NORTH HARBOUR

Flood Management Plan
(including sports fields, additional fill areas and Area 1)

Prepared for:

North Harbour Holdings Pty Ltd



SLR Ref: 620.30047.00200-R01
Version No: v9
December 2025

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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with North Harbour Holdings Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
620.30047.00200-R01-v9	5 December 2025	Helen Doherty	Michael Della	Helen Doherty
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1 INTRODUCTION

1.1 Background

As part of the overall development of the North Harbour area (previously known as the North East Business Park Area), North Harbour Holdings Pty Ltd proposes to develop land located on Nolan Drive, Morayfield for a mix of uses including residential, business, recreation and open space. This area was previously known as the MIBA portion of the development and is located adjacent to the Caboolture River and bordered by local tributaries of the river, including Raff Creek. The local tributaries have a confluence at the eastern corner of the site. The MIBA area is shown in **Plate 1** below together with the Residential West precinct of the development. The Residential West Area (RWA) of the development was assessed in the approved report "Northeast Business Park, Residential West Flood Management Plan" prepared by Cardno 31 March 2015.

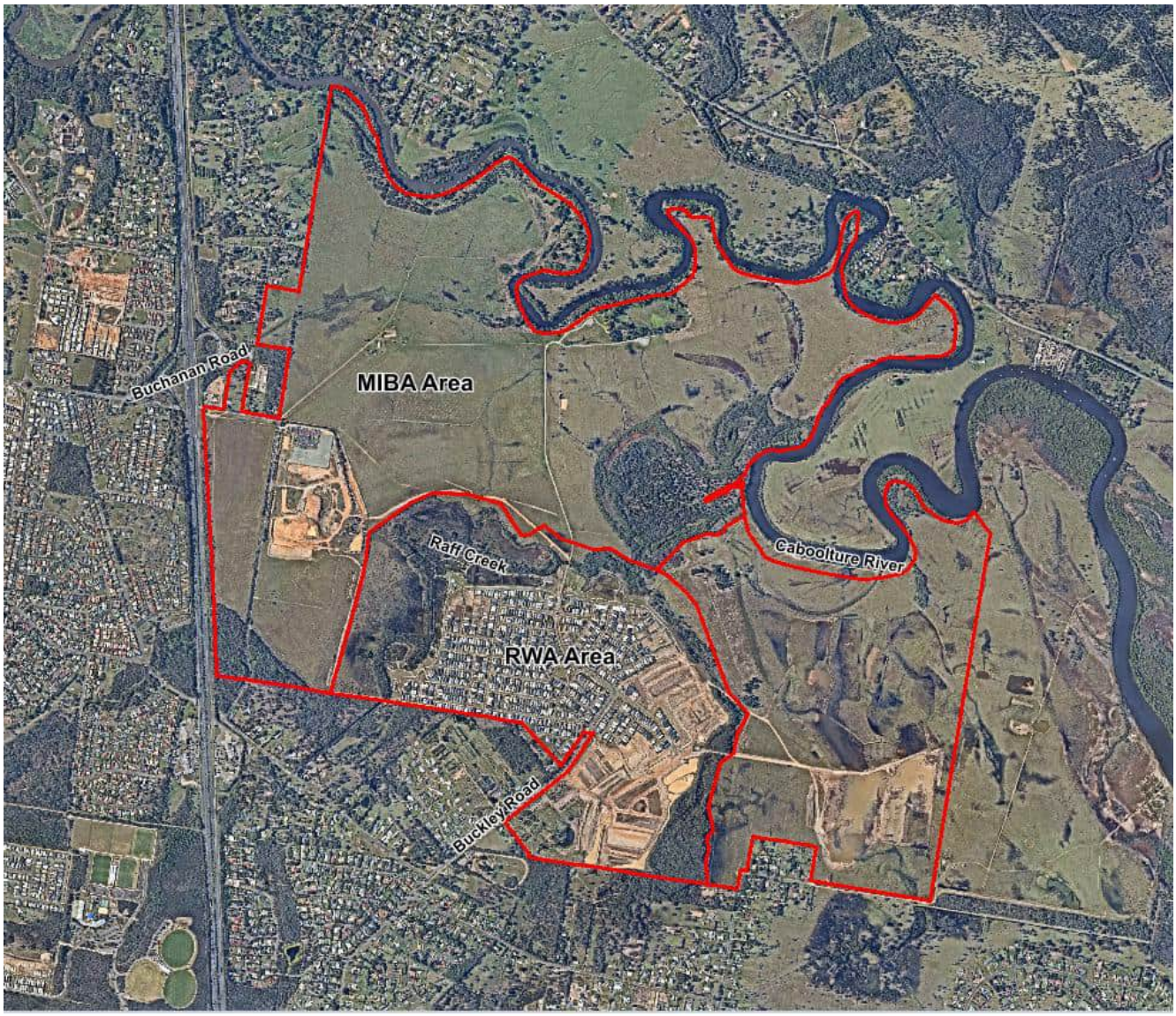


Plate 1 Site Locality

This current Flood Management Plan (FMP) provides a consolidated FMP including consideration of all elements of the development approved under the MIBA and RWA preliminary approvals within the post-development scenario. Version 4 of the MIBA FMP (i.e. titled "Northeast Business Park – Mixed Industry and Business Area Flood Management Plan", ref: 7903-59/R6) prepared by Cardno and dated 9 September 2016 was approved (referred herein as the Approved FMP) by Moreton Bay Regional Council (MBRC) on 18 October 2016 (Council ref: DA/7352/2002/XT/7). The preliminary development layout for the MIBA precinct is contained in the Approved Cardno FMP, which is presented in Appendix A.

A preliminary Material Change of Use application was submitted to Council on 28 March 2019. This application included a variation request for Residential, Business, Recreation, Open Space and related purposes in accordance with the North East Business Park Area Plan. The application concerns land located at 2, 15 and Lot 11 Nolan Drive, Morayfield, cadastrally described as Lot 1 on SP266287, Lot 11 on SP130251, Lot 15 on RP902073 and Lot 2 on SP169551 (Land). As part of that application, an updated version of the FMP was prepared – Version 5 of the Cardno Flood Management Plan (FMP), dated 8 September 2020 (reference 7903-59/R6V5).

A number of design changes have occurred since that FMP was prepared as a result of several factors influencing the evolution of the development design. Consequently, there is a requirement to bring the FMP up to date in accordance with Condition 21(b) of the approval issued by the Planning and Environment Court in relation to Appeal No. 255 of 2010 (28 June 2012). As the design of the access road has also been updated, compliance against Condition 27 is also demonstrated in this report.

1.2 Structure of Report

Flood assessment of this site has a detailed history, which has resulted in a lengthy report – *Mixed Industry and Business Area Flood Management Plan* prepared by Cardno (7903-59/R6V5, dated September 2020), herein referred to as the "FMP". The current report (herein referred to as the "Addendum report") is an addendum to that report and, for brevity's sake, does not seek to reproduce all details in the approved FMP, particularly with regards to the history of the assessment process (including responses to information requests). Rather, it directs attention to all of the changes to the proposed development design which have occurred since the original FMP was prepared.

Whilst the report is an addendum to the original FMP, the report format has been developed to provide a complete picture of the flood impact assessment for the site. Therefore, where it is considered necessary for the completeness of the Addendum report, information which has not been changed from the previous version of the FMP has been reproduced in the Addendum.

Results of the updated modelling are presented in the same format as for the Cardno report for ease of comparison.

A copy of the Cardno report is contained within **Appendix A** for reference.

1.3 Changes to Flood Management Plan Addendum

1.3.1 Version 0.3

Since the previous version of the report, the revised roughness scenario has been assessed. As a result of this assessment, an additional bund has been included in the design to alleviate impacts external to the site. Results tables and mapping have therefore been updated to reflect this change. No other changes have occurred.

1.3.2 Version 0.4

Since the previous version of the report, sports fields have been added to the north west corner of the site. Further description of the sports fields is provided in **Section 3.3.4**. Results tables and mapping have been updated to reflect this change. No other changes have occurred.

1.3.3 Version 0.5

Since the previous version of the report, the earthworks for the sports fields in the north west corner of the site have been progressed. The assessment has therefore been revised to include the updated DEM. Further description of the sports fields is provided in **Section 3.3.4**.

In addition, Council requested a number of matters be addressed in the FMP prior to finalisation. Each of these matters is discussed in **Section 0**, along with reference to the section of the FMP where the matter is addressed.

1.3.4 Version 0.6

Since the previous version of the report, information regarding the sports fields has been clarified in **Section 3.3.4.**

1.3.5 Version 7

Since the previous version of the report, a number of isolated fill areas have been incorporated into the design as detailed in **Section 3.3.4.**

1.3.6 Version 8

Since the previous version of the report, the impact of development of a portion of the south east corner of the site, known as Area 1 has been assessed. Area 1 includes the North South Urban Arterial (NSUA) and residential lots as detailed in **Section 3.3.6.**

1.3.7 Version 9

The current version of the report is v9. The only changes from the previous version were:

- the addition of velocity impact mapping and hazard mapping.
- additional explanation regarding flood impacts in the vicinity of Area 1.

These changes have been made in response to the information request by EDQ dated 26 November 2025. The information request items are copied below along with responses.

Table 1 EDQ RFI

Item	Request	Response
3	**Flood Impacts**	
	- Submit an updated flood management plan demonstrating the following: a. consistency with Council's updated flood study data utilising improved IFD data. A digital data package (processed river and creek model results for the entire city) and catchment packages (river and creek) are available at the link below. Digital flood study data request - City of Moreton Bay	The FMP has been updated to address the comments. The modelling has not been updated to adopt Council's updated flood study. Further commentary on this is provided below.
	b. Any mitigation measures or comments in relation to off-site adverse flooding impacts. Figures D.4.1 and G.5.1 of the submitted flood report indicates unacceptable flooding impacts (shown below), and proposed mitigation measures do not appear to relate to Precinct 1 works.	As discussed with EDQ officers, these impacts were a result of the model setup. This has been discussed in Section 3.5.2. Once the modelling inconsistency was addressed, these impacts no longer occurred.
	c. Velocity impact mapping and flood hazard category mapping has not been submitted to demonstrate non worsening in accordance with MBRC Flood Policy.	Additional mapping has been added to the appendices.
	d. Confirm adopted Flood Planning Levels (including freeboard) to demonstrate immunity in major flood events using updated modelling.	Flood Planning Levels are included in Table 6
	e. Demonstrate the development has ingress/egress in 1% AEP events (including interim ingress/egress to Farry Road).	A section has been added to the FMP to address ingress/egress. Refer Section 3.5.3.

It is noted that the FMP was originally prepared in early 2021. That FMP was prepared as an addendum to the Cardno report of September 2020. Since that time, as the development has evolved, the FMP has been progressively updated. The FMP therefore covers a significant history of the North Harbour development and therefore contains a lot of information which is not necessarily relevant to the most recent update to the development.

Similarly, the modelling has been progressively updated to address the changes, with all impact assessment based on comparison to conditions prior to any development on the site to ensure that impacts do not accumulate. The modelling conducted for Version 8 of the FMP (which assessed the potential impacts of the development of Area 1) was conducted prior to Council's updated flood model becoming available. It is understood that Council's model is in fact only available now to selected developments. SLR, on behalf of North Harbour, are currently reviewing Council's updated model for use in the assessment of future development of the area. However, Council's updated model requires a number of changes to make it fit for use for the assessment of future development. It is considered premature to adopt the model for the assessment of Area 1. However, it is understood that the primary concern is the change to the hydrology, which has resulted in increased flood levels. The flood planning levels provided in the FMP are therefore based on Council's updated flood model.

1.4 Council Matters to be Addressed

1.4.1 Item 1

The amended North Harbour - Flood Management Plan (Version v0.4) dated June 2023 prepared by SLR Consulting Australia Pty Ltd should be signed by the RPEQ.

All versions of the North Harbour – Flood Management Plan have been prepared by an RPEQ. Details of the RPEQ number and a signature have been added to the document.

1.4.2 Item 2

The date of the survey for the DEM incorporated in the model should be detail under Section 3.3.3. This is necessary to take into account the existing and proposed topographical changes for calculating floodplain losses.

The DEM used for the analysis of the post development case was provided by the civil engineers responsible for the detailed design of the development and represents the as constructed details for those areas which have been developed and the proposed earthworks for other areas as at 29 November 2023.

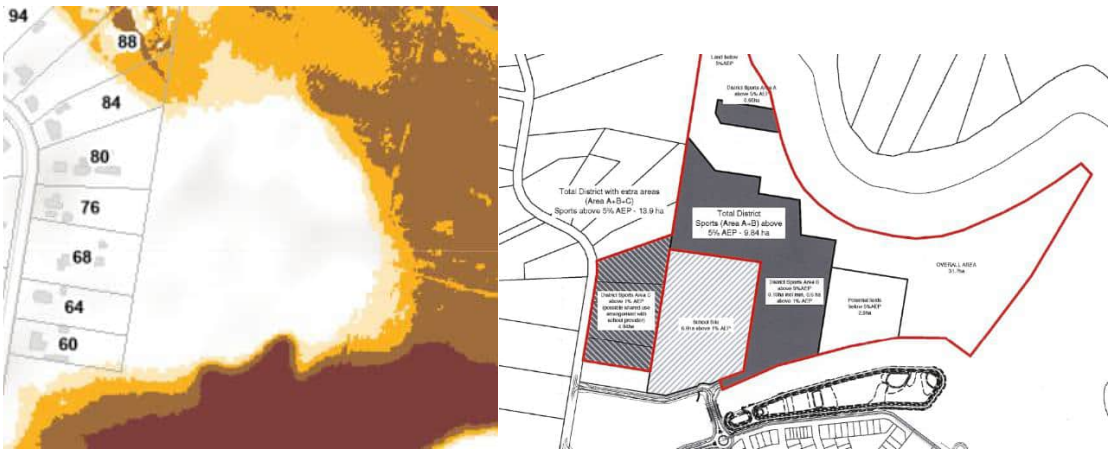
1.4.3 Item 3

Section 3.3.4 notes that the proposed sports fields are designed to have flood immunity of 5% AEP. However, the proposed sports field location is also generally immune to floods up to 1% AEP. This should be noted and discussed under Section 3.3.4 of the report with the design intent of the proposed filling clarified.

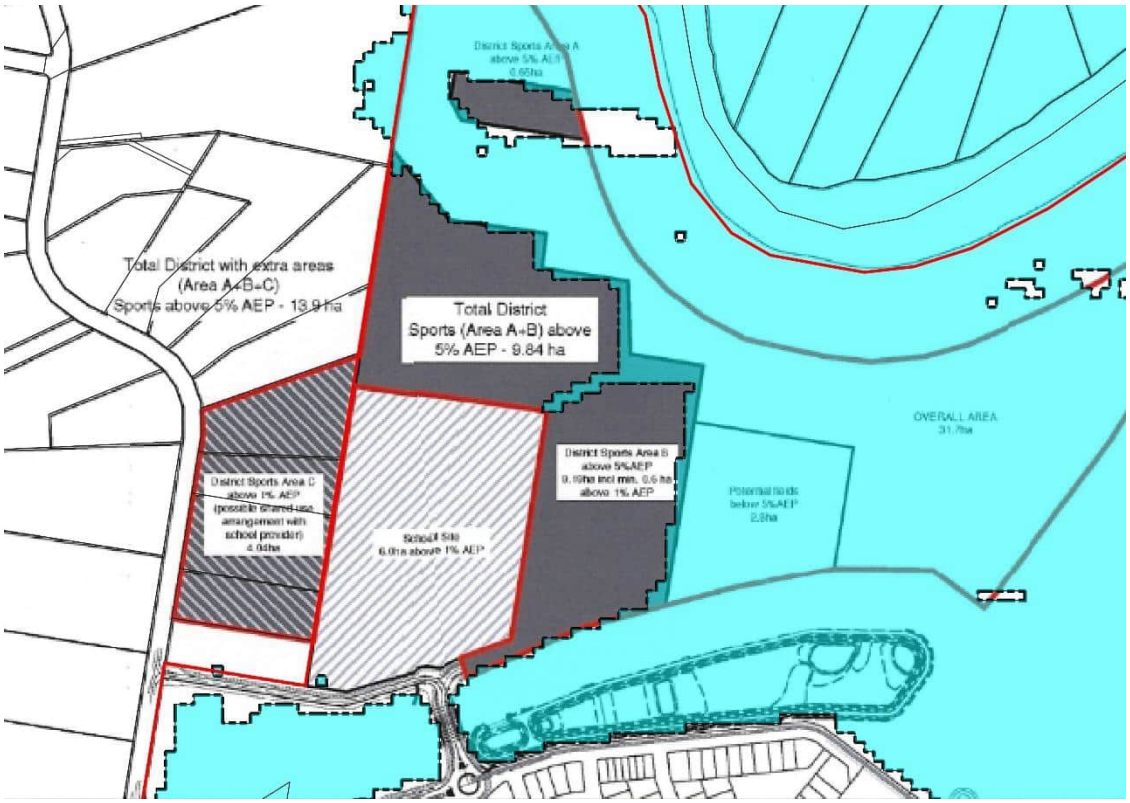
Additional commentary has been added to Section 3.3.4 to clarify the flood immunity of the fields.

1.4.4 Item 4

Under Item 2.2.1 of North Harbour Infrastructure Agreement 2023 the District Sports Park land is required to be filled to achieve flood immunity requirement as per NH-RN-DSPS2. These requirements should be specifically identified and confirmed as being achieved.



The extent of inundation for the 5% AEP event has been overlaid on the above plan to demonstrate that the extent above the 5% AEP flood level on the figure below. It can be noted that the flood model uses a 10 grid.



1.4.5 Item 5

Additionally, it is unclear why there is such a large difference in storage detailed in Table 2[1] under Section 3.3.4. The sports field is approximately 91,900 m2 in area which roughly equates to 91,900 m3 in volume if 1m of compensatory fill/cut is applied however the table details a flood storage gain 2x-5x larger in terms of volume. Please clarify how this flood storage gain is being achieved with the proposed filling and confirm the volumes in Table 2 are correct.

The flood storage volume is a measure of the volume of storage available for flood water. It is calculated by subtracting the ground level from the water level for an event and multiplying by the surface area. GIS software performs this calculation. In areas where the water level does not change significantly across the site, the change in flood storage from existing to developed will be similar to the cut and fill balance.

However, the flood storage volume is not necessarily an indication of the change in ground level alone as it also takes into account the change in water level. In the case of this site, there is a water level rise within the site of up to 0.9 metres in the vicinity of the compensatory cut, as typically occurs in a detention area. This increase in water level accounts for the majority of the change in flood storage on the site.

The volumes in Table 2 are correct.

[1] As of FMP v9, Table 2 is Table 3

2 SITE DESCRIPTION

2.1 Current Conditions

At the time of preparation of this report (December 2023), the site has been partially developed, with the Residential West area (RWA) approved and mostly constructed, including installation of wetlands and stormwater management features on the RWA side of Raff Creek. The RWA as at November 2020 is shown on **Plate 1**. As shown on this figure, the RWA is bounded by Raff Creek to the north and west, rural residential development to the south and an un-named tributary to the east. The un-named tributary conveys runoff from an upstream catchment of approximately 185 ha. This tributary joins Raff Creek at the north east corner of the RWA. Raff Creek then flows to the Caboolture River approximately 650 metres downstream.

Prior to the commencement of construction, the RWA was undeveloped land, with vegetation consisting predominantly of medium to long grass with riparian vegetation located along the banks of Raff Creek.

The remainder of the site (described within this report as the MIBA area) is bounded by the Caboolture River to the east and north, Raff Creek to the south and the Bruce Highway and rural residential development to the west. The area is predominantly in a natural state with vegetation consisting principally of medium to long grass with riparian vegetation located along the banks of both the Caboolture River and Raff Creek. A local gully flows through the area from west to east connecting the Buchanan Road overpass with the Caboolture River.

The portion of the MIBA site located on the corner of Nolan Drive and Trafalgar Drive is currently a rural residential lot with scattered trees around the perimeter and within the northern extents of the property.

2.2 Proposed Development

The RWA is now an existing residential community consisting of over 1500 lots. Wetlands and associated stormwater quality infrastructure and park areas have been constructed along the northern edge of the development.

The revised MIBA development is proposed to consist of approximately 170 ha of urban residential, commercial, educational, recreation and open space and related purpose, located along the western boundary and central to the overall site area.

Access to the development from the west is to be via the existing interchange with the Bruce Highway/Buchanan Road/Trafalgar Drive. The connection (referred herein as the access road) between the interchange and the site has been designed and incorporated in the current modelling. The access road works involve the closure of Trafalgar Drive for a distance of approximately 125 metres to accommodate the access road and associated drainage works. Access to Trafalgar Drive to both the north and south will be maintained via internal roads within the site.

Loss of floodplain storage occurring as a result of filling portions of the development site will be compensated for by the lowering of the existing ground level of an area within the northern floodplain. This compensatory storage area has been designed to accommodate the future road corridor linking the MIBA site to the area north of the Caboolture River.

As a result of the revised roughness assessment, an additional bund has been incorporated in the design. This bund has a level of 4.8 mAHD and is located along the southern and eastern edges of the compensatory storage area. Previously, the compensatory storage area drained via a number of openings – two of which allowed for drainage to the south. The incorporation of the bund in the design means that these openings will no longer exist. Drainage of the compensatory storage area will be achieved via the remaining opening to the north and pipes located where the openings were previously located. These pipes will be sized to ensure that the compensatory storage area is drained within a number of hours of a flood event occurring. An initial estimate of the pipe size has been included in the flood modelling.

The proposed development also includes a road crossing of Raff Creek linking the Residential West site to the MIBA site. The road crossing includes multiple culverts and a bridge over Raff Creek to limit the impact on peak flood levels external to the site's boundaries.

3 FLOODING ASSESSMENT

3.1 Overview

The Cardno FMP (refer **Appendix A**) provides a detailed description and history of the modelling undertaken to date for this site. The reader is referred to this document for any relevant historical information.

The modelling conducted for this addendum has adopted the flood modelling from the previous assessments with changes detailed later in this report.

3.2 Model Update

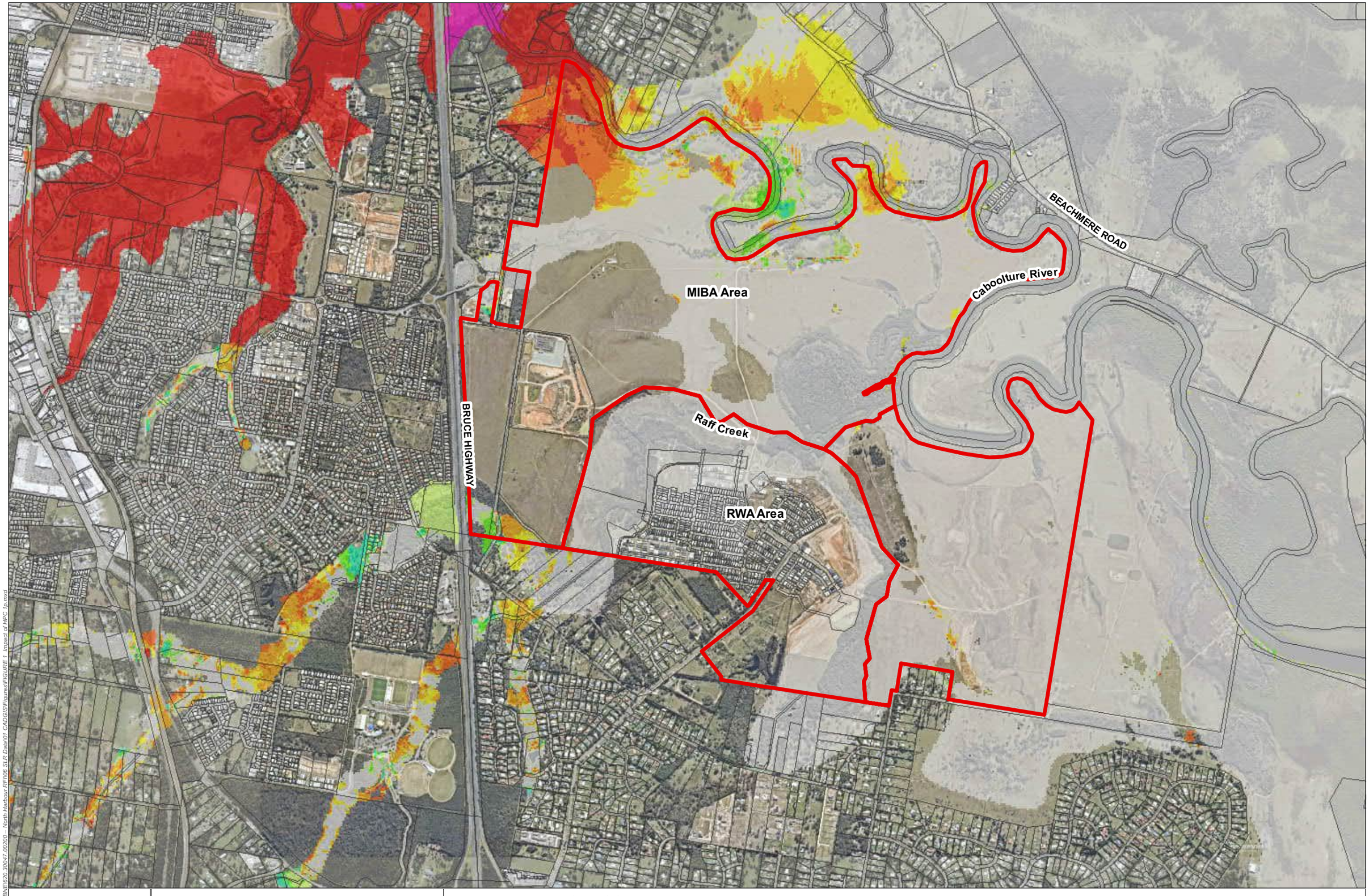
All models were updated to the latest version of TUFLOW (2020-10-AA). In addition, the HPC version of the model was adopted. This version allows for a significant improvement in the model run times. The impact of this update to the model was assessed by comparing the results of the approved model with those from the HPC version for both the existing and developed cases, for the 1% AEP and the 10% AEP. It was found that in the vicinity of the site, the impact on flood level was minimal. Upstream of the site, there were larger impacts. However, these impacts were consistent between the pre and post development cases, such that the effect on the impacts of the proposed development were typically less than 2mm, with isolated areas of up to 6mm.

The impact of the adoption of the HPC version of the model is demonstrated for the pre development case on **Figure 1** for the 1% AEP event and **Figure 2** for the 10% AEP event. These figures demonstrate that in the vicinity of the site, the HPC results match the TUFLOW Classic results very well, with differences in flood level typically within 50mm, with a small area in the northern section of the site with differences of up to 150 mm. These differences are not considered to be large enough to impact on the calibration parameters. Where there are differences, the HPC run is resulting in higher flood levels. Further, these areas do not occur in the vicinity of structures. The difference in flood level at the Raff Creek bridge is 4mm for the 1% AEP event and 15mm for the 10% AEP event. The head loss across the structure is unchanged. These differences were therefore considered to be acceptable.

The use of HPC using the latest version of TUFLOW was considered to be appropriate for all further impact modelling.

3.3 Changes to Model

This section describes all of the changes that have been made to the TUFLOW model as part of the most recent assessment. A number of these changes were necessitated by changes to the proposed development design, whilst others were related solely to the modelling.



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Legend

- Site Boundary
- Cadastre Boundary

Impact (m)

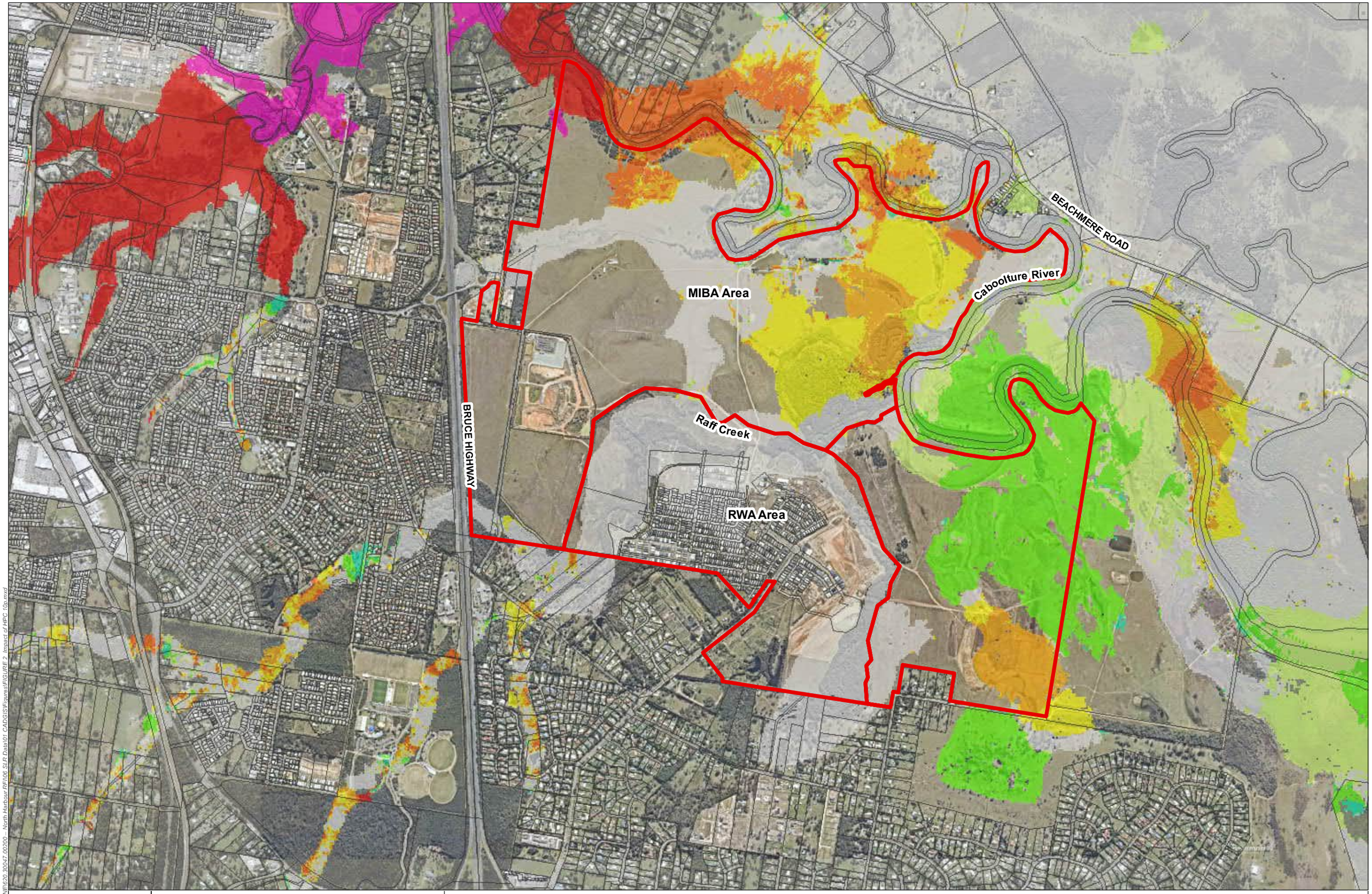
Below -0.200	-0.030 to -0.020	0.050 to 0.100
-0.200 to -0.100	-0.020 to 0.020	0.100 to 0.200
-0.100 to -0.050	0.020 to 0.030	Above 0.200
-0.050 to -0.030	0.030 to 0.050	

North Harbour
Flood Management Plan

Existing Conditions (E007) - 1% AEP
Impact of HPC

FIGURE 1

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Legend

- Site Boundary
- Cadastre Boundary

Impact (m)

Below -0.200	-0.030 to -0.020	0.050 to 0.100
-0.200 to -0.100	-0.020 to 0.020	0.100 to 0.200
-0.100 to -0.050	0.020 to 0.030	Above 0.200
-0.050 to -0.030	0.030 to 0.050	

North Harbour
Flood Management Plan

Existing Conditions (E007) - 10% AEP
Impact of HPC

FIGURE 2

H:\Projects-SLR\620-BNE\620.30047.00200 - North Harbour RFI\06 SLR Data\01 CAD\GIS\Figures\FIGURE 2 Impact of HPC 10p.mxd

3.3.1 Model Efficiencies

As a result of the number of iterations that the model has been through, and the age of the model, it was considered that the model was cumbersome and difficult to assess confidently. The model files were therefore amended for efficiency. This involved the following:

- Incorporation of local and regional events into a single tcf file through the use of IF statements;
- Modification of TUFLOW folder structure to match TUFLOW standard. This significantly reduces the number of sub folders;
- Renaming of filenames as detailed in **Table 2** to provide clarity on the event being modelled;

Table 2 File Naming System

Case	Previous tcf Filename	Current tcf Filename
Pre development regional event	CAB_002b_E_~e1~_~e2~_CD11	NH_~e1~_~e2~_Exxx
Post development regional event	CABFM_D_~e1~_~e2~_Rxxx	NH_~e1~_~e2~_Dxxx
Pre development local events	CABSM_~e~_EXT_L130	NH_~e1~_~e2~_Exxx
Post development local events	CABSM_~e~_DEV_Lxxx	NH_~e1~_~e2~_Dxxx

- Removal of all redundant Digital Elevation Models (DEMs). Because of the number of changes that have occurred to the model since it was first set up, the model included a large number of DEMs and topography modification files. A number of these were overwritten by subsequent DEMs. Redundant DEMs were removed from the tgc files for clarity.

3.3.2 Model corrections

Also as a result of the number of iterations which have occurred with this model, a number of minor errors had crept into the modelling. These errors were corrected to ensure the model was representative of the proposed development. The changes were:

- Adjustment of Manning's n extent for wetlands. The proposed extent of the wetlands has changed slightly between the approved version of the model and the current version. The extent of the Manning's value of 0.06 for wetlands was not consistent with the current extent of the wetlands and was therefore adjusted to match. **Figure 3** and **Figure 4** illustrate the Manning's values used for the pre and post development cases respectively. It is noted that the pre development case values are as provided in the Council model. These figures therefore show the changes in Manning's applied to the model.
- Similarly, the Manning's n value for parks was adjusted to ensure consistency with the proposed/constructed parks.
- The Manning's n value in the northern part of the site (at the proposed drain connecting the Buchanan Road interchange with the Caboolture River and across the proposed cut area) was not consistent with the approved model. This value was returned to the value used in the approved model.
- The topography along the banks of the Caboolture River in the vicinity of the site was not smooth, resulting in minor impacts. The transition between the two DEMs in this area was smoothed to provide a cleaner DEM.



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Legend

- Site Boundary
- Cadastre Boundary

Manning's value

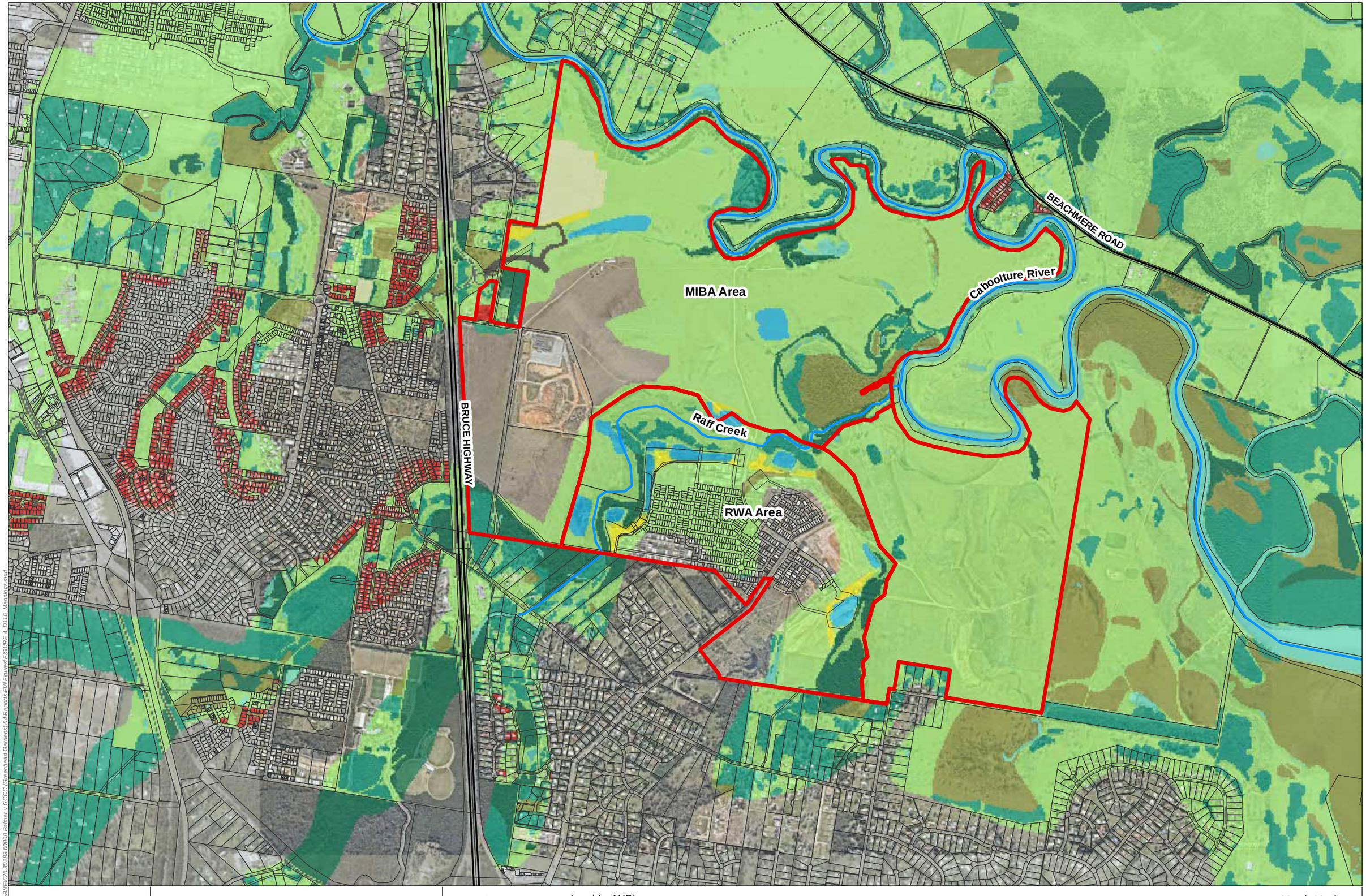
- Park (0.045)
- Wetland (0.06)
- Urban (0.30)
- Waterbodies (0.03)
- Roads (0.015)
- Grass (0.25 - 0.025)
- Medium vegetation (0.075 - 0.15)
- Reeds (0.08)
- Dense vegetation (0.09 - 0.18)

North Harbour
Flood Management Plan

Existing Conditions (E007)
Manning's

FIGURE 3

H:\Projects-SLR\610-BNE\620.30047.00200 - North Harbour RP\06 SLR Data\01 CAD\GIS\Figures\FIGURE 3 E007 Mannings.mxd



H:\Projects-SLR\610.BNE\620.BNE620.30283.00000 Palmer - CGCC (Greenheart Gardens)\04 Reports\FIA\Figures\FIGURE 4 D116 Mannings.mxd

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0 500 1,000 1,500 Meters

15-Jun-2023 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

- Park (0.045)
- Wetland (0.06)
- Urban (0.30)
- Waterbodies (0.03)
- Roads (0.015)
- Grass (0.25 - 0.025)
- Fields (0.04)
- Medium vegetation (0.075 - 0.15)
- Reeds (0.08)
- Dense vegetation (0.09 - 0.18)

North Harbour
Flood Management Plan

Developed Conditions (D060)
Manning's

FIGURE 4

- The approved model employed SA polygons which covered the extent of the catchment for application of inflows. For the developed case, this resulted in unrealistic input of inflows at a number of locations. In these areas, the SA polygons were reduced in size for both the existing and developed cases so that inflows were applied at a discrete location, as is common practice.
- The Raff Creek culverts had been modelled using a layered flow constriction due to stability issues (refer Section 3.3.2 of **Appendix A**). Once the model was upgraded, it was found that there were no stability issues with modelling these drainage structures as true culverts.

3.3.3 Changes to Proposed Development

A number of changes occurred to the model as a result of the progression of the design for the proposed development. These changes are detailed below.

- The latest DEM for the site was incorporated in the model. The latest DEM is SLR FLOOD MGA 231129, dated 29th November 2023.
- Despite being the latest DEM, a number of modifications were required for the DEM due to ongoing design modifications. These included:
  - Removing the batter along the western edge of Raff Creek between the two wetlands.
  - Adjusting the maximum level of the bunds within the wetlands – typically to a level of 2.4 mAHD. Levels were advised by DesignFlow who are the wetland designers.

Finally, a number of changes occurred to the model as a result of the progression of the design for the proposed development. It is noted that a number of these elements are incorporated in the most recent DEM. They remain listed below as a record of the changes to the modelling since the Cardno approved FMP. The changes were:

- Incorporation of the proposed access road connecting the site to the Buchanan Road interchange with the Bruce Highway. This involved the adjustment of the location of the proposed culverts under the access road as well as removal of culverts under Trafalgar Drive. It was found during this process that the number of culverts previously designed for this location was excessive. The model was therefore used to determine an appropriate number of culverts at this location.
- The inclusion of culverts under the proposed extension of Buckley Road.
- Removal of the wetland in the northern part of the site, between the future road and the Caboolture River. The bund which was located on the eastern side of this wetland has also been removed. This area has been returned to its existing (pre development) state.
- Trimming of an area downstream of the Raff Creek crossing. A minor amount of trimming has been incorporated in the model in the area downstream of the Raff Creek crossing. This trimming has been designed to ensure that the area remains free draining and avoids sensitive vegetation. The depth of trimming is typically 200mm, with greater depths at the northern end of the cut area. No trimming occurred adjacent to the creek, in order to protect existing riparian vegetation.
- Incorporation of recent detailed survey, particularly in the vicinity of the proposed access road; and
- Incorporation of proposed bund along southern and eastern edges of compensatory storage area.

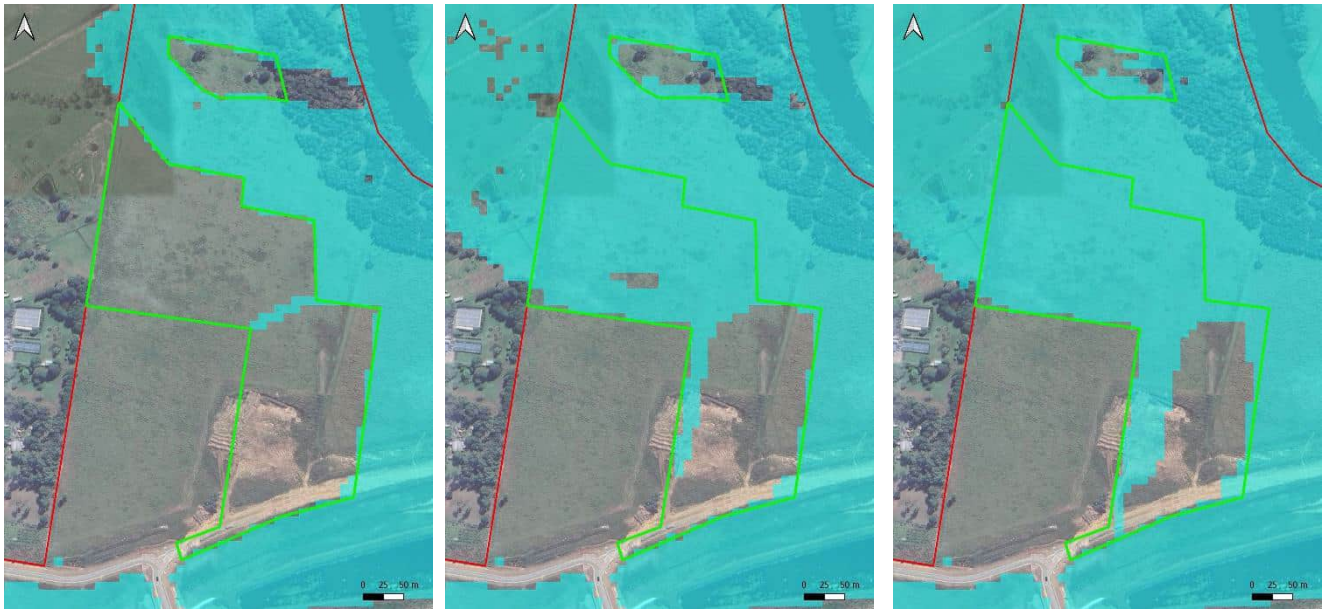
3.3.4 Incorporation of Sports Fields

The proposed development has progressed further, with sports fields now proposed for the north west corner of the site. The sports fields have been designed to achieve a minimum level of immunity for the fields and facilities including hard courts, clubhouse, car parking and access. The areas to be immune to each key regional event are:

- at least 1% AEP flood immunity – 2.87 ha;
- at least 2% AEP flood immunity – 4.23 ha; and
- at least 5% AEP flood immunity – 9.52 ha.

The extent of each event (shaded blue), in relation to the proposed sports field area (green line) is shown below.

5% AEP **2% AEP** **1% AEP**



In order to achieve this flood immunity for the fields, the extent of the compensatory cut area has been reduced. The impact of this reduction in compensatory cut has been tested to ensure that the site continues to maintain a flood storage balance. The results of this assessment are detailed in **Table 3**.

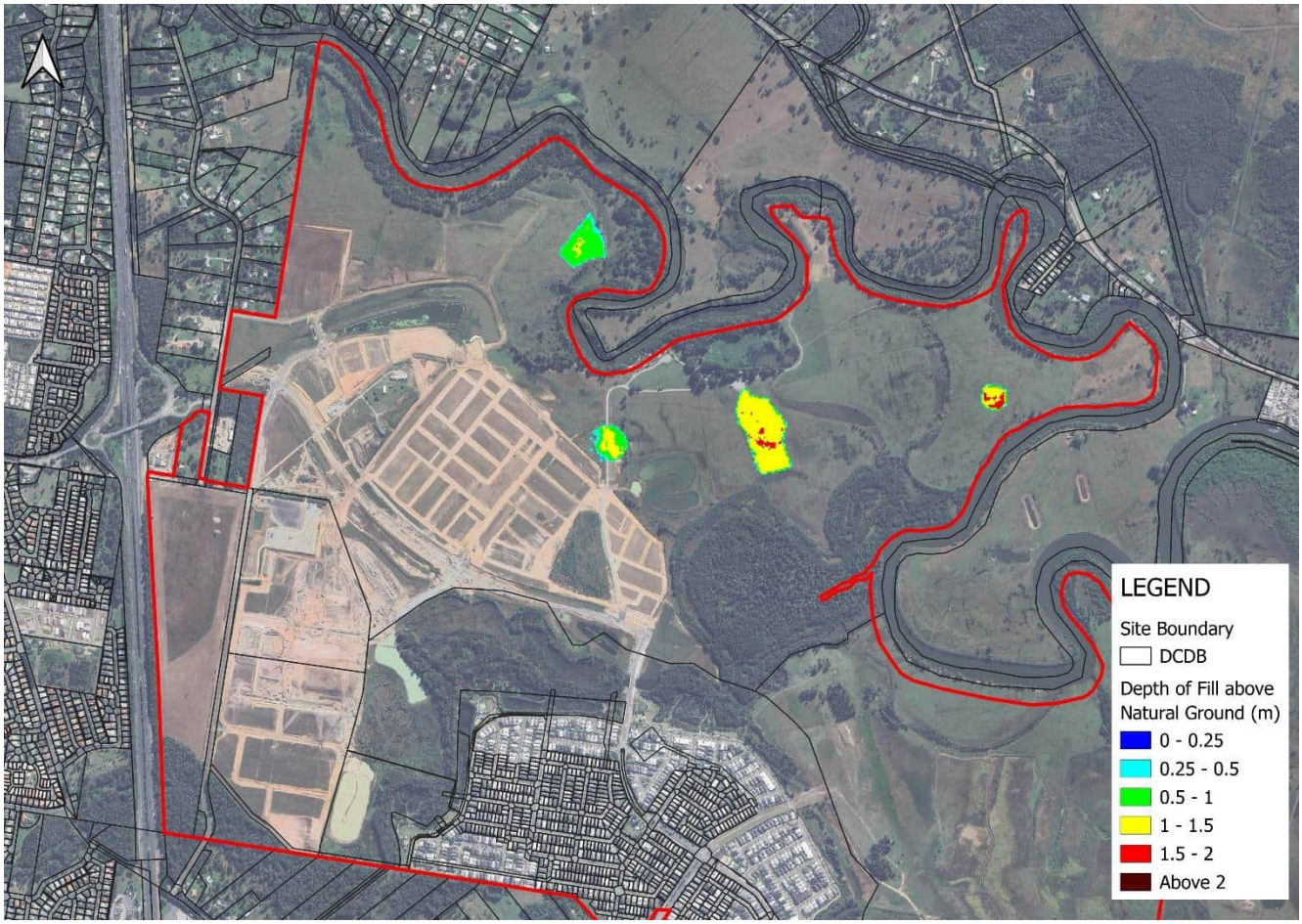
Table 3 Flood Storage Assessment

AEP	Flood Storage (m^3)		Difference (m^3)
	Pre Development	Post Development	
1%	5,927,705	6,107,078	179,373
2%	5,312,099	5,582,196	270,097
5%	4,511,391	4,888,945	377,554
10%	3,315,779	3,793,424	477,645
39%	2,096,896	2,639,850	542,954

A Manning's n value of 0.04 was adopted for the fields.

3.3.5 Incorporation of Fill Areas

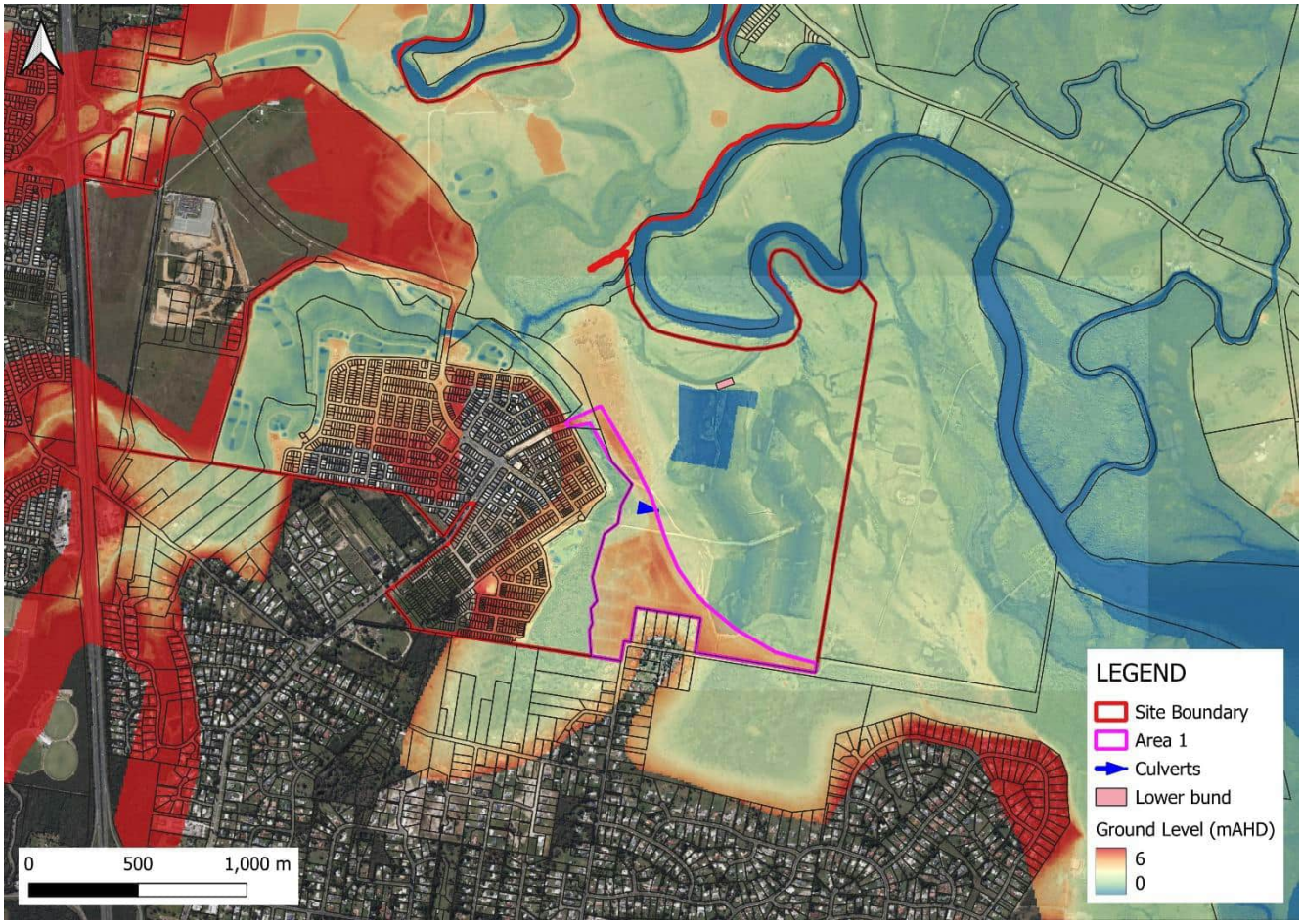
The proposed development has progressed further, with a number of small isolated fill areas now proposed for the north west corner of the site. The locations of these additional fill areas and their height above the natural surface are shown below.



The total volume of this additional fill is 76,500 m^3. This additional fill therefore does not result in a loss of floodplain storage from the commencement of the development (refer Table 2).

3.3.6 Incorporation of Area 1

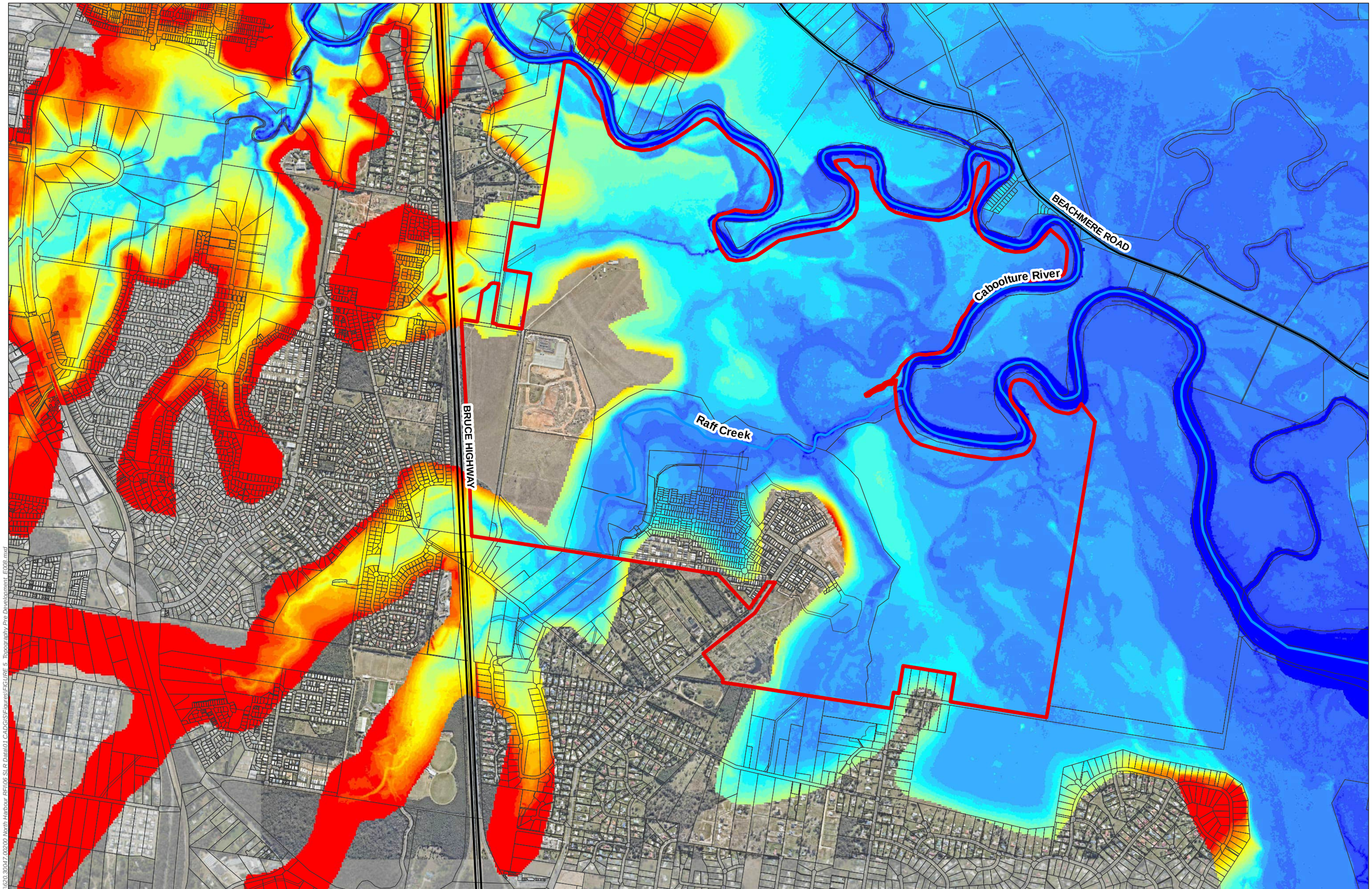
The proposed development has progressed further, with an area in the south eastern part of the site being proposed for development. The area includes residential lots, the North South Urban Arterial (NSUA) and associated features and some cut. The locations of these inclusions are shown below.



The impact of the changes on the topography is demonstrated in **Figure 5** and **Figure 6**, which show the topography for the pre and post development cases respectively.

The proposed design includes a culvert crossing of the NSUA. The location of this crossing is shown above. The culverts adopted are 10 by 3.0 x 1.5 metre RCBC. This culvert arrangement has been found to result in no adverse impacts external to the site. This culvert arrangement may change during detailed design.

In order to ensure there were no impacts, modifications to the topography were also required. The site currently includes a bund along the southern side of an old channel between the borrow pits and the Caboolture River. It was found that if this bund was breached by the adjacent cut area, impacts occurred to the property to the east for regional events. However, if this bund was fully retained, impacts occurred to the property to the east for local events. It was found that a lowering of the bund over a length of 75 metres ensured no impacts occurred for any events. The location of this lowering is shown above.



SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

09-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Ground Level (mAHD)

< 0	1.5 - 2.0	3.5 - 4.0	5.5 - 6.0	7.5 - 8.0	9.5 - 10.0
0.0 - 0.5	2.0 - 2.5	4.0 - 4.5	6.0 - 6.5	8.0 - 8.5	10.0 - 10.5
0.5 - 1.0	2.5 - 3.0	4.5 - 5.0	6.5 - 7.0	8.5 - 9.0	10.5 - 11.0
1.0 - 1.5	3.0 - 3.5	5.0 - 5.5	7.0 - 7.5	9.0 - 9.5	

North Harbour
Flood Management Plan

Existing Conditions (E008) Topography

FIGURE 5

H:\Projects-SLR\620.BNE\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Figures\FIGURE 5 Topography Pre Development E008.mxd

BEACHMERE ROAD

Caboolture River

Raff Creek

BRUCE HIGHWAY

0 500 1,000 1,500 Meters

09-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

Site Boundary

Cadastre Boundary

Ground Level (mAHD)

< 0	1.5 - 2.0	3.5 - 4.0	5.5 - 6.0	7.5 - 8.0	9.5 - 10.0
0.0 - 0.5	2.0 - 2.5	4.0 - 4.5	6.0 - 6.5	8.0 - 8.5	10.0 - 10.5
0.5 - 1.0	2.5 - 3.0	4.5 - 5.0	6.5 - 7.0	8.5 - 9.0	10.5 - 11.0
1.0 - 1.5	3.0 - 3.5	5.0 - 5.5	7.0 - 7.5	9.0 - 9.5	

North Harbour
Flood Management Plan

Developed Conditions (D146)
Topography

FIGURE 6

H:\Projects-SLR\620.BNE\620.BNE620.30047.00200.North Harbour.RFI\06.SLR Data\01.CAD\GIS\Figures\FIGURE 6 Topography Post Development D146.mxd

3.3.7 Summary

In addition, for clarity, unless noted otherwise in the previous sections, no changes were made to the following:

- Model inflows
- Tailwater boundaries
- Roughness coefficients
- Model extent/cell size

In accordance with previous assessments, the model was analysed for the following events:

REGIONAL EVENTS

- 2 year ARI Regional Event, MHWS tailwater boundary (0.82mAHD);
- 10 year ARI Regional Event, MHWS tailwater boundary (0.82mAHD);
- 50 year ARI Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD);
- 100 year ARI Regional Event including Climate Change. This event included provision for a 20% increase in rainfall intensity, an 800mm rise in sea level (relative to the 20 year ARI storm surge level) and an additional 250mm level rise to account for increased cyclonic activity (3.19mAHD);
- 200 year ARI Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD);
- 500 year ARI Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD); and
- PMF Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD).

