REPORT

40 THE TUNNELL ROAD, BILLINUDGEL, NSW

HYDRAULIC IMPACT ASSESSMENT

FILL PAD 2018

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FLOODWORKS

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Transmission Register

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1. Introduction

A hydraulic assessment has been completed for 40 The Tunnell Road (Billinudgel, NSW - the subject site) to consider potential hydraulic impacts arising from the placement of an earth fill pad after 2018. This will be undertaken by comparing the hydraulic function of the floodplain using 2018 ground survey levels (pre-existing i.e., no fill), and present day 2021 ground survey levels (existing i.e. with fill).

The key objective of this assessment is to determine whether the proposed fill pad has impacted the floodplain's existing hydrodynamic function.

To achieve this, a 1%AEP (100-year ARI), 1%AEP_CC (Climate Change), and PMF hydrodynamic assessment will be undertaken to determine the maximum water height, velocity, peak depth, hazards, and potential hydrodynamic impacts.

The subject site is located within the heavily modified Marshals Creek catchment and is characterised by a steep forested upper catchment, rural and urban mid-catchment, and tidal estuarine lower catchment.

Figure 1 below shows the location of the study site, which has a land area of approximately 5.312ha.

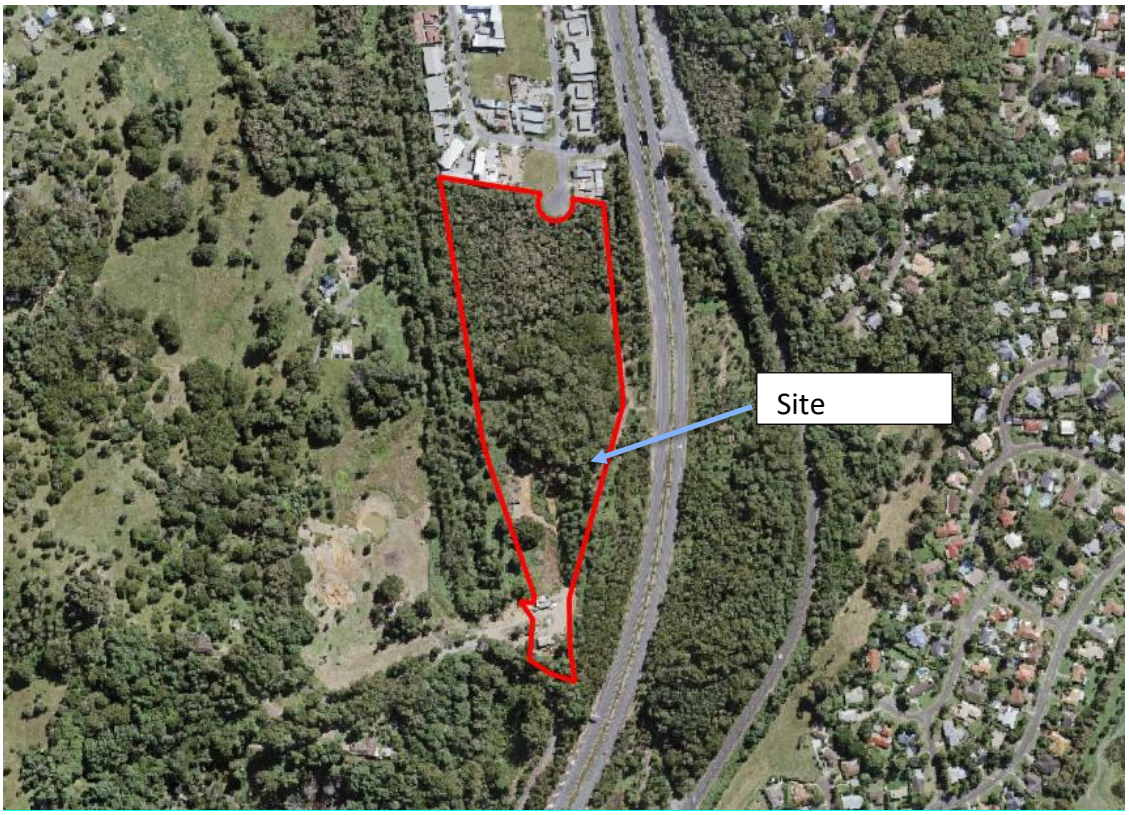

Figure 1 – Subject Site

2. Hydraulic Impact Assessment

2.1. Objectives

This Hydraulic Impact Assessment aims to demonstrate that the proposed development does not significantly change the existing hydrodynamics within the floodplain.

1D/2D TUFLOW has been used for this analysis. The TUFLOW software models the design terrain (i.e. Digital Terrain Model) of the study area as a series of grid points (2D cells). This allows flows in excess of channel capacity or pipe network to break out and continue along the floodway in the 2D domain, as the topography dictates. The hydraulic structures (i.e. the minor culvert network) have been represented as 1D elements (ESTRY), which are dynamically linked to the 2D elements. The TUFLOW model computes the capacity of the 1D element and once exceeded, the surcharged flow is transferred to the 2D model. Flood levels, discharge, and velocity can be extracted from the model as functions of time at required locations.

TUFLOW is an industry-standard two-dimensional river analysis model used to estimate flood characteristics such as flood level, velocity, and flood depth and any impacts the proposed development may have on surrounding properties.

2.2. 2D Model Set-Up

2.2.1. Model Extent

The 2021 North Byron flood model (Byron Shire Council, 2021) was used in the following assessment, with the truncated model extent presented in Figure 2. The extents were set at an appropriate distance from the subject site to influence the results. All boundaries were extracted from the original Council model.

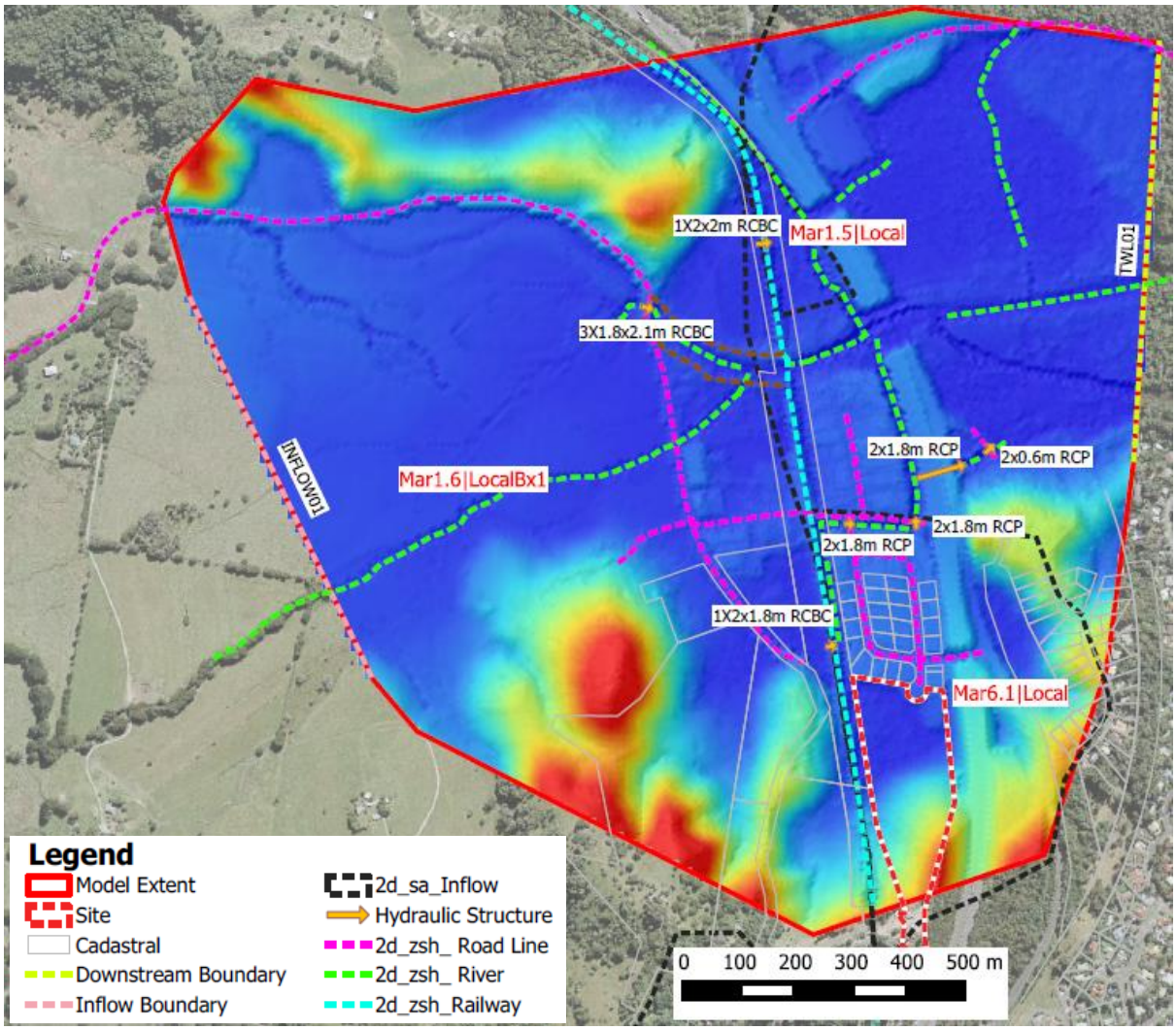

Figure 2 - TUFLOW Model Extents

2.2.2. Resolution and Time Step

To maintain stability in the TUFLOW model for all scenarios, a grid size of 4m and a time step of 2s were adopted. The grid size is based on model efficiency and size constraints for the model's extents.

2.2.3. Topography

The North Byron flood model (BSC 2021) was updated with the site survey and design data provided by the Client. The topography used is shown in Figure 3, Figure 4 and Figure 5.

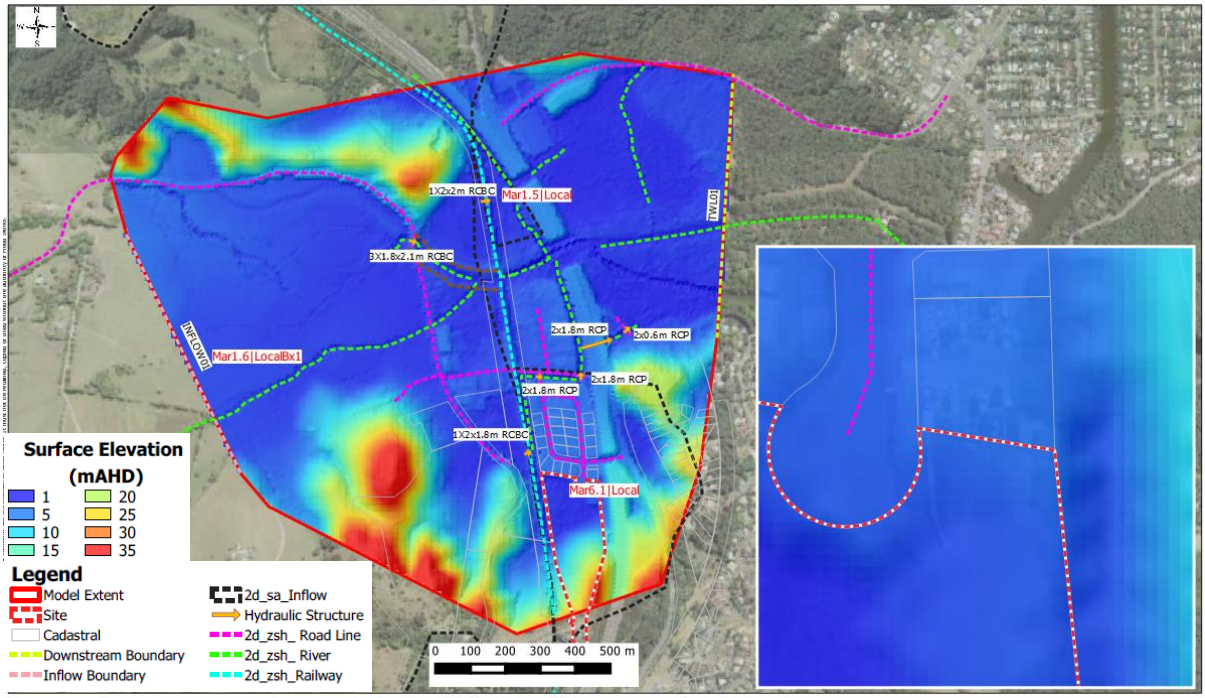

Figure 3 – Pre-existing Surface Elevation Data (2018 Survey i.e. No Fill)

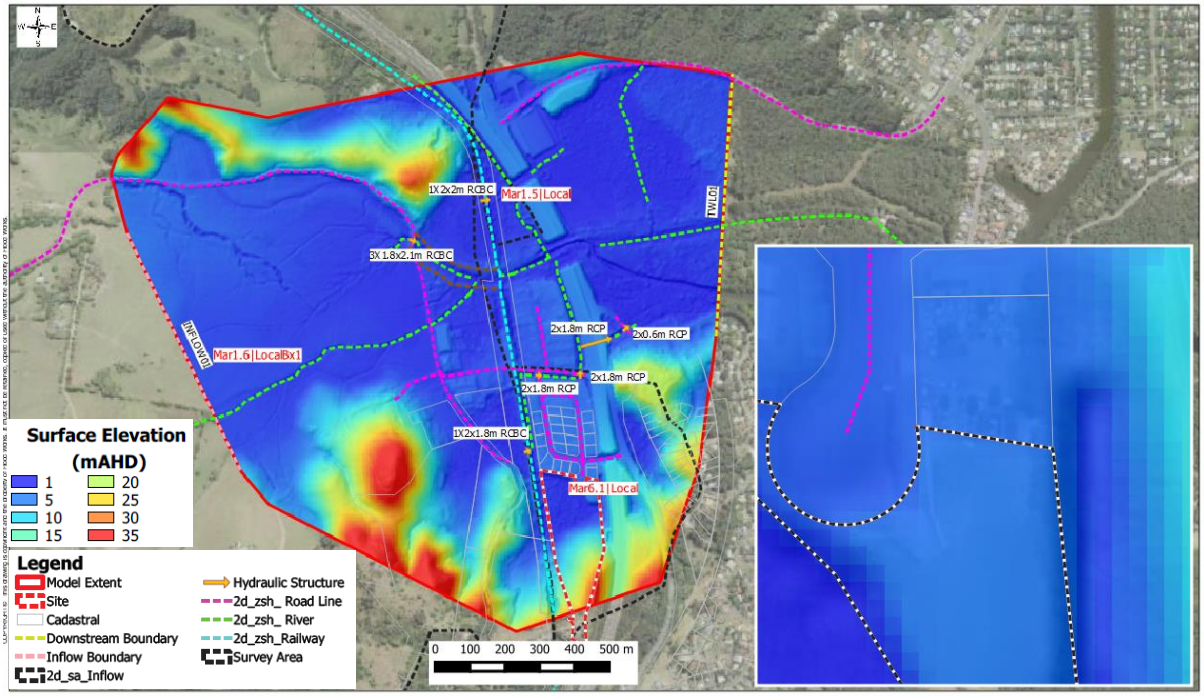

Figure 4 – Existing Surface Elevation Data (2021 Survey i.e. with fill)

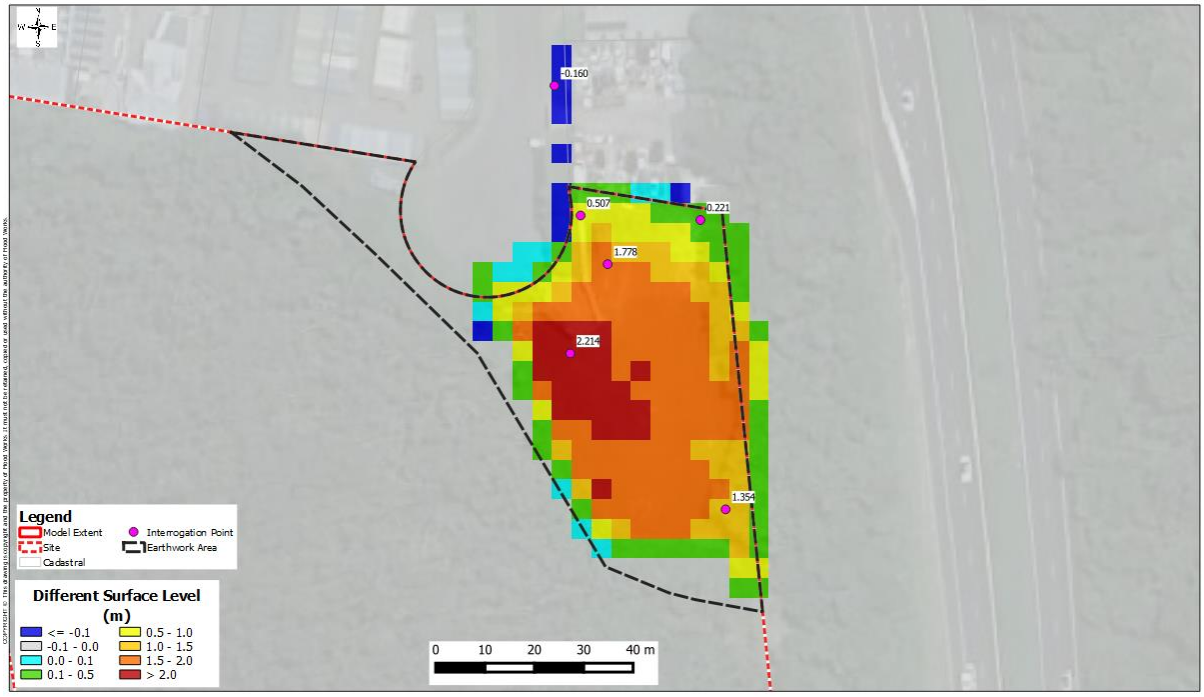

Figure 5 – Difference in Surface Level Between Existing Model and Pre-Existing Model

2.2.4. Roughness

Manning's roughness values were adopted from the BSC 2021 model and updated for the existing case, which represents the post-2018 earth fill only. Figure 6 shows the roughness values adopted for the existing case hydrodynamic model.

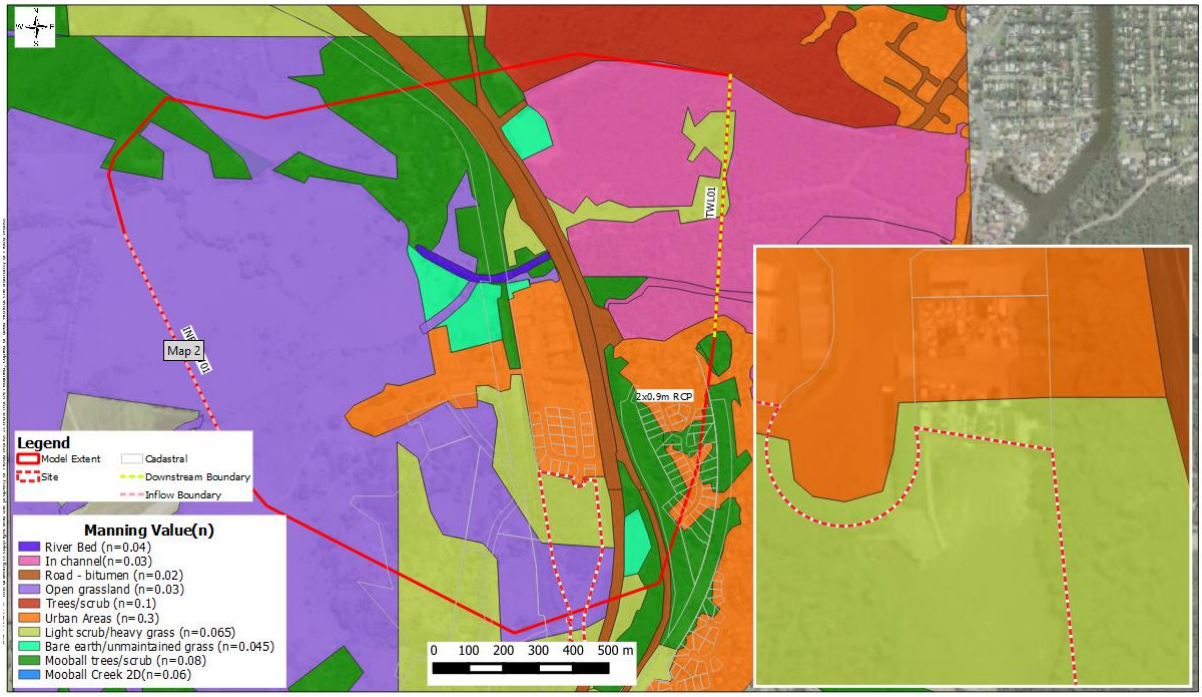

Figure 6 – Existing Case Roughness Map

2.2.5. Boundary Conditions

The regional upstream inflows and downstream rating curves were extracted from Council's TUFLOW model and used as the boundary conditions, with boundary locations shown in Figure 3 above.

2.3. TUFLOW Model Validation

A truncated TUFLOW model was developed to improve resolution and run times. The results from the truncated model were compared against the *North Byron flood model* (*BSC 2021)* for the 1%AEP design event. The truncated TUFLOW model compares well to the *North Byron flood model* (BSC 2021) for the 1% design event. Figure 7 shows the comparison of water levels between the truncated model and the *North Byron flood (BSC 2021)* TUFLOW model for the 1%AEP design event.

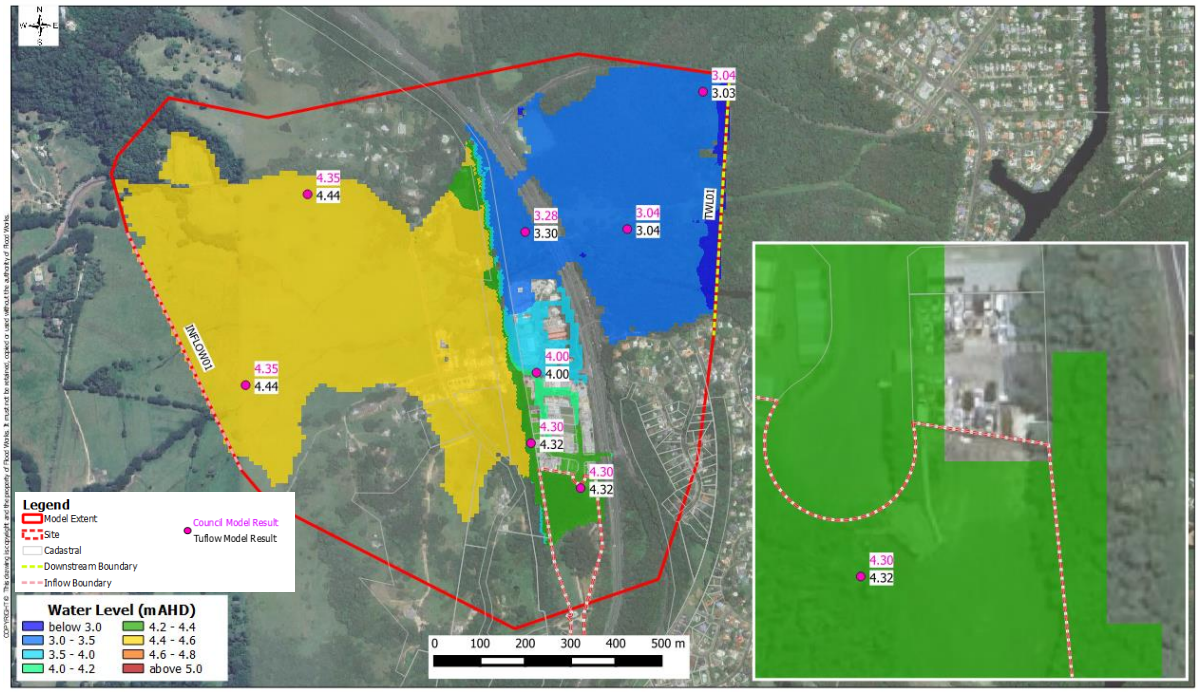

Figure 7 – Calibration Results for the 1% AEP design event

2.4. Pre-Existing Case

The Pre-Existing 1%AEP, 1%AEP_CC (0.2%AEP equivalent), and PMF peak water level, depth, velocity, and hazard are shown for the existing case in Figure 8 to Figure 19 below respectively.

