Zone IN2 Light Industrial

1 Objectives of zone

- To provide a wide range of light industrial, warehouse and related land uses.
- To encourage employment opportunities and to support the viability of centres.
- To minimise any adverse effect of industry on other land uses.
- To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.
- To support and protect industrial land for industrial uses.

2 Permitted without consent

Environmental protection works

3 Permitted with consent

Agricultural produce industries; Animal boarding and training establishments; Artisan food and drink premises; Depots; Extractive industries; Garden centres; General industries; Hardware and building supplies; Industrial training facilities; Landscaping material supplies; Light industries; Liquid fuel depots; Markets; Hotel or motel accommodation; Neighbourhood shops; Oyster aquaculture; Plant nurseries; Places of public worship; Research stations; Resource recovery facilities; Roads; Rural supplies; Vehicle sales or hire premises; Take away food and drink premises; Tank-based aquaculture; Timber yards; Warehouse or distribution centres; any other development not specified in 2 or 4.

4 Prohibited

Agriculture; Air transport facilities; Airstrips; Amusement centres; Biosolid treatment facilities; Business premises; Camping grounds; Caravan parks; Cemeteries; Charter and tourist boat facilities; Child care centres, Commercial premises; Correction centres; Eco-tourist facilities; Exhibition homes; Exhibition village; Health services facilities; Heavy industries; Heavy industrial storage establishments; Helipads; Highway service centres; Home-based child care; Home businesses; Mooring pens; Moorings; Pond-based aquaculture; Passenger transport facilities; Recreation areas; Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Residential accommodation; Rural industries; Sewage treatment plants; Tourist and visitor accommodation; waste disposal facilities.

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Our Ref: L.B23951.004.03_Southern_Cross_Expansion.docx

18 May 2021

Ballina Shire Council
40 Cherry Street
Ballina NSW 2478
PO Box 450, Ballina NSW 2478

Attention: Peter Brown

Dear Peter,

RE: SOUTHERN CROSS EXPANSION – DEVELOPMENT OF MITIGATION OPTIONS

This letter report outlines the background, methodology and results of the flood impact assessment for the proposed Southern Cross Expansion on Southern Cross Drive, Ballina, herein referred to the as the 'Site'. The objective of the assessment is to quantify the impact to water level and flood hazard, as a result of proposed fill associated with the Site, on peak flood levels for the 1% and 5% Annual Exceedance Probability (AEP) flood events (excluding climate change).

The Southern Cross Master Plan area was assumed filled in the Ballina Floodplain Risk Management Study (2012) and Ballina Floodplain Risk Management Plan (2015)[1], which were undertaken in accordance with the Floodplain Development Manual (DIPNR, 2005). This assessment is therefore focused only on flood level impacts and does not include flood risk management or flood planning levels except to determine whether flood hazard is increased.

1 Introduction

1.1 Background

Ballina Shire Council has identified that the proposed development at the Site is shown as flood affected. Council have specified that a flood impact assessment is required to comply with local development controls.

Development of flood prone land in Ballina is assessed using Council's regional flood model for cumulative and incremental impacts. A base case (pre-development) model and an integrated (all approved and rezoned development) model are used. The base case model is representative of the catchment in 2013. The integrated model has been progressively updated since 2013 to include all changes to the catchment inclusive of planned future changes. Integrated model inclusions are discussed in section 3.2 of this letter report.

Ballina Shire Council's acceptable tolerance for a development within the Ballina Shire is less than 50mm cumulative and 10mm incremental increase to peak flood levels. There is no requirement for managing changes to flood hazard although it is included as additional information.

1.2 Site Description

The proposed development is approximately 4.5 hectares in size. As shown in Figure 1-1, the Site is represented as a single five lot subdivision to the northeast of Airport Link Road. The service roads

[1] https://ballina.nsw.gov.au/floodplain-management

associated with these 5 lots will also be filled to above the 1% AEP flood level, contributing to a total fill area of 5.77 ha. As only the 4.5 ha lot area has been tested as part of the current assessment, subsequent modelling will follow to confirm the proposed mitigation strategy results in acceptable impacts for the larger fill area.

Proposed drainage conveys flow from the Site beneath Airport Link Road and in a south easterly direction towards a proposed bioretention basin. Flow from the development discharges in a south easterly direction beneath Cork Lane, Forest Oak Boulevard and North Creek Road, eventually discharging to North Creek.

The proposed lots are part of the larger Southern Cross Master Plan area, and this development is the first stage of this masterplan development.

1.2.1 Proposed Development

The development will involve raising existing ground levels across the Site. The general location of the Site is illustrated in Figure 1-1.


Ballina Byron
Gateway Airport
North Creek
Southern Cross Drive
N Creek Road
Tamarind Drive
LEGEND
Site Boundary
Title
The Site
Figure
1-1
Rev
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2 Flood Hazard Definitions

The Australian Emergency Management Institute provides guidance in categorising flood hazard. The hazard curves, which recognise key thresholds in flood depths, velocities and combined depths, are provided in Figure 2-1. These flood hazard definitions are not Council Flood Risk Precincts and instead focus on identifying areas of high risk to people, structures and vehicles.

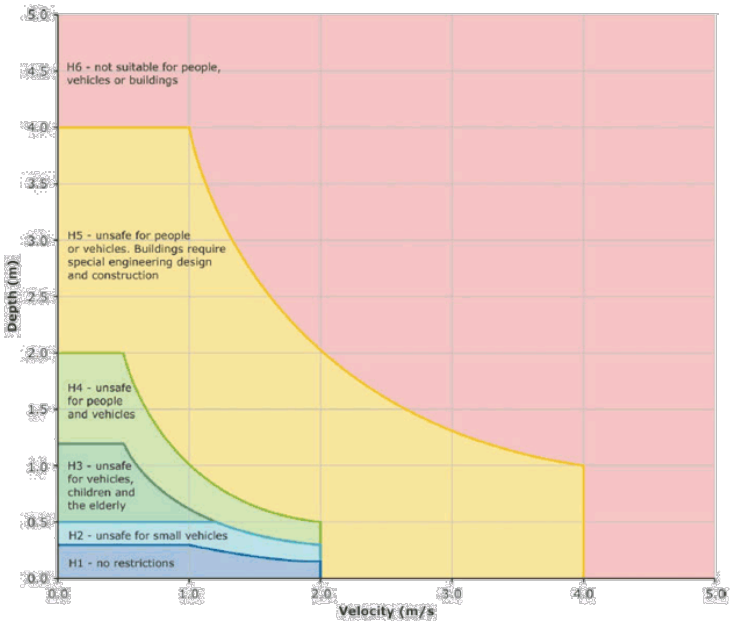


Figure 2-1 Flood Hazard Curves

Each hazard category from H1 (lowest hazard) to H6 (highest hazard) is defined by depth, velocity and combined depth-velocity limits, and has been determined based on recognised limits of safety for people, buildings and vehicles (informed by laboratory testing).

Table 2-1 Flood Hazard Classification

Flood Hazard Category	Description	Depth-Velocity Limit	Depth Limit
H1	Generally safe for vehicles, people and buildings	≤ 0.3 m^2/s	≤ 0.3 m
H2	Unsafe for small vehicles	≤ 0.6 m^2/s	≤ 0.5 m
H3	Unsafe for vehicles, children and the elderly	≤ 0.6 m^2/s	≤ 1.2 m
H4	Unsafe for vehicles and people	≤ 1.0 m^2/s	≤ 2.0 m

Flood Hazard Category	Description	Depth-Velocity Limit	Depth Limit
H5	Unsafe for vehicles and people All building types vulnerable to structural damage	≤ 4.0 m^2/s	≤ 4.0 m
H6	Unsafe for vehicles and people All building types considered vulnerable to failure	> 4.0 m^2/s	> 4.0 m

3 Flood Modelling

3.1 Design Flood Event

The pre-development and post-development scenarios have been simulated for the 1% AEP and 5% AEP events. Richmond River, local creek and storm surge dominated floods have been simulated and combined to identify the worst-case scenario for flooding at the site and impacted areas.

3.2 Ballina Integrated Model

The integrated model includes the infrastructure and developments that have either been constructed, approved or rezoned since the cumulative impacts policy was adopted. Listed in Table 3-1 are all flood prone developments that have been assessed, including whether they are currently represented in the integrated flood model.

Table 3-1 Integrated Model Inclusions

Development / Infrastructure	Status	Included
B&B Timbers Teven Road	Filled	Yes
Transport Precinct Teven Road	Not fully approved	Yes
Ballina Bypass	Constructed	Yes
Ballina Heights sportsfields	Constructed	Yes
Ballina Homeworld Site	DA consent issued	Yes
Ballina Racecourse redevelopment	DA consent issued	Yes
Ballina Waterways (including Burns Ferry Road site)	Rezoning in progress	Yes
'Barretts development' North Creek	Strategic growth area	Yes
Cumbalum Precinct B	Rezoned and design in progress	Yes
Deadmans Creek Road lowering	Requires further assessment	No
'Dr Stewarts' development North Creek	Not in flood plain	No
Emigrant Creek South Bridge Upgrade	Under construction	Yes
Gallans Road Cycleway	Requires further assessment	No
GoGrow site Teven Road	Part of Teven Road Transport Precinct	Yes

Development / Infrastructure	Status	Included
Hutley Drive	DA consent issued	Yes
Natuna	Under construction	Yes
Pimlico Road minor residential filling	DA consent issued	Yes
Ray Date site Teven Road	Part of teven road transport precinct	No
Riveroaks	Constructed	Yes
Service Centre at West Ballina between Pacific Highway and Bruxner Highway	DA submitted	Yes
Southern Cross Master Plan	Still in planning phase	No
Waster Transfer Centre floodway	Part of southern cross masterplan	Yes
West Ballina Arterial	Proposed, current alignment included	Yes
West Ballina Masterplan	Strategic growth area	No
West Ballina Service Centre and Flood Relief Culverts	DA consent issued	Yes
Woodburn to Ballina	Under construction	Yes
Koellner Steel	Included in LiDAR	Yes
Palm Lakes (fill extent)	Still in planning phase	No[2]
Palm Lakes (acoustic walls)	Still in planning phase	Yes
Empire Vale	DA submitted	Yes
RMS geotechnical study	Short term proposal	No
Airport Drive Upgrade	Currently under construction (included as per construction issued plans)	Yes

The simulations are summarised below:

- Run 433 – unmitigated scenario including the Palm Lakes development
- Run 434 – unmitigated scenario excluding Palm Lakes
- Runs 482, 485 and 487 – mitigation scenarios excluding Palm Lakes following advice that the Palm Lakes development is not proceeding.

3.3 2013 Base Case

The base case model is representative of the catchment in 2013.

[2] Included for run 433, not included for run 434, 482, 485 or 487

4 Non-Mitigated Results

4.1 Flood Levels

Pre-developed case peak flood levels at the Site vary from 1.63m to 1.64m AHD for the 5% AEP flood event, and 1.76m to 1.79m AHD for the 1% AEP flood event as shown on Figures A-1 and A-2. Flood hazard in the pre-developed case varies from H1 to H3 in both the 5% AEP flood event and the 1% AEP flood event as shown on figures A-3 and A-4.

Peak flood levels for the integrated case including the Southern Cross Expansion development (but not including mitigation) along the southern boundary of the Site are 1.84m AHD and 1.87m AHD on the northern boundary for the 1% AEP event. West of the Site peak flood levels are approximately 1.90m AHD.