LOCAL EVENTS

- 2 year ARI Local Event, MHWS tailwater boundary (0.82 mAHD)
- 5 year ARI Local Event, MHWS tailwater boundary (0.82 mAHD)
- 10 year ARI Local Event, MHWS tailwater boundary (0.82 mAHD)
- 50 year ARI Local Event, MHWS tailwater boundary (0.82 mAHD)
- 100 year ARI Local Event, MHWS tailwater boundary (0.82 mAHD)

Since the only change to the existing model was the upgrade in the version of TUFLOW, and this upgrade was shown to have minimal effect on flood levels within the site, the January 2011 event was not reanalysed. Levels obtained from previous analyses were considered appropriate.

3.4 Design Changes

Although design changes have been generally listed above, major design changes are described in greater detail in this section.

3.4.1 Access Road

The design of the proposed North South Urban Arterial (NSUA), which connects the site with the Buchanan Road interchange at the Bruce Highway has progressed since the last version of the FMP was prepared. The proposed design will maintain the existing infrastructure at the Buchanan Road interchange, with the NSUA connecting to the roundabout at the eastern end of Buchanan Road. Trafalgar Drive will be split into a northern end and a southern end with access to Trafalgar Drive from Buchanan Road achieved via the NSUA and other roads internal to the site. Closure of Trafalgar Drive allows for an improvement to the drainage in the area with the connection between the culverts under the Bruce Highway and an informal drainage channel which connects to the Caboolture River being formalised with a drain. Design drawings for the proposed access road are contained in **Appendix B**.

Prior to construction of the NSUA, flooding in this area is dominated by backwater effects from the Caboolture River, with the peak flood level for the 1% AEP event being constant for approximately 600 metres downstream of Trafalgar Drive. However, there is also a local catchment which needs to be accommodated for local events. This catchment, shown shaded green on the below Plate, includes significant areas on the western side of the Motorway. Runoff from these areas will be accommodated by a floodway channel running alongside the NSUA as discussed above. This floodway is shown on **Plate 2** below.

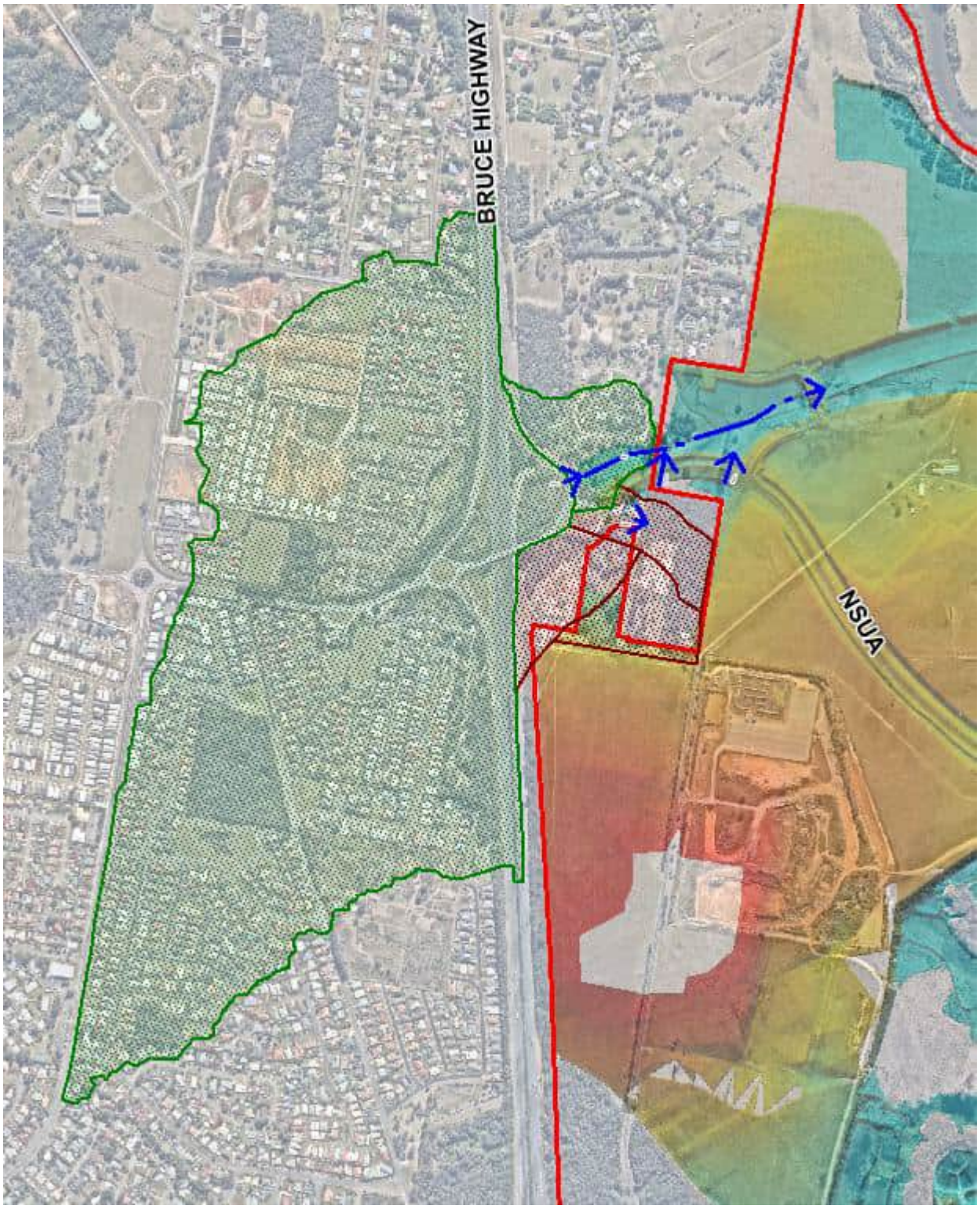


Plate 2 Catchments in vicinity of NSUA connection with Buchanan Road

It is noted that the majority of the catchment draining to the floodway channel is located west of the Bruce Highway. Except for during extreme events, the upstream flow in this catchment crosses the highway via a number of pipes located at the Buchanan Road interchange. These culverts discharge to the north of the proposed access road as shown in **Plate 3** below. This catchment was previously conveyed to the Caboolture River via overland flow.

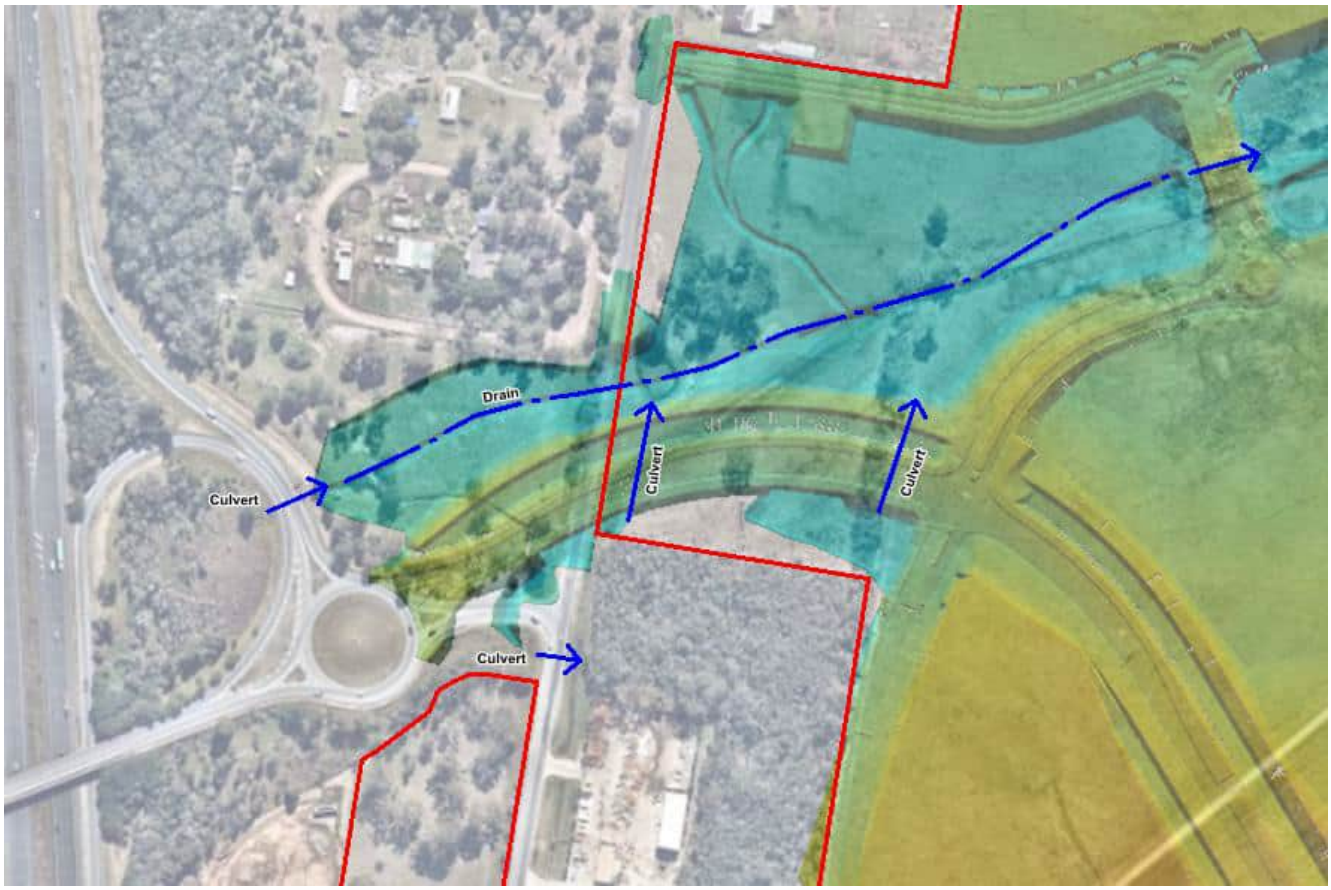


Plate 3 Major Drainage Features at Interchange

The crossing of the waterway has culverts sized to convey the overland flow. In addition, the access road includes culverts to convey the small catchment south of the proposed access road (shown hatched in red on **Plate 2**) to the formalised drain. The design includes 2 sets of culverts, each with 4 by 900mm diameter pipes. These culverts have been sized to ensure no flood impacts occur upstream of the NSUA for local events.

Trafalgar Drive will now be truncated by the North South Arterial Road and will terminate in a cul-de-sac on the northern side of the road. Similarly, the southern arm of Trafalgar Drive will be effectively replaced by a northern extension of Nolan Drive, although this southern arm will also be retained for local access purposes. Local access to both ends of Trafalgar Drive is maintained for local access purposes.

3.4.2 Wetlands

As the development design has progressed, the wetland configuration has also changed. Wetlands have changed in shape, location and level. All changes proposed for wetlands have been designed by DesignFlow and incorporated in the model.

3.5 Model Results

3.5.1 Flood Mapping

The results of the modelling are provided in the following appendices.

Table 4 Result Locations

Figure No	Case
APPENDIX C	**PRE DEVELOPMENT, REGIONAL EVENT RESULTS**
Figure C.1.1	Pre Development Water Surface Level – E008 – 39% AEP (2 year ARI) Event
Figure C.1.2	Pre Development Water Surface Level – E008 – 10% AEP (10 year ARI) Event
Figure C.1.3	Pre Development Water Surface Level – E008 – 2% AEP (50 year ARI) Event
Figure C.1.4	Pre Development Water Surface Level – E008 – 1% AEP (100 year ARI) Event
Figure C.1.5	Pre Development Water Surface Level – E008 – 0.5% AEP (200 year ARI) Event
Figure C.1.6	Pre Development Water Surface Level – E008 – 0.2% AEP (500 year ARI) Event
Figure C.1.7	Pre Development Water Surface Level – E008 – PMF Event
Figure C.2.1	Pre Development Flooding Depth – E008 – 39% AEP (2 year ARI) Event
Figure C.2.2	Pre Development Flooding Depth – E008 – 10% AEP (10 year ARI) Event
Figure C.2.3	Pre Development Flooding Depth – E008 – 2% AEP (50 year ARI) Event
Figure C.2.4	Pre Development Flooding Depth – E008 – 1% AEP (100 year ARI) Event
Figure C.2.5	Pre Development Flooding Depth – E008 – 0.5% AEP (200 year ARI) Event
Figure C.2.6	Pre Development Flooding Depth – E008 – 0.2% AEP (500 year ARI) Event
Figure C.2.7	Pre Development Flooding Depth – E008 – PMF Event
Figure C.3.1	Pre Development Velocities – E008 – 39% AEP (2 year ARI) Event
Figure C.3.2	Pre Development Velocities – E008 – 10% AEP (10 year ARI) Event
Figure C.3.3	Pre Development Velocities – E008 – 2% AEP (50 year ARI) Event
Figure C.3.4	Pre Development Velocities – E008 – 1% AEP (100 year ARI) Event
Figure C.3.5	Pre Development Velocities – E008 – 0.5% AEP (200 year ARI) Event
Figure C.3.6	Pre Development Velocities – E008 – 0.2% AEP (500 year ARI) Event
Figure C.3.7	Pre Development Velocities – E008 – PMF Event
APPENDIX D	**POST DEVELOPMENT, REGIONAL EVENT RESULTS**
Figure D.1.1	Post Development Water Surface Level – D146 – 39% AEP (2 year ARI) Event
Figure D.1.2	Post Development Water Surface Level – D146 – 10% AEP (10 year ARI) Event
Figure D.1.3	Post Development Water Surface Level – D146 – 2% AEP (50 year ARI) Event
Figure D.1.4	Post Development Water Surface Level – D146 – 1% AEP (100 year ARI) Event
Figure D.1.5	Post Development Water Surface Level – D146 – 0.5% AEP (200 year ARI) Event
Figure D.1.6	Post Development Water Surface Level – D146 – 0.2% AEP (500 year ARI) Event

Figure No	Case
Figure D.1.7	Post Development Water Surface Level – D146 – PMF Event
Figure D.2.1	Post Development Flooding Depth – D146 – 39% AEP (2 year ARI) Event
Figure D.2.2	Post Development Flooding Depth – D146 – 10% AEP (10 year ARI) Event
Figure D.2.3	Post Development Flooding Depth – D146 – 2% AEP (50 year ARI) Event
Figure D.2.4	Post Development Flooding Depth – D146 – 1% AEP (100 year ARI) Event
Figure D.2.5	Post Development Flooding Depth – D146 – 0.5% AEP (200 year ARI) Event
Figure D.2.6	Post Development Flooding Depth – D146 – 0.2% AEP (500 year ARI) Event
Figure D.2.7	Post Development Flooding Depth – D146 – PMF Event
Figure D.3.1	Post Development Flood Velocity – D146 – 39% AEP (2 year ARI) Event
Figure D.3.2	Post Development Flood Velocity – D146 – 10% AEP (10 year ARI) Event
Figure D.3.3	Post Development Flood Velocity – D146 – 2% AEP (50 year ARI) Event
Figure D.3.4	Post Development Flood Velocity – D146 – 1% AEP (100 year ARI) Event
Figure D.3.5	Post Development Flood Velocity – D146 – 0.5% AEP (200 year ARI) Event
Figure D.3.6	Post Development Flood Velocity – D146 – 0.2% AEP (500 year ARI) Event
Figure D.3.7	Post Development Flood Velocity – D146 – PMF Event
Figure D.4.1	Post Development Hazard – D146 – 39% AEP (2 year ARI) Event
Figure D.4.2	Post Development Hazard – D146 – 10% AEP (10 year ARI) Event
Figure D.4.3	Post Development Hazard – D146 – 2% AEP (50 year ARI) Event
Figure D.4.4	Post Development Hazard – D146 – 1% AEP (100 year ARI) Event
Figure D.4.5	Post Development Hazard – D146 – 0.5% AEP (200 year ARI) Event
Figure D.4.6	Post Development Hazard – D146 – 0.2% AEP (500 year ARI) Event
Figure D.4.7	Post Development Hazard – D146 – PMF Event
Figure D.5.1	Post Development Impacts – D146 – 39% AEP (2 year ARI) Event
Figure D.5.2	Post Development Impacts – D146 – 10% AEP (10 year ARI) Event
Figure D.5.3	Post Development Impacts – D146 – 2% AEP (50 year ARI) Event
Figure D.5.4	Post Development Impacts – D146 – 1% AEP (100 year ARI) Event
Figure D.5.5	Post Development Impacts – D146 – 0.5% AEP (200 year ARI) Event
Figure D.6.1	Post Development Velocity Impacts – D146 – 39% AEP (2 year ARI) Event
Figure D.6.2	Post Development Velocity Impacts – D146 – 10% AEP (10 year ARI) Event
Figure D.6.3	Post Development Velocity Impacts – D146 – 2% AEP (50 year ARI) Event
Figure D.6.4	Post Development Velocity Impacts – D146 – 1% AEP (100 year ARI) Event
Figure D.6.5	Post Development Velocity Impacts – D146 – 0.5% AEP (200 year ARI) Event

Figure No	Case
APPENDIX E	**PRE DEVELOPMENT, LOCAL EVENT RESULTS**
Figure E.1.1	Pre Development Water Surface Level – E008 – 39% AEP (2 year ARI) Event
Figure E.1.2	Pre Development Water Surface Level – E008 – 18% AEP (5 year ARI) Event
Figure E.1.3	Pre Development Water Surface Level – E008 – 10% AEP (10 year ARI) Event
Figure E.1.4	Pre Development Water Surface Level – E008 – 2% AEP (50 year ARI) Event
Figure E.1.5	Pre Development Water Surface Level – E008 – 1% AEP (100 year ARI) Event
Figure E.2.1	Pre Development Flood Depth – E008 – 39% AEP (2 year ARI) Event
Figure E.2.2	Pre Development Flood Depth – E008 – 18% AEP (5 year ARI) Event
Figure E.2.3	Pre Development Flood Depth – E008 – 10% AEP (10 year ARI) Event
Figure E.2.4	Pre Development Flood Depth – E008 – 2% AEP (50 year ARI) Event
Figure E.2.5	Pre Development Flood Depth – E008 – 1% AEP (100 year ARI) Event
Figure E.2.1	Pre Development Flood Velocity – E008 – 39% AEP (2 year ARI) Event
Figure E.2.2	Pre Development Flood Velocity – E008 – 18% AEP (5 year ARI) Event
Figure E.2.3	Pre Development Flood Velocity – E008 – 10% AEP (10 year ARI) Event
Figure E.2.4	Pre Development Flood Velocity – E008 – 2% AEP (50 year ARI) Event
Figure E.2.5	Pre Development Flood Velocity – E008 – 1% AEP (100 year ARI) Event
APPENDIX F	**POST DEVELOPMENT, LOCAL EVENT RESULTS**
Figure F.1.1	Post Development Water Surface Level – D146 – 39% AEP (2 year ARI) Event
Figure F.1.2	Post Development Water Surface Level – D146 – 18% AEP (5 year ARI) Event
Figure F.1.3	Post Development Water Surface Level – D146 – 10% AEP (10 year ARI) Event
Figure F.1.4	Post Development Water Surface Level – D146 – 2% AEP (50 year ARI) Event
Figure F.1.5	Post Development Water Surface Level – D146 – 1% AEP (100 year ARI) Event
Figure F.2.1	Post Development Flood Depth – D146 – 39% AEP (2 year ARI) Event
Figure F.2.2	Post Development Flood Depth – D146 – 18% AEP (5 year ARI) Event
Figure F.2.3	Post Development Flood Depth – D146 – 10% AEP (10 year ARI) Event
Figure F.2.4	Post Development Flood Depth – D146 – 2% AEP (50 year ARI) Event
Figure F.2.5	Post Development Flood Depth – D146 – 1% AEP (100 year ARI) Event
Figure F.3.1	Post Development Velocity – D146 – 39% AEP (2 year ARI) Event
Figure F.3.2	Post Development Velocity – D146 – 18% AEP (5 year ARI) Event
Figure F.3.3	Post Development Velocity – D146 – 10% AEP (10 year ARI) Event
Figure F.3.4	Post Development Velocity – D146 – 2% AEP (50 year ARI) Event
Figure F.3.5	Post Development Velocity – D146 – 1% AEP (100 year ARI) Event
Figure F.4.1	Post Development Hazard – D146 – 39% AEP (2 year ARI) Event

Figure No	Case
Figure F.4.2	Post Development Hazard – D146 – 18% AEP (5 year ARI) Event
Figure F.4.3	Post Development Hazard – D146 – 10% AEP (10 year ARI) Event
Figure F.4.4	Post Development Hazard – D146 – 2% AEP (50 year ARI) Event
Figure F.4.5	Post Development Hazard – D146 – 1% AEP (100 year ARI) Event
Figure F.5.1	Post Development Impacts – D146 – 39% AEP (2 year ARI) Event
Figure F.5.2	Post Development Impacts – D146 – 18% AEP (5 year ARI) Event
Figure F.5.3	Post Development Impacts – D146 – 10% AEP (10 year ARI) Event
Figure F.5.4	Post Development Impacts – D146 – 2% AEP (50 year ARI) Event
Figure F.5.5	Post Development Impacts – D146 – 1% AEP (100 year ARI) Event
Figure F.6.1	Post Development Velocity Impacts – D146 – 39% AEP (2 year ARI) Event
Figure F.6.2	Post Development Velocity Impacts – D146 – 18% AEP (5 year ARI) Event
Figure F.6.3	Post Development Velocity Impacts – D146 – 10% AEP (10 year ARI) Event
Figure F.6.4	Post Development Velocity Impacts – D146 – 2% AEP (50 year ARI) Event
Figure F.6.5	Post Development Velocity Impacts – D146 – 1% AEP (100 year ARI) Event

3.5.2 Commentary on Results

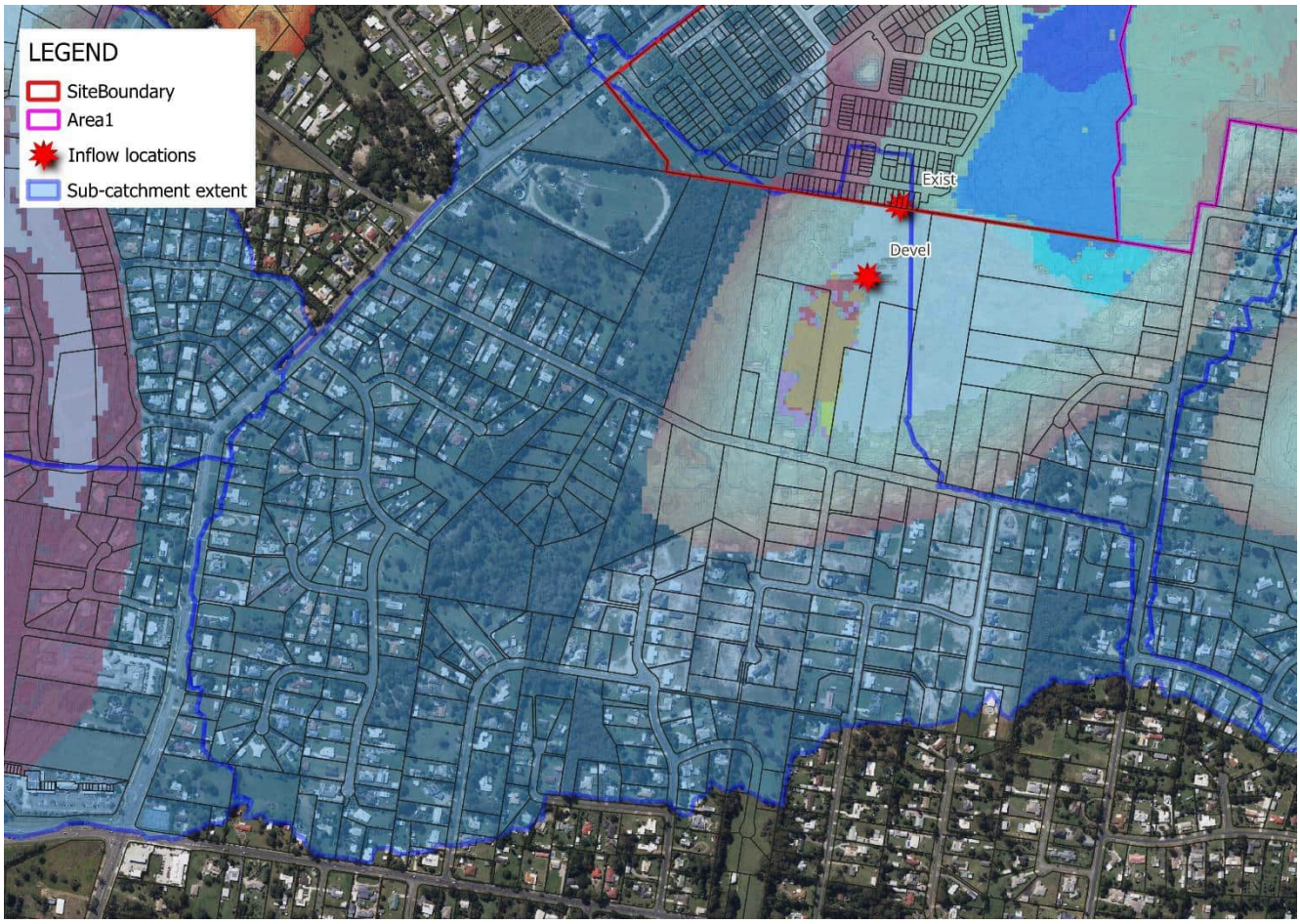
As shown in the impact plots in **Appendix D** and **Appendix F**, the current modelling shows no adverse impacts external to the site in excess of Council's standard acceptance criteria of 20 mm for all events up to and including the 1% AEP event, at all locations, except for a small area of impact of 21 mm within the creek on the eastern side of the site.

Impacts which were previously occurring at the properties adjacent to the Buchanan Road access to the site (Caboolture Gravel and Landscapes, Lot 12 RP145197 and Lot 12 SP248894) no longer occur due to the inclusion of the proposed bund along the southern and eastern sides of the compensatory storage area.

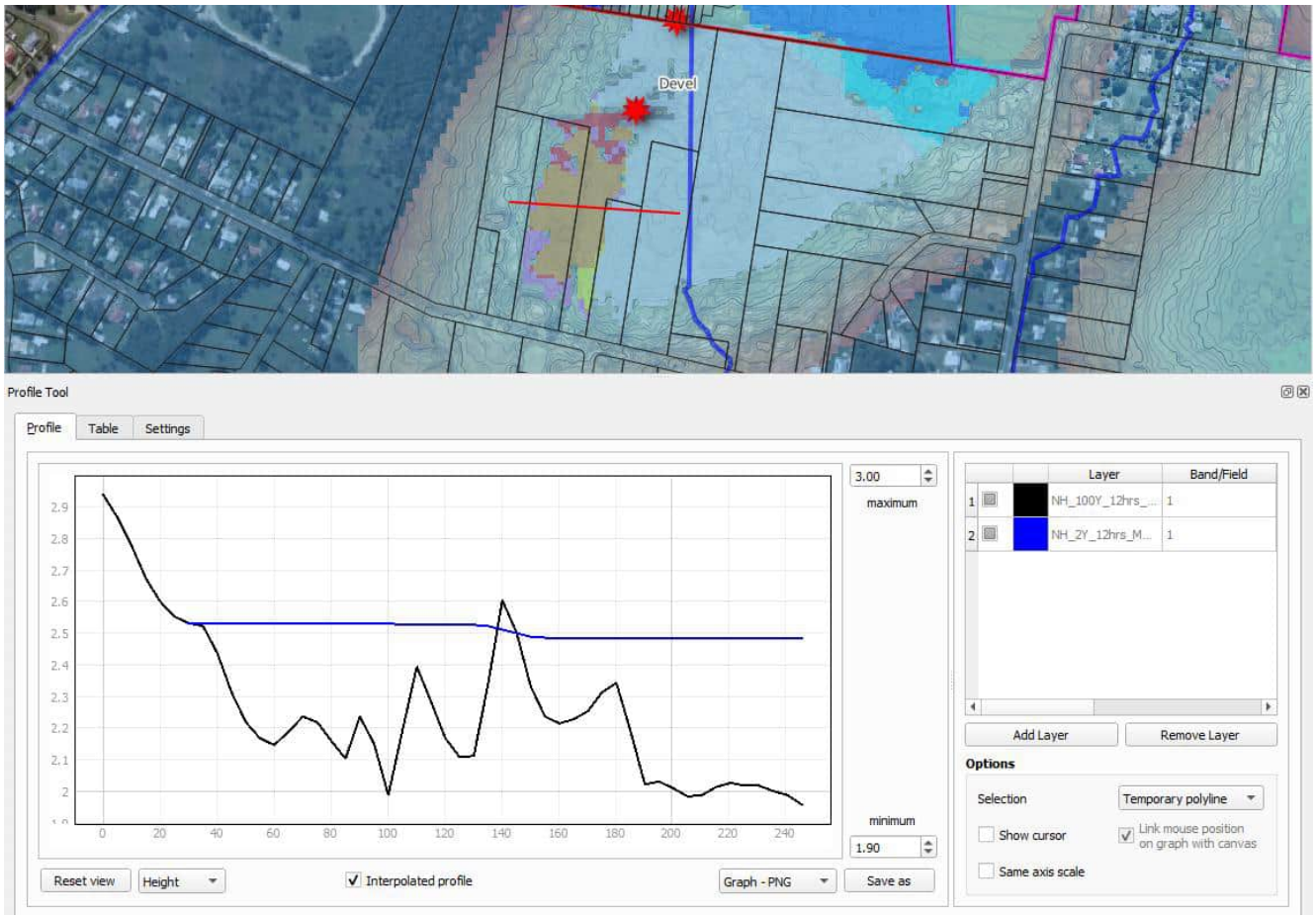
The mapping also demonstrates that the access road achieves flood immunity for the 1% AEP event and results in no impacts on the Bruce Highway, a state controlled road.

Results in the vicinity of the proposed bund near the sports fields show that the bund is not overtopped for the more frequent events (39% and 10% AEP regional events). As the bund is overtopped, velocities increase in the vicinity of the bund, with the peak velocity for the 1% AEP event being 1.5 m/s. The bund will need to be designed to withstand these velocities.

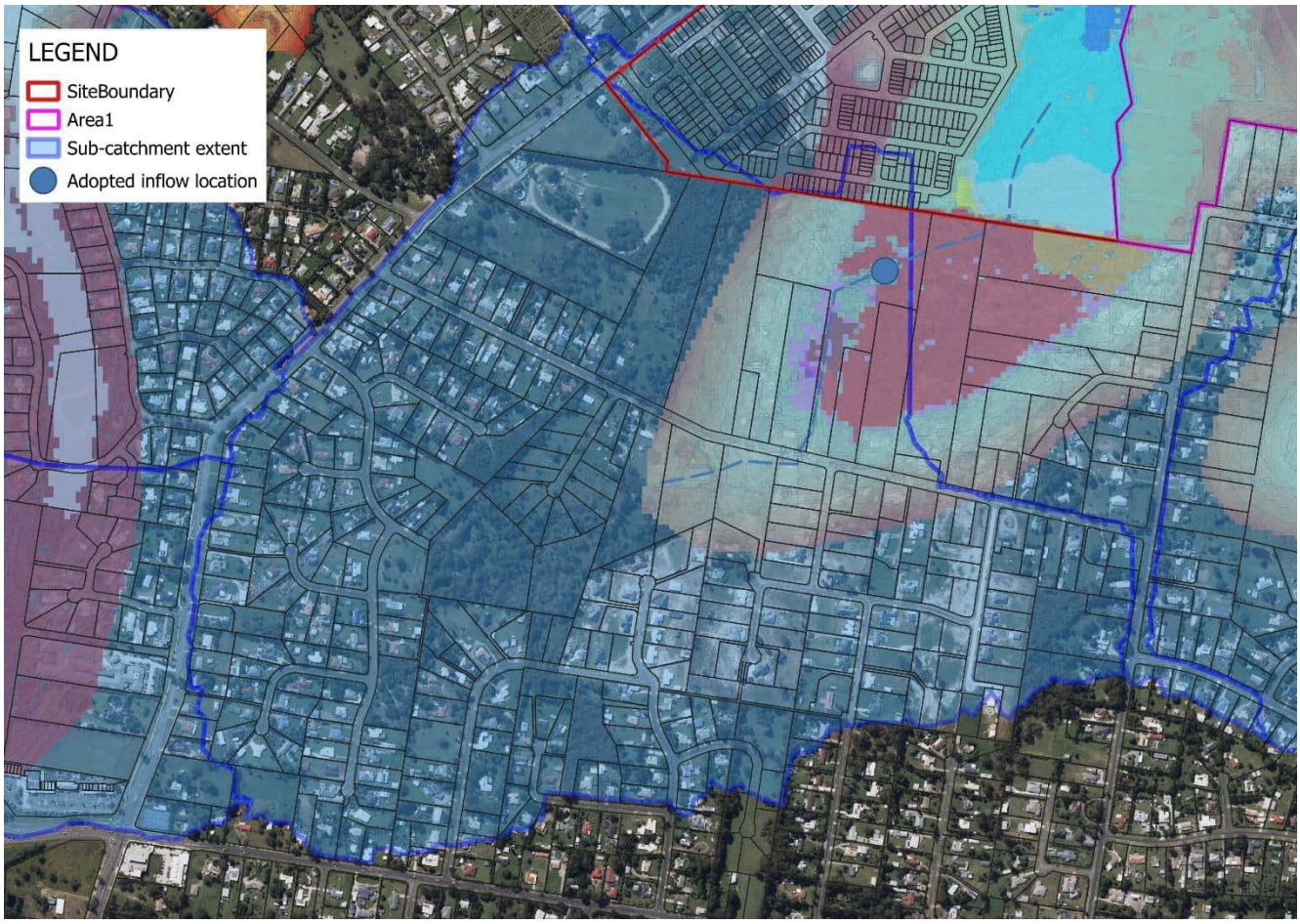
Impacts which occurred in Version 8 near Cobb Road for the 39% AEP regional event no longer occur as the inflow locations have been adjusted to more realistic locations. Council's model applies inflows over the entire subcatchment, which results in the inflow being applied to the lowest point in the area. In this area, for the existing case, the lowest point was in a small drain within the developed area. Post development, this drain was removed and filled, resulting in the lowest point being much further upstream as shown below.



The topography of the area also meant that for the post development case, all of the inflow was being applied within a low area with high ground surrounding it, with no flow escaping until late in the event and no runoff from downstream of this area entering the area showing the impacts. A cross section showing the water level is shown below.



Clearly, given the size of the sub-catchment, the entire inflow should not be applied within an isolated low point. Further, the inflow should be applied within the main watercourse and the inflow location for both the pre and post development cases should be the same as no changes are occurring in this area. The inflow location has therefore been moved to be within the watercourse, towards the downstream end of the catchment as shown below. Once this occurred, impacts no longer occurred at this location.


LEGEND
SiteBoundary
Area1
Sub-catchment extent
Adopted inflow location

Minimum lot levels are provided below in **Table 5** and **Table 6**. Reporting points listed in Table 4 are as for previous versions of the FMP. Reporting points for Area 1 have been added. Lot levels in Table 4 are based on Council's 2014 TUFLOW model for consistency with previous version of the FMP. Lot levels in Table 5 are based on Council's 2022 TUFLOW model to ensure lot levels allow for updated flood levels.

Table 5 Minimum Lot Levels throughout the site – 2014 Model

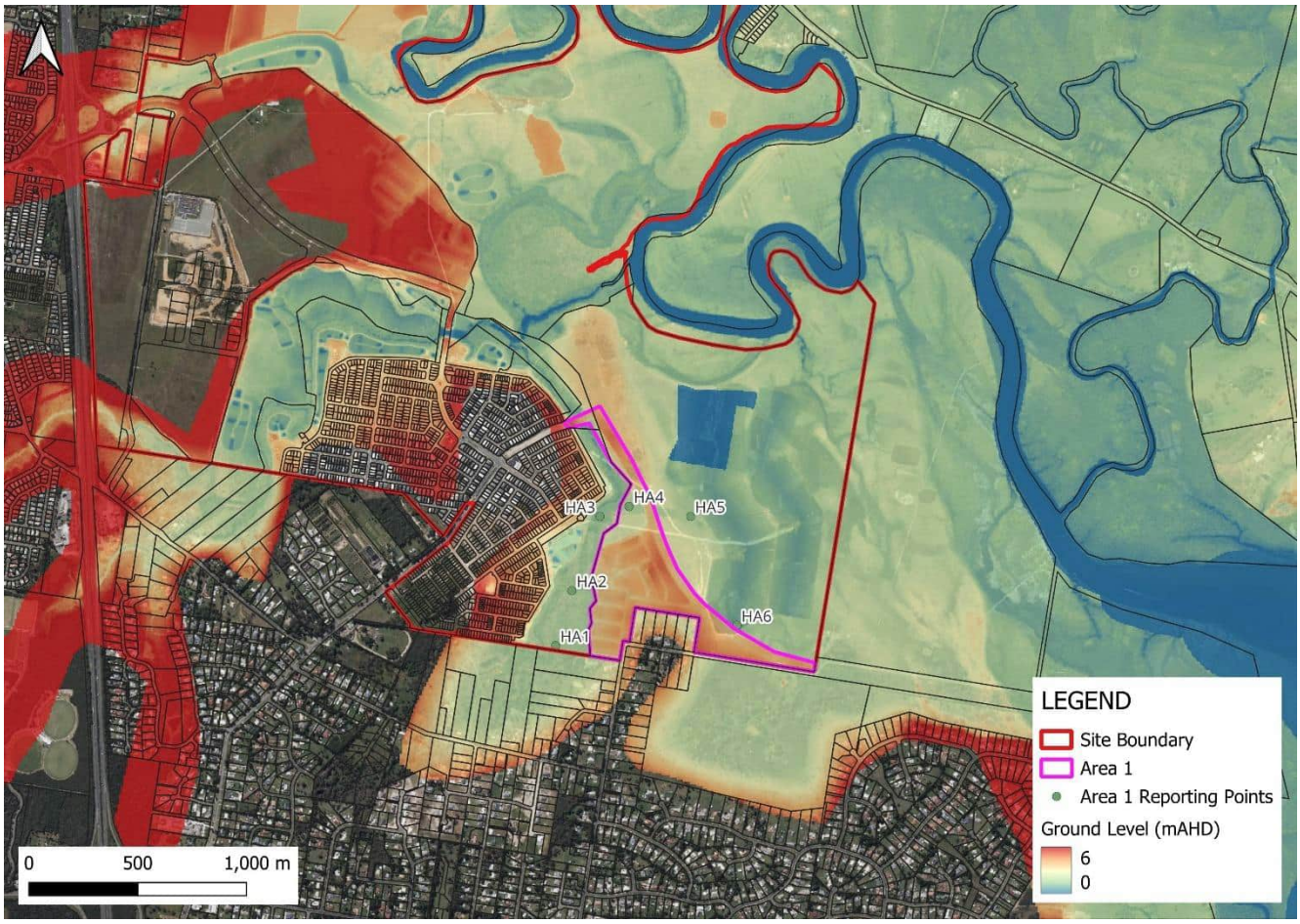
Reporting Point*	Location	Flood Level (mAHD)		
		1% AEP (incl CC)	January 2011 Event	Minimum Lot Levels (incl 300mm freeboard)
H97	North Multi-Use Area	5.78	5.58	6.08
H112	East Multi-Use Area	4.33	4.39	4.69
H99	Upstream Multi-Use Area	4.34	4.38	4.68
H102	Trafalgar Drive	4.34	4.37	4.67
H114	Downstream Drainage Channel	4.28	4.30	4.60
H128	MIBA East	3.85	3.81	4.15
H117	MIBA South East	3.74	3.37	4.04
H27	Downstream Raff Creek Crossing	3.69	3.23	3.99
H4	Upstream Boundary of Site Raff Creek	3.70	3.24	4.00
H14	Raff Creek	3.69	3.23	3.99
H16	Raff Creek	3.69	3.23	3.99
H23	Upstream Raff Creek Crossing	3.69	3.23	3.99
H38	East RWA Unnamed waterway	3.68	3.22	3.98
H39	East RWA Unnamed waterway	3.54	3.21	3.84
H45	South east RWA Unnamed waterway	3.54	3.40	3.84

* Refer **Appendix A** for locations of reporting points

Table 6 Minimum Lot Levels at Area 1 – 2022 Model

Reporting Point*	Location	Flood Level (mAHD)	
		1% AEP (incl CC)	Minimum Lot Levels (incl 300mm freeboard)
HA1	Area 1 - SW	3.15	3.45
HA2	Area 1 - W	3.15	3.45
HA3	Area 1 - NW	3.15	3.45
HA4	Area 1 - N	3.13	3.43
HA5	Area 1 - NE	3.09	3.39
HA6	Area 1 – SE	3.08	3.38

* Refer **below** for locations of reporting points



It is noted that all lots in Area 1 are above the minimum lot level.

Peak flood levels throughout the site for other AEPs, at the same reporting points as above are listed in **Table 7** below. These are provided for information purposes.

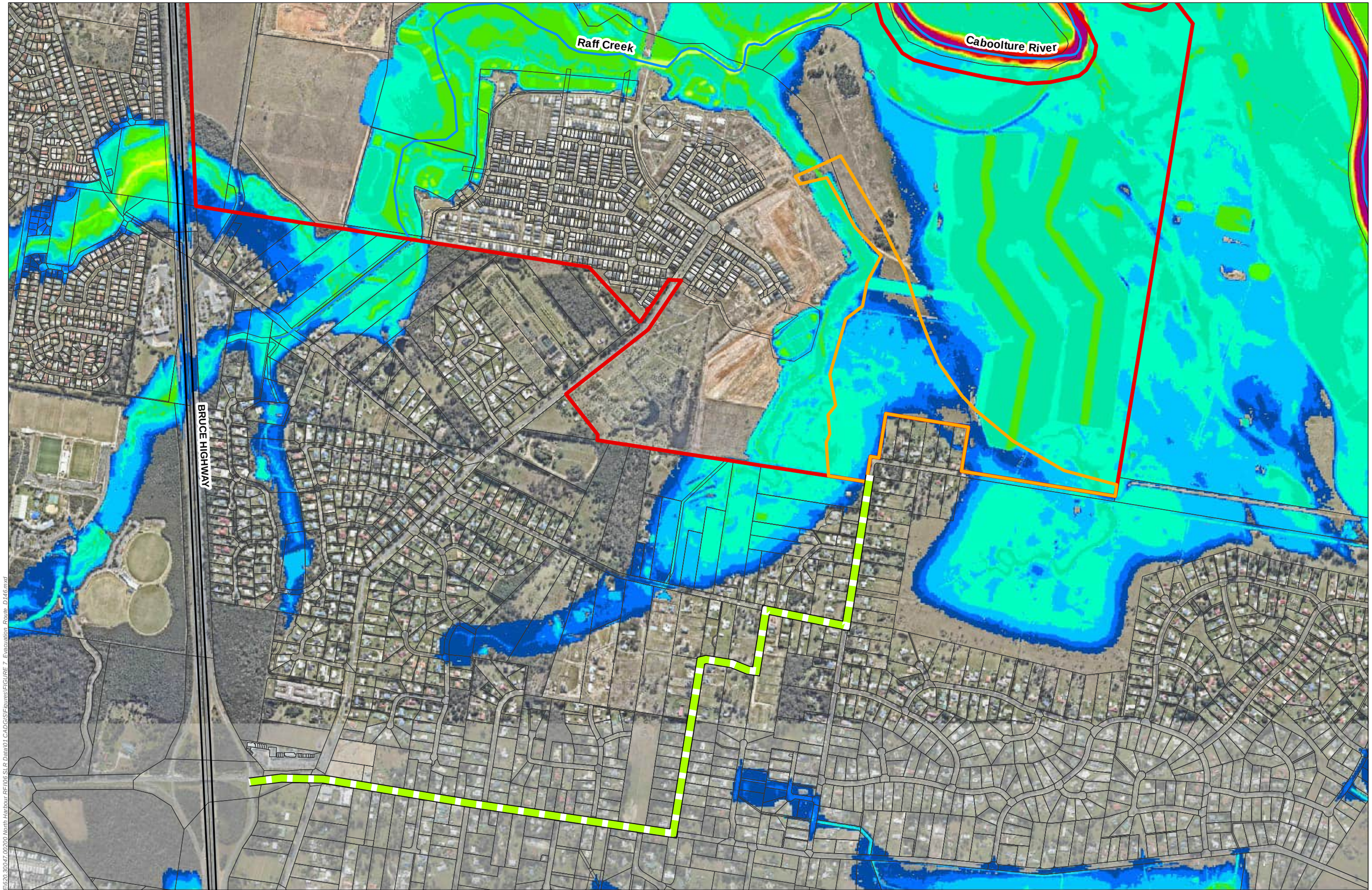
Table 7 Peak Flood Levels throughout the Site

Reporting Point*	Location	5% AEP Flood Level (mAHD)	1% AEP (incl CC) Flood Level (mAHD)	PMF Flood Level (mAHD)
H97	North Multi-Use Area	5.16*	5.78	7.72
H112	East Multi-Use Area	3.77	4.33	6.24
H99	Upstream Multi-Use Area	3.78	4.34	6.29
H102	Trafalgar Drive	3.78	4.34	6.29
H114	Downstream Drainage Channel	3.77	4.28	6.00
H128	MIBA East	3.44	3.85	5.52
H117	MIBA South East	2.94	3.74	5.53
H27	Downstream Raff Creek Crossing	2.88	3.69	5.36
H4	Upstream Boundary of Site Raff Creek	2.96	3.70	5.39
H14	Raff Creek	2.89	3.69	5.38
H16	Raff Creek	2.88	3.69	5.38
H23	Upstream Raff Creek Crossing	2.88	3.69	5.38
H38	East RWA Unnamed waterway	2.87	3.68	5.25
H39	East RWA Unnamed waterway	2.81	3.54	5.16
H45	South east RWA Unnamed waterway	2.81	3.54	5.15

* No inundation occurs for this event at this location. Flood level shown was extracted from nearest inundated area.

3.5.3 Flood Emergency Egress – Area 1

As noted by EDQ, Area 1 is to be constructed prior to the North South Urban Arterial. Concern has been raised as to the path of egress from the area during a flood emergency. **Figure 7** has been prepared to demonstrate the path of exit during a 1% AEP event. This route provides flood free egress to the highway and beyond during the 1% AEP event.



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\09 SLR Data\01 CAD\GIS\Figures\FIGURE 7 Evacuation Route- D146.mxd

SLR
www.slrconsultingaustralia.com.au

0 310 620 930 Meters

10-Dec-2025 Scale: 1:12,500

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary
- Area1
- Evac_Route

Depth (m)

- 0.01 to 0.25
- 0.25 to 0.50
- 0.50 to 1.00
- 1.00 to 1.50
- 1.50 to 2.00
- 2.00 to 2.50
- 2.50 to 3.00
- 3.00 to 3.50
- 3.50 to 4.00
- 4.00 to 4.50
- 4.50 to 5.00
- 5.00 to 5.50
- 5.50 to 6.00
- 6.00 to 6.50
- Above 6.50

North Harbour
Flood Management Plan

Evacuation Route
1% AEP

FIGURE 7

3.6 Revised Roughness Assessment

3.6.1 Modelling

In accordance with previous versions of the Flood Management Plan, a revised roughness scenario has also been assessed. This case was assessed due to concerns that the level of vegetation assumed in the Council model reflects the floodplain being cleared and relatively maintained. This was not the case prior to 2003 and may not be the case in the future. The impact of the proposed development under the unmaintained case therefore forms the basis of the revised roughness assessment.

As with previous versions of the Flood Management Plan, the existing case was modified to reflect conditions in 2003. Based on aerial photography and verbal advice received from maintenance staff, the following vegetation values were adopted:

- Dense Vegetation: Depth 0-1.5m “n” = 0.09, depth >1.5m “n”=0.18; and
- Medium Dense Vegetation “n”=0.10.

The extent of each type of vegetation is shown on **Figure 8**.

As noted in earlier versions of the FMP, it is considered that the level of vegetation assumed for the pre-development scenario conservatively underestimates the likely actual roughness level.

For the post-development scenario, for those areas not impacted by the development, the Manning’s values adopted for the pre development case were adopted. Elsewhere, the level of roughness was adjusted to reflect conditions following revegetation works within Raff Creek.

The adopted values for the post-development case were as follows:

- Dense Vegetation: Depth 0-1.5m “n” = 0.09, depth >1.5m “n”=0.18 (same as pre-development);
- Medium Dense Vegetation “n”=0.10 (same as pre-development);
- Reeds “n”=0.08;
- Wetlands “n”=0.06; and
- Parks “n”=0.045.

It was assumed that the sports fields would be maintained. The revised roughness values were therefore not applied to the sport fields.

The extent of each type of vegetation is shown on **Figure 9**.

Modelling of the revised roughness case considered the following events:

- 1% AEP regional event in the Caboolture River; and
- 1%, 2%, 10%, 39% and 18% AEP events in Raff Creek



H:\Projects-SLR\620.BNE\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Figures\FIGURE 7_E007R_Mannings.mxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Manning's value

- Park (0.045)
- Wetland (0.06)
- Medium vegetation (0.10)
- Urban (0.30)
- Waterbodies (0.03)
- Roads (0.015)
- Grass (0.25 - 0.025)
- Medium vegetation (0.075 - 0.15)
- Reeds (0.08)
- Dense vegetation (0.09 - 0.18)

North Harbour
Flood Management Plan

Existing Conditions (E008R)
Revised Roughness, Manning's

FIGURE 7



H:\Projects-SL\P1620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CADGIS\Figures\FIGURE 8_D116R_Mannings.mxd

SLR
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0 500 1,000 1,500 Meters

16-Jun-2023 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Manning's

- Park (0.045)
- Wetland (0.06)
- Medium Vegetation (0.10)
- Urban (0.30)
- Waterbodies (0.03)
- Roads (0.015)
- Grass (0.25 - 0.025)
- Fields (0.04)
- Medium vegetation (0.075 - 0.15)
- Reeds (0.08)
- Dense vegetation (0.09 - 0.18)

North Harbour
Flood Management Plan

Developed Conditions (D116R)
Revised Roughness, Manning's

FIGURE 8

3.6.2 Flood Mapping

The results of the modelling are provided in the **Appendix G**. **Table 8** provides a list of the figures within **Appendix G**.

Table 8 Result Locations

Figure No	Case
APPENDIX G	**REVISED ROUGHNESS ASSESMENT**
Figure G.1.1	Pre Development Water Surface Level – E008R – 39% AEP (2 year ARI) Local Event
Figure G.1.2	Pre Development Water Surface Level – E008R – 18% AEP (5 year ARI) Local Event
Figure G.1.3	Pre Development Water Surface Level – E008R – 10% AEP (10 year ARI) Local Event
Figure G.1.4	Pre Development Water Surface Level – E008R – 2% AEP (50 year ARI) Local Event
Figure G.1.5	Pre Development Water Surface Level – E008R – 1% AEP (100 year ARI) Local Event
Figure G.1.6	Pre Development Water Surface Level – E008R – 1% AEP (100 year ARI) Regional Event
Figure G.2.1	Pre Development Flooding Depth – E008R – 39% AEP (2 year ARI) Local Event
Figure G.2.2	Pre Development Flooding Depth – E008R – 18% AEP (5 year ARI) Local Event
Figure G.2.3	Pre Development Flooding Depth – E008R – 10% AEP (10 year ARI) Local Event
Figure G.2.4	Pre Development Flooding Depth – E008R – 2% AEP (50 year ARI) Local Event
Figure G.2.5	Pre Development Flooding Depth – E008R – 1% AEP (100 year ARI) Local Event
Figure G.2.6	Pre Development Flooding Depth – E008R – 1% AEP (100 year ARI) Regional Event
Figure G.3.1	Post Development Water Surface Level – D146R – 39% AEP (2 year ARI) Local Event
Figure G.3.2	Post Development Water Surface Level – D146R – 18% AEP (5 year ARI) Local Event
Figure G.3.3	Post Development Water Surface Level – D146R – 10% AEP (10 year ARI) Local Event
Figure G.3.4	Post Development Water Surface Level – D146R – 2% AEP (50 year ARI) Local Event
Figure G.3.5	Post Development Water Surface Level – D146R – 1% AEP (100 year ARI) Local Event
Figure G.3.6	Post Development Water Surface Level – D146R – 1% AEP (100 year ARI) Regional Event
Figure G.4.1	Post Development Flooding Depth – D146R – 39% AEP (2 year ARI) Local Event
Figure G.4.2	Post Development Flooding Depth – D146R – 18% AEP (5 year ARI) Local Event
Figure G.4.3	Post Development Flooding Depth – D146R – 10% AEP (10 year ARI) Local Event
Figure G.4.4	Post Development Flooding Depth – D146R – 2% AEP (50 year ARI) Local Event
Figure G.4.5	Post Development Flooding Depth – D146R – 1% AEP (100 year ARI) Local Event
Figure G.4.6	Post Development Flooding Depth – D146R – 1% AEP (100 year ARI) Regional Event
Figure G.5.1	Post Development Impacts – (D146R-E008R) – 39% AEP (2 year ARI) Local Event
Figure G.5.2	Post Development Impacts – (D146R-E008R) – 18% AEP (5 year ARI) Local Event

Figure No	Case
Figure G.5.3	Post Development Impacts – (D146R-E008R) – 10% AEP (10 year ARI) Local Event
Figure G.5.4	Post Development Impacts – (D146R-E008R) – 2% AEP (50 year ARI) Local Event
Figure G.5.5	Post Development Impacts – (D146R-E008R) – 1% AEP (100 year ARI) Local Event
Figure G.5.6	Post Development Impacts – (D146R-E008R) – 1% AEP (100 year ARI) Regional Event

3.6.3 Commentary on Results

As shown on the impact plots in **Appendix G**, the proposed development results in no impacts greater than 20mm external to the site for all events except for the 1% AEP regional event. For this event, a maximum impact of 45 mm occurs to the east of the Caboolture River in an area currently subject to inundation to depths greater than 1.5m. Given this, it is considered that the development will not produce unacceptable impacts when revised roughness conditions are considered.

4 STORMWATER QUANTITY MANAGEMENT

The results of the hydraulic modelling detailed in **Section 3** above indicated that the development will not cause a material impact on peak flood levels that would result in an actionable nuisance external to the site.

Given the results of the flood modelling, no on-site detention is deemed necessary for either the MIBA or RWA portions of the development.

5 CONCLUSIONS

North Harbour Holdings Pty Ltd propose to develop land located at Nolan Drive, Morayfield. The site is located adjacent to both the Caboolture River and Raff Creek.

This addendum to the Flood Management Plan has been prepared to comply with the conditions of approval issue by the Planning and Environment Court and to address concerns raised in the current Planning and Environment Court appeal.

The Flood Management Plan has been updated as the development of the site has progressed, with this version of the Plan incorporating the sports fields in the northern part of the site, a number of small additional fill areas and development of Area 1 in the south eastern part of the site.

The modelling conducted to assess the impacts of the proposed development has determined that the development does not result in adverse impacts external to the site.

6 CLOSURE

This report has been prepared by:



Helen Doherty

Principal Surface Water Engineer

RPEQ No 20364

APPENDIX A

Cardno *Mixed Industry and Business Area Flood Management Plan*

North East Business Park

Mixed Industry and Business Area Flood Management Plan

7903-59/R6V5



Prepared for
North Harbour Holdings Pty Ltd
(formerly known as North East Business Park Pty Ltd)

8 September 2020

Cardno
Shaping the Future

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A	17 June 2016	Draft	G. Lambourne	GL	H. Doherty	HD
B	20 June 2016	Draft for client comment	G. Lambourne	GL	H. Doherty	HD
1	20 June 2016	Final	G. Lambourne	GL	H. Doherty	HD
2	21 June 2016	Revised App F	G. Lambourne	GL	H. Doherty	HD
3	26 August 2016	Response to RFI	G. Lambourne	GL	H. Doherty	HD
4	9 September 2016	Response to 2nd RFI	G. Lambourne	GL	H. Doherty	HD
C	28 August 2020	Draft for client comment	M.Koi	MK	S.Martinez	SM
5	8 September 2020	Consolidation of Assessments - Final	M.Koi	MK	S.Martinez	SM

Version	Reason for Issue	Approved for Release By	Approved (Signature)	Approved Release Date
A	Draft	G. Lambourne	GL	17 June 2016
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1	Final	G. Lambourne	GL	20 June 2016
2	Final	G. Lambourne	GL	21 June 2016
3	Response to RFI	G. Lambourne	GL	26 August 2016
4	Response to 2nd RFI	G. Lambourne (RPEQ 7708)	GL	9 September 2016
C	Version 5 Draft for client comment	S.Martinez	SM	28 August 2020
5	Consolidation of Assessments	S.Martinez (RPEQ 07137)	SM	8 September 2020

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Appendix L Sensitivity Analysis – Post-Development Results – Regional Events

Appendix M Sensitivity Analysis – Post-Development Results – Local Events

Appendix N Critical Duration Assessment

Appendix O Save Date Model Files & Humes' Hume-King floodgate brochure

1 Introduction

1.1 Background

North Harbour Holdings Pty Ltd (previously known as North East Business Park Pty Ltd) proposes to develop the Mixed Industrial and Business Area (MIBA) as part of the North East Business Park (NEBP) located on Nolan Drive, Morayfield. The site for the MIBA portion of the Business Park development is located adjacent to the Caboolture River and bordered by local tributaries of the river, including Raff Creek. The local tributaries have a confluence at the eastern corner of the site. The MIBA site location is shown in Plate 1 below together with the Residential West precinct of the development. The Residential West Area (RWA) of the development was assessed in the approved report *"Northeast Business Park, Residential West Flood Management Plan"* prepared by Cardno 31 March 2015.

The MIBA Flood Management Plan (FMP) provides a consolidated FMP including all elements of the development approved under the MIBA and RWA preliminary approvals within the post-development scenario. The Version 4 of the MIBA FMP (i.e. titled "*Northeast Business Park – Mixed Industry and Business Area Flood Management Plan"*, ref: 7903-59/R6) prepared by Cardno and dated 9 September 2016 was approved (referred herein as the Approved FMP) by Moreton Bay Regional Council (MBRC) on 18 October 2016 (Council ref: DA/7352/2002/XT/7). The preliminary development layout for the MIBA precinct, as adopted in the Approved FMP is presented in Appendix A.



Plate 1 – Site Location

The Approved FMP was prepared in support of the application and in compliance with the conditions of approval issued for the Mixed Industry and Business area and the agreed outcomes as detailed in the Meeting Minutes – MIBA Flooding Analysis 1 September 2015.

The relevant conditions of approval addressed by the report are as follows:

- Conditions 21(b) and 27 of the approval issued by the Planning and Environment Court in relation to Appeal No. 255 of 2010 (28 June 2012).

The approval conditions and meeting minutes are listed in Appendix B. The compliance of this report to the conditions is detailed in Section 1.2.

