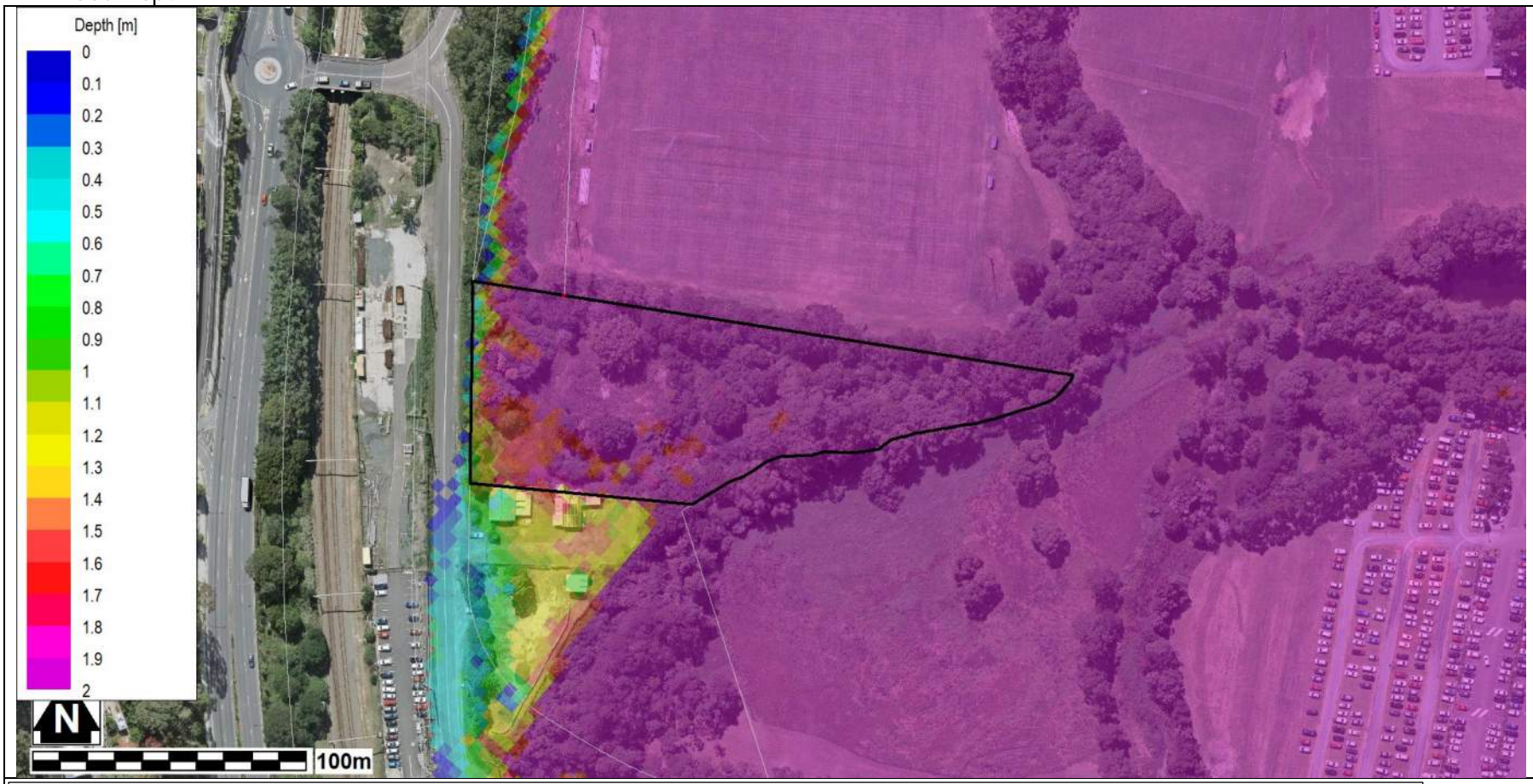
PMF Flood Extents



Phone: 1300 463 954 I **Email:** ask@centralcoast.nsw.gov.au I ABN 73 149 644 003
Wyong Office: 2 Hely St / PO Box 20 Wyong NSW 2259 **Gosford Office:** 49 Mann St / PO Box 21 Gosford NSW 2250

Flood Information Certificate

PMF Flood Depth



Flood Information Certificate

1% AEP Flood Extents

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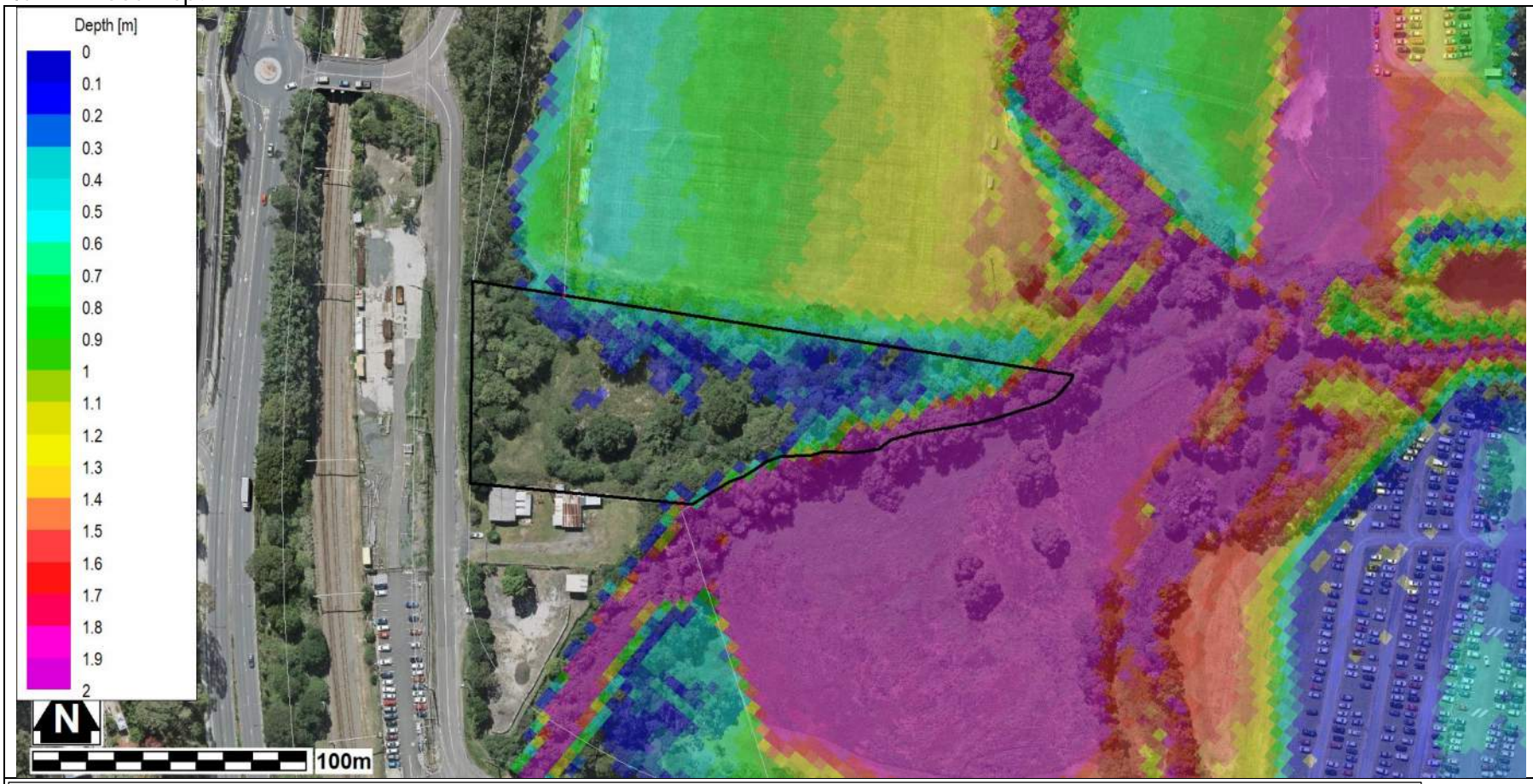
Flood Information Certificate