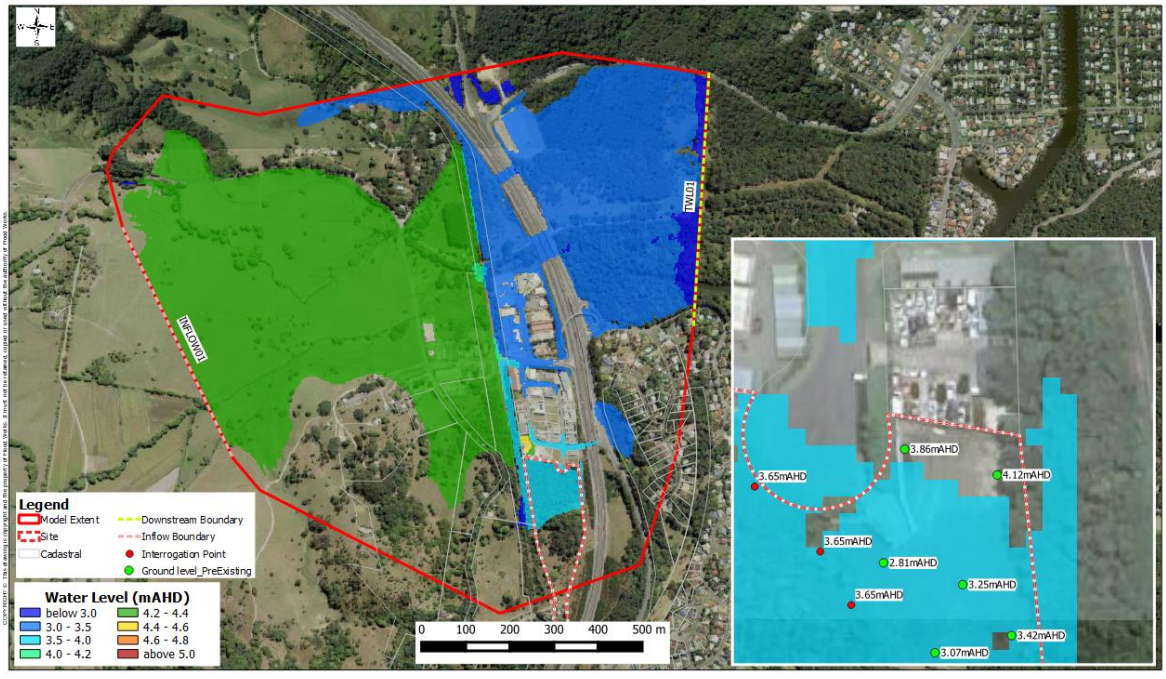

Figure 8 – Pre-Existing Maximum Water Level – 1% AEP

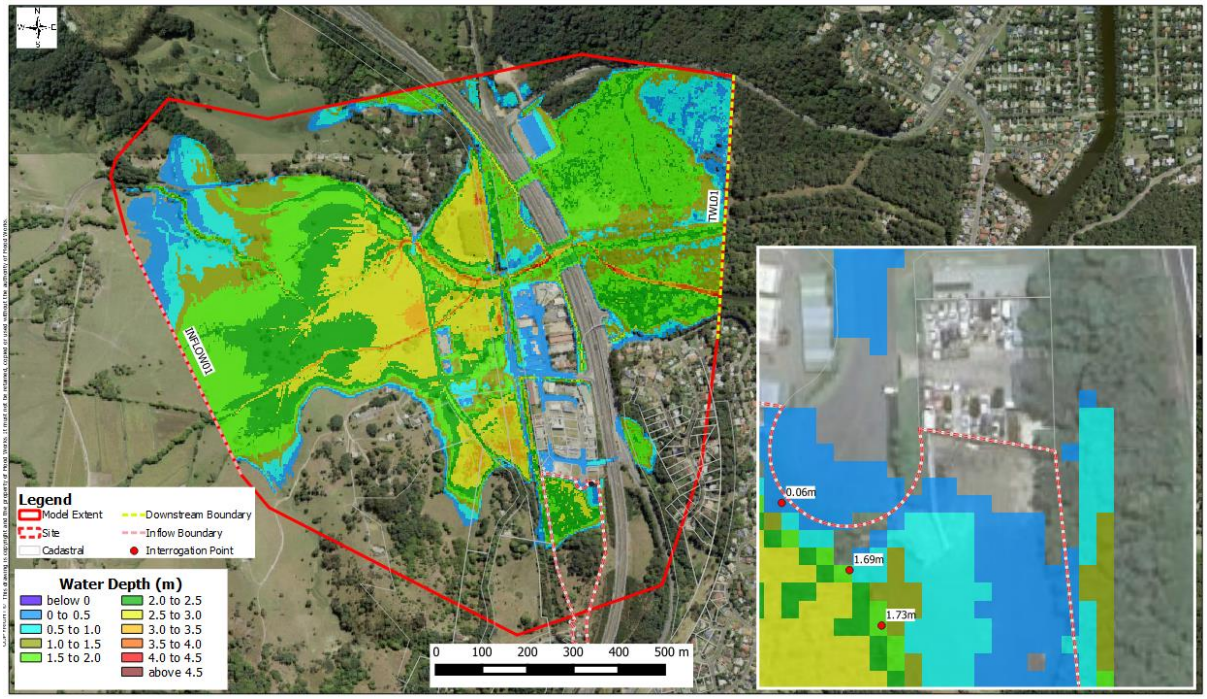

Figure 9 – Pre-Existing Maximum Depth – 1% AEP

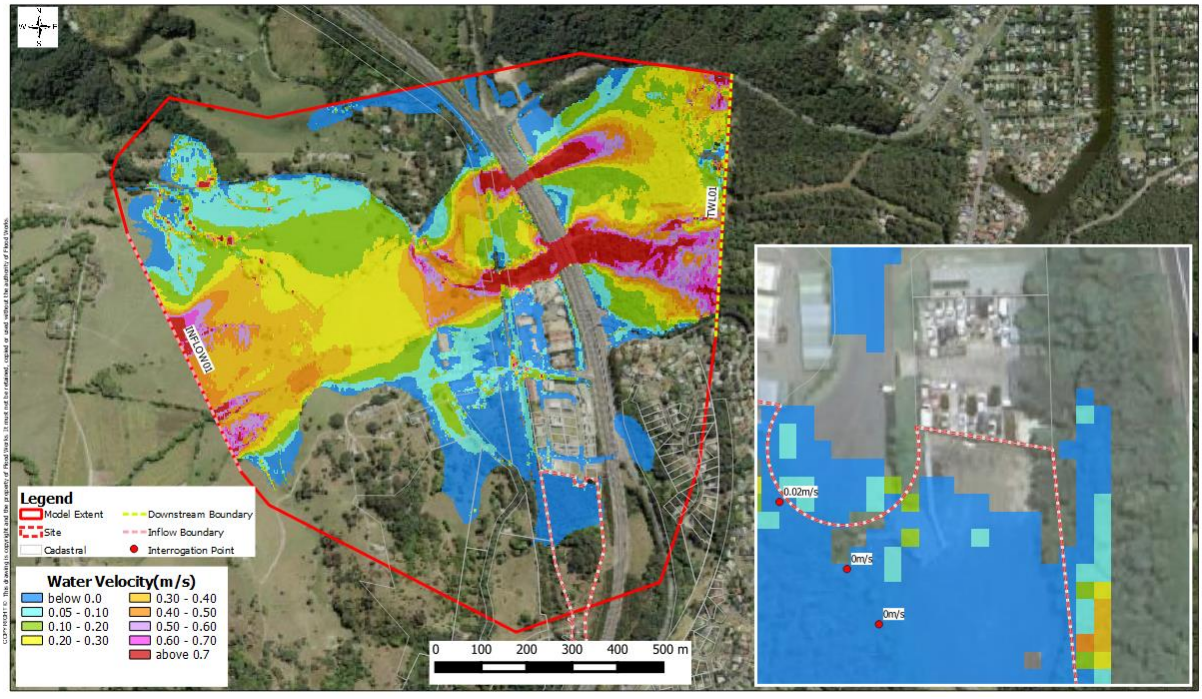

Figure 10 – Pre-Existing Maximum Velocity – 1% AEP

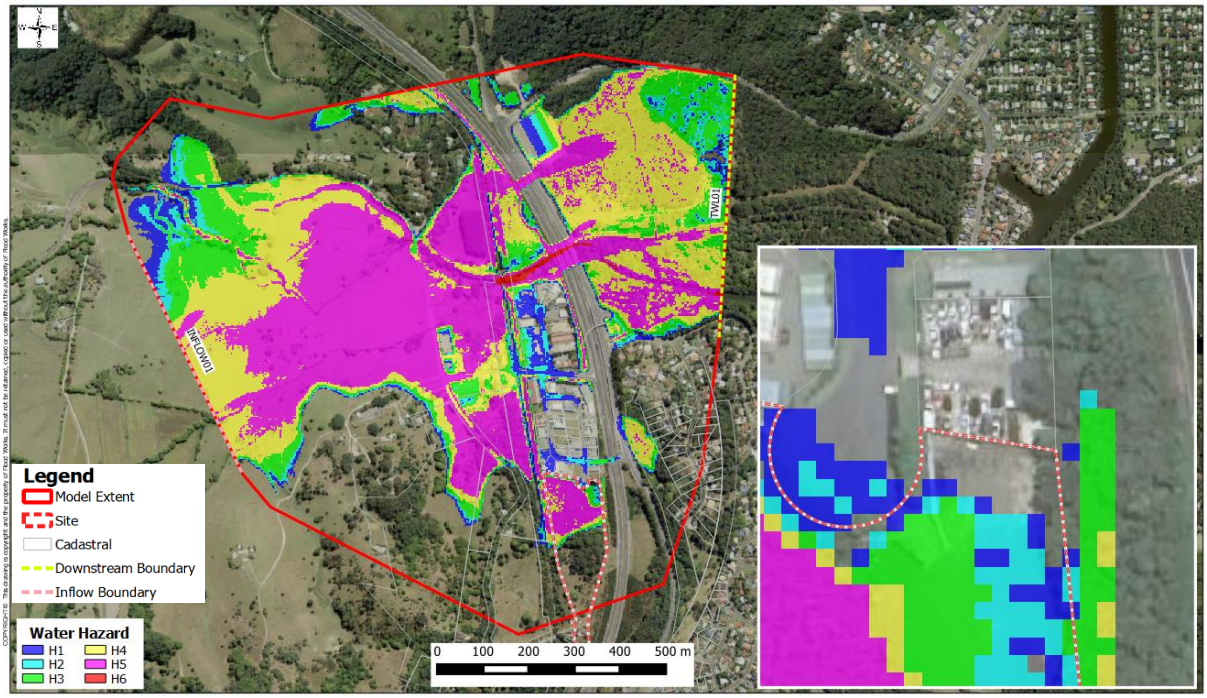

Figure 11 – Pre-Existing Maximum Flood Hazard – 1% AEP

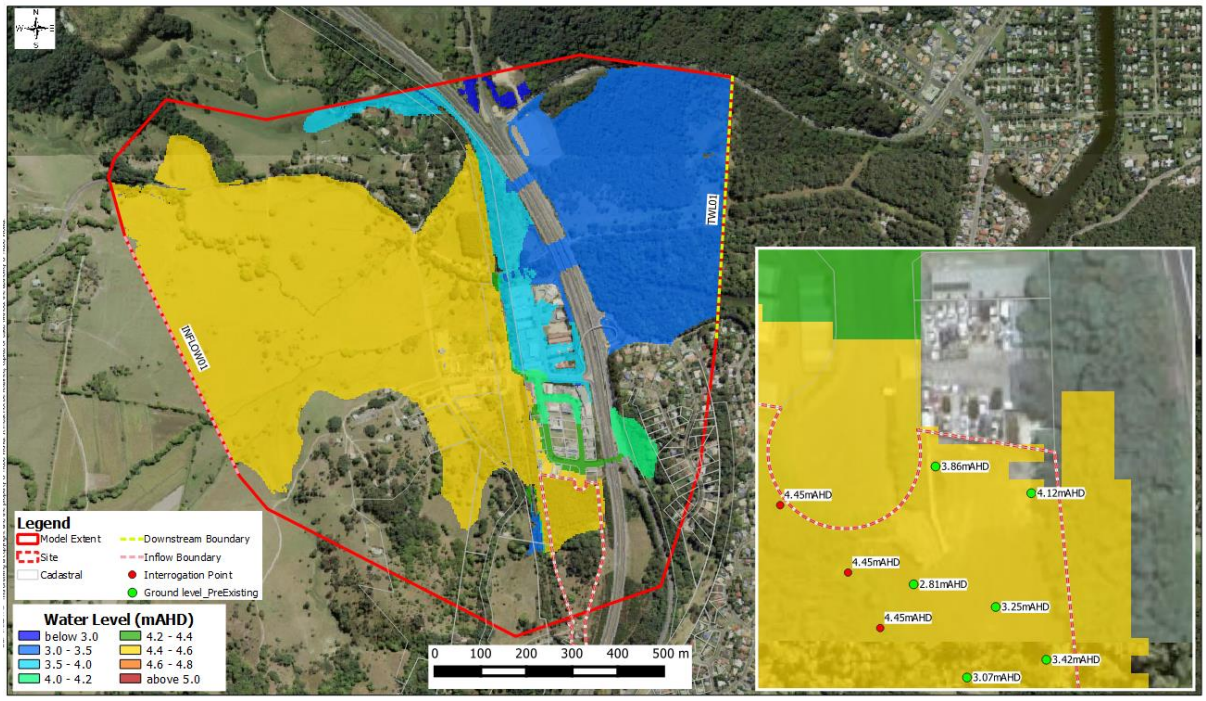

Figure 12 – Pre-Existing Maximum Water Level – 1% AEP_CC (0.2% AEP Equivalent)

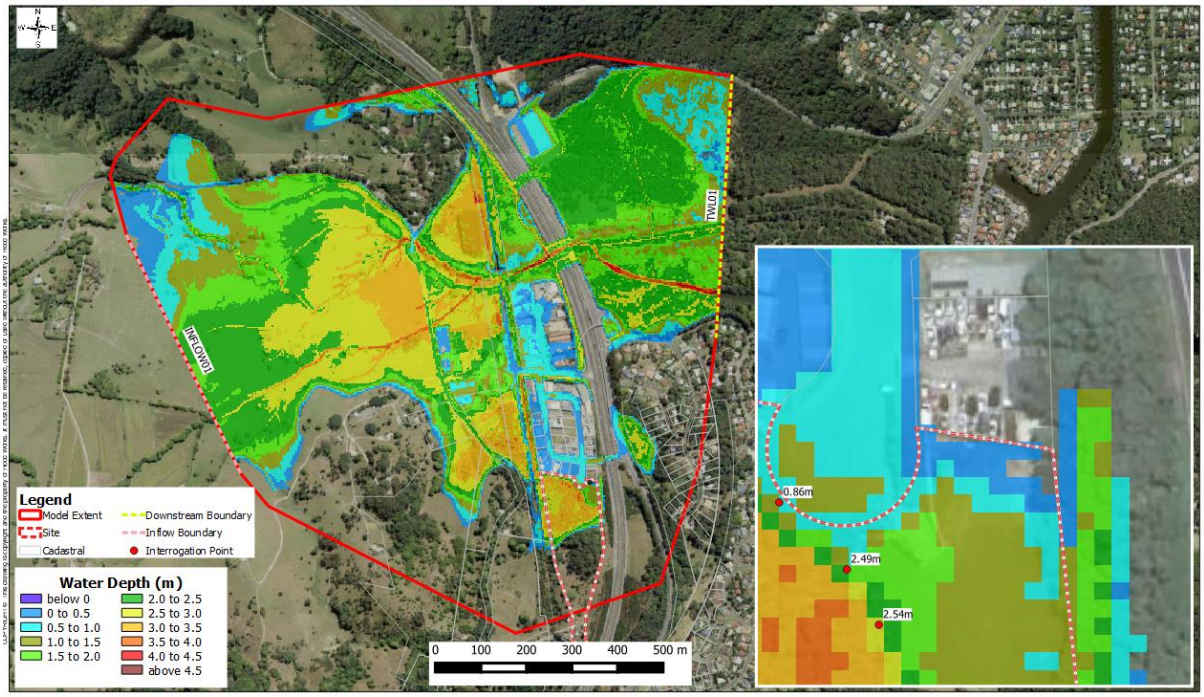

Figure 13 – Pre-Existing Maximum Depth – 1%AEP_CC (0.2% AEP Equivalent)

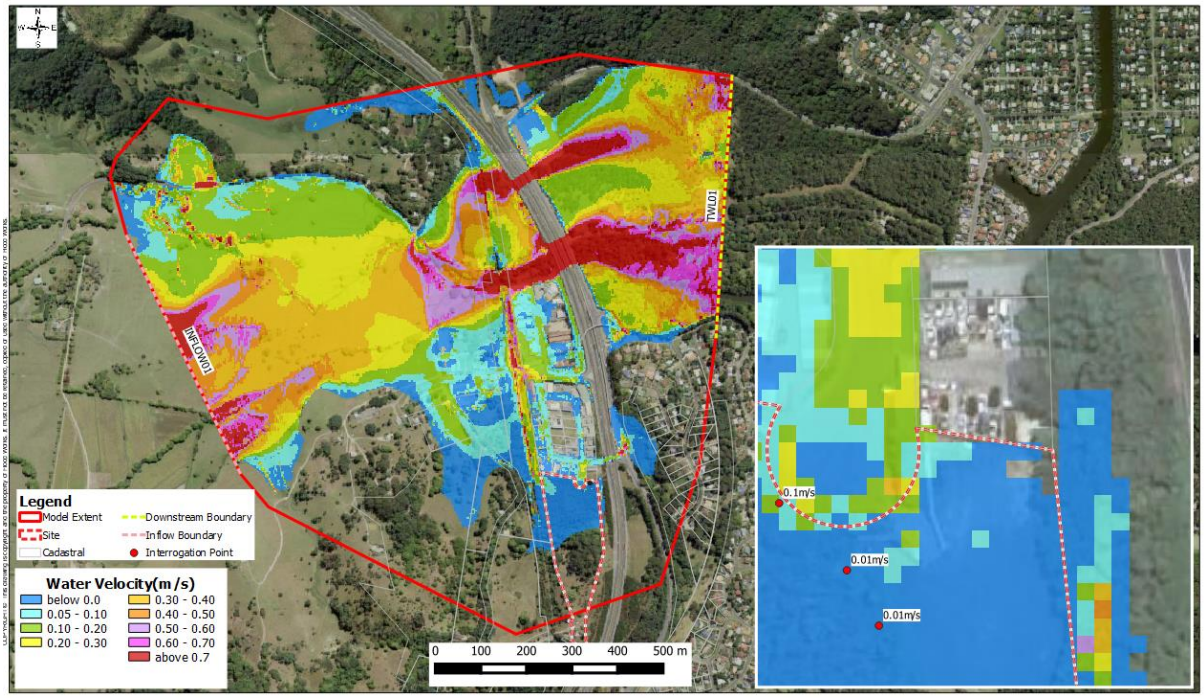

Figure 14 – Pre-Existing Maximum Velocity – 1% AEP_CC (0.2% AEP Equivalent)

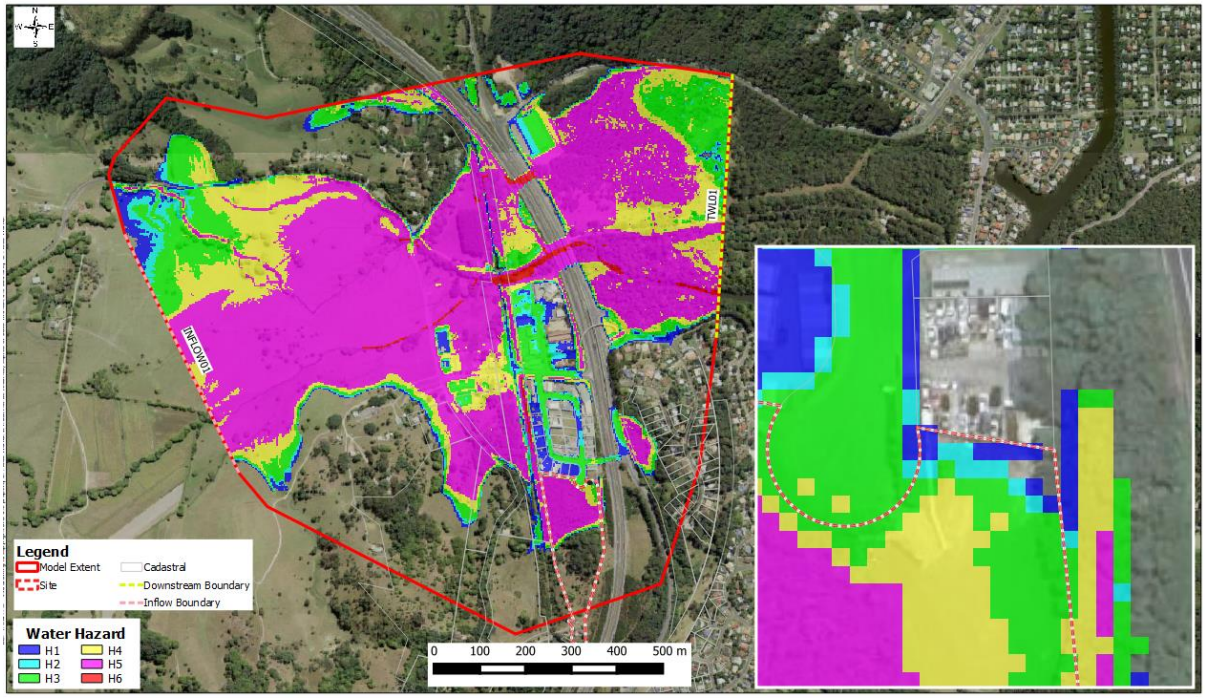

Figure 15 – Pre-Existing Maximum Flood Hazard – 1% AEP_CC (0.2% AEP Equivalent)

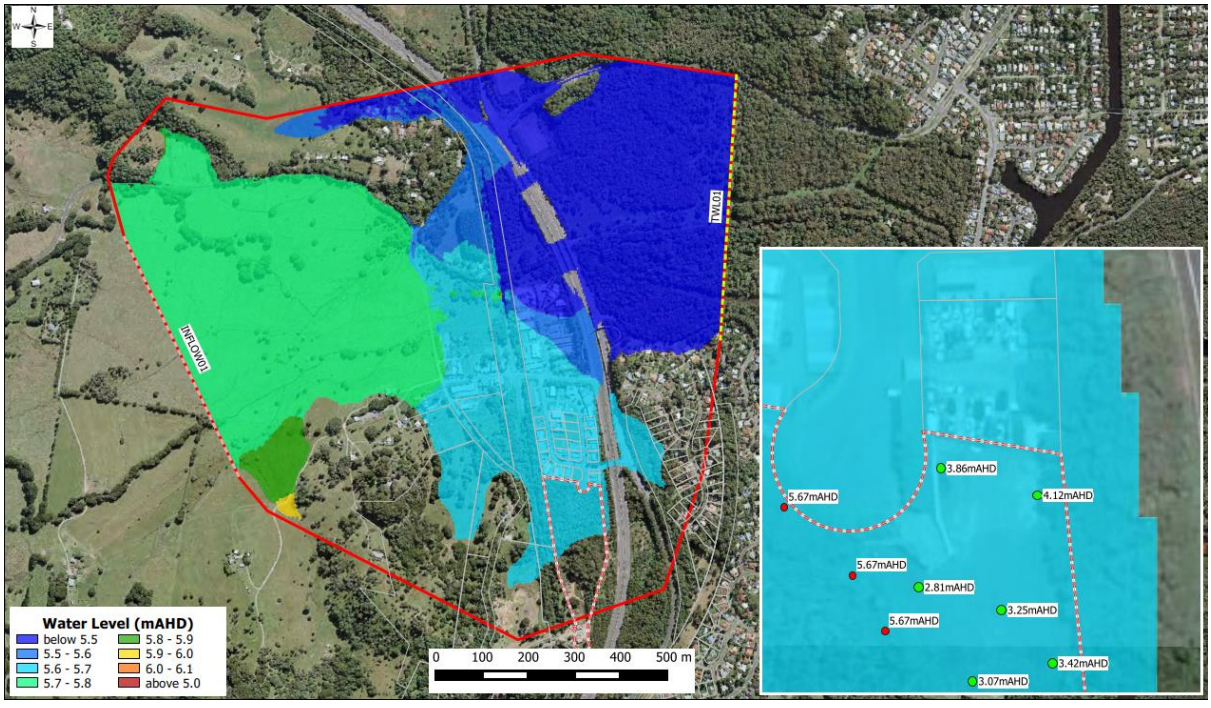

Figure 16 – Pre-Existing Maximum Water Level – PMF

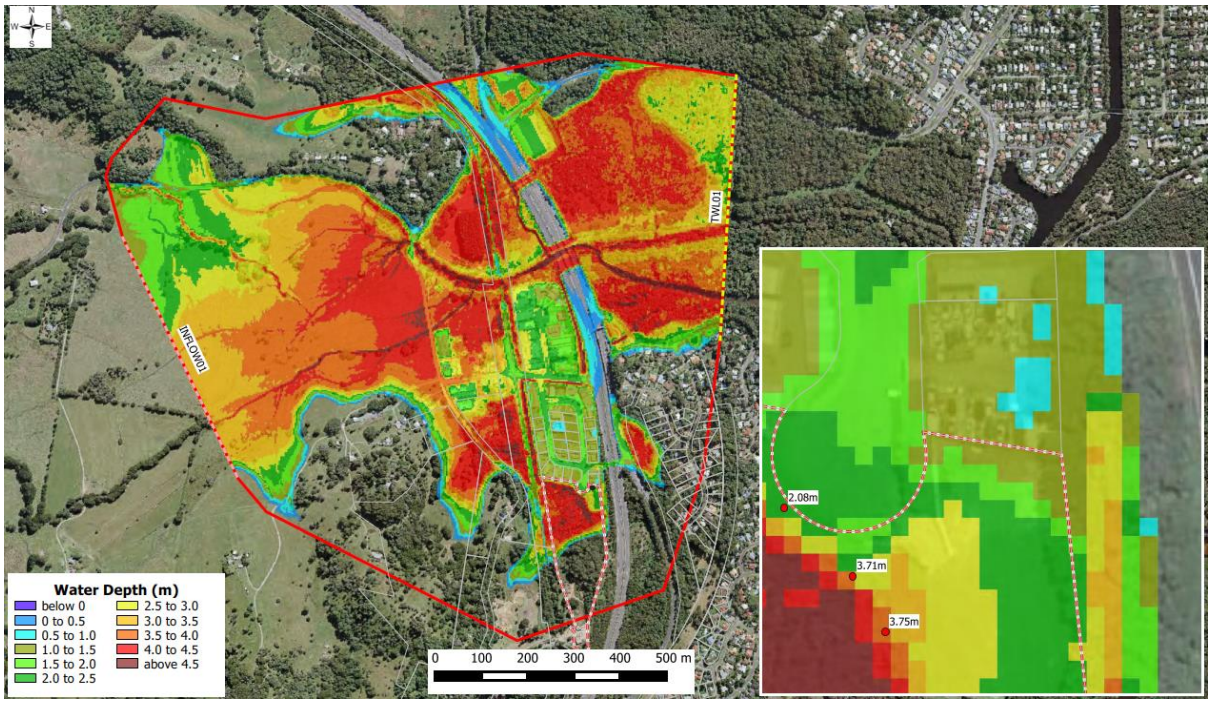

Figure 17 – Pre-Existing Maximum Depth – PMF

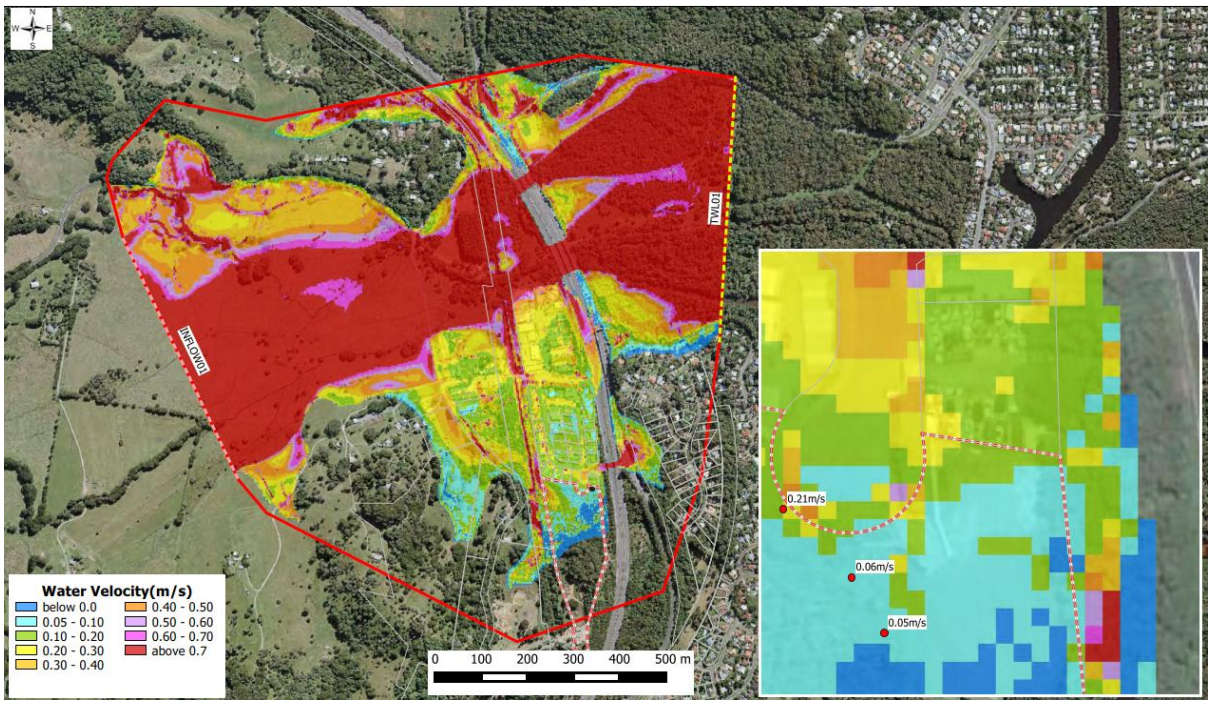

Figure 18 – Pre-Existing Maximum Velocity – PMF

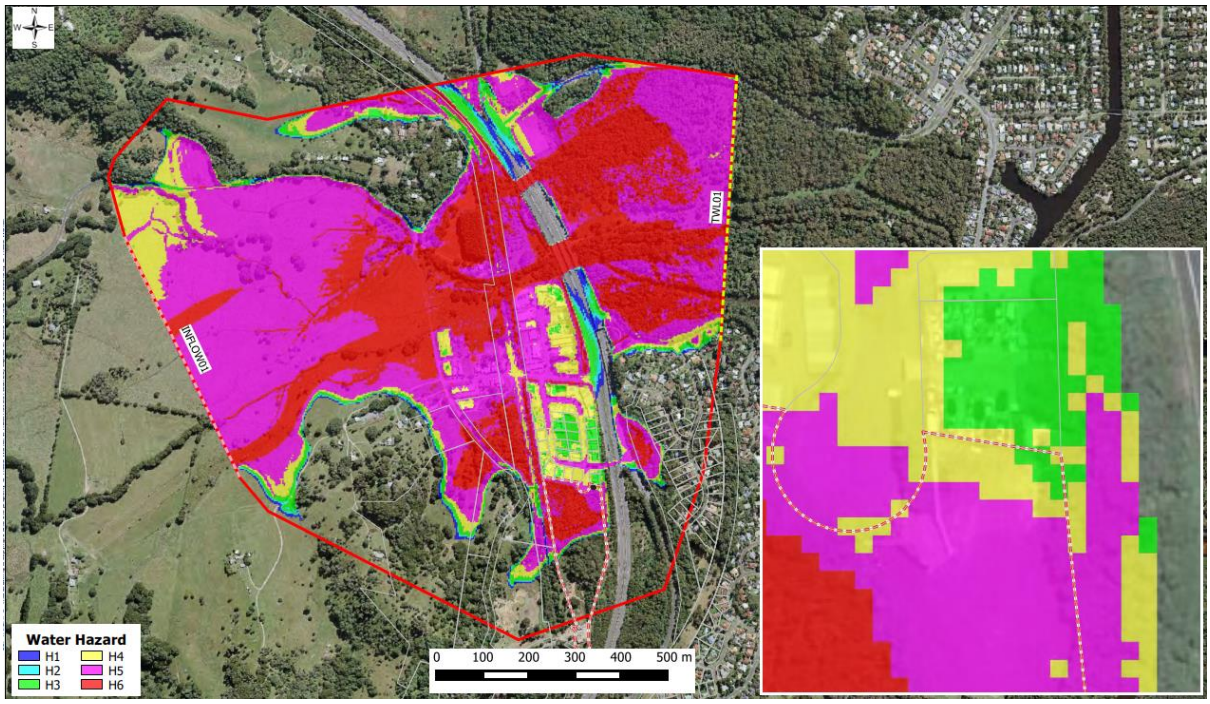

Figure 19 – Pre-Existing Maximum Hazard – PMF

2.5. Existing Case

The Existing Case 1%AEP, 1%AEP_CC (0.2%AEP equivalent) and PMF peak water level, depth, velocity, and hazard are shown in Figure 20 to Figure 31 below respectively.