Changes were made to the development and hence, additional flood assessments were carried out subsequent to the Approved FMP. Key findings of these subsequent flood assessments were summarised and reported in three technical memorandums, all prepared by Cardno. The subsequent technical memorandums prepared by Cardno include:

- "*Technical Memorandum – Hydraulic Assessment – Works 2*", dated 19 December 2018;
- "*Technical Memorandum – Hydraulic Assessment – Works 2*", dated 19 August 2019; and
- "*Technical Memorandum – Works 2 Additional Hydraulic Assessment*", dated 27 March 2020.

The change in use in a portion of the MIBA site (i.e. to residential development) has been considered in these studies, however the change in use has no material impact on the overall flooding outcomes of this Version 5 FMP since the extent of development footprint remained generally consistent with the Approved FMP.

On 19 May 2020, Council issued Additional Information Requirements (AIR) requesting additional information to assist in the assessment of the development (Council ref: DA/7352/2002/XT/11). In particular, Item 8 of the AIR requested that an amended FMP be prepared and submitted. As such, this Version 5 of the MIBA FMP has been prepared to consolidate all the subsequent flood assessment works carried out since the Approved FMP (i.e. as reported in the above technical memorandums) and to address Council's 19 May 2020 AIR. Note that changes made to the design of the NEBP development area as reported in each of the technical memorandum outlined above are summarised and discussed further in Section 3.2.2.

Further, all responses provided in the Approved FMP to address Council's AIR and conditions of approval have been retained in this Version 5 FMP (i.e. in Section 1.2 and 1.3) for completeness purposes. Response to the latest Council's AIR, dated 19 May 2020 are provided in Section 1.4 of this Version 5 FMP.

1.2 Conditions of Approval

Table 1-1 provides a direct response to the conditions of approval/meeting minutes and the locations in the report where the information required to satisfy the conditions is provided.

Table 1-1 Summary of Conditions and Response

Item	Response and Location in Report
Planning and Environment Court Condition 21(b) MBRC Stormwater Detention and Flood Plain Management	
Submit for approval a Flood Management Plan (FMP) prepared by a suitably qualified and experienced Stormwater Engineer demonstrating non-worsening and no adverse off site impacts for local and river flood events. For local flood management this will require any necessary detention/attenuation for local storm events corresponding to 2, 5, 10, 50, and 100 year ARI storm event including a possible 100 year ARI Caboolture River flood event coinciding with a 20 year storm tide. In addition the proposed development is to be assessed against the 2011 flood event to determine the adequacy of proposed development levels. The plan is to demonstrate that any discharge towards downstream properties does not result in an increase of peak flow discharge of concentration of the stormwater to downstream properties.	This report is provided to satisfy the condition. Flood modelling has considered a range of events including the following: - 2, 5, 10, 20, 50, and 100 year ARI local events - 100 year ARI Caboolture River regional event coincident with 20 year storm tide; and - January 2011 event. Additional events have also been considered as agreed at the 1 September 2015 meeting as noted in the attached minutes (Appendix B)
Council's requirements in relation to sizing and configuration of detention basins at the development permit application stage are outlined in Council's 2005 Caboolture Shire Plan (as amended) Planning Scheme Policy 4 – Design & Development Manual – Section 8.18 "Stormwater Detention. The Flood Management Plan is to address the following issues:	Modelling presented in Section 3 and 4 demonstrates that detention basins are not deemed necessary as part of development.
(i) Council's current hydraulic flood model is to be used to assess the impacts of the MIBA development;	Refer Section 3. Council's supplied hydraulic model was used for the assessment of flood impacts. Acceptability of the model for use in this assessment was confirmed by Council at the 1 September 2015 meeting as noted in the attached minutes (Appendix B). Further, since Council approved the MIBA FMP in late 2016, Council has not released any further updates to the Caboolture River model. The most recent report available on Council's website is the "Regional Floodplain Database: 2014 Model Maintenance Report – Caboolture River", dated October 2015.
(ii) Provide revised reporting demonstrating no net loss of flood plain storage volume for storm events Q2, Q5, Q10, Q50 and the Q100 ARI flood event based on the above item. Volumetric details are to be provided at each development stage to demonstrate preservation of the existing flood plain storage.	Section 3.2.2 of the report details the ability to achieve no net loss of floodplain storage volume.
(iii) Any proposed excavation, alterations to site contours or reshaping of areas are to be contained within the NEBP MIBA Structure Plan areas and be free draining. Any volumes to be occupied by permanent water levels will not be credited towards compensatory earthworks calculations;	All compensatory flood storage excavation is within the open space precinct to the north of the MIBA area. All works have been included in the detailed flood modelling. Provision of culvert outlets to the Caboolture River will ensure free draining of the storage area such that the storage volume is available at the onset of each flood event. All volumes below the standing water level within proposed constructed wetlands has not been credited towards the compensatory earthworks calculations.
(iv) All works (filling and/or mitigation) within the existing flood plain must be contained within the subject land and not create adverse impacts on adjoining, upstream or downstream	Modelling based on the Council model as supplied (refer Section 3.1 and 3.5.1) and with revised roughness levels within the site (refer Section 3.1

Item		Response and Location in Report
	properties, cause affluxes in flood conditions, redirect water away from existing flow paths where they cross adjoining boundaries or concentrate flows upon adjoining properties. Note: Any modification to internal flow paths must consider the environmental impacts of such changes.	and Section 3.5.2) confirm that development will not create adverse impacts on adjacent, upstream, or downstream properties.
(v)	Hydraulic remodelling must be accurately based on finished surface coverage's (i.e. grasses in diversion banks and overflow bypass channels, river bank revegetation works, tree density and plantings in open spaces, etc.) and their associated Manning 'n' roughness coefficient within the floodplain. Adopted friction values must reflect minimal maintenance requirements, and the report must also include a maintenance management plan acceptable to Council;	Appropriate roughness values have been selected for both the Council model as supplied and revised roughness cases (refer to Section 3.1).
(vi)	Discharge from the individual stages and the overall site as a whole does not cause nuisance to any person, property or premises;	Modelling has indicated that there will be no adverse impact for the Council model as supplied and revised roughness scenarios (refer Sections 3.5.1 and 3.5.2).
(vii)	Use of advanced methodology by electronic modelling techniques is to be undertaken in determining and estimating detention volumes. Council does not support the Queensland Urban Drainage Manual methods in this instance, as these methods are only suitable for low volume estimations; and	A local WBNM model was used to confirm that detention basins are not required (refer Section 4).
(viii)	Demonstrate safe flood egress from all new lots to a flood free area of sufficient size (i.e. outside the extent of the Probable Maximum Flood). Assessment to include 800mm of sea level rise allowance resulting from predicted climate change impacts to the year 2100.	Safe flood egress can be achieved to a flood free area of sufficient size for the PMF event with provision of an emergency access to the Bruce Highway (refer Section 3.5.2.3)
Planning and Environment Court Condition 27. MBRC Flood Immune Access		
Provide trafficable flood immune access during a 100 year ARI storm event by providing all necessary cross drainage culverts or other cross bridging structures over waterways and drainage channels. All cross drainage and bridging structures are to be designed and built in accordance with the relevant standards current at the time of the development.		Cross drainage structures and bridges have been designed to achieve the flood immunity requirements as agreed during the 1 September 2015 meeting with Council. Flood modelling has demonstrated that the Raff Creek crossing will achieve 100 year ARI trafficability considering climate change conditions to 2100. The access to the Community Multi-use Area will also achieve trafficability greater than the 10 year ARI event considering climate change to 2100.
Minutes of Meeting – MIBA Flooding Analysis, 1 September 2015 Moreton Bay Regional Council		
Provide and have approved by Council a consolidated and final Flood Management Plan (FMP) for the development. The FMP must: 1. Model to be used – Noting advice from Council that the Caboolture River Flood Model used to model the Res West area can be used for modelling of MIBA – no requirements to use updated model of river.		The Council supplied model used for the Res West FMP has been used for this assessment.

Item	Response and Location in Report
2. Res West – Noting will be including detailed design work completed with respect to wetlands for Res West as part of modelling for MIBA.	The detailed design for Res West including the reconfigured wetlands has been included with the MIBA development as part of the post-development scenario.
3. Confirmation of model details – 3a: Base Case and Developed Case: Proposed base case to be situation prior to Res West and developed case to be with Res West (including modified wetlands) and MIBA in place. Not proposing runs with Res West and new wetlands as a separate case.	Base case as per Council supplied modelled without Res West included. The detailed design for Res West including the reconfigured wetlands has been included with the MIBA development as part of the post-development scenario.
3b: Modelling Scenarios – Consistent with Res West FMP, three scenarios to be considered: 1, Council model as supplied including roughness values (referred to as the smooth-smooth case) as per Table 3-2 of the Res West FMP, the roughness values in the Council model as supplied. When modelling the developed case for this scenario, as per the Res West FMP the above values will be used together with an n value of 0.06 for constructed wetlands (ref p13 of Res West FMP) 2. Revised roughness case with pre-development roughness altered to reflect no maintenance of the site (conditions circa 2003 as defined by Council for Res West) and post-development roughness matching proposed level of vegetation (referred to as the rough-rough case). For areas currently in a maintained state, the following roughness values will continue to be adopted for the base case pre-development modelling (ref Res West FMP p13): • Dense Vegetation: Depth 0-1.5m “n”=0.09, depth>1.5m “n”=0.18; and • Medium Dense Vegetation “n”=0.10. For the post-development case, for areas to be vegetated as part of the development, the following roughness values will continue to be adopted (ref Res West FMP p13); • Dense Vegetation: Depth 0-1.5m “n”=0.09, depth>1.5m “n”=0.18 (same as pre-development); • Medium Dense Vegetation “n”=0.10 (same as pre-development); • Reeds “n”=0.08; • Wetlands “n”=0.05; and • Parks “n”=0.045.	Post-development case for smooth-smooth scenario included the constructed wetland roughness of “n”=0.06. The revised roughness case includes pre-development conditions circa 2003 adopting the recommended roughness values. Based on the proposed landscaping for the development, the recommended roughness values have been adopted for the rough-rough case. The results for this scenario are presented in Section 3.5.2.

Item	Response and Location in Report
3. Sensitivity Analysis with post development roughness values increased as per conditions of approval for Res West; Parks "n"=0.06 Reeds "n"=0.12	The sensitivity analysis adopted the increased roughness for the parks and reeds with the results presented in Section 3.5.3.
3c - Events to be modelled and Tailwater/Intensity Values The events to be modelled to satisfy the condition of approval and to be consistent with the Res West FMP are detailed below.	Flood modelling has considered a range of events including the following: - 2, 5, 20, 10, 20, 50, and 100 year ARI regional and local events; - PMF; - Climate Change scenarios; and - January 2011 event. The recommended tailwater levels agreed have been adopted for each nominated event.

Case	Events	Tailwater	Rainfall Intensities
Council Model as Supplied			
Regional	2, 10	MHWS- 0.82 mAHD	Standard
	50, 100, 200, 500, PMF	20 Year Storm Surge- 2.14 mAHD	Standard
	100 with climate change	20 Year Storm Surge plus 800 mm sea level rise plus additional 250 mm to allow for increased cyclonic activity- 3.19 mAHD	+20%
	January 2011	Recorded Tide	Pluvios
Revised Roughness			
Regional	100	20 Year Storm Surge- 2.14 mAHD	Standard
	100 with climate change	20 Year Storm Surge plus 800 mm sea level rise plus additional 250 mm to allow for increased cyclonic activity- 3.19 mAHD	+20%
Local	2, 5, 10, 50, 100	MHWS- 0.82 mAHD	Standard
Sensitivity			
Regional	100	20 Year Storm Surge- 2.14 mAHD	Standard
Local	100	MHWS- 0.82 mAHD	Standard

Item	Response and Location in Report
3d – Mapping of Results Propose mapping of results similar to Res West FMP **Case** / **Level** / **Depth** / **Velocity** / **Impact** *Council Model as Supplied* Regional- 2, 10, 50, 100, 200, 500, PMF (pre/post) Regional- 2011 (post) Regional- 100 Year with full climate change (post) *Revised Roughness* Regional- 100 Year (pre/post) Regional- 100 Year with full climate change (post) Local- 2, 5, 10, 50, 100 (pre/post) *Sensitivity* Regional- 100 Year (post) Local- 100 Year (post)	The results of the flood modelling are included in Appendices D to M.
3e- 20 Year Event Will be analysing the 20 year event to determine area of site above 20 year flood level for park contribution purposes. Propose to adopt tailwater level of MHWS (0.82 mAHD) for analysis for local and regional events and to complete analysis using Council model as supplied (ie smooth model). It is proposed that mapping be completed as per 10 year events.	The 20 year flood level for use in defining the park contribution adopted a tailwater level of MHWS + 0.8m (1.62mAHD) as per the meeting minute agreement and rainfall intensities considering climate change to the 2100 horizon (+20%).
3f – Excavation for storage In accordance with approval for Res West, no excavation for compensatory storage will be assumed to occur below the level of the MHWS tide (0.82mAHD).	All compensatory storage volumes have been calculated adopting 0.82mAHD as the minimum level.

Item	Response and Location in Report
Other Business:	
1. Issue of potential for treatment of runoff from MIBA to be achieved either in lot or by wetlands in floodplain. Council noted concern that in lot devices may not be appropriately maintained and that preference for treatment to occur as end of line.	Constructed wetlands have been modelled for the MIBA development.
Agreed position was to model wetlands in place for MIBA.	Flood modelling has demonstrated that the Raff Creek crossing will achieve 100 year ARI trafficability considering climate change conditions to 2100. The access to the Community Multi-use Area will also achieve trafficability greater than the 10 year ARI event considering climate change to 2100.
2. Council noted Raff Creek crossing will need to be trafficable in Q100 (noting the definition of the Q100 is to the 2100 horizon).	
3. Council noted that the connection from MIBA to the small area to be built in the northern part of the site only needs to be Q10 (again to the 2100 horizon).	Results for this scenario were presented in Cardno letter of 30 October 2015.
4. NEBP noted intention to model Res West with new wetland configuration in place for the 100 year event. If the impact of the revised configuration is similar to that obtained previously, then it was agreed that Council would accept the proposed revision to the wetland configuration.	As outlined above, the detailed design for Residential West including the reconfigured wetlands has been included with the MIBA development as part of the post-development scenario.

1.3 Response to Request for Information

Moreton Bay Regional Council's consultants Water Technology carried out an initial review of Version 1 of the Flood Management Plan with subsequent comments included in an Information Request dated 23 August 2016. A copy of the Information Request has been added to Appendix B of this report.

This section of the report addresses each item of the Information Request, and have been updated, if required, to address the additional assessment undertaken as part of this version of the FMP.

1.3.1 Implications of Adopted Floodplain Roughness

It is our understanding that the initial requirement to assess the impacts of the development under higher roughness conditions was to inform Moreton Bay Regional Council, that should MBRC not undertake regular maintenance of both Raff Creek and floodplain areas within the site, the resultant impacts on external properties would not cause an unacceptable impact resulting in actionable damage or nuisance. The higher roughness scenario was not intended to define the developments fill level requirements.

As noted, the majority of the MIBA site's floodplain has been designated as "medium dense vegetation" with a Manning's n = 0.10 for depths>0.2m to n=0.025 for depths>2m. This higher roughness is only applicable should vegetation over the site return to similar conditions to those in 2003 as a result of MBRC (to whom the majority of this land will ultimately be transferred), not continue suitable maintenance practices. While the detailed landscape design for the MIBA open space has not been completed, the landscape design will include the preparation of a vegetation management plan for the floodplain that will ensure floodplain conditions are consistent with the "low grass/grazing" assumptions.

As with other landscape spaces within North East Business Park, an objective of the landscape design will be to not unduly increase Council's maintenance burden above the level expected for the future public asset. The detailed landscape plan and associated vegetation management plan will be prepared and submitted to Council for approval as part of a future operational works application.

1.3.2 Revision to Figure 2 and Appendix A

Figure 2 has been updated to clarify the extent of the compensatory storage areas, borrow area, wetlands and fill. The difference in topography between pre and post-development scenarios is also shown.

Additional plans showing the development layouts and wetland locations for both the MIBA and RWA developments have also been added to Appendix A.

1.3.3 Trafalgar Drive Access Criteria

The detailed design of the Trafalgar Drive Access works will need to satisfy the criteria as set out in Section 3.3.2. This version of the FMP has considered this matter in further detail.

1.3.4 Local Flood Model Details

Further details regarding the local flood modelling have been included in Section 3.4.5.

1.3.5 Critical Event Duration

Verification that the 12 hour event is the critical event duration has been confirmed based on a review of BMT-WBM's report for Council titled *"Regional Floodplain Database: 2014 Model Maintenance Report - Caboolture River (CAB)"* October 2015. Figure 3-1 (Rev A) (included as Appendix N) of the report shows the critical durations for the 1% AEP event and indicates that the 12 hour event is critical across the majority of the site, with only a small area on Raff Creek being identified as being a 24 hour critical event. The BMT-WBM report also indicated that the selection of the 2, 6 and 12 hour storm durations were considered suitable for use across the whole area with the 12 hour being applicable to the "lower catchment" (excluding Beachmere).

This is also consistent with the assessment undertaken for the RWA of the development. It can also be noted that shorter duration events were considered for the local event assessment.

1.3.6 Appendices Titles

Titles for Appendices E, L and M have been corrected as requested.

1.3.7 Key Reporting Point Locations

A new Figure 11 has been included clearly identifying the key reporting point locations.

1.3.8 Offsite Impacts for 2 Year ARI Event

As noted in Section 3.5.2.2 in the Local Flood Model detail, there is a similar localised increase in flood levels upstream of the south-eastern boundary of the site for the regional 2 year ARI flood event. The impacts appear to be partially a result of the 10m model grid not effectively representing the existing drainage channel that enters the site from the south which would provide additional conveyance of local flows past the site. We believe this is due to local topographic effects represented in the model rather than as a result of model changes.

1.3.9 Calibration of WBNM Model and Adopted Losses

A discussion on the WBNM model and adopted losses is included in Section 4.1.

1.3.10 WBNM Catchment Figures

A new Figure 9 of the pre-development WBNM model, at the same scale as the post-development model has been included, in addition to Figure 7 that includes the full catchment extents.

1.3.11 Local Model Results

A review of the local model results indicated a post-processing error was the cause of the reductions in peak water levels within Raff Creek over 1km upstream of the site. This has been rectified with the revised local flood event results included in the current report.

1.3.12 Model Grid Size

The 10m grid is considered suitable for assessment of both the regional and local flood events for the current stage of the application, and is consistent with the RWA assessment as well as the Approved FMP. This version of the FMP has further assessed and considered the design of the Trafalgar Drive access road crossing.

1.3.13 Structures Modelled as Layered Flow Constrictions

Further detail regarding the use of Layered Flow Constrictions to model the structures is included in Section 3.3.2.

1.3.14 Raff Creek Bridge and Culvert Crossing Details

The total span included within the final modelled scenario was actually 35m. A shorter span was tested during the design process and was inadvertently inserted into the final report. A revised drawing showing the actual bridge width as modelled has been included in Appendix C. The detailed design of the bridge is generally similar to the drawings shown in Appendix C.

1.3.15 Model Save Date Files

The TUFLOW model was rerun with the Check MI Save Date == Warning to identify the files that may have potentially revised but not included in the latest model. Of the files identified, all but one were the Council “as supplied” input files which have not been changed by Cardno during the modelling process. The single file added by Cardno with a later save date was checked and verified as the correct version and subsequently the TUFLOW model scenarios run and reported are considered to be current. The list of the files identified is included as Appendix O.

1.3.16 Model Code Boundary

A review of the impact of the model code boundary on PMF events has been detailed in Section 3.5.2.3.

1.4 Response to Additional Information Requirements

This section of the report addresses each item of the Additional Information Request issued by Council on 19 May 2020 (Council ref: DA/7352/2002/XT/11) for the development. Each item of Council's AIR has been reproduced in the following in italics.

Item 1 – The Technical Memorandum dated 27 March 2020 does not have sufficient information in terms of assessing all storm events up to the 0.1% AEP and PMF scenario for both local and regional event, storm surge tailwater boundary and hazard assessment. Provide additional assessment and details to address these events and requirements.

Storm events from the 2 year ARI up to and including the PMF events have been assessed for the regional flood scenario and storm events from the 2 year ARI up to and including the 100 year ARI events have been assessed for the local flood scenario, and reported in this Version 5 FMP. The regional and local storm events carried out as part of this study are similar to that reported in the Approved FMP. Section 3.1 of this report summarises all the storm events carried out as part of the Version 5 FMP update.

Item 2 – Provide a post-development roughness plan.

A post-development roughness plan has been included in this report as Figure 13.

Item 3 – All model re-runs are to include the 2100 climate change scenario and revised roughness. Refer to the September 2016 FMP.

Noted and similar climate change and revised roughness modelling scenarios to that of the Approved FMP have been carried out and reported in this Version 5 FMP. Scenarios carried out as part of this study are discussed in Section 3.1 of this report. Modelling results are discussed in Section 3.5 of this report.

Item 4 – Provide a revised Peak Post-Development Flood Level table.

Peak post-development flood levels in Table 3.2 of this report have been updated with the current modelling results.

Item 5 – In the Technical Memorandum dated 19 August 2019, it is identified that properties in Farry Road and Cobb Road, Burpengary East would be subject to flood depth impact of up to 0.1m. This change in flood impact not acceptable in accordance with the Planning Scheme. Provide revised flood model and report detail to address the flood depth impact and necessary mitigation requirements.

Further changes to the development site have been made to further mitigate flood impacts previously estimated for properties in Farry Road and Cobb Road as part of this study. Additional changes made to the post-development flood model for the development area are discussed in Section 3.2.2.4. Modelling results of the regional events and local events are presented in Appendix E and Appendix L respectively.

Item 6 – Provide details of the typical flood gate type proposed at Trafalgar Drive/NSUA.

The proposed culvert crossings at this location have been amended to RCPs. The changes made and typical type of flood gate proposed are discussed in Section 3.2.2.4 of this report. A copy of the Humes' floodgate system brochure is attached to Appendix O of this report.

Item 7 – Provide further detail of the proposed bulk earthworks near the Buchanan Road interchange and the new Nolan Drive/Trafalgar Drive connection road intersection. This bulk earthwork detail is required to be included in the stormwater model to inform the bulk earthworks Operational Works (DA/39447/2019/V4D). Indicate the batter slope and treatment at this location.

The bulk earthworks design TIN adopted in the post-development scenario flood model is provided by KN Group and remained similar to that adopted in the August 2019 study. Refer to the design drawings by KN Group submitted as part of the development application.

Item 8 – As there are significant modifications to the earthworks and the above items a full amended flood management report is required instead of a memorandum. Submit a fully consolidated amended Flood Management Plan (FMP) for approval.

This Version 5 FMP has been updated and prepared to consolidate all changes made to the development area since the Approved FMP.

2 Site Description

2.1 Existing Conditions

2.1.1 Mixed Industry and Business Area

The MIBA site has a total area of approximately 430ha with existing ground levels ranging from 17mAHD to the east of Nolan Drive in the south west portion of the overall site to <1.0mAHD within the local gully in the north east of the site.

The MIBA site has frontage to the Caboolture River along the northern and eastern property boundaries with Raff Creek forming the southern extents.

The site is predominantly vacant with vegetation consisting principally of medium to long grass with riparian vegetation located along the banks of both the Caboolture River and the historical Raff Creek alignment in the south eastern extents of the site. A cleared area off Nolan Drive was, up to recently, utilised as an earthmoving equipment training facility.

The portion of the MIBA site located on the corner of Nolan Drive and Trafalgar Drive is currently a rural residential lot with scattered trees around the perimeter and within the northern extents of the property.

A natural gully starting at Trafalgar Drive and extending east to the Caboolture River conveys runoff from a local catchment to the west which includes the Bruce Highway/Buchanan Road interchange. Existing cross drainage culverts are located under the interchange on-ramp as well as under Trafalgar Drive.

2.1.2 Residential West

The RWA site has a total area of approximately 107ha with pre-development ground levels ranging from 17.75mAHD along the southwest frontage to Buckley Road to 1.0mAHD along the northern boundary to Raff Creek.

The northern and western extents of the RWA site have frontage to Raff Creek while the eastern extents are located adjacent to an un-named gully/waterway that conveys runoff from an upstream catchment of approximately 185 ha. The confluence of Raff Creek and the un-named waterway is located adjacent to the northeast corner of the RWA site before Raff Creek joins the Caboolture River, approximately 650m further downstream.

The RWA site in its pre-development condition was vacant, with vegetation consisting predominantly of medium to long grass with riparian vegetation located along the banks of the historical Raff Creek alignment in the northern extents of the site.

The site location and local features are shown in Figure 1.

2.2 Proposed Development

2.2.1 Mixed Industry and Business Area

The proposed MIBA development is to consist of an urban commercial/industry of approximately 170ha located along the western boundary and central to the overall site area. A community multi-use area is also proposed in the northern portion of the site together with provision for sporting fields. An Environmental Centre has also been provided adjacent to the Raff Creek road crossing in accordance with Condition 8c of the approval conditions. The balance of the site is to consist of open space, parklands and constructed wetlands.

The designated sports fields to the north of the multi-use area are located on land which is to remain essentially at natural surface levels. Access to the multi-use area will be via both Trafalgar Drive and a new road crossing from the main MIBA development area. The road crossing traverses the proposed constructed drainage channel that replaces the existing natural gully that conveys runoff from the catchment upstream of Trafalgar Drive.

Access to the main MIBA development area from the west is to be via the existing interchange with the Bruce Highway/Buchanan Road/Trafalgar Drive. The access road crossing between Trafalgar Drive and MIBA that

traverses the natural floodway has been represented as a series of pipe culvert system in the flood model and has been sized to result in minimal impact on the flood characteristics upstream.

To compensate for the loss of floodplain storage resulting from filling portions of the development site to obtain suitable flood immunity, a total area of approximately 19.6ha is proposed to be excavated within the northern floodplain to the east of the multi-use area. The compensatory storage area has been nominally excavated to a level of 2.3mAHD and split into two areas to accommodate the future road corridor linking the MIBA site to the suburbs to the north of the Caboolture River.

As part of the current assessment, the proposed road crossing of Raff Creek linking the RWA site to the MIBA site has been included. The road crossing includes multiple culverts and a bridge over Raff Creek to limit the impact on peak flood levels external to the site's boundaries.

The preliminary development layout and major drainage features as adopted in the Approved FMP are shown in Figure 2. It should be noted that the proposed change in use in a portion of the MIBA footprint to residential development has been considered, however the change in use has no material impact on the overall flooding outcomes of this Version 5 FMP since the extent of development footprint for MIBA remained generally consistent with the Approved FMP.

2.2.2 Residential West (including Palm Farm)

RWA is a residential community consisting of over 1,500 lots. The development footprint includes filling adjacent to Raff Creek and the un-named waterway to ensure an acceptable immunity to flood inundation from both the local creeks/waterways and from regional Caboolture River flooding, including storm surge.

It is also proposed to establish constructed wetlands adjacent to Raff Creek and the un-named waterway to the east of the site, to provide the stormwater quality treatment of the runoff generated from the developed portion of the site. Existing wetland areas will be generally retained or reconstructed.

Open space/park areas have also been allocated throughout the RWA site and adjacent to the major creeks/gullies.

As part of the development of the RWA, it was required to also provide compensatory earthworks within the area of land to the east of the un-named waterway that is situated along the RWA's eastern boundary.

3 Flooding Assessment

3.1 Overview

Condition 21(b) of the approval conditions requires the development of the site not to adversely impact on the flooding of properties external to the site. To assess the impact of the development of peak flood levels, Moreton Bay Regional Council requires that *"Council's current hydraulic model is used to assess the impacts of the RWA development."*

Council's supplied model was developed as part of the *Regional Floodplain Database Hydrologic and Hydraulic Modelling Caboolture* of June 2012 prepared by BMT WBM. The model adopted for this assessment is a two-dimensional TUFLOW model which was provided by Council. This version of the model was also updated in 2013 and was adopted for the Residential West Flood Management Plan. Refer to Table 1.1 for history of hydraulic model.

In accordance with the requirements of the condition of approval and agreed meeting minutes, modelling of the site was based on this supplied version of Council's current model. For the investigation, a number of scenarios were considered, as detailed below.

- ***Council model as supplied***

  The model as supplied by Council was used to define flow conditions prior to and with the development of both the RWA and MIBA in place.

  It can be noted that detailed survey of the pre-development RWA, MIBA sites and within Raff Creek was undertaken by Jensen Bowers. This topographic information was included in the pre-development model scenario.

  When the Council model was reviewed, it was noted that the level of vegetation assumed within the site reflected the current situation, with land being maintained in an artificially 'smooth' condition via regular maintenance of the floodplain by North East Business Park (in anticipation of future development occurring).

  If this maintenance were to cease, then vegetation regrowth would occur relatively rapidly, returning the floodplain to conditions equivalent to those in place prior to maintenance commencing. Based on available photographic evidence and verbal advice from long term maintenance staff, a significantly higher level of vegetation would be associated with conditions prior to maintenance commencing.

  As part of the overall development, revegetation works will be completed within the floodplain. As the modelling needs to identify the relative impact of development (and to confirm that the development will not have an unacceptable relative impact) it would not be reasonable to compare results obtained for a developed case including revegetation against a base case that does not include vegetation.

  For this scenario, to assess the relative impact of the development, the floodplain was assumed to have a similar level of vegetation to that adopted for the Council model (with adjustments as noted in Section 3.4.3).

  The Council model as supplied was used to model the following events:

  - 2 year ARI Regional Event, MHWS tailwater boundary (0.82mAHD);
  - 10 year ARI Regional Event, MHWS tailwater boundary (0.82mAHD);
  - 50 year ARI Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD);
  - 100 year ARI Regional Event including Climate Change. This event included provision for a 20% increase in rainfall intensity, an 800mm rise in sea level (relative to the 20 year ARI storm surge level) and an additional 250mm to account for increased cyclonic activity (3.19mAHD);
  - 200 year ARI Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD);
  - 500 year ARI Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD);
  - PMF Regional Event, 20 Year ARI Storm Surge tailwater boundary (2.14mAHD); and

- January 2011 flood event.

In addition, to provide inundation extents to inform the park contribution areas the 20 year ARI event adopted the following characteristics:

- 20 year ARI Regional Event, MHWS tailwater boundary including climate change (increase of 800mm rise in sea level to 1.62mAHD). This event also included provision for a 20% increase in rainfall intensity.

- ***Revised Roughness Case***

  Noting that the level of vegetation assumed in the Council model reflects the floodplain being cleared, a revised roughness case was considered. For this scenario, the Council model of the existing case was modified to reflect a level of vegetation consistent with the site not being maintained. Based on previous discussions with Council for the RWA assessment and a review of available aerial photography, conditions in 2003 were considered to be appropriate for the definition of base case levels.

  As the revised base case included vegetation of the floodplain, the developed case considered the level of revegetation proposed for the development. This scenario allowed the impact of development assuming vegetated conditions for both the current and developed cases.

  Modelling of the revised roughness case considered the 100 year ARI regional event in the Caboolture River, and local flooding in Raff Creek for events with recurrence intervals of 2, 5, 10, 50, and 100 years.

- ***Sensitivity Analysis***

  As agreed during the meeting with Council on 1 September 2015 and in line with the RWA assessment, a sensitivity analysis was undertaken assuming a higher level of vegetation in certain developed parts of the site. The intent of the analysis was to confirm that a higher level of vegetation would not produce unacceptable flood level impacts (greater than 20 mm) external to the site. The base case for comparison purposes was the revised roughness pre-development case.

  For this scenario, only the 100 year ARI regional Caboolture River and local Raff Creek flood events were modelled.

The model used for the analysis is described in the following sections.

3.2 Model Extent and Topography

3.2.1 Pre-development Scenario

The Council supplied TUFLOW model was built with both 5m and 10m computational grid resolutions and incorporates the entire Caboolture River catchment. The 10m grid resolution was deemed suitably refined for the assessment of the development impacts given the extents of both the existing local flooding and also the proposed development fill and excavated flow paths. The coarser grid also enabled a reduction in run times.

The extent of the model is shown in Figure 3.

The topography used in the Council supplied model was based on 2009 Aerial Laser Scanning (ALS) survey data. BMT WBM also incorporated breaklines into this data where required to ensure streams, gullies and road embankments were adequately represented.

The topography across the site and within Raff Creek was updated for the pre-development scenario with detailed survey data undertaken by Jensen Bowers Surveyors for North Harbour Holdings Pty Ltd (previously known as North East Business Park Pty Ltd).

3.2.2 Post-development Scenario

For the post-development scenario, design Digital Elevation Models (DEMs) were developed by KN Group that incorporated the proposed filling, excavation areas and constructed wetland extents.

In addition, modifications to the terrain were incorporated during the modelling iteration process. These modifications included provision of bunds, modelled as ridgelines, transition zones upstream and downstream

of the Raff Creek road crossing, widened drainage channel between MIBA and the community multi-use area, and excavated areas to balance floodplain storage, each modelled as elevation shapes.

Key features of the post-development design as adopted in the Approved FMP are shown in the Figure 2 and include the following:

Mixed Industry and Business Area

- While the majority of the proposed urban footprint is above the regional 100 year ARI peak flood levels, some filling will be required around the perimeter of the central development to ensure lot levels achieve the required flood immunity. Lot levels are to be above the higher of the 100 year ARI peak flood level including the impacts of climate change and the January 2011 flood event levels. The filling will effectively remove the existing overflow between Raff Creek and the Caboolture River that occurred during the larger Caboolture River flood events;
- Earthworks and drainage proposed for the area of the development located to the south of Nolan and Trafalgar Drives will redirect post-development flows from the catchment to the south to now discharge upstream of the new Community Multi-use Area road crossing;
- Constructed wetlands within the main Raff Creek, and within the Caboolture River floodplain around the perimeter of the urban MIBA footprint. The constructed wetlands have been included assuming a minimum standing water level and minimum perimeter bunds at levels nominated in the Stormwater Quality Management Plan prepared by DesignFlow;
- The drainage channel between the main MIBA development footprint and the community multi-use area was widened to a total base width of approximately 60m;
- The Raff Creek road crossing is to incorporate a bank of 25 x 3000mm (W) x 2100mm (H) RCBCs along the northern overbank area of Raff Creek with a minimum invert level of 1.4mAHD (above HAT). Modifications to the topography upstream and downstream of the crossing include transitions areas generally as shown in the KN Group Drawings included in Appendix C. In addition, Raff Creek itself is proposed to be widened marginally to 20m at the base, with the road crossing to incorporate a bridge over two spans totalling 35m including rock spill throughs. The typical bridge design is also included in the KN Group drawings; and
- To compensate for the loss of floodplain storage resulting from filling portions of the MIBA development site to obtain suitable flood immunity, a total area of approximately 19.6ha is proposed to be excavated within the northern floodplain to the east of the multi-use area. The compensatory storage area has been nominally excavated to a level of 2.3mAHD (detailed design including minimum slopes and batters will result in invert levels ranging from approximately 1.6mAHD up to 3.0mAHD) and split into two areas to either side of the future road corridor linking the MIBA site to the suburbs to the north of the Caboolture River and the requirements for sporting fields adjacent to the Community Multi-Use Area.

  The storage areas have been offset from the river overbanks to maintain existing conveyance controls and will therefore require provision of culverts linking the low points to outlets to the Caboolture River to ensure they remain free draining.

  As the peak flood levels across the MIBA site vary by 2 to 3m from upstream to downstream, determining a typical balance stage storage table for the full range of levels is not practical.

  To demonstrate compliance with the intent of maintaining the floodplain storage across the site, the estimated fill volume required to achieve a 100 year ARI flood immunity based on the pre-development peak flood level surface was determined. The total volume of fill required is estimated to be 235,000m^3 using 12D. The estimated flood storage volume added, based on the existing surface levels within the excavated cut areas, was determined within 12D to be 360,000m^3. The excess cut volume of over 120,000m^3 will more than offset the relatively small additional fill required for the road crossings and wetland bunds.

  Detailed balance floodplain storage volumes will be determined at the detailed design stage.

  Where staging is proposed, the excavated storage areas will be required to be constructed prior to filling of the urban footprint.

Residential West Area

- Filling of the area within the central northern portion of the RWA site adjacent to Raff Creek to above the 100 year ARI peak flood levels. Lot levels are to be above the higher of the 100 year ARI peak flood level including the impacts of climate change and the January 2011 flood event levels;
- Filling within the south east corner of the RWA site adjacent to the unnamed waterway;
- Filling along the development footprint extents adjacent to Raff Creek and the unnamed waterway to provide suitable park areas. The majority of park areas have been designed to have immunity for the designated 100 year ARI design flood event;
- Constructed wetlands between the proposed parks, development footprint and the main Raff Creek and unnamed waterway banks. The constructed wetlands have been included assuming a minimum standing water level at HAT (1.36mAHD) and perimeter bunds at a minimum 2.16mAHD;
- Compensatory cut is located adjacent to the banks of the main Raff Creek waterway and also within a borrow area located on the land opposite the eastern extents of the RWA development. The compensatory cut areas have been lowered to as low as 0.0mAHD, however flood storage volumes only account for volumes above the MHWS level of 0.82mAHD; and
- A 955m long bund 300mm high along the southern bank of the small drain to the north of the borrow area to limit additional flows being conveyed through the borrow area.

The detailed design of the borrow area has been undertaken by KN Group with the drawings included in Appendix C. The accumulative flood storage volumes for the Residential West Area were presented in the approved "*Northeast Business Park, Residential West Flood Management Plan*".

As discussed in Section 1.1, additional flood assessments have been carried out since the Approved FMP, to test the likely flood impacts that subsequent changes made to the NEBP development area will have to the surrounding properties. The changes made to the post-development scenario of the flood model adopted in the Approved FMP in the subsequent assessments are discussed in sequence as follow, which include changes made as part of this Version 5 FMP update. The proposed change in use in a portion of the MIBA (i.e. to residential development) has been considered in these studies, however the change in use has no material impact on the overall flooding outcomes of this Version 5 FMP since the extent of the development footprint remained generally consistent with the Approved FMP. Refer to the individual technical memorandum prepared by Cardno for detailed information of each assessment carried out. Changes made to each subsequent technical memorandum are discussed briefly below.

3.2.2.1 Post-Development Scenario – 19 December 2018 Technical Memorandum

Key changes made to the post-development flood model as part of the proposed Works 2 design adopted in this study include:

- The proposed Wetlands 4 & 5 are to be set at an elevation of 1.5mAHD with appropriate battering to existing levels.
- The conveyance cut area is to be lowered by 1 m to allow for additional flow in the south east direction along the edge of the approved development footprint. It is noted that a future access track is proposed across the south east edge of the conveyance cut area to provide access to the future Caboolture River Parkland. The conveyance cut area is to be graded downhill to the north west connecting into the northern drainage channel to avoid the need for a major culvert crossing in this area. The conveyance cut area will not provide a permanent low flow connection between the northern drainage channel and Raff Creek and as such, does not need to be constructed with a typical channel profile.
- Base level grading of the approved compensatory floodplain storage cut area (refer FMP) has also been modelled to ensure it achieves adequate drainage capability. A small drainage outlet has been modelled in the north and south bunding of this wetland to allow free drainage.
- A bund at 4.2mAHD along the southern edge to Wetland 5 has been proposed to reduce the flooding capacity from the Wetland 5 area into the north drainage channel; and

- A number of areas (shaded green) have been reverted back to existing ground levels. Future works may be proposed within these areas at a later stage.

The topographic changes adopted in this study are shown in the following figure.

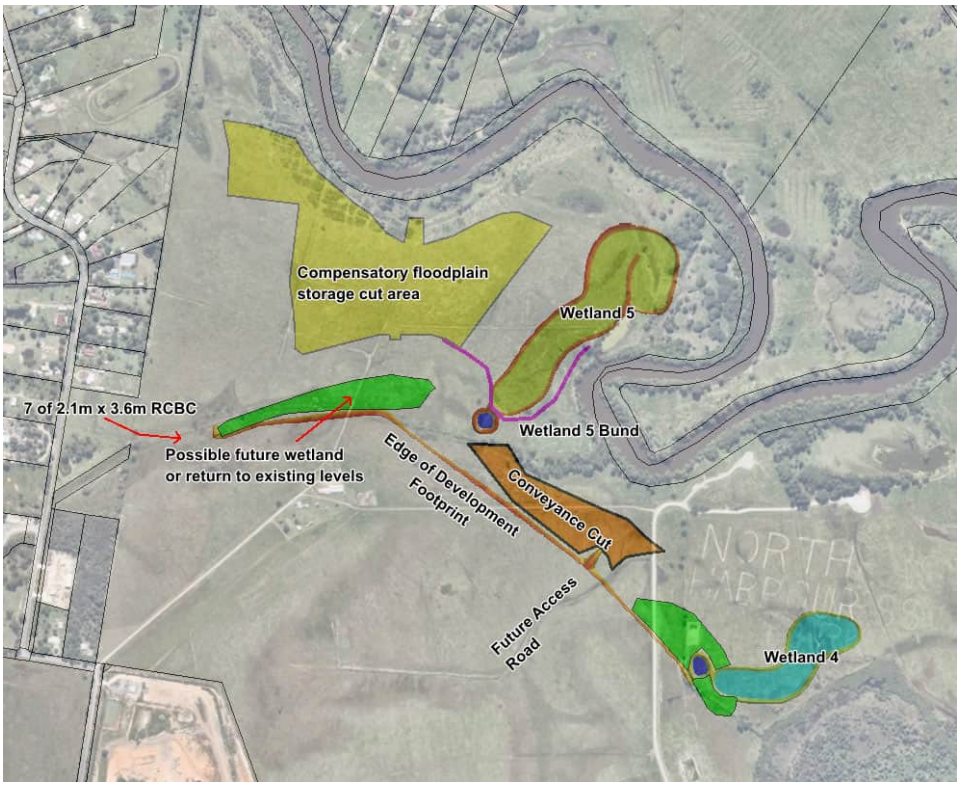


Plate 2 – Adopted Topographic Changes in 19 December 2018 Study

In this study, the development footprint remained similar to that of the Approved FMP. Plate 3 shows the changes in surface elevation to the NEBP development area as part of this study (i.e. when compared to the surface elevation adopted in the Approved FMP).

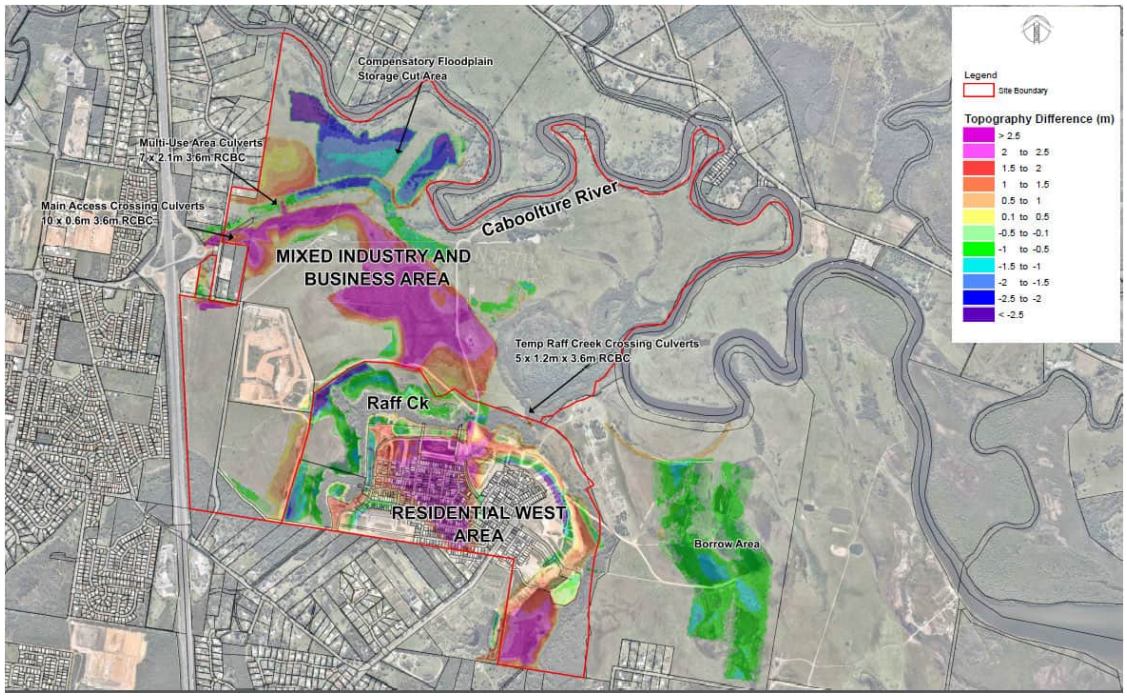


Plate 3 – Surface Elevations Differences Between 19 December 2018 Study and Approved FMP

3.2.2.2 Post-Development Scenario – 19 August 2019 Technical Memorandum

In this study, the post-development scenario flood model adopted in the 19 December 2018 study was updated with a revised surface elevation design of the proposed Works 2 (provided by KN Group) as well as some surface modification features. Key surface elevation features made as part of this study are shown in Plate 4 below, which include:

- Changes to the configuration of Wetland 4 and Wetland 5 from those previously adopted in the December 2018 Technical Memorandum;
- Three bunds at 4.7mAHD along the southern end of the proposed compensatory floodplain storage cut area, west of Wetland 5 (refer to Plate 4 for exact location);
- A bund at 4.5mAHD along the downstream side of Wetland 5 (i.e. east of Wetland 5) has been adopted in the hydraulic model to reduce the amount of upstream flow being discharged directly into the Caboolture River to the east (refer to Plate 4 for exact location of bund);
- Filling of a cut area near the north-east corner of the proposed compensatory floodplain storage cut area to retain the previous shape of this cut area (refer to Plate 4 for exact location); and
- Re-grading of a section of the drainage channel proposed along the southern edge of the proposed compensatory floodplain storage cut area (refer to Plate 4 for exact location) to allow smoother flow along the drainage channel.

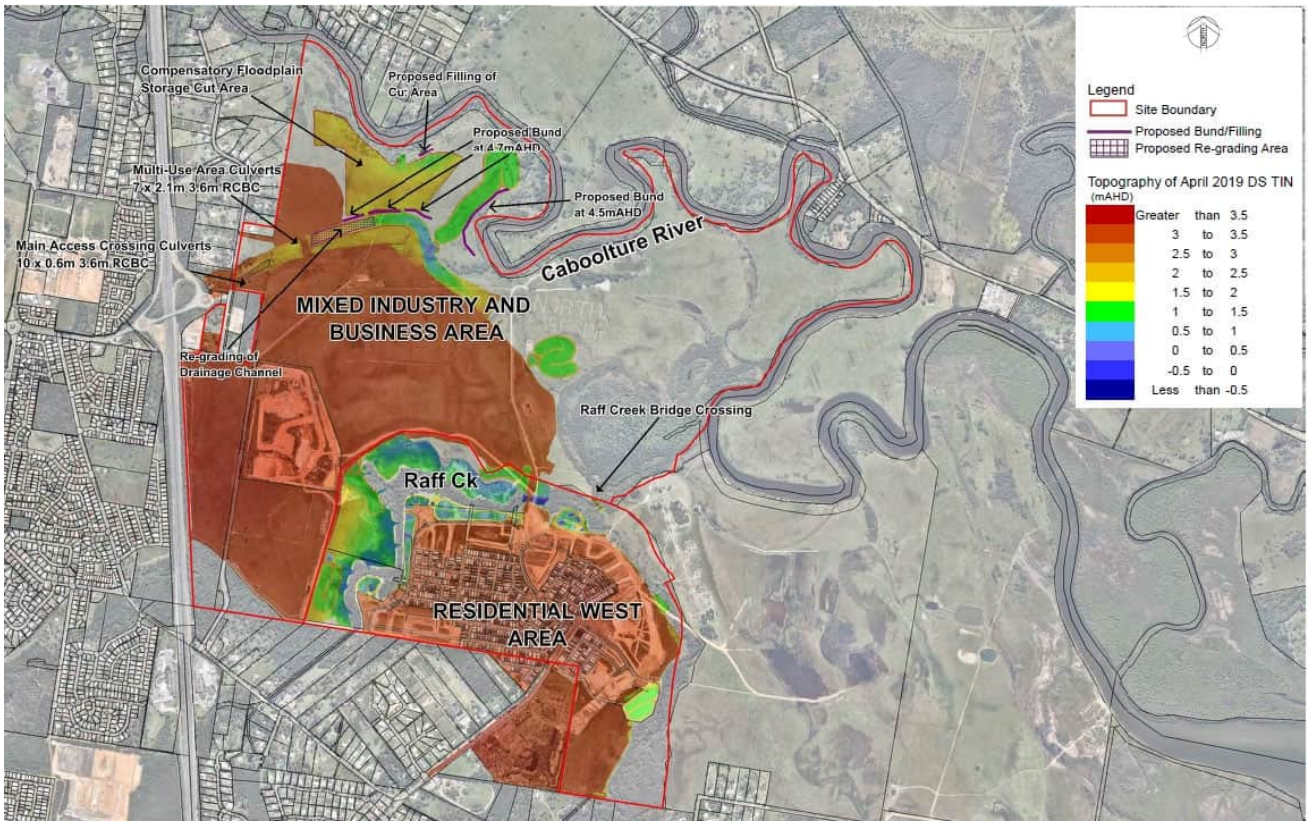


Plate 4 – Key Modifications Made in 19 August 2019 Study

3.2.2.3 Post-Development Scenario – 27 March 2020 Technical Memorandum

The only change made in the post-development scenario flood model (i.e. as adopted in the 19 August 2019 study) as part of this study is the application of flap gates to the two sets of 5 x 3600mm (W) x 600mm (H) RCBCs culvert crossing proposed under the internal road (i.e. north of Lot 13 RP145197 and Lot 2 RP194131) that connects Trafalgar Drive and the MIBA development area. Therefore, no changes were made to the surface elevation of the post-development scenario model adopted in the 19 August 2019 study. It should be noted that this study only assesses the likely flood impacts for the 100 year ARI regional event.

3.2.2.4 Post-Development Scenario – Version 5 FMP

To further mitigate the estimated flood impacts on external properties in Farry Road and Cobb Road, Burpengary East (i.e. as deemed unacceptable by Council in Item 5 of the May 2020 AIR), additional changes to the surface elevation and model features of the post-development scenario flood model adopted in the March 2020 study were made. Further changes made to the post-development flood model as part of this study include:

- The provision of a 40m wide channel that links between the unnamed waterway east of the Residential West Area and the borrow area. The invert level of the 40m wide channel has been set at 1.20mAHD. A 10m wide temporary road that crosses the channel has been modelled with 30m long of this road set at 2.75mAHD, which acts as a causeway to allow additional floodwater to move between the unnamed waterway and borrow area. 7 x 1050mm diameter RCPs were adopted under this temporary road in the 40m wide channel to convey low flow from the unnamed waterway to the borrow area. The upstream and downstream invert levels of these RCPs have been set at 1.20mAHD;
- Approximately 8.9ha of the south-west corner of the borrow area (i.e. area south of the outlet of 40m wide channel on the borrow area) has been cut to 1.17mAHD to provide additional flood storage for the area; and

- The two sets of 5 x 3600mm (W) x 600mm (H) RCBCs culvert crossing proposed under the internal road (i.e. north of Lot 13 RP145197 and Lot 2 RP194131) that connects Trafalgar Drive and the MIBA development area have been updated to two sets of RCPs as part of Version 5 FMP update. Two sets of 22 x 900mm diameter RCPs have been adopted in the post-development scenario flood model as part of this Version 5 FMP update. Similar to the March 2020 study, all these RCPs have been modelled with flap gate applied to each pipe to prevent backflow of floodwater (i.e. 900mm diameter Hume-King floodgate system installed at the downstream end of each RCP). Refer to the Hume's Hume-King floodgate brochure attached in Appendix O for details of the flap gate system.

The above changes made to the post-development scenario flood model as part of this Version 5 FMP update are shown in Figure 12. Note that apart from the changes made discussed in Section 3.2.2.1 to Section 3.2.2.4, all other model features in the post-development scenario remained similar to that adopted in the post-development scenario flood model reported in the Approved FMP.

3.3 Structures

3.3.1 Pre-development Scenario

As part of the original study undertaken for Council, an infrastructure data assessment was undertaken by BMT WBM. The assessment identified all applicable infrastructure data that was needed to be collected for the detailed modelling of the Caboolture River Catchment.

The required hydraulic structure details were supplied by Moreton Bay Regional Council. These structures were represented in the TUFLOW model typically as one-dimensional structures for culverts with two-dimensional flow over these structures. All bridges were represented within the two-dimensional domain of the model with appropriate losses applied.

A review of the modelled areas in the immediate vicinity of the development revealed that culvert structures on the Buchanan Road interchange off ramp and across Trafalgar Drive to the south of the interchange were not included in Council's model resulting in ponding behind these road embankments. Given the proximity to the MIBA site boundaries, these two structures were included in the updated pre-development model assuming the following details:

- Buchanan Road Interchange culvert: 2 x 1800 x 1800 RCBCs (Source: Site inspection measurement); and
- Trafalgar Drive Culvert: 3 x 1200 x 500 RCBCs (Source: Jensen Bowers Survey).

3.3.2 Post-development Scenario

No changes were made to the pre-development bridges or culverts in the post-development scenario. Additional road crossings were included for the Raff Creek crossing between RWA and MIBA, the access to the Community Multi-use Area, the main access road linking MIBA to the Buchanan Road interchange via Trafalgar Drive and temporary road crossing of the 40m wide channel linking the unnamed waterway east of RWA and the borrow area (i.e. as discussed in Section 3.2.2.4). The representation of each crossing within the post-development model is detailed below, with all these structures being included in an operational works application for the initial stage of the North South Urban Arterial Road. It is understood that this application will be lodged with Council at the same time as the submission of this Version 5 FMP for Council consideration.

Raff Creek Crossing

The Raff Creek crossing includes 25 x 3000mm (W) x 2100mm (H) RCBCs with an invert level of 1.4mAHD and a dual span bridge over a widened Raff Creek with a total span of approximately 35m. Both structures were represented in the model with a layered flow constriction polygon.

The bridge deck was modelled with a 20m wide deck at an obvert of 3.7mAHD, a 1.2m deep deck and 1m safety rail. The safety rail was modelled as 100% blocked. The adopted form loss coefficients and overall energy losses were verified using a steady state HEC-RAS model of the immediate Raff Creek reach.

Multi-use Community Area Crossing

The community multi-use area crossing includes 7 x 3600mm (W) x 2100mm (H) RCBCs with an upstream invert level of 2.02mAHD and downstream invert level of 1.93mAHD. The community multi-use area crossing has been represented as 1D component in the flood model.

Main Access Road Crossing

The main access road to the MIBA site from the west is to ultimately link to the Buchanan Road interchange of the Bruce Highway via Trafalgar Drive. The current configuration of this intersection proposes the road traverses a local waterway area that is subject to flood inundation over a width of nearly 170m to depths of 300-400mm. Being situated right on the site boundary limits the area available to provide mitigation to offset any upstream impacts that will ultimately result from the road crossing. Hence, the road crossing has to be designed to provide adequate conveyance capacity to minimise likely upstream impacts.

The road crossing has been represented as 1D component in the flood model and modelled as 2 sets of 22 x 900mm diameter RCPs with a flap gate applied to each pipe to prevent backflow of floodwater. The existing natural surface levels of the area upstream of the road were maintained.

Use of Layered Flow Constrictions for Structures

Some post-development structures detailed above have been represented within the TUFLOW model as Layered Flow Constrictions. The selection of this methodology was a result of the width of the structure components compared to the cell size causing instabilities through the culverts when modelled as one-dimensional structures.

3.4 Hydrology

3.4.1 Inflows

The existing Caboolture River hydrologic model, used to compile inflows for the TUFLOW model, is a Watershed Bounded Network Model (WBNM) model. The sub-catchment delineation and existing model were supplied to BMT WBM by Moreton Bay Regional Council for use in the Caboolture River Flood Model.

Inflows were modelled in TUFLOW covering the entire sub-catchment area. This approach means that flow is added to the model from the lowest topographic point in the catchment. The sub-catchments within the model are shown in Figure 3.

The impact of the development on peak flood levels was assessed for the 2, 10, 50, 100, 200, 500 year ARI 12 hour duration events as well as the PMF.

The finished development lot levels are also required to be above both the 100 year ARI event including the effects of climate change, and the January 2011 flood event. Inflows for the January 2011 event were also provided by BMT WBM. The climate change events include provision for a 20% increase in the design rainfall intensities.

In addition to the regional events detailed above, the regional 20 year ARI 12 hour event with consideration for climate change was assessed to inform the park contribution requirements.

The inflow hydrographs for the Council supplied model were based on the WBNM hydrologic modelling undertaken by BMT WBM. The WBNM model assumed ultimate development conditions of all sub-catchments based on the land uses designated in Council's current planning scheme. The location of the site within the lower reaches of the wider Caboolture catchment would mean development of the site would result in the time to peak of local runoff hydrographs being further removed from the Caboolture River peaks resulting in lower peak flows within the Caboolture River. It was therefore decided to be consistent with the assessment undertaken for the RWA development, in that no changes to the impervious fraction between the pre and post-development scenarios was required.

The inflows remained effectively unchanged between the pre and post-development scenarios with the only change being the proposed redirection of 88% of sub-catchment CAB_44_01614 to upstream of the Community Multi-use Area crossing.

Section 4 of this report details the revisions to the hydrology undertaken for the stormwater quantity assessment and ultimately incorporated in the inflows for the local flood models.

3.4.2 Tailwater Boundaries

The downstream model boundary is at the mouth of the Caboolture River.

The water level adopted for each regional event modelled is as follows:

- 50, 100, 200 and 500 year ARI and PMF regional Caboolture River events– 20 Year Storm Surge of 2.14mAHD;
- 2, 5, and 10 year ARI regional Caboolture River events – Mean High Water Spring Tide Level (0.82mAHD);
- 100 year ARI regional Caboolture River event plus Climate Change – 3.19mAHD made up of the 20 Year Storm Surge of 2.14mAHD plus 800mm sea level rise and an additional 250mm to account for increased cyclone activity;
- 20 Year ARI event for park contribution – MHWS + 800mm equal to 1.62mAHD;
- January 2011 Flood Event – time-varying water level derived from Maritime Safety Queensland (MSQ) representing the tide levels; and
- 2 to 100 year ARI local events – Mean High Water Spring Tide Level (0.82mAHD).

3.4.3 Roughness Coefficients

3.4.3.1 Council Model as Supplied

- ***Pre-Development Scenario***

  Roughness coefficients adopted in the Council-provided TUFLOW model were based on land use mapping. In total, 10 different land uses were defined as detailed in Table 3-1. The respective roughness coefficients are shown in Figure 4. It can be noted that these roughness values were as supplied in the Council model.

Table 3-1 Adopted Roughness Coefficients- Council Model as Supplied

Landuse Type	Manning's 'n' Roughness Coefficient
Roads/Footpaths	0.015
Waterbodies	0.030
Low Grass/Grazing*	Ranging from 0.025 at 2m depth to 0.250 at 0m depth
Crops	0.040
Medium Dense Vegetation*	Ranging from 0.075 up to a depth of 1.5m and 0.150 above 1.5m
Reeds	0.080
Dense Vegetation*	Ranging from 0.090 up to a depth of 1.5m to 0.180 above 1.5m
Urban Block (>2000m^2)	0.300
Buildings	1.000
*Depth varying (linear) Manning's 'n' roughness was applied	

- ***Post-development Scenario***

  For the post-development scenario, roughness coefficients were adjusted from the pre-development scenario to reflect the proposed development land use. Areas affected by the proposed bulk earthworks within the flood inundation extents external to new development areas assumed to be

revegetated to a similar density to that which currently exists. Figure 13 shows the Manning's "n" roughness coefficients adopted in the post-development scenario.