4.2 Flood Impacts

Incremental impacts are the difference between the integrated model with the Site and without the Site (i.e. the impacts associated with Southern Cross Expansion development). Peak flood levels in the 1% AEP event are expected to increase between 10mm and 20mm along the northern boundary and within the vegetated area to the west of the Site when no mitigation is applied. While an insignificant decrease in peak flood levels is expected on the eastern side, (i.e. a reduction of less than 5mm) a decrease of up to 50mm is expected along North Creek Road.

As flood impacts are considered unacceptable, a mitigation strategy was implemented to reduce flood impacts to an allowable level.

5 Mitigation

5.1 Mitigation Options

This assessment considered increasing the storage capacity and connectivity of local flowpaths to reduce the impact to peak flood levels as described in Section 4. Specifically, the location considered for the mitigation assessment was the grassed area, between the Southern Cross Expansion Site and the Ballina Airport.

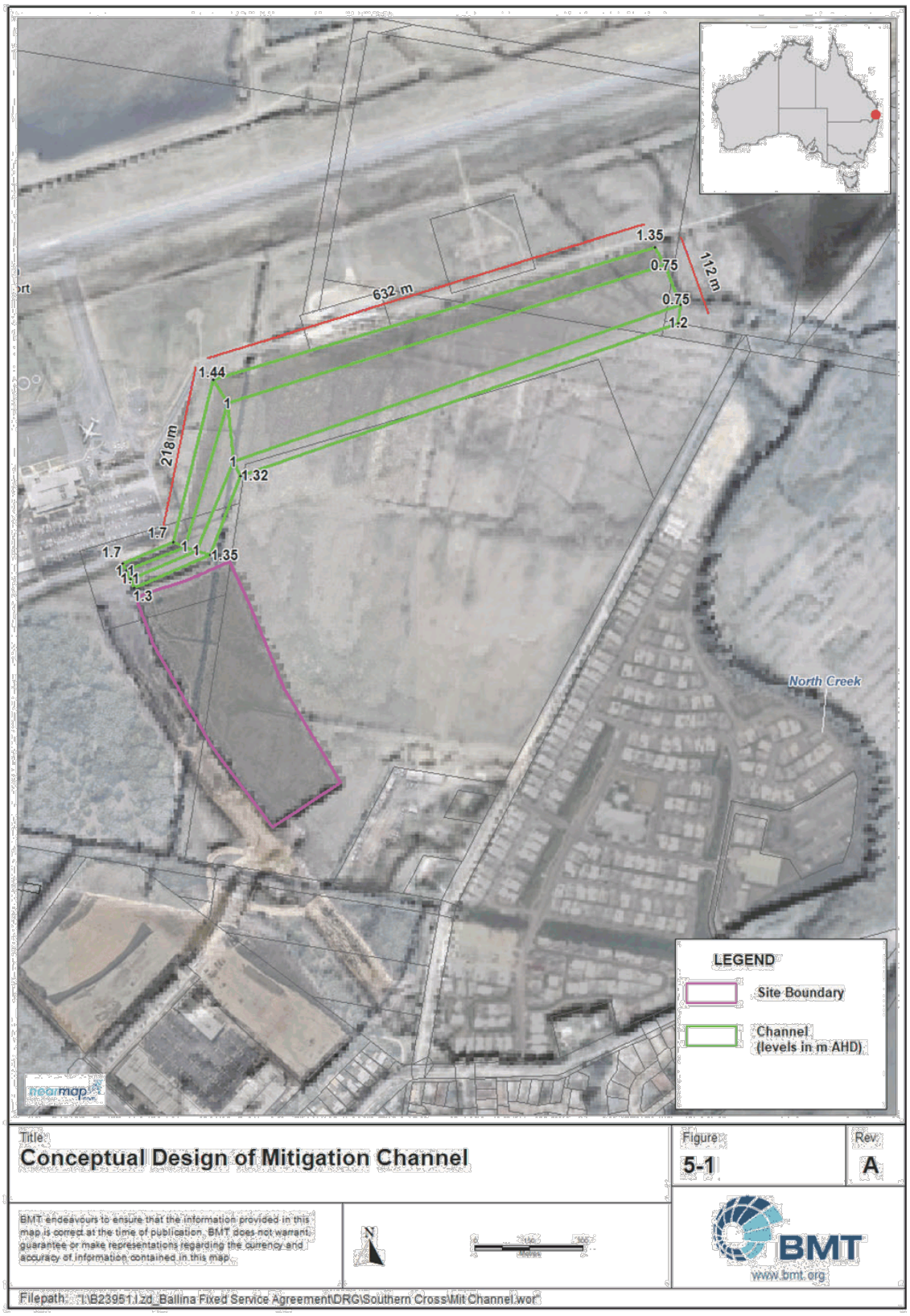
The following scenarios have been tested:

- Scenario 1: Shallow channel between Airport Boulevard and Corks Lane
- Scenario 2: Shallow channel between Airport Boulevard and North Creek (removing Corks Hill)
- Scenario 3: Deep channel between Airport Boulevard and North Creek (removing Corks Hill)

This letter includes mapping of results from Scenario 1. The channel considered in Scenario 1 has been placed to avoid:

- Impacting private property;
- Impacting on airport operations;
- Corks Hill; and
- Damage to wetland and nature reserve areas.

The channel functions by providing flood storage space before draining gradually to North Creek in the east as flood levels retreat. Scenario 1 is illustrated in Figure 5-1 below:


1.35
0.75
112 m
632 m
0.75
1.2
1.44
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218 m
1
1.32
1.7
1.7
1
1
1.35
1.1
1.1
1.3
North Creek
LEGEND
Site Boundary
Channel
(levels in m AHD)
nearmap
Title
Conceptual Design of Mitigation Channel
Figure
5-1
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5.2 Mitigation Results - Shallow Channel between Airport Boulevard and Corks Lane

5.2.1 Flood Levels

Peak flood levels for the along the southern boundary of the Site are shown on Figures A-5 and A-6. Flood levels are slightly reduced when compared to the pre-developed case, as explained further below.

5.2.2 Flood Impacts

Refer to Figures A-9 and A-10 for the 5% and 1% AEP incremental flood impacts. Peak flood levels for the 1% AEP event are expected to increase by between 10mm and 15mm for an area of approximately 2.5 hectares, to the east of the mitigation channel footprint (within an area owned by Council). A decrease in flood levels when compared to the pre-developed case up to 30mm can be seen within both the mitigation channel and the Site. Peak Flood levels for the 5% AEP event show decreases of between 10mm and 30mm throughout the Site and surrounding area including the Ballina Airport, the mitigation channel, the vegetated area south of Southern Cross Drive and the land east of Corks Lane.

Refer to Figures A-11 and A-12 for 5% and 1% AEP cumulative flood impacts. Cumulative impacts immediately west of the Site exceed 90mm, east of the Site impacts exceed 50mm. Overall there is a reduction in cummulative impacts adjacent to the Site, thanks to the reduced water levels caused by the proposed mitigation option.

5.2.3 Flood Hazard

The inclusion of the Site and the mitigation floodway make a negligible difference to flood hazard. Increases in flood hazard are confined to the Southern Cross Masterplan area. The range of hazard values remains within H1 to H3, however the areas of H2 and H3 within the southern Cross Masterplan area are increased. The affected area is owned by Council and is planned to be filled in the future. Flood hazard for the mitigated integrated case including the Southern Cross Expansion development are shown on Figures A-7 and A-8.

6 Discussion

The currently proposed fill extent for the Southern Cross Expansion (Stage 1) is shown to have a significant impact on peak flood levels within the surrounding vegetated area to the west of the site if no mitigation strategy is adopted. The impact is caused by a combination of storage and conveyance related factors. Floodplain filling has reduced flood storage and the current development footprint blocks the natural overland flow path from the floodplain to the North Creek Canal.

Significant impacts to flood levels are expected in both the 1% and 5% AEP events in the vegetated area west of the Site as a result of the first stage of the development.

Water level impacts within the vicinity of the Site are improved by up to 38 and 28mm respectively when compared to the pre-developed case over an approximate area of 100 and 36 hectares, in both the 5% and 1% AEP events, as a result of implementing a mitigation channel, north of the Site, between Airport Boulevard and Corks Lane. Therefore, the inclusion of the proposed mitigation channel in the design reduces flood levels in the vicinity of the site and meets Council's requirements for less than 10 mm of incremental flood impact. 50 mm of cumulative flood impact is already exceeded in this area, however, the proposed Site and mitigation channel slightly reduce this impact rather than worsening it.

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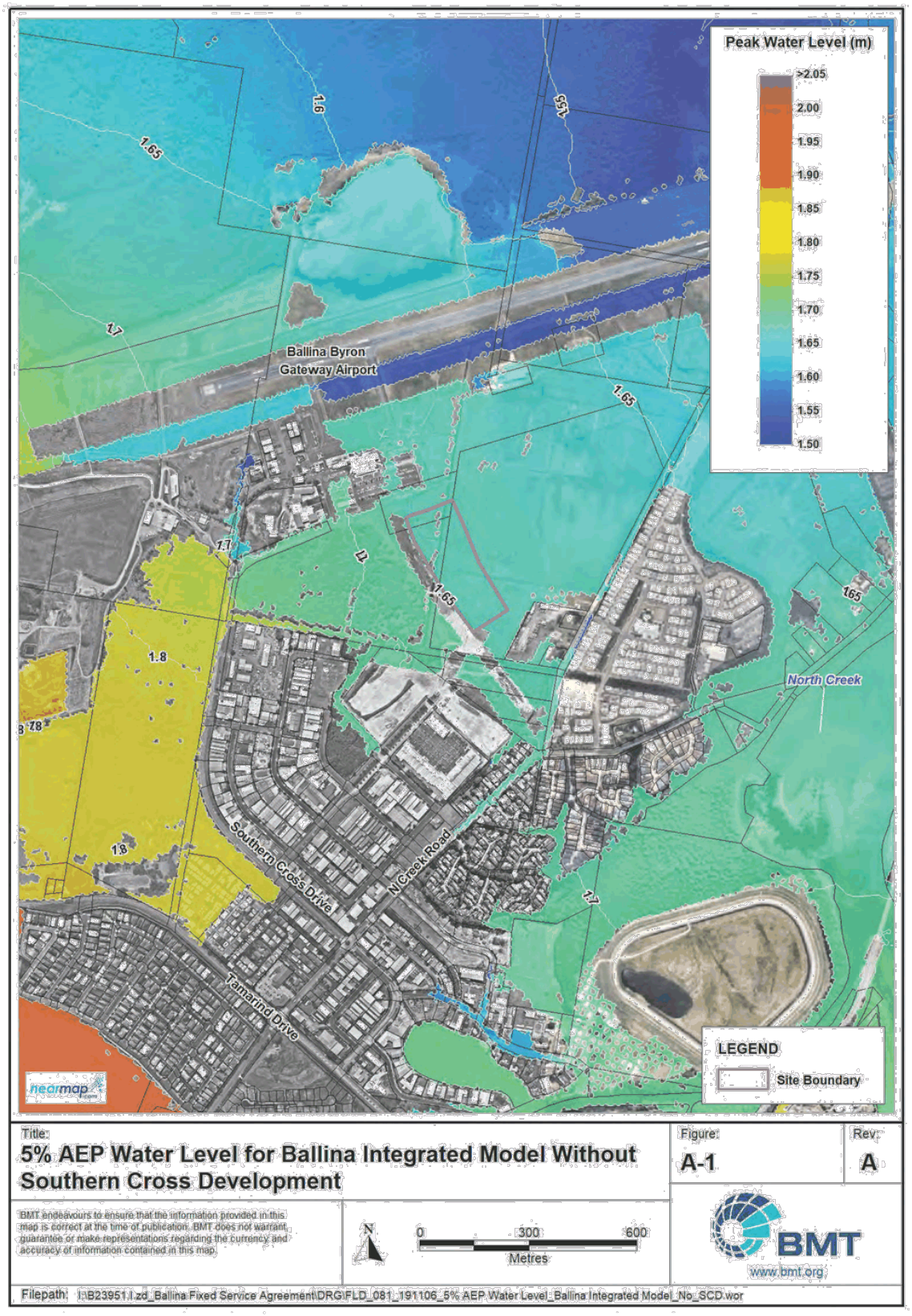
Yours Faithfully