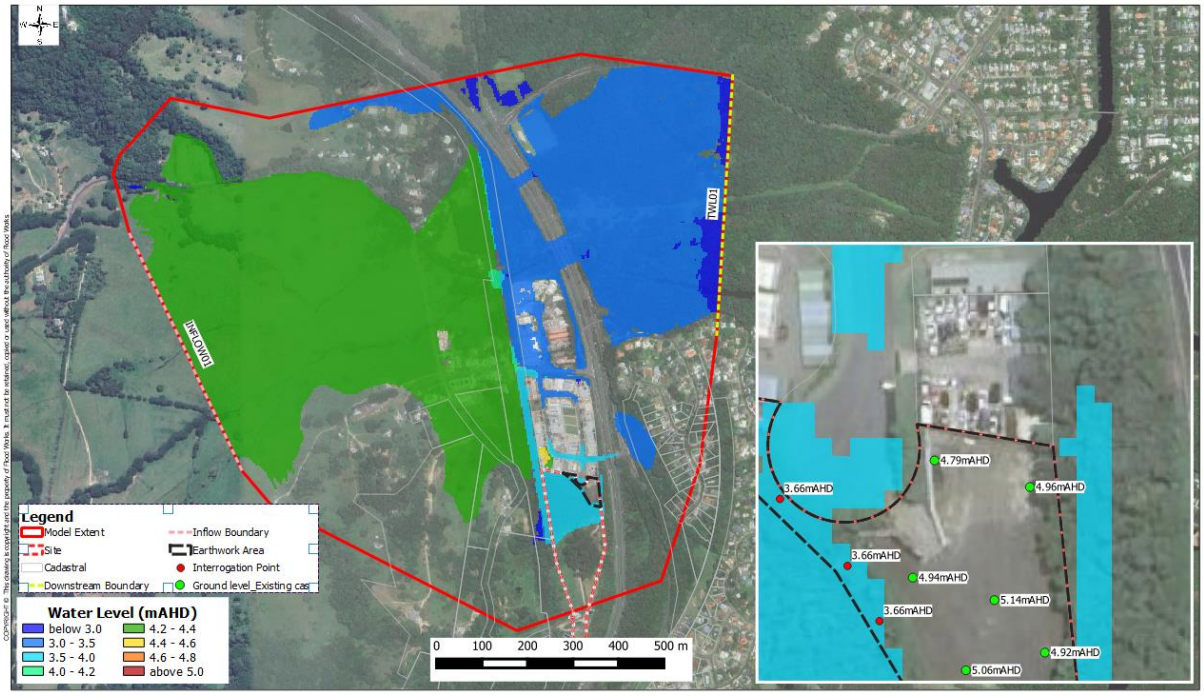

Figure 20 – Existing Maximum Water Level – 1% AEP

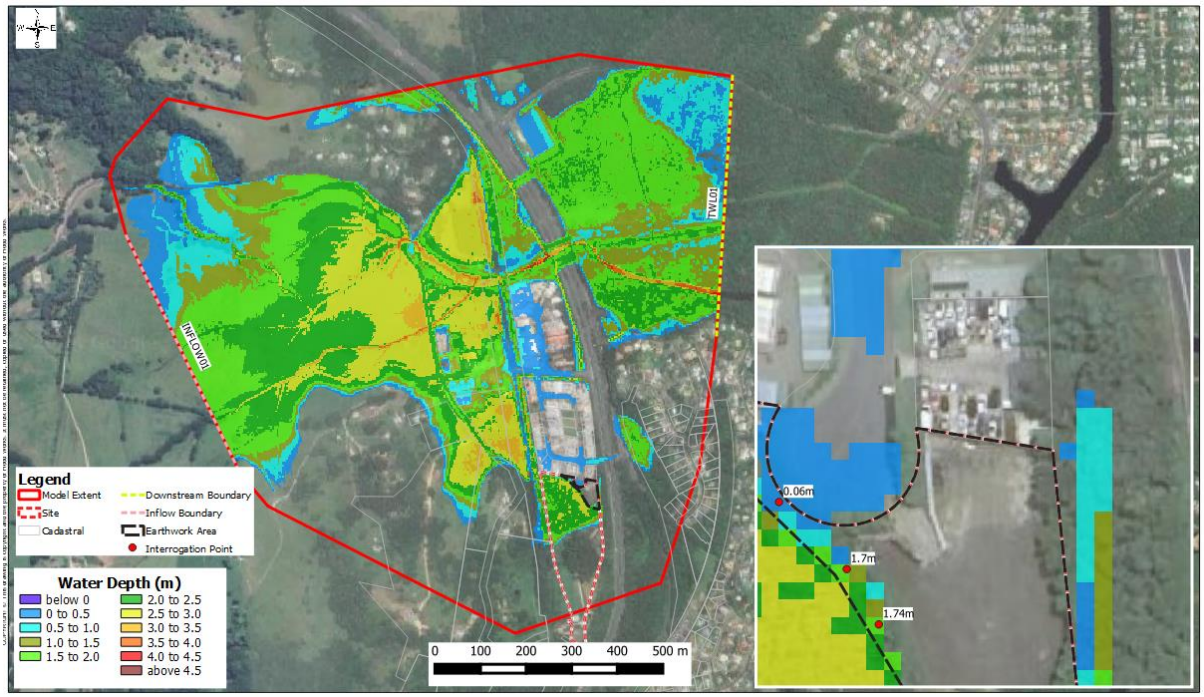

Figure 21 – Existing Maximum Depth – 1% AEP

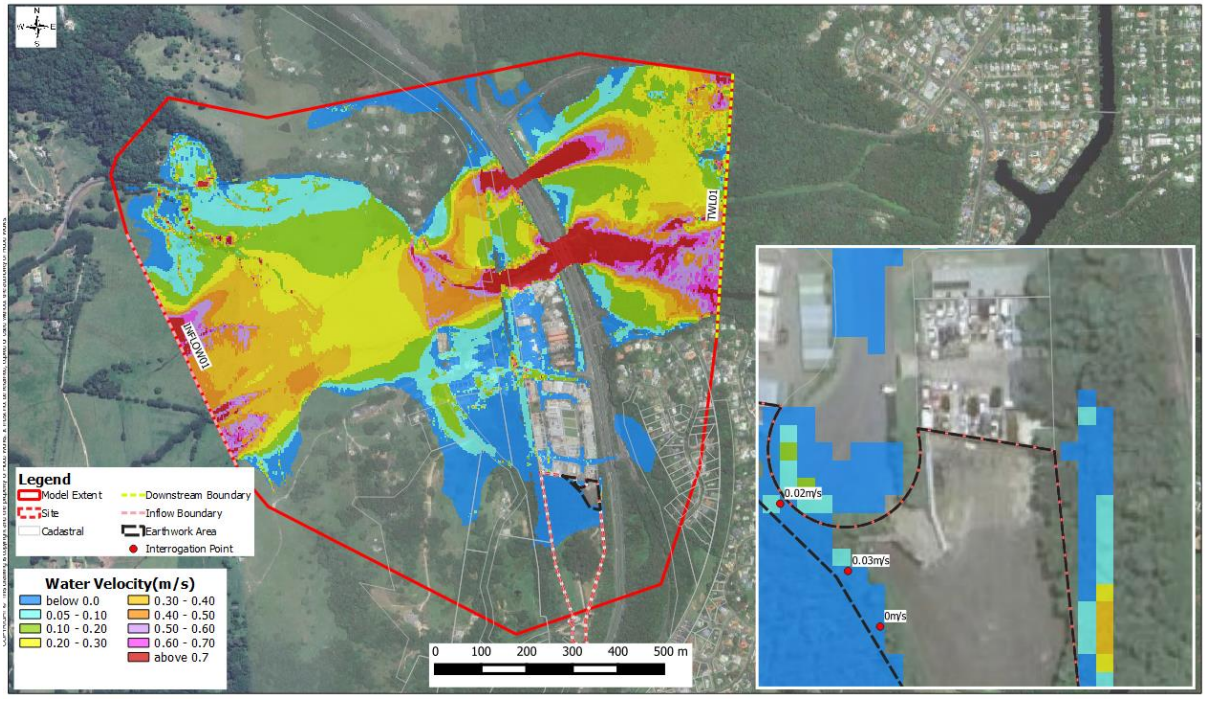

Figure 22 – Existing Maximum Velocity – 1% AEP

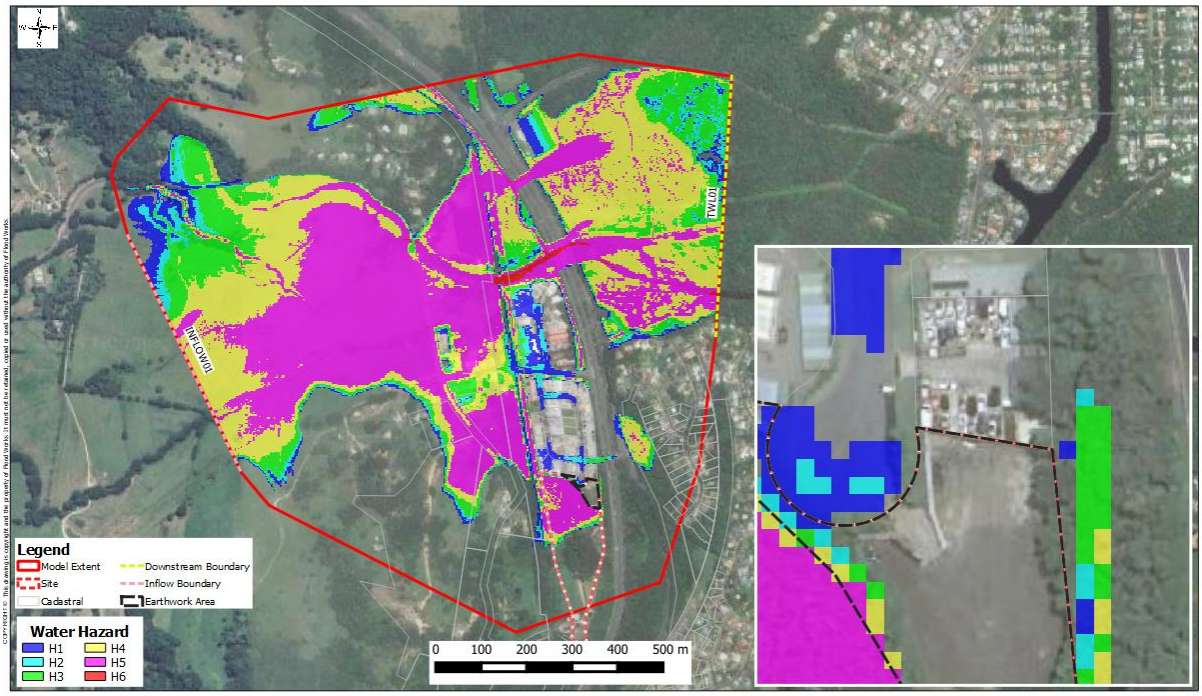

Figure 23 – Existing Maximum Flood Hazard – 1% AEP

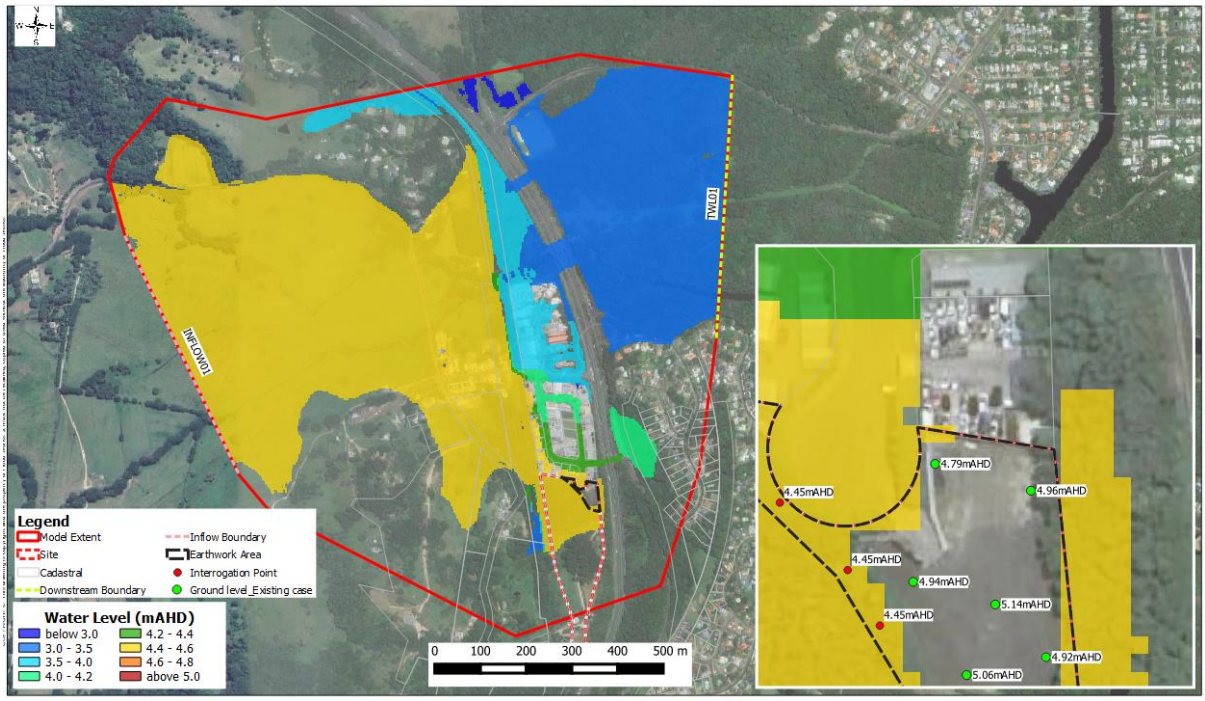

Figure 24 – Existing Maximum Water Level – 1% AEP_CC (0.2% AEP Equivalent)

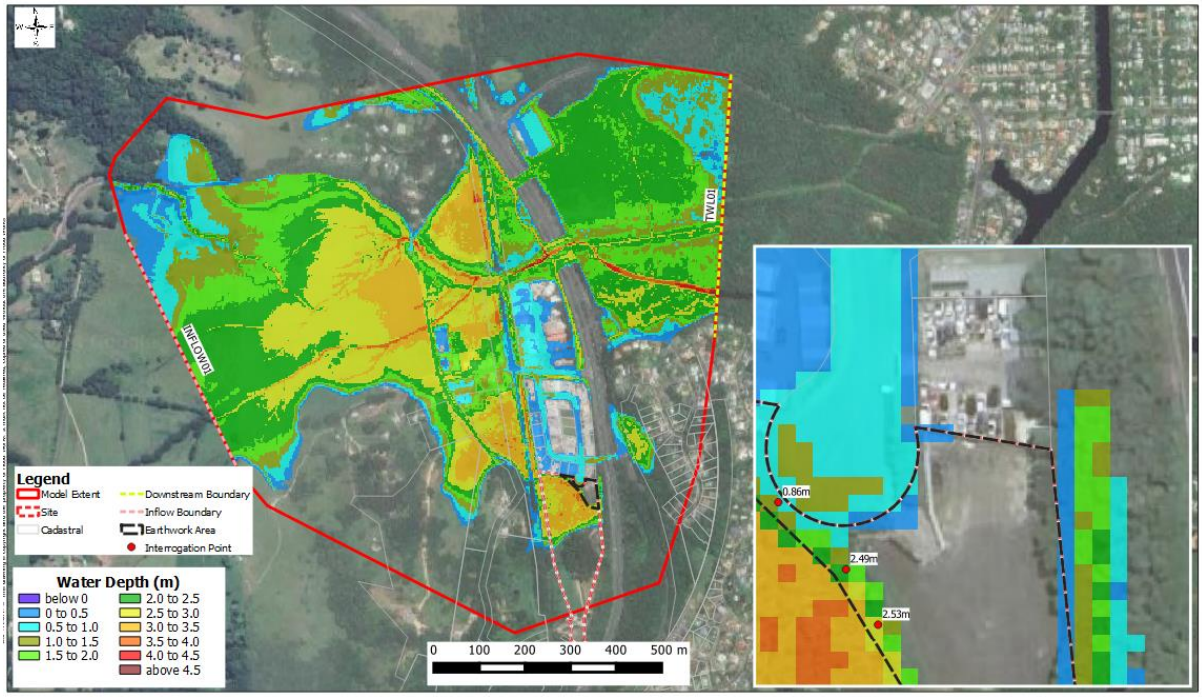

Figure 25 – Existing Maximum Depth – 1% AEP_CC (0.2% AEP Equivalent)

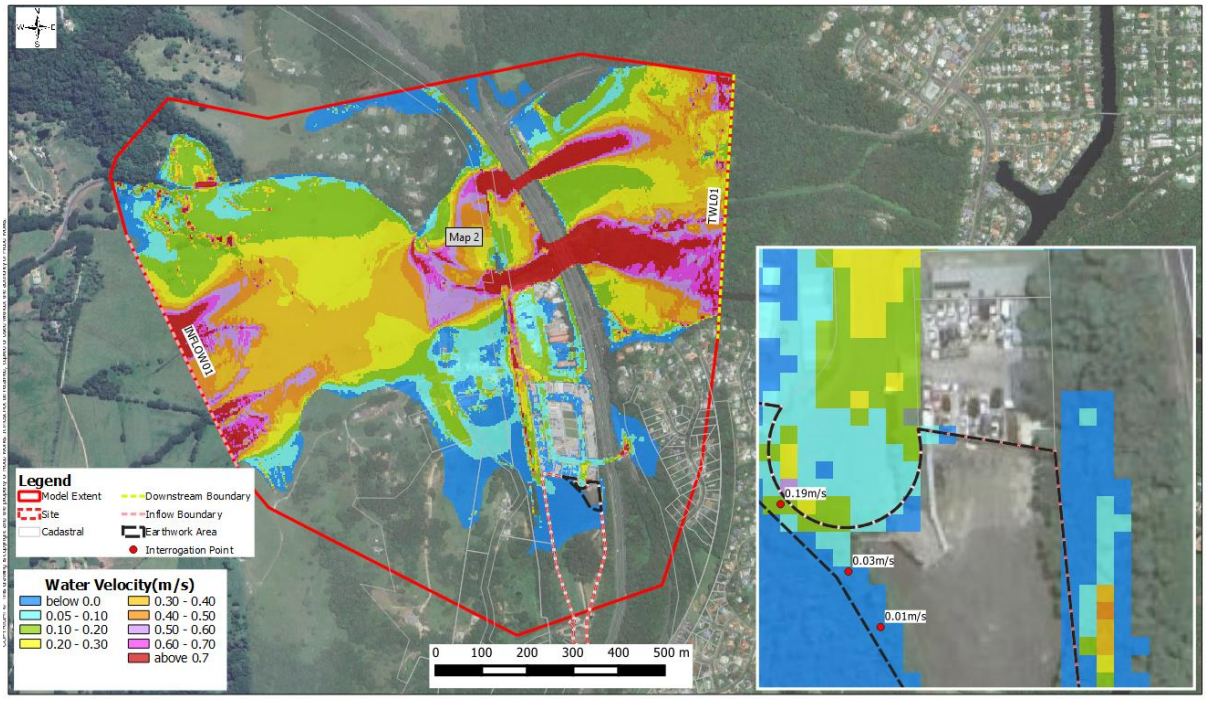

Figure 26 – Existing Maximum Velocity – 1% AEP_CC (0.2% AEP Equivalent)

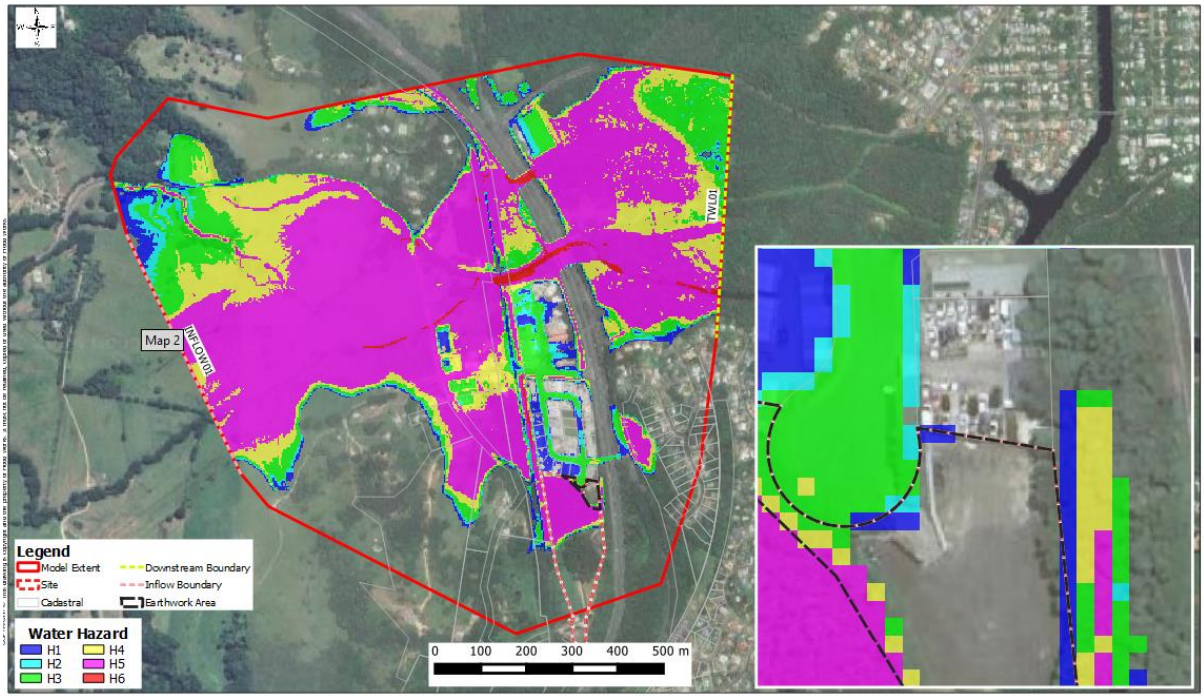

Figure 27 – Existing Maximum Flood Hazard – 1% AEP_CC (0.2% AEP Equivalent)