1% AEP Flood Depth

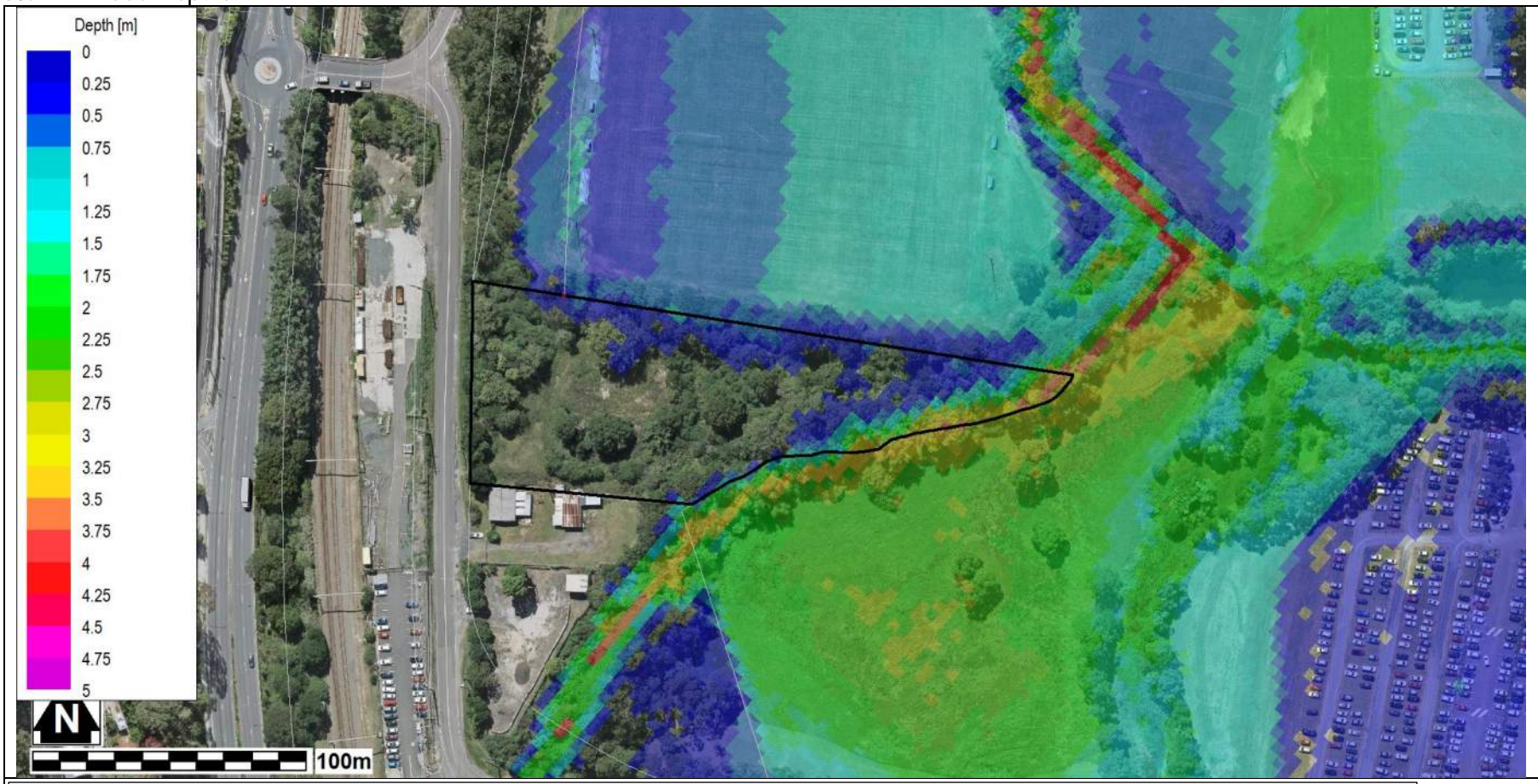


Flood Information Certificate

5% AEP Flood Extents

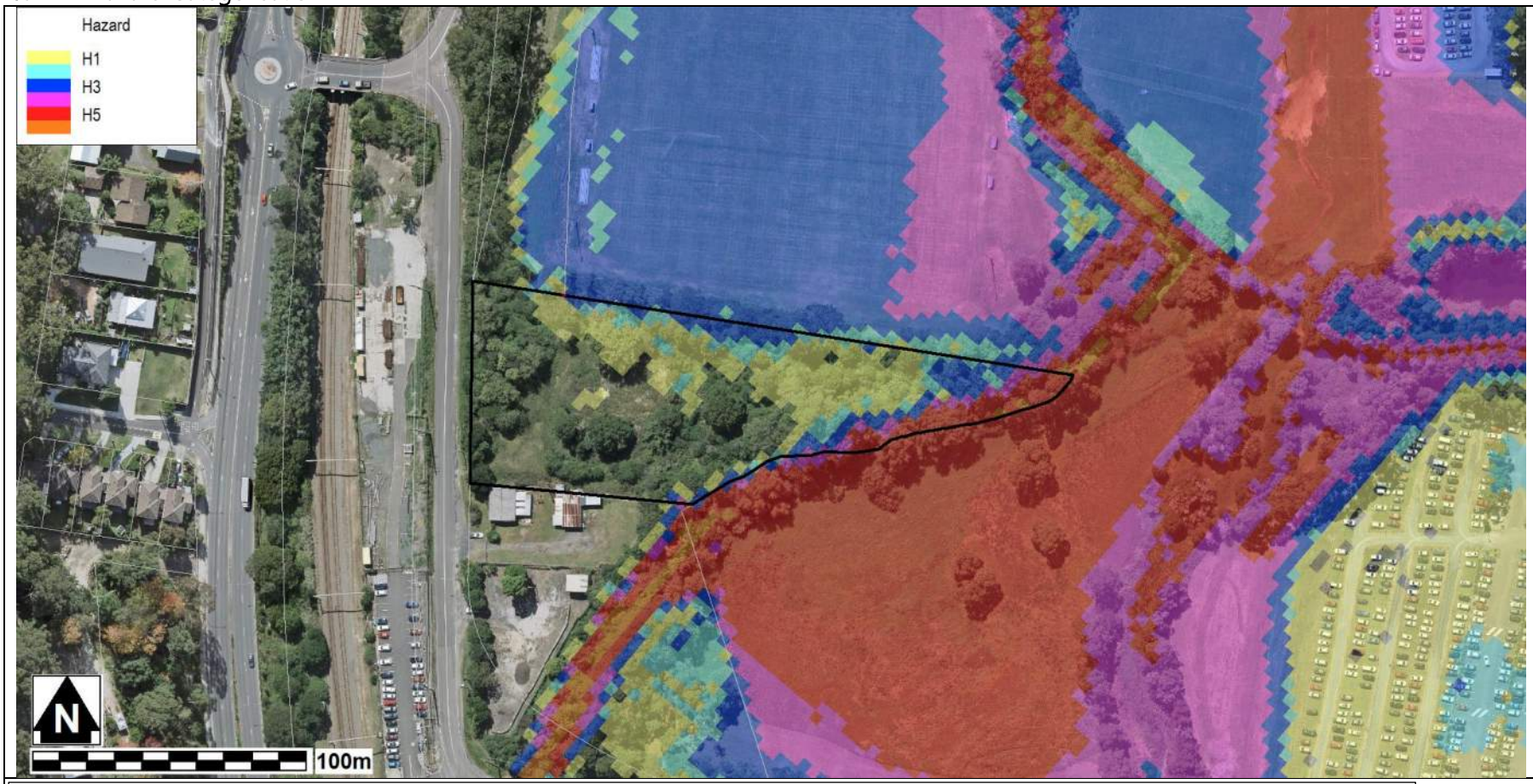
Flood Information Certificate

5% AEP Flood Depths



Flood Information Certificate

1% AEP Hazard Categorisation



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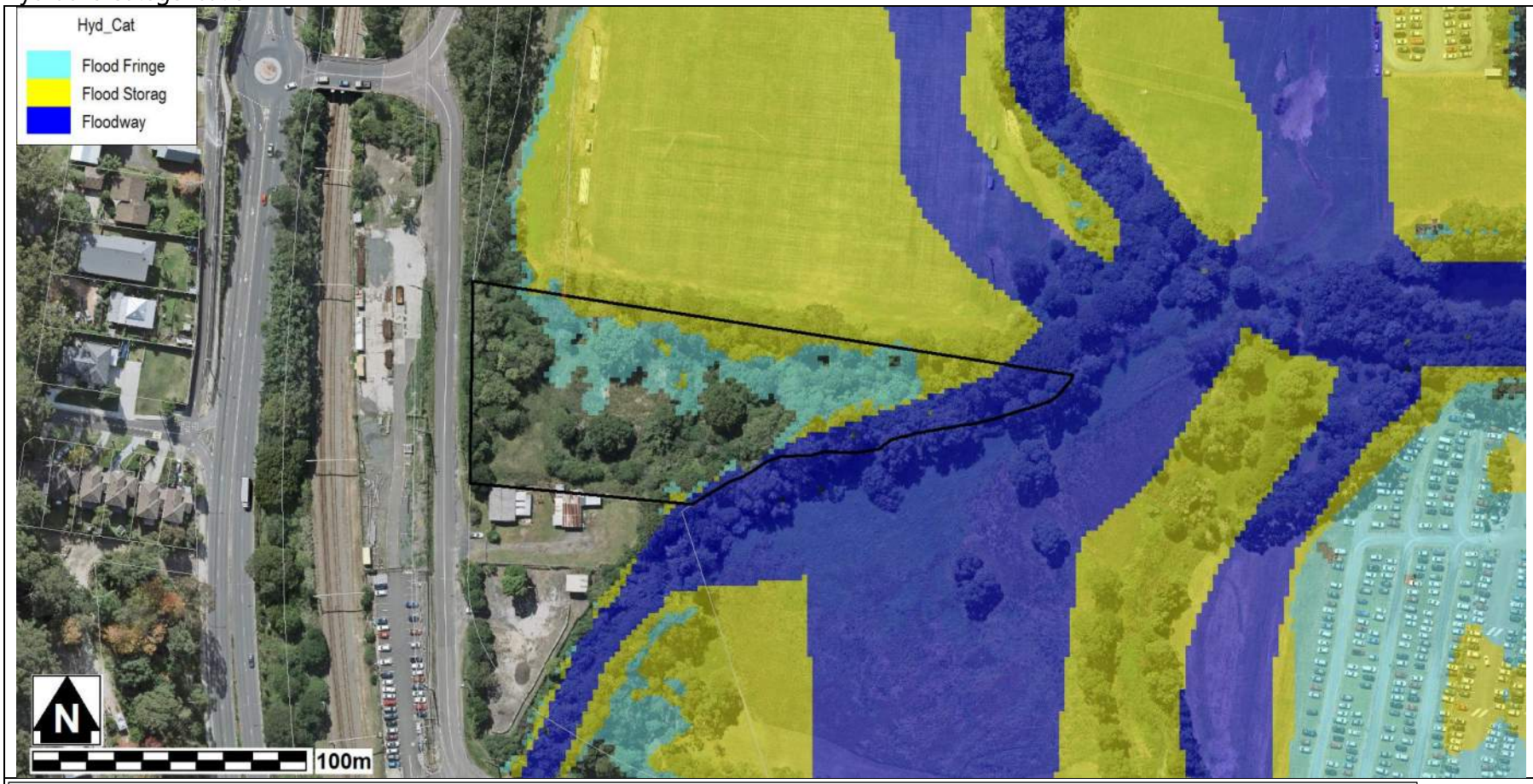
Flood Information Certificate

Hydraulic Categorisation



Flood Information Certificate

Property Address:	4 Brownlee St, OURIMBAH
Lot /DP:	42/DP1237817
Date Prepared:	26 June 2023
Source of information:	Ourimbah Creek Floodplain Risk Management Study & Plan, 2019

This Flood Certificate provides advice furnished in good faith by the council relating to the likelihood of the land identified above being flooded and to the nature or extent of any such flooding ("flood risk") .