The *Ecological Assessment Report, NEBP – Residential West RoL, 4 June 2014* and *Raff Creek Restoration Concept Plan, NEBP – Residential Area, 4 June 2014* prepared by Cardno to support the Residential West application, acknowledged that increased vegetation densities may ultimately occur across the Raff Creek waterway over time, should maintenance within the creek corridor not be continued. While the *Raff Creek Restoration Concept Plan* has been updated by JWA (November 2015), the vegetation densities remain unchanged. This will naturally increase the Manning's "n" roughness coefficients currently adopted within the post-development scenario. However, similar increased vegetation densities would also be expected to occur over the existing site without maintenance. To provide a consistent basis for the comparison of existing and developed cases, the increase in vegetation density that would result should the creek corridor not be maintained, was not included in either the existing or developed cases. For this scenario, the revised roughness case (below) is relevant.

3.4.3.2 Revised Roughness Case

- ***Pre-Development Scenario***

  For this scenario, conditions circa 2003 were assumed. Based on aerial photography and the verbal advice received from maintenance staff, the following vegetation values were adopted:

  - Dense Vegetation: Depth 0-1.5m "n" = 0.09, depth >1.5m "n"=0.18; and
  - Medium Dense Vegetation "n"=0.10.

  The extent of each type of vegetation is shown on Figure 5. It can be noted that it is considered that the level of vegetation assumed for the pre-development scenario conservatively underestimates the likely actual roughness level.

- ***Post-Development Scenario***

  For the post-development scenario, the level of roughness was adjusted to reflect conditions following revegetation works within Raff Creek.

  The adopted values for the post-development case were as follows:

  - Dense Vegetation: Depth 0-1.5m "n" = 0.09, depth >1.5m "n"=0.18 (same as pre-development);
  - Medium Dense Vegetation "n"=0.10 (same as pre-development);
  - Reeds "n"=0.08;
  - Wetlands "n"=0.06; and
  - Parks "n"=0.045.

  The extent of each type of vegetation is shown on Figure 6.

3.4.3.3 Sensitivity Analysis

For the sensitivity analysis, the roughness values adopted for the park and reeds areas were adjusted as follows for the post-development case:

- Reeds "n" from 0.08 to 0.12; and
- Parks "n" from 0.045 to 0.06.

The extent of each type of vegetation was unchanged from the revised roughness post development case as shown on Figure 6.

3.4.4 Time Step and Simulation Details

The time step adopted for the 1D and 2D analyses was 1.0 and 2.0 seconds respectively.

3.4.5 Local Flood Model

To assess the impact of the development on localised flood events within Raff Creek and the smaller waterways impacted by the site, a local TUFLOW Model was utilised. The local flood model does not include any regional flows for the Caboolture River. The extent of the local TUFLOW model is shown in Figure 10.

The local flood event assessment compared pre-development and post-development scenarios considering the revised roughness values for both scenarios.

Inflows to the model were limited to the sub-catchments of Raff Creek and areas potentially impacted by the site. The sub-catchments were those from the local WBNM models detailed in Section 4. For all the local event ARIs a Mean High Water Springs tailwater level boundary condition equal to 0.82mAHD was applied at the mouth of the Caboolture River.

3.5 Model Results

3.5.1 Council Model as Supplied

3.5.1.1 Flood Mapping

Mapping was completed with respect to the following:

- flood levels (pre-development and post-development);
- flood depths (pre-development and post-development);
- flood velocities (pre-development and post-development);
- bed shear stress (post-development);
- stream power (post-development); and
- flood hazard (post-development).

It can be noted that the shear stress and stream power mappings have been included for the sake of completeness. Shear stress and stream power were mapped (and included in other reports) as part of the application to confirm that excessive scour would not occur in the wetlands provided for the treatment of stormwater runoff. Flood hazard mapping has been included to show areas with potential flood hazard based on the Moreton Bay Regional Council's flood hazard classification. The Moreton Bay Regional Council's flood hazard classification criteria is summarised as follow.

- H1 – Hydraulically suitable for parked or moving cars;
- H2 – Hydraulically suitable for parked or moving heavy vehicles and wading by able-bodied adults;
- H3 – Hydraulically suitable for light construction (e.g. Timber frame and brick veneer);
- H4 – Hydraulically suitable for heavy construction (e.g. steel frame and reinforced concrete); and
- H5 – Generally unsuitable.

The results of the modelling are provided in the following appendices.

- ***Regional Flood Modelling, Pre-Development Case***

  The results obtained from the regional modelling of the Caboolture River for the pre-development case are provided in **Appendix D**, as follow. The mappings of the pre-development scenario remained similar to those reported in the Approved FMP.

  Pre-Development Water Surface Levels
  - Figure D.1.1 Pre-Development Water Surface Levels - CD11- 2 Year ARI Event
  - Figure D.1.2 Pre-Development Water Surface Levels - CD11- 10 Year ARI Event
  - Figure D.1.3 Pre-Development Water Surface Levels - CD11- 50 Year ARI Event
  - Figure D.1.4 Pre-Development Water Surface Levels - CD11- 100 Year ARI Event
  - Figure D.1.5 Pre-Development Water Surface Levels - CD11- 200 Year ARI Event
  - Figure D.1.6 Pre-Development Water Surface Levels - CD11- 500 Year ARI Event
  - Figure D.1.7 Pre-Development Water Surface Levels - CD11- PMF Event

Pre-Development Flooding Depths

- Figure D.2.1 Pre-Development Flooding Depths - CD11- 2 Year ARI Event
- Figure D.2.2 Pre-Development Flooding Depths – CD11- 10 Year ARI Event
- Figure D.2.3 Pre-Development Flooding Depths – CD11- 50 Year ARI Event
- Figure D.2.4 Pre-Development Flooding Depths – CD11- 100 Year ARI Event
- Figure D.2.5 Pre-Development Flooding Depths – CD11- 200 Year ARI Event
- Figure D.2.6 Pre-Development Flooding Depths – CD11- 500 Year ARI Event
- Figure D.2.7 Pre-Development Flooding Depths – CD11- PMF Event

Pre-Development Velocities

- Figure D.3.1 Pre-Development Velocities - CD11- 2 Year ARI Event
- Figure D.3.2 Pre-Development Velocities – CD11- 10 Year ARI Event
- Figure D.3.3 Pre-Development Velocities – CD11- 50 Year ARI Event
- Figure D.3.4 Pre-Development Velocities – CD11- 100 Year ARI Event
- Figure D.3.5 Pre-Development Velocities – CD11- 200 Year ARI Event
- Figure D.3.6 Pre-Development Velocities – CD11- 500 Year ARI Event
- Figure D.3.7 Pre-Development Velocities – CD11- PMF Event

- ***Regional Flood Modelling, Post-Development Case***

  The results obtained from the regional modelling of the Caboolture River for the post-development case are provided in **Appendix E**, as follow.

  Post-Development Water Surface Levels

  - Figure E.1.1 Post-Development Water Surface Levels - R169 - 2 Year ARI Event
  - Figure E.1.2 Post -Development Water Surface Levels- R169 - 10 Year ARI Event
  - Figure E.1.3 Post -Development Water Surface Levels- R169 - 50 Year ARI Event
  - Figure E.1.4 Post -Development Water Surface Levels- R169 - 100 Year ARI Event
  - Figure E.1.5 Post -Development Water Surface Levels- R169 - 200 Year ARI Event
  - Figure E.1.6 Post -Development Water Surface Levels- R169 - 500 Year ARI Event
  - Figure E.1.7 Post -Development Water Surface Levels- R169 - PMF Event

  Post-Development Flooding Depths

  - Figure E.2.1 Post -Development Flooding Depths - R169 - 2 Year ARI Event
  - Figure E.2.2 Post -Development Flooding Depths – R169 - 10 Year ARI Event
  - Figure E.2.3 Post -Development Flooding Depths – R169 - 50 Year ARI Event
  - Figure E.2.4 Post -Development Flooding Depths – R169 - 100 Year ARI Event
  - Figure E.2.5 Post -Development Flooding Depths – R169 - 200 Year ARI Event
  - Figure E.2.6 Post -Development Flooding Depths – R169 - 500 Year ARI Event
  - Figure E.2.7 Post -Development Flooding Depths – R169 - PMF Event

  Post-Development Velocities

  - Figure E.3.1 Post-Development Velocities - R169 - 2 Year ARI Event
  - Figure E.3.2 Post -Development Velocities – R169 - 10 Year ARI Event
  - Figure E.3.3 Post -Development Velocities – R169 - 50 Year ARI Event
  - Figure E.3.4 Post -Development Velocities – R169 - 100 Year ARI Event
  - Figure E.3.5 Post -Development Velocities – R169 - 200 Year ARI Event
  - Figure E.3.6 Post -Development Velocities – R169 - 500 Year ARI Event
  - Figure E.3.7 Post -Development Velocities – R169 - PMF Event

Bed Shear Stress

- Figure E.4.1 Post-Development Bed Shear Stress – R169 – 2 Year ARI Event
- Figure E.4.2 Post-Development Bed Shear Stress – R169 – 10 Year ARI Event
- Figure E.4.3 Post-Development Bed Shear Stress – R169 – 50 Year ARI Event
- Figure E.4.4 Post-Development Bed Shear Stress – R169 – 100 Year ARI Event

Stream Power

- Figure E.5.1 Post-Development Stream Power – R169 – 2 Year ARI Event
- Figure E.5.2 Post-Development Stream Power – R169 – 10 Year ARI Event
- Figure E.5.3 Post-Development Stream Power – R169 – 50 Year ARI Event
- Figure E.5.4 Post-Development Stream Power – R169 – 100 Year ARI Event

Impact Plots

- Figure E.6.1 Water Surface Level Impacts – CD11 and R169 – 2 Year ARI Event
- Figure E.6.2 Water Surface Level Impacts – CD11 and R169 – 10 Year ARI Event
- Figure E.6.3 Water Surface Level Impacts – CD11 and R169 – 50 Year ARI Event
- Figure E.6.4 Water Surface Level Impacts – CD11 and R169 – 100 Year ARI Event
- Figure E.6.5 Water Surface Level Impacts – CD11 and R169 – 200 Year ARI Event
- Figure E.6.6 Water Surface Level Impacts – CD11 and R169 – 500 Year ARI Event
- Figure E.6.7 Velocity Impacts – CD11 and R169 – 100 Year ARI Event

Flood Hazard

- Figure E.7.1 Post-Development Flood Hazard – R169 – 2 Year ARI Event
- Figure E.7.2 Post-Development Flood Hazard – R169 – 10 Year ARI Event
- Figure E.7.3 Post-Development Flood Hazard – R169 – 50 Year ARI Event
- Figure E.7.4 Post-Development Flood Hazard – R169 – 100 Year ARI Event

- ***Regional Flood Modelling, Climate Change***

  The results obtained from the regional modelling of the Caboolture River with consideration of climate change for the pre-development and post-development cases are provided in **Appendix F**.

  - Figure F.1.1 Pre-Development Water Surface Levels - CD11 - Climate Change 100 Year ARI Event
  - Figure F.2.1 Post -Development Water Surface Levels - R169 - Climate Change 100 Year ARI Event
  - Figure F.3.1 Post -Development Water Surface Levels - R169 - Climate Change 20 Year ARI Event

- ***Regional Flood Modelling, January 2011 Event***

  The results obtained from modelling the January 2011 event for the post-development scenario are provided in **Appendix G**. Figure G.1 shows the water surface levels calculated for the January 2011 event based on the Council model of the region.

3.5.1.2 Council Model as Supplied - Commentary

Peak 100 year ARI flood levels for the MIBA portion of the development range from approximately 6.0mAHD at the upstream boundary within the Caboolture River to 3.20mAHD adjacent to the proposed Raff Creek crossing. Within the existing gully in the north of the site between Trafalgar Drive and the Caboolture River the peak 100 year ARI flood level starts at approximately 4.45mAHD at the western boundary of the site. Flood inundation of a large portion of the site results from the Caboolture River breaking its banks resulting in overflow through the site in a general north-west to south-east direction.

The modelling also shows that the Caboolture River currently overflows through the MIBA property to the north of the Residential West precinct to Raff Creek in the 100 year ARI event.

The detailed flood modelling within the RWA area of the development indicates that the existing 100 year ARI inundation extents are generally confined to creeks and natural waterways and generally only encroaches into the proposed RWA development footprint within the central northern area of the RWA site that was the historical alignment of Raff Creek and in the south-east corner adjacent to the unnamed waterway.

The existing peak 100 year ARI flood levels within Raff Creek range from 3.29mAHD in the south-west corner down to 3.21mAHD at the confluence of Raff Creek and the unnamed waterway.

The bulk earthworks and mitigation measures proposed for the development have been demonstrated to not result in any significant adverse impacts external to the site that would be considered to be an actionable nuisance. Increase in flood level as high as approximately 37mm is estimated over a small area to the east of the Caboolture River (i.e. near the middle of MIBA northern boundary) in an area that is rural in nature and is currently inundated to depths of over 1.0m in the 100 year ARI event. Afflux is also estimated at this location in the 50 year ARI event. This area is considered to be part of the floodplain of Caboolture River. Reduction in flood level is estimated at this location for the 10 year and 2 year ARI events. The significant compensatory earthworks within the northern floodplain results in a reduction upstream of the site within the Caboolture River of 35mm and up to 800mm over the storage area itself.

Increase in flood level as high as 27mm is estimated in Raff Creek immediately upstream of the RWA for the 100 year and 50 year ARI events. The afflux area is estimated to be within the existing Raff Creek corridor. Afflux as high as 23mm is also estimated on area south of Farry Road near the borrow area in the 50 year ARI event. This afflux area is currently zoned as being rural and agricultural, and is considered to be part of the Caboolture River floodplain. Future development potential of this area is considered to be limited. Given the modelling results show that afflux only estimated for the 50 year ARI event on this area and that the development has improved the flood immunity of this area for the smaller 2 year and 10 year ARI events, the afflux is considered to be acceptable and will not result in adverse impacts to the surrounding properties.

Impacts during the smaller events are generally confined to the North East Business Park property boundary with a small increase of up to 36mm also occurring on the property to the east of the RWA which is part of the broader North Harbour development. Impacts (i.e. as high as 83mm) upstream of the RWA's south-eastern boundary for the 2 year ARI event remained similar to that reported in the Approved FMP and are attributed to modelling anomaly due to local topographic effects.

Increase in flood level as high as 40mm over a small area immediately east of Caboolture River (i.e. near the mid-northern of MIBA boundary) is also estimated for the 100 year ARI and 50 year ARI events. This estimated afflux area is currently zoned as rural with limited development potential and is considered to be part of the Caboolture River floodplain. Based on this and given that the estimated flood depth in the 50 year ARI event is in excess of 1m, the estimated afflux is therefore considered to not result in any material adverse impacts.

The allocation of park areas based on the modelling results will ensure that Council's conditions to have at least 50% of the park area with 100 year ARI immunity with the balance above the 20 year ARI level will be satisfied. It can be noted that the designated sports fields to the north of the multi-use area have an immunity up to the 20 year ARI regional event.

A review of the velocity results through the proposed constructed wetlands indicated that peak velocities are less than 0.8m/s during the 100 year ARI event, which should minimise the potential for damage to vegetation within each wetland. Throughout the balance of the site the velocities are generally less than 1m/s. There are some isolated areas around the edges of the storage area and over the wetland bunds where velocities are above 2.5m/s. Consideration to providing erosion protection measures in these areas is recommended to limit potential scour.

Maximum flow velocity in the 7 x 1050mm diameter RCPs under the temporary access road at the proposed 40m wide channel is estimated to be in excess of 2m/s during the 10 year and 100 year ARI events. Hence, appropriate scouring protection should be provided, especially at the downstream of the culvert crossing to limit potential scour.

A review of the modelling results indicated that the estimated flood hazard remained consistent with those reported in the two previous studies (i.e. 2018 technical memorandum and 2019 technical memorandum).

Peak post-development flood levels were extracted at the selected locations throughout the site as shown in Figure 11 for the 100 year ARI event with impacts of climate change and the January 2011 event to assist in defining the minimum lot levels.

The resultant peak flood levels are included in Table 3-2 below.

Table 3-2 Peak Post-development Flood Levels (mAHD)

Node	General Location	100 Year ARI plus Climate Change (R169)	January 2011 Event	Minimum Lot Levels including 300mm freeboard (mAHD)
H97	North Multi-Use Area	5.563	5.580	5.880
H112	East Multi-Use Area	4.574	4.389	4.874
H99	Upstream Multi-Use Crossing	4.584	4.376	4.884
H102	Trafalgar Drive	4.584	4.374	4.884
H114	Downstream Drainage Channel	4.520	4.301	4.820
H128	MIBA East	3.967	3.811	4.267
H117	MIBA South East	3.726	3.371	4.026
H27	Downstream Raff Creek Crossing	3.686	3.232	3.986
H4	Upstream Boundary of Site Raff Creek	3.705	3.236	4.005
H14	Raff Creek	3.696	3.230	3.996
H16	Raff Creek	3.693	3.229	3.993
H23	Upstream Raff Creek Crossing	3.691	3.228	3.991
H38	East RWA Un-named Waterway	3.650	3.216	3.950
H39	East RWA Un-named Waterway	3.598	3.211	3.898
H43	South east RWA Un-named Waterway	3.560	3.399	3.860

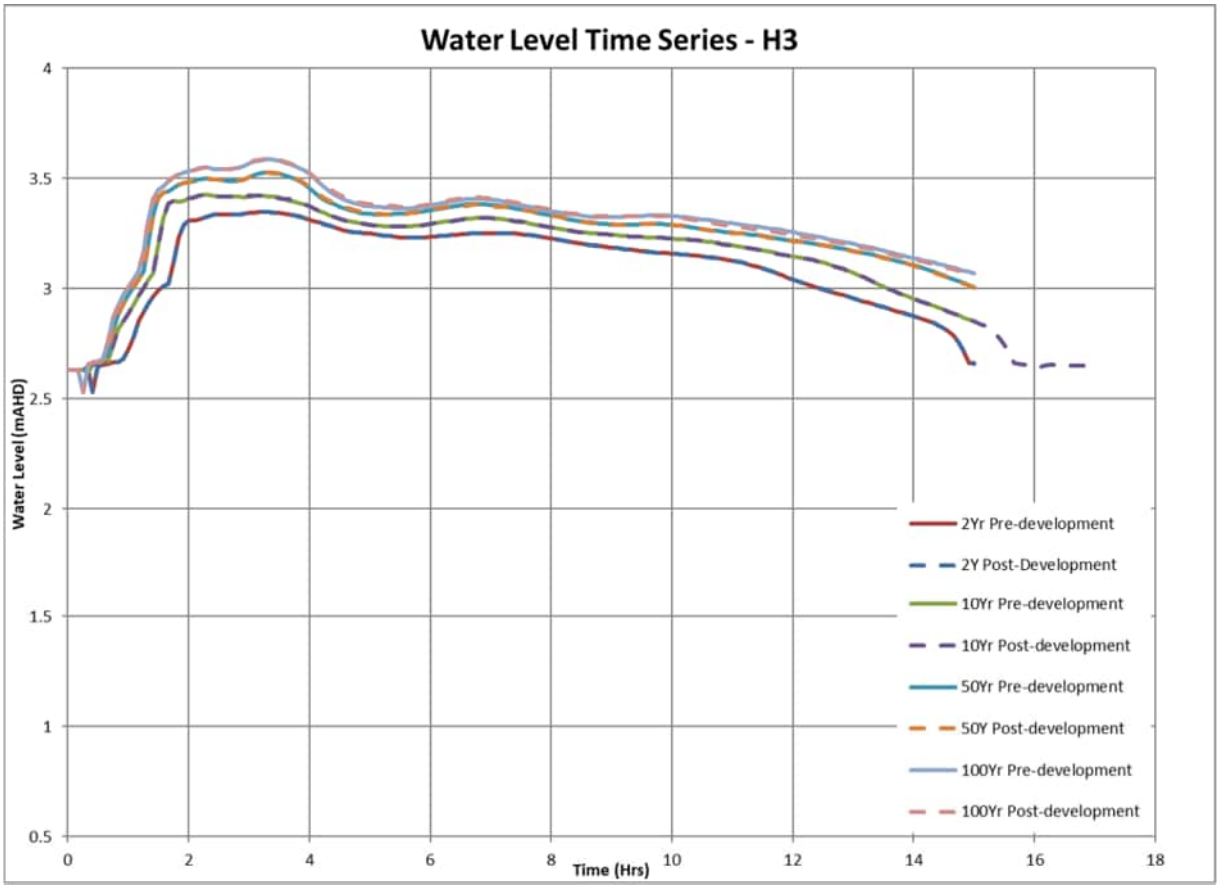
Minimum development lot levels will need to be above the maximum flood level envelope produced by the climate change and January 2011 events plus allowance for 300mm freeboard. In this respect the 100 year ARI plus climate change produces higher peak flood levels than the January 2011 across the entire site. The respective minimum lot levels are also nominated in the above table.

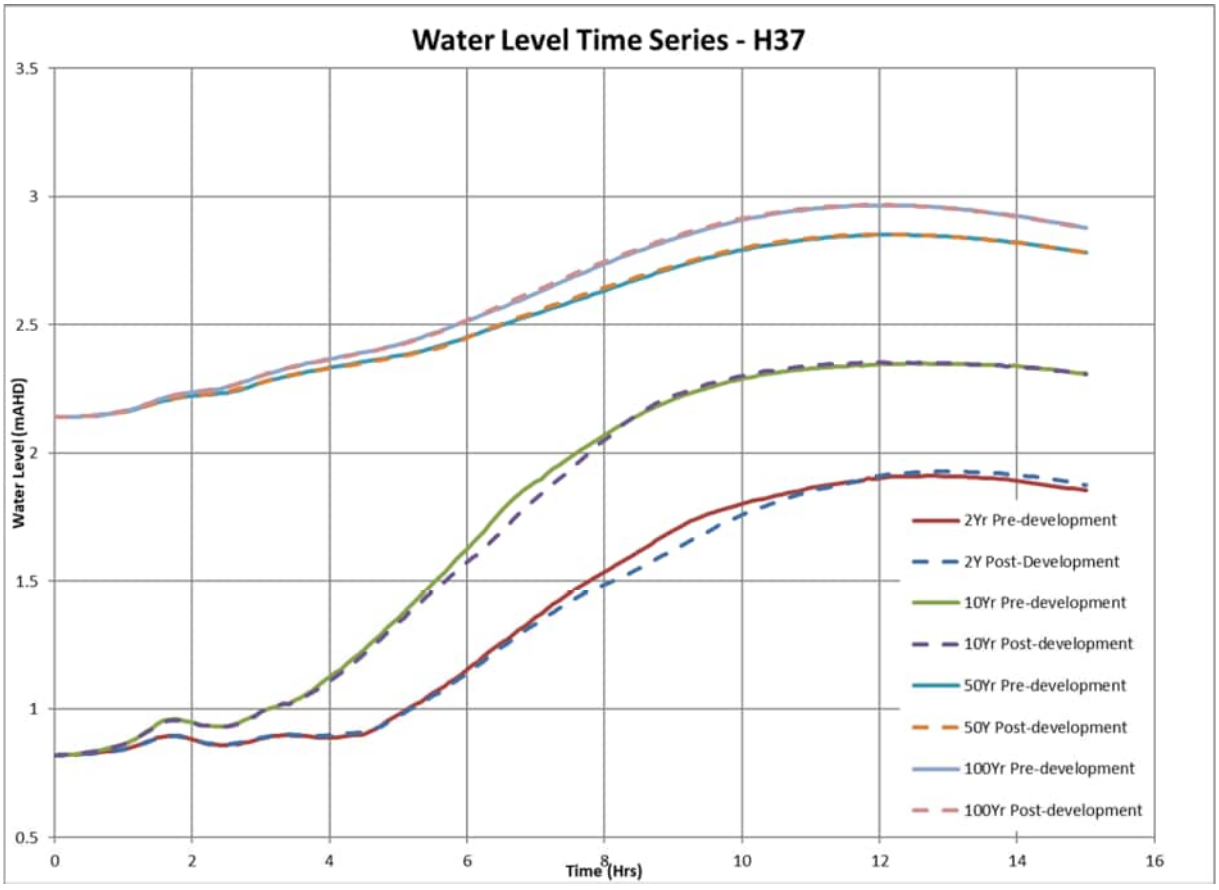
At the Raff Creek road crossing, the estimated peak 100 year ARI plus climate change event level for the post-development scenario is 3.69mAHD. The minimum road level is currently set at approximately 3.47mAHD (i.e. near the southern end of the crossing) therefore the road will be inundated by approximately 220mm of floodwater flood free during this event. The depth x velocity (flood hazard) over this portion of the road for this event is estimated to be less than 0.10m^2/s. As the estimated flood depth is less than 250mm and estimated flood hazard less than 0.40m^2/s, the road is therefore considered to be trafficable in this event. As such, the flood immunity requirements agreed upon with Council in the September 2015 meeting of being trafficable in this event have been satisfied.

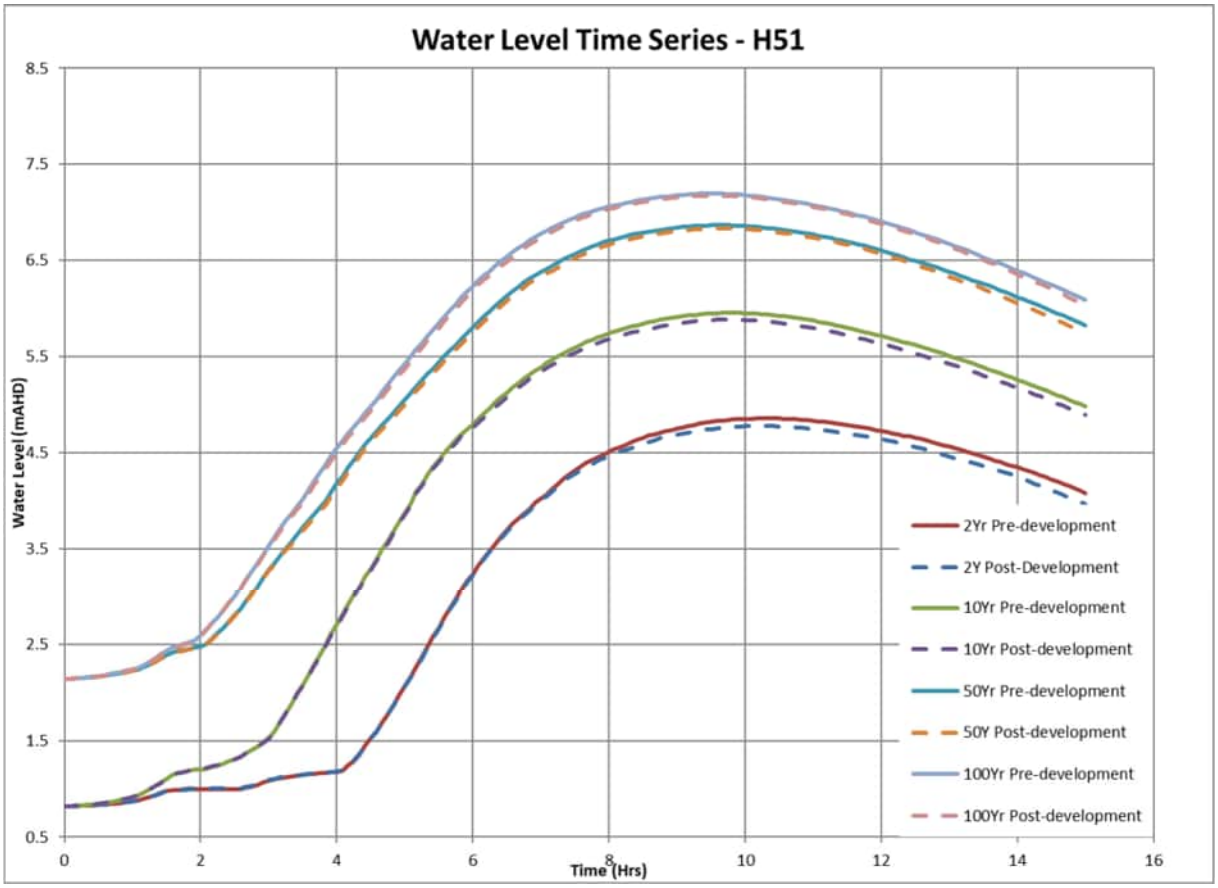
3.5.1.3 Council Model as Supplied - Hydrograph Timing

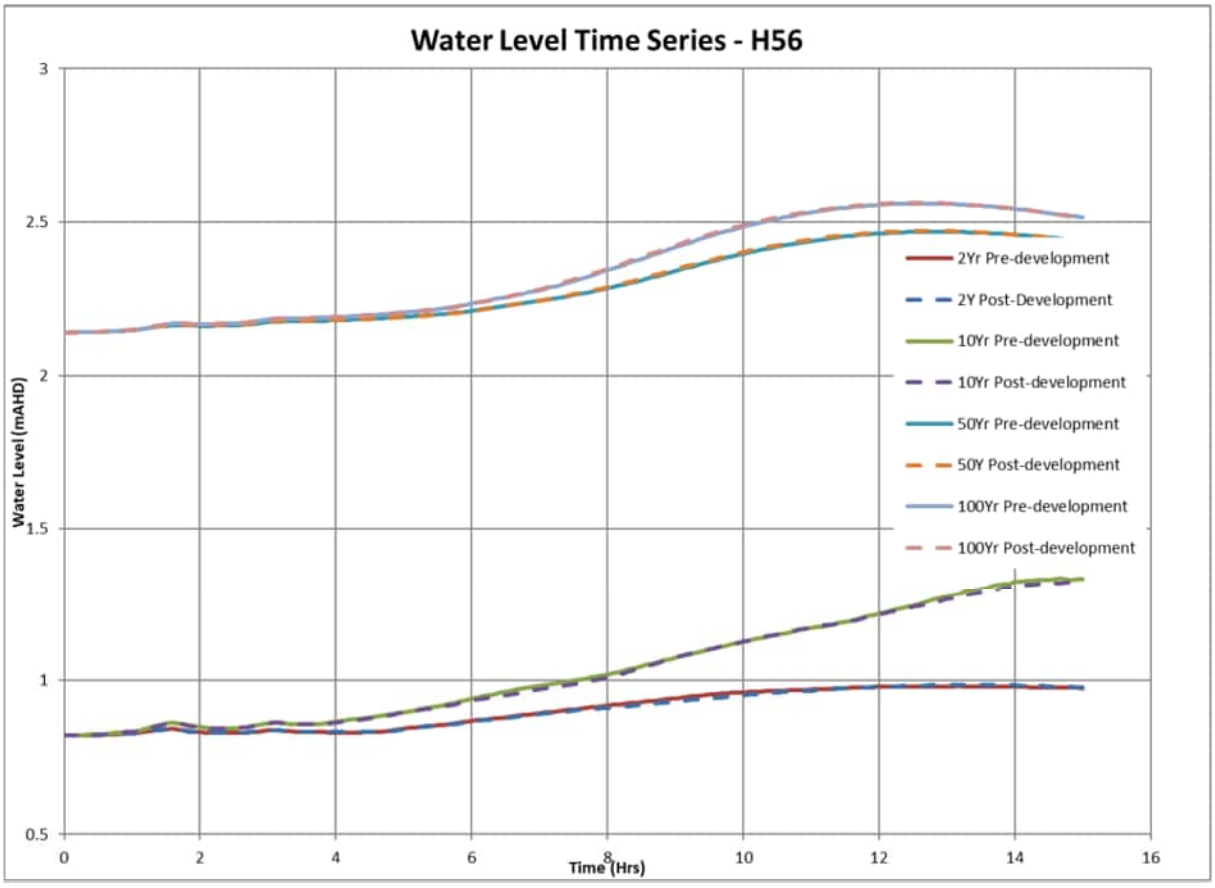
To confirm that development will not have an adverse impact on flood levels, time-series hydrographs were extracted at selected locations as shown in Figure 11.

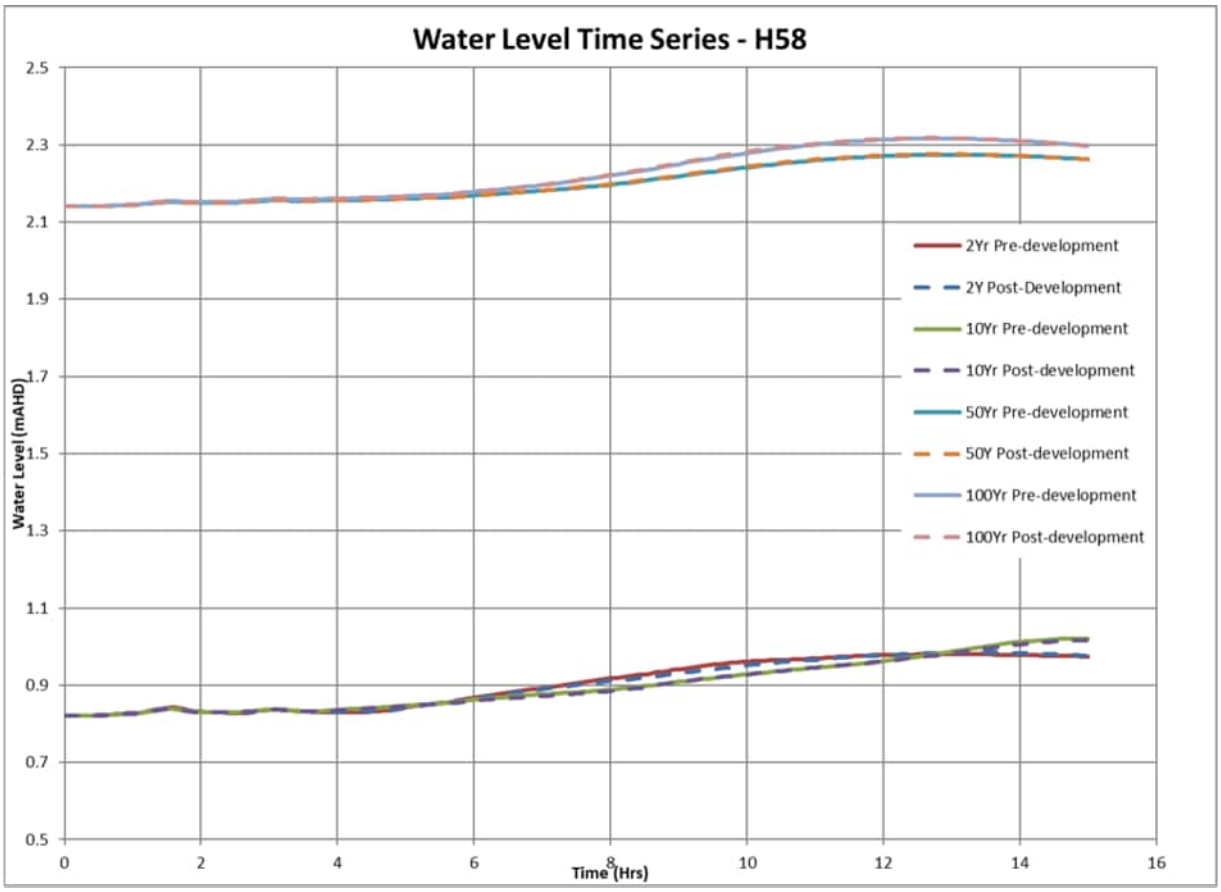
The following plots present the time histories at a number of key points in the region surrounding the site.


Water Level Time Series - H3
Water Level (mAHD)
Time (Hrs)
2Yr Pre-development
2Y Post-Development
10Yr Pre-development
10Yr Post-development
50Yr Pre-development
50Y Post-development
100Yr Pre-development
100Yr Post-development


Water Level Time Series - H37
Water Level (mAHD)
Time (Hrs)
2Yr Pre-development
2Y Post-Development
10Yr Pre-development
10Yr Post-development
50Yr Pre-development
50Y Post-development
100Yr Pre-development
100Yr Post-development


Water Level Time Series - H51
Water Level (mAHD)
Time (Hrs)
2Yr Pre-development
2Y Post-Development
10Yr Pre-development
10Yr Post-development
50Yr Pre-development
50Y Post-development
100Yr Pre-development
100Yr Post-development


Water Level Time Series - H56
Water Level (mAHD)
Time (Hrs)
2Yr Pre-development
2Y Post-Development
10Yr Pre-development
10Yr Post-development
50Yr Pre-development
50Y Post-development
100Yr Pre-development
100Yr Post-development



With reference to the water level hydrographs, it is observed that the development will not significantly impact on the rising limb of the hydrograph. It is therefore considered that the warning and evacuation time available in the event of a major flood will not be noticeably reduced or changed compared to current conditions.

3.5.2 Revised Roughness Scenario

3.5.2.1 Flood Mapping

For the revised roughness scenario, mapping was completed with respect to the following:

- flood levels (pre and post development); and
- flood depths (pre and post development).

Mapping of velocities was not included as the velocities for this case will be less than those associated with the Council model as supplied. Similarly, shear stress and stream power will be less for this case.

The results of the modelling are provided in the following appendices.

- ***Regional Flood Modelling, Pre-Development Case***

  The results obtained from the regional modelling of the Caboolture River for the pre-development case are provided in **Appendix H**, as follow and remained similar to that reported in the Approved FMP.

  - Figure H.1.1 Revised Roughness Pre-Development Regional Flood Water Surface Levels – CD11R – 100 Year ARI Event
  - Figure H.2.1 Revised Roughness Pre-Development Regional Flood Water Depth – CD11R – 100 Year ARI Event

- ***Regional Flood Modelling, Post-Development Case***

  The results obtained from the regional modelling of the Caboolture River for the post-development case are provided in **Appendix I**, as follow.

  - Figure I.1 Revised Roughness Post-Development Regional Flood Water Surface Levels – R169R – 100 Year ARI Event
  - Figure I.2 Revised Roughness Post-Development Regional Flood Water Depth – R169R – 100 Year ARI Event
  - Figure I.3 Revised Roughness Post-Development Regional Flood Impacts – R169R – 100 Year ARI Event
  - Figure I.4 Revised Roughness Post-Development Regional Flood Water Surface Levels – R169R – PMF Event

- ***Local Flood Modelling, Pre-Development Case***

  The results obtained from the local modelling for the pre-development case are provided in **Appendix J**, as follow and remained similar to that reported in the Approved FMP.

  - Figure J.1.1 Revised Roughness Pre-Development Local Flood Water Surface Levels – L130 – 2 Year ARI Event
  - Figure J.1.2 Revised Roughness Pre-Development Local Flood Water Surface Levels – L130 – 5 Year ARI Event
  - Figure J.1.3 Revised Roughness Pre-Development Local Flood Water Surface Levels – L130 – 10 Year ARI Event
  - Figure J.1.4 Revised Roughness Pre-Development Local Flood Water Surface Levels – L130 – 50 Year ARI Event
  - Figure J.1.5 Revised Roughness Pre-Development Local Flood Water Surface Levels – L130 – 100 Year ARI Event
  - Figure J.2.1 Revised Roughness Pre-Development Local Flooding Depths – L130 – 2 Year ARI Event
  - Figure J.2.2 Revised Roughness Pre-Development Local Flooding Depths – L130 – 5 Year ARI Event
  - Figure J.2.3 Revised Roughness Pre-Development Local Flooding Depths – L130 – 10 Year ARI Event
  - Figure J.2.4 Revised Roughness Pre-Development Local Flooding Depths – L130 – 50 Year ARI Event
  - Figure J.2.5 Revised Roughness Pre-Development Local Flooding Depths – L130 – 100 Year ARI Event

- ***Local Flood Modelling, Post-Development Case***

  The results obtained from the local modelling for the post-development case are provided in **Appendix K**, as follow.

  - Figure K.1.1 Revised Roughness Post-Development Local Flood Water Surface Levels – L169 – 2 Year ARI Event
  - Figure K.1.2 Revised Roughness Post-Development Local Flood Water Surface Levels – L169 – 5 Year ARI Event
  - Figure K.1.3 Revised Roughness Post-Development Local Flood Water Surface Levels – L169 – 10 Year ARI Event
  - Figure K.1.4 Revised Roughness Post-Development Local Flood Water Surface Levels – L169 – 50 Year ARI Event
  - Figure K.1.5 Revised Roughness Post-Development Local Flood Water Surface Levels – L169 – 100 Year ARI Event
  - Figure K.2.1 Revised Roughness Post-Development Local Flooding Depths – L169 – 2 Year ARI Event
  - Figure K.2.2 Revised Roughness Post-Development Local Flooding Depths – L169 – 5 Year ARI Event

- Figure K.2.3 Revised Roughness Post-Development Local Flooding Depths – L169 – 10 Year ARI Event
- Figure K.2.4 Revised Roughness Post-Development Local Flooding Depths – L169 – 50 Year ARI Event
- Figure K.2.5 Revised Roughness Post-Development Local Flooding Depths – L169 – 100 Year ARI Event
- Figure K.3.1 Revised Roughness Local Flooding Water Surface Impacts – L130 & L169 – 2 Year ARI Event
- Figure K.3.2 Revised Roughness Local Flooding Water Surface Impacts – L130 & L169 – 5 Year ARI Event
- Figure K.3.3 Revised Roughness Local Flooding Water Surface Impacts – L130 & L169 – 10 Year ARI Event
- Figure K.3.4 Revised Roughness Local Flooding Water Surface Impacts – L130 & L169 – 50 Year ARI Event
- Figure K.3.5 Revised Roughness Local Flooding Water Surface Impacts – L130 & L169 – 100 Year ARI Event

3.5.2.2 Revised Roughness Scenario- Commentary

With reference to the impact plots shown in Appendix I for regional flooding and in Appendix K with respect to local flooding, the revised roughness case is considered to produce no adverse relative impact that would be considered to be an actionable nuisance with respect to flood levels external to areas which are part of the broader North Harbour development. Maximum increase in peak flood levels for the regional 100 year ARI event is up to 35mm to the east of the Caboolture River in an area currently subject to inundation to depths greater than 1.0m, and is considered to be part of the Caboolture River floodplain area. There is also a small increase in peak flood level upstream of the borrow area and immediately south of Farry Road of 21mm which is confined to area that is currently zoned as rural/agricultural. Therefore, it is not anticipated that any structures or buildings will be adversely affected.

For the majority of the local flood events, excluding the 2 year ARI and 5 year ARI events, the development will not result in any significant impacts external to the site. A small impact confined within the banks of the Caboolture River north of the borrow area for the 50 year and 100 year ARI local events, which is mainly due to a small change to the timing of peaks.

For the 5 year ARI local event, afflux as high as 31mm is estimated over the area between the Bruce Highway and the Buchanan Road on-ramp, west of Trafalgar Drive. This afflux area is estimated to be on grassed area that will subject to flood depth in excess of 1m in the 5 year ARI local event and is located within the Bruce Highway corridor. Hence, the estimated small increase in flood level in this area will not result in any material adverse impacts.

For the 2 year ARI local event, there is a localised increase in flood level by as much as 31mm upstream of the south-eastern boundary of the site. The impacts appear to be partially a result of the 10m model grid not effectively representing the existing drainage channel that enters the site from the south which would provide additional conveyance of local flows past the site. The estimated afflux area is within the drainage corridor of the existing unnamed waterway east of the RWA and it is not expected that any structures or buildings will be adversely affected.

Based on the above, it is considered that the development will not produce unacceptable adverse impacts when revised roughness conditions are considered.

For the Council model as supplied scenario, stage hydrographs were extracted (Section 3.5.1.3) to confirm that the development would not impact on warning and evacuation times in the region. Given the negligible differences between pre and post development hydrographs for this scenario, the extraction of similar hydrographs was not considered to be warranted for the revised roughness scenario.

3.5.2.3 Revised Roughness - PMF Escape Routes

The inundation extent as a result of the regional PMF flood event is shown in Appendix I in Figure I.4. The analysis was completed assuming a tailwater level equal to the 20 year storm surge level plus climate change of 3.19mAHD.

With reference to this figure, the inundation extents indicate that flood free egress is available to the south of the RWA site via Buckley Road. This will provide access for this portion of the development to ground with sufficient area above the PMF flood event.

For the main MIBA development area, access to the site is restricted due to inundation of the Raff Creek crossing and the Trafalgar Drive interchange during the PMF event. Upgrades to the Bruce Highway/Trafalgar Drive interchange may ultimately improve the flood free access to the site. As an alternate emergency escape route, it is recommended that a gated access be accommodated off the new internal road that is located along the western boundary of the site fronting the Bruce Highway. The topography in this area suggests acceptable linkage can be provided to allow egress to the Bruce Highway in the event of extreme flooding in the area. Any fencing, for example for acoustic purposes, would need to include a gated entrance in the design.

It is noted that the TUFLOW model code boundary "as supplied" by Council is positioned such that in some locations the PMF event is confined by the model boundary. While this is expected to result in conservative estimates of peak flood levels given the flood storage areas outside the code boundary not being considered, there is also the potential that inundation extents that could impact on the evacuation routes during the PMF have not been considered. Upon review the only potential impact on the evacuation route from both the MIBA and RWA sites is to the south of Trafalgar Drive. The peak flood for the PMF event at this location is approximately 7.1mAHD. The alternate emergence escape route along the western boundary is considered to be still available with existing levels at greater than 9mAHD along this boundary.

3.5.3 Sensitivity Analysis

3.5.3.1 Flood Mapping

For the revised roughness scenario, mapping was completed with respect to the following:

- flood levels (pre-development and post-development); and
- flood depths (pre-development and post-development).

As per the conditions of approval, the sensitivity analysis only considered the 100 year ARI regional Caboolture River and 100 year ARI local events with the revised roughness base case. As the sensitivity analysis only involved changes to the roughness values adopted for the post-development case, results obtained from the revised roughness scenario for the pre-developed case are still applicable for comparison purposes for this sensitivity scenario. As such, results of the revised roughness scenario for the pre-development scenario as shown below are used for impact assessment of the sensitivity scenario.

- Regional Event, Pre-Development Appendix H
- Local Event, Pre-Development Appendix J

The flood mapping completed with respect to the post-development case for the sensitivity analysis is presented in the following appendices.

- ***Regional Flood Modelling, Post-Development Case***

  The results obtained from the regional modelling of the Caboolture River for the post-development case are provided in **Appendix L**, as follow.

  - Figure L.1.1 Sensitivity Case Post- Development Regional Flood Water Surface Levels – R169S – 100 Year ARI Event
  - Figure L.2.1 Sensitivity Case Post- Development Regional Flood Water Depth – R169S – 100 Year ARI Event
  - Figure L.3.1 Sensitivity Case Post- Development Regional Flood Impacts – R169S – 100 Year ARI Event

- ***Local Flood Modelling, Post-Development Case***

  The results obtained from the local modelling of Raff Creek for the post-development case are provided in **Appendix M**, as follow.

- Figure M.1.1 Sensitivity Case Post- Development Local Flood Water Surface Levels – L169S – 100 Year ARI Event
- Figure M.2.1 Sensitivity Case Post- Development Local Flood Water Depth – L169S – 100 Year ARI Event
- Figure M.3.1 Sensitivity Case Post- Development Local Flood Impacts – L169S – 100 Year ARI Event

3.5.3.2 Sensitivity Analysis - Commentary

With reference to the impact plot shown on Appendix L for the regional 100 year ARI event, the impacts are similar to the revised roughness case above and it is considered that no adverse relative impact would result in an actionable nuisance with respect to flood levels external to areas which are part of the broader North Harbour development. Maximum increases in peak flood levels for the regional 100 year ARI event is up to 35mm to the east of the Caboolture River in an area currently subject to inundation to depths greater than 1.0m. Similar to the revised roughness scenario, there is also a small increase in peak flood level upstream of the borrow area and immediately south of Farry Road of 21mm which is confined to area that is currently zoned as rural/agricultural. Therefore, it is not anticipated that any structures or buildings will be adversely affected.

Further, afflux as high as 40mm is estimated over a small area in Raff Creek west of RWA. The afflux is estimated to contain within the Raff Creek corridor, hence no structures or buildings will be adversely affected. This area in question is already inundated to a depth of the order of a metre or more in the pre-development scenario. The increase is therefore not considered to be of material significance.

With reference to the impact plot shown on Figure M.3.1 (Appendix M) for the local 100 year ARI event, afflux as high as 40mm is estimated over few small areas within the Caboolture River downstream of the NEBP development. These increases are considered to be related to small changes in the timing of peaks and occur in areas where the increase is not considered to be of significance. Increase in flood level as high as 80mm is estimated over a small area within the unnamed waterway south-east of the RWA. Given the size and location of the impact area, the afflux is considered to be the “noise” of the flood model and will not result in material adverse impacts.

3.5.4 Flood Hazard

The detailed hazard mappings of the 2 year ARI to 100 year ARI regional flood events modelled for the post-development scenario are shown as Figure E.7.1 to Figure E.7.4 in Appendix E, respectively. These results show that there is no material change in flood hazard results from that reported in the previous 2018 technical memorandum and 2019 technical memorandum, as a result of the proposed variation of land uses and works.

In accordance to the requirement of Section 3 of Council’s Planning Scheme Policy for “Flood Hazard, Coastal and Overland Flow”, a risk based approach to assessing flood hazard has been adopted. Plate 5 below shows the combined flood risk matrix utilised in the determination of the likely flood risk of the post-development scenario. In order to compute the flood risk, the 1,000 year ARI flood event was simulated. Figure E.8.1 shows the estimated 1,000 year ARI flood risk for the site and its immediate vicinity areas.

Likelihood level		NERAG 2010[1]	Consequence level				
Current MBRC flood mapping (Flood Check)			Insign-ificant	Minor	Moderate	Major	Catastr-ophic
Coastal hazard (storm tide inundation)	Flood hazard						
0.01% AEP 2014 (1:10,000 ARI)	River and Creek Floodplain Extent (PMF)	Rare	T-VL	T-VL	T-L	T-L	T-L
0.1% AEP 2014 (1:1,000 ARI)	0.1% AEP 2014 (1:1,000 ARI)	Unlikely	T-L	T-L	T-M	I-H	EI-H
1% AEP 2014 (1:100 ARI)	1% AEP 2014 (1:100 ARI)	Possible	T-M	T-M	T-M	EI-H	EI-H
5% AEP 2014 (1:20 ARI)	5% AEP 2014 (1:20 ARI)	Likely	T-M	T-M	T-M	EI-H	EI-H
Hydraulic Hazard category			H1	H2	H3	H4	H5
Risk to Life and Property			Low		High		
Approximate floodplain hydraulic category			Flood fringe	Flood storage		Floodway / flood conveyance	

EI-H	Extremely Intolerable High Risk
I-H	Intolerable High Risk
T-M	Tolerable Medium Risk
T-L	Tolerable Low Risk
T-VL	Tolerable Very Low Risk

1. National Emergency Risk Assessment Guidelines October 2010 (NERAG 2010)

Plate 5 – Flood Risk Matrix Adopted

3.5.5 State Code 1: Development in A State-Controlled Road Environment Assessment

The Bruce Highway and Beachmere Road are the two state-controlled roads located within the vicinity of the NEBP development area. Bruce Highway is located west of the NEBP development area and a section of the highway is adjacent to the site. Beachmere Road is located north of the NEBP development area. This section of the report has been dedicated to demonstrate that the proposed development complies with PO12-PO14 of the State Code 1: Development in a state-controlled road environment. These performance outcomes have been reproduced in Table 3-3 and the individual response is provided on the last column of the table.

Table 3-3 Response to State Code 1 – Stormwater and Drainage

Performance Outcomes	Acceptable Outcomes	Response
Stormwater and drainage		
PO12 Development does not result in an actionable nuisance, or worsening of, stormwater, flooding or drainage impacts in a state-controlled road.	No acceptable outcome is prescribed.	The modelling results show that both Bruce Highway and Beachmere Road will not subject to actionable flooding impacts as a result of the proposed development, for all the modelled regional flood events up to and including the 500 year ARI event. Refer to Appendix E for detailed results regarding flooding impacts.
PO13 Run-off from the development site is not unlawfully discharged to a state-controlled road.	**AO13.1** Development does not create any new points of discharge to a state-controlled road. AND	The proposed development design features do not alter the approved lawful point of discharge for the site.
	AO13.2 Stormwater run-off is discharged to a lawful point of discharge. Note: Section 3.9 of the Queensland Urban Drainage Manual, Institute of Public Works Engineering Australasia (Queensland Division) Fourth Edition, 2016, provides further information on lawful points of discharge. AND	
	AO13.3 Development does not worsen the condition of an existing lawful point of discharge to the state-controlled road.	
PO14 Run-off from the development site during construction does not cause siltation of stormwater infrastructure affecting a state-controlled road.	**AO14.1** Run-off from the development site during construction is not discharged to stormwater infrastructure for a state-controlled road.	Run-off from the development site during construction has not been altered to that proposed within the Approved FMP and appropriate sediment and erosion control plan will be implemented for each construction phase at the site.

4 Stormwater Quantity Management

The development of the site has the potential to increase local site runoff due to the increase in impervious areas associated with the development. This potential increase in local peak flows can ultimately result in increased peak discharges within the adjacent waterways that can result in erosion of the waterway and affect bank stability.
To assess the impact the proposed development has on peak discharges from the site, and ultimately within the adjacent creeks and waterways, pre- and post-development flows for the local catchments discharging to Raff Creek, the un-named waterway to the east of the RWA, the natural gully downstream of Trafalgar Drive and ultimately the Caboolture River were predicted using the WBNM for the catchments both external and internal to the site.

4.1 WBNM Modelling

The WBNM model used to calculate the inflows to Council's regional TUFLOW model of the wider Caboolture River catchment was provided by BMT WBM. The supplied WBNM model was refined in the area surrounding the site to include better definition of the local sub-catchments and to assess the impact on local flows from the proposed development. The local WBNM model layout is presented in Figure 7.
The model parameters and rainfall losses which were adopted by BMT WBM following extensive calibration and validation processes undertaken for the wider catchment have been applied to the local WBNM model. These parameters include:

- Lag Parameter C: 1.6
- Initial Loss: 0mm
- Continuing Loss: 2.5mm/h

These model parameters were not modified as part of this assessment.
Model Calibration and Initial Losses
The design rainfall estimates for the Caboolture River flood study was undertaken by Worley Parsons for Council and documented in the report "*Regional Floodplain Database: Design Rainfall – Burpengary Pilot Project*", dated 5 November 2012.
An extract from Section 4.1.7 of this study is included below:

> *There is a fairly wide range of values which have been adopted for the flood studies. Initial loss values vary from 0mm up to 25mm with a median value of 15mm. Continuing loss values vary from 1mm/hr up to 4mm/hr, with a median value of 2.5mm/hr.*
> *Adopted Values: The values to be adopted for the BUR pilot studies are as follows:*
>
> - *Pervious Area Initial Loss Values: 0mm for all design events*
> - *Pervious Area Continuing Loss Values: 2.5mm/hr for all design events. This is consistent with clay soil types which are dominant in the region*
> - *Impervious Area Initial Loss Values: 0mm for all design events*
> - *Impervious Area Continuing Loss Values: 0mm/hr for all design events.*
>
> *These values are considered reasonably conservative. The justification for the 0mm initial loss value for all design events is that there is evidence to suggest that large rainfall events typically occur during periods of generally wet weather so catchments are generally saturated.*
> *It is recommended that these values be reviewed following the TUFLOW calibration being carried out as part of the BUR pilot study.*
> *Primary Justification: Industry accepted procedure*
> *Also:*
>
> - *Evidence to suggest common condition where saturation of catchment achieved prior peak burst*

Although initial losses are found to vary for the historical rainfall events, it is common practice to adopt 0mm initial loss and 2.5mm/hr continuing loss for both pre-development and post-development conditions. This is also consistent with the assessment undertaken for the Residential West Area of the development.

4.1.1 Pre-development Scenario

The percentage impervious for each sub-catchment was previously based on the ultimate development of the catchment based on the land uses designated in Council's current planning scheme. The WBNM model catchments were further delineated within the site extent from those provided in Council's model prepared by BMT WBM. The resultant catchments' fraction impervious values were adjusted across the site based on aerial imagery and Council's Planning Scheme Landuse maps. The catchments external to the site remained unchanged as per the original WBNM model.

4.1.2 Post-development Scenario

Based on the proposed development layout, both the sub-catchment extents and the percentage impervious of those sub-catchments impacted by the development were modified.
Modification of the sub-catchment extents was undertaken to ensure any redirection of flows as a result of earthworks and the development layout is appropriately considered. The post-development WBNM model layout is shown in Figure 8.

A percentage impervious of 90% was adopted for the industrial/commercial component of the MIBA development.

A percentage impervious of 57.5% was adopted for the urban residential component of the RWA based on reference to typical ranges of values recommended within the *Queensland Urban Drainage Manual* (QUDM) for Urban Residential – Low Density (including roads) 45-85% and the Water by Design *MUSIC Modelling Guidelines (Version 1)* – 2010 Table 3.6 for Residential 15 dwellings/ha of 50-60%. Considering that the development has a density of 13.7 dwellings/ha, a percentage impervious of 57.5% is deemed suitable for the impact assessment.

4.1.3 WBNM Results

The pre-development and post-development WBNM models were run for a number of storm durations ranging from 10 to 720 minutes for all design storm events from the 1 to 100 year ARI. The resultant impact on the peak 1 and 100 year ARI flows within Raff Creek (upstream of confluence with the unnamed waterway), the unnamed waterway, within Raff Creek before it discharges to the Caboolture River and within the drainage channel downstream of Trafalgar Drive are detailed in Table 4-1 and Table 4-2.

Table 4-1 Impact on local 1 Year ARI Peak Flows

Location	Pre-development 1 Year ARI Peak Flow (m^3/s)	Post-development 1 Year ARI Peak Flow (m^3/s)
Raff Creek (upstream of confluence with the un-named waterway)	42.96	43.34
Un-named waterway east of RWA	15.79	15.36
Raff Creek (upstream of Caboolture River)	56.09	56.92
Upstream of Buchanan Road	11.43	9.10
Drainage channel downstream of Trafalgar Drive	12.88	13.99
Catchment Discharging to East of MIBA Area via overland flow and local gullies	4.45	4.88

Table 4-2 Impact on local 100 Year ARI Peak Flows

Location	Pre-development 100 Year ARI Peak Flow (m^3/s)	Post-development 100 Year ARI Peak Flow (m^3/s)
Raff Creek (upstream of confluence with the un-named waterway)	169.63	171.06
Un-named waterway east of RWA	56.74	55.03
Raff Creek (upstream of Caboolture River)	214.19	216.54
Upstream of Buchanan Road	37.17	29.20
Drainage channel downstream of Trafalgar Drive	45.01	48.11
Catchment Discharging to East of MIBA Area via overland flow and local gullies	13.92	12.73

The results presented in the tables above indicate that the development has the potential to increase local peak flows within Raff Creek, the drainage channel downstream of Trafalgar Drive and to east of the MIBA development area. It can be noted that the redirection of sub-catchment MIBA_06_0000 results in a reduction in flow along the drain upstream of the Buchanan Road/Trafalgar Drive intersection. This reduction in flow at this point indicates that on-site detention measures are not required for the portion of the MIBA development on the corner of Nolan Drive and Trafalgar Drive.

While the small increase in flows determined by the hydrology model is not expected to impact on the local creeks, waterways or the Caboolture River, it can be noted that the routing of flows through the modified Raff Creek and the attenuation effects of the proposed road crossings are better represented by the hydraulic model. The results of the hydraulic modelling detailed in Section 3 above indicate that the development will not cause a material impact on peak flood levels that would result in an actionable nuisance external to the site. Further, the previous requirement in the superseded State Planning Policy to maintain the 1 year peak flows to pre-development levels has been removed in the current State Planning Policy for tidal receiving waters.

Given the results above of the flood modelling, no on-site detention is deemed necessary for either the MIBA or RWA portions of the development.

5 Conclusion

North Harbour Holdings Pty Ltd (previously known as North East Business Park Pty Ltd) proposes to develop the Mixed Industrial and Business Area (MIBA) as part of the North East Business Park located on Nolan Drive, Morayfield.