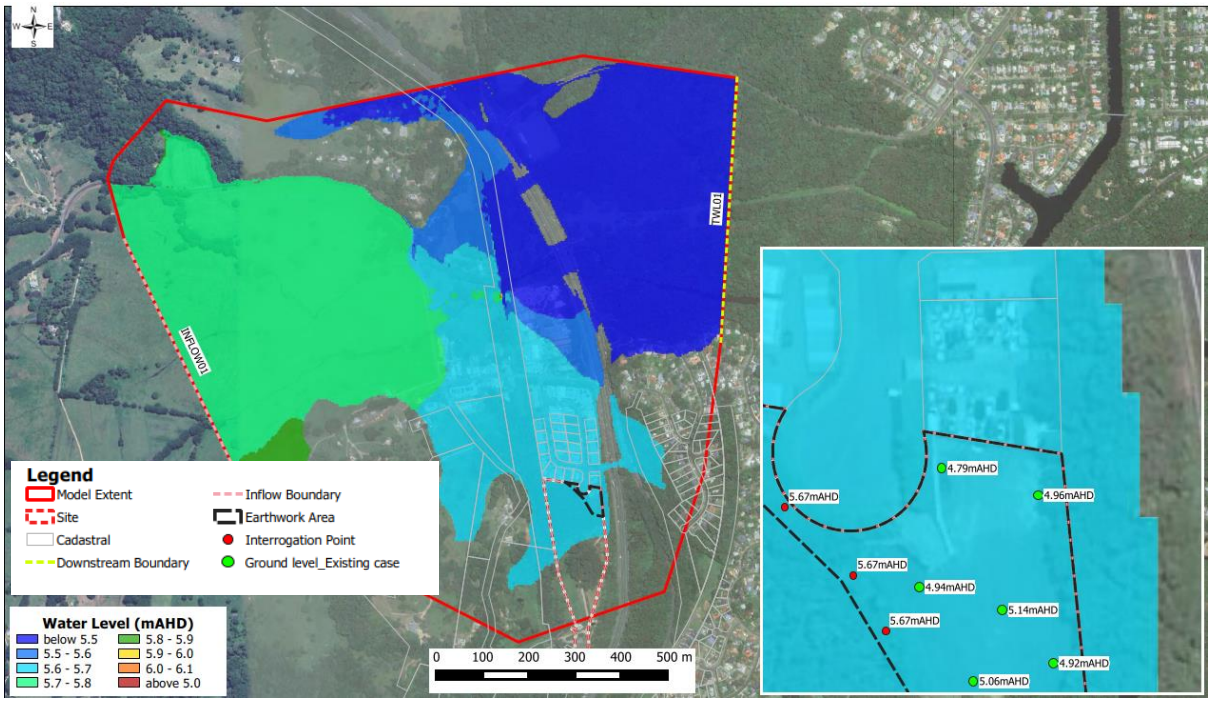

Figure 28 – Existing Maximum Water Level – PMF

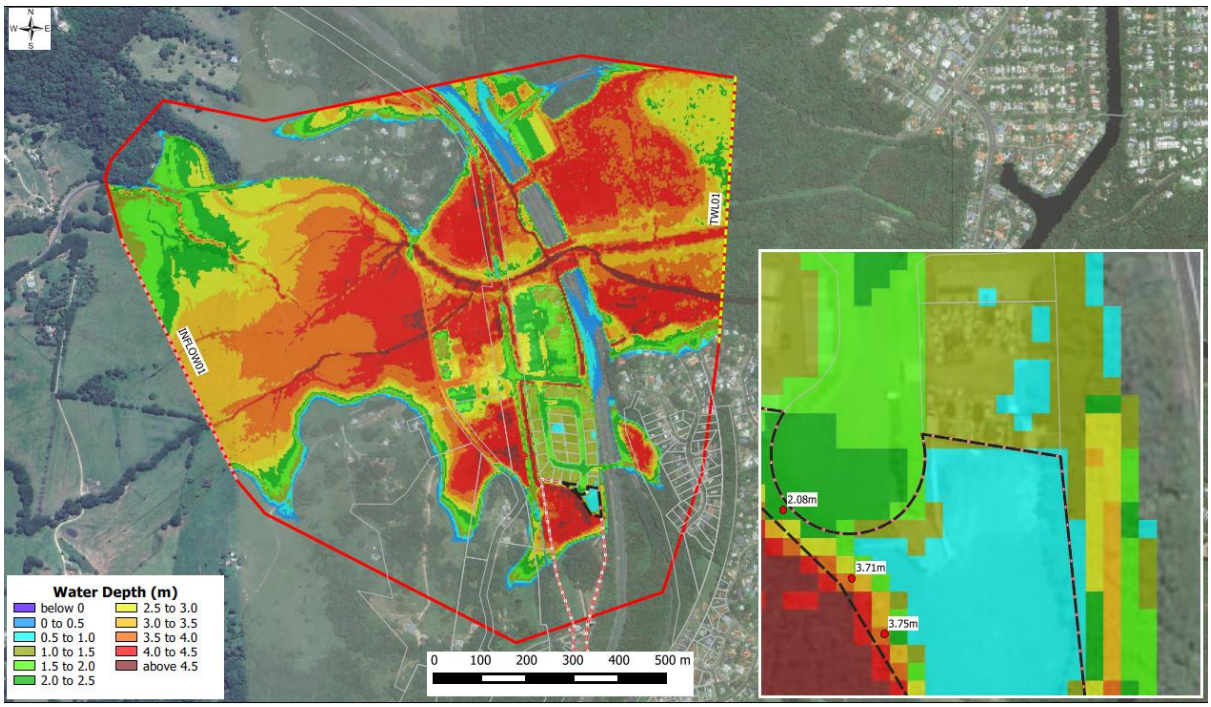

Figure 29 – Existing Maximum Depth – PMF

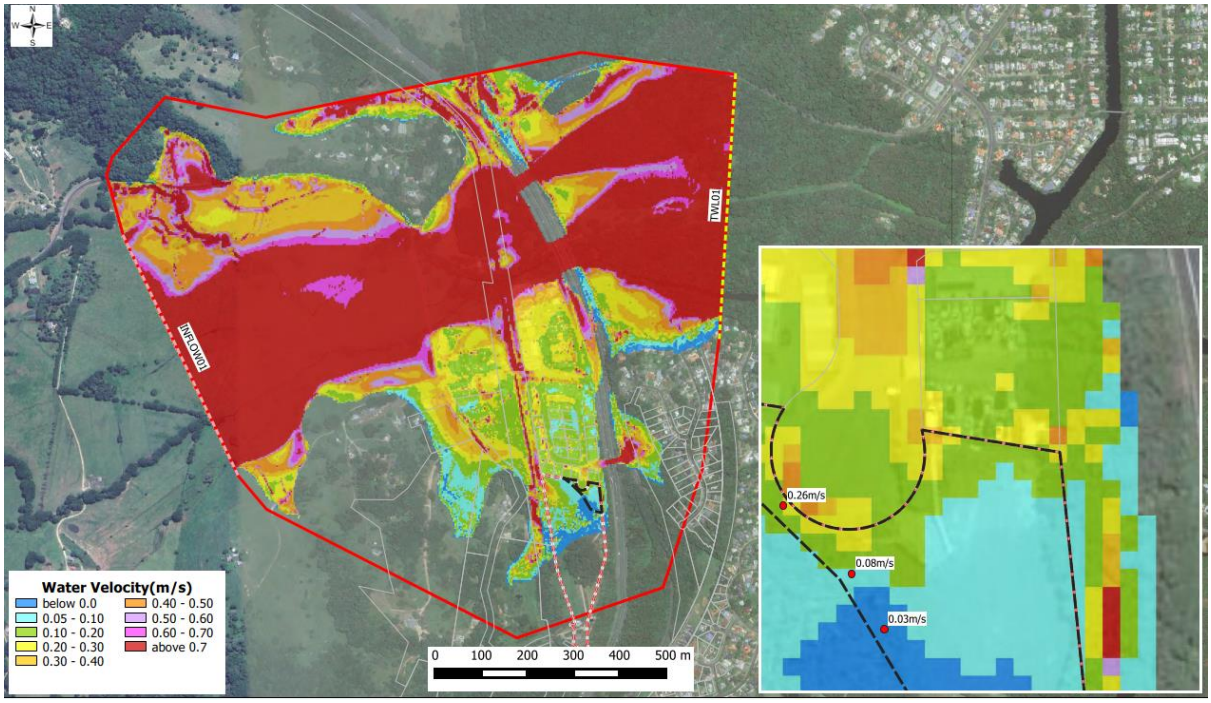

Figure 30 – Existing Maximum Velocity – PMF

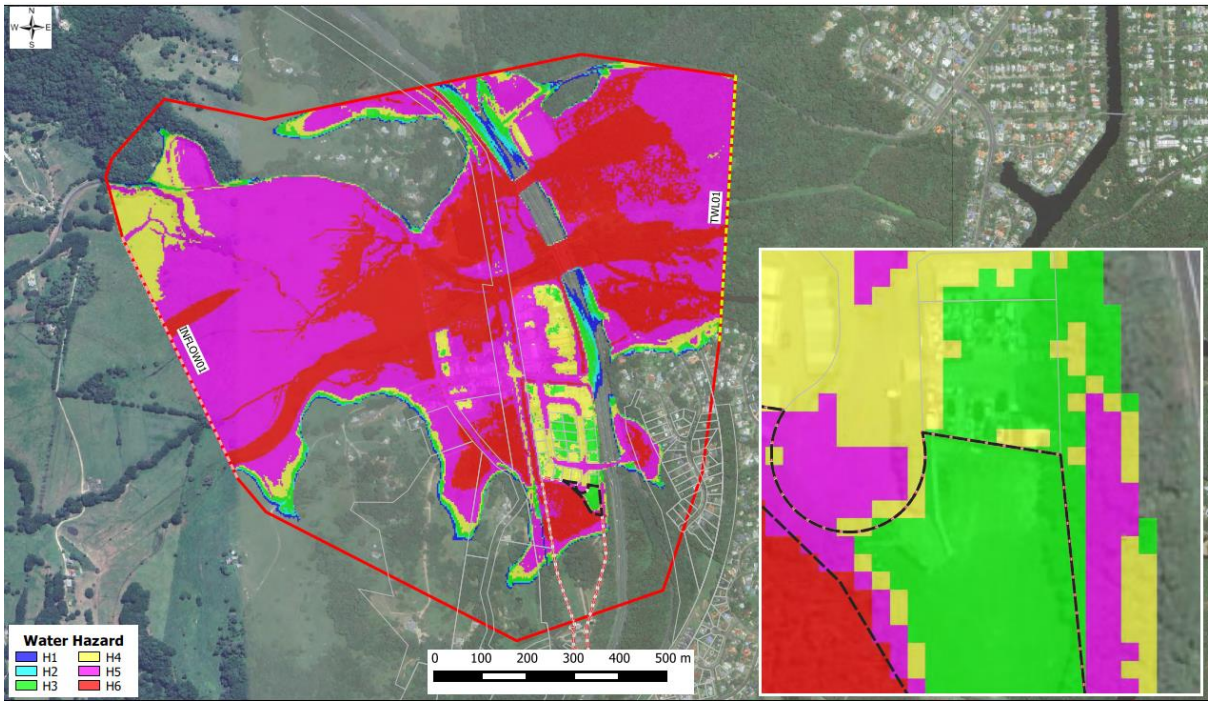

Figure 31 – Existing Maximum Hazard – PMF

2.6. Impact Assessment

A Hydraulic Impact Assessment (HIA) was undertaken to determine any potential impacts arising from the placement of fill on the subject site after 2018. This was performed by subtracting the maximum water levels and velocity associated with the existing case (i.e. 2021 survey) from the pre-existing case (i.e. 2018 survey) for the 1%AEP and 1% AEP_CC (0.2%AEP Equivalent) design events. The results of this afflux assessment are provided in Figure 32 to Figure 35 .

Afflux level less than 10mm and afflux velocity less than 0.1m/s are considered non-actionable.

The assessment results demonstrate no significant increases in peak water level or velocity associated with the current earthwork. The results show that the current earthwork will not impact peak water levels upstream or downstream of the subject site for the 1%AEP or the 1%AEP (0.2%AEP equivalent) design event.

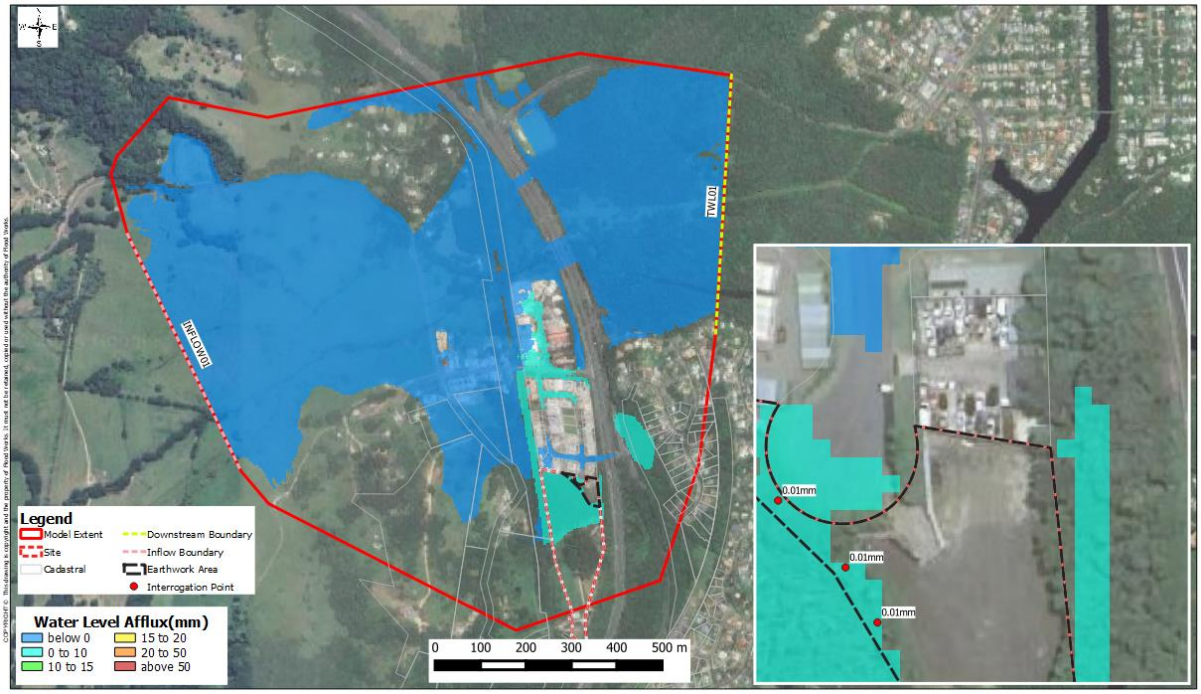

Figure 32 – Maximum Flood Level Afflux– 1% AEP

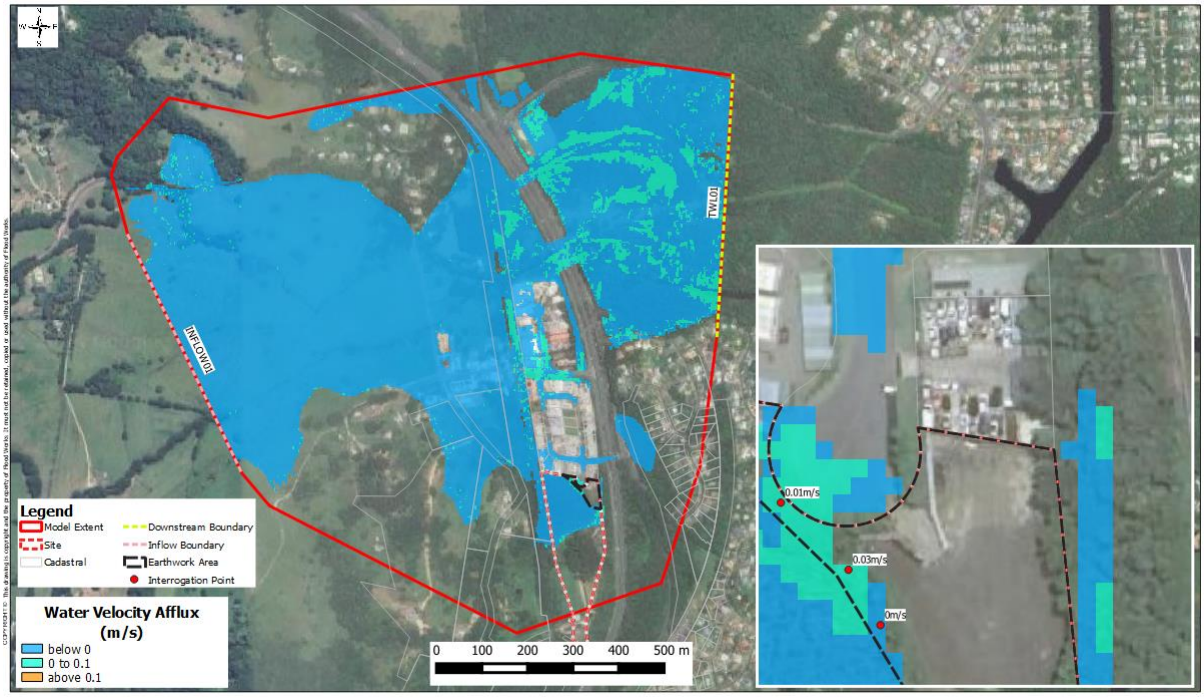

Figure 33 – Maximum Flood Velocity Afflux– 1% AEP

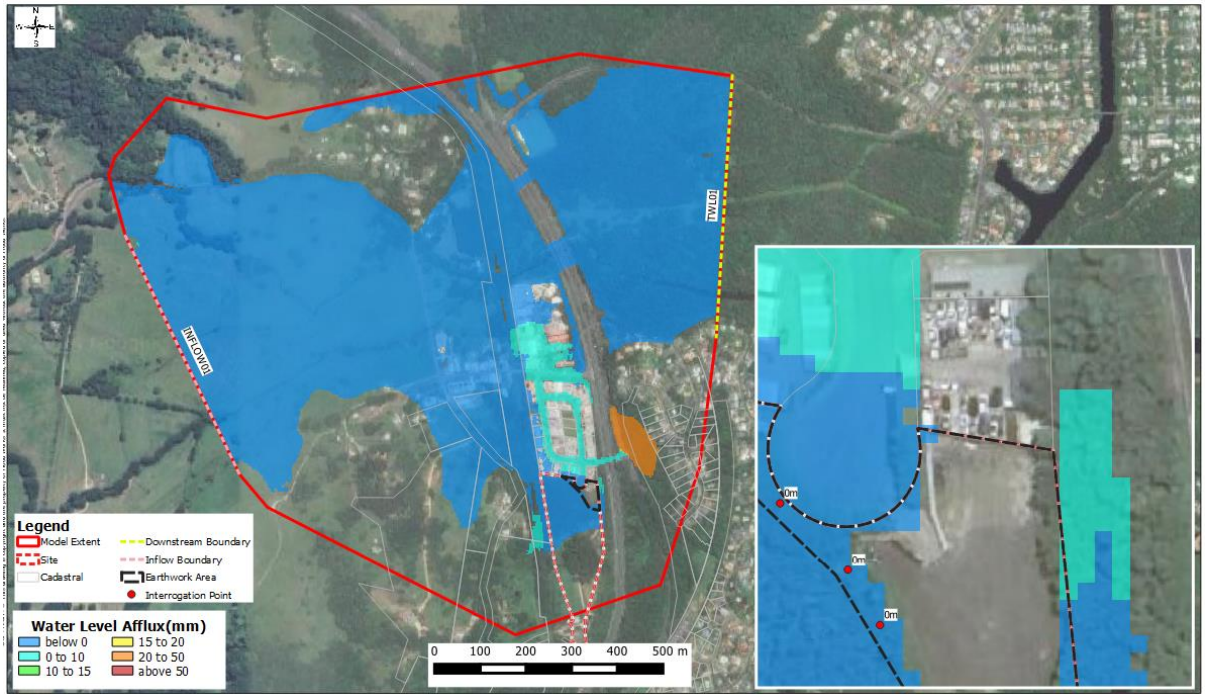

Figure 34 – Maximum Flood Level Afflux– 1% AEP_CC (0.2% AEP Equivalent)

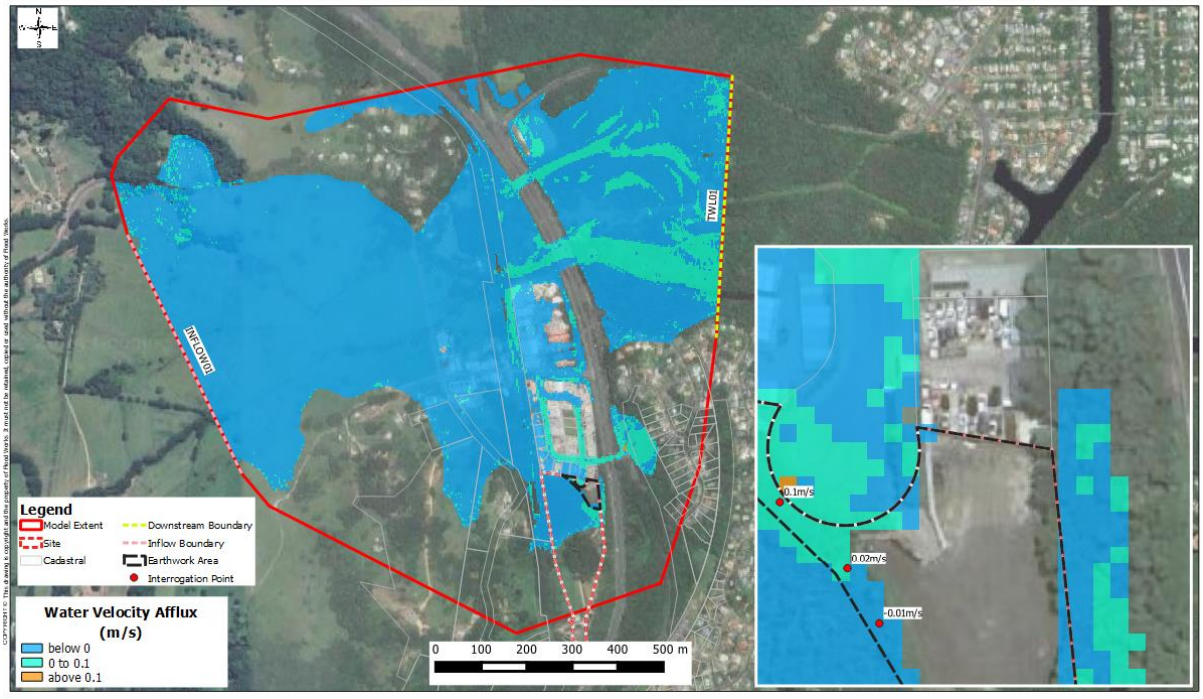

Figure 35 – Maximum Flood Velocity Afflux– 1% AEP_CC (0.2% AEP Equivalent)

3. BYRON LEP and DCP

The Byron Shire Council web map shows that a portion of the site is mapped "Fill Exclusion Zone" (Figure 36), with a small area generally consistent with the DA-approved portion of the site free of this constraint. Impacts of rezoning within any part of the "Fill Exclusion Zone" have been addressed and justified in having regard to LEP 2014 cl 5.21 (Table 1) and draft DCP 2014 – Chapter C2 – Areas Affected by Flood (Table 2).

Figure 36 – Fill Exclusion Zone

Table 1 Byron LEP 2014

BYRON Local Environment Plan (LEP) 2014	Comply?	Comment
5.21 Flood Planning		
(1) The objectives of this clause are as follows—		
(1)(a) to minimise the flood risk to life and property associated with the use of land,	Y	No Change
(1)(b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,	Y	1%AEP and 1%AEP_CC produced no impact
(1)(c) to avoid adverse or cumulative impacts on flood behaviour and the environment,	Y	1%AEP and 1%AEP_CC
(1)(d) to enable the safe occupation and efficient evacuation of people in the event of a flood.	N/A	
(2) Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development—	Y	Finished level of the fill pad is greater than the 1%AEP_CC
(2)(a) is compatible with the flood function and behaviour on the land,	Y	
(2)(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties,	Y	1%AEP and 1%AEP_CC
(2)(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood,	N/A	
(2)(d) incorporates appropriate measures to manage risk to life in the event of a flood,	N/A	
(2)(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.	N/A	Not near watercourse
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters—		
(3)(a) the impact of the development on projected changes to flood behaviour as a result of climate change,	Y	1%AEP and 1%AEP_CC
(3)(b) the intended design and scale of buildings resulting from the development,	N/A	
(3)(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	N/A	

(3)(d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	N/A	

Table 2 Byron DCP 2014

Byron Shire Council DCP 2014 - Chapter C2 Areas Affected By Flood	**Comply?**	**Comments**
Commercial and Industrial floor levels are generally required to achieve the Projected 2050 Flood Planning Level. Where this cannot occur, Council will consider flood roofing and emergency storage above the Projected 2050 Flood Planning Level to minimise damage that may occur during flooding (refer to sections C2.3.4 Flood Proofing and C2.3.5 Special Provisions).	Y	Fill Pad is greater than the 1%AEP_CC (0.2%AEP Equivalent)

4. Summary

Floodworks have completed a Hydraulic Impact Assessment for the earth fill placed on 40 The Tunnell Road, Billinudgel (the subject site) post 2018.

A truncated flood model was developed using upstream and downstream boundary conditions, roughness values and topography derived from the *North Byron Flood* TUFLOW flood model (BSC 2021). The truncated model was calibrated successfully to the North Byron flood model 2021.

The pre-existing case used the 2018 ground survey, whilst the existing case used the 2021 survey.

The assessment results demonstrate no changes in peak water levels greater than 1mm or peak water velocity greater than 0.1m/s associated with the current earthwork on the subject site for 1%AEP and 1%AEP_CC (0.2%AEP equivalent) design events.

The current earthwork will not significantly impact the pre-existing hydraulic function of the Marshalls Creek floodplain upstream or downstream of the subject site.

The fill pad has been constructed in accordance with Byron Shire Council Local Environment Plan (LEP., 2014 section 5.21, and the Development Control Plan (DPC) 2014, -Chapter C2 Areas Affected by Flood.