Flood level and flood planning advice is provided in the tables below and as maps in the Appendix. This advice regarding flood risk has been derived from the flood study listed above. Should you have any enquiries concerning this certificate, please do not hesitate to contact Andrew Dewar on 1300 463 954 during the hours of 8.00am to 4.15pm Monday to Friday

Flood Level Information Table

Flood Event	Minimum Level (m AHD)	Maximum Level (m AHD)
PMF	18.48	18.70
1% AEP	16.30	16.47
5% AEP	16.15	16.31

Planning Information Table

Flood Control Lot	☒
Minimum Habitable Floor Level	16.97m AHD
Complying Development: Flood Exclusionary Categories	
(a) Flood Storage Area	☒
(b) Floodway Area	☒
(c) Flow Path	☐
(d) High Hazard Area (H3, H4, H5, H6 Hazard Categorisation)	☒
(e) High Risk Area	☐

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Flood Information Certificate

Minimum Habitable Floor Level in the Planning Information Table above is also known as the Flood Planning Level. It is derived from the maximum 1% AEP Flood Level plus 0.5m freeboard and an allowance for sea level rise if applicable. For large lots the maximum 1% AEP flood level may vary across the lot; as such the Minimum Habitable Floor Level would vary at different locations on the lot, which may result in a lower Minimum Habitable Floor Level than the one quoted in the Planning Information Table. Note that Minimum Habitable Floor Levels are based on a flood size that has a 1% chance each year of either being reached or exceeded. Larger floods still have a small chance of occurring. For this reason, Council recommends that property owners consider the merits of choosing a floor level above the minimum floor level if practical to do so.

Flood Mapping related to this address is included in the Appendix. On the Environmental Layers you can choose to view 1% AEP (1 in 100y) flood extents, as well as Flood Precincts, which are referred to in the Development Control Plan.
https://maps.centralcoast.nsw.gov.au/public/

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- Former Wyong: LEP 2013 Clauses 5.21 & 7.3, DCP 2013 Chapter 3.3

https://www.centralcoast.nsw.gov.au/plan-and-build/planning-controls-and-guidelines

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https://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Planning-Approval-Pathways/Complying-development

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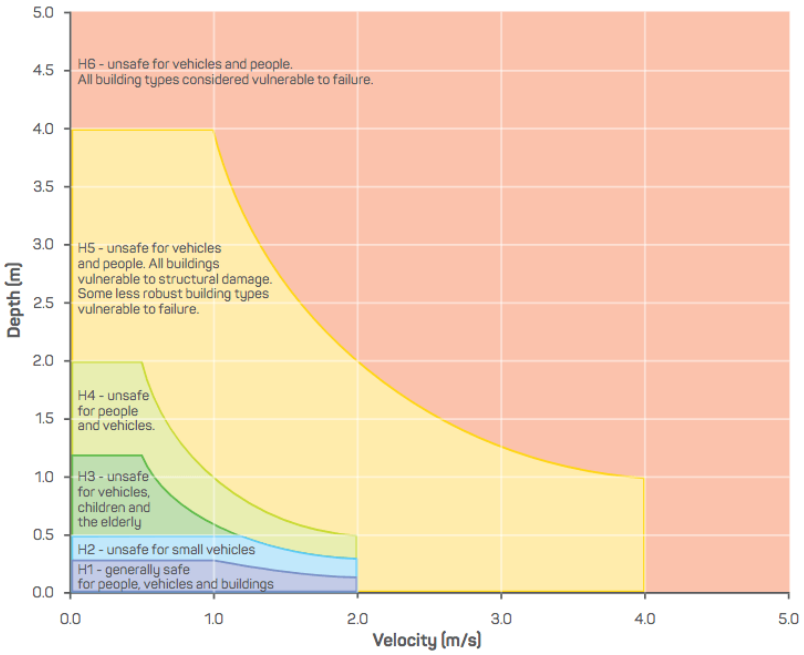
Council classifies flood hazard using thresholds related to the stability of people as they walk or drive through flood waters, or shelter in a building during a flood. This method classifies hazard on a spectrum of H1 to H6 as described by the hazard vulnerability curves below. For further information refer to: Flood Hazard: Guideline 7.3, Australian Institute for Disaster Resilience 2017 https://knowledge.aidr.org.au/media/3518/adr-guideline-7-3.pdf

Flood Information Certificate



Source – Australian Institute for Disaster Resilience 2017. Hydraulic Hazard: refer also to Australian Rainfall and Runoff Section 7.2.7 General Flood Hazard Curves (Figure 6.7.9) http://book.arr.org.au.s3-website-ap-southeast-2.amazonaws.com/

Disclaimers

a. This certificate is based on Council's relevant flood study, which covers a large area and utilises *airborne laser scanning* ground level data. Flood depths as shown on the maps at specific locations may not accurately account for localised changes in ground topography; the accuracy of flood depth information at a specific location may be improved by taking the flood level and subtracting the accurate ground level at a particular location, which could be established by a Registered Surveyor.

b. Without limiting s.733 of the *Local Government Act* 1993, Council expressly disclaims all and any liability and responsibility in respect of loss, damage or injury to person or property arising from anything done or omitted to be done by any person in reliance, whether wholly or in part, upon any part of this information. Any person having regard to the information contained in this document is encouraged to seek, at their discretion, all other sources of information on the subject matter as they consider appropriate, which may include local knowledge and/or professional advice.

c. Council does not, and cannot, warrant that it will, in its capacity as a consent authority under the *Environmental Planning and Assessment Act 1979*, grant consent to a DA that seeks to erect or use dwellings or other structures on the above property that conform with the levels set out in the above information. Council assesses DAs based on merit, which must consider various development controls as set out in the LEP and DCP. For any development proposal on a *Flood Control Lot* Council recommends the applicant to engage the services of a professional engineer who specialises in Flood Risk Management.