BMT

Zita Dore
Senior Flood Engineer


Peak Water Level (m)
>2.05
2.00
1.95
1.90
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Ballina Byron Gateway Airport
North Creek
Southern Cross Drive
N Creek Road
Tamarind Drive
LEGEND
Site Boundary
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Title:
5% AEP Water Level for Ballina Integrated Model Without Southern Cross Development
Figure:
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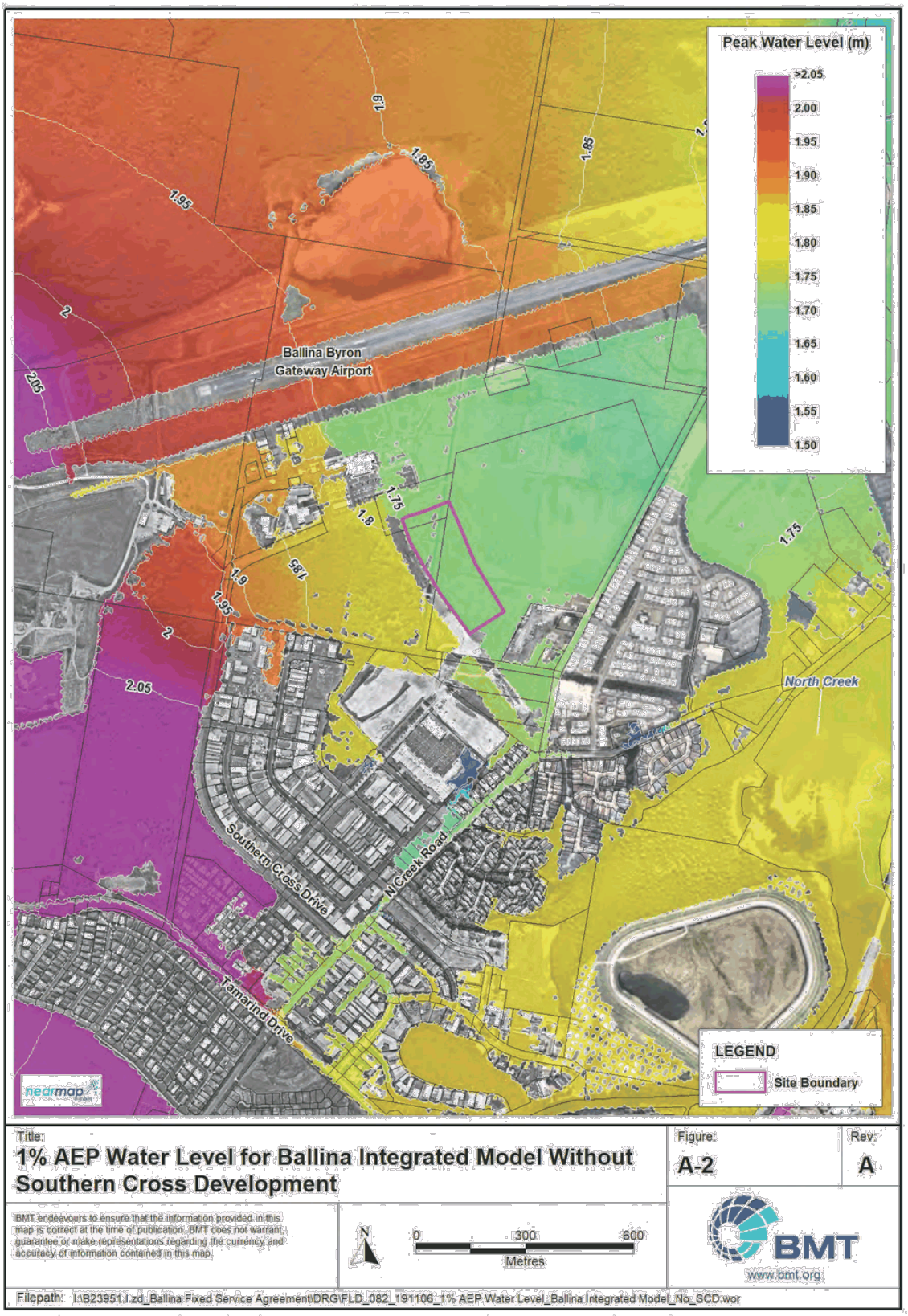
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Ballina Byron Gateway Airport
North Creek
N Creek Road
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Tamarind Drive
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1% AEP Water Level for Ballina Integrated Model Without Southern Cross Development
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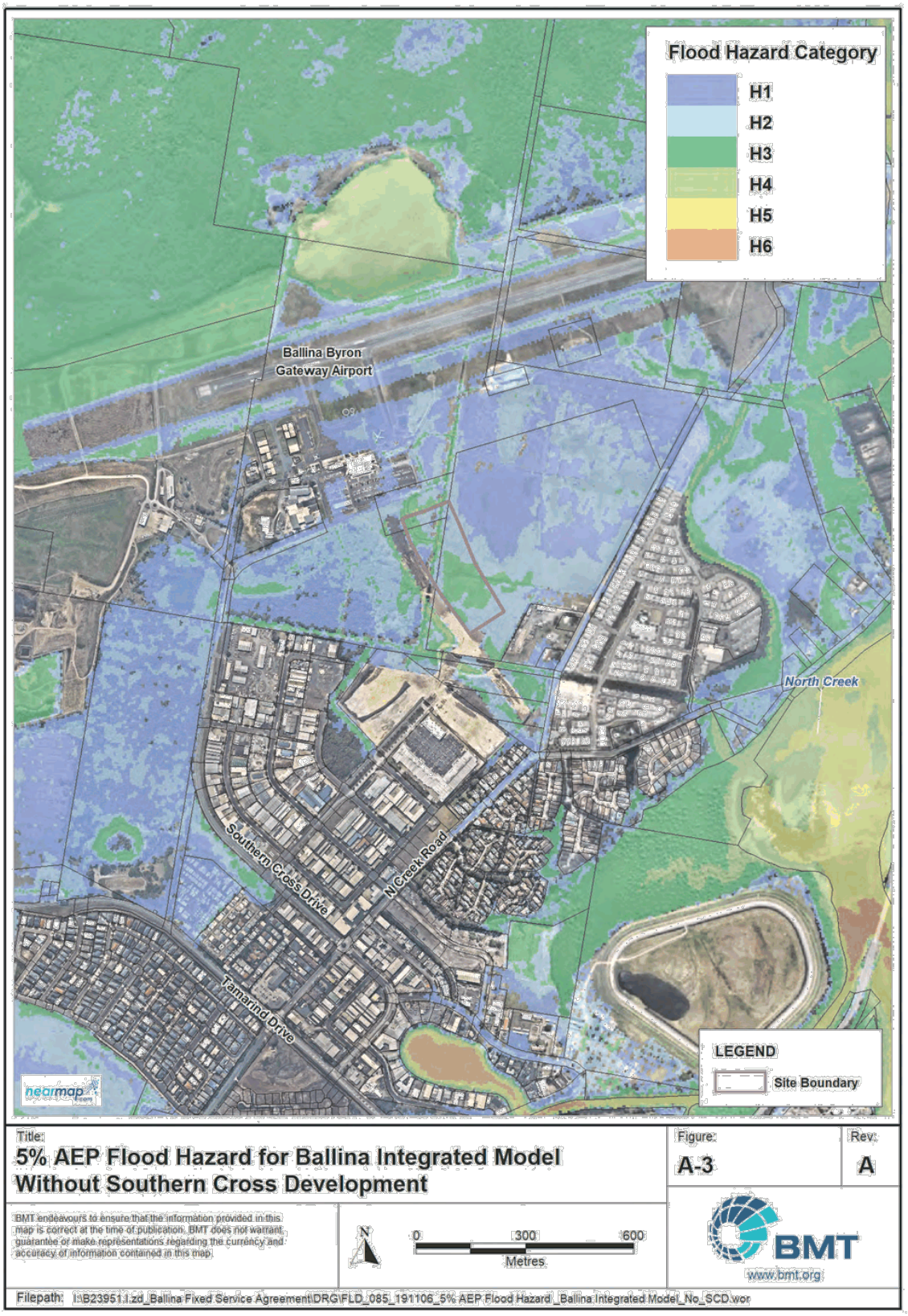
Flood Hazard Category
H1
H2
H3
H4
H5
H6
Ballina Byron Gateway Airport