5. References

- *North Byron Flood Model (Byron Shire Council 2021)*
- Australian Rainfall and Runoff 2019
- New South Wales Floodplain Development Manual 2005

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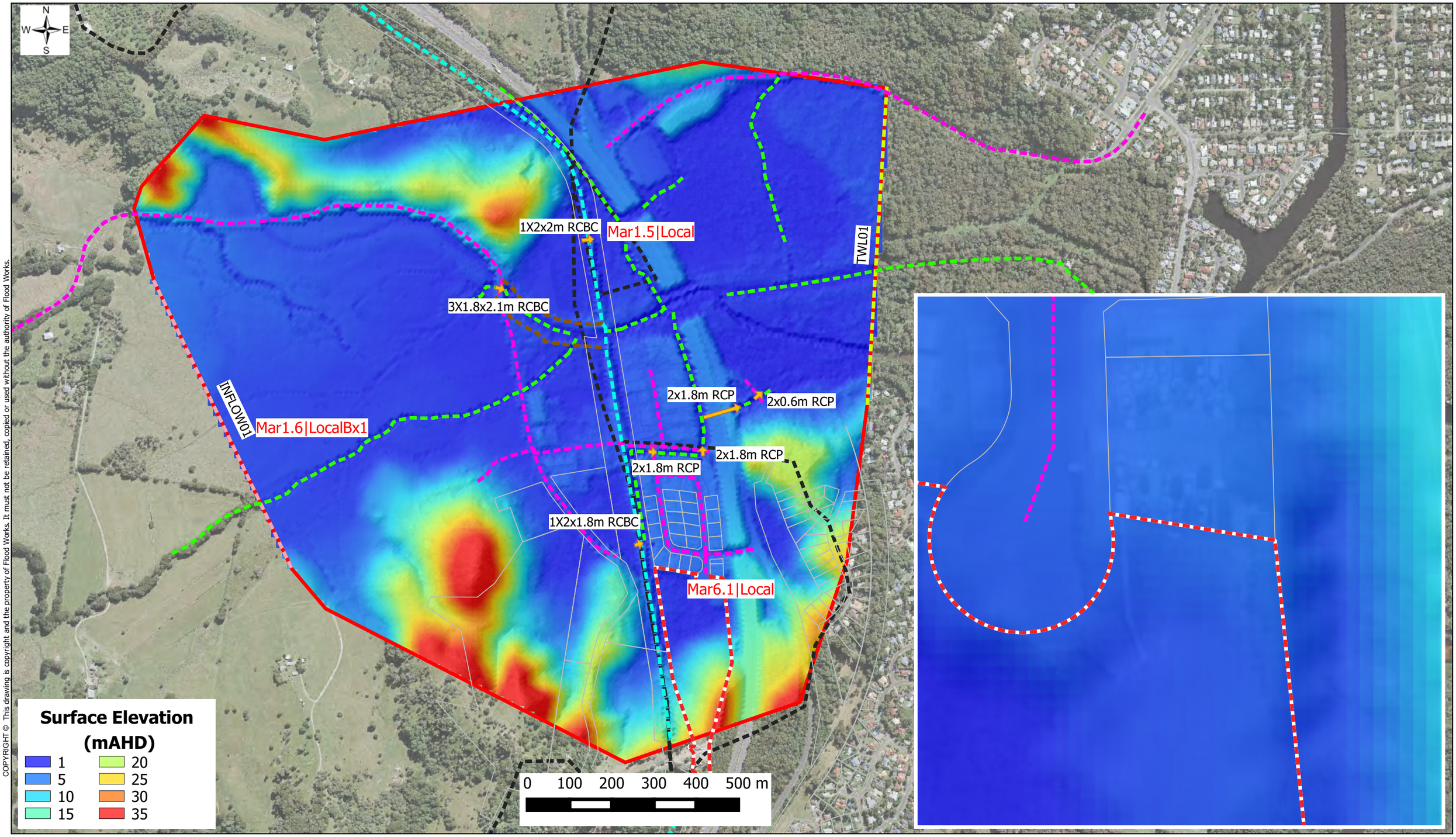

FIG 01 PRE-EXISTING CASE
TUFLOW MODEL FEATURE (with LIDAR 2010)

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- 2d_sa_Inflow
- Hydraulic Structure
- 2d_zsh_ Road Line
- 2d_zsh_ River
- 2d_zsh_Railway

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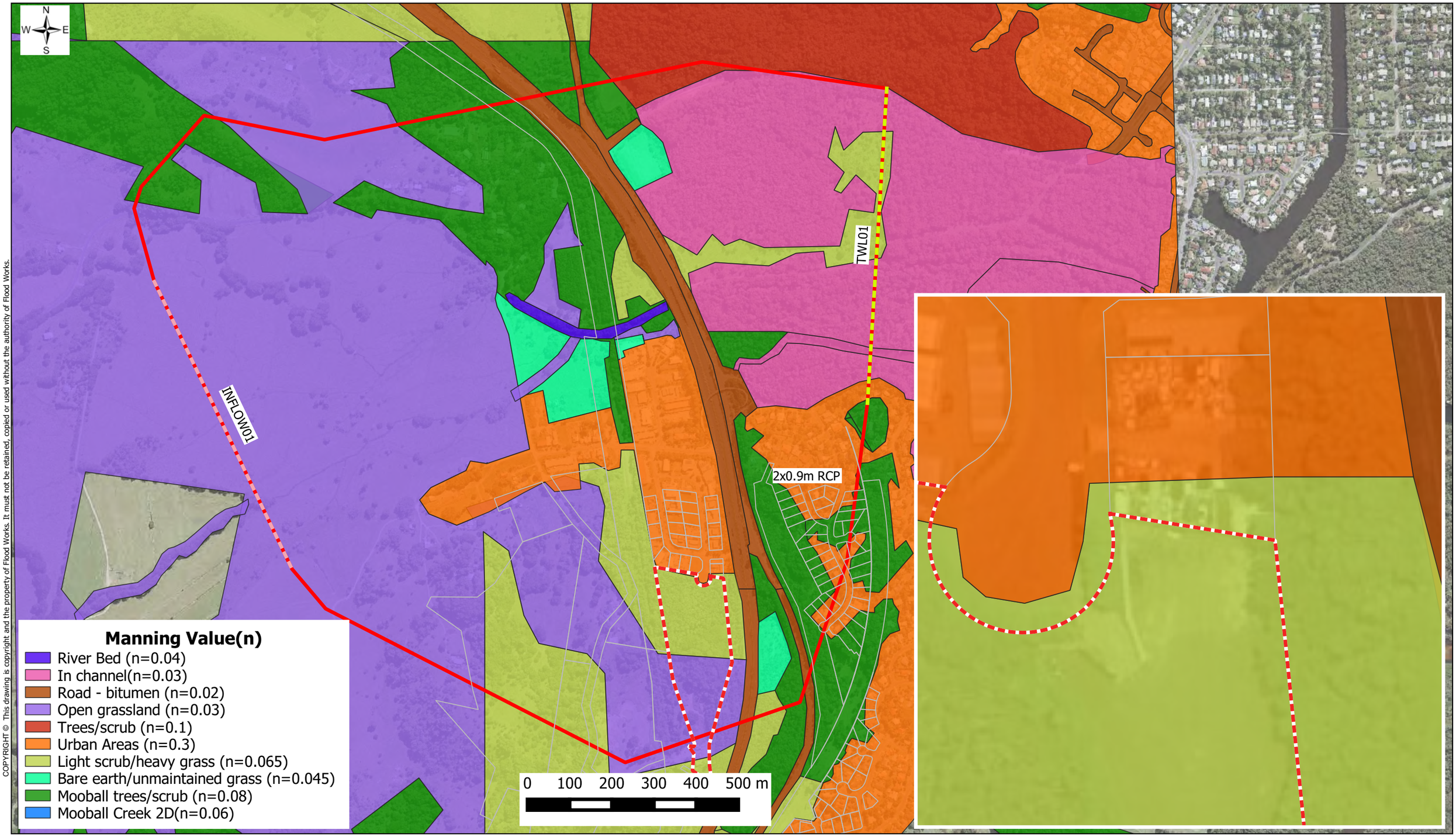

FIG 02 PRE-EXISTING CASE TUFLOW MANNING MAP

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary

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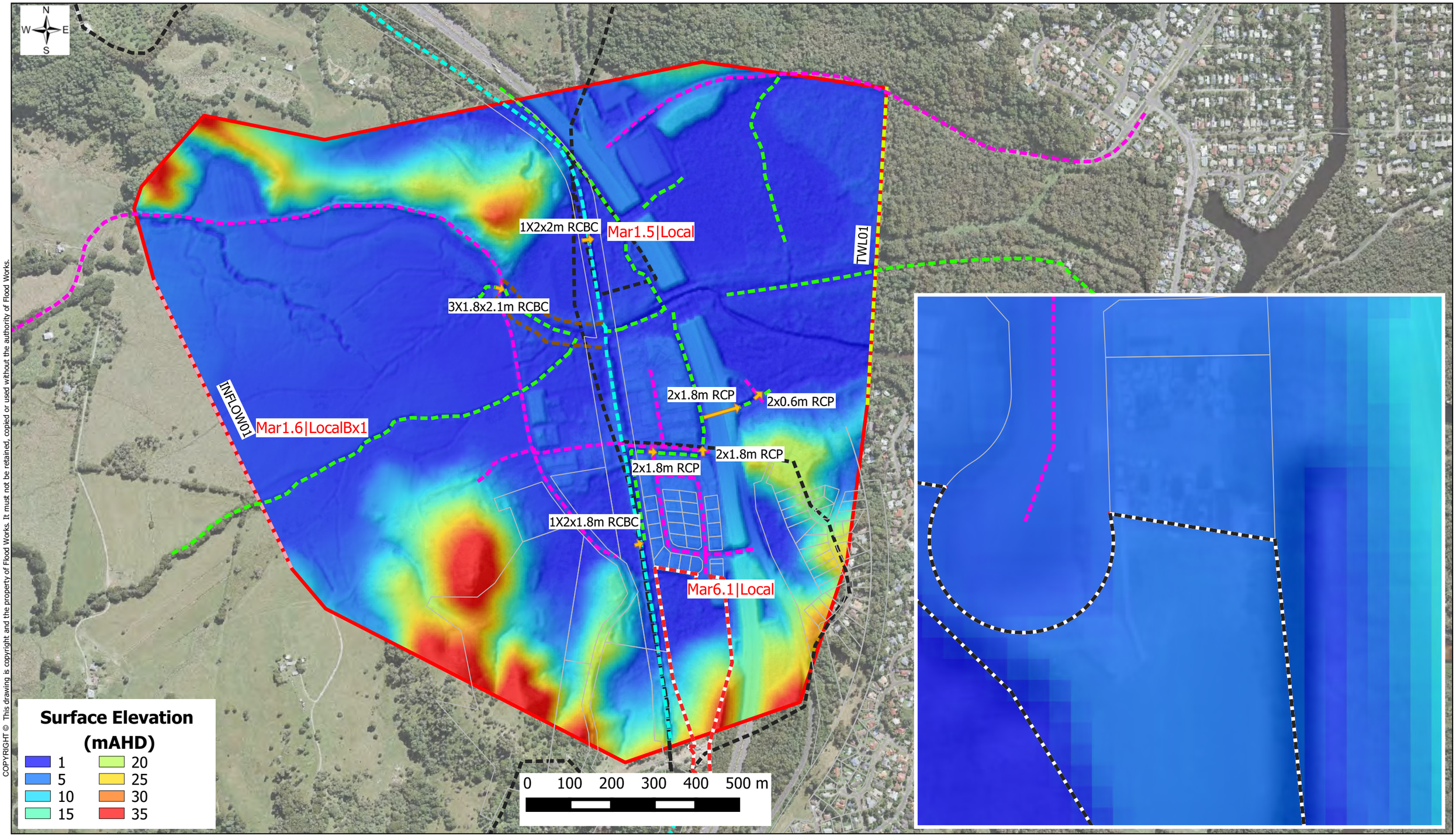

FIG 03 EXISTING CASE TUFLOW MODEL FEATURE (with LIDAR 2010 and SURVEY DATA)

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- 2d_sa_Inflow
- Hydraulic Structure
- 2d_zsh_ Road Line
- 2d_zsh_ River
- 2d_zsh_Railway
- Earthwork Area

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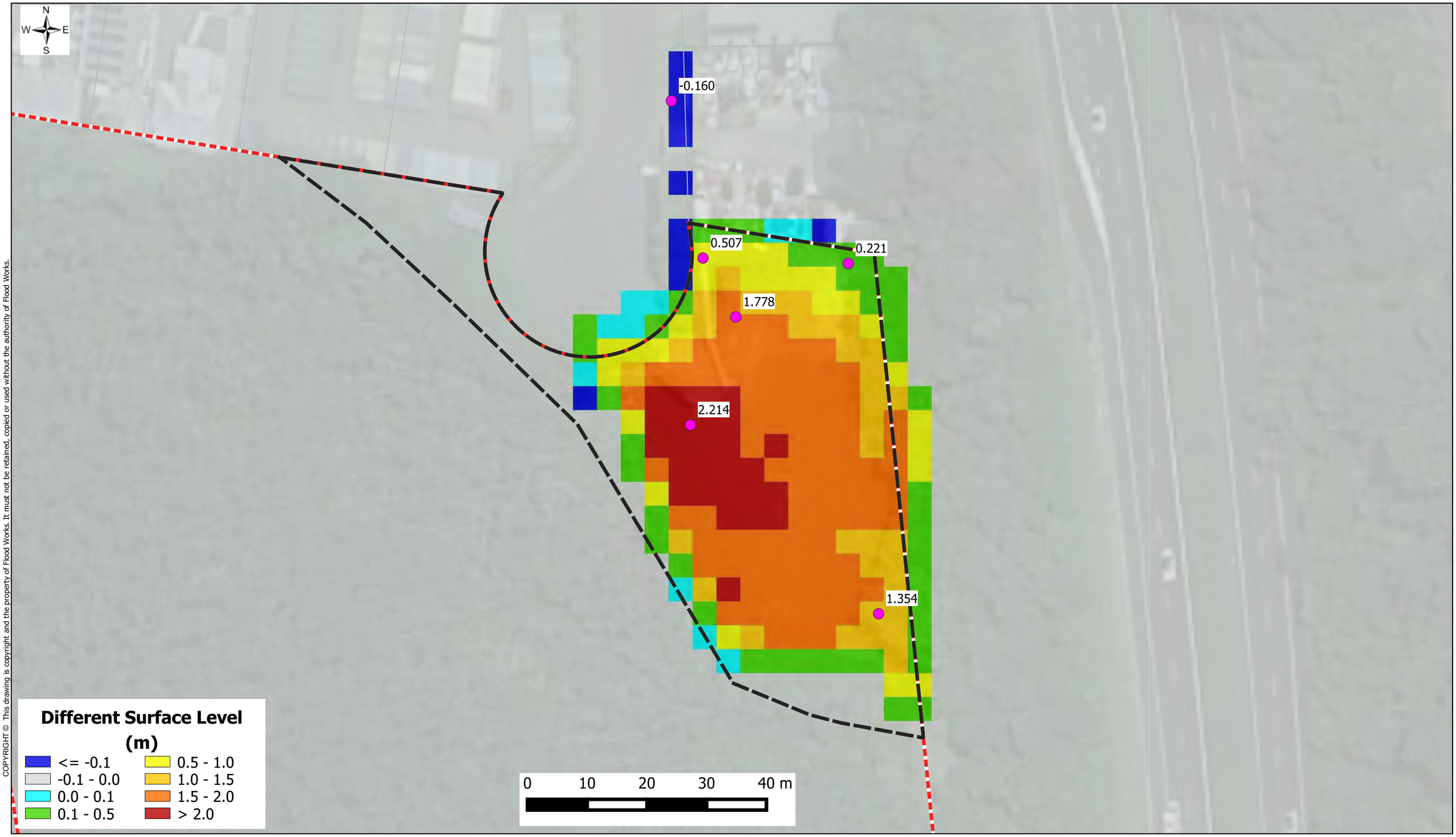

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FIG 04 - DIFFERENCE SURFACE LEVEL BETWEEN EXISTING MODEL AND PRE-EXISTING MODEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Interrogation Point
- Earthwork Area

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N
W E
S

3.04
3.03

4.35
4.44

3.28
3.30

3.04
3.04

TWL01

INFLOW01

4.35
4.44

4.00
4.00

4.30
4.32

4.30
4.32

4.30
4.32

Water Level (mAHD)

below 3.0	4.2 - 4.4
3.0 - 3.5	4.4 - 4.6
3.5 - 4.0	4.6 - 4.8
4.0 - 4.2	above 5.0

0 100 200 300 400 500 m

FIG 05 CALIBRATION 1% AEP BETWEEN TUFLOW MODEL AND COUNCIL MODEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Council Model Result
- Tuflow Model Result

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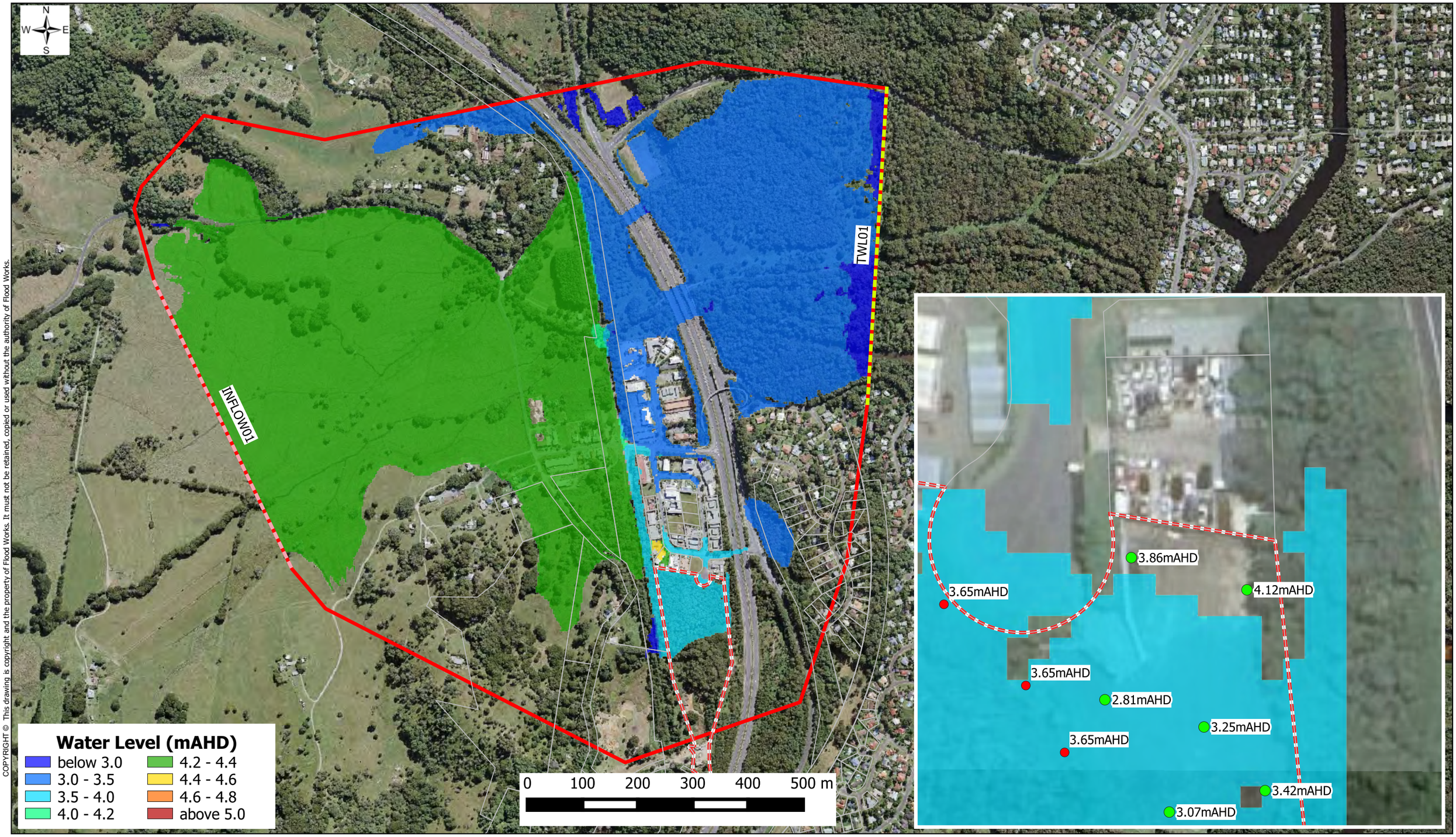

FIG A01 PRE EXISTING CASE
1% AEP
FLOOD WATER LEVEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point
- Ground level_PreExisting

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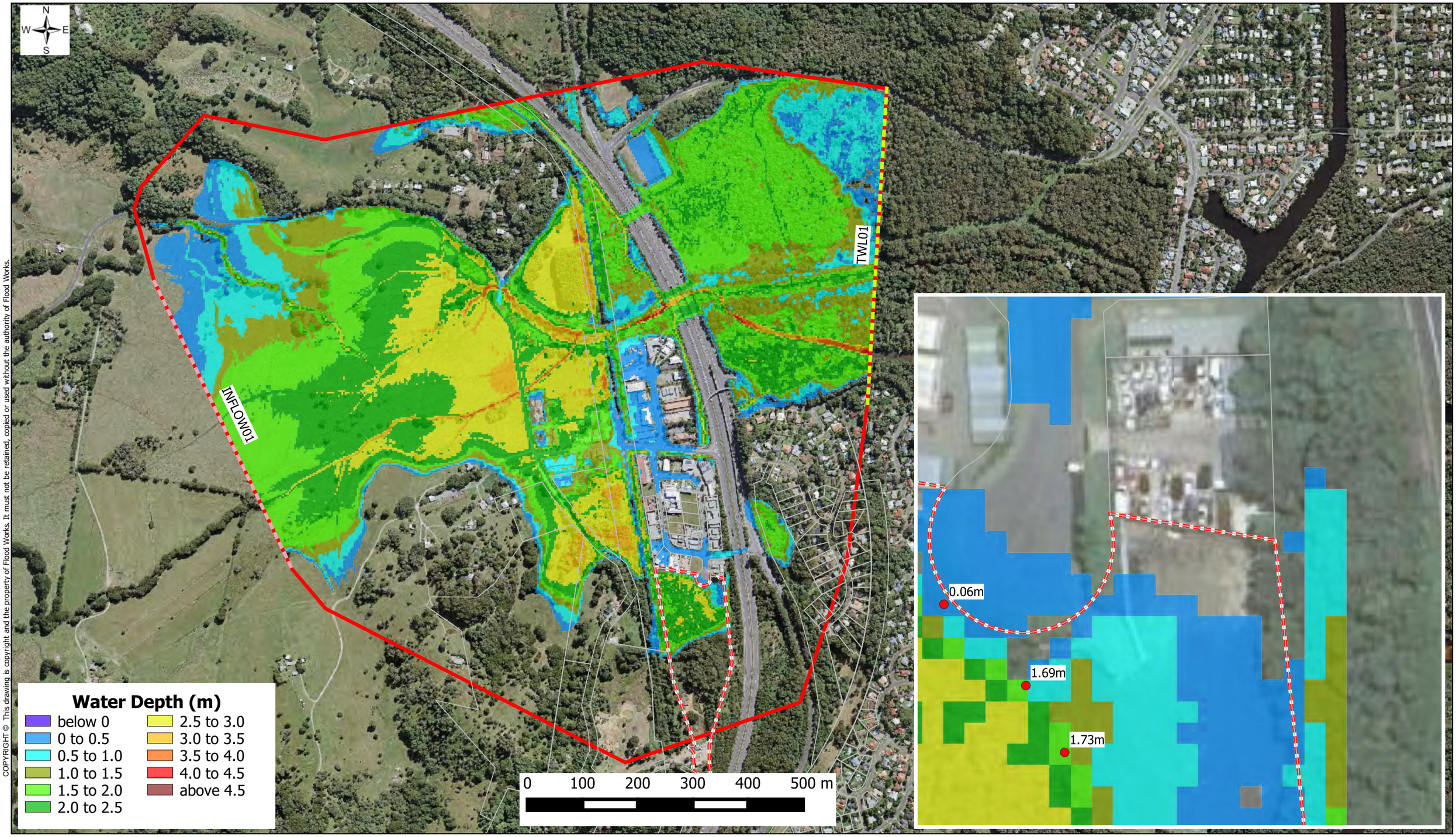

FIG A02 PRE EXISTING CASE
1% AEP
FLOOD WATER DEPTH

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point

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N
W E
S

INFLOW01

TWL01

0.02m/s

0m/s

0m/s

Water Velocity(m/s)

- below 0.0
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 0.60
- 0.60 - 0.70
- above 0.7

0 100 200 300 400 500 m

FIG A03 PRE EXISTING CASE
1% AEP
FLOOD WATER VELOCITY

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point

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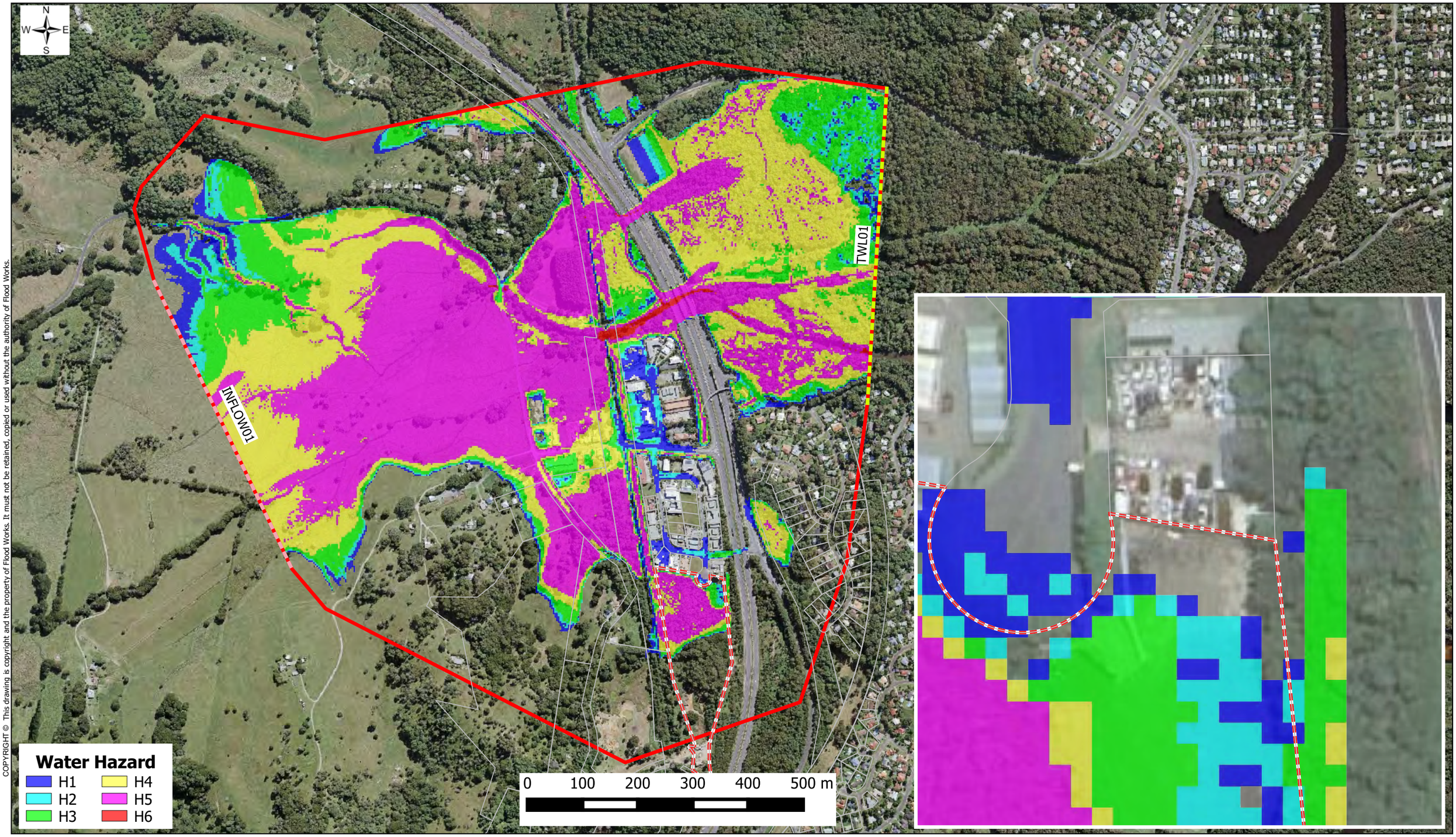