Flood Information Certificate

Glossary

AEP	*Annual Exceedance Probability*: The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage. For example, the 1% AEP flood has a 1% probability of occurring in any given year. This flood is sometimes referred to as 1 in 100, 100yr ARI or Q100
AHD	*Australian Height Datum* is the reference level for defining ground levels in Australia. The level of 0.0m AHD is approximately mean sea level.
Airborne Laser Scanning	A ground level measurement system in which a laser is emitted from an instrument in an aircraft and directed to the ground in a scanning pattern
DA	Development Application
DCP	Development Control Plan
Flood Control Lot	A land parcel that is subject to flood related development controls
Flood Hazard	Flooding which has the potential to cause loss: loss of life, injury or economic loss. The degree of hazard varies with the severity of flooding and is affected by flood behaviour (extent, depth, velocity, isolation, rate of rise of floodwaters, duration), topography and emergency management.
Flood Storage Area	Areas that are important for the temporary storage of floodwaters during the passage of flood.
Floodway Area	Those areas where a significant volume of water flows during floods.
Flow Path	Those areas where a flow path is identified in the relevant flood study, generally associated with velocities greater than 1 metre per second in the 1% AEP flood.
Freeboard	A factor of safety used in relation to the setting of floor levels. The typical freeboard set by the NSW Government is 0.5m, unless Council can demonstrate a different freeboard can apply as defined in an adopted Floodplain Risk Management Plan.
Ground Levels	Highest and lowest ground levels on the property, predominately based on ground level information databases created by *Airborne Laser Scanning*. A Registered Surveyor can confirm exact ground levels.
High Hazard Area	Those areas where flooding has the potential to be unsafe or cause damage. Council considers those areas that are Hazard Category H3 or above in a 1% AEP flood to be high hazard. Refer to Section on Flood Hazard below.
High Risk Area	Those areas of high flood risk as identified in a flood study or Floodplain Risk Management Plan.
LEP	Local Environment Plan
PMF	The *Probable Maximum Flood* is an extreme flood deemed to be the largest flood that could conceivably occur at a specific location. It is generally not physically or economically possible to provide complete protection against this flood event but should be considered for emergency response. The PMF defines the extent of flood prone land (i.e. the floodplain).

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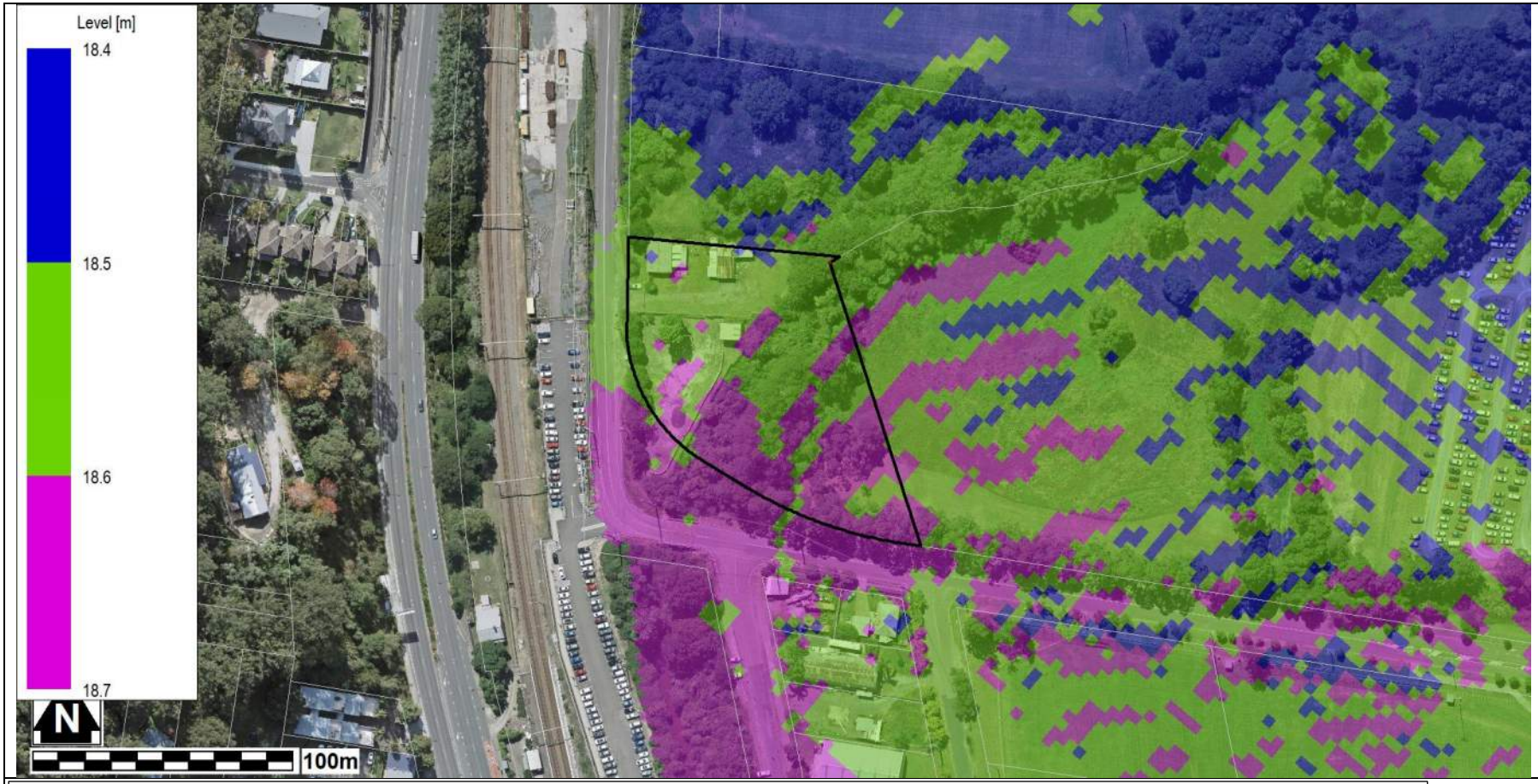
Flood Information Certificate