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Southern Cross Drive
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5% AEP Flood Hazard for Ballina Integrated Model Without Southern Cross Development
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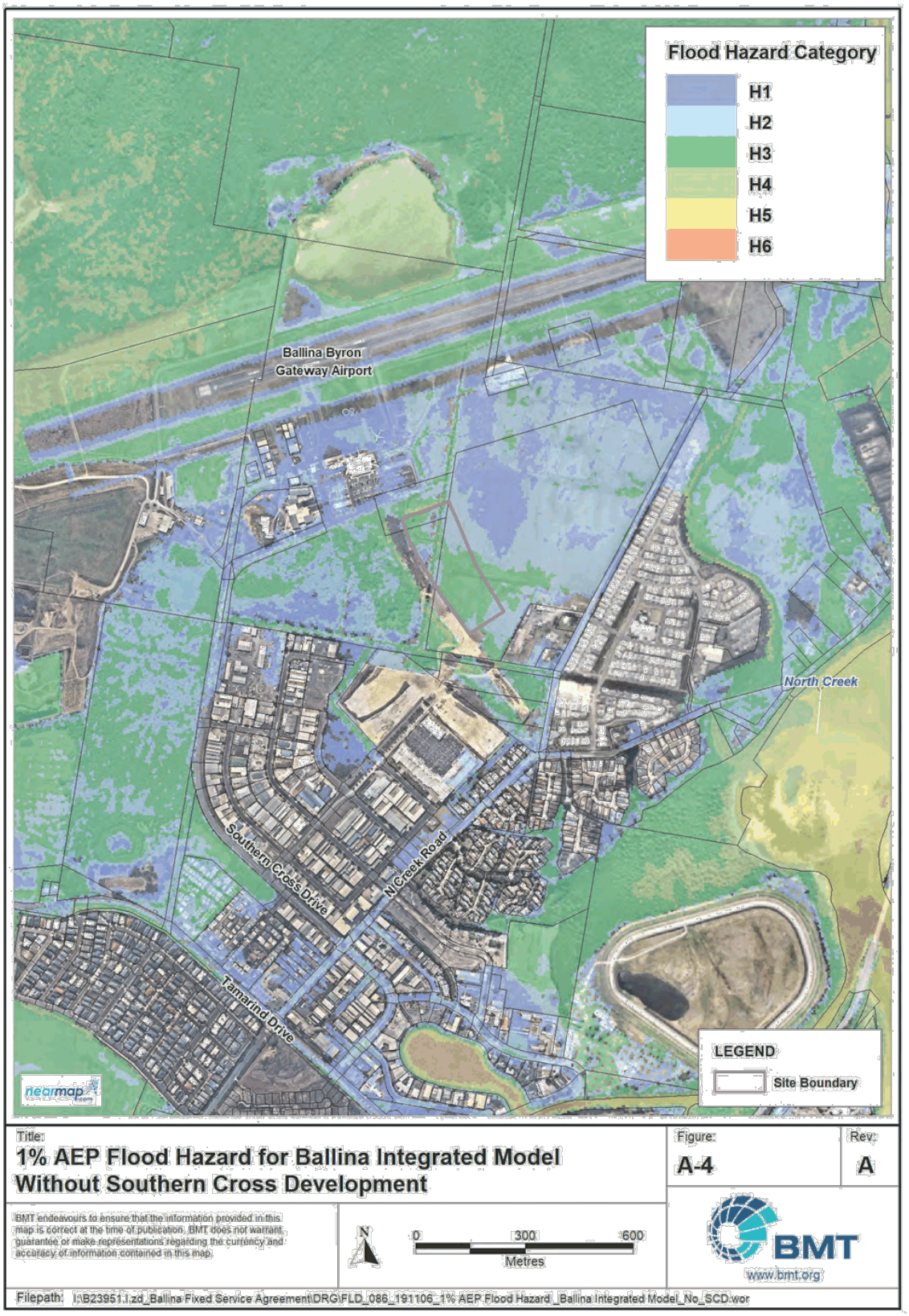
Flood Hazard Category
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Ballina Byron
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1% AEP Flood Hazard for Ballina Integrated Model
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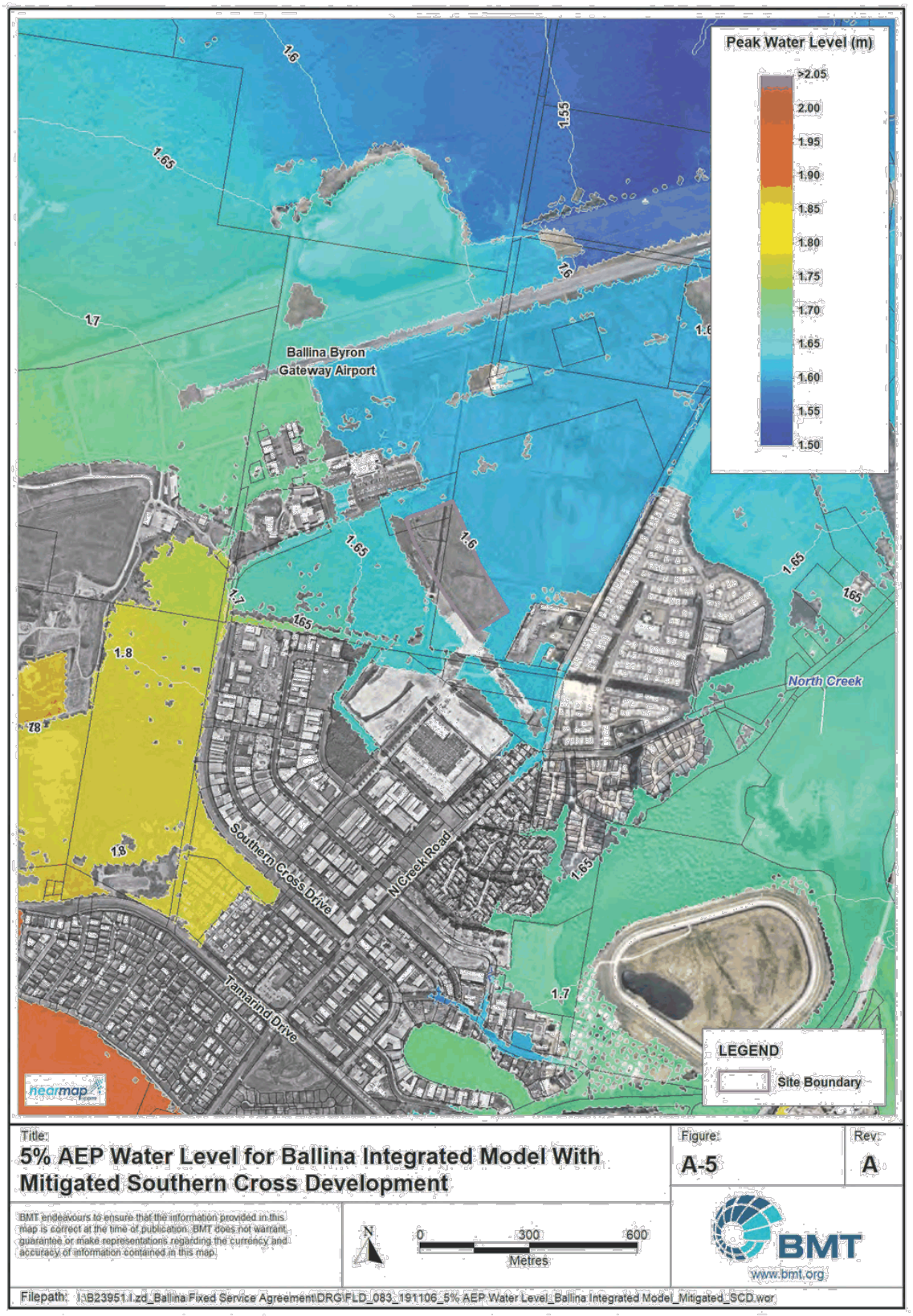
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Ballina Byron Gateway Airport
North Creek
Southern Cross Drive
N Creek Road
Tamarind Drive
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Site Boundary
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5% AEP Water Level for Ballina Integrated Model With Mitigated Southern Cross Development