FIG A04 PRE EXISTING
1% AEP
FLOOD WATER HAZARD

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary

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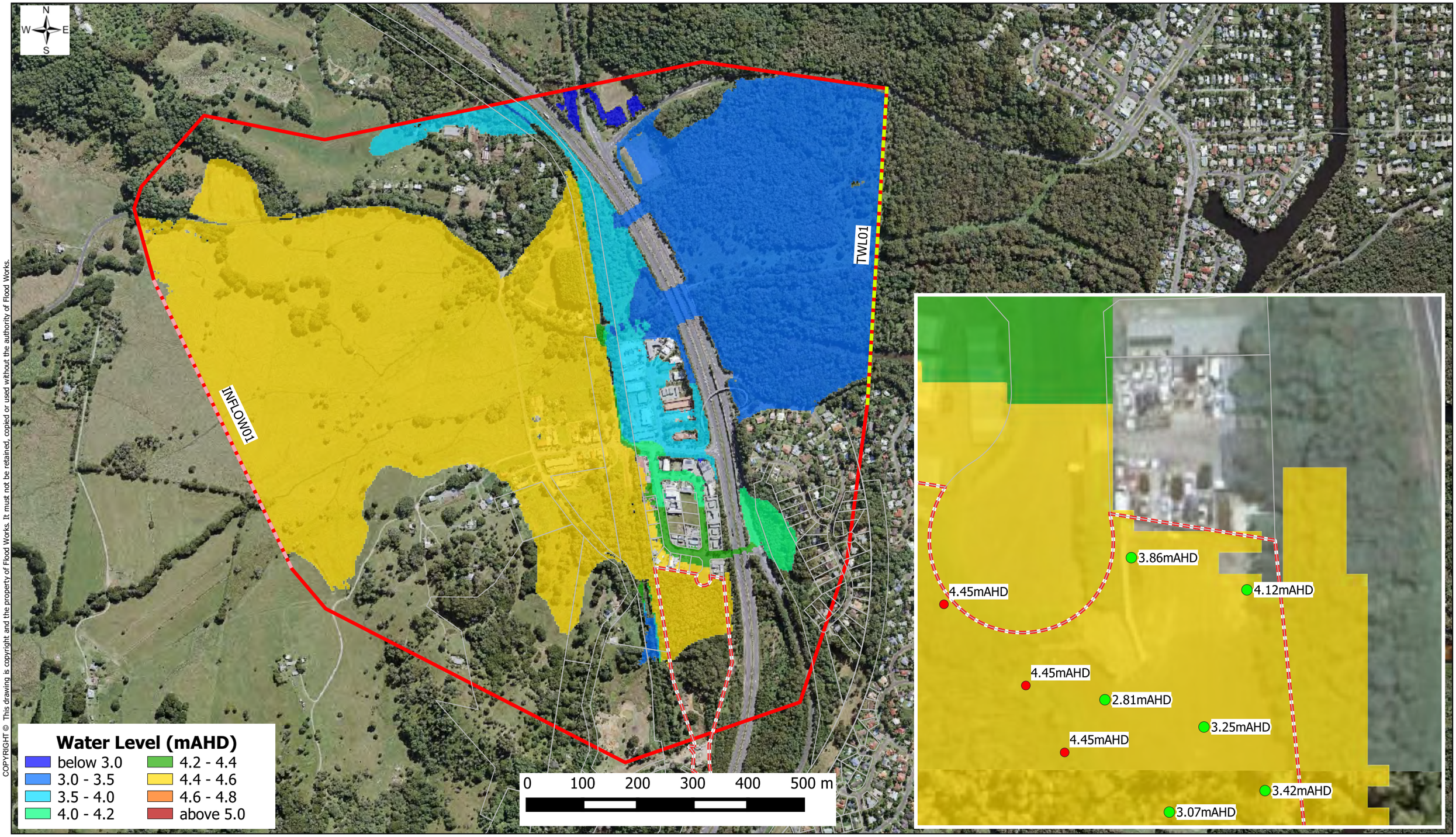

FIG A05 PRE EXISTING CASE
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER LEVEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point
- Ground level_PreExisting

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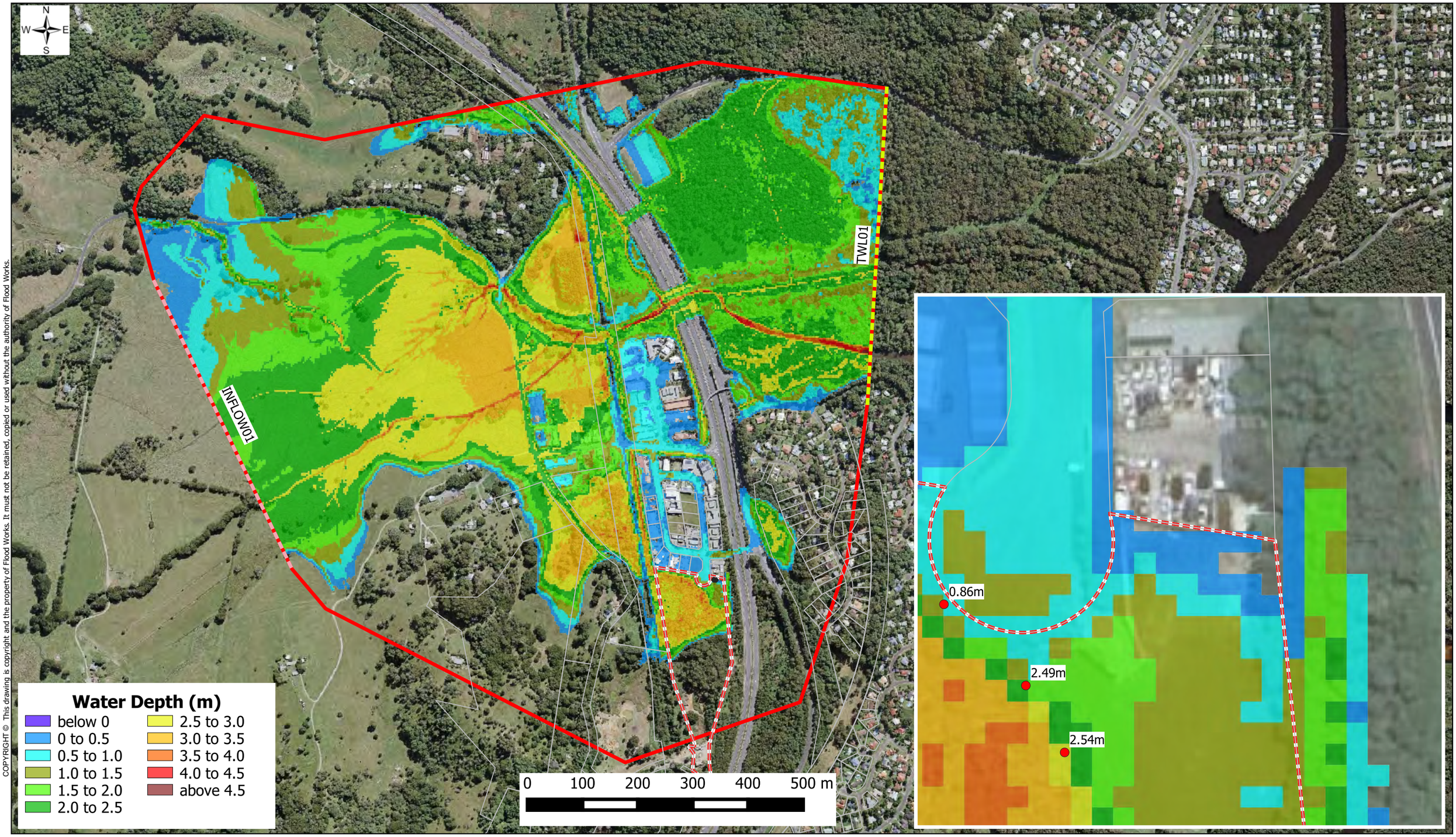

FIG A06 PRE EXISTING CASE
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER DEPTH

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point

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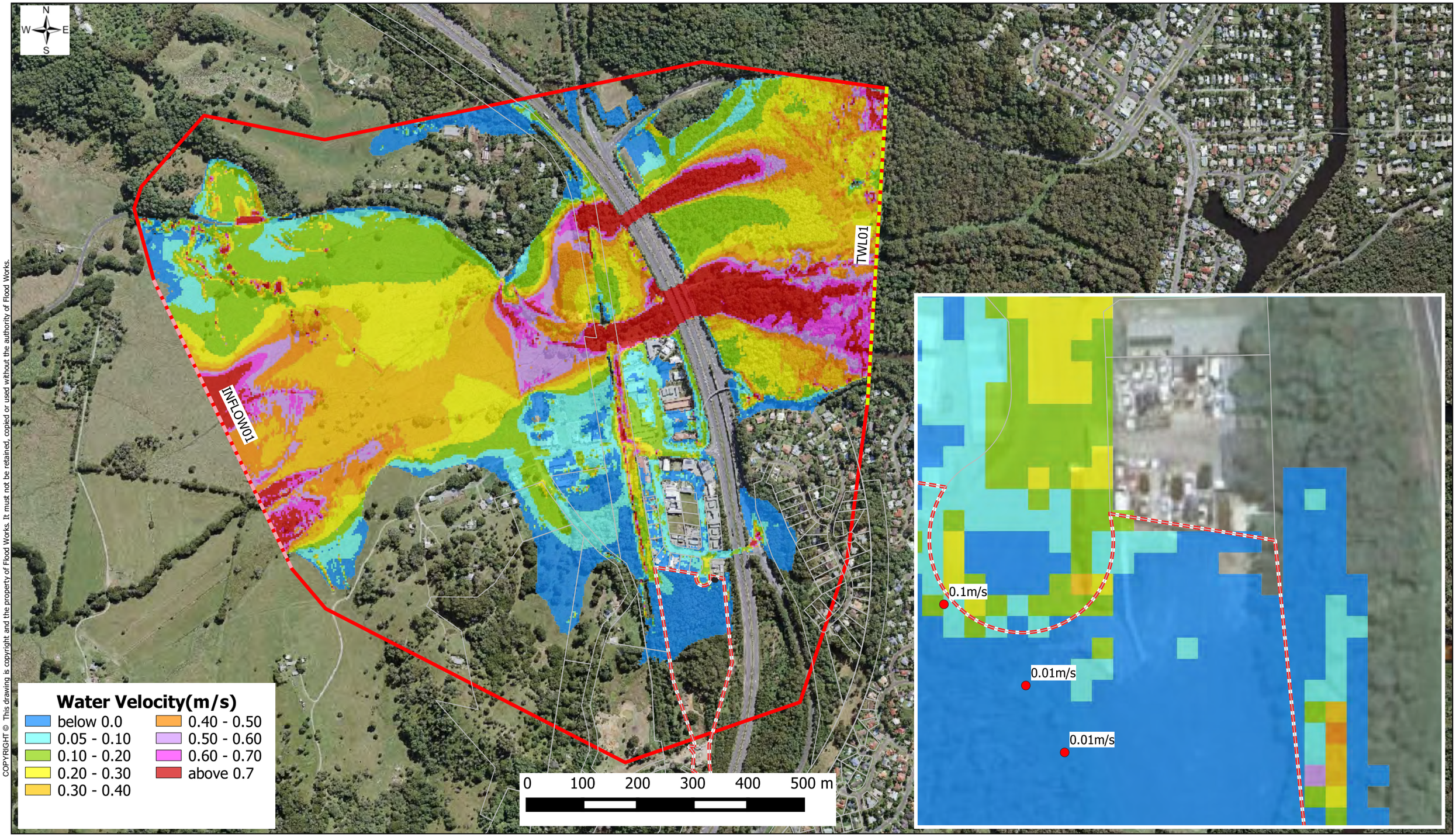

FIG A07 PRE EXISTING CASE
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER VELOCITY

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point

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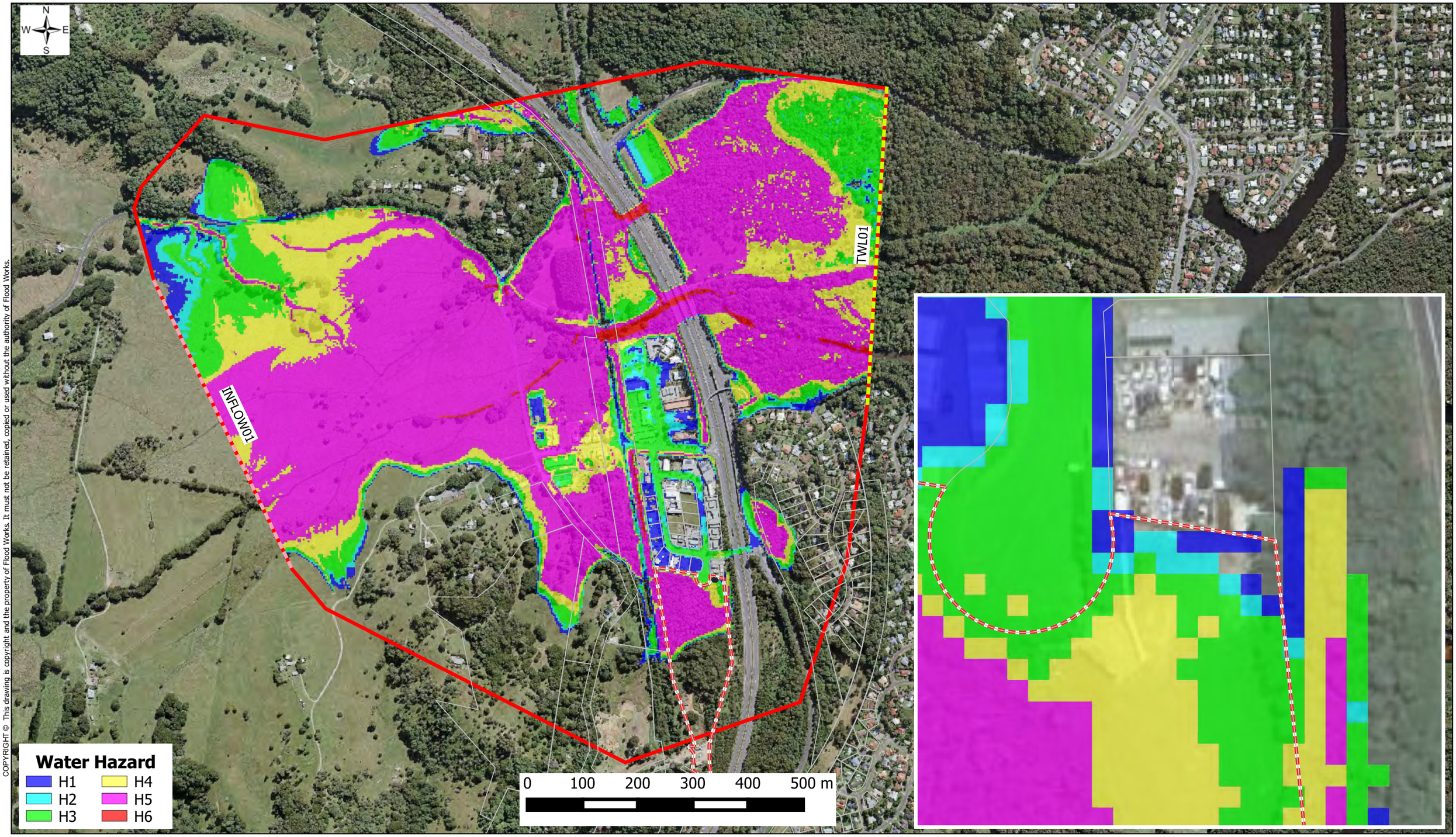

FIG A08 PRE EXISTING
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER HAZARD

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary

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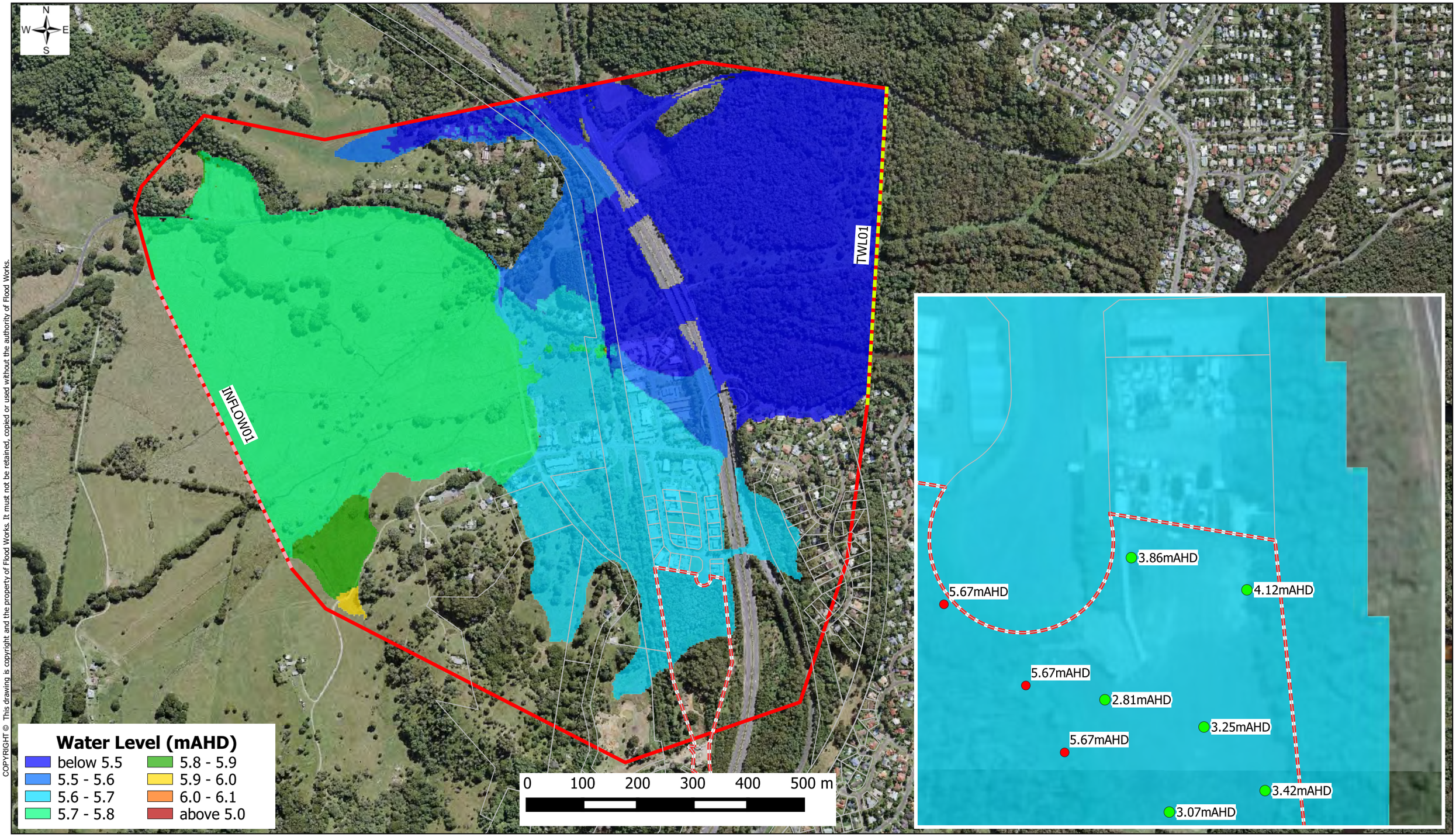

FIG A09 PRE EXISTING CASE
PMF EVENT
FLOOD WATER LEVEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point
- Ground level_PreExisting

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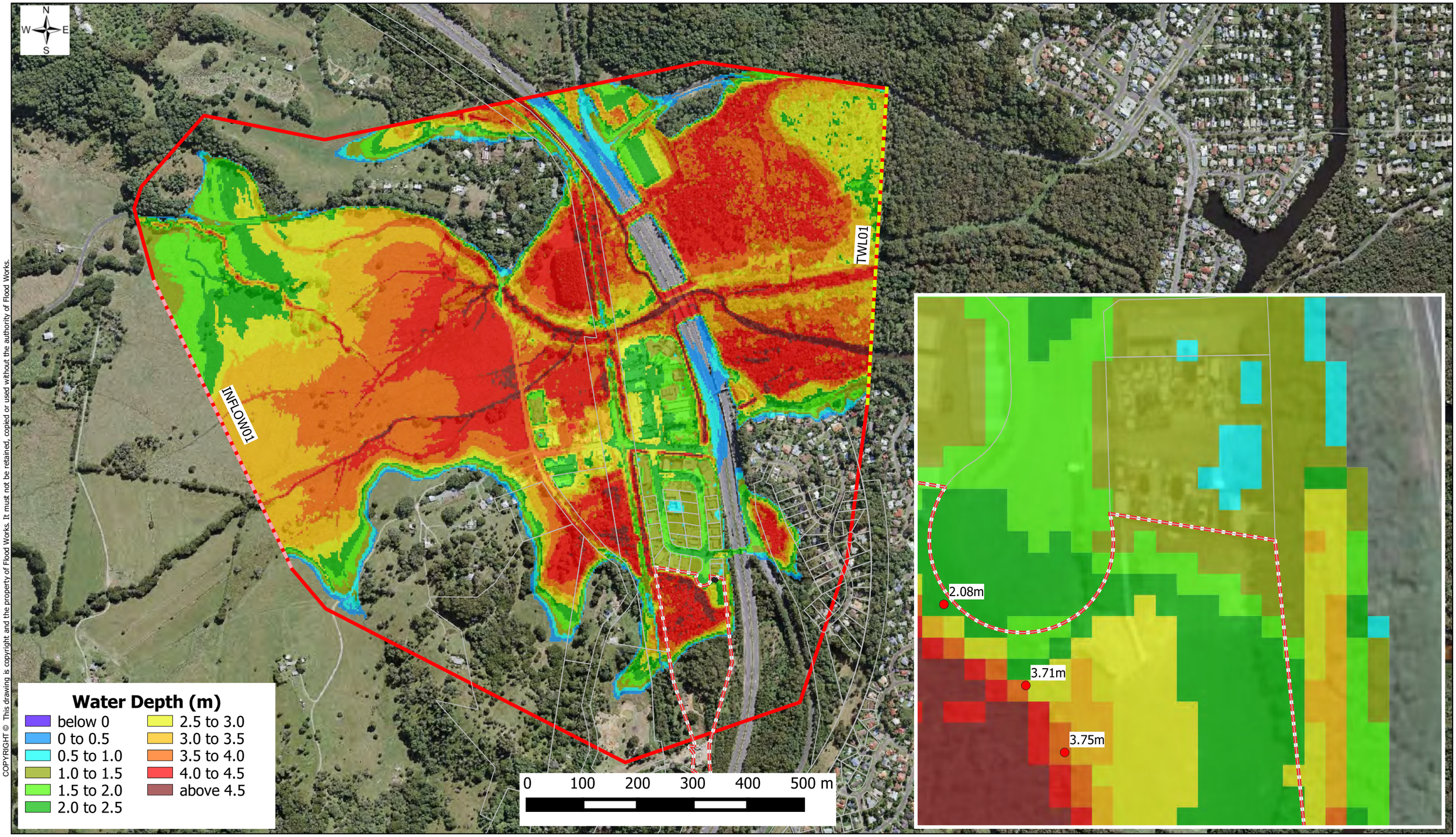

FIG A10 PRE EXISTING CASE
PMF EVENT
FLOOD WATER DEPTH

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point

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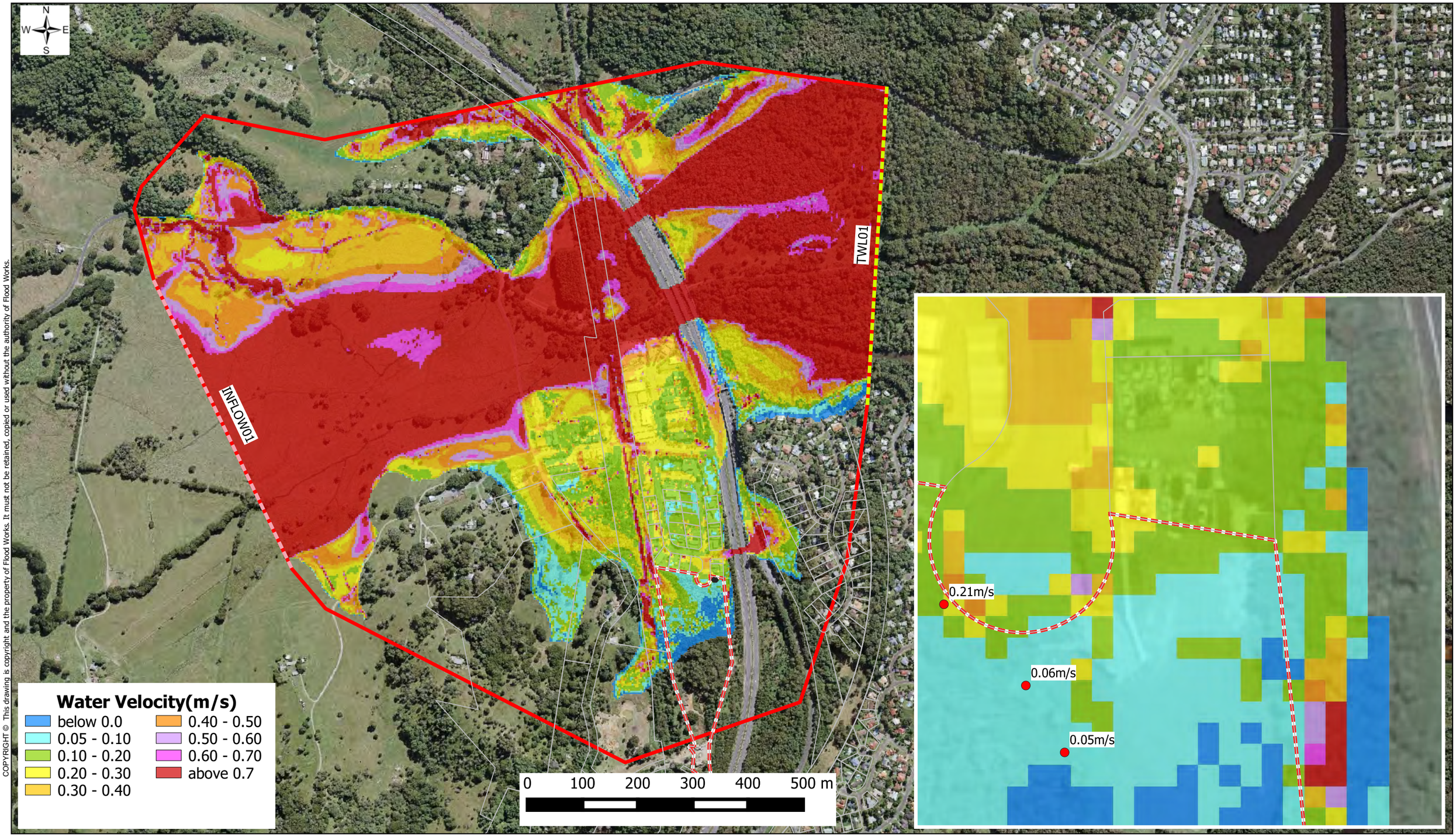