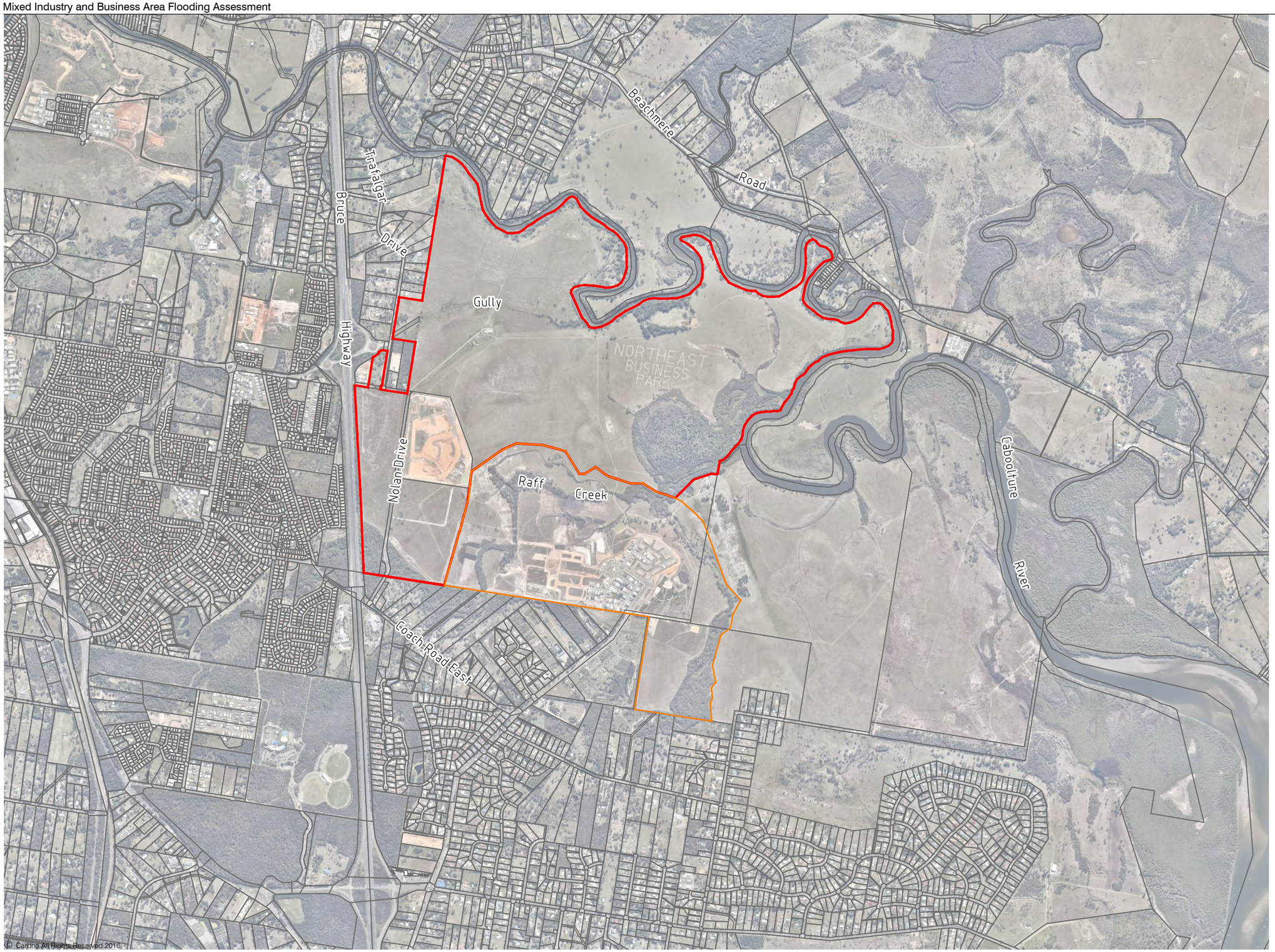
This Flood Management Plan has been prepared to comply with the conditions of approval issued by the Planning and Environment Court and subsequent conditions and agreed actions issued by Moreton Bay Regional Council.

The modelling completed in support of the plan has indicated that MIBA development in conjunction with the Residential West Area component can proceed without producing unacceptable adverse impacts external to the site that would be considered to cause an actionable nuisance.

FIGURES

Figure 1 Site Location and Local Features
Figure 2 Preliminary Development Layout and Major Drainage Features
Figure 3 Regional TUFLOW Model
Figure 4 Council Model Pre-Development Roughness
Figure 5 2003 Pre-Development Scenario
Figure 6 2003 Post Development Scenario
Figure 7 Pre-Development Local WBNM Model (Full Extent)
Figure 8 Post-Development Local WBNM Model
Figure 9 Pre-Development Local WBNM Model
Figure 10 Local TUFLOW Model
Figure 11 Reporting Point Locations
Figure 12 Additional Changes to Post-Development Flood Model
Figure 13 Post-Development Model Roughness

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Shaping the Future



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June 2016

Scale 1:25,000 (A3)

FIGURE 1
SITE LOCATION AND LOCAL FEATURES

Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: O:\7903-59\Figures\R6VA_MIBA_FMP\FIGURE 1 - Site Location and Local Features.dwg
XREF's:

PRINT DATE: 20 June, 2016 - 4:41pm

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Compensatory Floodplain Storage Cut Area
Future Road Connection to Northern Suburbs
Beachmere Road
Trafalgar Drive Access
Bruce Highway
Trafalgar Drive
Multi-Use Area Crossing
10 x 3600 x 2400 RCBCs
WL6
WL5
Drainage Channel 60m Base Width
WL4
NORTHEAST BUSINESS PARK
Raff Creek Crossing
20 x 3000 x 2100 RCBCs
2 x 17.5m Span Bridge
Excavated Transition Area
Upstream and Downstream Crossing
Raff Creek invert widened to 30m base
Caboolture River
Nolan Drive
WL3
Raff Creek
WL2
WL1
Bund
Borrow Area
Coach Road East

Legend
- MIBA Site Boundary
- RWA Site Boundary
- WL1 MIBA Wetland

Topography Difference (mm)
- Above 4,000
- 3,500 to 4,000
- 3,000 to 3,500
- 2,500 to 3,000
- 2,000 to 2,500
- 1,500 to 2,000
- 1,000 to 1,500
- 500 to 1,000
- 100 to 500
- -500 to -100
- -1,000 to -500
- -1,500 to -1,000
- -2,000 to -1,500
- -2,500 to -2,000
- -3,000 to -2,500
- -3,500 to -3,000
- -4,000 to -3,500
- Below -4,000

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200 0 200 400 600 800 1000m
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Scale 1:20,000 (A3)

FIGURE 2

PRELIMINARY DEVELOPMENT LAYOUT AND MAJOR DRAINAGE FREATURES

July 2016

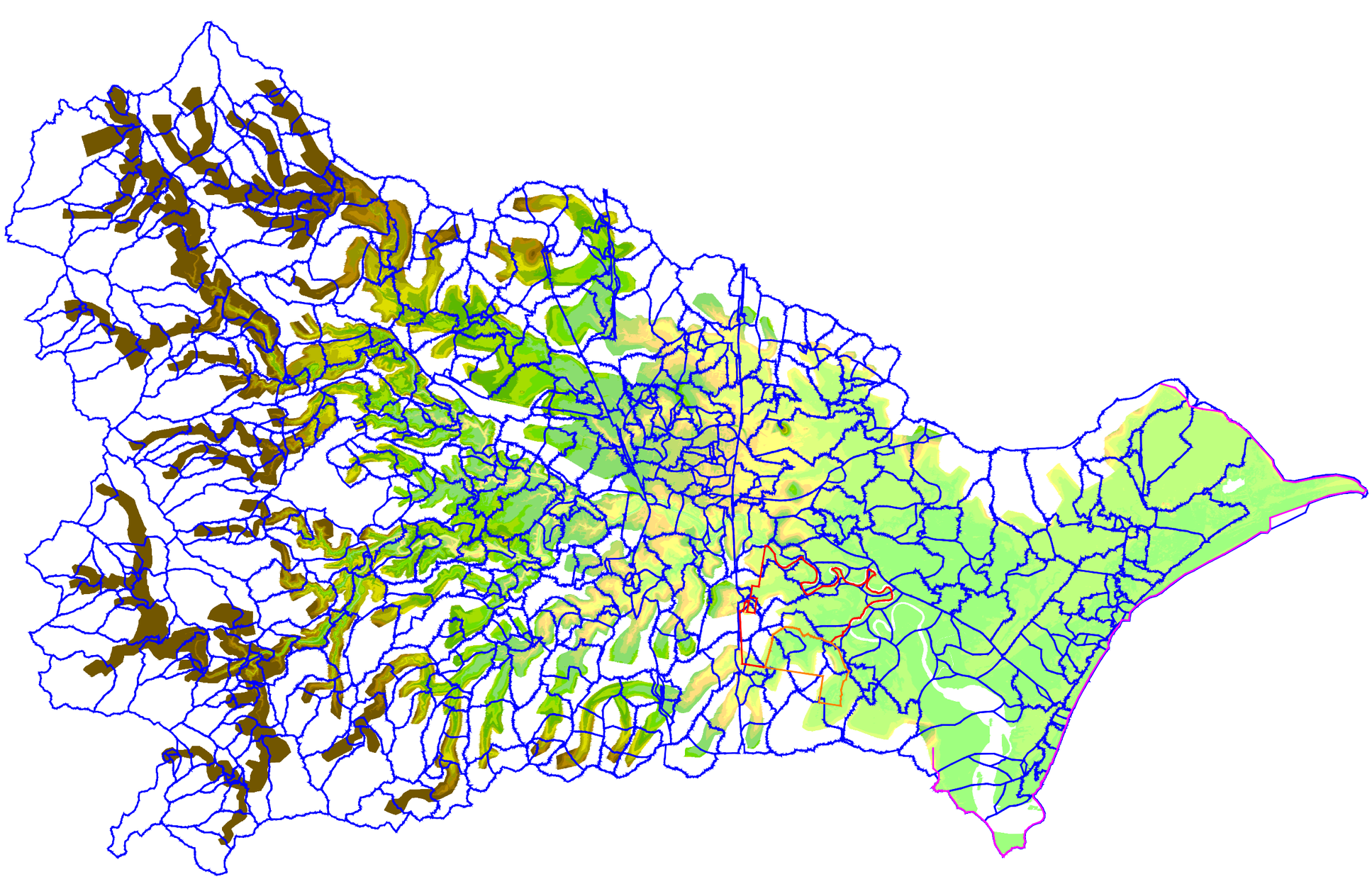
Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: C:\Temp_Cad\AcPublish_7924\FIGURE 2 - Prelim Development Layout.dwg
XREF's: Results_Topo; Cadastre_frim; Development_Layout; Results_Topodiff

PRINT DATE: 28 July, 2016 - 1:59pm

Cardno



N

Legend

- MIBA Site Boundary
- RWA Site Boundary
- Regional WBNM Model Catchment Boundary
- Model Downstream Boundary

Elevation (mAHD)

- Above 34.00
- 32.00 to 34.00
- 30.00 to 32.00
- 28.00 to 30.00
- 26.00 to 28.00
- 24.00 to 26.00
- 22.00 to 24.00
- 20.00 to 22.00
- 18.00 to 20.00
- 16.00 to 18.00
- 14.00 to 16.00
- 12.00 to 14.00
- 10.00 to 12.00
- 8.00 to 10.00
- 6.00 to 8.00
- 4.00 to 6.00
- 2.00 to 4.00
- 0.00 to 2.00

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Aerial imagery courtesy of Nearmap, 2016

1 0 1 2 3 4 5km
1:100,000

Scale 1:100,000 (A3)

FIGURE 3
REGIONAL TUFLOW MODEL

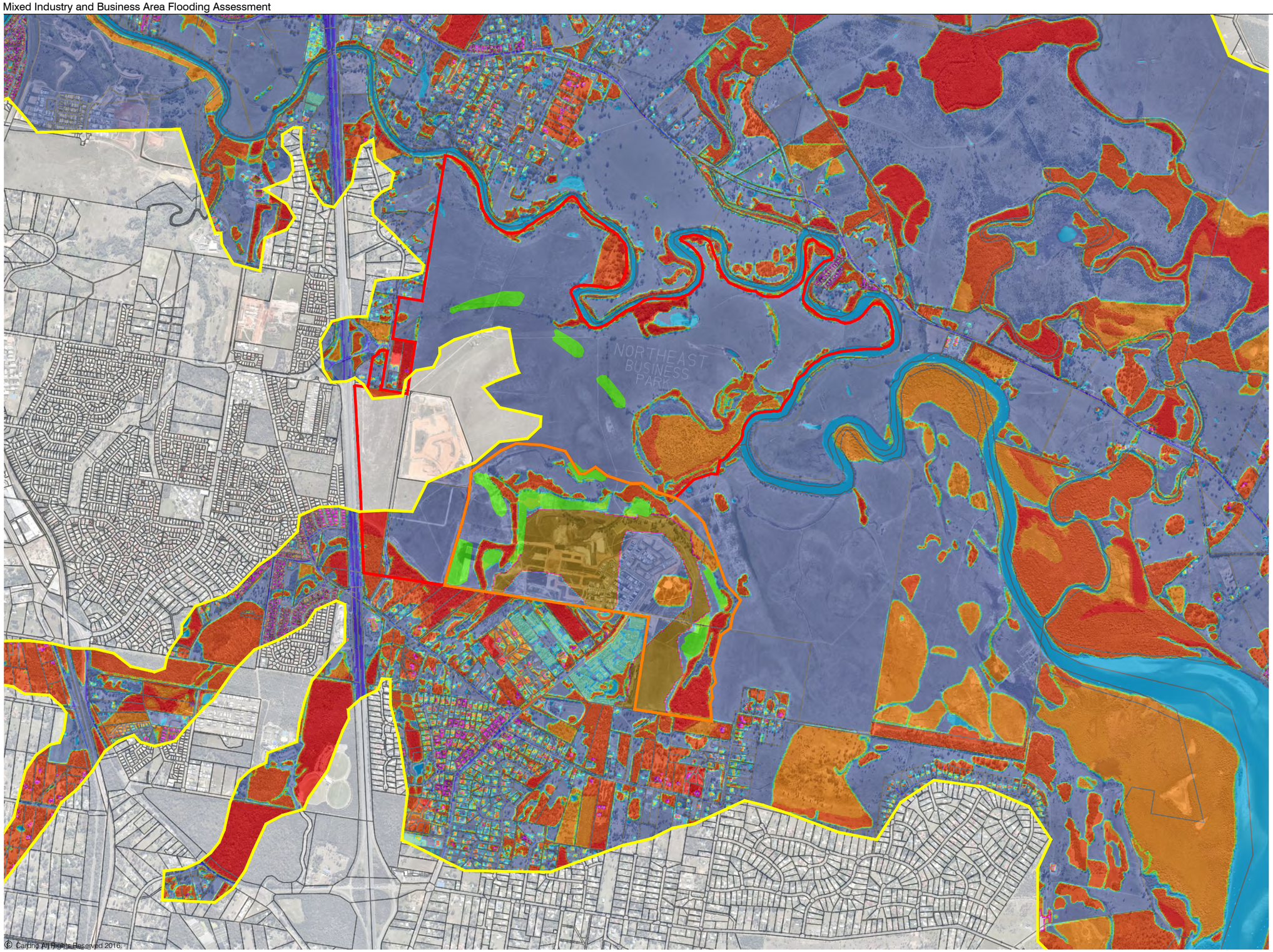
September 2016

Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: O:\7903-59\Figures\R6VA_MIBA_FMP\FIGURE 3 - Regional TUFLOW model.dwg
XREF's: Results_Topo; Figure3-Subcatchments

PRINT DATE: 08 September, 2016 - 3:52pm



N

Legend

- MIBA Site Boundary
- RWA Site Boundary
- Model Extent

Manning's 'n' Value

- 1.000
- 0.500
- 0.355
- 0.275
- 0.180
- 0.150
- 0.080
- 0.070
- 0.060
- 0.055
- 0.050
- 0.045
- 0.040
- 0.030
- 0.025
- 0.020
- Below 0.020

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250 0 250 500 750 1000 1250m
1:25,000

Scale 1:25,000 (A3)

FIGURE 4
COUNCIL MODEL PRE-DEVELOPMENT ROUGHNESS

June 2016

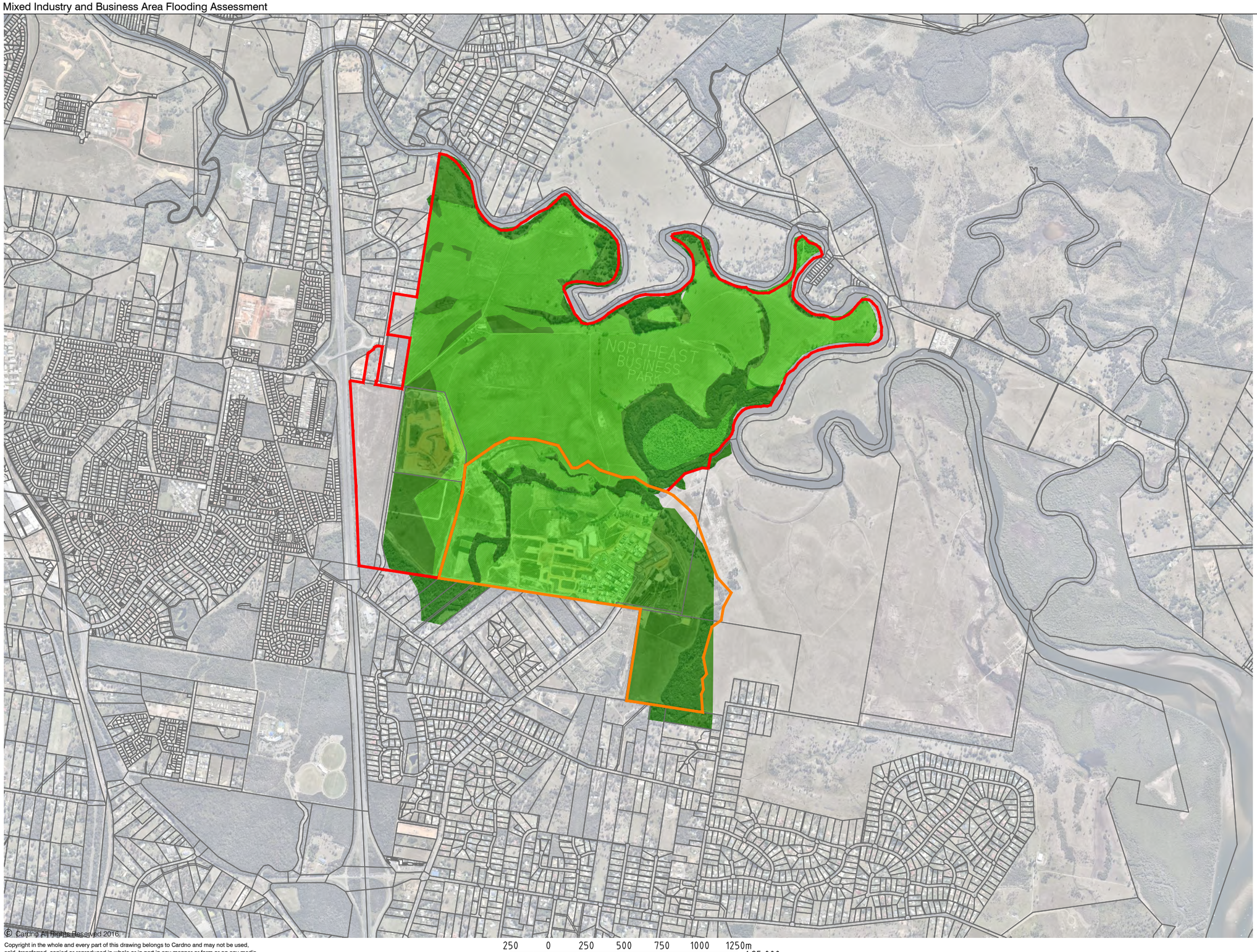
Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: G:\7903-59\Figures\R6VA_MIBA_FMP\FIGURE 4 - Council Model Post Development Roughness.dwg
XREF's: Results_Rgh; Cadastre_Full; Figure_4_CAB_2d_mat_Wetlands104

PRINT DATE: 20 June, 2016 - 6:14pm

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N

Legend

- MIBA Site Boundary
- RWA Site Boundary
- Medium Density Vegetation
- Dense Vegetation

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250 0 250 500 750 1000 1250m
1:25,000

Scale 1:25,000 (A3)

FIGURE 5
2003 PRE-DEVELOPMENT SCENARIO

June 2016

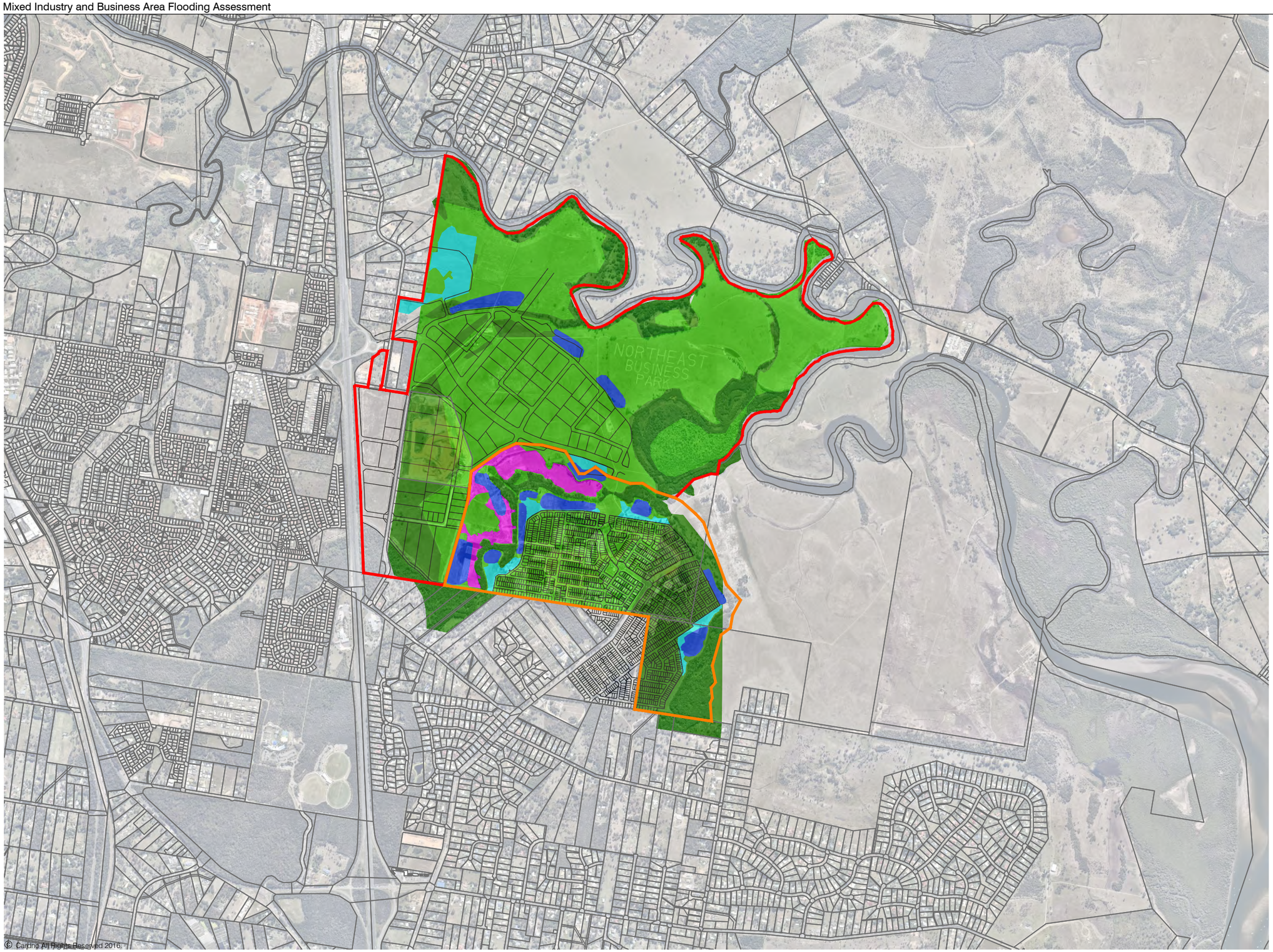
Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: O:\7903-59\Figures\R6VA_MIBA_FMP\FIGURE 5 - Pre-Development Scenario.dwg
XREF's: Combined_rgh

PRINT DATE: 20 June, 2016 - 7:26pm

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N

Legend

- MIBA Site Boundary
- RWA Site Boundary
- Wetlands
- Parks
- Reeds
- Medium Density Vegetation
- Dense Vegetation

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250 0 250 500 750 1000 1250m

1:25,000

Scale 1:25,000 (A3)

FIGURE 6
POST-DEVELOPMENT SCENARIO

June 2016

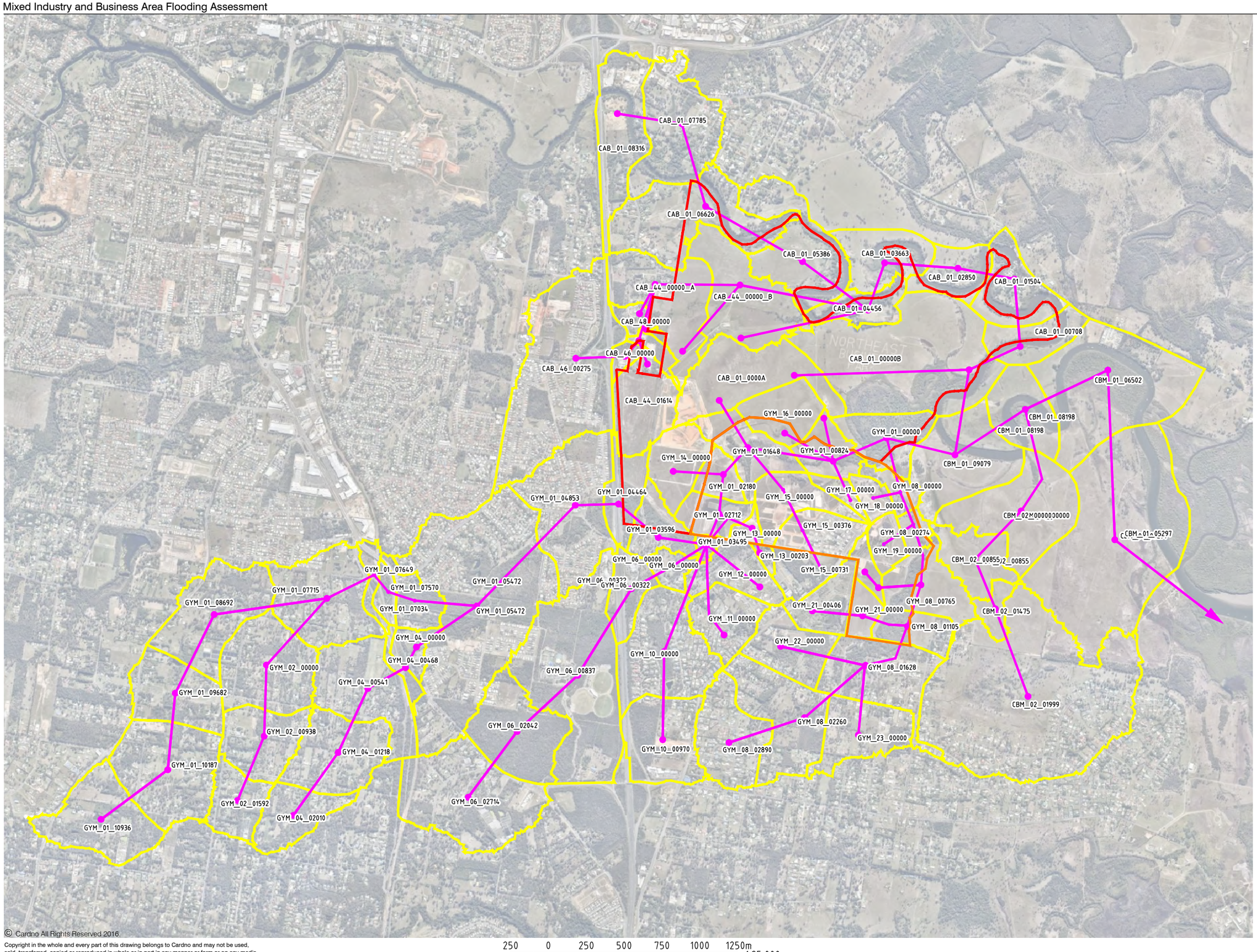
Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: O:\7903-59\Figures\R6VA_MIBA_FMP\FIGURE 6 - Post-Development Scenario.dwg
XREF's: Combined_Roughness; Development_Layout

PRINT DATE: 20 June, 2016 - 7:06pm

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Legend

- MIBA Site Boundary
- RWA Site Boundary
- Catchment Boundary
- Catchment Link
- Catchment Node

250 0 250 500 750 1000 1250m

1:25,000

Scale 1:30,000 (A3)

FIGURE 7

PRE-DEVELOPMENT LOCAL WBNM MODEL (FULL EXTENT)

June 2016

Project No.: 7903-59

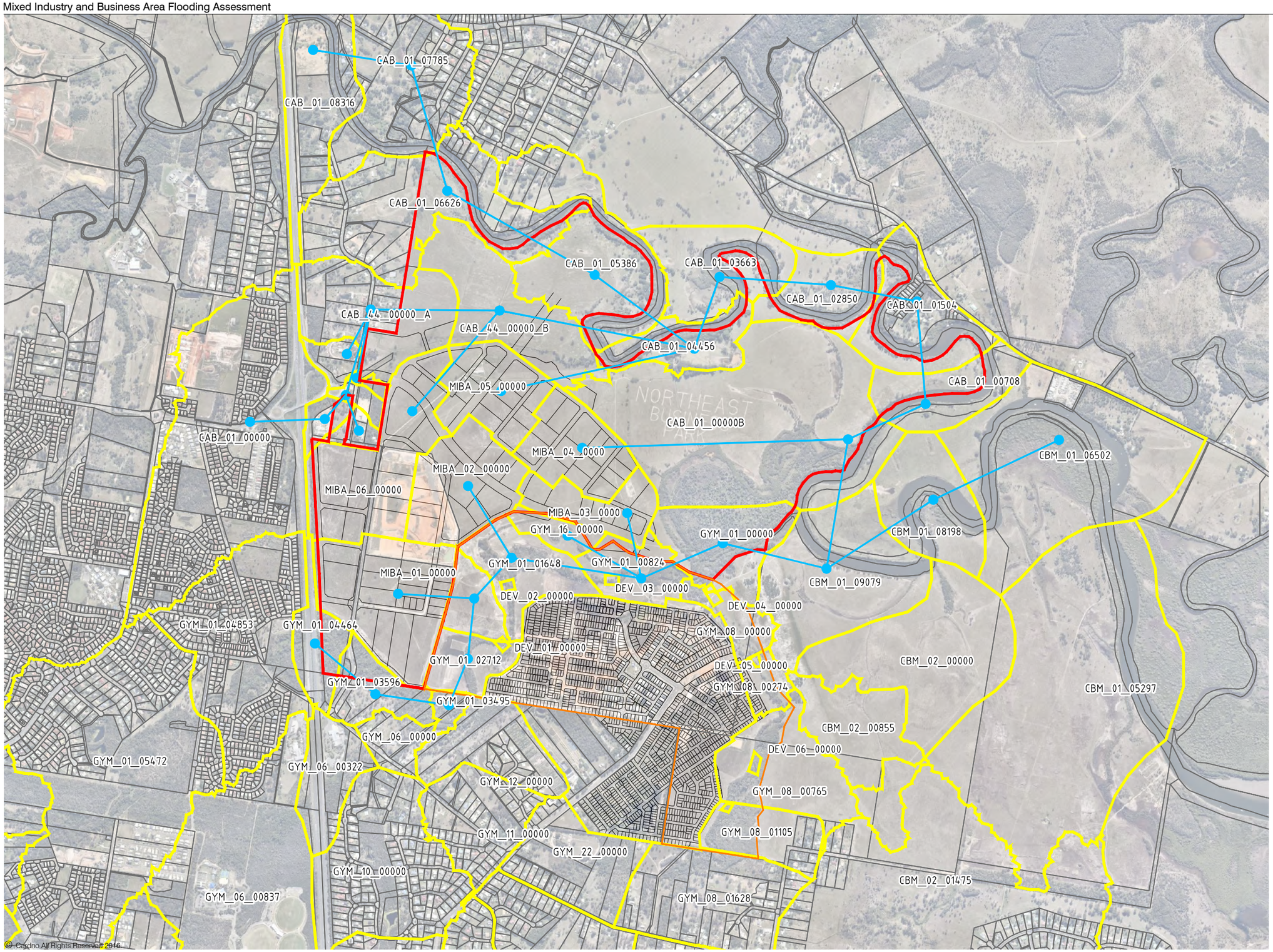
Northeast Business Park Pty Ltd

CAD FILE: O:\7903-59\Figures\R6VA_MIBA_FMP\FIGURE 7 - Pre_Developed Local WBNM Model (2).dwg

XREF's:

PRINT DATE: 28 July, 2016 - 2:03pm

Cardno



N

Legend

- MIBA Site Boundary
- RWA Site Boundary
- Catchment Boundary
- Development Catchment Links
- Catchment Node

250 0 250 500 750 1000 1250m
1:25,000

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Scale 1:20,000 (A3)

FIGURE 8
POST-DEVELOPMENT LOCAL WBNM MODEL

June 2016

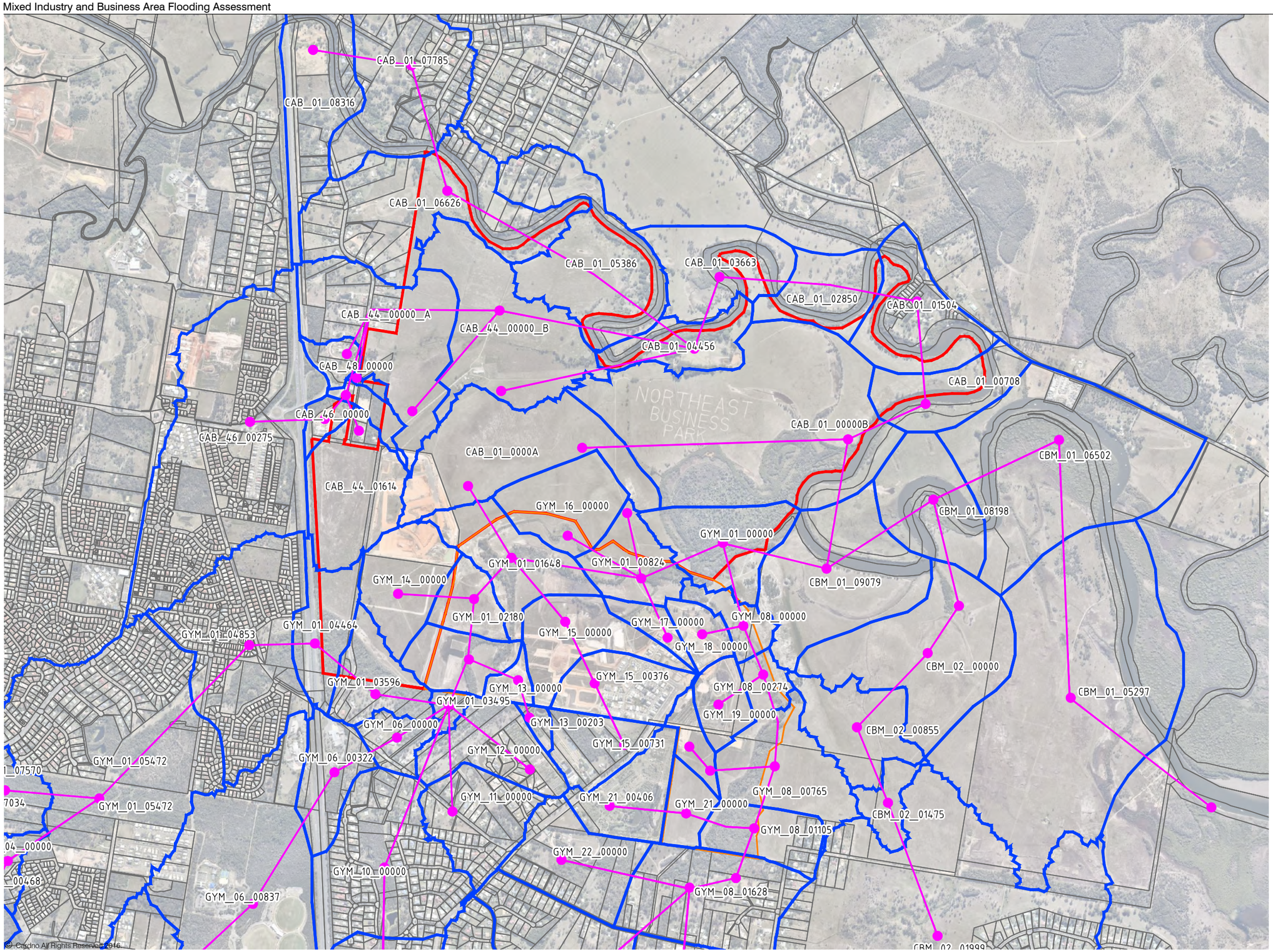
Project No.: 7903-59

PRINT DATE: 20 June, 2016 - 5:00pm

Northeast Business Park Pty Ltd

CAD FILE: G:\7903-59\Figures\R6VA_MIBA_FMP\FIGURE 8 - Post Development Local WBNM Model.dwg
XREF's: Development_Layout

Cardno



Legend

- MIBA Site Boundary
- RWA Site Boundary
- Catchment Boundary
- Development Catchment Links
- Catchment Node

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200 0 200 400 600 800 1000m

1:20,000

Scale 1:20,000 (A3)

FIGURE 9

PRE-DEVELOPMENT LOCAL WBNM MODEL

July 2016

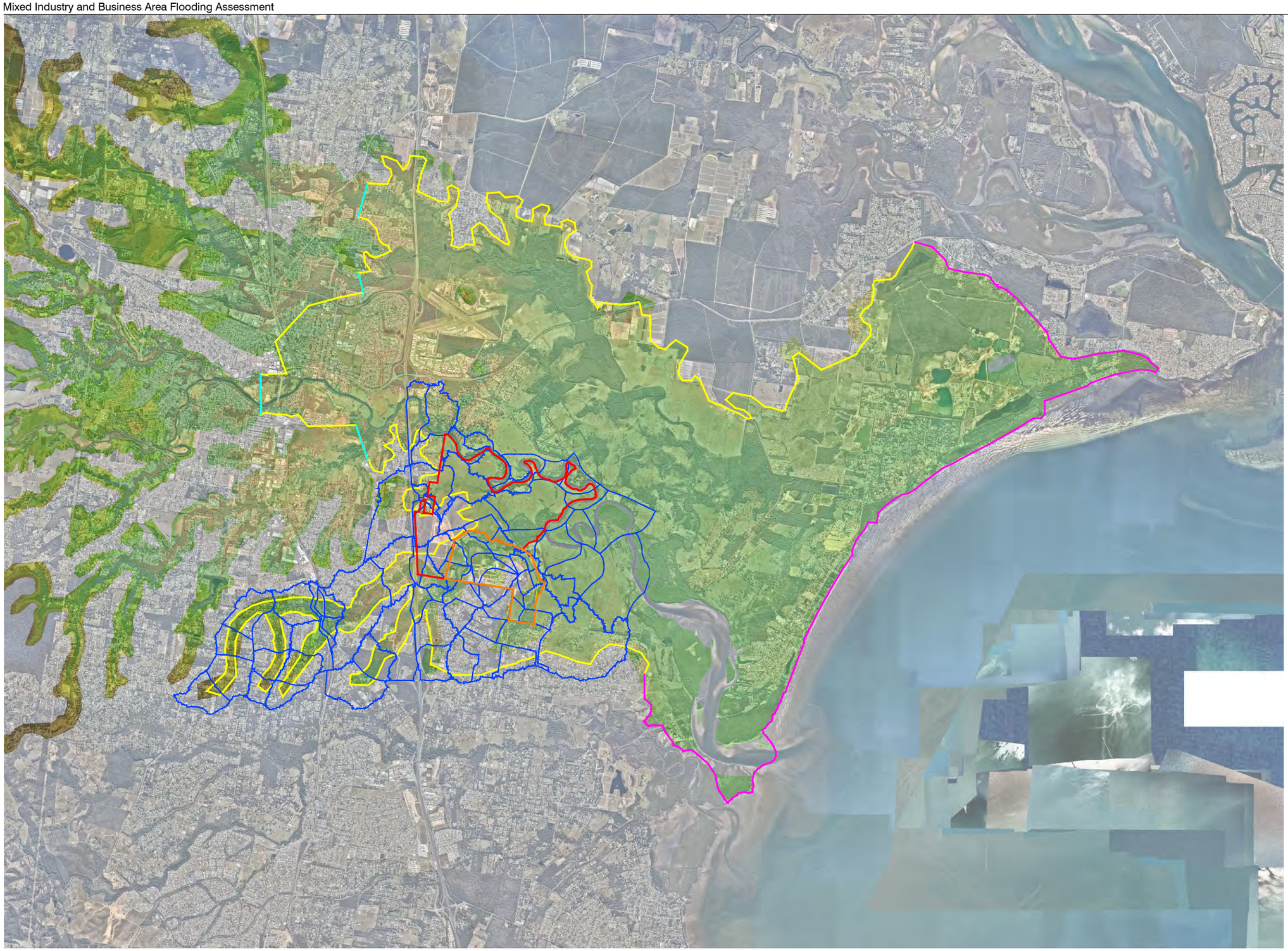
Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: C:\Temp_Cad\AcPublish_7924\FIGURE 9 - Pre_Developed Local WBNM Model.dwg
XREF's: Development_Layout

PRINT DATE: 28 July, 2016 - 1:37pm

Cardno



N

Legend

- MIBA Site Boundary
- RWA Site Boundary
- Local WBNM Model Catchment Boundary
- Model Upstream Boundary
- Model Downstream Boundary
- Model Extents

Elevation (mAHD)

- Above 34.00
- 32.00 to 34.00
- 30.00 to 32.00
- 28.00 to 30.00
- 26.00 to 28.00
- 24.00 to 26.00
- 22.00 to 24.00
- 20.00 to 22.00
- 18.00 to 20.00
- 16.00 to 18.00
- 14.00 to 16.00
- 12.00 to 14.00
- 10.00 to 12.00
- 8.00 to 10.00
- 6.00 to 8.00
- 4.00 to 6.00
- 2.00 to 4.00
- 0.00 to 2.00

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Aerial imagery courtesy of Nearmap, 2016

0.75 0 0.750 1.5 2.25 3.0 3.75km

1:75000

Scale 1:75,000 (A3)

FIGURE 10
LOCAL TUFLOW MODEL

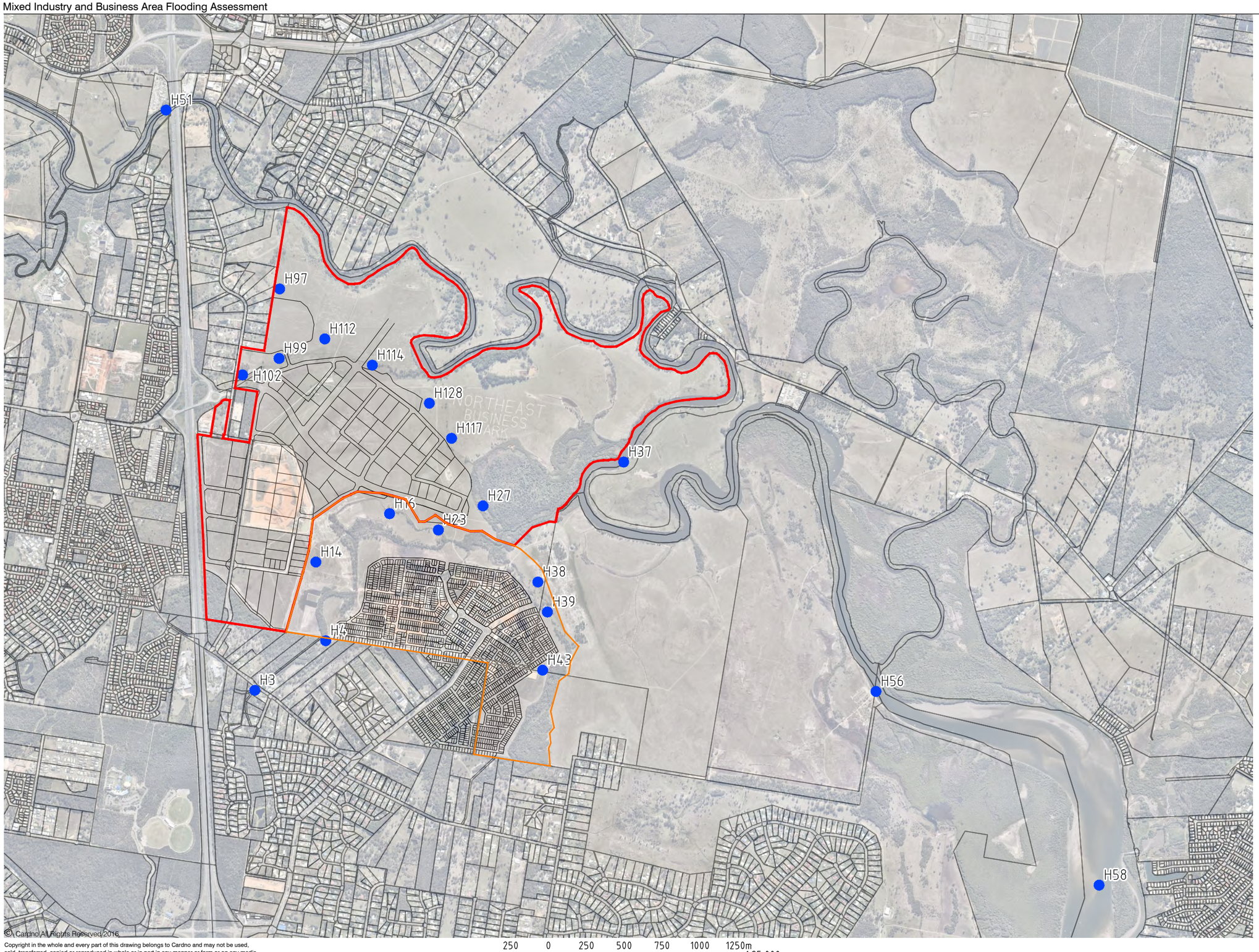
June 2016

Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: C:\Temp_Cad\AcPublish_7924\FIGURE 10 - Local TUFLOW model.dwg
XREF's: Results_Topo; Figure3-Subcatchments

PRINT DATE: 28 July, 2016 - 1:32pm



N

Legend

- MIBA Site Boundary
- RWA Site Boundary
- H1 Reporting Point

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Aerial imagery courtesy of Nearmap, 2016

250 0 250 500 750 1000 1250m
1:25,000

Scale 1:20,000 (A3)

FIGURE 11
REPORTING POINT LOCATIONS

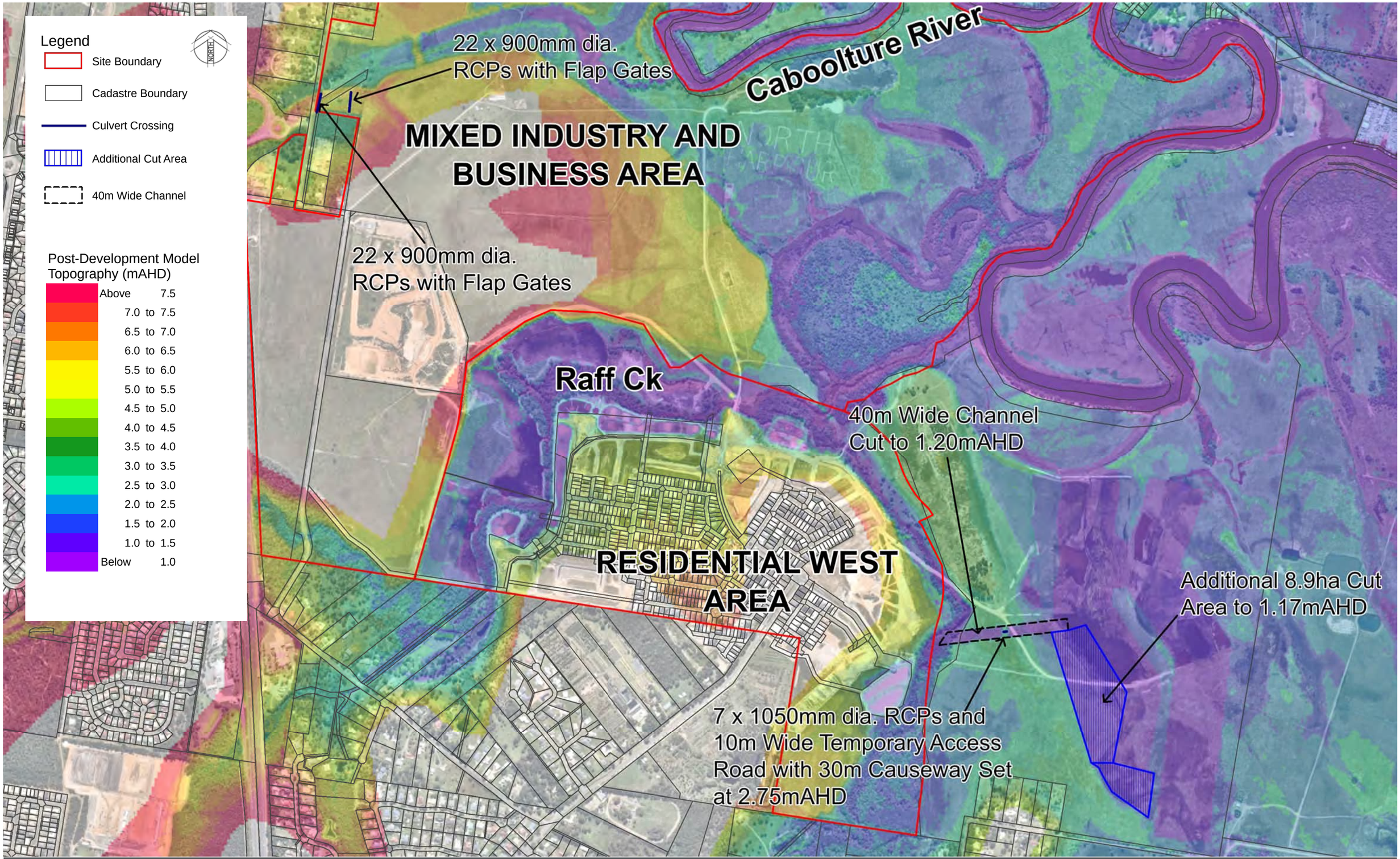
July 2016

Project No.: 7903-59

Northeast Business Park Pty Ltd

CAD FILE: C:\Temp_Cad\AcPublish_7924\FIGURE 11 - Reporting Point Locations.dwg
XREF's: Results_Topo; Cadastre_Frim; Development_Layout; Results_Topodiff

PRINT DATE: 28 July, 2016 - 1:35pm



O:\17903-59\Figures\R6v5

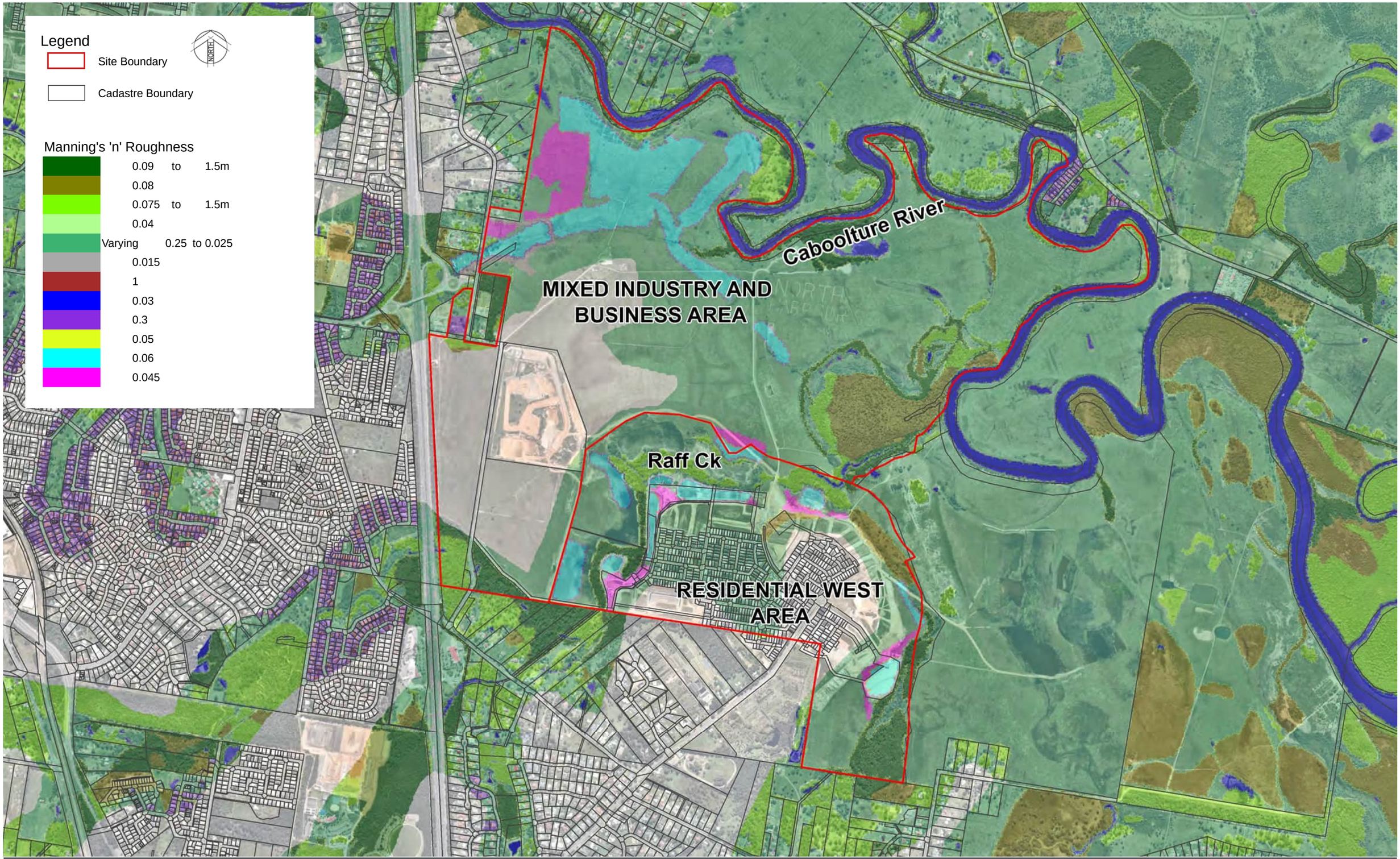
Cardno
Level 11, North Tower, 515 St Pauls Terrace
Fortitude Valley QLD 4006
Tel. 07 3369 9822

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Date
AUGUST 2020
Size
A3
Scale
1:12,000

0 0.6
kilometres
Scale 1:12,000

FIGURE 12
ADDITIONAL CHANGES MADE TO V5 FMP POST-DEVELOPMENT MODEL - R169 & L169
FLOOD MANAGEMENT PLAN
NORTH EAST BUSINESS PARK



O:\7903-59\Figures\R6v5

Cardno

Level 11, North Tower, 515 St Pauls Terrace
Fortitude Valley QLD 4006
Tel. 07 3369 9822

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Date
AUGUST 2020
Size
A3
Scale
1:17,000

0 0.85
kilometres
Scale 1:17,000

FIGURE 13
POST-DEVELOPMENT MODEL ROUGHNESS - R169

FLOOD MANAGEMENT PLAN

NORTH EAST BUSINESS PARK

APPENDIX B

Design Drawings

Supplied separately by Civil Engineers

APPENDIX C

TUFLOW Results – Regional Events, Pre Development

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.1.1_E008_2V_h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event Peak Flood Levels - 39% AEP

Figure C.1.1

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

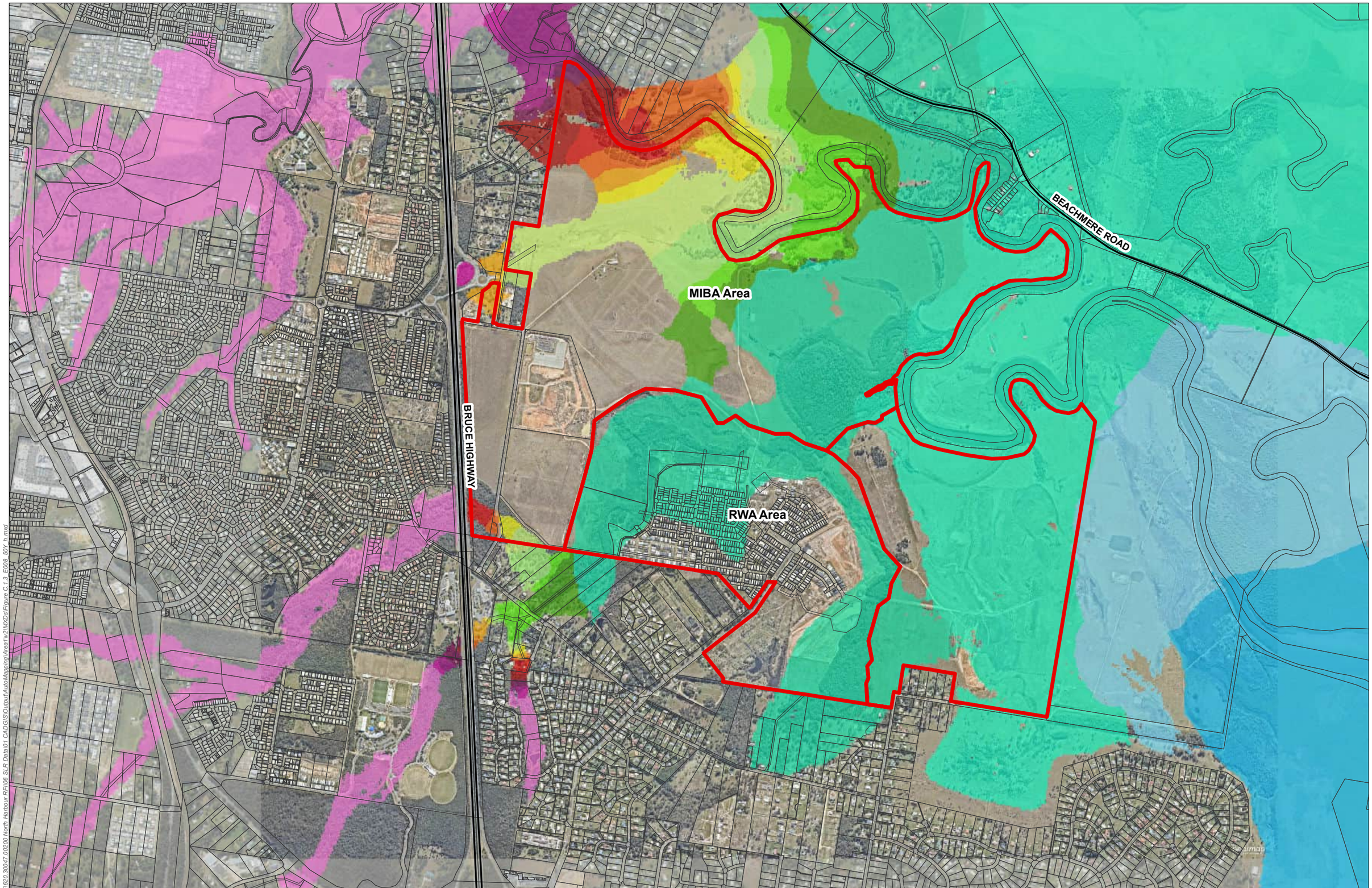
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event Peak Flood Levels - 10% AEP

Figure C.1.2

H:\Projects-SLR\620.BNE\620.BNE.620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.1.2_E008_10Y_h.mxd