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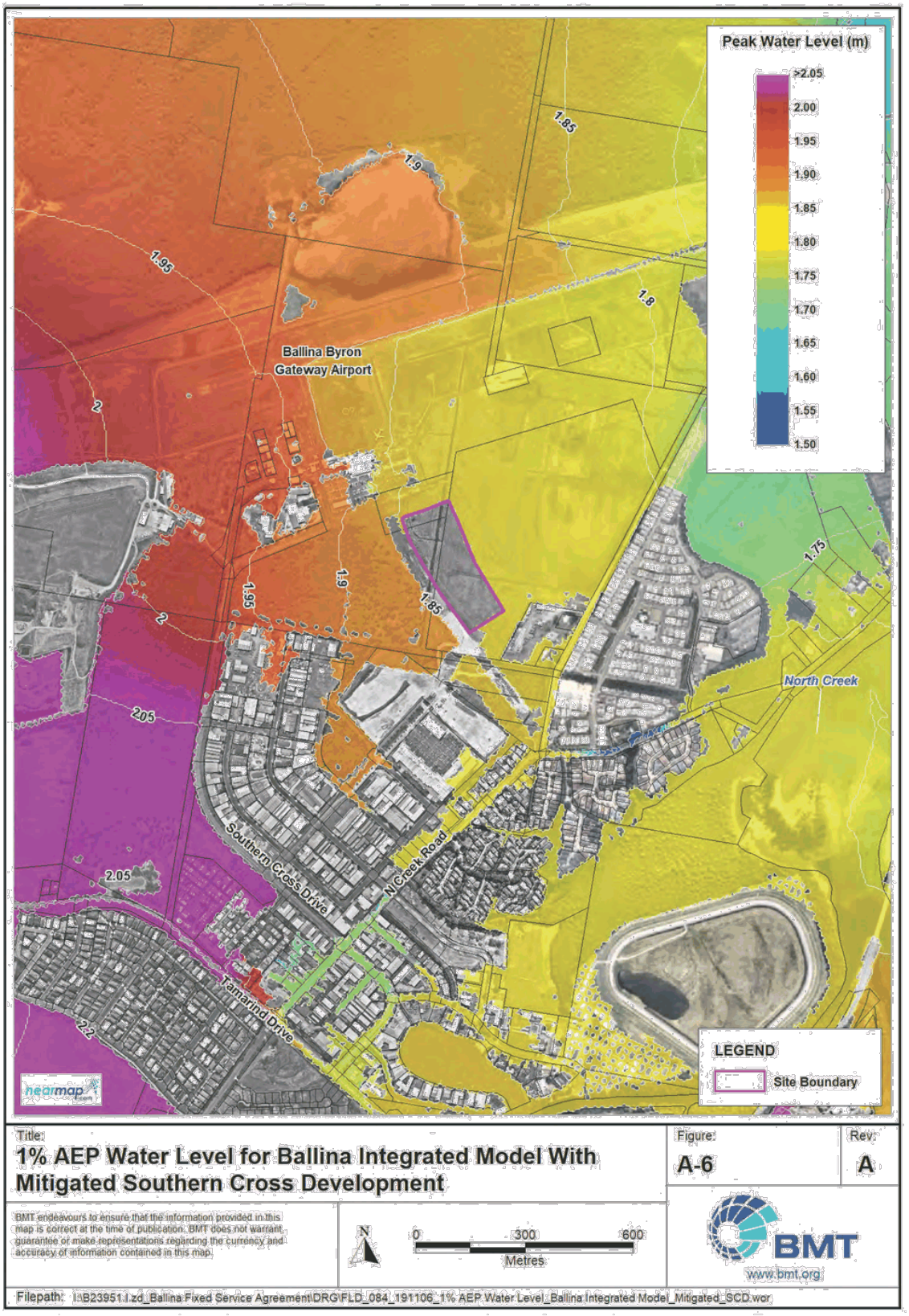
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Ballina Byron Gateway Airport
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1% AEP Water Level for Ballina Integrated Model With Mitigated Southern Cross Development
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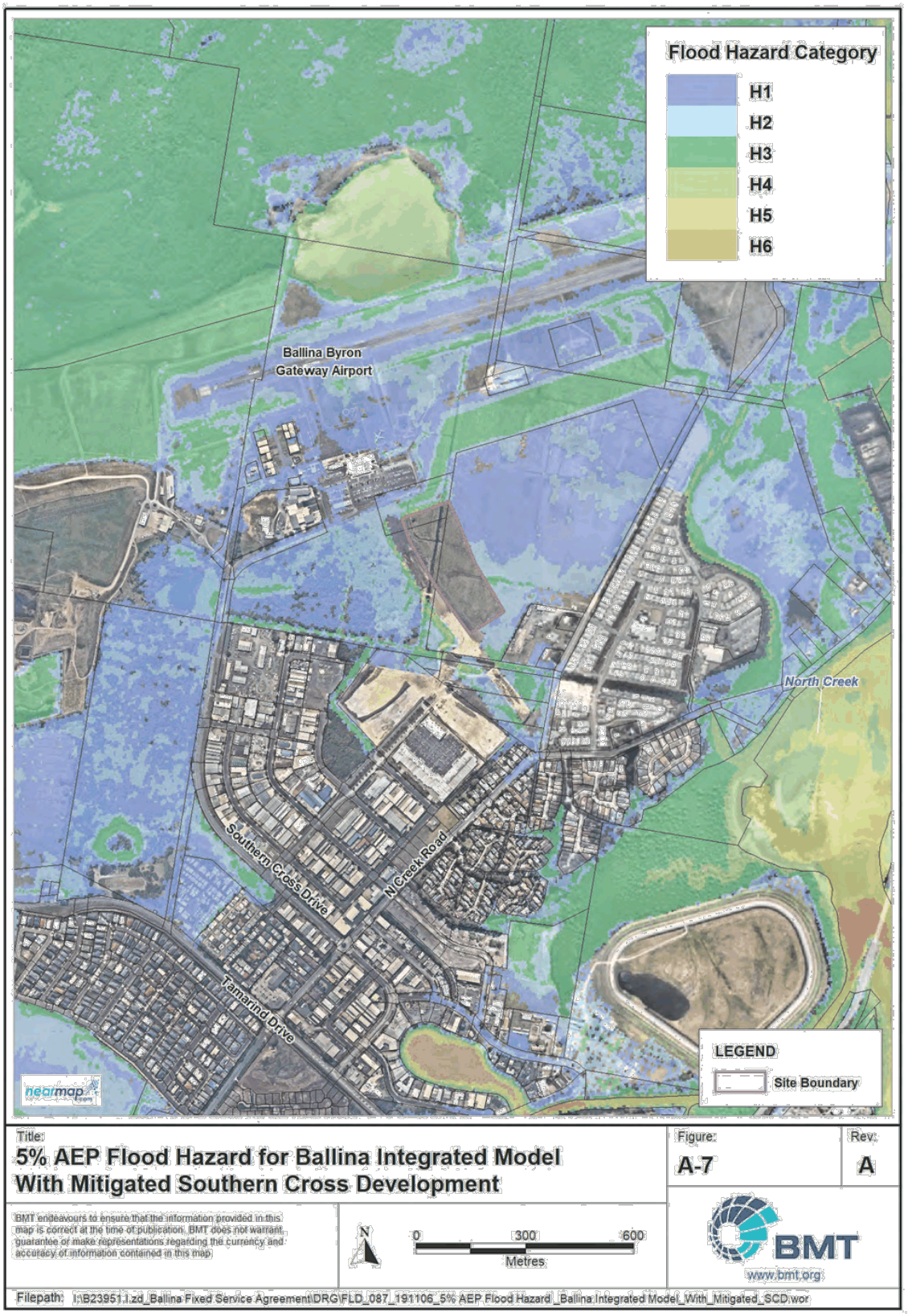
Flood Hazard Category
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Southern Cross Drive
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Tamarind Drive
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5% AEP Flood Hazard for Ballina Integrated Model
With Mitigated Southern Cross Development
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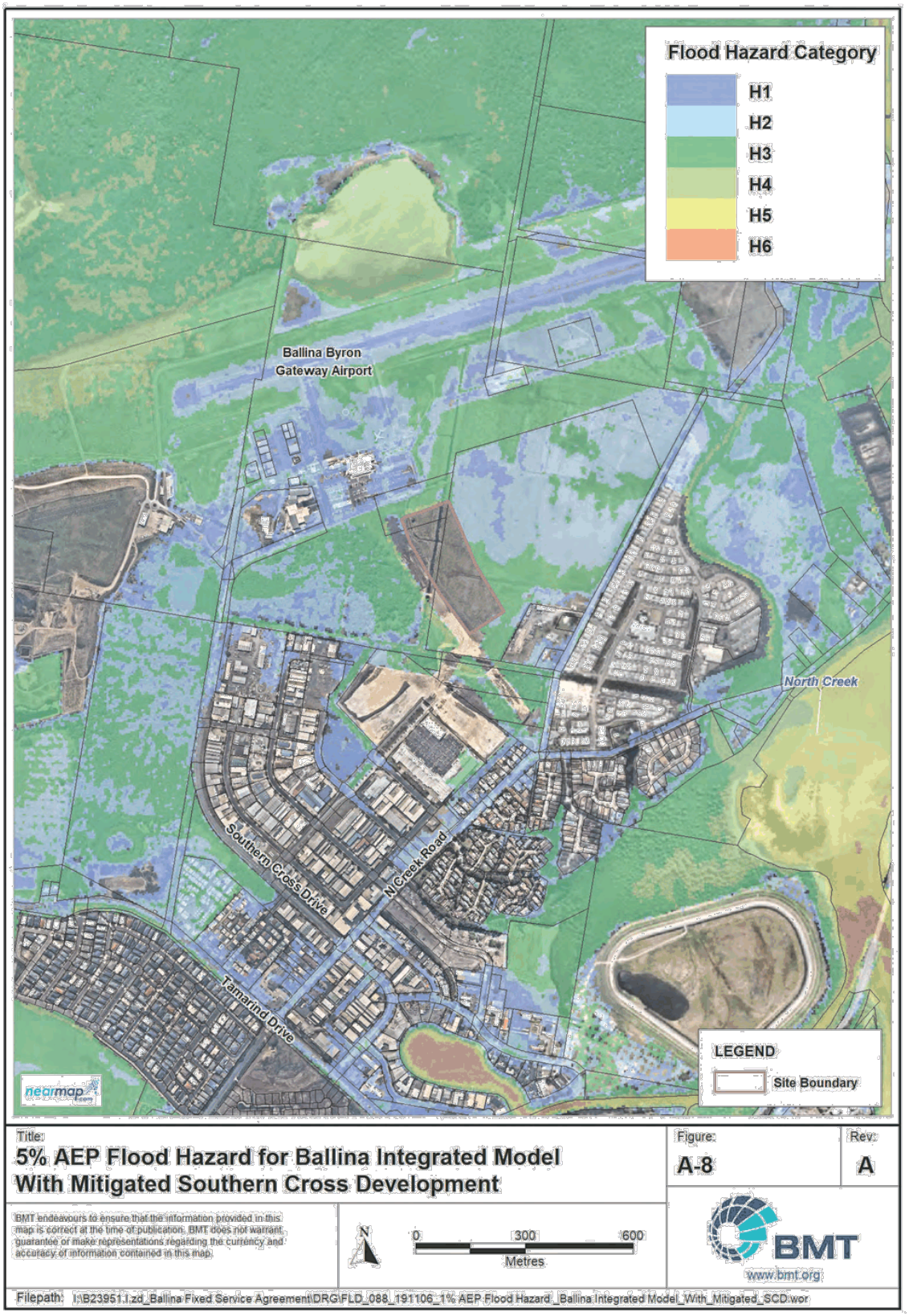
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5% AEP Flood Hazard for Ballina Integrated Model
With Mitigated Southern Cross Development
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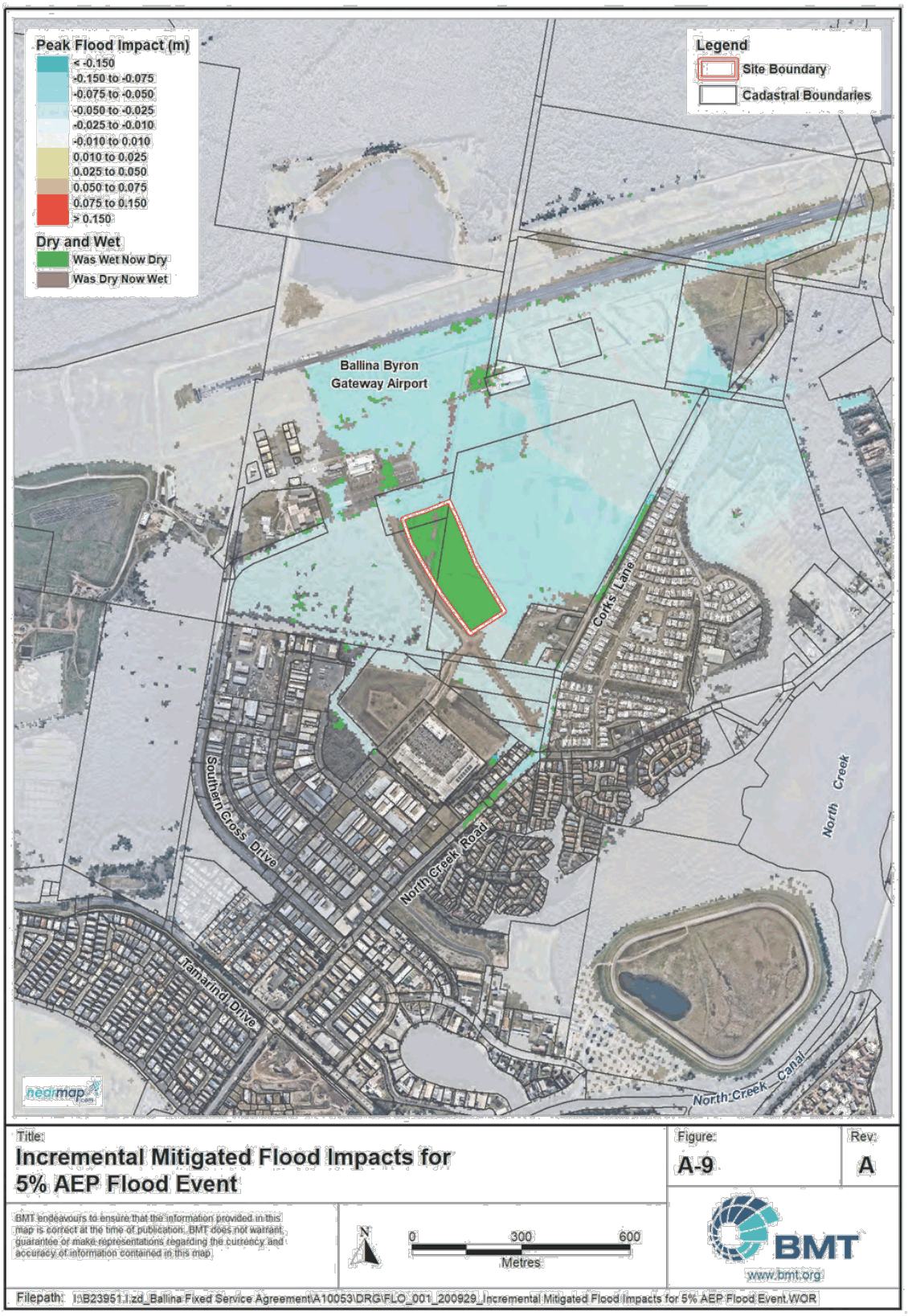