FIG A11 PRE EXISTING CASE
PMF EVENT
FLOOD WATER VELOCITY

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Interrogation Point

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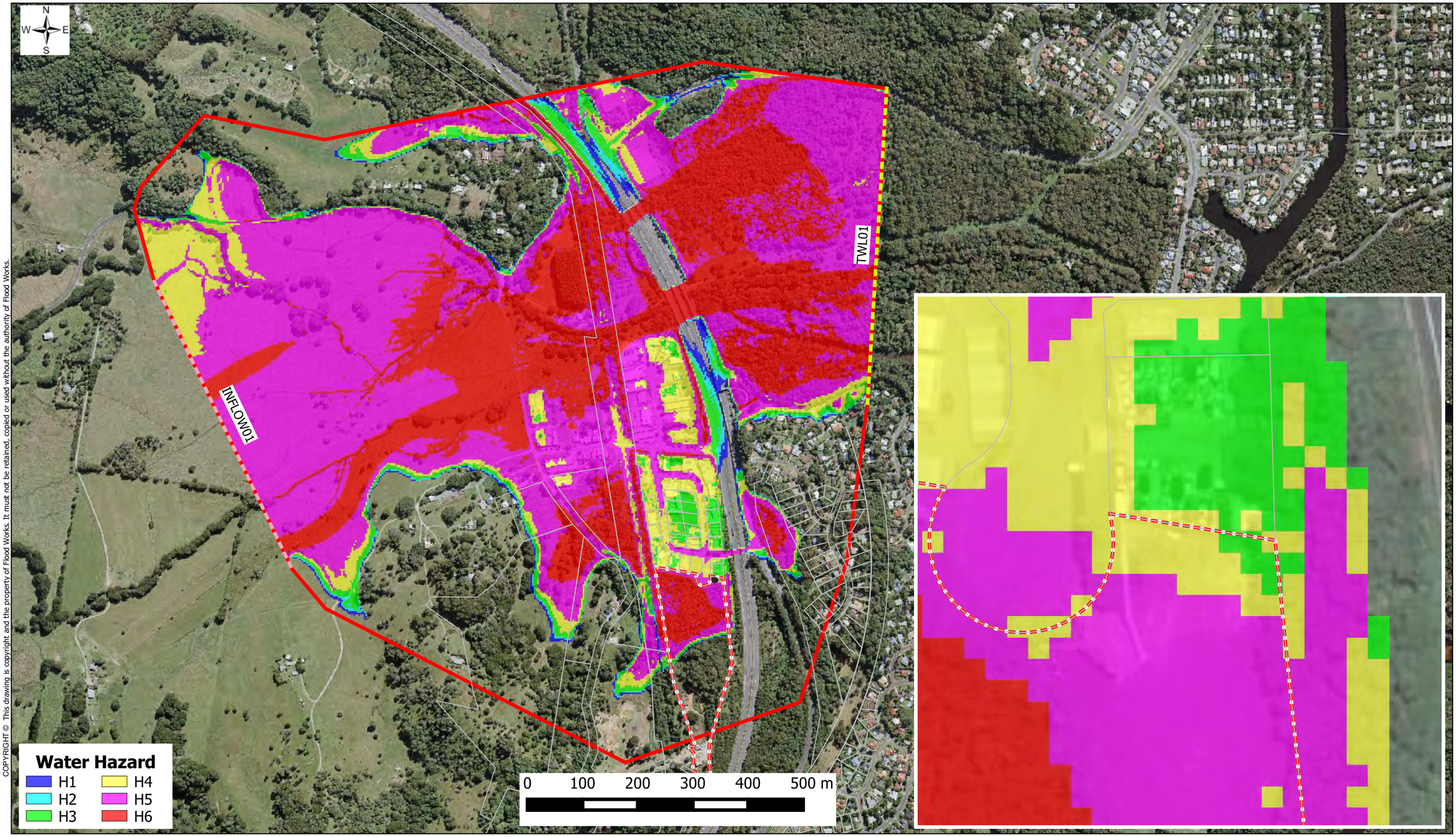

FIG A12 PRE EXISTING
PMF EVENT
FLOOD WATER HAZARD

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary

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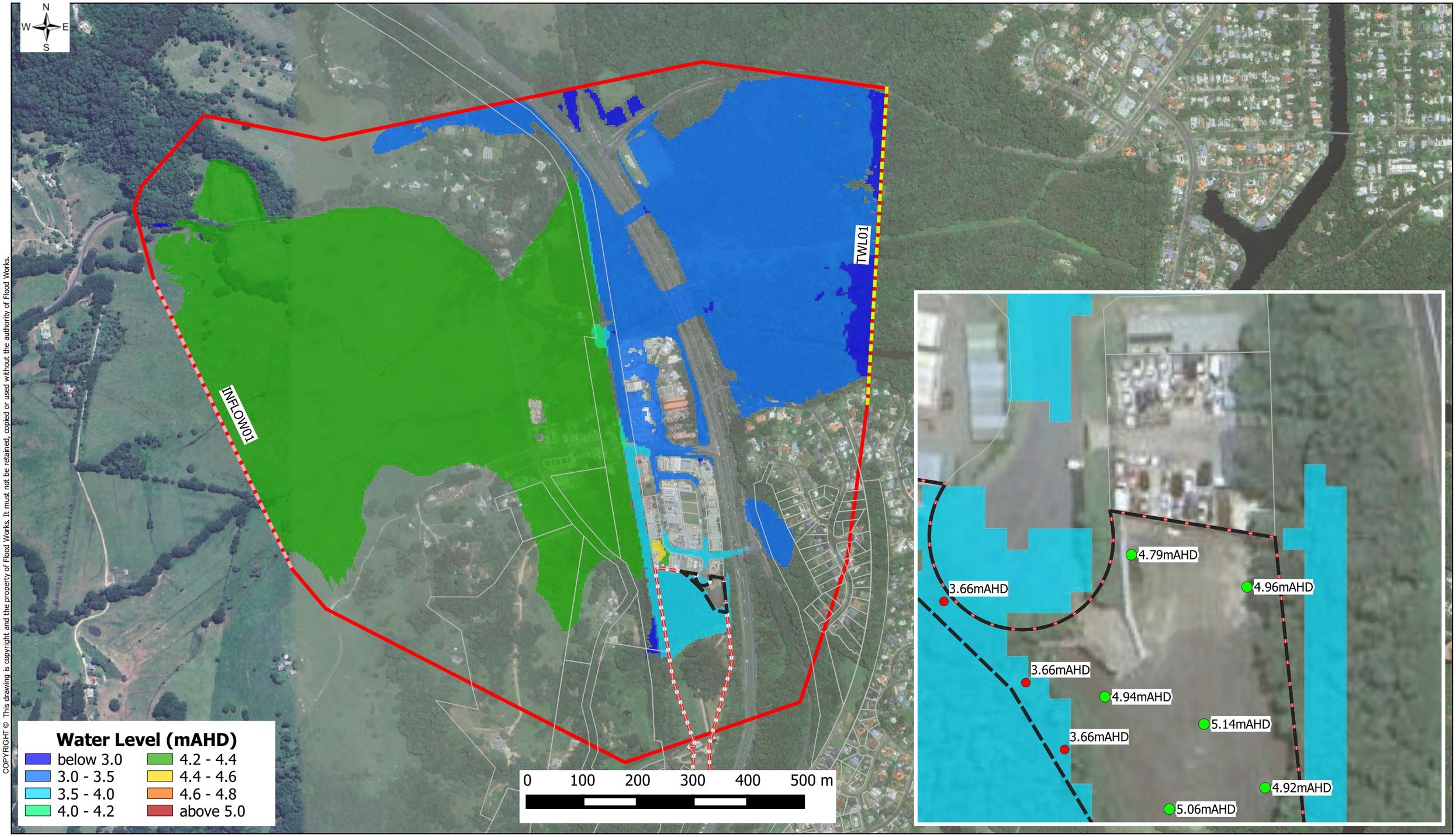

FIG B01 EXISTING CASE
1% AEP
FLOOD WATER LEVEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point
- Ground level_Existing case

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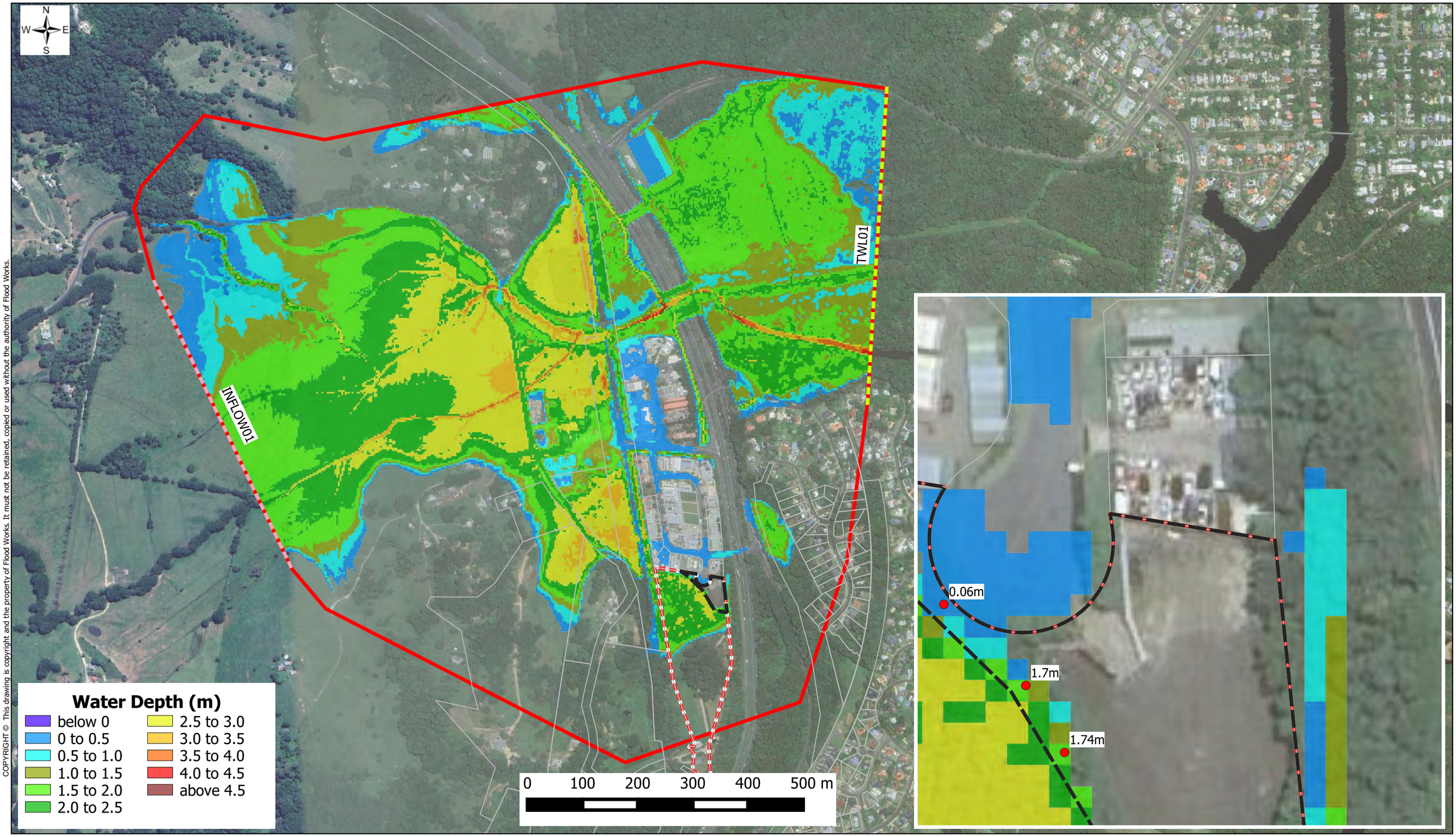

FIG B02 EXISTING CASE
1% AEP
FLOOD WATER DEPTH

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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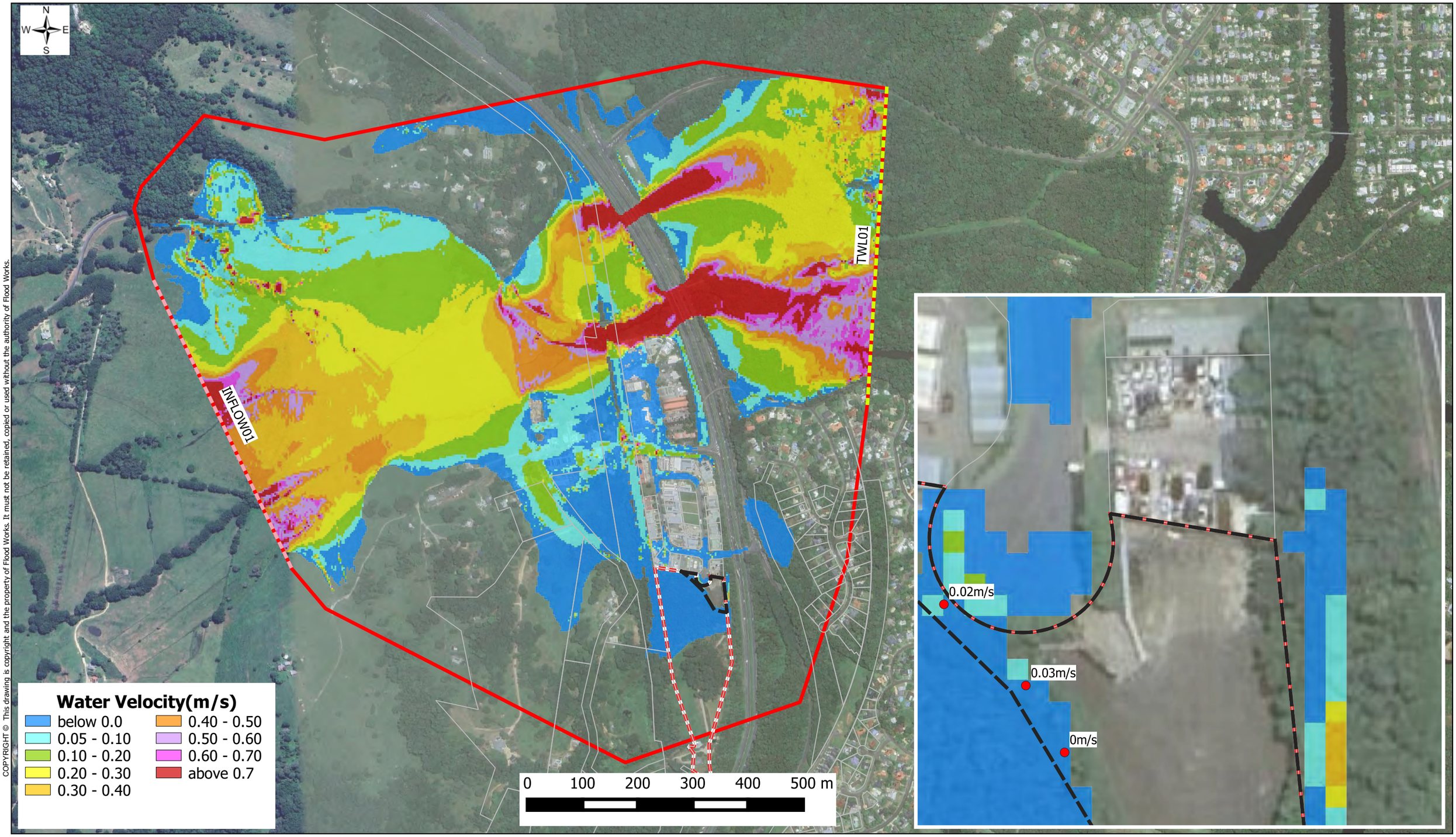

FIG B03 EXISTING CASE
1% AEP
FLOOD WATER VELOCITY

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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N
W E
S

INFLOW01

TWL01

Water Hazard

H1	H4
H2	H5
H3	H6

0 100 200 300 400 500 m

FIG B04 EXISTING CASE
1% AEP
FLOOD WATER HAZARD

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area

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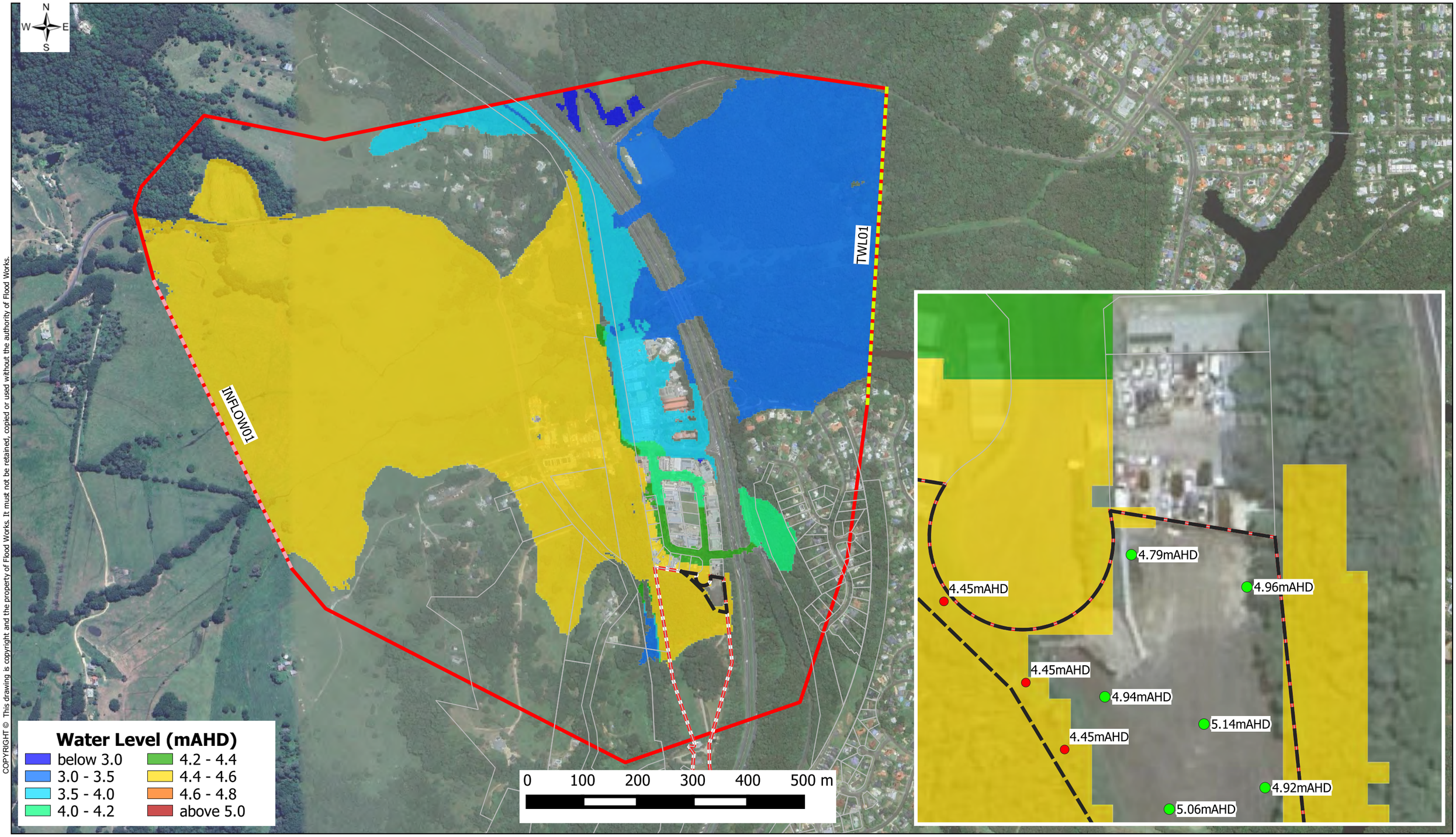

FIG B05 EXISTING CASE
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER LEVEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point
- Ground level_Existing case

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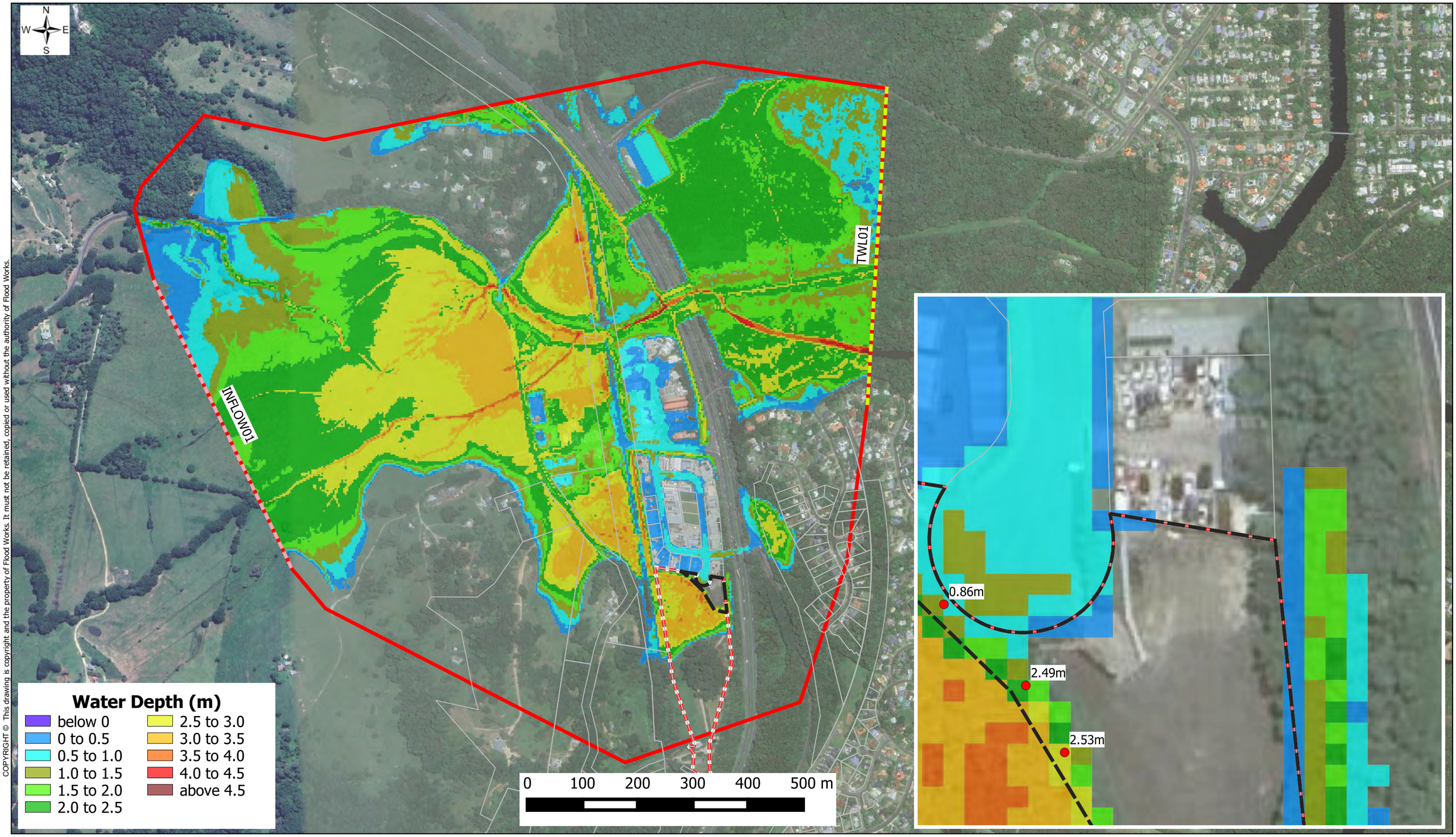

FIG B06 EXISTING CASE
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER DEPTH

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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N
W E
S

INFLOW01

TWL01

0.19m/s

0.03m/s

0.01m/s

Water Velocity(m/s)

below 0.0	0.40 - 0.50
0.05 - 0.10	0.50 - 0.60
0.10 - 0.20	0.60 - 0.70
0.20 - 0.30	above 0.7
0.30 - 0.40	

0 100 200 300 400 500 m

FIG B07 EXISTING CASE
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER VELOCITY

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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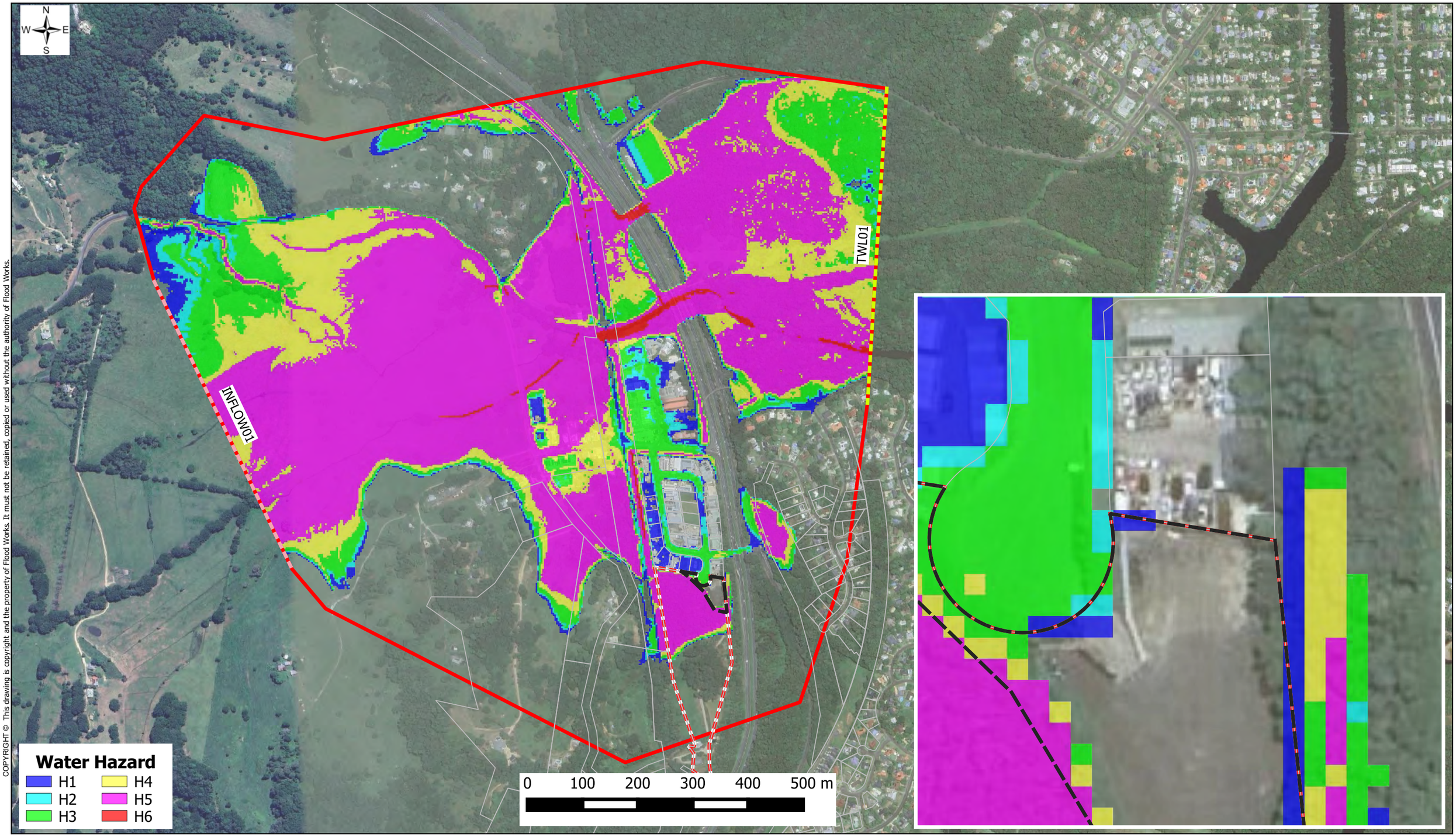