PMF Flood Extents



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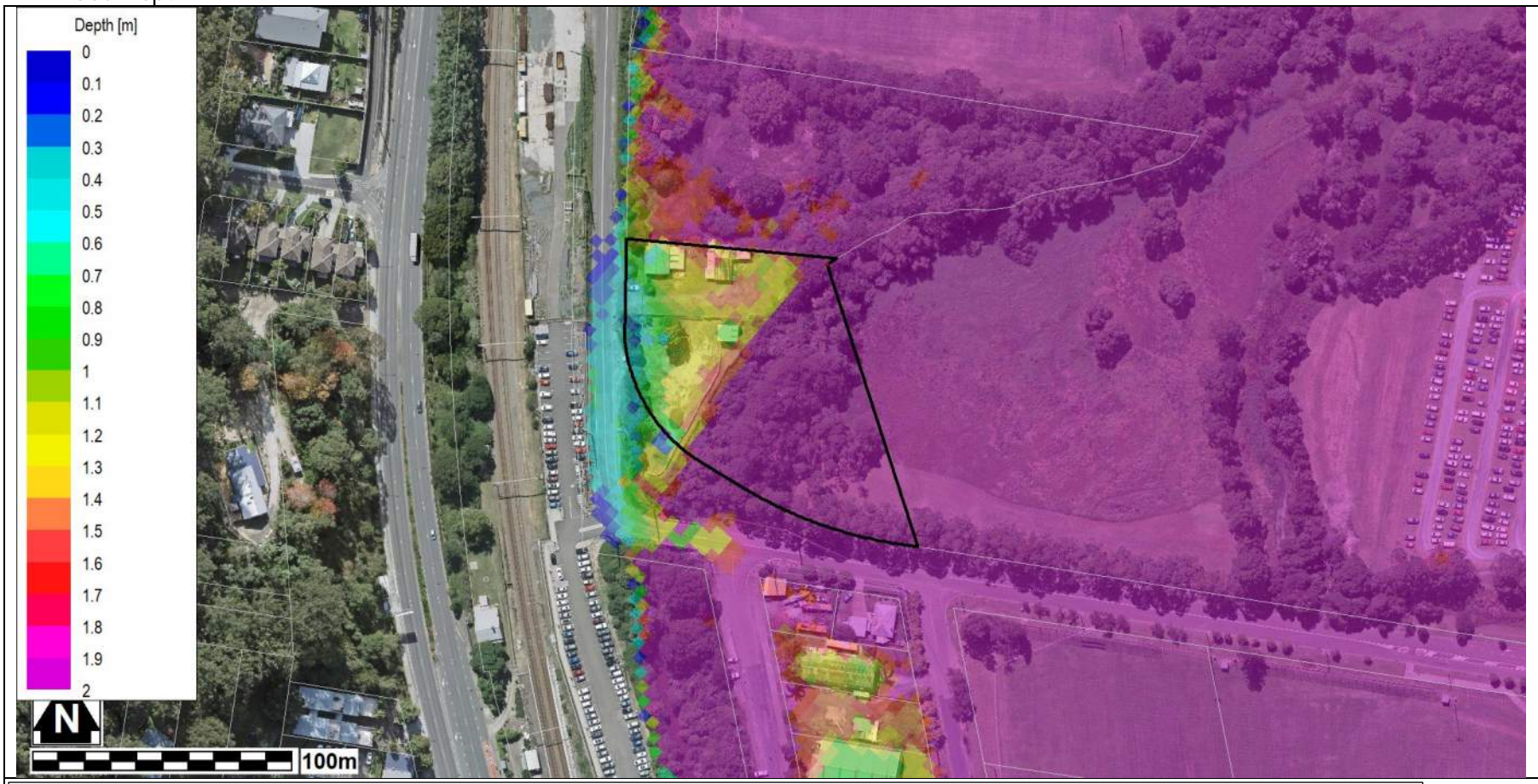
PMF Flood Depth