Peak Flood Impact (m)
< -0.150
-0.150 to -0.075
-0.075 to -0.050
-0.050 to -0.025
-0.025 to -0.010
-0.010 to 0.010
0.010 to 0.025
0.025 to 0.050
0.050 to 0.075
0.075 to 0.150
> 0.150
Dry and Wet
Was Wet Now Dry
Was Dry Now Wet
Legend
Site Boundary
Cadastral Boundaries
Ballina Byron
Gateway Airport
Corks Lane
Southern Cross Drive
North Creek Road
Tamarind Drive
North Creek
North Creek Canal
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Incremental Mitigated Flood Impacts for
5% AEP Flood Event
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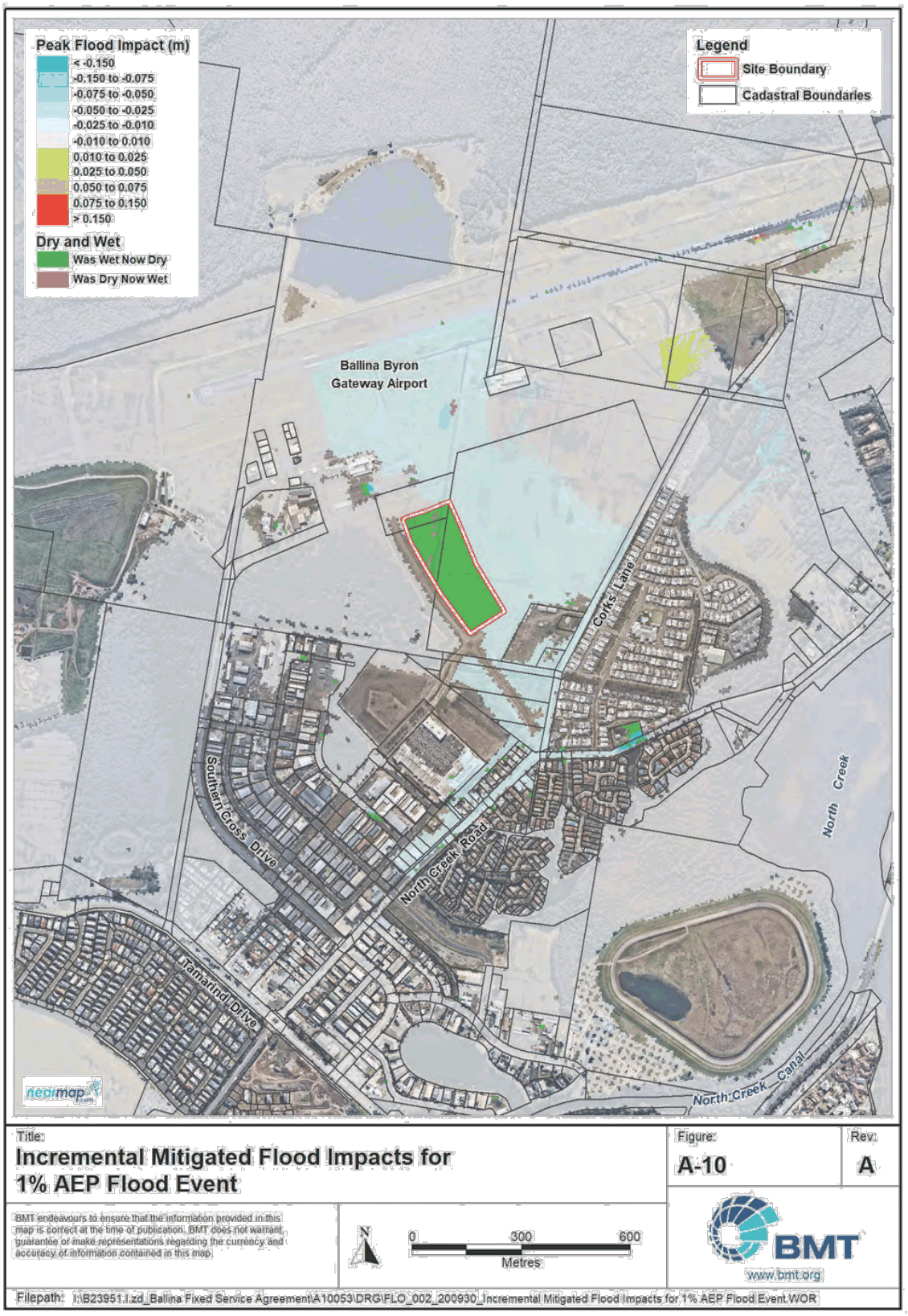
Peak Flood Impact (m)
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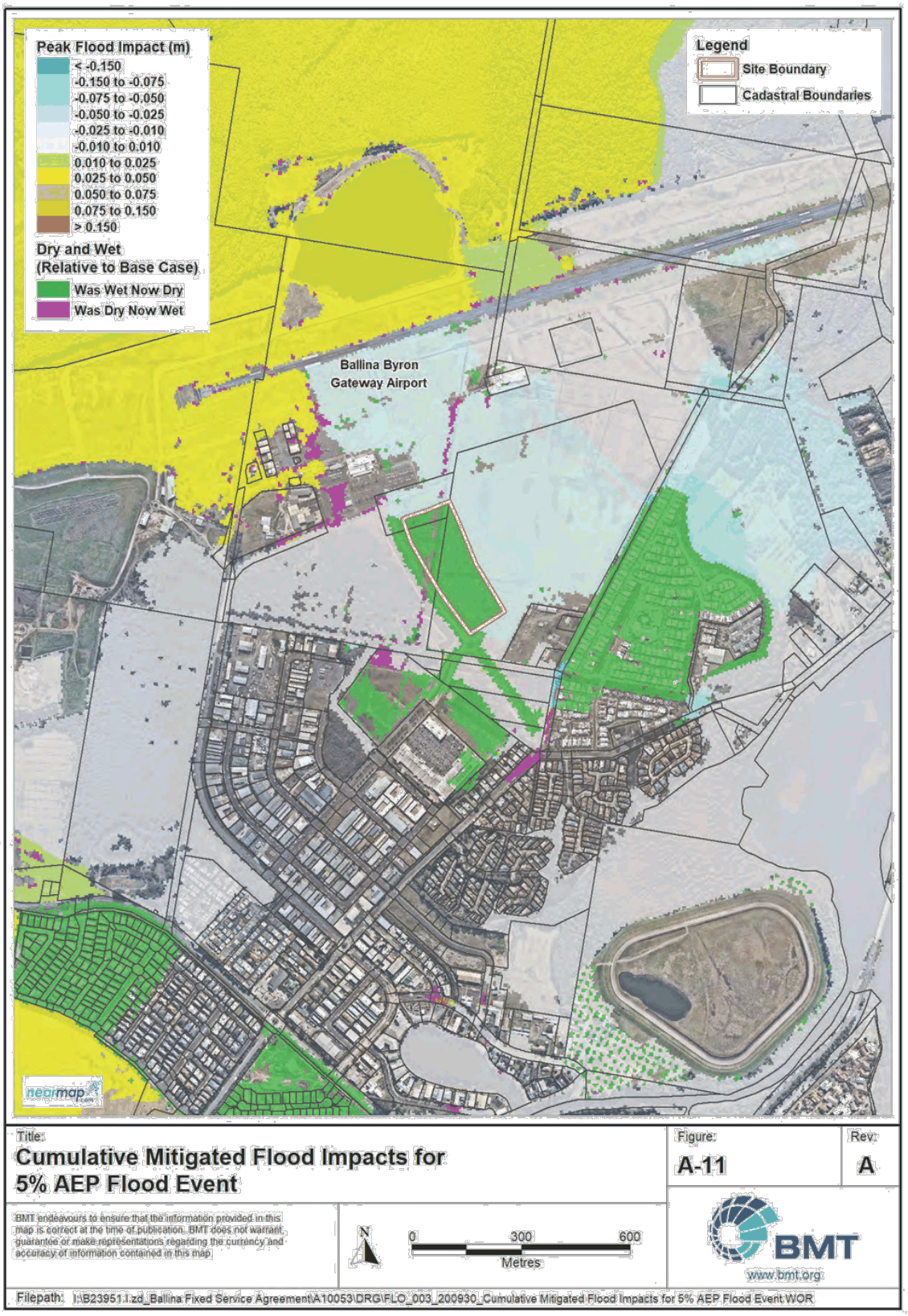
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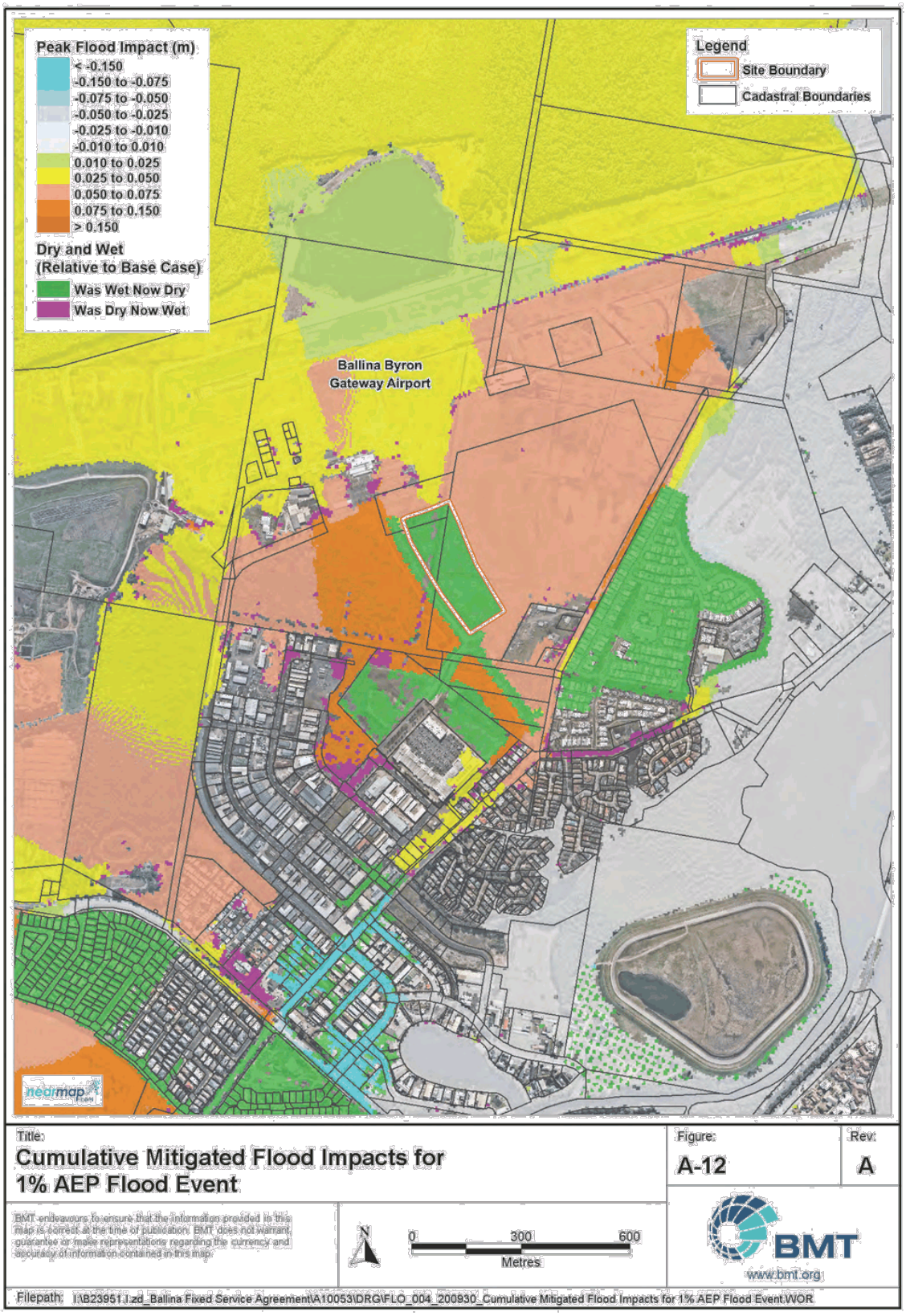
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Southern Cross Industrial Estate Rezoning Planning Proposal – Stage 1