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.1.3_E008_50Y_h.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

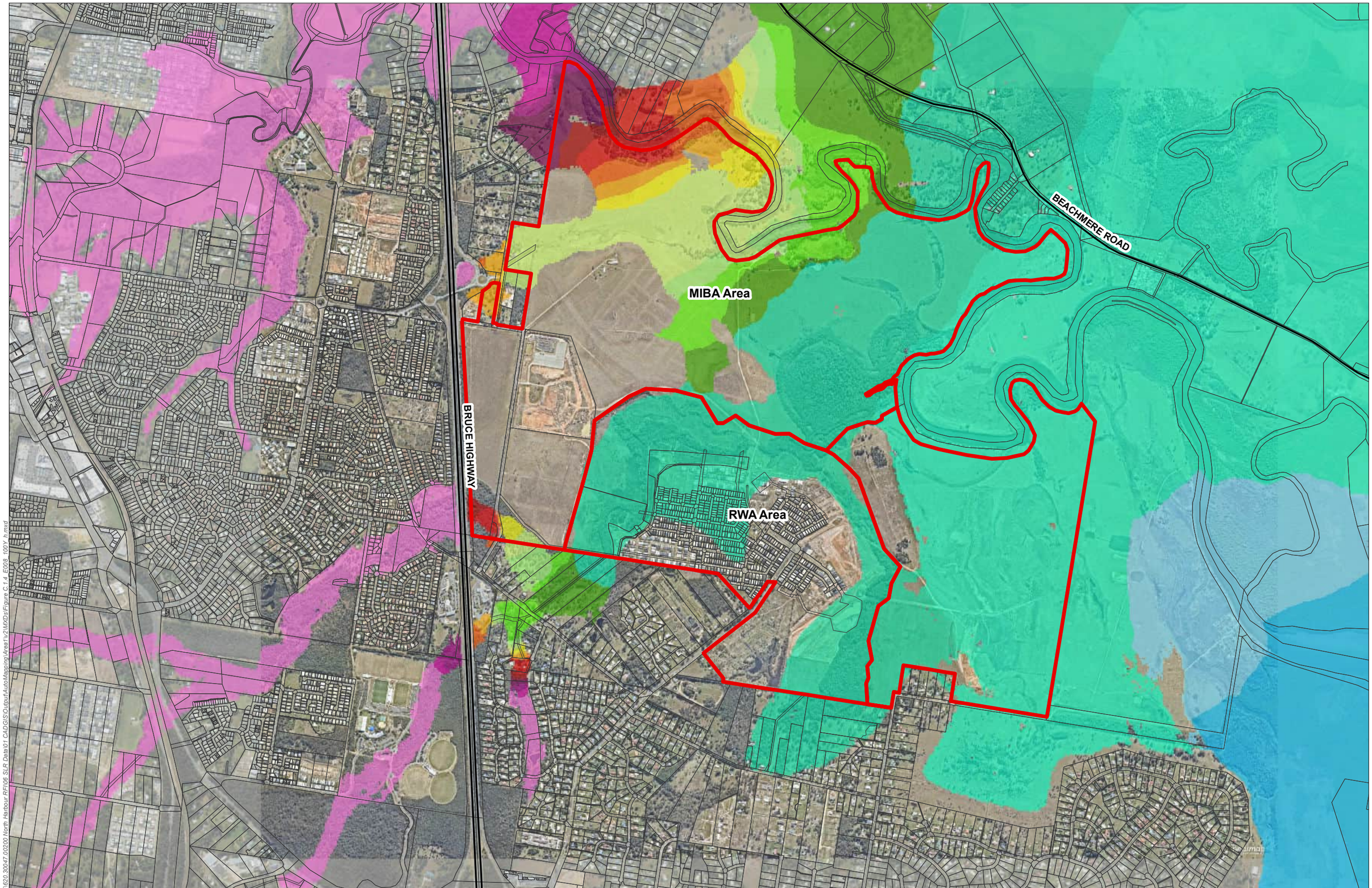
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Levels - 2% AEP

Figure C.1.3



0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

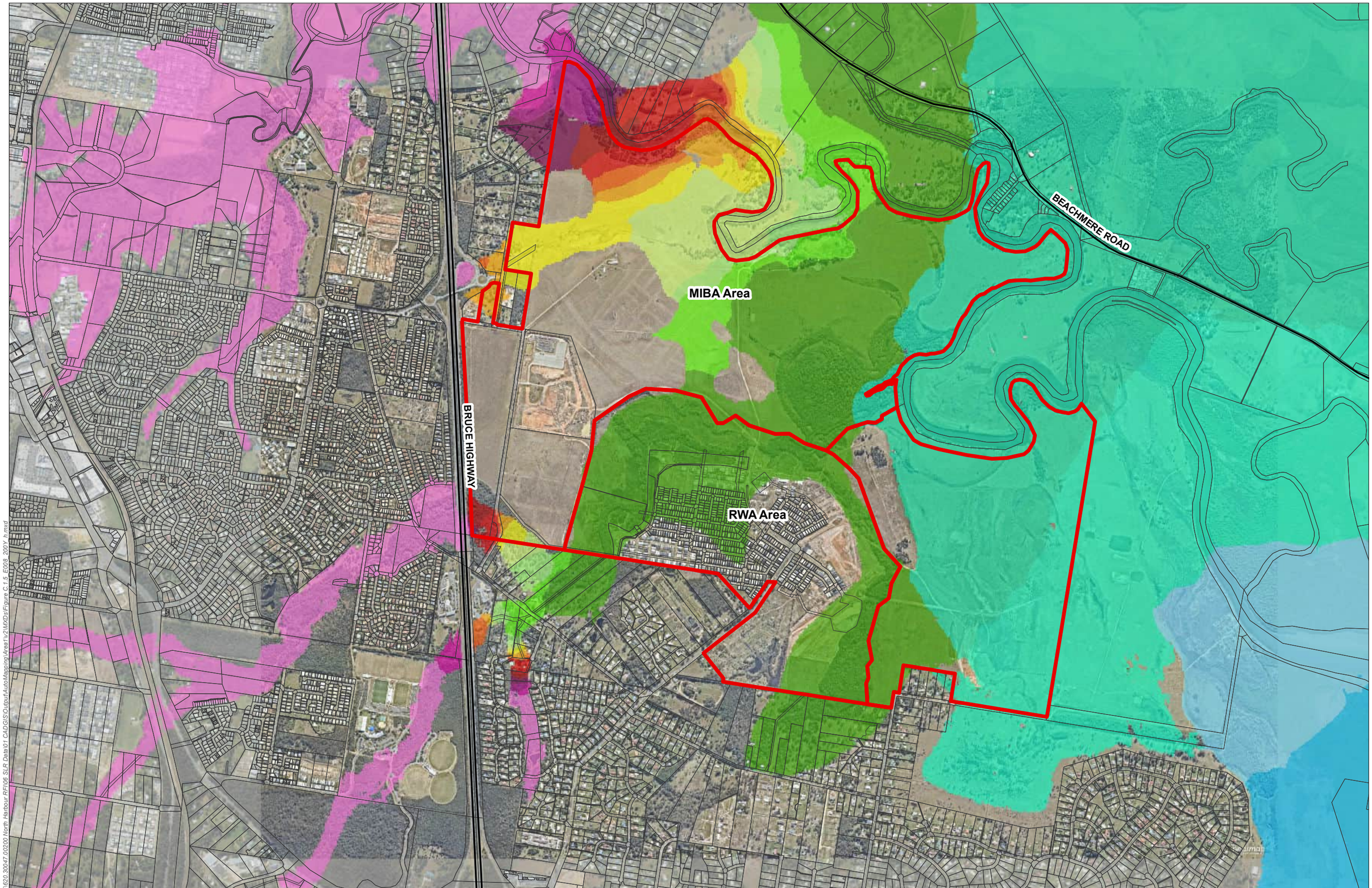
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Levels - 1 % AEP

Figure C.1.4

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.1.4_E008_100Y_h.mxd



H:\Projects-SLR\620.BNE\620.30047.00200.North Harbour RFI\06.SLR Data\01.CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.1.5_E008_200Y_h.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

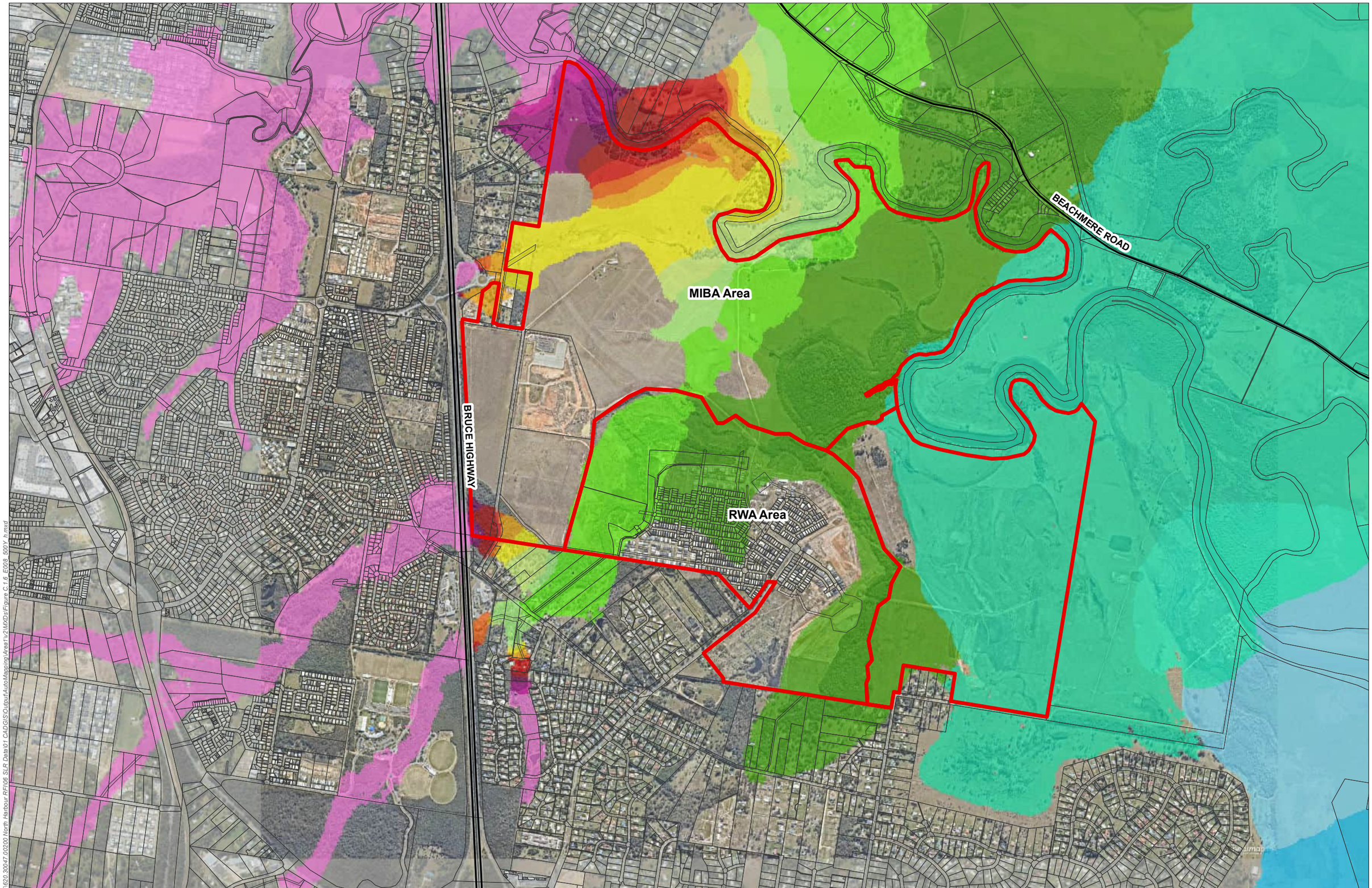
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Levels - 0.5%AEP

Figure C.1.5



H:\Projects-SLR\620.BNE\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.1.6_E008_500Y_h.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

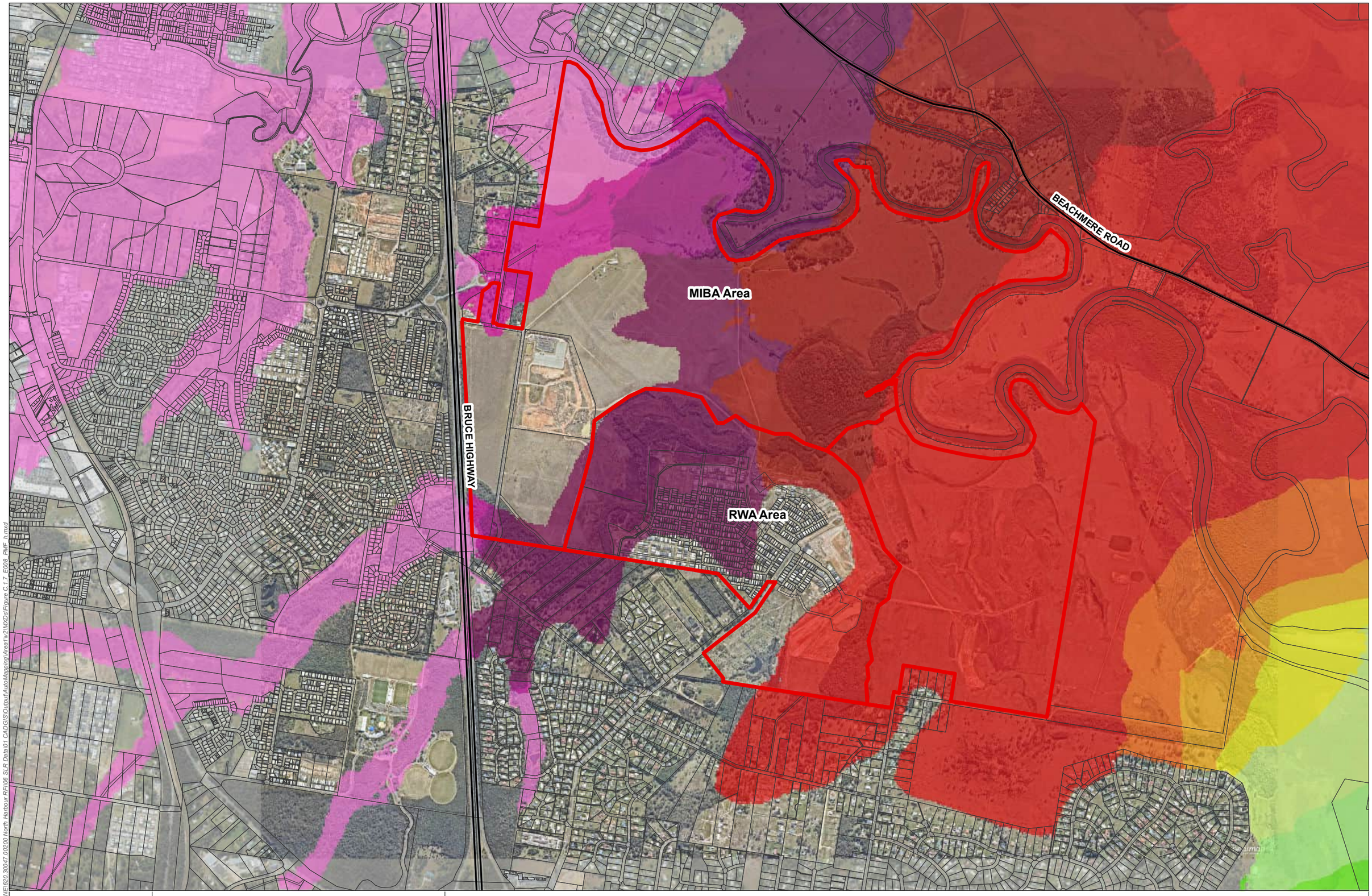
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Levels - 0.2% AEP

Figure C.1.6



H:\Projects-SLR\620-BNE\620-BNE620.300047.00200 North Harbour RFI\05 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.1.7_E008_PMF_h.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

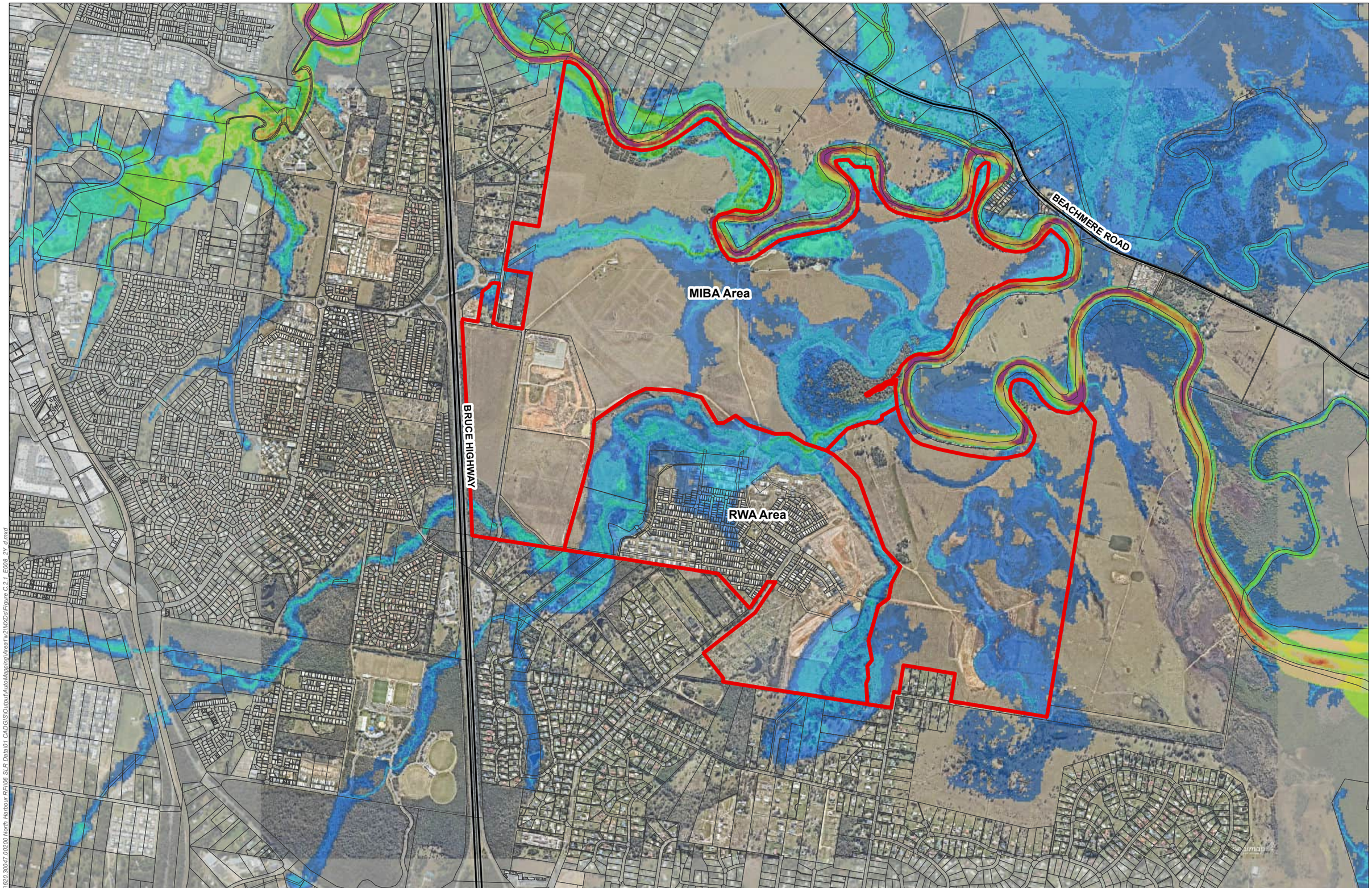
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event Peak Flood Levels - PMF

Figure C.1.7



H:\Projects-SL\EI620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.2.1_E008_2V_d.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

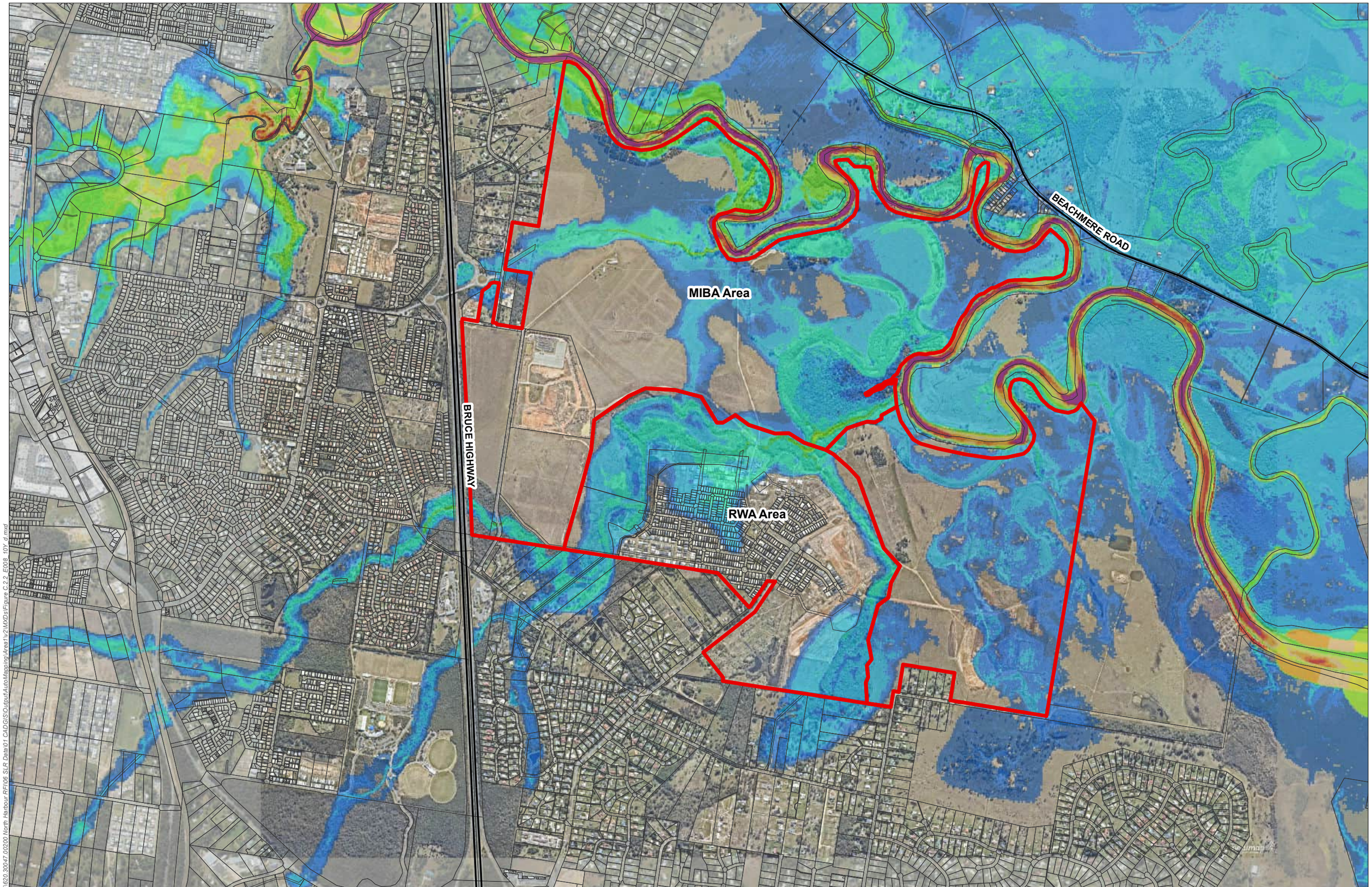
Depth (m)

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0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Depths - 39% AEP

Figure C.2.1



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.2.2_E008_10Y_d1.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

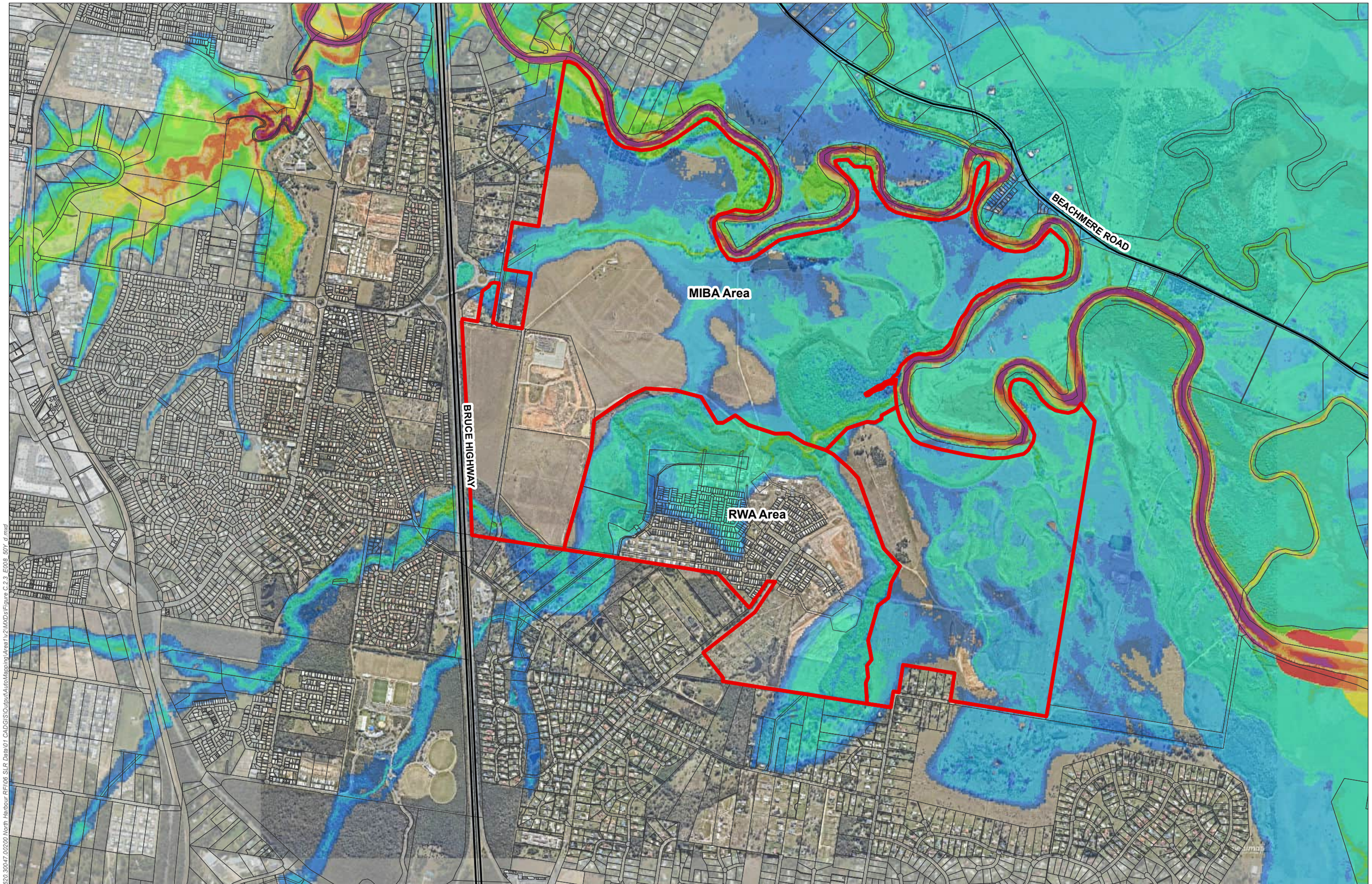
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0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Depths - 10% AEP

Figure C.2.2



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.2.3_E008_50Y_f4.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

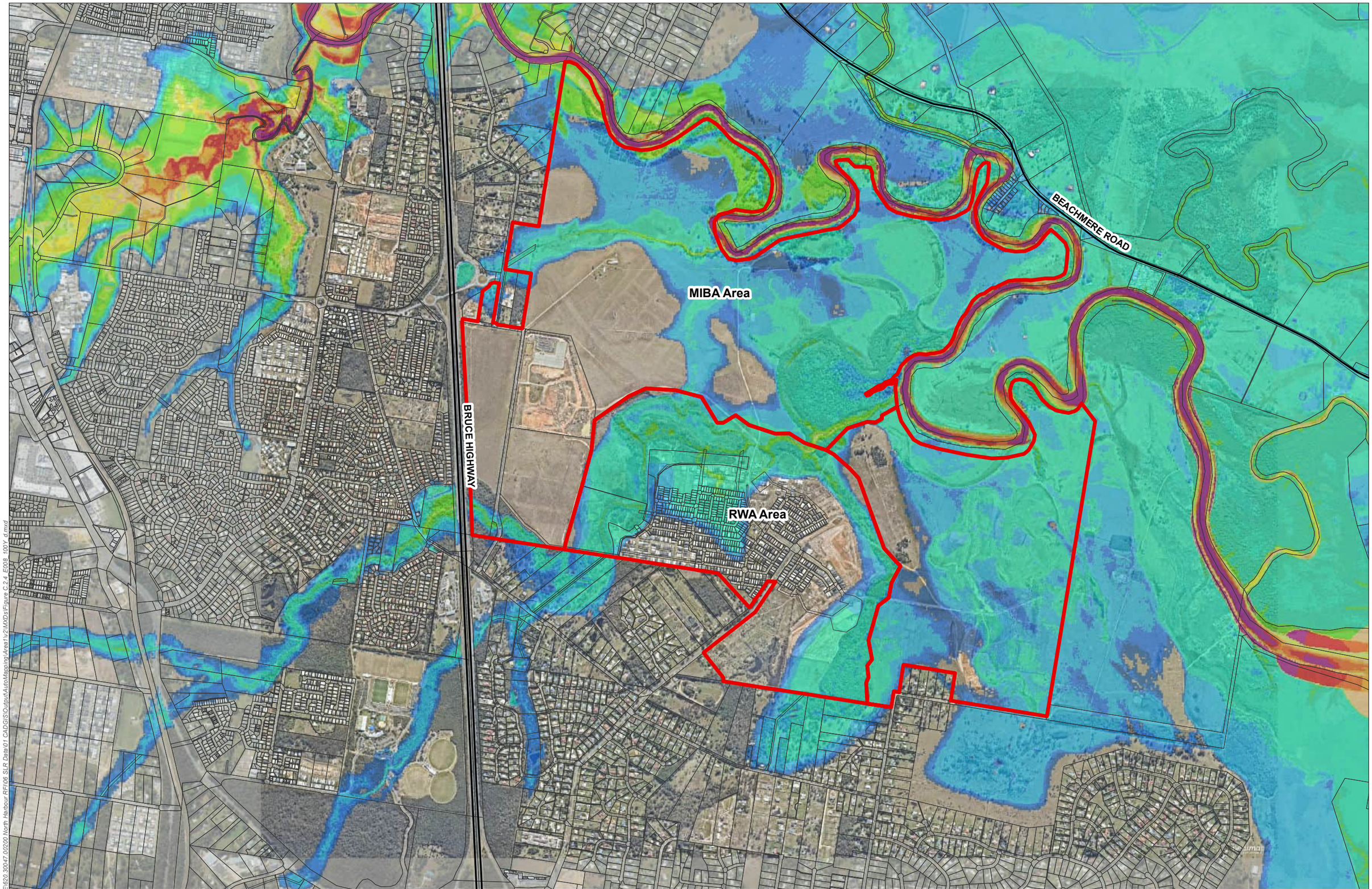
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Depths - 2% AEP

Figure C.2.3



H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.2.4_E008_100Y.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

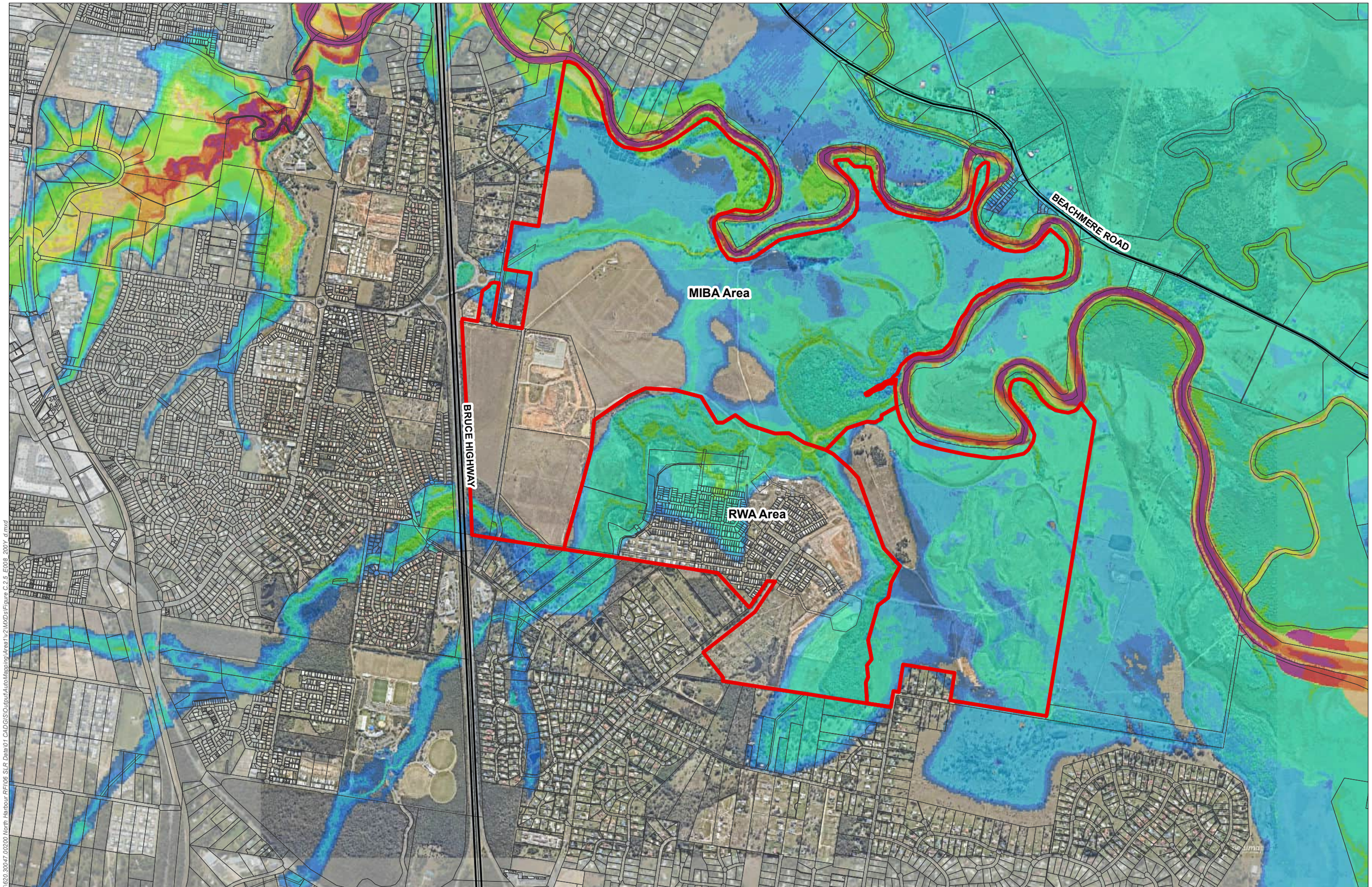
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Depths - 1 % AEP

Figure C.2.4



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.2.5_E008_200Y.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

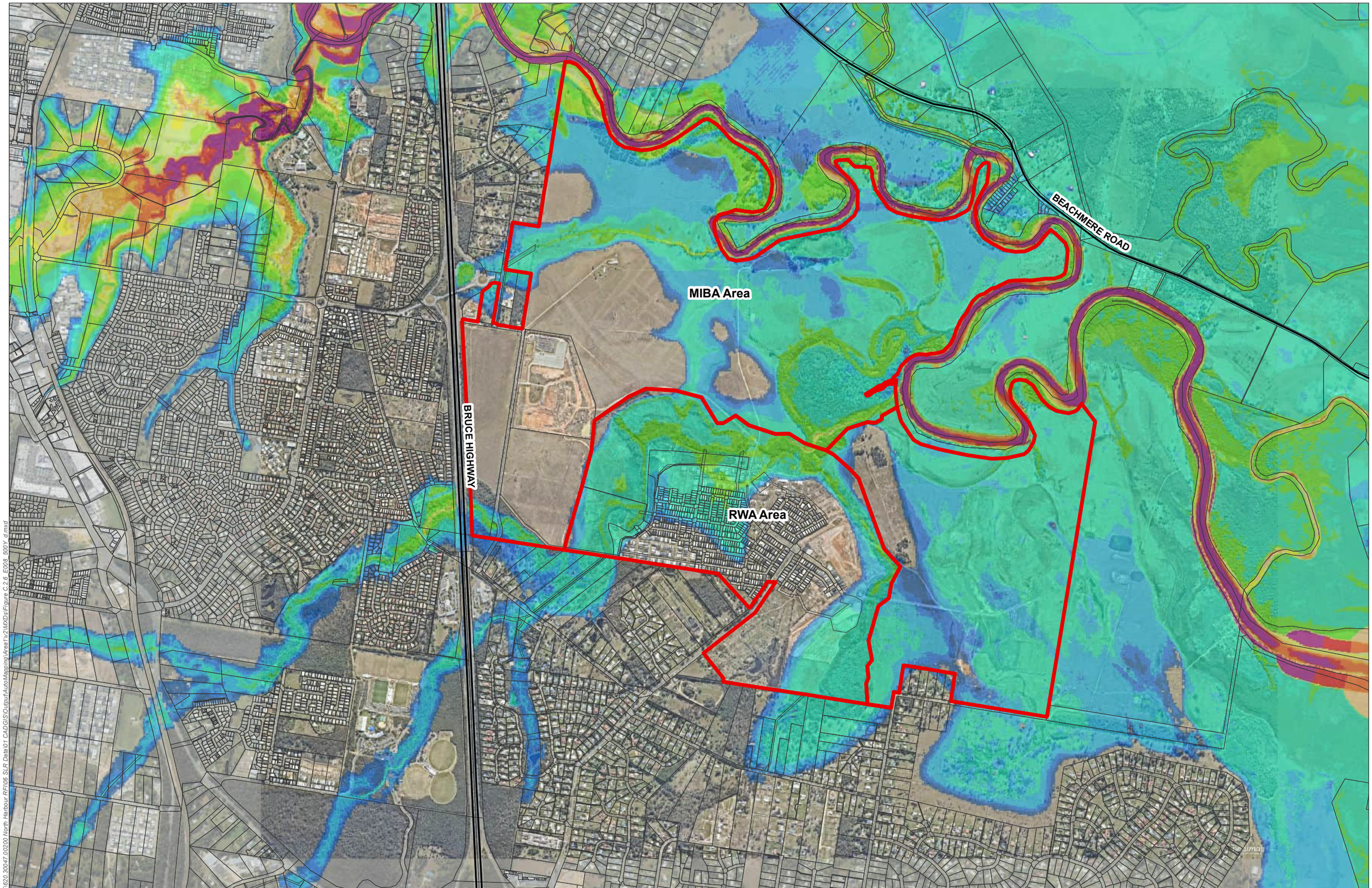
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Depths - 0.5%AEP

Figure C.2.5



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.2.6_E008_500Y.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

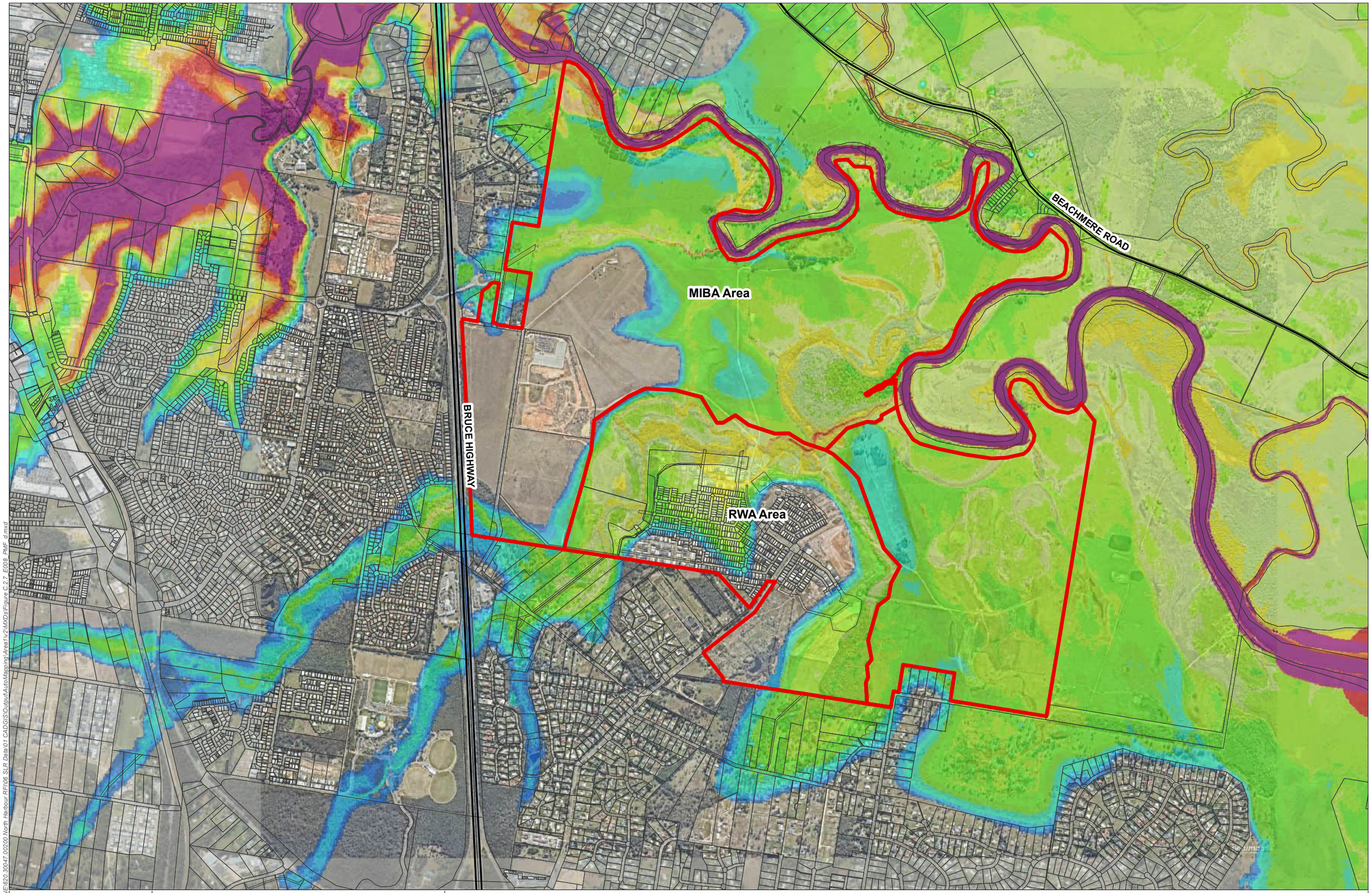
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Depths - 0.2% AEP

Figure C.2.6



0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Depths - PMF

Figure C.2.7

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.2.7_E008_PMF_d.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

Site Boundary

Cadastre Boundary

Velocity (m/s)

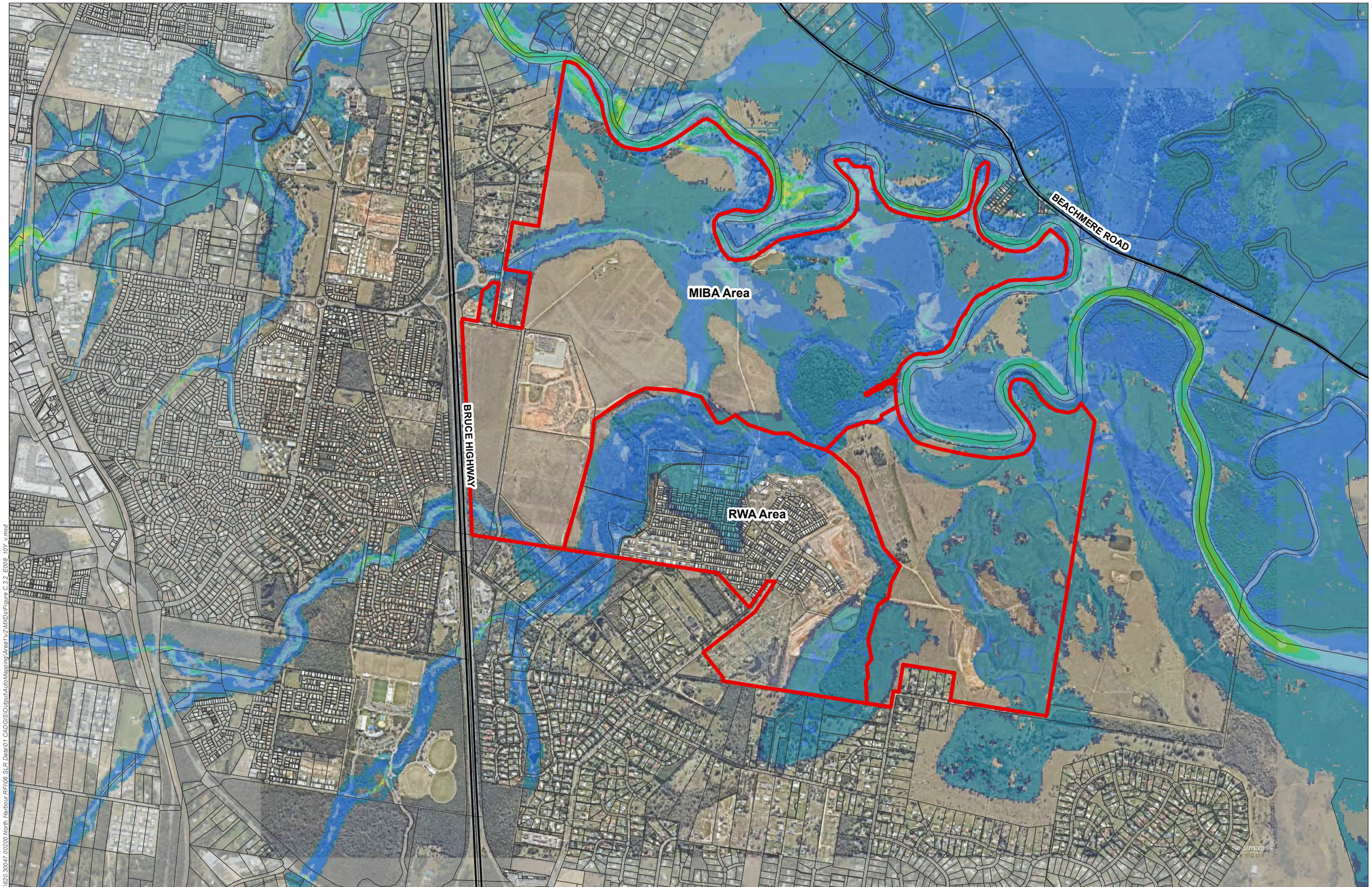
Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Velocities - 39% AEP

Figure C.3.1

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Outputs\AutoMapping\Area1\v2\MXDs\Figure C.3.1_E008_PV_v.mxd



SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

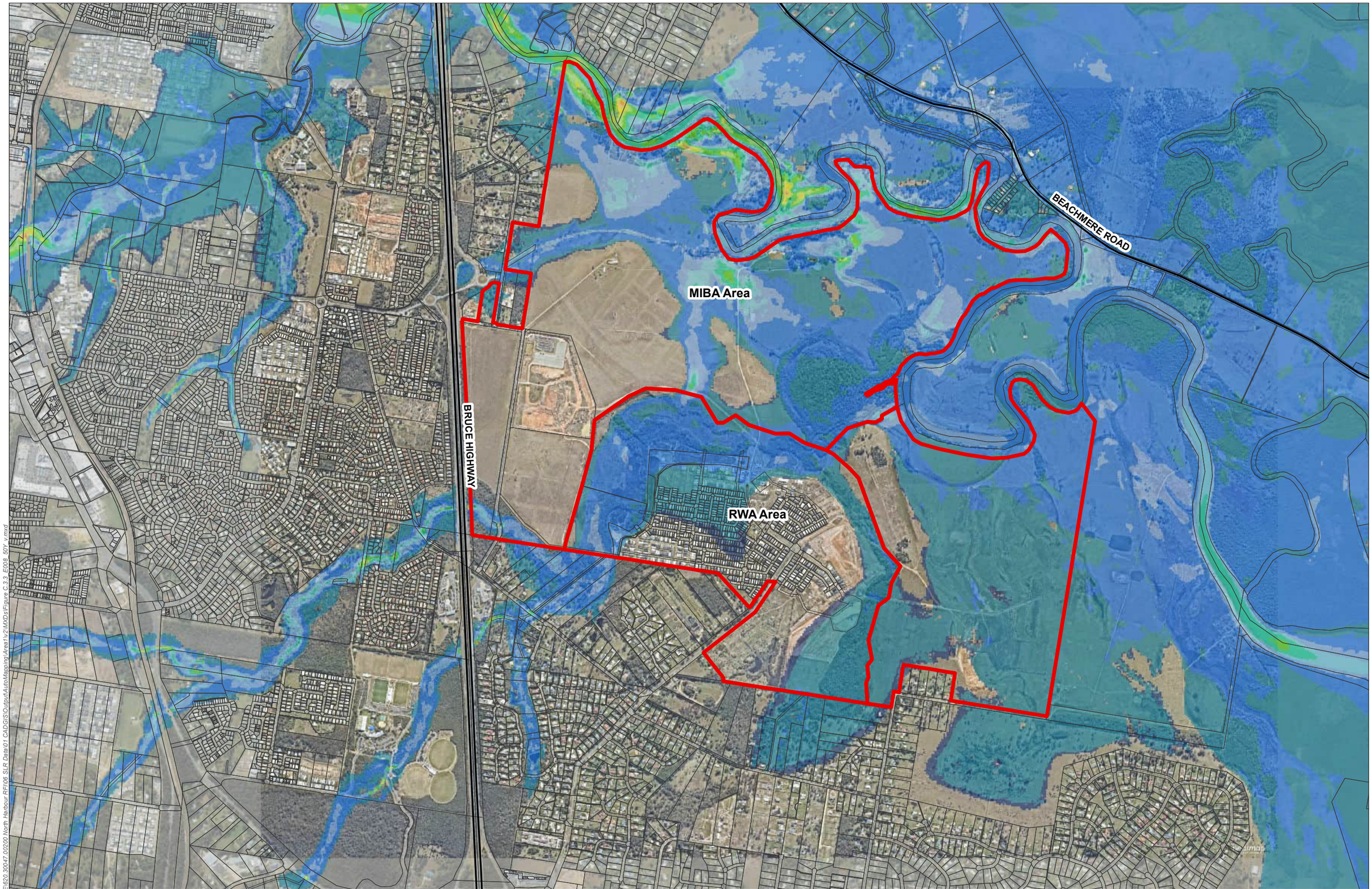
Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Velocities - 10% AEP

Figure C.3.2

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.3.2_E008_10Y_v.mxd



H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.3.3_E008_50Y.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

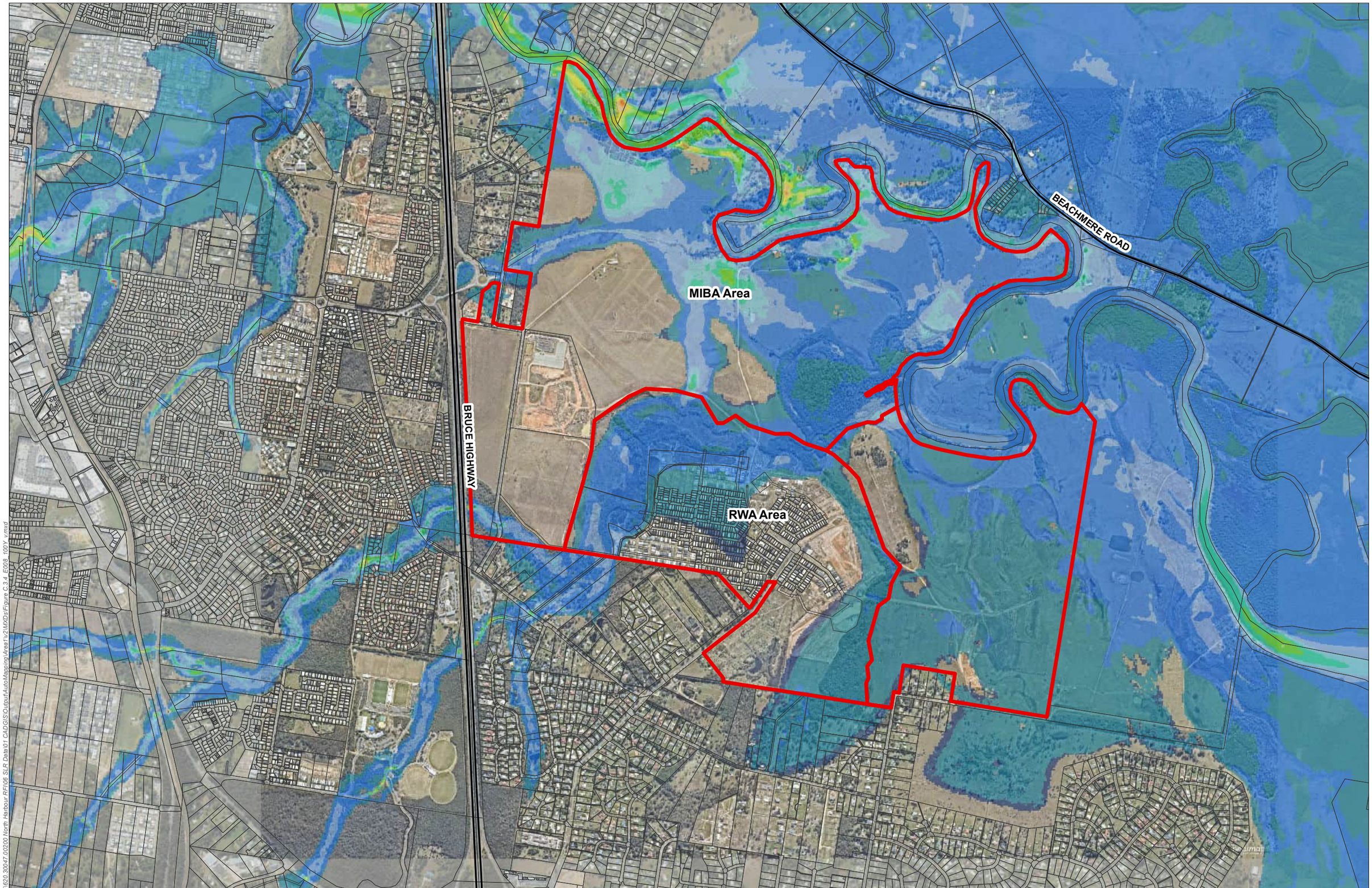
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Velocities - 2% AEP

Figure C.3.3



0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

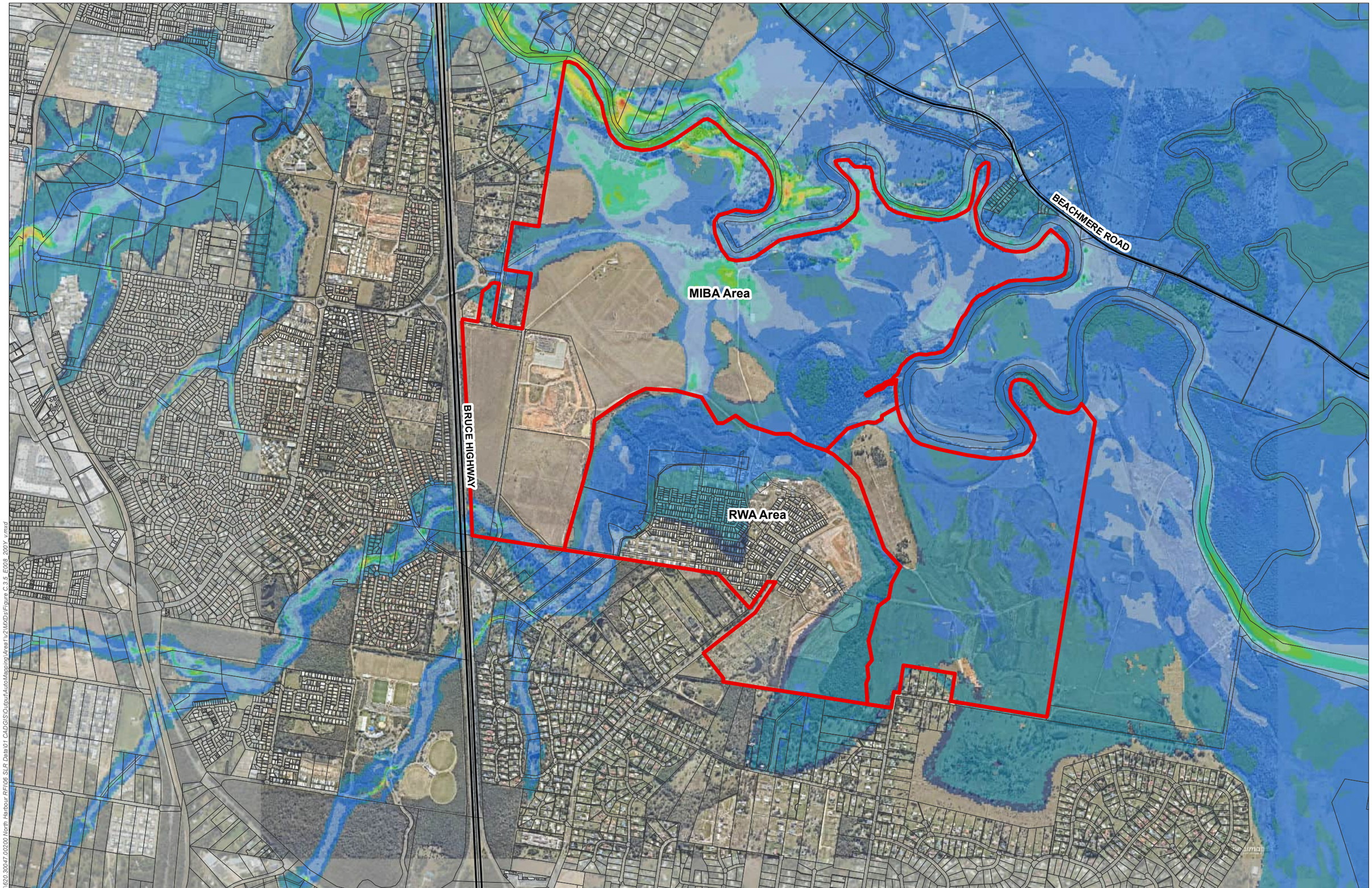
Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Velocities - 1 % AEP

Figure C.3.4

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.3.4_E008_100Y_v.mxd



H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.3.5_E008_200Y.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Velocities - 0.5%AEP