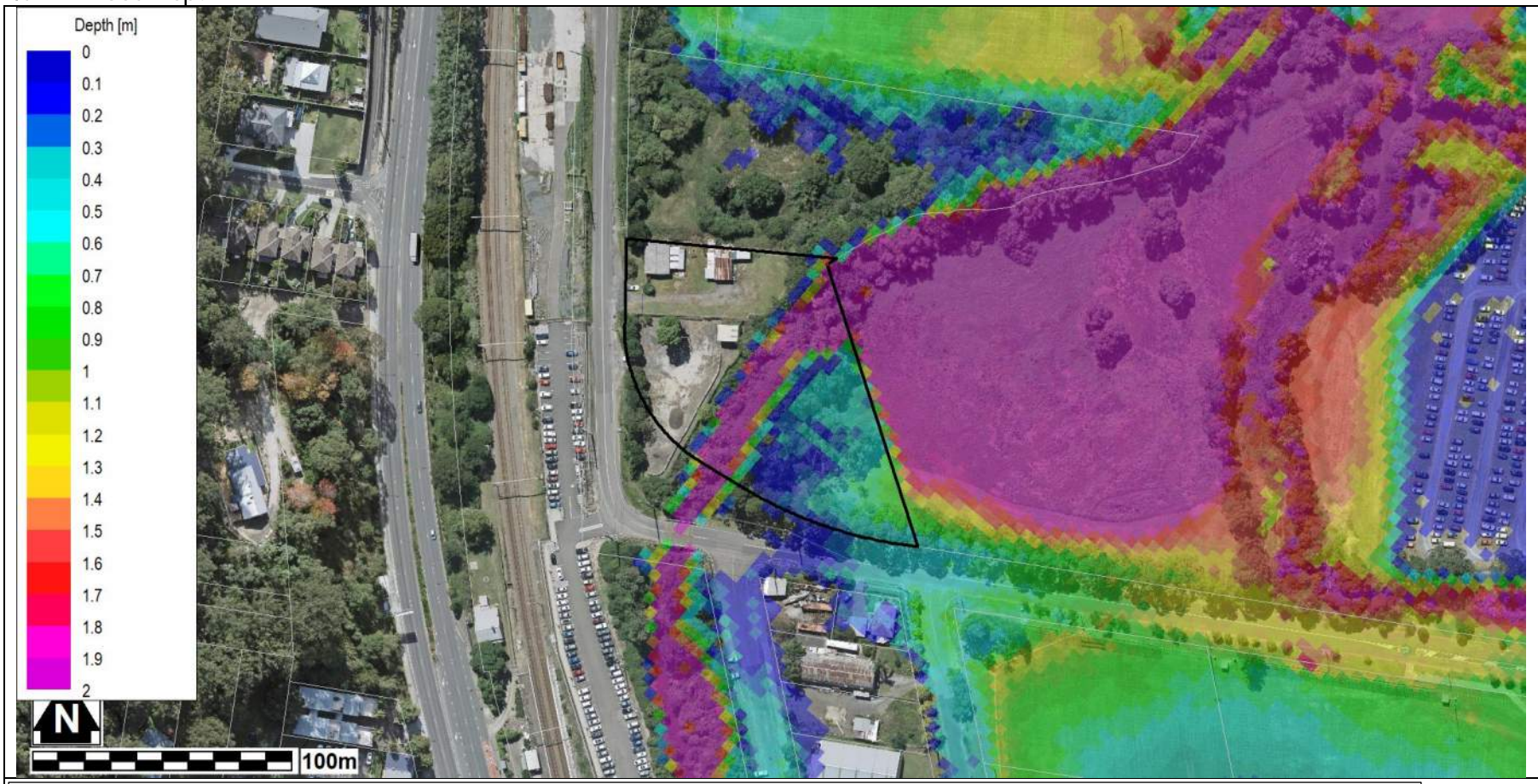


Flood Information Certificate

1% AEP Flood Extents

Flood Information Certificate

1% AEP Flood Depth



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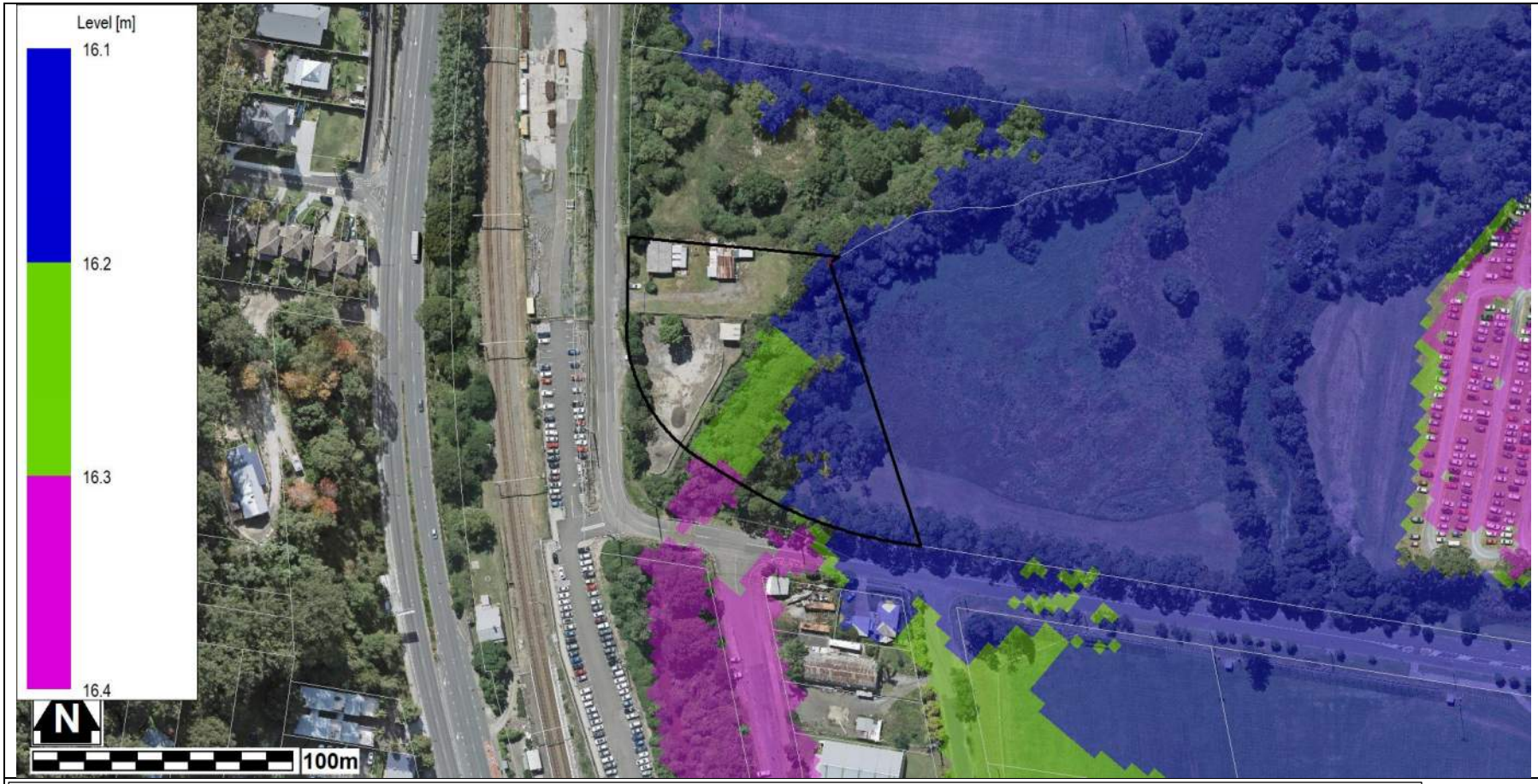
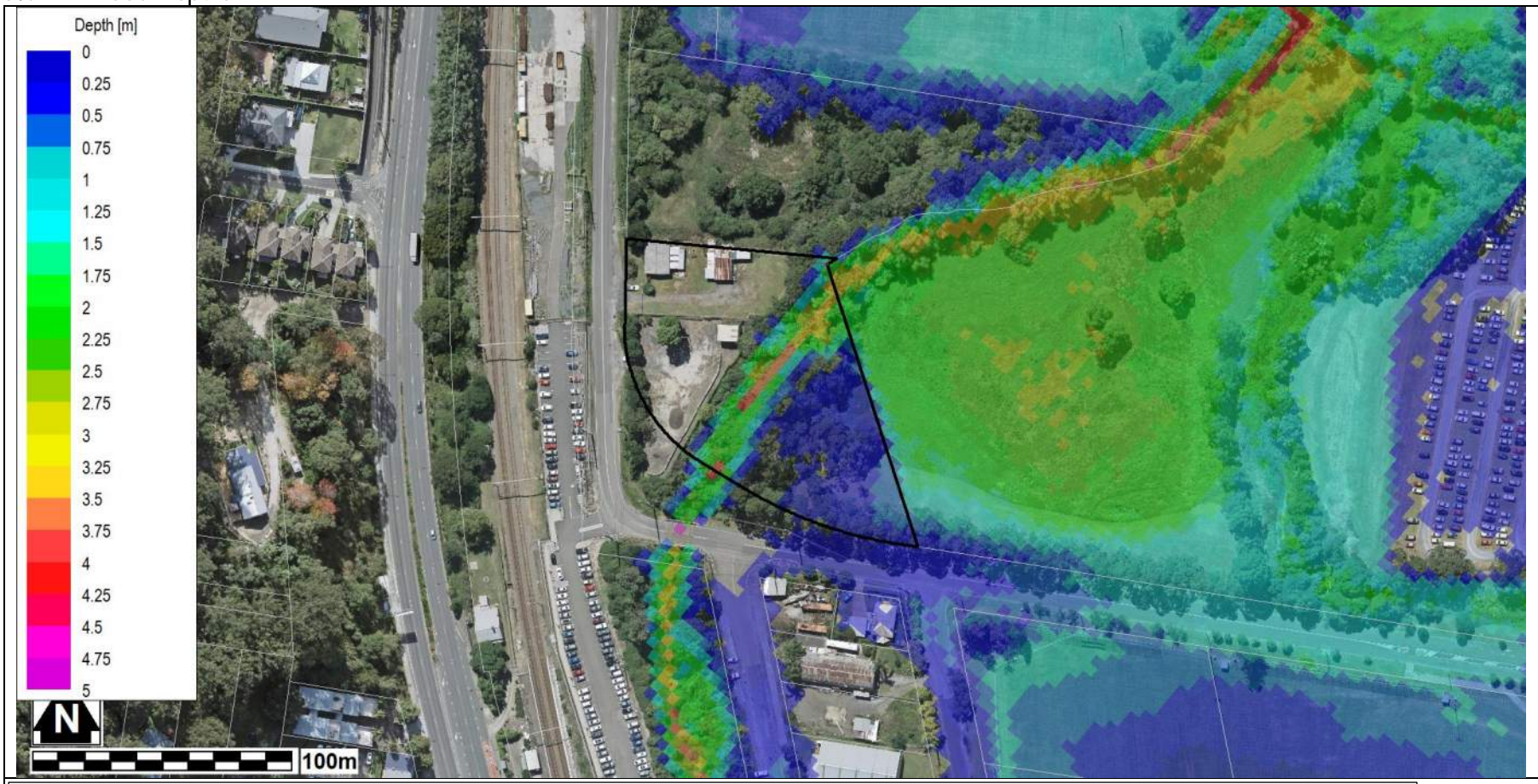
5% AEP Flood Extents