Ecological Assessment - Summary

Final Report

April 2021

Disclaimer:

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Acknowledgement of Country:

Ballina Shire Council and Hydrosphere Consulting acknowledge the Bundjalung people, Traditional Custodians of the lands discussed in this report and pay tribute and respect to the Elders past, present and emerging of the Bundjalung nation.

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19-016 SOUTHERN CROSS INDUSTRIAL REZONING – ECOLOGICAL ADVICE
SOUTHERN CROSS INDUSTRIAL ESTATE REZONING – STAGE 1: ECOLOGICAL SUMMARY

REV	DESCRIPTION	AUTHORS	REVIEW	APPROVAL	DATE
0	Draft for client review	U. Makings	R. Campbell, M. Howland	M. Howland	30/03/2021
1	Minor edits	U. Makings	R. Campbell	R. Campbell	1/4/2021

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1. INTRODUCTION AND BACKGROUND

To enable expansion of the Southern Cross Industrial Estate, Ballina Shire Council (BSC) is preparing a planning proposal for Stage 1 of the rezoning of a parcel of land immediately south of Ballina Airport. The site is part of a larger land parcel under investigation to be rezoned for industrial use.

A number of ecological assessments of the broader site have been undertaken. The aim of this report is to provide a summary of the existing ecological assessments that relate to the Stage 1 rezoning area.

1.1 Site and Proposal

The Stage 1 proposed rezoning site is located immediately south of Ballina Airport at the northern end of Airport Boulevard (under construction). The site is located on Lot 7 and 8, DP 793980 and is currently zoned SP2 Infrastructure and RU2 Rural Landscape under the *Ballina Local Environment Plan 2012*. The planning proposal comprises a request to rezone the proposal area to IN1 General Industrial with the formation of five industrial 'super lots' and internal access road (approximately 5.85 ha, Figure 1).

The dominant vegetation at the site is shown in Plate 1.

Plate 1: Dominant vegetation at the site (looking north towards airport) – September 2019

All assessment and environmental restoration work for the Airport Boulevard project have been undertaken in accordance with the approval for Part V Activity 22.2018/6.

1.2 Previous Studies

The ecological and related assessments that have been undertaken across the broader site and the findings of these assessments relating to the Stage 1 proposal are outlined in Table 1. This report is based on information and outcomes provided in those studies and no additional surveys or investigations were undertaken for this summary report.

Figure 1: Stage 1 planning proposal area

Table 1: Previous ecological assessments

Report	Author	Outline	Findings relevant to the Stage 1 rezoning proposal
Ecological Assessment Airport Boulevarde Project	Blackwood Ecological Services (2017)	This assessment was undertaken as part of the approval for the Airport Boulevarde project however the study area includes the Stage 1 and broader rezoning area.	Identified four vegetation communities on the proposal site and two were considered to be consistent with Endangered Ecological Communities (EECs): • Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions. • Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions. Recorded four individuals of the threatened Hairy Joint Grass (*Arthraxon hispidus*) on the proposal site and others within the vicinity. Recorded Wallum froglet (*Crinia Tinnula*) in the broader rezoning site and identified a range of other threatened fauna species that may present at the site.
Additional information – Hairy joint grass and occurrence of Wallum froglets	Blackwood Ecological Services (2018a)	Additional information requested by BSC for the proposed Airport Boulevard development.	An area of freshwater wetland within the road footprint and proposed rezoning site provides habitat for Wallum froglet. No change to the assessment of impact on Hairy joint grass.
Additional Wallum froglet assessment	Blackwood Ecological Services (2018b)	Assessment of land adjoining the proposed Airport Boulevard footprint and assessment of impacts on Wallum froglet.	Identification of "higher quality" Wallum froglet habitat within the proposed Stage 1 rezoning area.

Report	Author	Outline	Findings relevant to the Stage 1 rezoning proposal
*Likely occurrence of wallum froglet (*Crinia tinnula*) and wallum sedge frog (*Litoria olongburensis*) at the proposed Southern Cross Industrial Estate, Southern Cross Drive Ballina*	Sandpiper Ecological Surveys (2019)	Habitat assessment and field surveys to confirm identification of *Crinia tinnula* records within the proposed rezoning area from Blackwood Ecological Services (2017; 2018a, 2018b).	Concluded that the subject site (rezoning area - including Stage 1) does not support suitable habitat for the Wallum froglet (*Crinia tinnula*) or Wallum sedge frog (*Litoria olongburensis*) and the proposed road development would have no impact on these species.
A letter to Hydrosphere Consulting reviewing the conservation status of vegetation communities identified in the 'Ecological Assessment Airport Boulevard Project'	Biodiversity Assessment Solutions (2019a)	Reviewed the conservation status of vegetation communities identified in Blackwood (2017).	The features of Swamp Oak forest and Freshwater wetland communities at the site do not satisfy the relevant Scientific Committee Final Determination criteria for listing as Endangered Ecological Communities (EECs). The key characteristics not satisfied are edaphic and locational properties.
Southern Cross Industrial Estate Ecological Assessment Rezoning Planning Proposal	Biodiversity Assessment Solutions (2019b)	Ecological assessment of the broader rezoning site.	The site is heavily disturbed and of limited ecological value generally, with areas of the site considered to be of moderate value. None of the vegetation communities on the site are considered to meet the definitions of an EEC. Further, it was generally concluded that the site does not represent significant habitat for any threatened species.
Southern Cross Industrial Estate Rezoning Planning Proposal - Soils Assessment	Hydrosphere Consulting (2019)	Soil sampling to determine soil characteristics across the proposed rezoning site to support findings from Biodiversity Assessment Solutions (2019).	Overall, the subject site is dominated by loamy sand and sand which is not consistent with the soil texture description in any of the relevant EEC Scientific Determinations.

Report	Author	Outline	Findings relevant to the Stage 1 rezoning proposal
Preliminary Biodiversity Assessment Method Calculations	Biodiversity Assessment Solutions (2020).	Preliminary assessment of biodiversity offset requirements and any issues or constraints relating to the progression of a Biodiversity Development Assessment Report at development assessment stage for the proposed Stage 1 rezoning.	Provides the most recent vegetation survey of the proposed Stage 1 rezoning site. Vegetation community composition and structure at the site had changed over previous 12-15 months.

1.3 Site Disturbance

The site has experienced significant historic disturbance as follows:

- Historically cleared of vegetation –pre-1958.
- Agricultural drainage through the site and the surrounding area.
- An aquaculture facility (prawn farm) which included the construction of large open ponds was located across the majority of the site from the 1980s with the facility still evident in 1991 aerial photography. The ponds were infilled after closure, however minor topographical variations and constructed drains have persisted (outlines of the historic aquaculture ponds are evident). These two features have influenced the hydrology of the site as well as vegetation composition.
- Grazing and slashing continue to influence vegetation structure, composition and condition.

More recently, the construction of Airport Boulevard and drainage modifications as a part of Airport Boulevard construction, has likely resulted in hydrological changes and combined with modified grazing at the site has potentially influenced the vegetation community composition and structural changes.

2. LEGISLATIVE CONTEXT

2.1 Biodiversity Conservation Act 2016 and Regulation 2017

The Act provides provisions for the protection of threatened or protected animal and plant species, threatened ecological communities and areas of outstanding biodiversity value.

Six individuals of one threatened flora species, Hairy Joint Grass (*Arthraxon hispidus*), listed under the Act, have been recorded on the Stage 1 site (Section 3). There is potential for several threatened fauna species to potentially use the site.

Part 7 of the regulation details when an activity requires assessment under the Biodiversity Offset Scheme (BOS). Three main triggers apply as detailed below.

1. Whether the amount of native vegetation being cleared exceeds a threshold (Table 2). In the case of a subdivision, the proposed clearing must include all future clearing likely to be required for the intended use of the land after it is subdivided. If the land on which the proposed development is located has different minimum lot sizes the smaller or smallest of those minimum lot sizes is used to determine the area clearing threshold. It is likely that the clearing threshold will be triggered by the proposal and is likely to require assessment under the BOS.

Table 2: BOS clearing thresholds

Minimum lot size	Clearing threshold, above which the BOS applies
< 1 ha	0.25 ha or more
1 to < 40 ha	0.5 ha or more
40 ha to < 1,000ha	1 ha or more
≥ 1,000 ha	2 ha or more

2. Biodiversity map threshold – clearing of native vegetation or associated biodiversity impacts on land mapped on the Biodiversity Values Map. No areas of the site are mapped on the Biodiversity Values Map.
3. A threatened species 'Test of Significance' – for local development that does not exceed any of the other BOS thresholds. If a 'Test of Significance' indicates the proposal will have a significant impact on a threatened species, the BOS applies, and a BAM assessment is required. Tests of significance undertaken previously indicate that the proposal is unlikely to significantly impact threatened species.

2.1.1 Endangered Ecological Communities

EECs are listed in Part 2 of Schedule 2 of the *Biodiversity Conservation Act 2016*. In each case, the EEC is stated to be "as described in the determination of the Scientific Committee under Division 5 of Part 2". The

NSW Scientific Committee Final Determinations generally highlight seven key criteria which are required to be satisfied to enable listing as an EEC. These are:

- Plant community composition – assemblage of species within the vegetation community.
- Plant community structure – the three-dimensional structure of a vegetation community.
- Elevation – height above sea level.
- Edaphic – relating to the physical and chemical conditions of the soil.
- Hydrological – influences of water on species structure and composition such as soil moisture and salinity.
- Topographical – the arrangement of physical features of an area.
- Locational – landscape position.

2.2 State Environmental Planning Policy – Koala Habitat Protection

Biodiversity Assessment and Solutions (2019b) assessed the broader rezoning site in the context of this SEPP. This assessment is applicable to the Stage 1 proposal and concluded that the site does not contain either 'potential' or 'core' Koala habitat.

2.3 State Environmental Planning Policy – Coastal Management

The does not lie within any mapped coastal management areas (coastal wetlands, littoral rainforest, coastal use or coastal environment) or their proximity area.

2.4 Environment Protection and Biodiversity Act 1999

Hairy Joint Grass is listed as Vulnerable under this Act. Other species such as the Grey Headed Flying Fox have the potential to intermittently occur at the site, however the lack of suitable vegetation or preferred habitat indicates that the site is unlikely to be considered as significant habitat for this species. A Test of Significance was prepared for these species by Biodiversity Assessment and Solutions (2019b) and the assessment concluded that the rezoning proposal is unlikely to significantly affect these species.

3. GEOLOGY AND SOILS

Geology and soils play a key role in influencing vegetation at a site and these edaphic features are used to describe EECs in the Scientific Determinations (Section 2.1.1) and determine whether a vegetation community is consistent with an EEC description.

The dominant geology underlying the site is estuarine tidal delta flat and estuarine paleochannel fill as mapped by Geological Survey of NSW (Colquhoun *et al.*, (2019). The material is considered to have been deposited under estuarine conditions and is of Holocene age.

The Lismore Area Coastal Quaternary Geology mapping (Hashimoto and Troedson, 2007) indicates the majority of the site is Holocene tidal delta flat - marine sand, silt, clay, shell gravel and a small portion of the site is Holocene estuarine paleochannel fill – organic mud, peat clay, silt, marine sand. These are considered to be estuarine plain systems. These units are underlain by Pleistocene sands – marine sand and indurated sand.

Soil across the site is mapped as the Tyagarah soil landscape. The Tyagarah soil landscape is considered to be an aeolian landscape described as 'sediment basins of mixed estuarine and aeolian origin forming level to gently undulating plains. Relief is <3 m, elevation <5 m and slopes <1%.' The soil geology is described by Morand (1994) as '*Quaternary estuarine alluvium overlain by and/or mixed with Quaternary (Pleistocene) sands. The sands are generally aeolian, originating from the adjacent beach ridge systems*'.

Two cores from the Hydrosphere Consulting (2020) soils assessment were located within the footprint of the Stage 1 proposal area. Results indicated that the soil was predominantly loamy sand. These results are consistent with those described in existing mapping and documentation. The soils at the proposed rezoning site are not consistent with the soil texture description in any of the relevant EEC Scientific Determinations.