Figure C.3.5

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

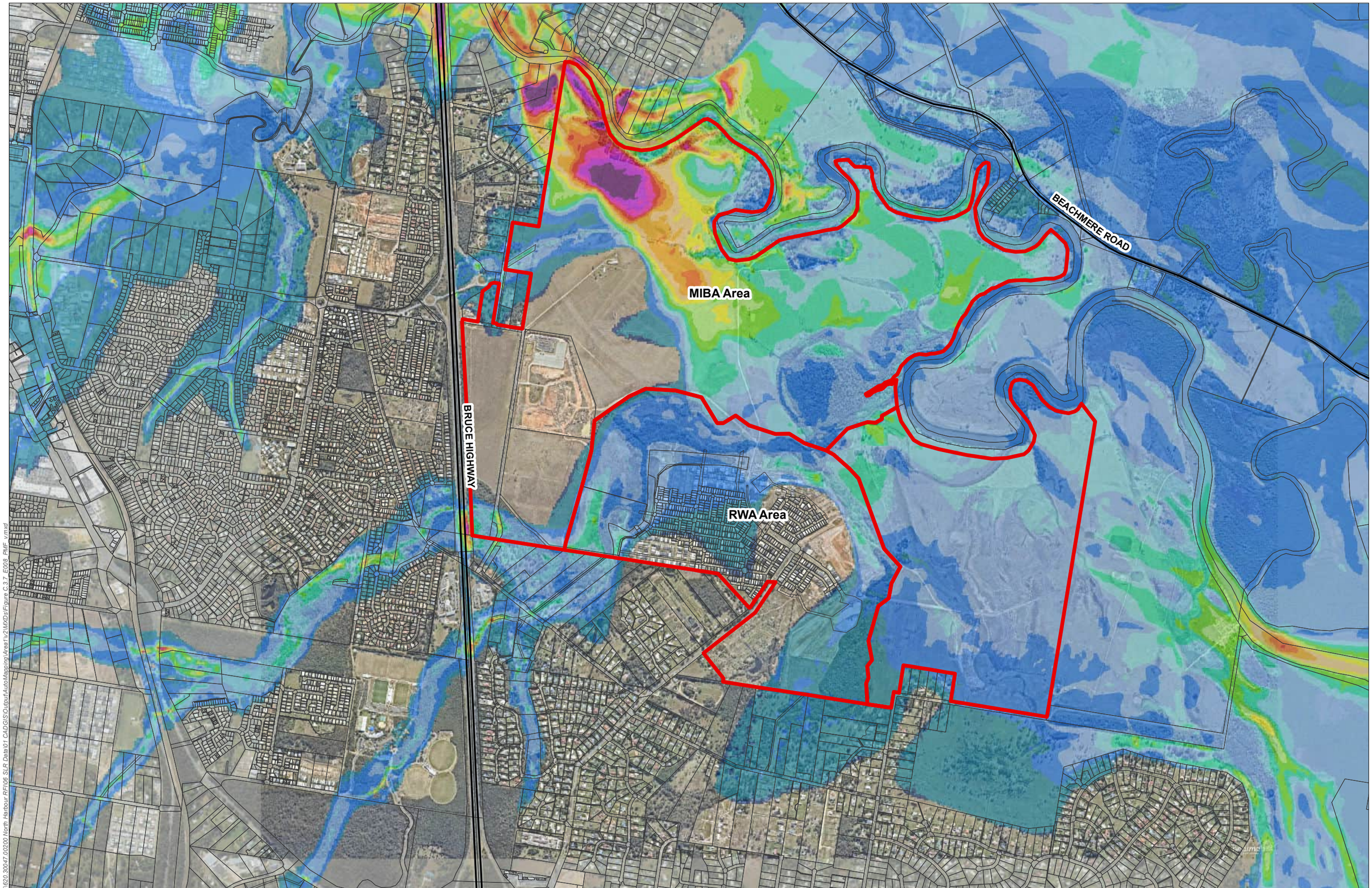
Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Velocities - 0.2% AEP

Figure C.3.6

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.3.6_E008_500Y_v.mxd



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure C.3.7_E008_PMF_v.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) Regional Event
Peak Flood Velocities - PMF

Figure C.3.7

APPENDIX D

TUFLOW Results – Regional Events, Post Development

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects\SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.1.1_D146_2Y_h.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Levels - 39% AEP

Figure D.1.1

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

Site Boundary

Cadastre Boundary

Level (m AHD)

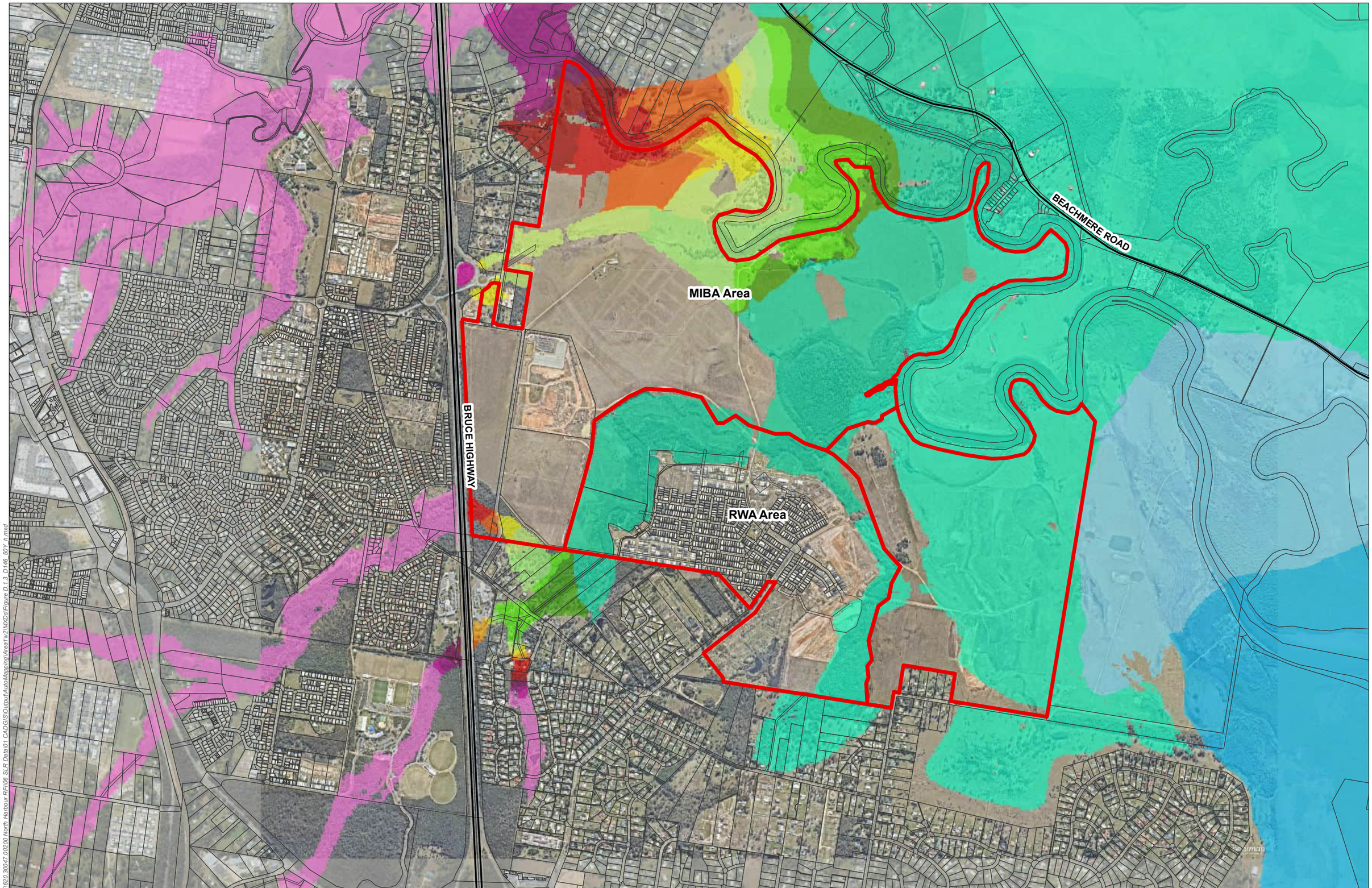
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Levels - 10% AEP

Figure D.1.2

H:\Projects-SLR\620-BNE\620-BNE620.300471.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.1.2_D146_10Y_h.mxd



H:\Projects-SL\610_BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.1.3_D146_50Y_A.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Levels - 2% AEP

Figure D.1.3

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

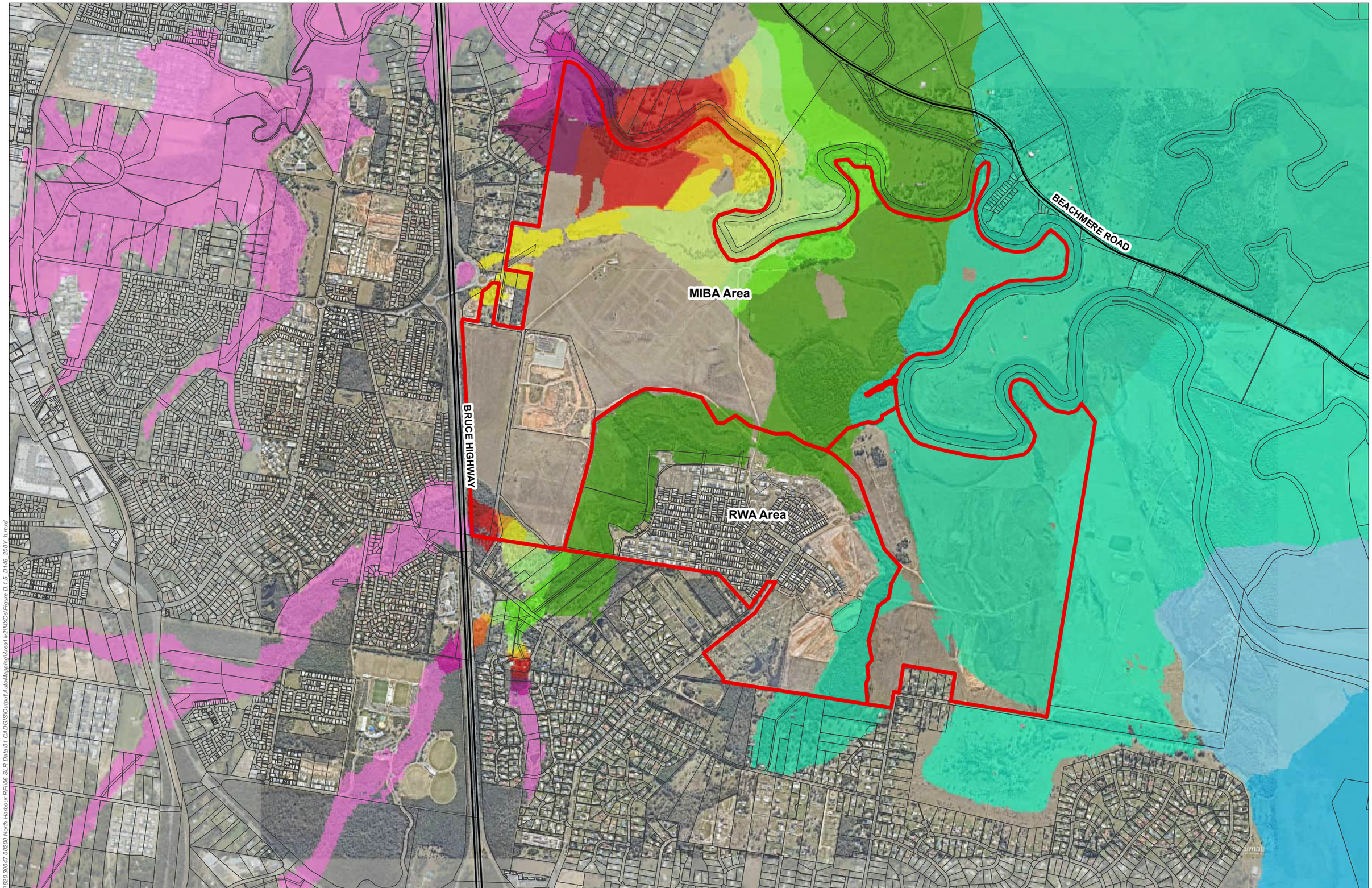
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Levels - 1 % AEP

Figure D.1.4

H:\Projects-SLR\620.BNE\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.1.4_D146_100Y_h.mxd



SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

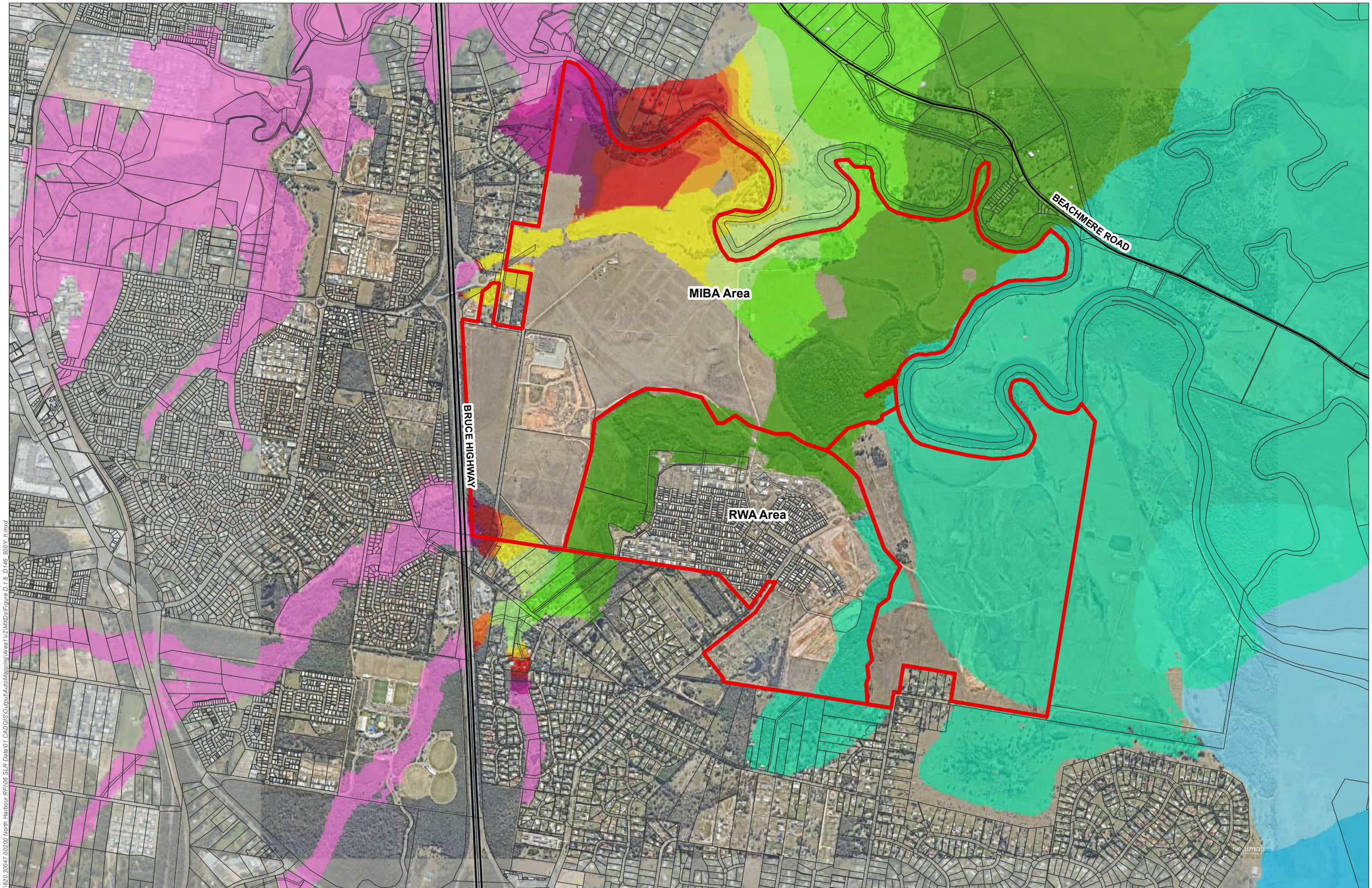
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Levels - 0.5%AEP

Figure D.1.5

H:\Projects-SLR\620.BNE\620.BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.1.5_D146_200Y_h.mxd



H:\Projects-SLR\620.BNE\620.BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.1.6_D146_500Y_h.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Levels - 0.2% AEP

Figure D.1.6

BEACHMERE ROAD

MIBA Area

BRUCE HIGHWAY

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\05 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.1.7_D146_PMF_h.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

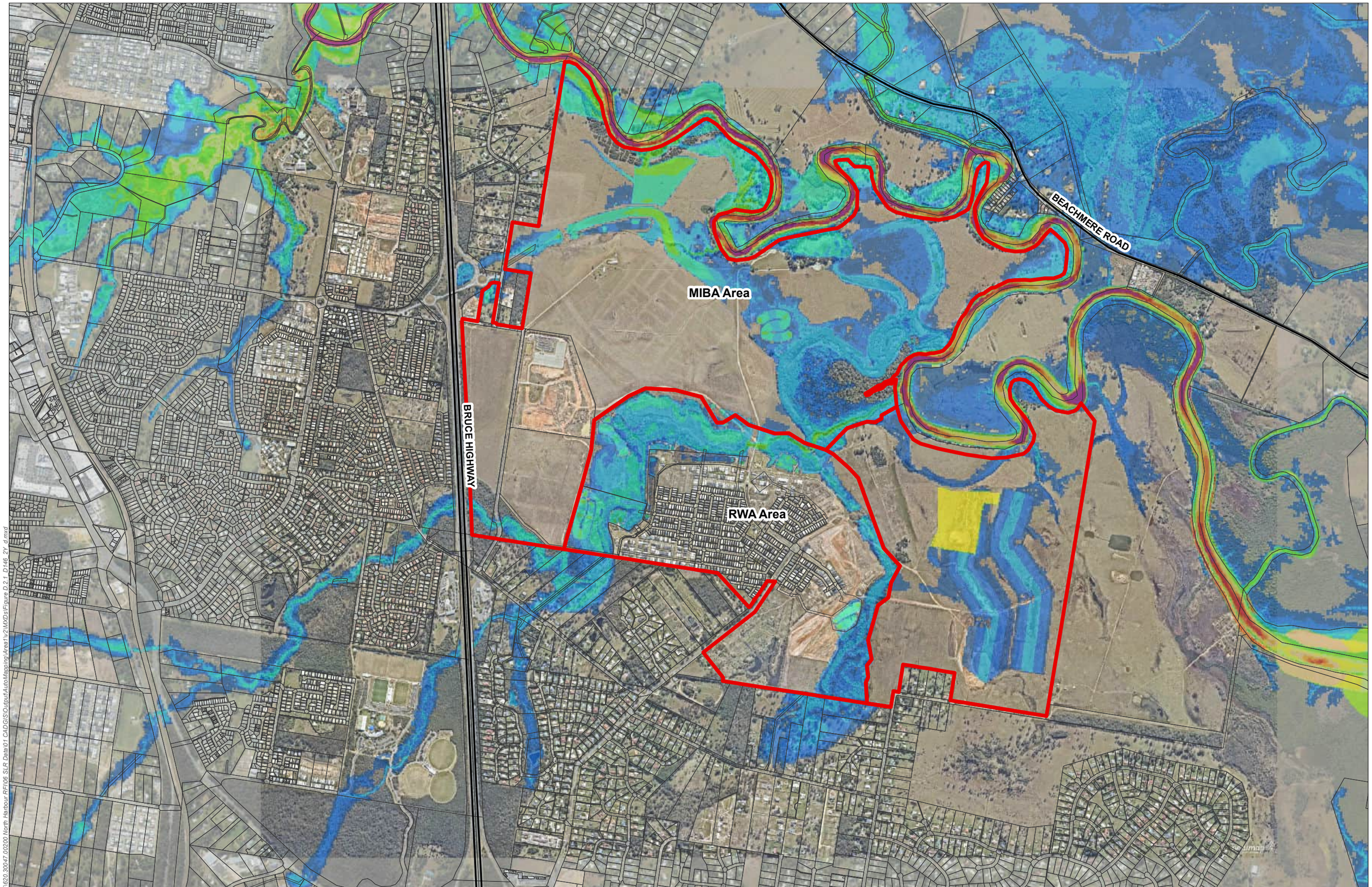
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event Peak Flood Levels - PMF

Figure D.1.7



0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

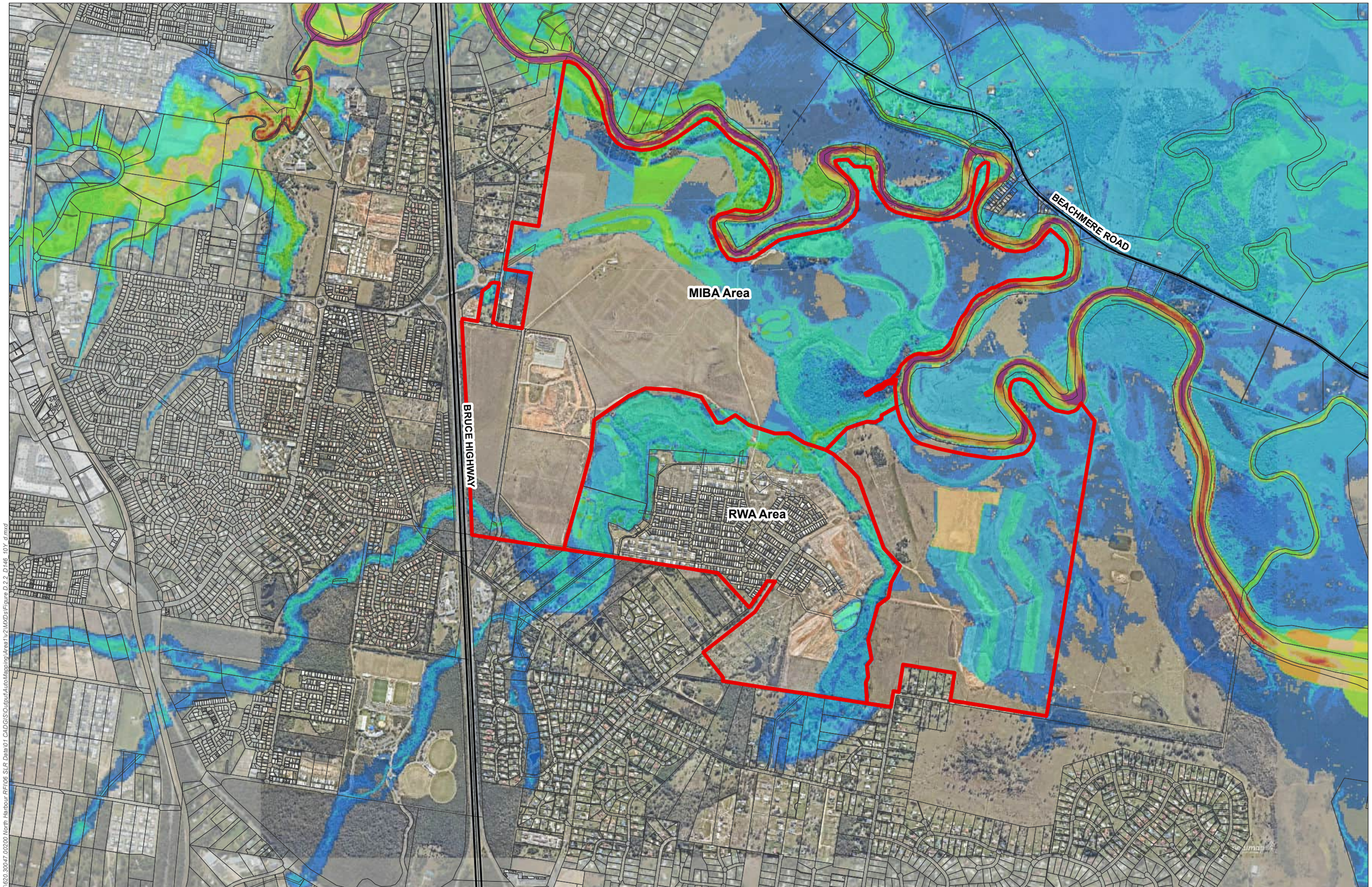
0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Depths - 39% AEP

Figure D.2.1

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.2.1_D146_2Y_d.mxd



H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.2.2_D146_10Y_d.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

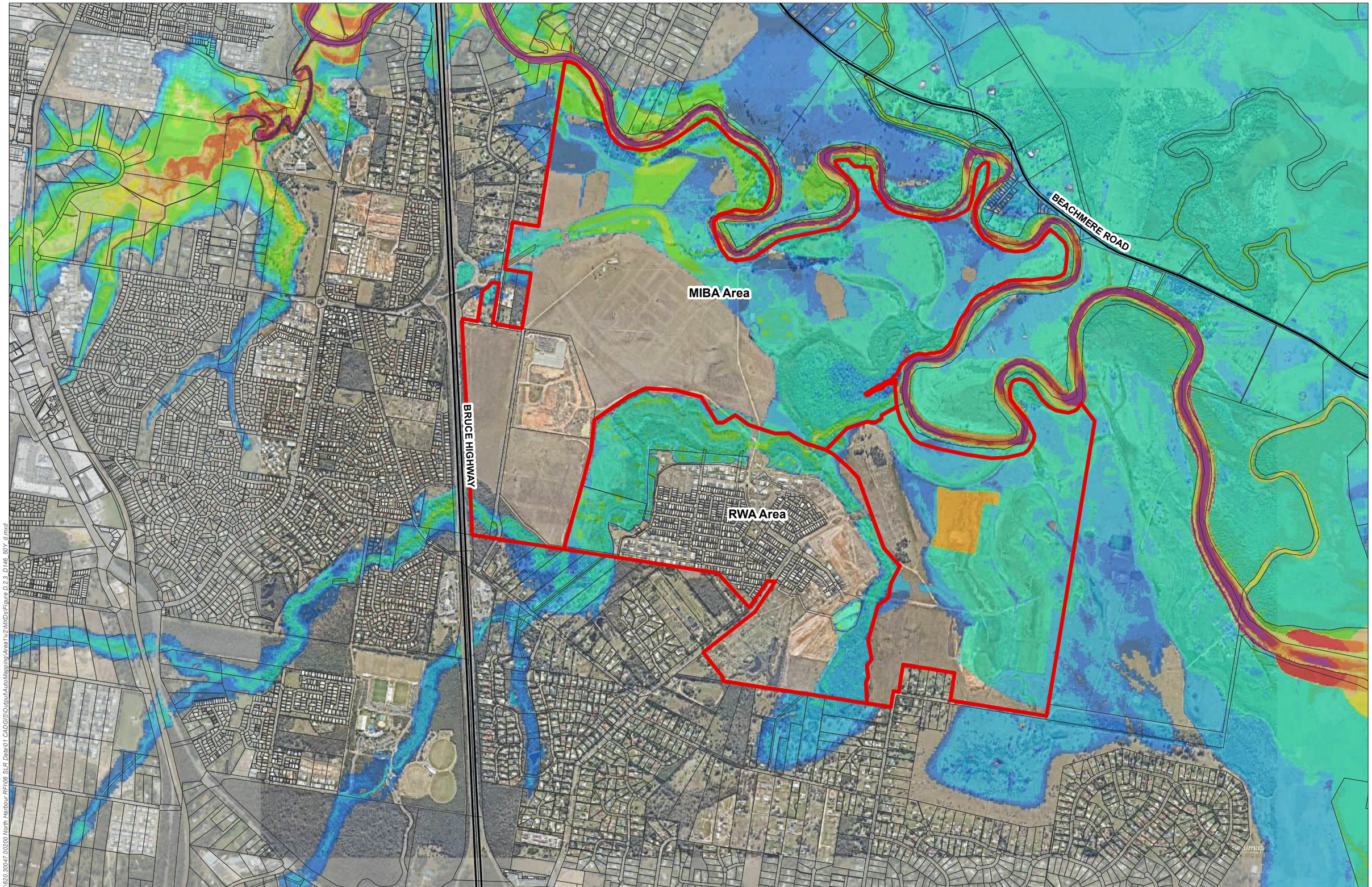
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Depths - 10% AEP

Figure D.2.2



H:\Projects-SLR\620.BNE\620.BNE620.300\47.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.2.3_D146_50Y_4.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

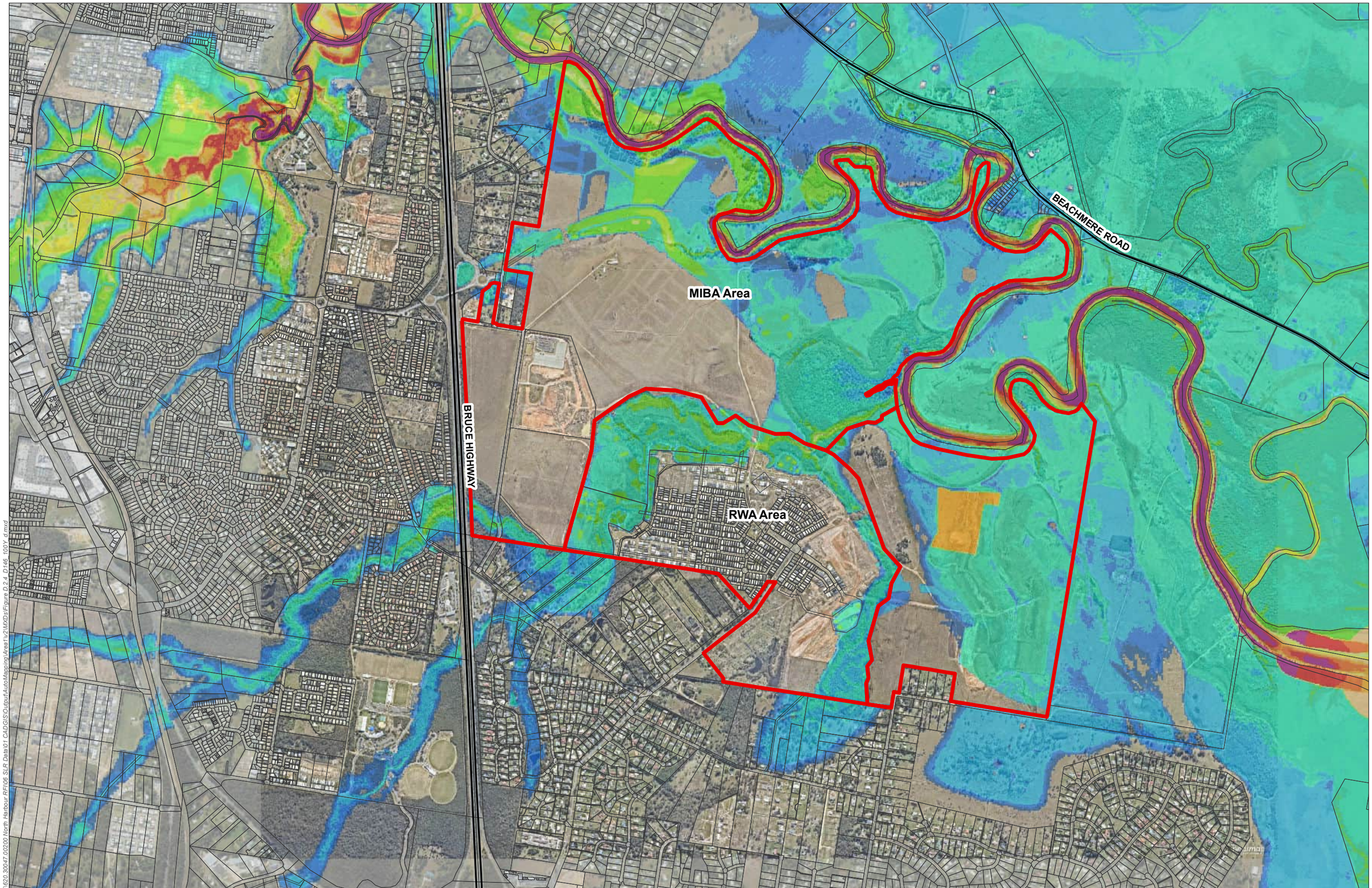
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Depths - 2% AEP

Figure D.2.3



H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.2.4_D146_100Y.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

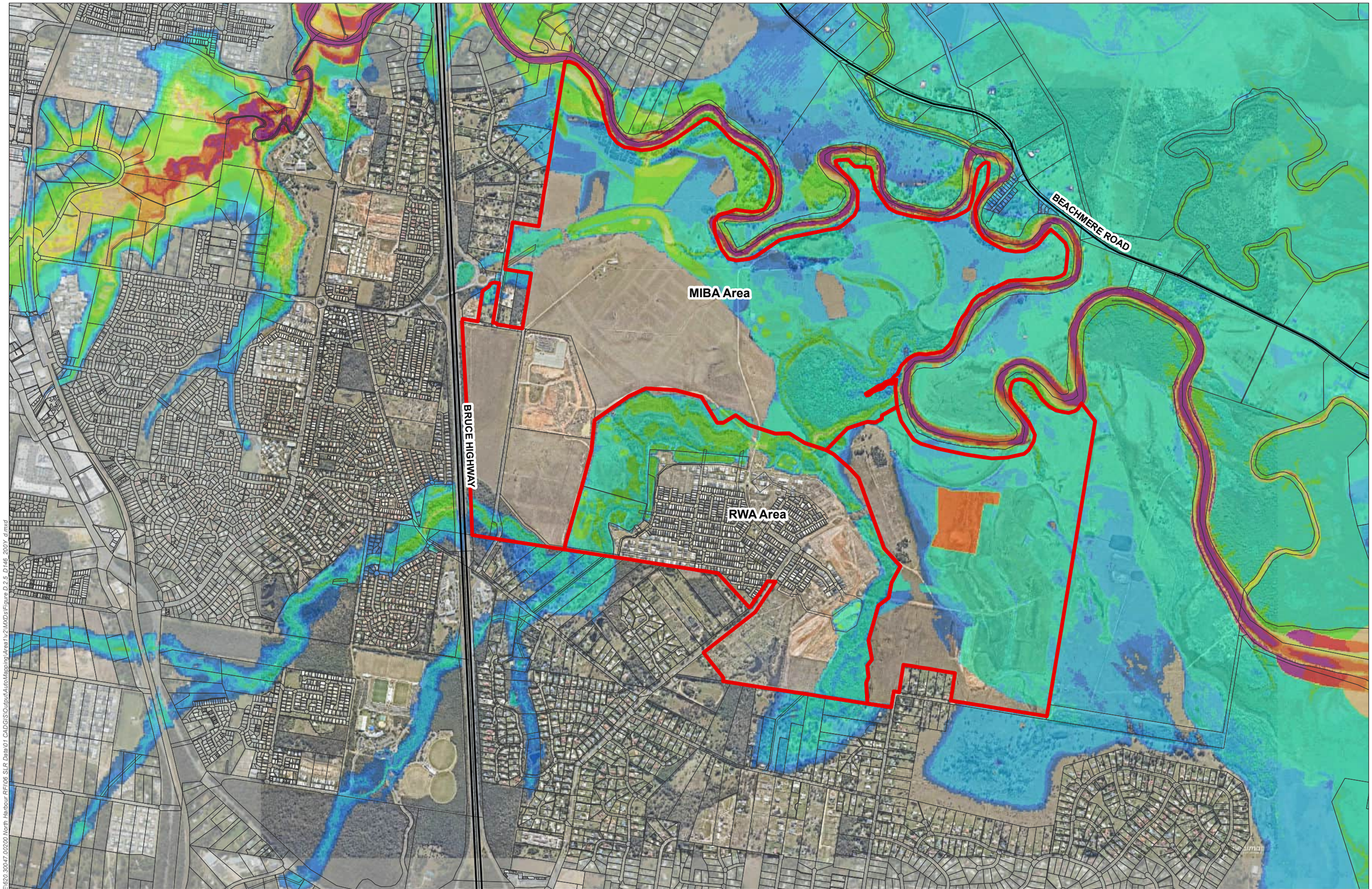
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Depths - 1 % AEP

Figure D.2.4



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.2.5_D146_200Y.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

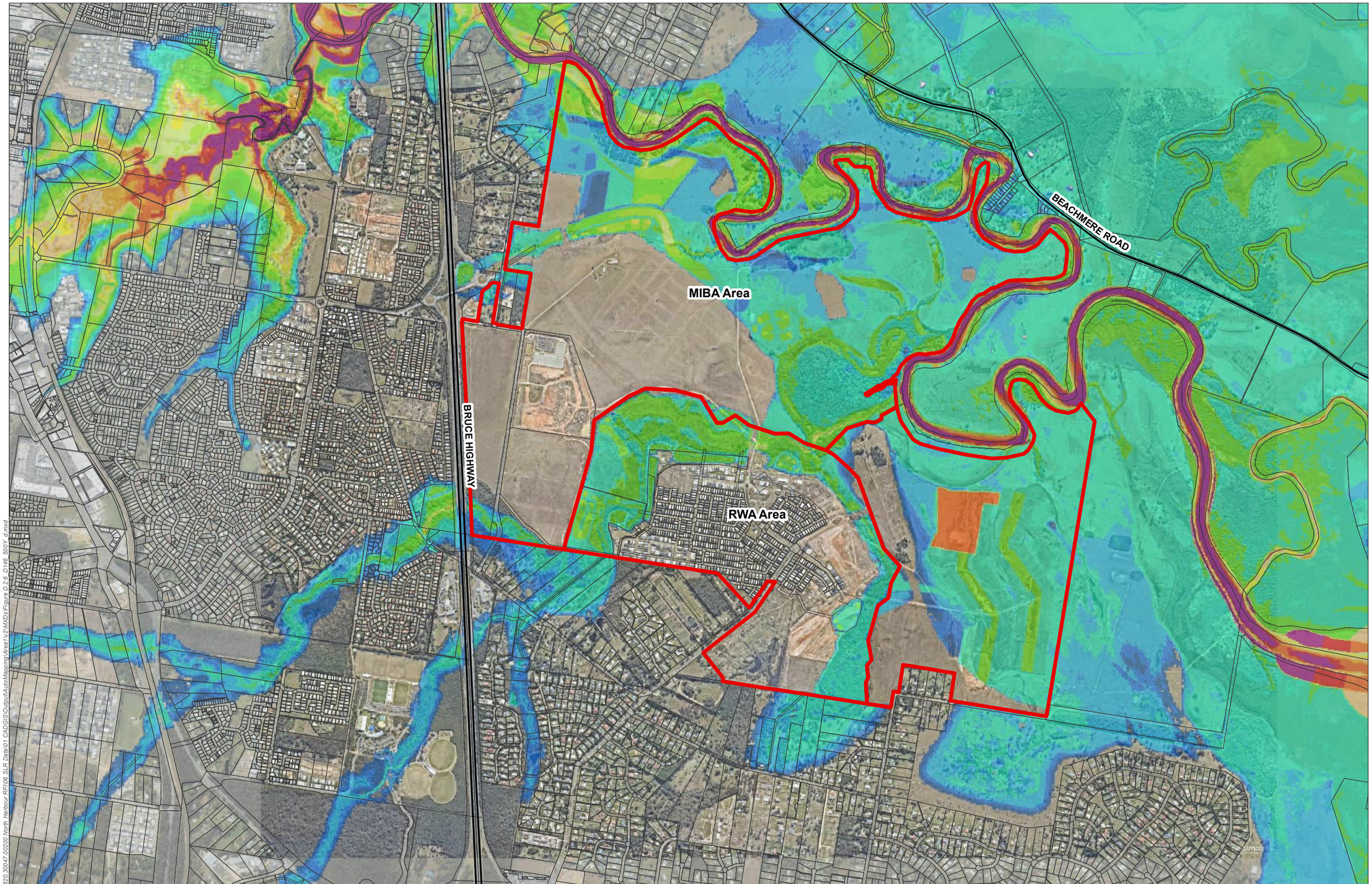
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Depths - 0.5%AEP

Figure D.2.5



H:\Projects-SLR\620.BNE\620.30047.00200.North Harbour RFI\06.SLR Data\01.CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.2.6_D146_500Y.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

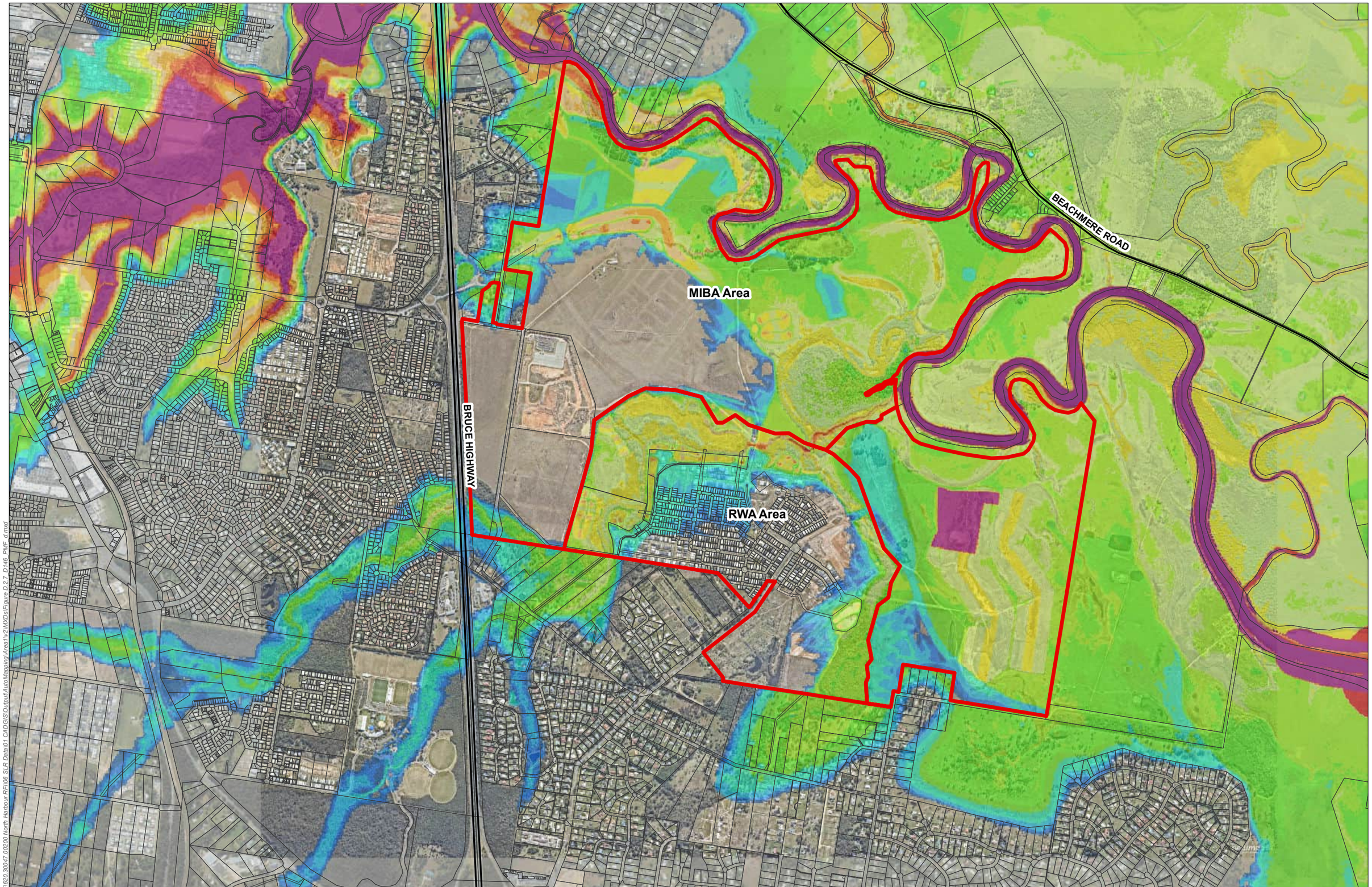
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Depths - 0.2% AEP

Figure D.2.6



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.2.7_D146_PMF_d.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

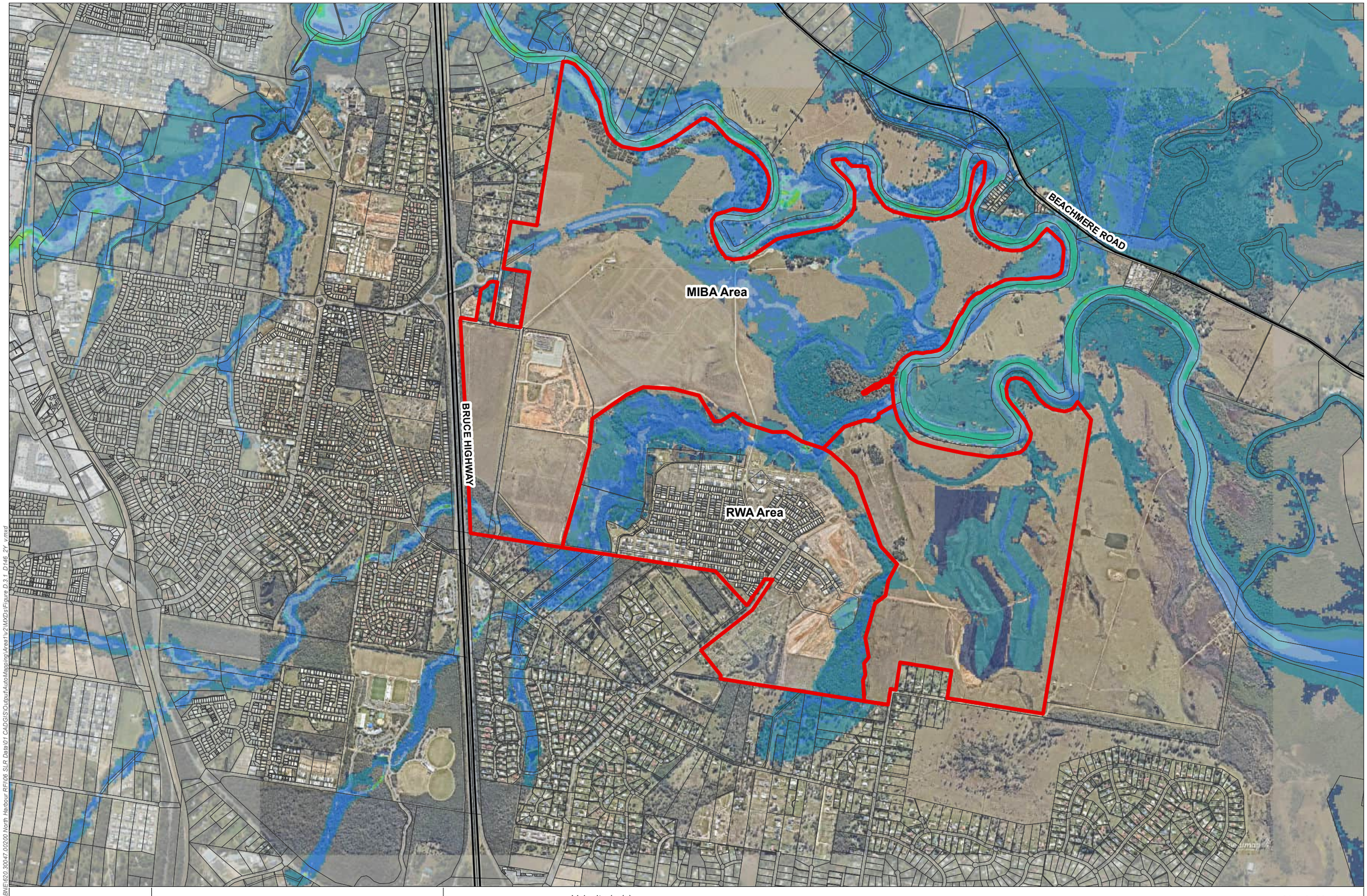
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Depths - PMF

Figure D.2.7



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.3.1_D146_2Y_v.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

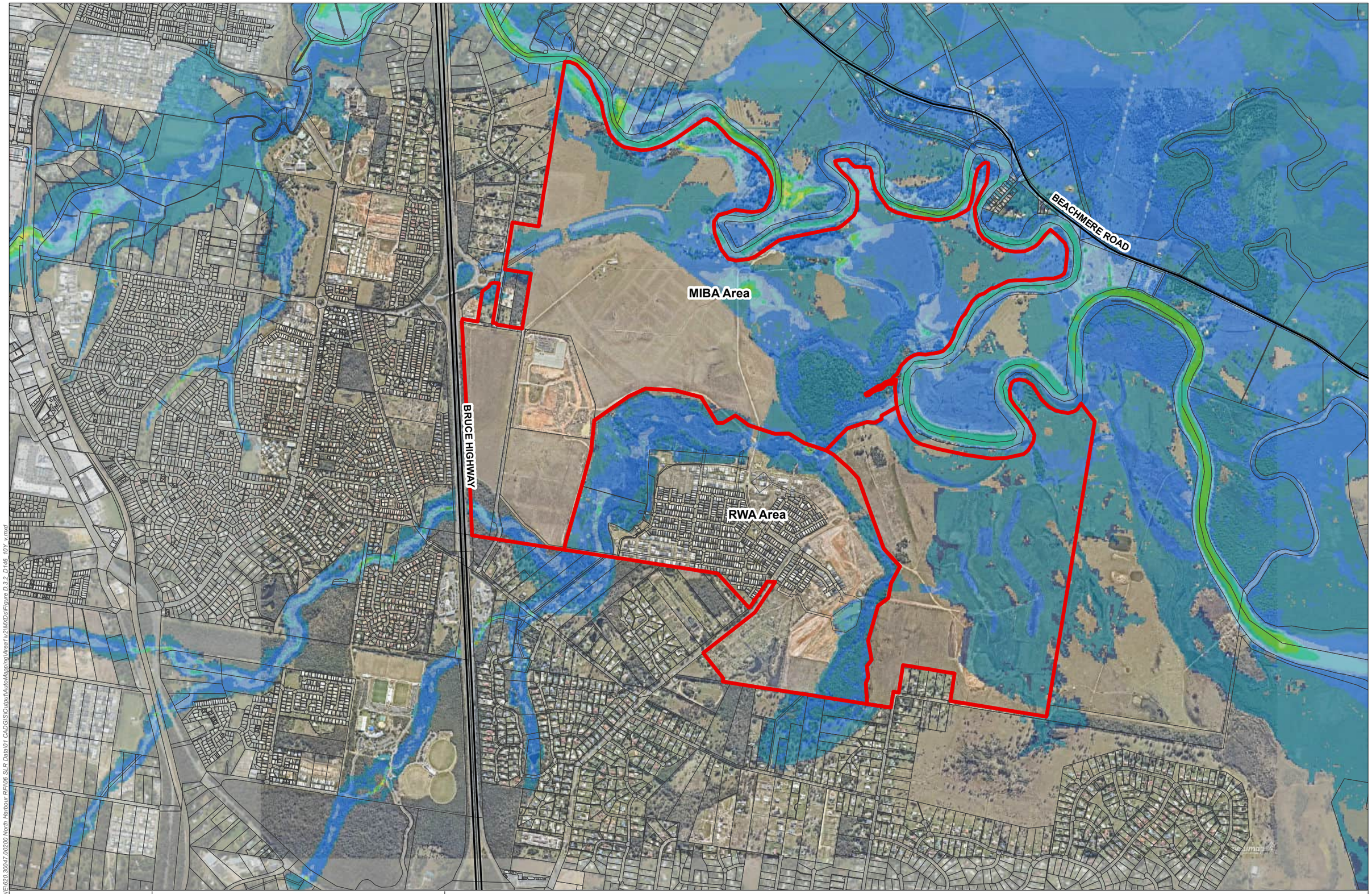
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Velocities - 39% AEP

Figure D.3.1



H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.3.2_D146_10Y.vmxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

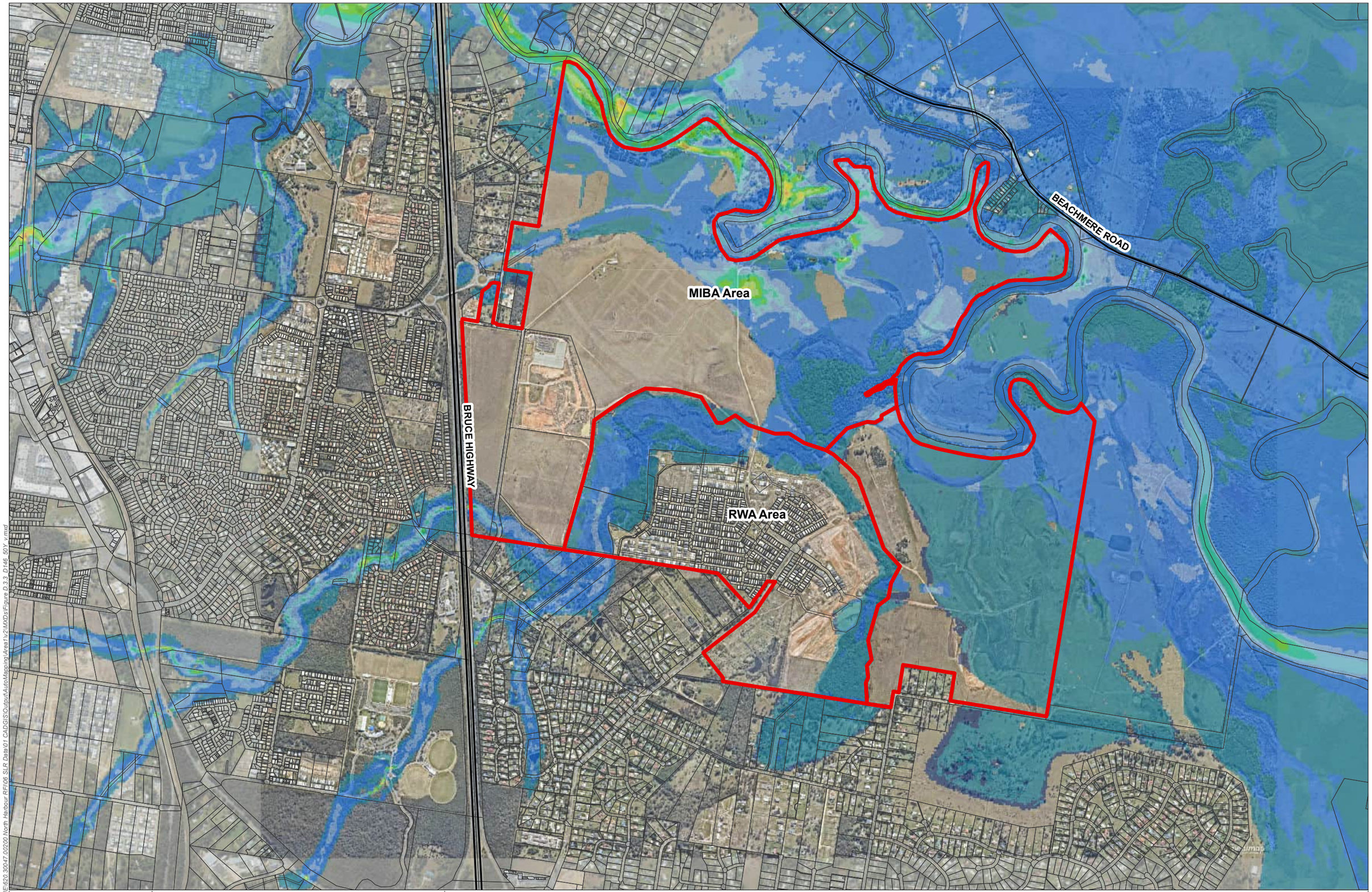
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Velocities - 10% AEP

Figure D.3.2



H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.3.3_D146_50Y_v.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

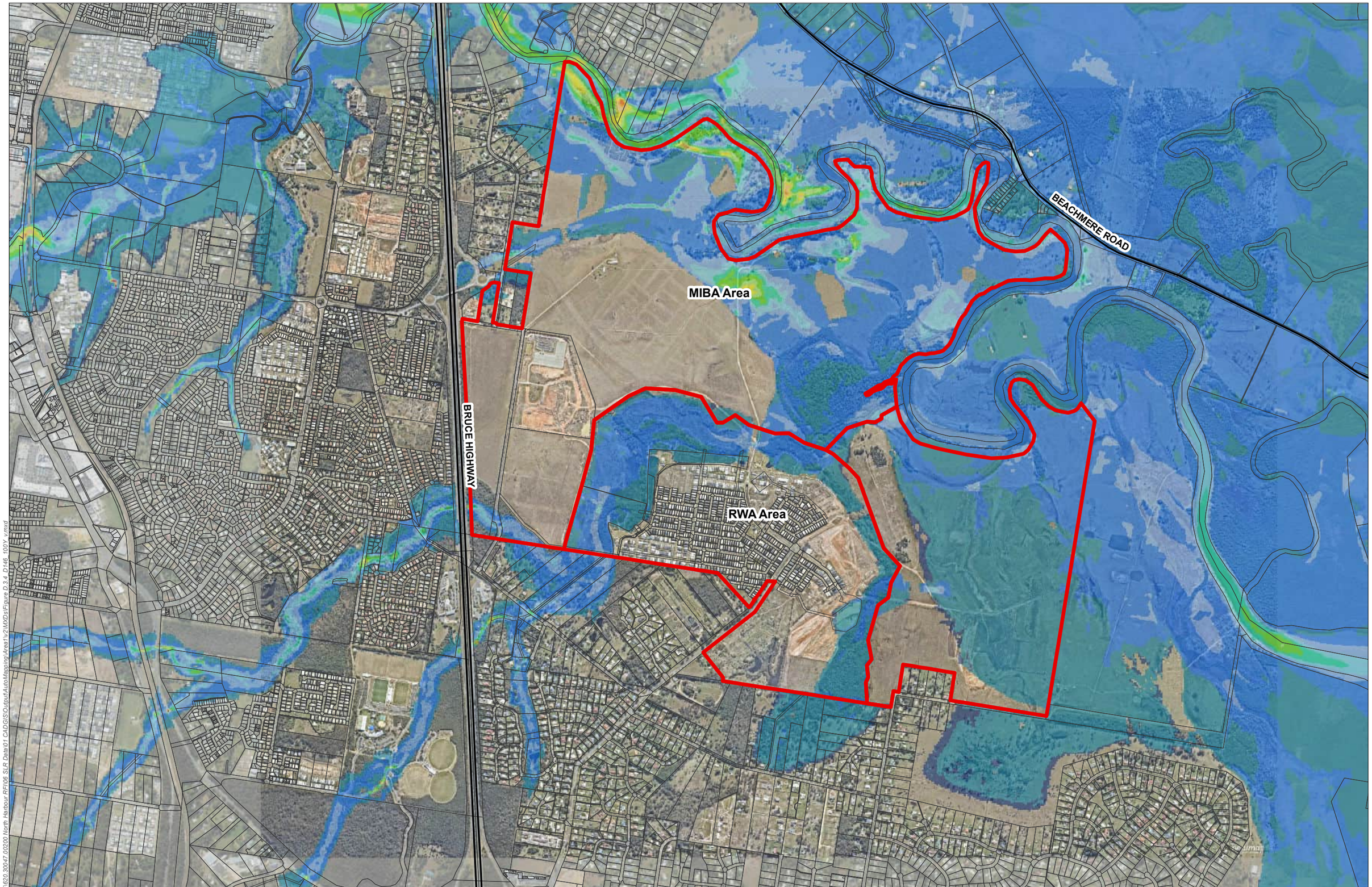
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Velocities - 2% AEP

Figure D.3.3



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.3.4_D146_100Y.vmxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