FIG B08 EXISTING CASE
1% AEP_CC (0.2% AEP EQUIVALENT)
FLOOD WATER HAZARD

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area

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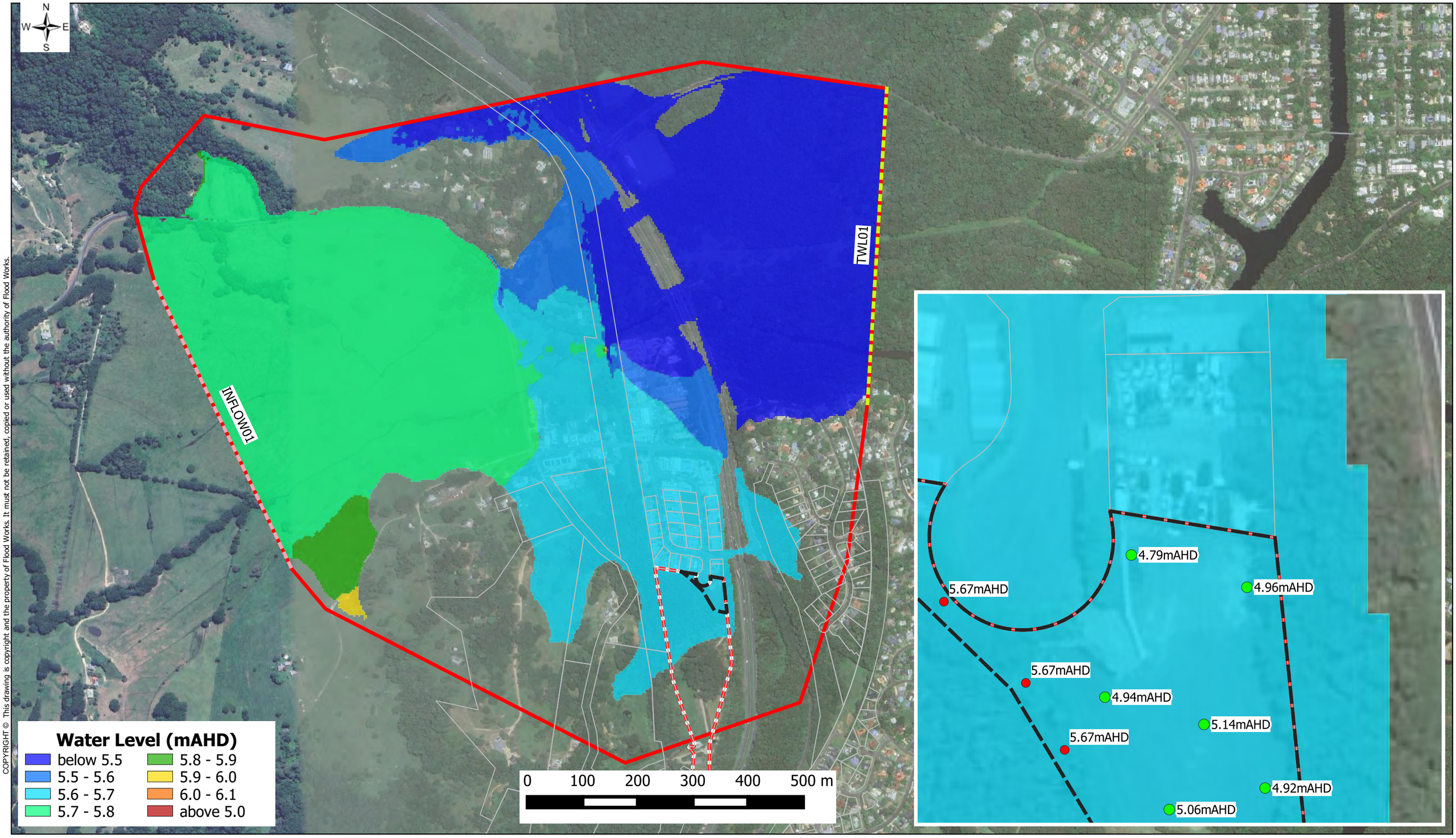

FIG B09 EXISTING CASE
PMF EVENT
FLOOD WATER LEVEL

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point
- Ground level_Existing case

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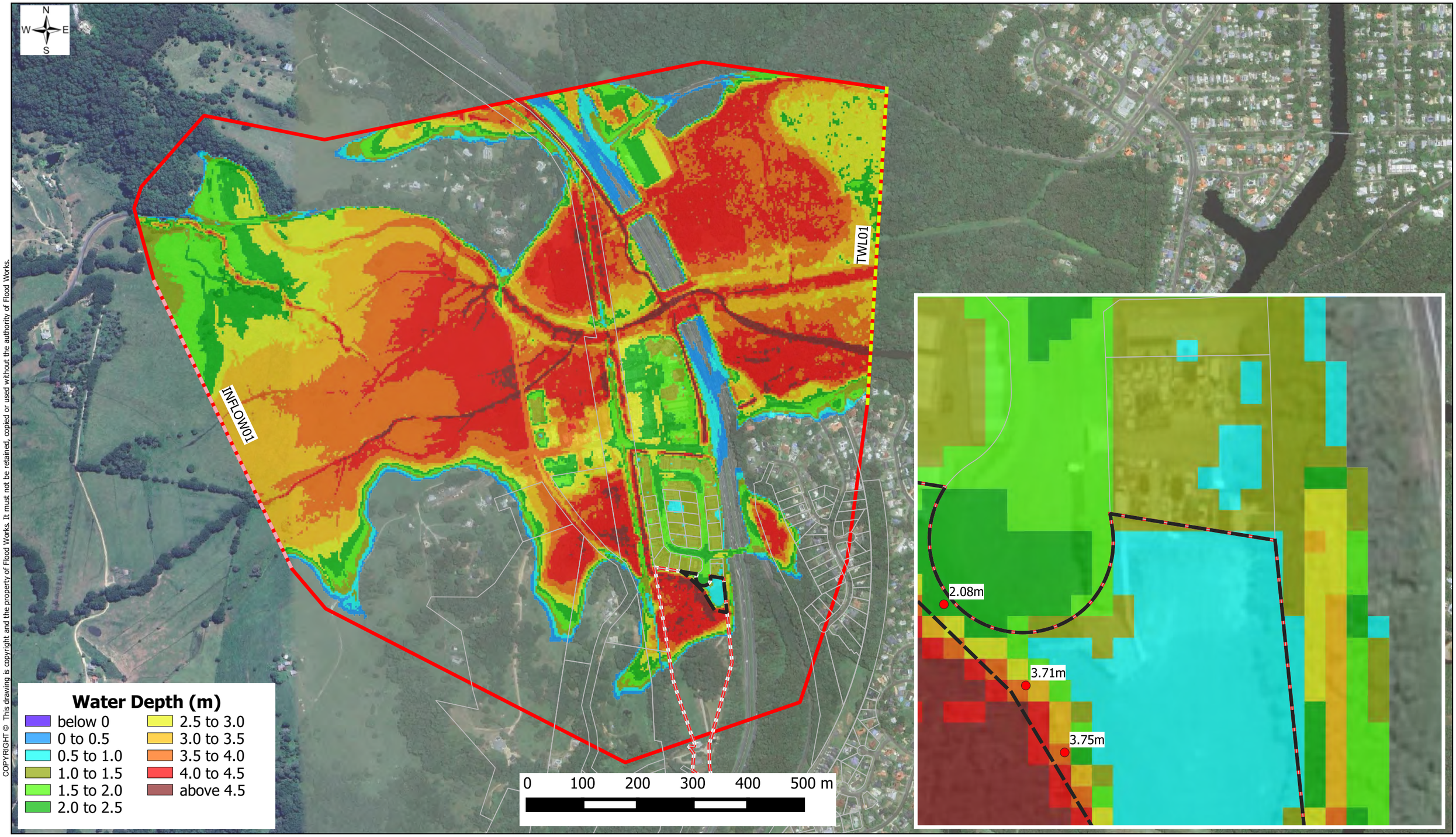

FIG B10 EXISTING CASE
PMF EVENT
FLOOD WATER DEPTH

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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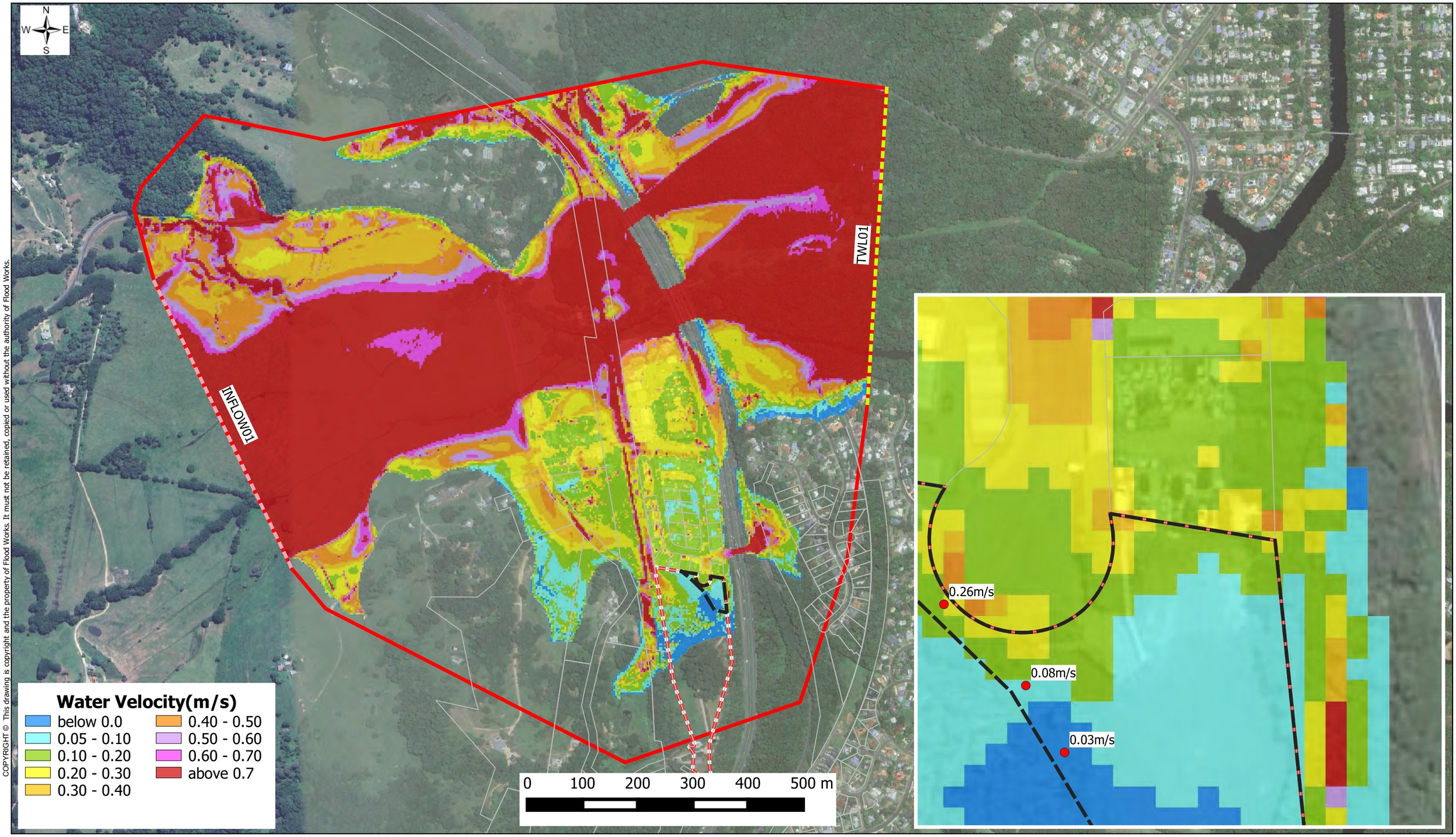

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FIG B11 EXISTING CASE
PMF EVENT
FLOOD WATER VELOCITY

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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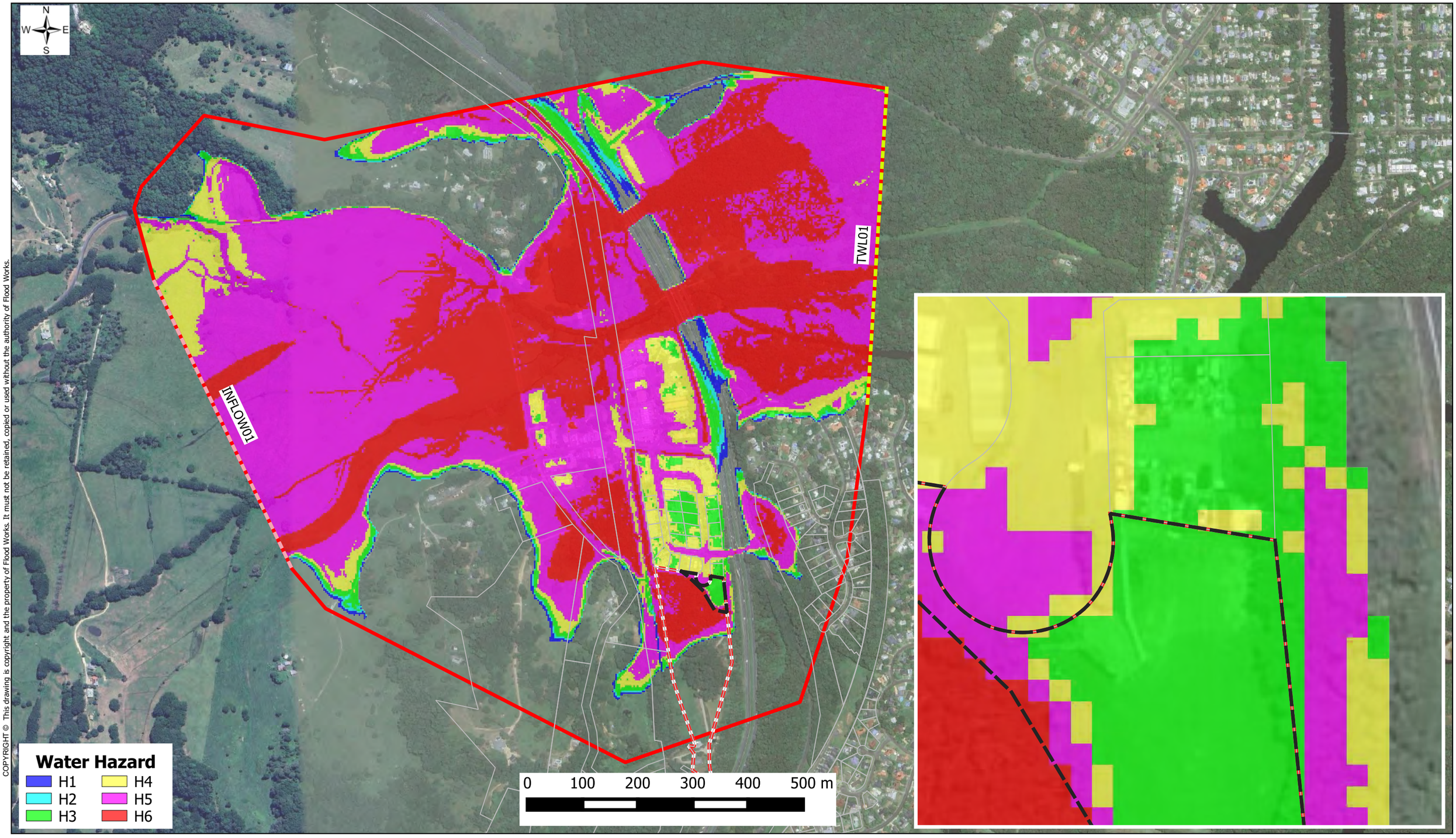

FIG B12 EXISTING CASE
PMF EVENT
FLOOD WATER HAZARD

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area

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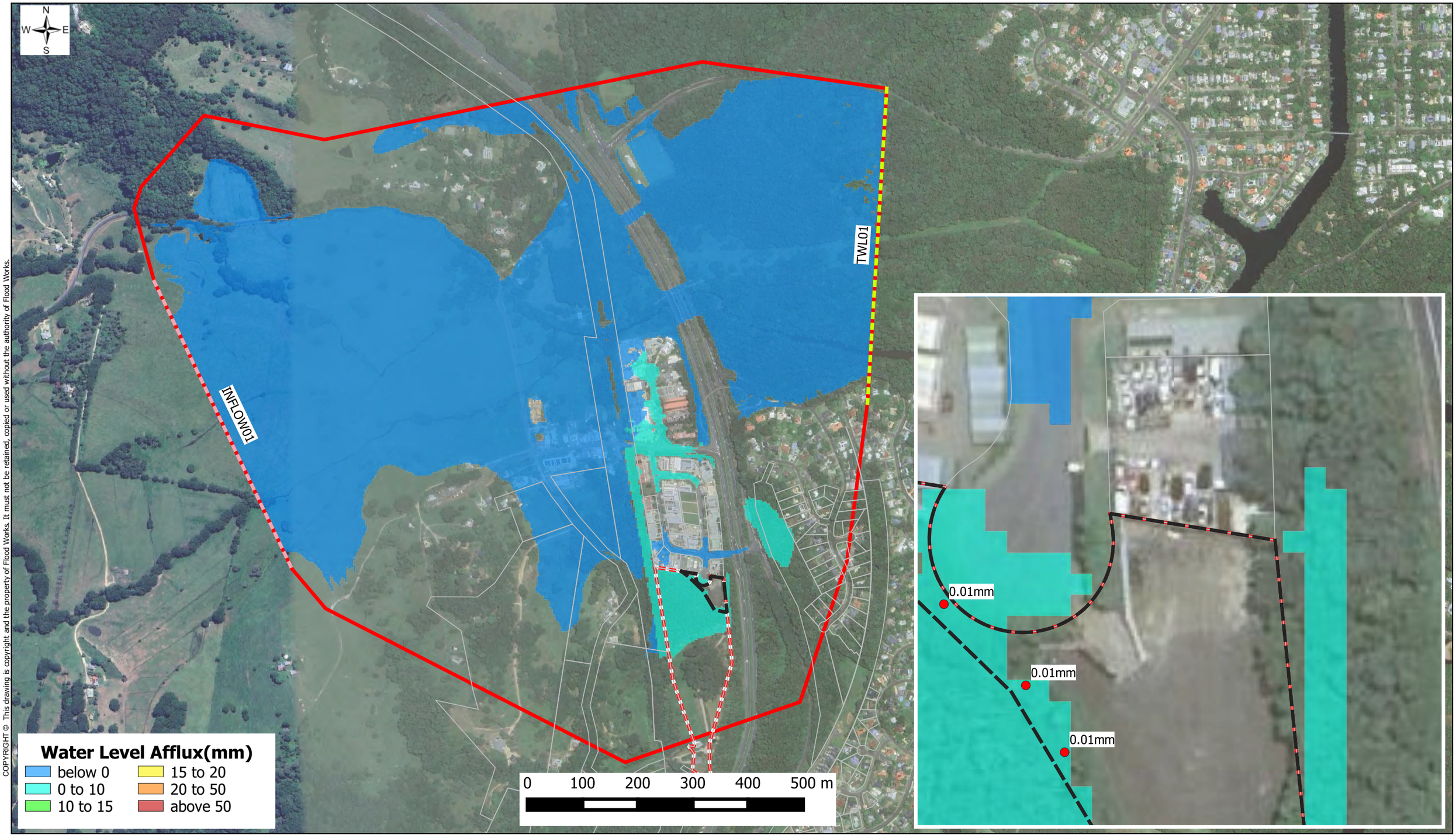

FIG C01 EXISTING CASE-PRE EXISTING CASE 1% AEP FLOOD WATER LEVEL AFFLUX

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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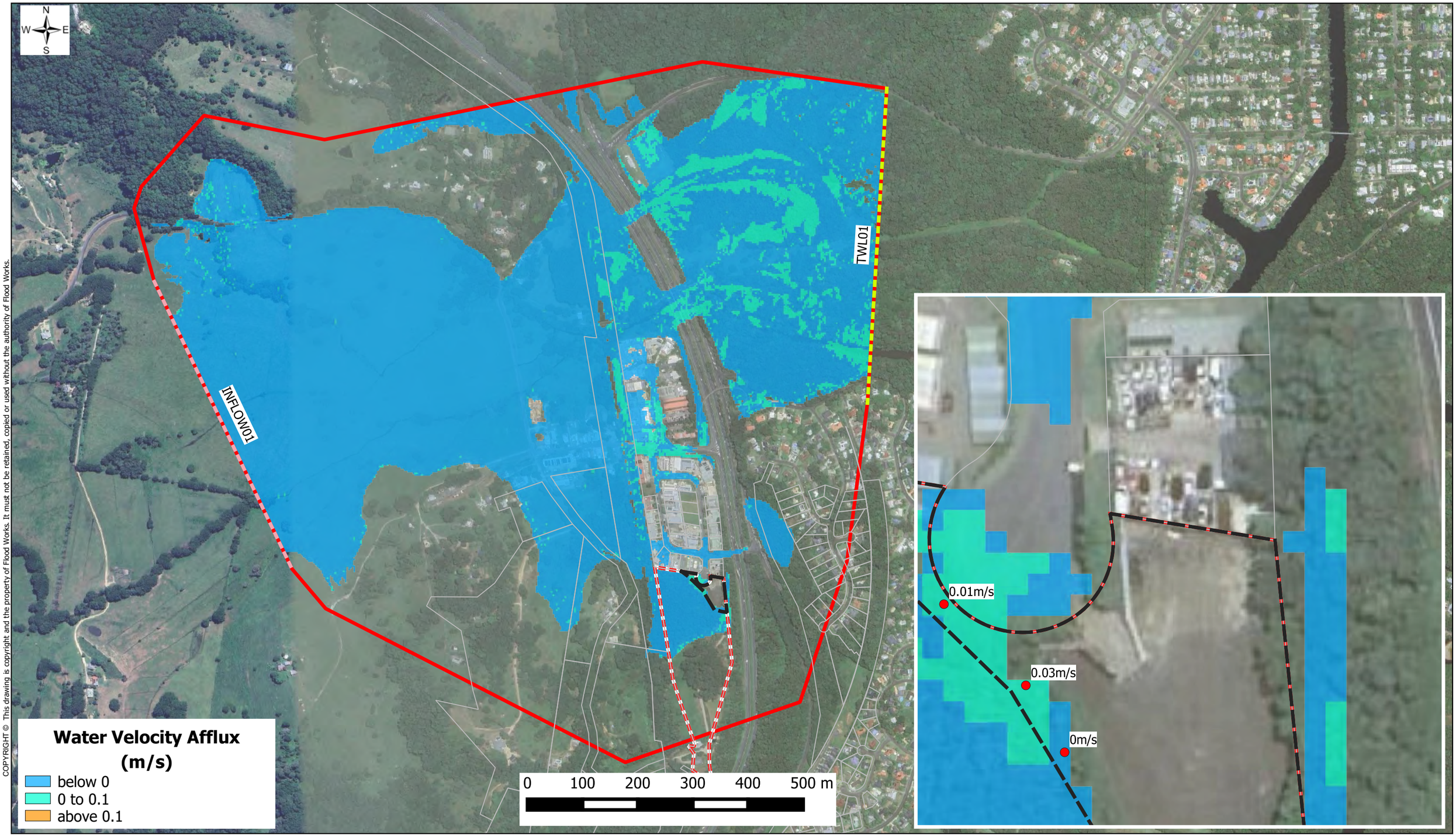

FIG C02 EXISTING CASE - PRE EXISTING CASE
1% AEP
FLOOD WATER VELOCITY AFFLUX

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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N
W E
S

INFLOW01

TWL01

0m
0m
0m

Water Level Afflux(mm)

below 0	15 to 20
0 to 10	20 to 50
10 to 15	above 50

0 100 200 300 400 500 m

FIG C03 EXISTING CASE-PRE EXISTING CASE 1% AEP_CC (0.2% AEP EQUIVALENT) FLOOD WATER LEVEL AFFLUX

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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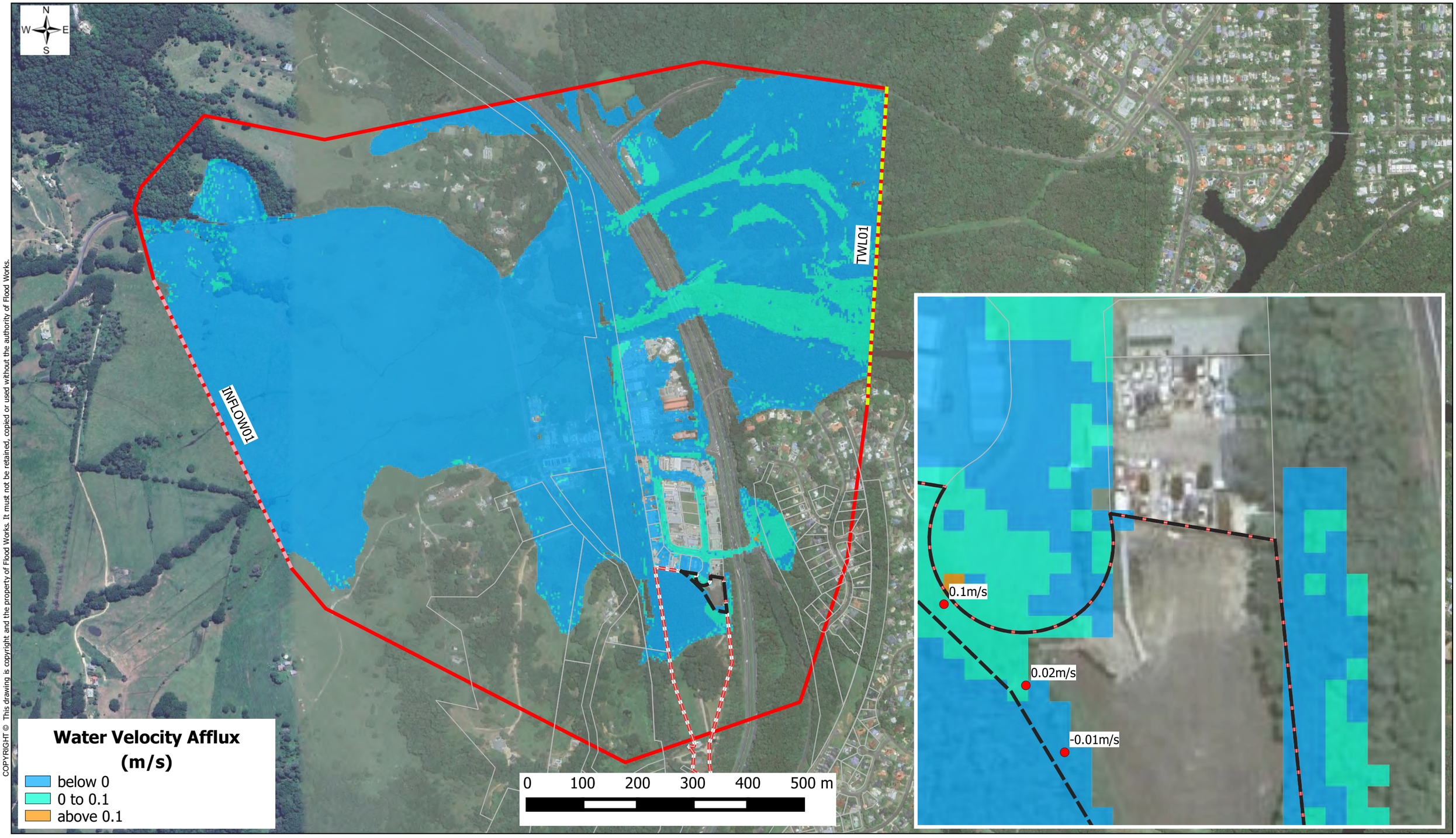

FIG C04 EXISTING CASE - PRE EXISTING CASE 1% AEP_CC (0.2% AEP EQUIVALENT) FLOOD WATER VELOCITY AFFLUX

PROJECTION: GDA94 / MGA ZONE 56
PROJECT: FW00076_40 The Tunnell Road Billinudgel
DATE: 06.08.2024

Legend

- Model Extent
- Site
- Cadastral
- Downstream Boundary
- Inflow Boundary
- Earthwork Area
- Interrogation Point

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