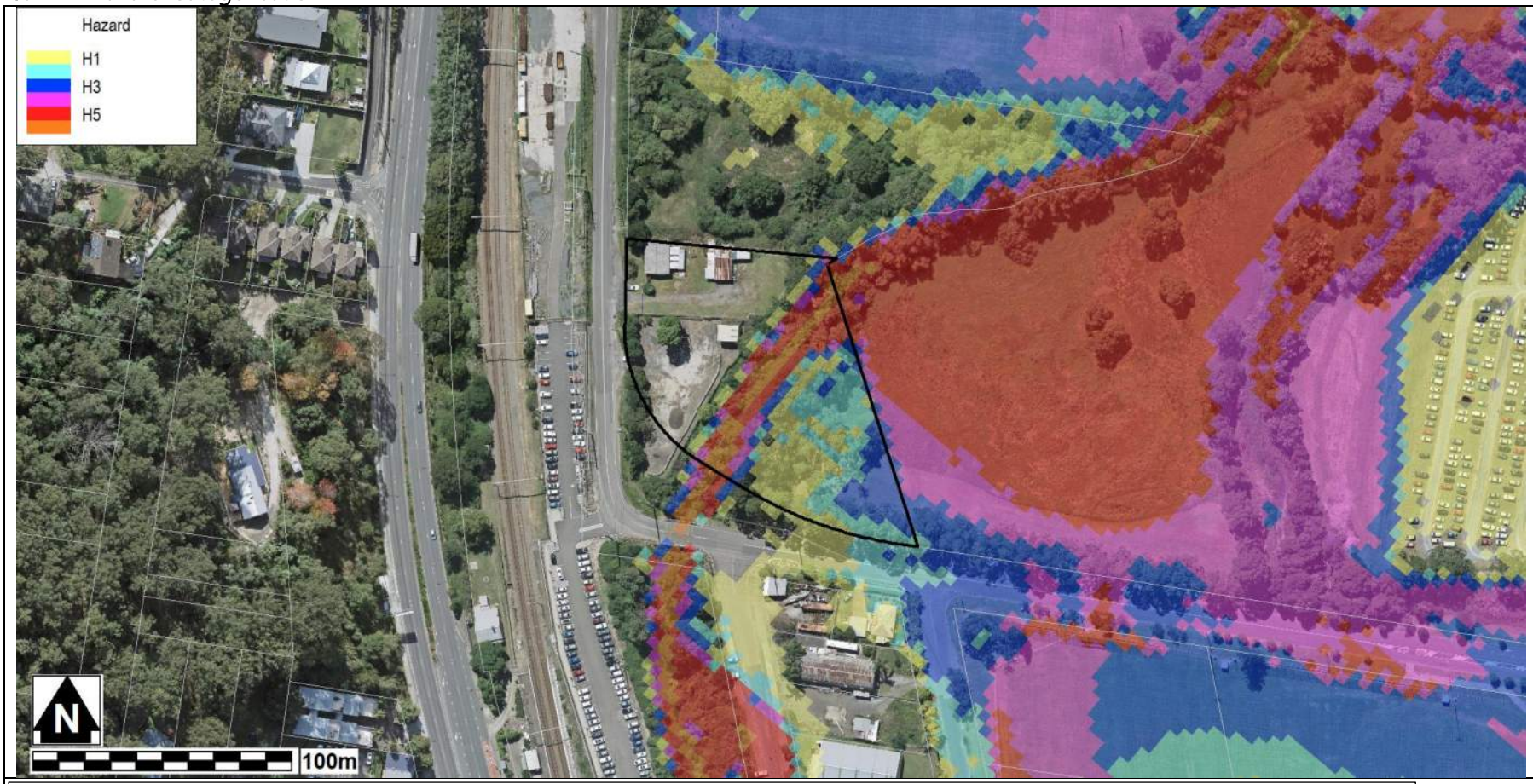
Flood Information Certificate

5% AEP Flood Depths



Flood Information Certificate

1% AEP Hazard Categorisation



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Flood Information Certificate

Hydraulic Categorisation