4. FLORA

The site was completely cleared prior to 1958 and no remnant forest or trees exist at the site. Due to historic clearing and land uses native vegetation present at the site is regenerated vegetation largely influenced by anthropogenic management of the area. Vegetation on the proposed Stage 1 rezoning site was mapped by Biodiversity Assessment and Solutions (2019b) as:

- Swamp Oak/Sea rush drain vegetation – regrowth of saline tolerant vegetation along the constructed drain. Dominated by Swamp Oak (*Casuarina glauca*) with a ground stratum of Sea Rush *Juncus kraussii*), Swamp Oak (*Casuarina qlauca*), Common Fringe-sedqe (*Timbristylis dichotoma*), Narrow-leaved Carpet Grass (*Axonopus fissifoiius*), Common Paspalum (*Paspalum dilatatum*) and Kikuyu (*Cenchrus clandestinus*).
- Freshwater wetland of drainage lines and depressions. The swamp oak vegetation was restricted to the constructed drains and the freshwater wetland occurred in other drainage/depressions.
- Exotic grassland. The remainder of the Stage 1 site is dominated by exotic grassland which occurs outside the lowest lying areas.
- Six individuals of Hairy Joint Grass (*Arthraxon hispidus*) have been recorded on the site in previous assessments during 2016 and 2017 (Blackwood Ecological Services, 2017). Hairy Joint Grass is listed as Vulnerable under both the *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999*.

The latest vegetation assessment of the site (Biodiversity Assessment and Solutions, 2020) undertaken for the purposes of preliminary BAM calculations, recorded six vegetation zones across two plant community types (Figure 2):

- Coastal freshwater meadows and forblands of lagoons and wetlands (freshwater wetland): approximately 3.82 ha.

- Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion (swamp oak forest): approximately 1.16 ha.

The condition of the vegetation documented by Biodiversity Assessment and Solutions (2020) is outlined in Table 3. The remainder of the site (approximately 0.87 ha) consists of the Airport Boulevard road batter/construction area) and the drainage system constructed as part of the Airport Boulevard project at the northern end of the site.

Table 3: Vegetation type and condition

Type	Condition			Total Area
	Low	Moderate	Good	
Freshwater wetland	1.4 ha	1.67 ha	0.75 ha	3.82 ha
Swamp Oak Forest	0.56 ha	0.36 ha	0.24 ha	1.16 ha

Biodiversity Assessment and Solutions (2020) noted that changes had occurred at the site over the previous 12-15 months which had influenced vegetation composition and structure. These changes occurred as a result of regrowth from changed land use, hydrological changes as a result of altered drainage at the site and construction of Airport Boulevard, as well as seasonal and climatic changes. Additional survey and assessment will be required as part of the Biodiversity Development Assessment Report (BDAR) to be undertaken as part of the environmental assessment for the future development.

Vegetation within the Stage 1 site was originally considered to consist of EECs – Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner bioregions and Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (Blackwood Ecological Services, 2017). However, several studies have been undertaken in the past 18 months (Biodiversity Assessment Solutions, 2019a; 2019b) to review the previous ecological assessment findings with regard to the status of vegetation at the site in relation to Schedule 2 of the *Biodiversity Conservation Act 2016*. These desktop and field assessments concluded that the site does not contain the features associated with a coastal floodplain (an important feature in defining the EECs considered at the site). Additionally, the degree of disturbance across the entire site, particularly the construction and then infilling of a large prawn farm across much of the site, suggests that vegetation distribution and composition is a result of anthropogenic influences. These factors indicate that the characteristics of the site are not consistent with all the features described in the relevant EEC Scientific Committee Determinations.

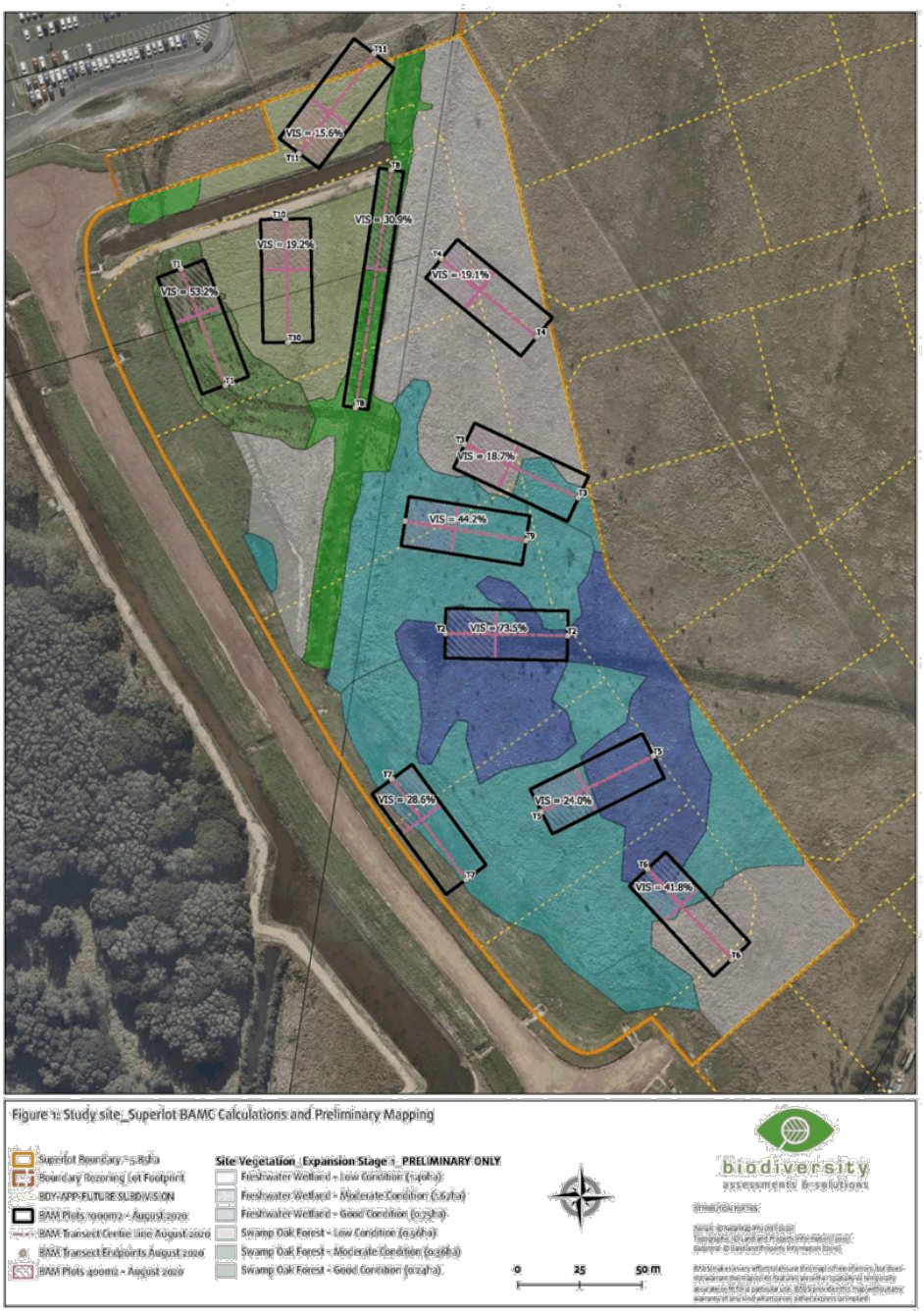

Figure 2: Stage 1 site vegetation

Source: Biodiversity Assessment and Solutions (2020)

5. FAUNA

The habitat value of the broader rezoning site was assessed by Biodiversity Assessment and Solutions (2019b). A summary of the findings in relation to the Stage 1 site is provided below:

- The Stage 1 site is not located within a known fauna corridor. Fauna corridors are located nearby, however the proposal is not expected to result in any significant direct or indirect impacts on those corridors.
- Habitat within exotic grass is of low value.
- Habitat within the freshwater wetlands is of moderate value.
- Habitat within the Swamp Oak forest is of moderate value.
- Two threatened species were identified as potentially occurring across the broader rezoning site:
    - Eastern Grass Owl (*Tyto longimembris*) – the broader rezoning site contains marginal potential habitat, likely to fluctuate in suitability depending on management and disturbance of the site at a given time. Regular slashing and extensive grazing are likely to periodically reduce or eliminate site suitability. The species has been previously recorded adjacent to the Stage 1 site. The Stage 1 site is expected to have only marginal potential habitat.
    - Grey-headed Flying Fox (*Pteropus poliocephalus*) – the Stage 1 site does not contain significant suitable roosting or foraging habitat. Preferred roosting, potential roosting and foraging habitat occurs within the locality.
- Considering the broader rezoning proposal, a Test of Significance under the *Biodiversity Conservation Act 2016* for the Eastern Grass Owl was undertaken. The assessment concluded that the broader proposal is not likely to significantly affect this species.

Previous records of Wallum Froglet (*Crinia tinnula*) were recorded in the locality of the site (Blackwood Ecological Services, 2017; 2018a; 2018b), however an assessment undertaken by Sandpiper Ecological Surveys (2019) concluded that the subject site (rezoning area - including Stage 1) does not support the Wallum froglet. This conclusion was based on genetic analysis of four individuals captured on site, identification of five individuals captured on site using standard field guides, analysis of calls recorded at the subject site and comparison of these calls and independent verification of calls by four ecologists. In addition, assessment of the habitat concluded that the site does not contain Wallum froglet habitat due to higher than preferred pH, high disturbance, likely high nutrients at the site and incompatible soils (type and salinity). The Wallum sedge frog (*Litoria olongburensis*) was also considered in the assessment which concluded the site does not support the species.

Preliminary BAM calculations for the proposed Stage 1 rezoning site generated several candidate fauna species, however, all candidate species were excluded for that exercise based on geographic limitations or degraded habitat, except for Southern myotis (*Myotis macropus*). Biodiversity Assessment and Solutions (2020) found that offsets under the BOS are likely to be required for some candidate species.

Overall, due to historical disturbances, ongoing anthropogenic impacts, lack of significant habitat features, degraded vegetation, location outside of a fauna corridor and low habitat value, the Stage 1 rezoning site is generally considered to be marginal habitat for native fauna. However, there is potential for the occurrence of several threatened fauna species that would need to be considered in future biodiversity assessments.

6. CONCLUSION

Biodiversity at the proposed Stage 1 rezoning site has been assessed in multiple studies in recent years as part of the broader rezoning proposal and adjacent development (Airport Boulevard). The understanding of the ecology of the locality has evolved over this period and is summarised as follows:

- The proposed Stage 1 rezoning site has a history of anthropogenic disturbance including clearing, drainage works, aquaculture, filling, grazing, slashing and adjacent road development.
- The site was completely cleared prior to the mid-1900s and all vegetation at the site is regrowth. Current vegetation consists of exotic grasslands, Swamp oak forest and Freshwater wetland. One threatened plant species (Hairy joint grass) has been previously recorded on the site (in 2016 and 2017).
- Overall, the dominant lithology of the site is sand and the soil profiles observed are consistent with the published classification of soils in the area. Sampling results show that the soils of the Stage 1 rezoning site are generally loam - loamy sand throughout the profile, which is generally reflective of the documented site geology and soils. This soil type does not match the soil texture description in the relevant EEC Scientific Determinations.
- Due to the historical disturbances, ongoing anthropogenic impacts, lack of significant habitat features, degraded vegetation and generally low habitat value the Stage 1 rezoning site is generally considered to be marginal habitat for native fauna. However, there is potential for the occurrence of several threatened fauna species that would need to be considered in future biodiversity assessments.

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