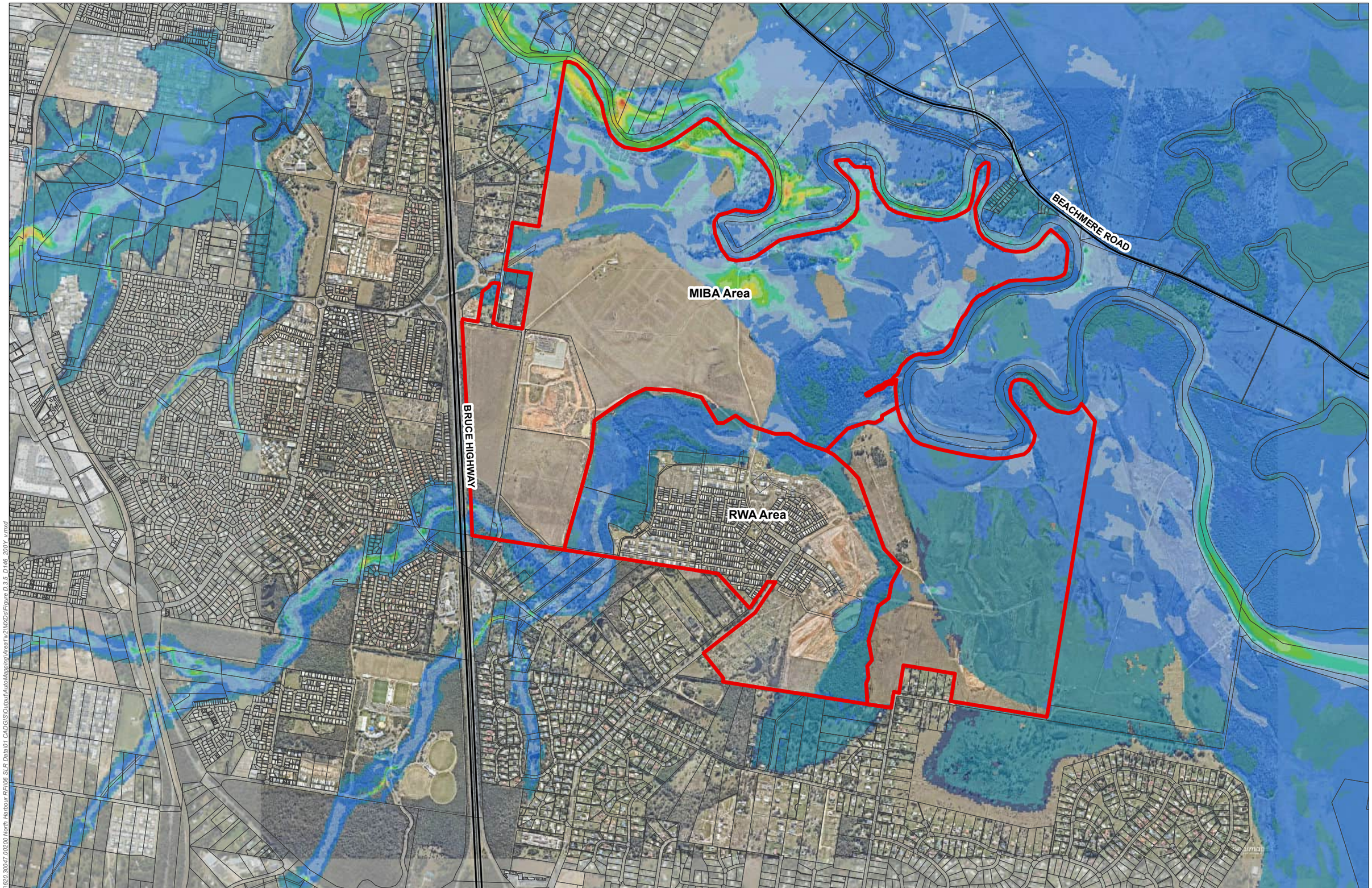
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Velocities - 1 % AEP

Figure D.3.4



SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

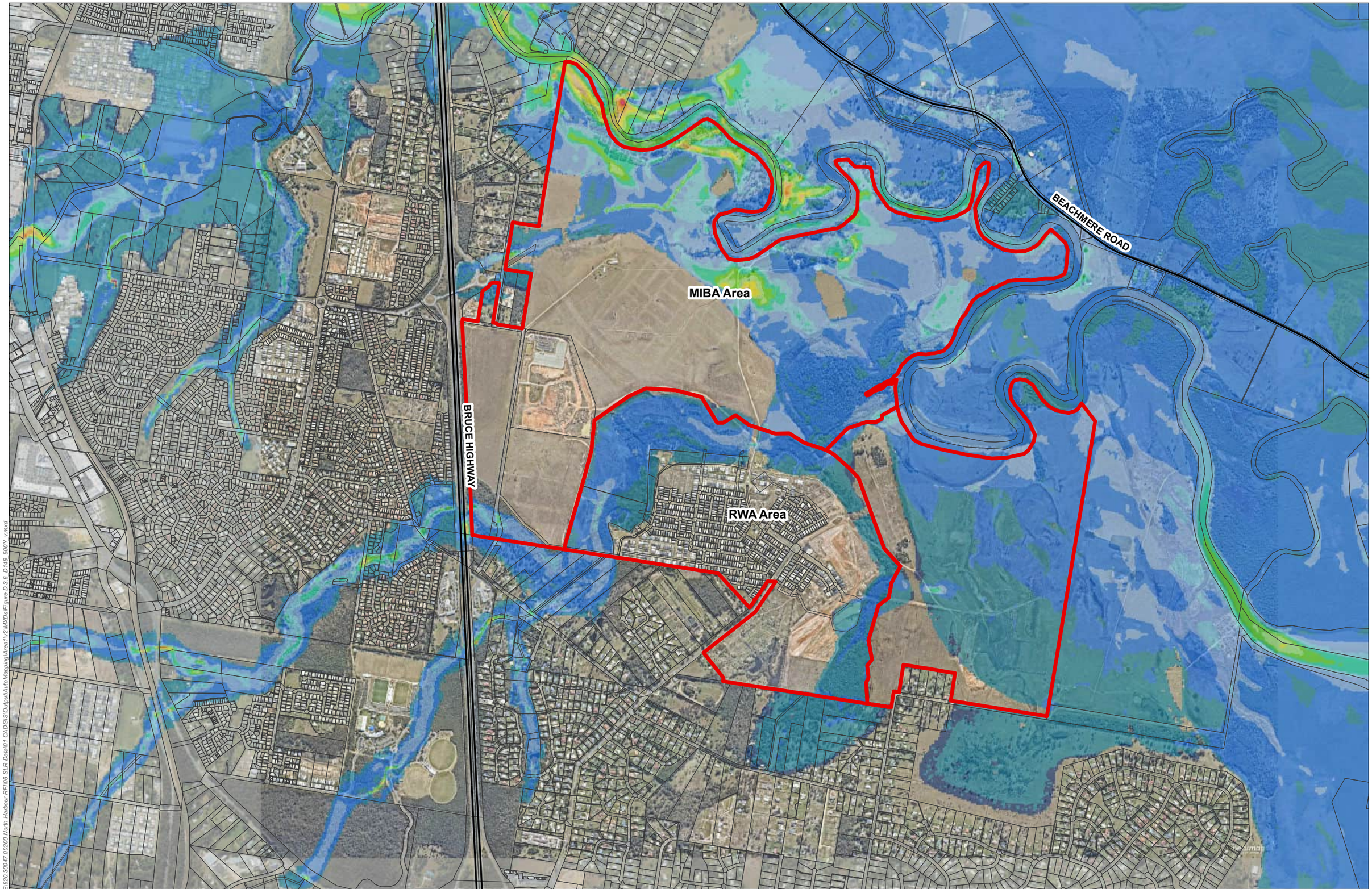
Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Velocities - 0.5%AEP

Figure D.3.5

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.3.5_D146_200Y_v1.mxd



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.3.6_D146_500Y.vmxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

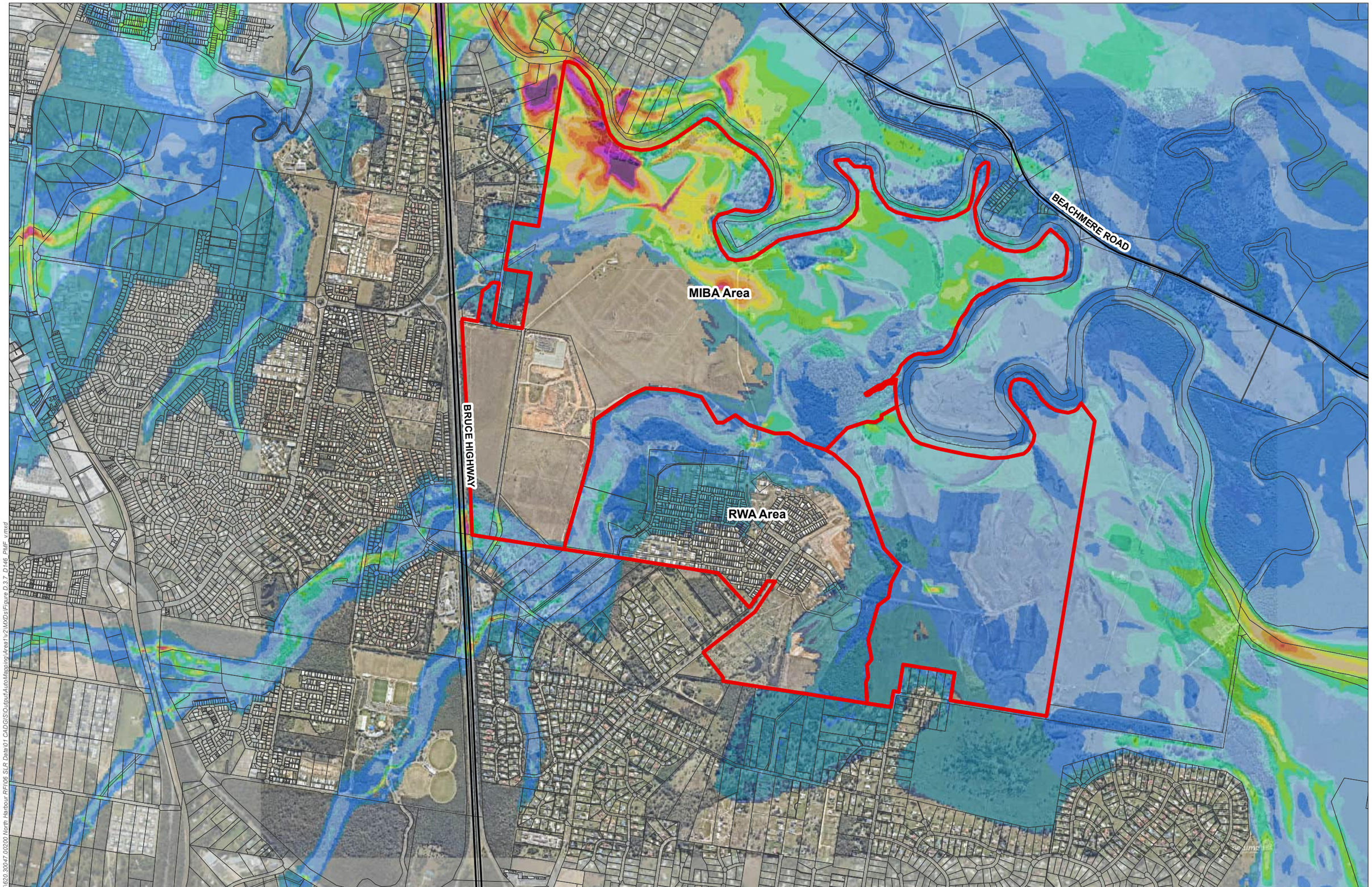
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Velocities - 0.2% AEP

Figure D.3.6



H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.3.7 D146 PMF v.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

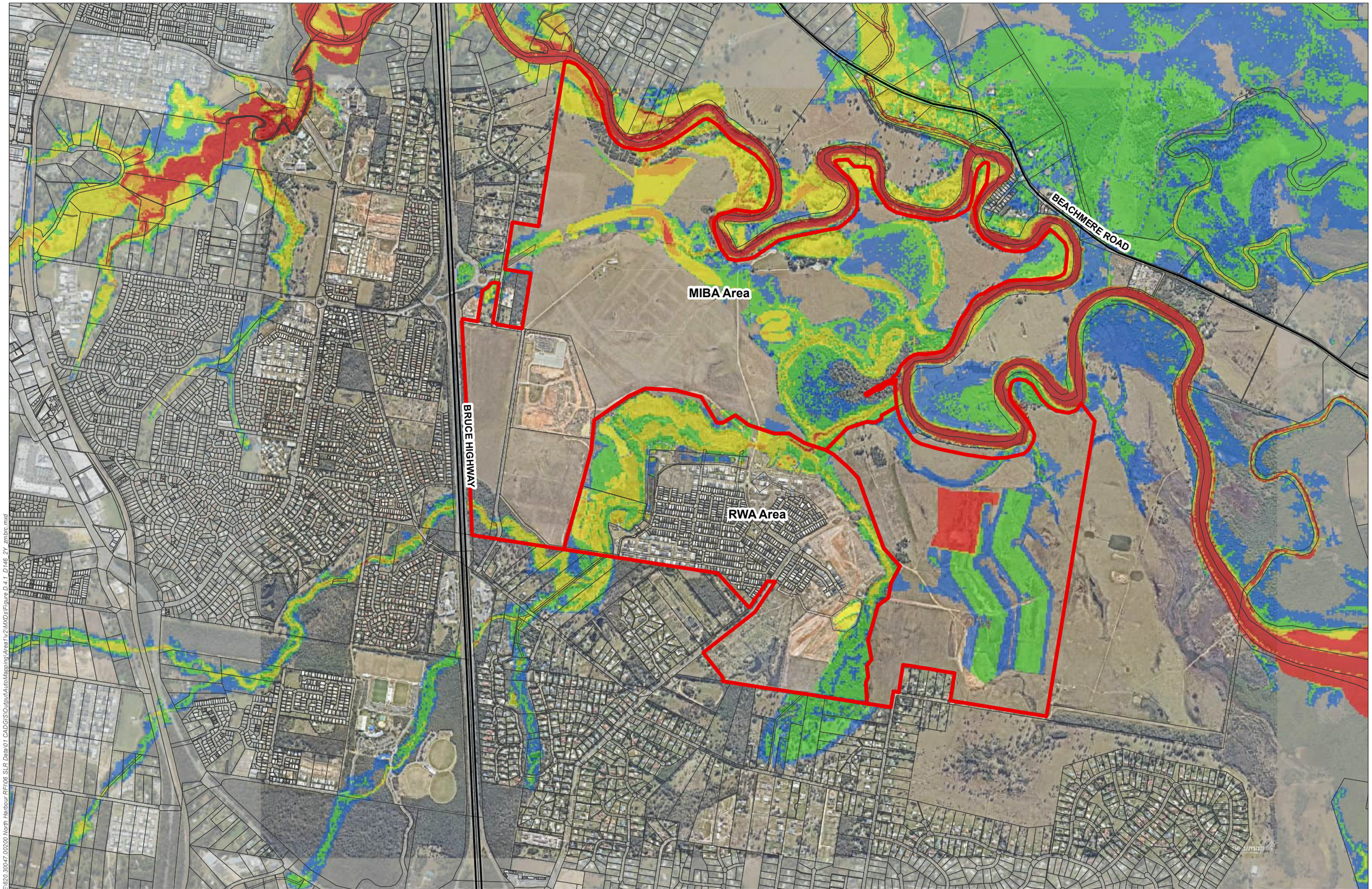
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Velocities - PMF

Figure D.3.7



H:\Projects-SL\Ri620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.4.1 D146 -2V - zmbce.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

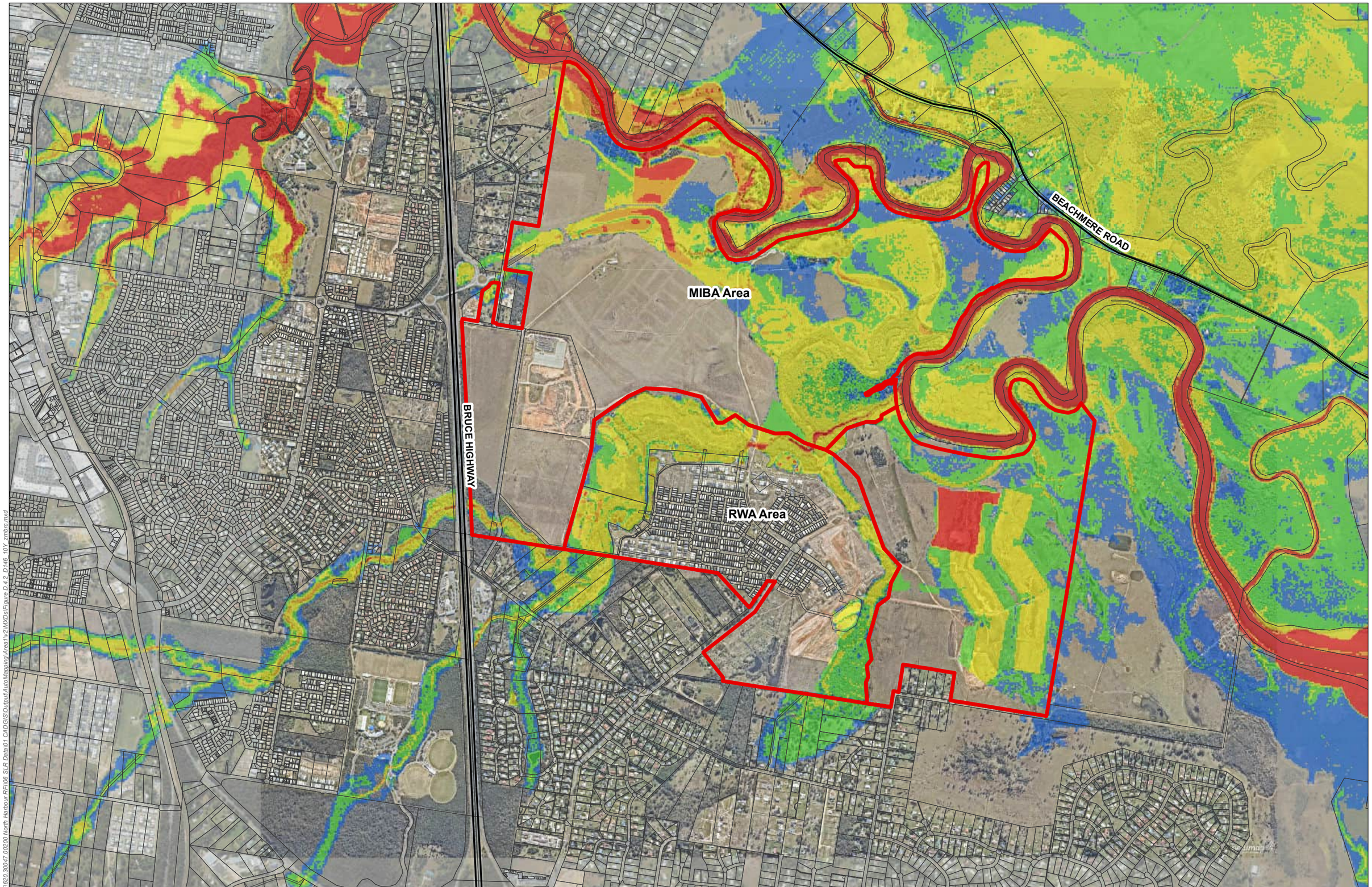
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Hazard - 39% AEP

Figure D.4.1



H:\Projects-SLR\620-BNE\620-BNE620.300\47.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.4.2_D146_10Y_zmbce.mxd

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

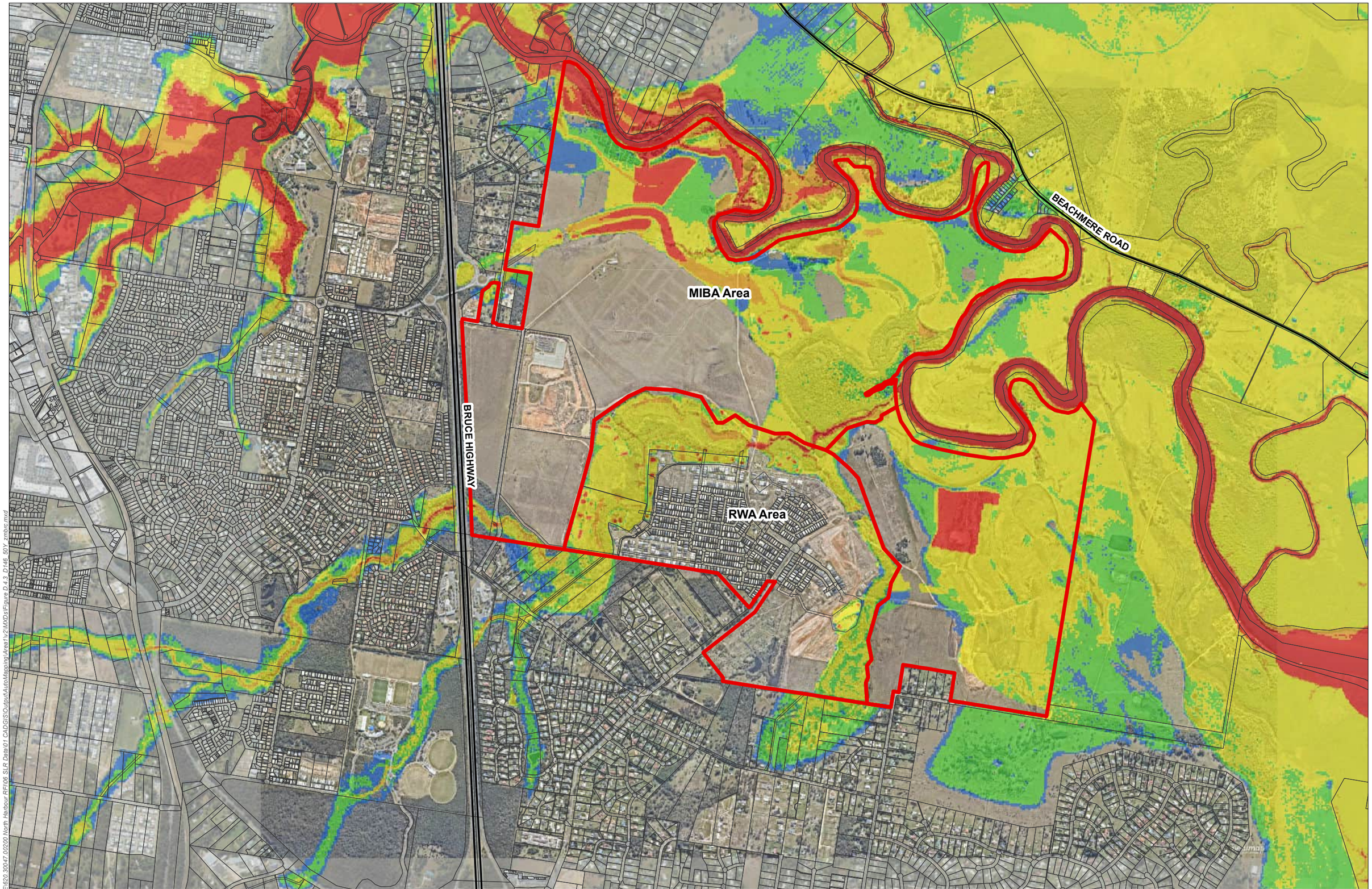
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Hazard - 10% AEP

Figure D.4.2



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.4.3_D146_50Y_embace.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

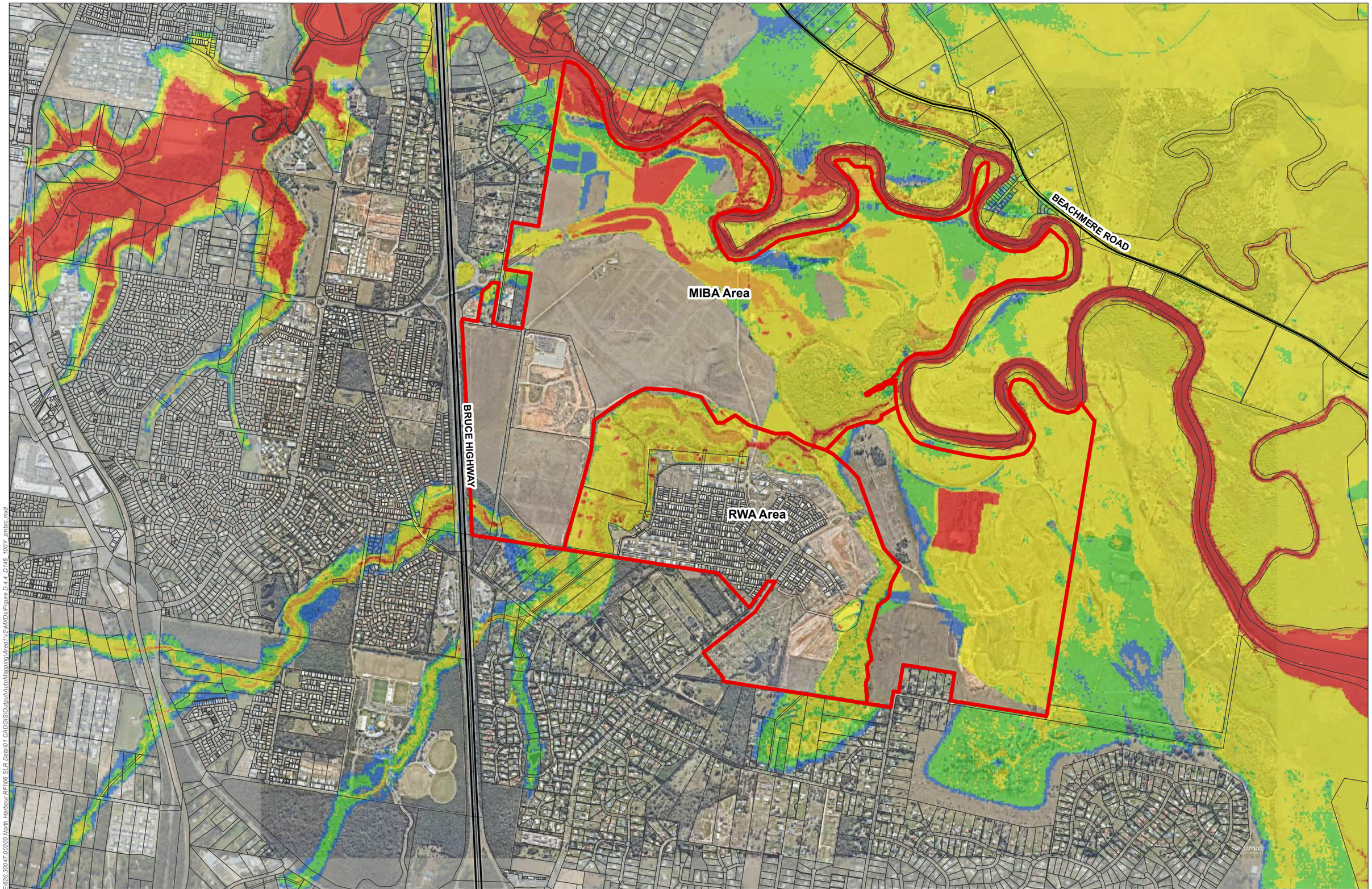
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Hazard - 2% AEP

Figure D.4.3



H:\Projects-SL\Ri620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.4.4 D146 100Y zmbnc.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

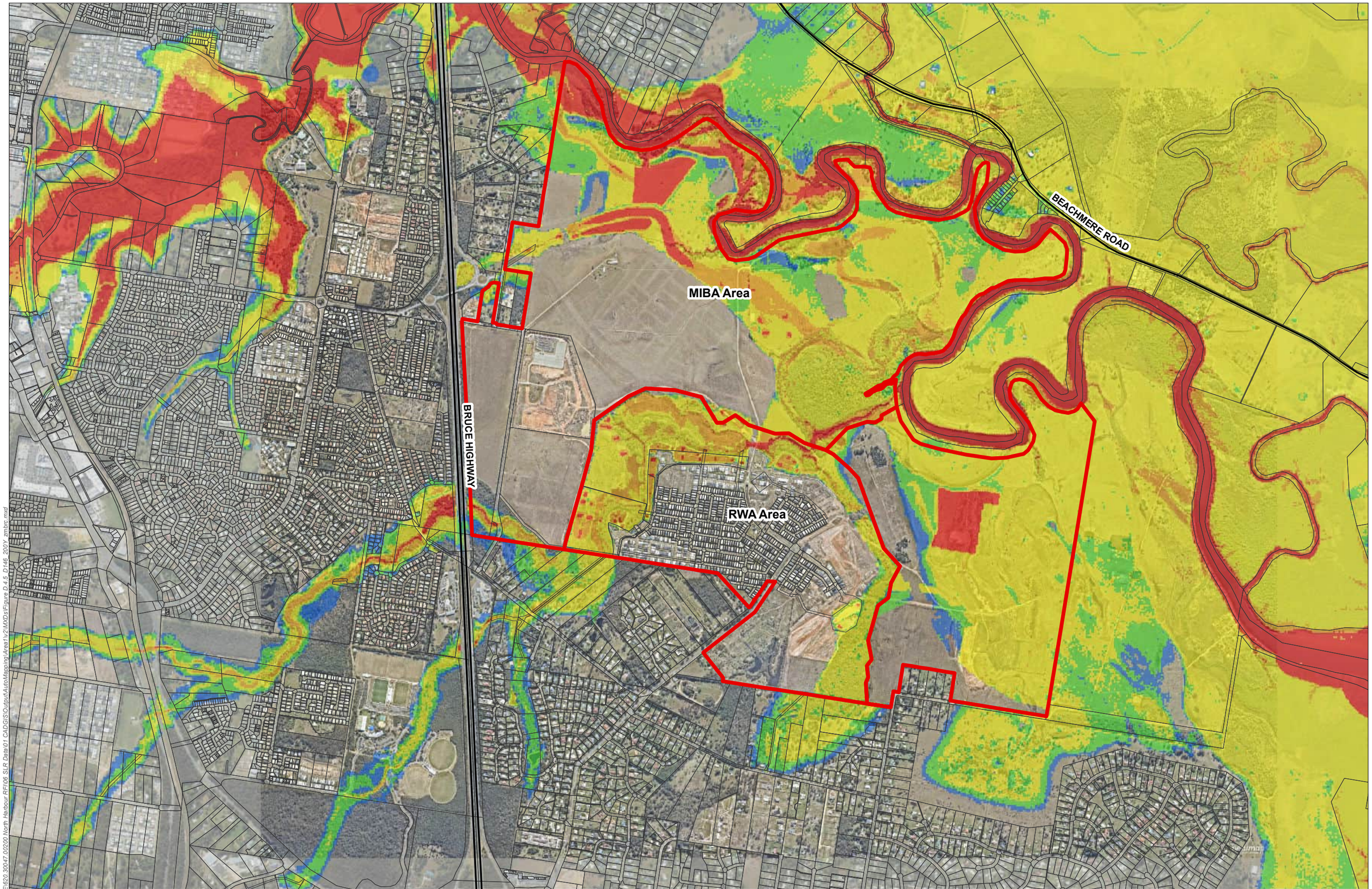
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Hazard - 1 % AEP

Figure D.4.4



H:\Projects-SL\Ri620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.4.5_D146_200Y_zmbnc.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

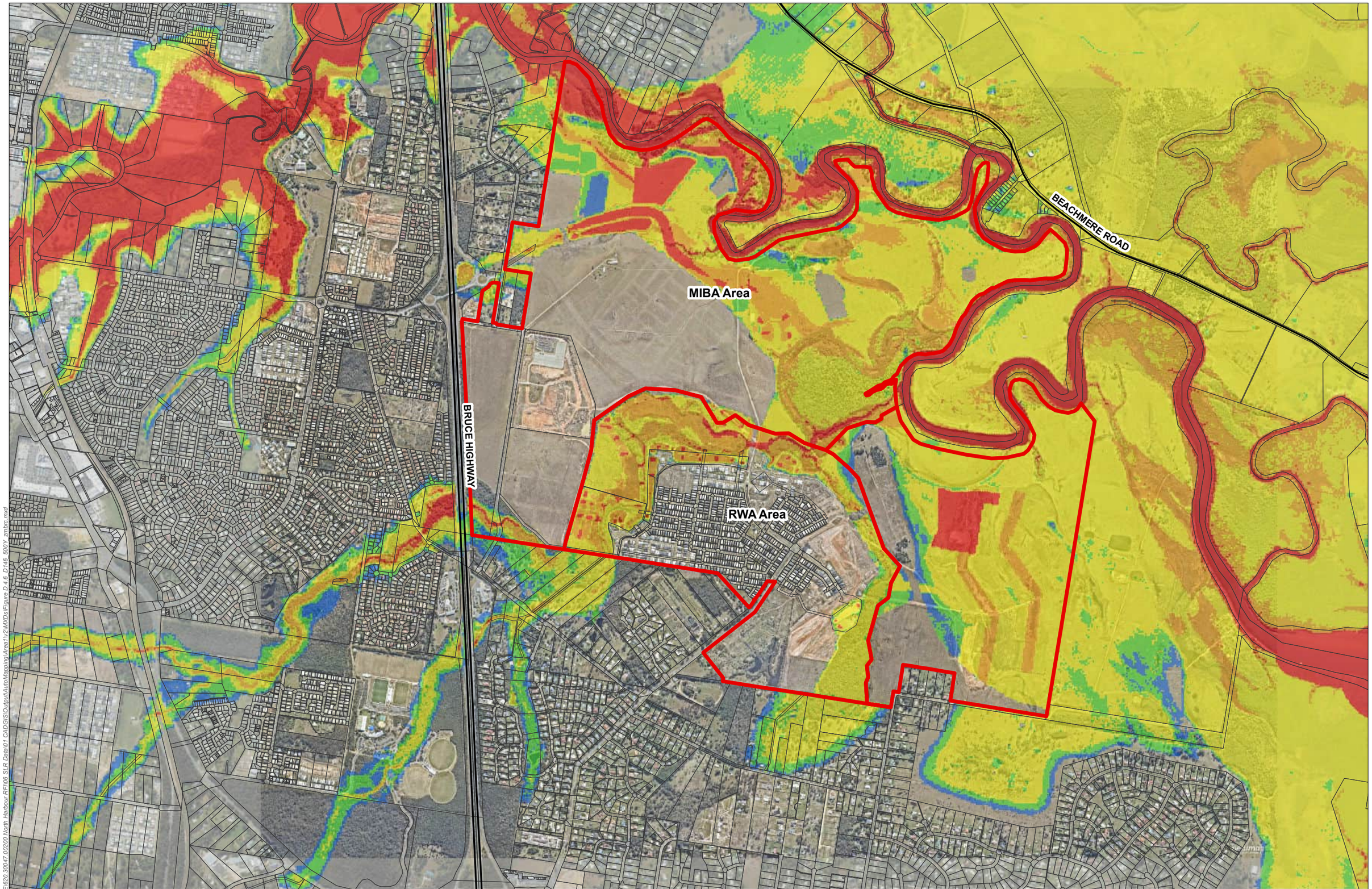
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Hazard - 0.5%AEP

Figure D.4.5



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.4.6_D146_500Y_zmbnc.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Hazard - 0.2% AEP

Figure D.4.6

BEACHMERE ROAD

MIBA Area

BRUCE HIGHWAY

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

- Site Boundary
- Cadastre Boundary

Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) Regional Event
Peak Flood Hazard - PMF

Figure D.4.7

H:\Projects\SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.4.7_D146_PMF_zmbc.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\2MXDs\Figure D.5.1_D146_2Y_1.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

10/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

Site Boundary

Cadastre Boundary

Afflux (m)

Below -0.200	-0.030 to -0.020	0.050 to 0.100	Was wet now dry
-0.200 to -0.100	-0.020 to 0.020	0.100 to 0.200	Was dry now wet
-0.100 to -0.050	0.020 to 0.030	Above 0.200	
-0.050 to -0.030	0.030 to 0.050		

North Harbour
Flood Management Plan

Developed Conditions (D146 - E011) Regional Event
Peak Flood Afflux - 39% AEP

Figure D.5.1

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

- Site Boundary
- Cadastre Boundary

Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Afflux - 10% AEP

Figure D.5.2

H:\Projects-SLR\620.BNE\620.BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.5.2_D146_10Y_Lmod

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.5.3_D146_50Y_I.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Afflux - 2% AEP

Figure D.5.3

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.5.4_D146_100Y_i.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

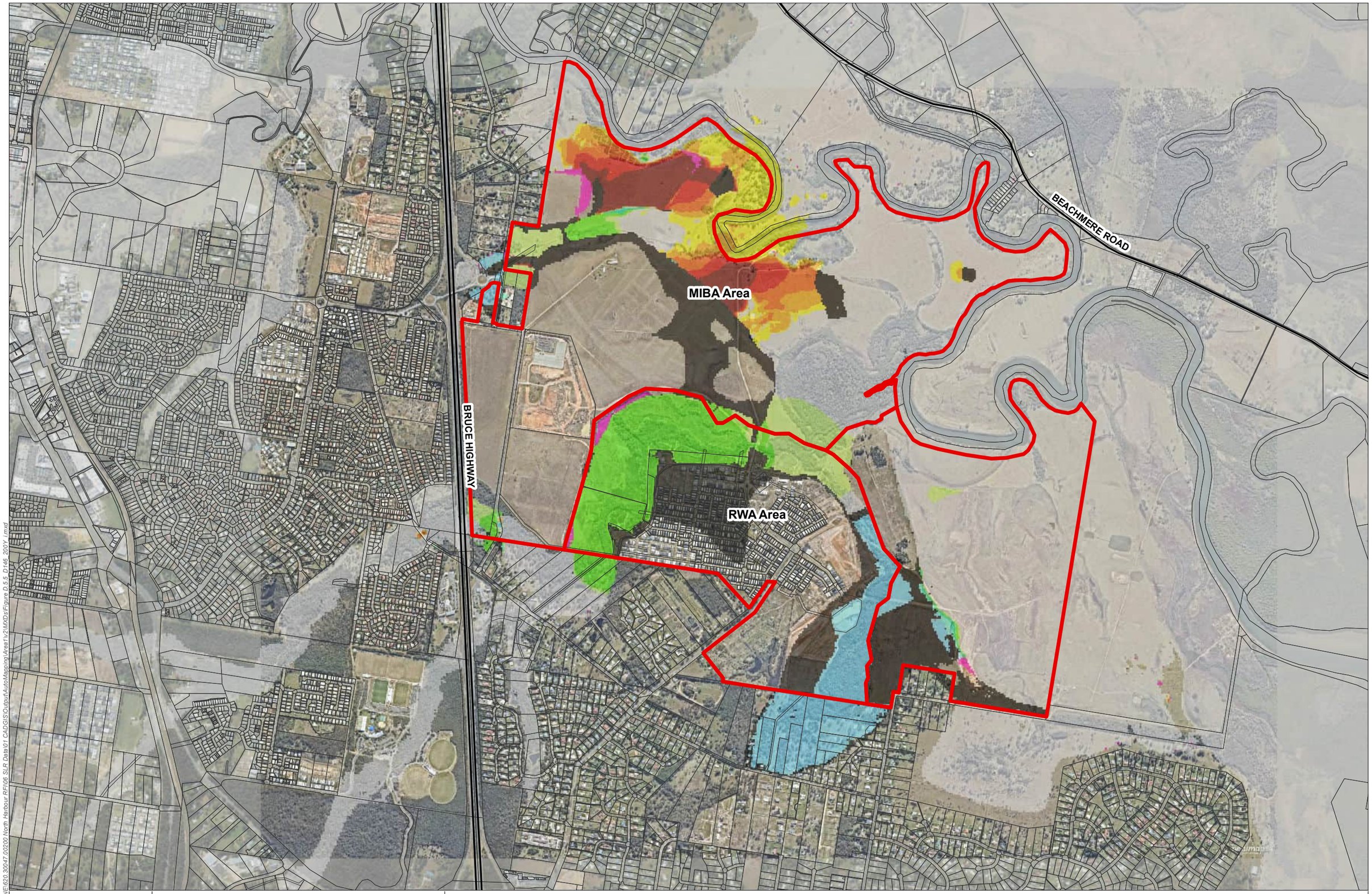
Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Afflux - 1 % AEP

Figure D.5.4



0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Afflux - 0.5%AEP

Figure D.5.5

H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.5.5_D146_200Y_i.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

Site Boundary

Cadastre Boundary

Impact (m/s)

< -0.50	0.10 - 0.25	Was wet now dry
-0.50 - -0.25	0.25 - 0.50	Was dry now wet
-0.25 - -0.10	> 0.50	
-0.10 - 0.10		

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Velocity Impact - 39% AEP

Figure D.6.1

H:\Projects-SLR\620.BNE\620.BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Outputs\AutoMapping\Area1\v2\MXDs\Figure D.6.1_D146_2Y_dv.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.6.2_D146_10Y.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Velocity Impact - 10% AEP

Figure D.6.2



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.6.3_D146_50Y_dv.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Velocity Impact - 2% AEP

Figure D.6.3

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.6.4 D146 100Y dv.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Regional Event
Peak Flood Velocity Impact - 1 % AEP

Figure D.6.4

MIBA Area

RWA Area

BEACHMERE ROAD

BRUCE HIGHWAY

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

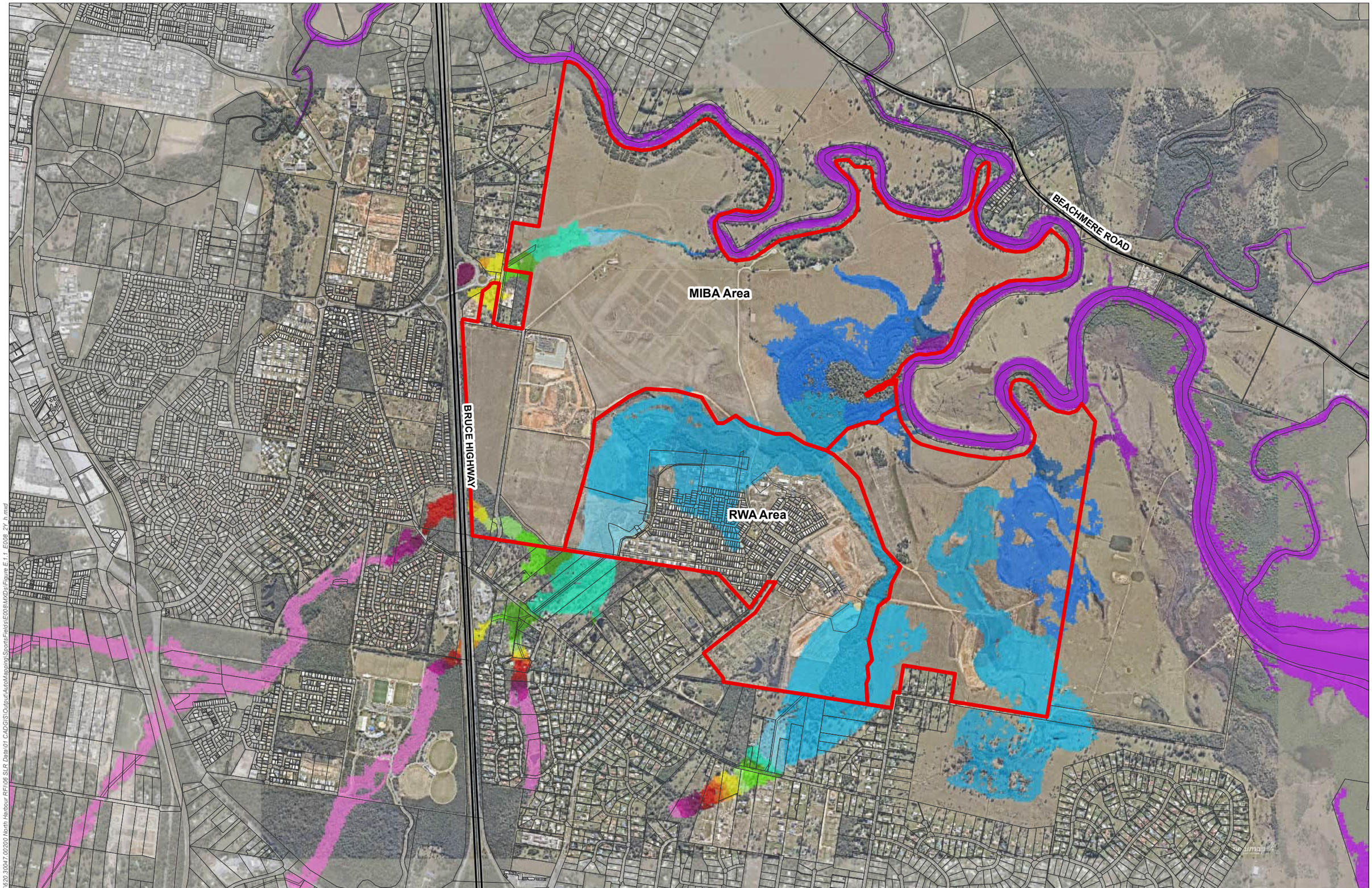
Developed Conditions (D146 - E008) Regional Event
Peak Flood Velocity Impact - 0.5%AEP

Figure D.6.5

H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure D.6.5_D146_200Y_dv.mxd

APPENDIX E

TUFLOW Results – Local Events, Pre Development



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.1.1_E008_2Y_h.mxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

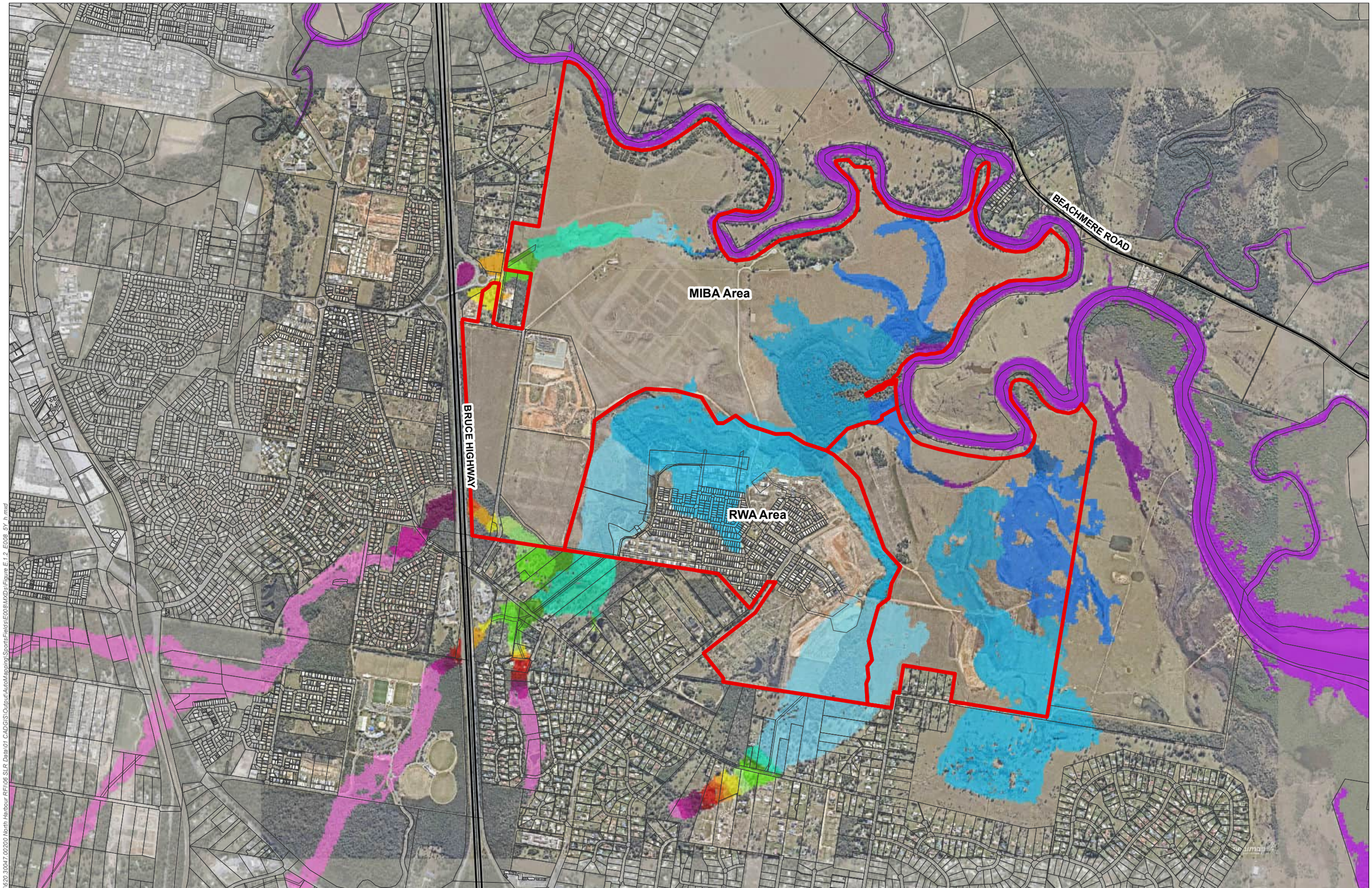
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Levels - 39% AEP

Figure E.1.1



0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Levels - 20% AEP

Figure E.1.2

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.1.2_E008_SY_h.mxd

MIBA Area

RWA Area

BRUCE HIGHWAY

BEACHMERE ROAD

H:\Projects-SLR\620-BNE\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.1.3_E008_10Y_A.mxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.00 to 1.25	1.25 to 1.50	1.50 to 1.75	1.75 to 2.00	2.00 to 2.25
2.25 to 2.50	2.50 to 2.75	2.75 to 3.00	3.00 to 3.25	3.25 to 3.50	3.50 to 3.75
3.75 to 4.00	4.00 to 4.25	4.25 to 4.50	4.50 to 4.75	4.75 to 5.00	5.00 to 5.25
5.25 to 5.50	5.50 to 5.75	5.75 to 6.00	6.00 to 6.25	Above 6.25	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Levels - 10% AEP

Figure E.1.3

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.1.4_E008_50Y_h.mxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

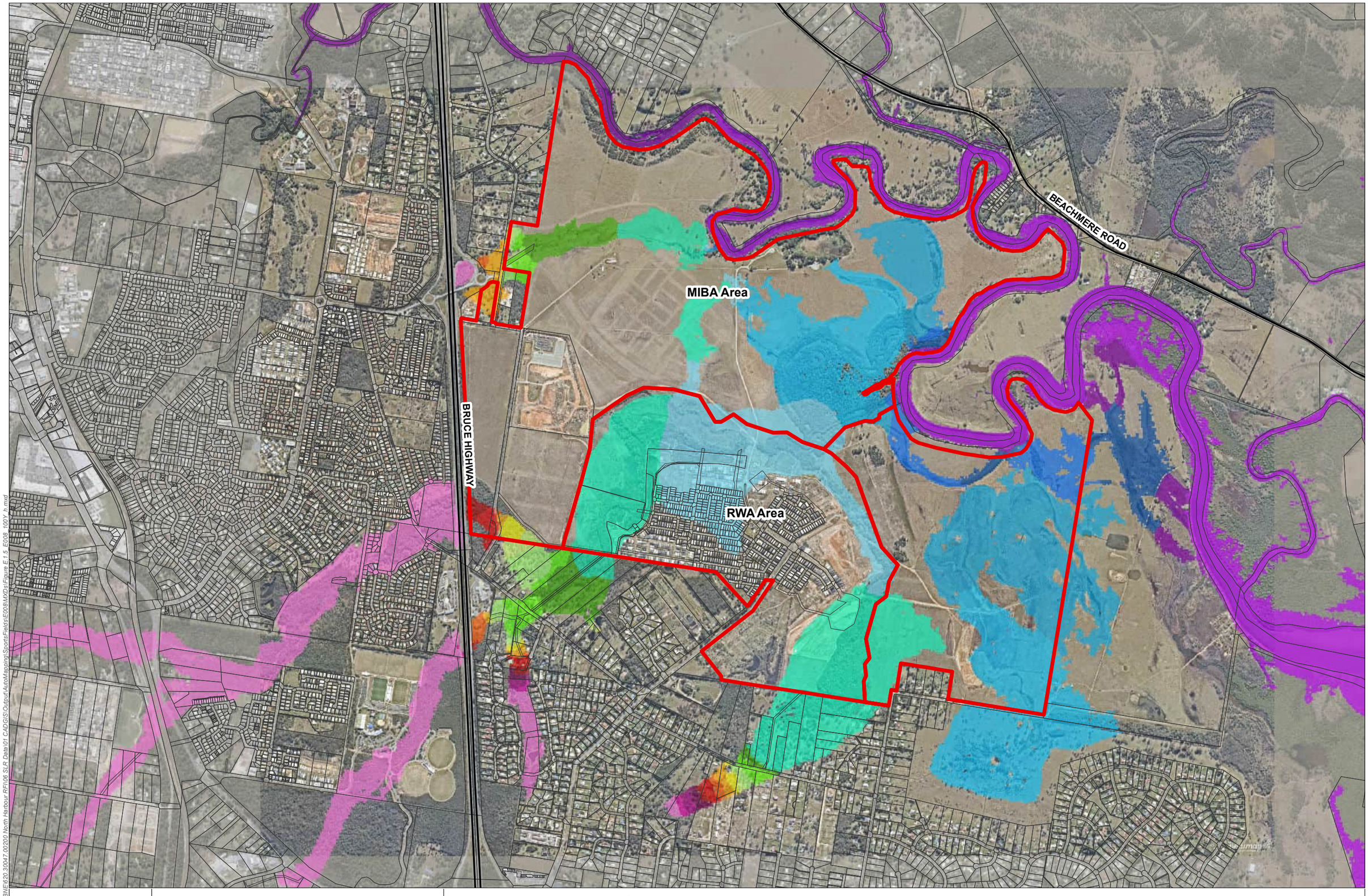
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Levels - 2% AEP

Figure E.1.4



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CADGIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.1.5_E008_100Y_Ar.mxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

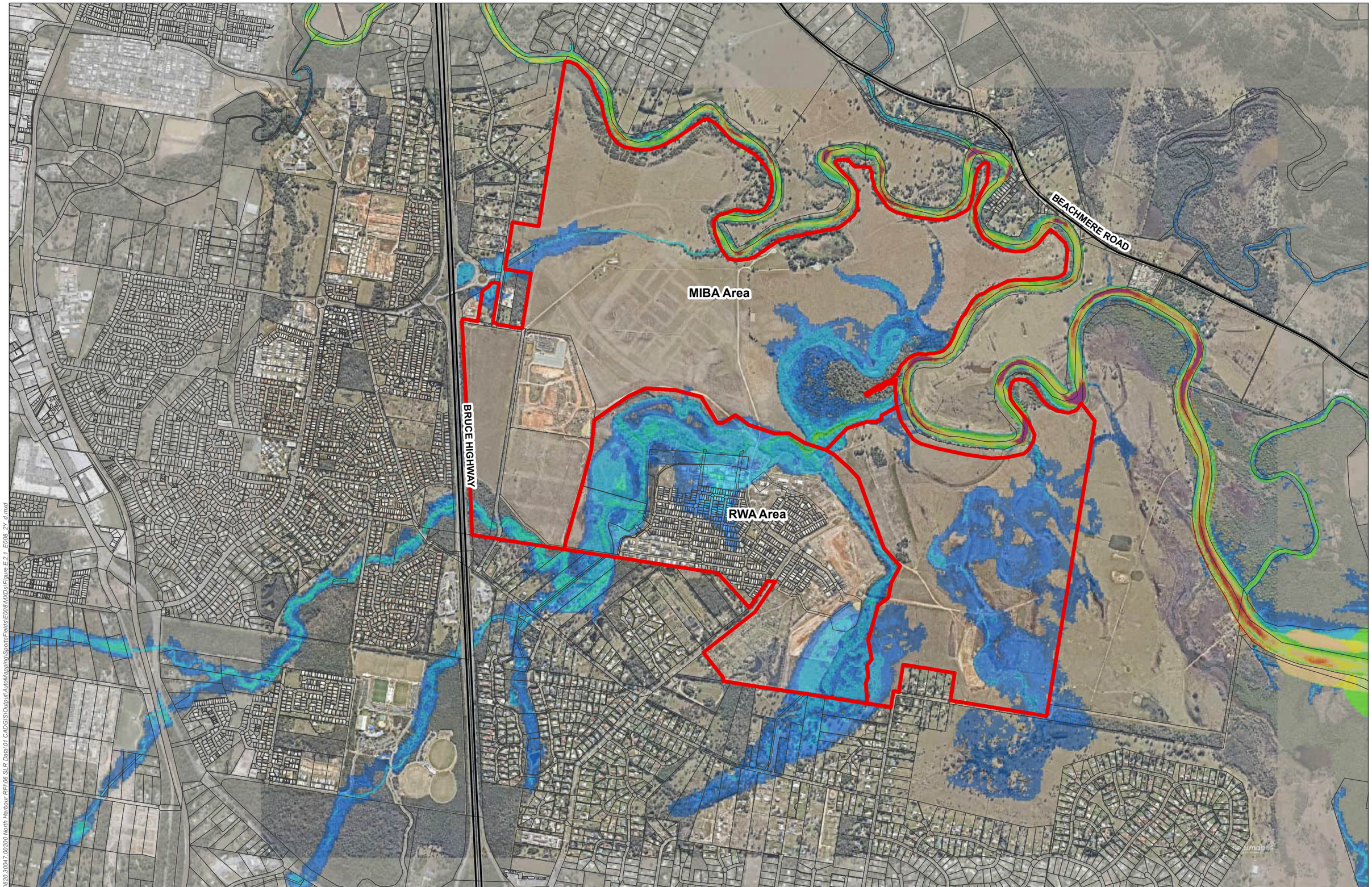
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Levels - 1 % AEP

Figure E.1.5



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.2.1_E008_2V_d.mxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

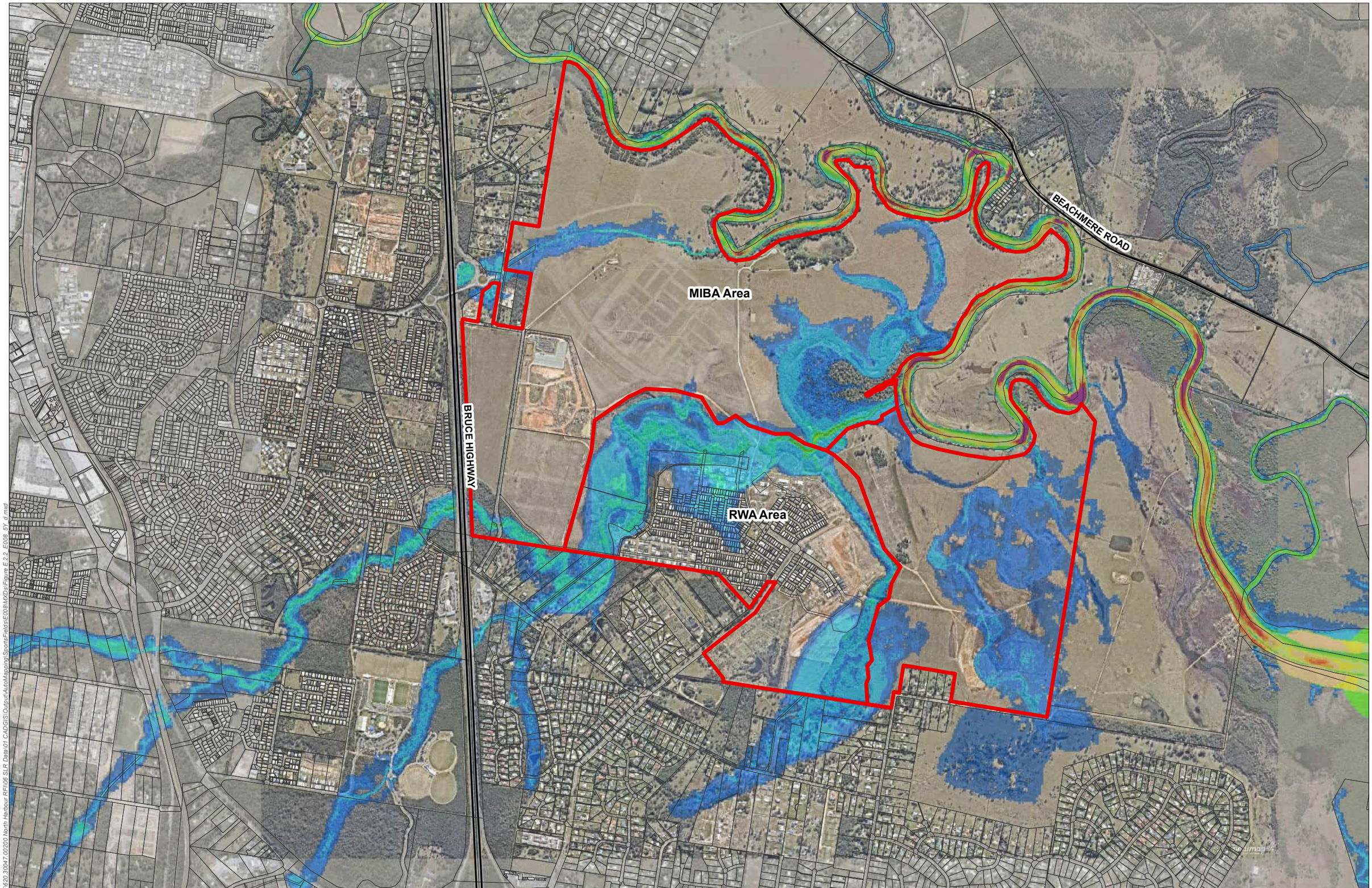
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Depths - 39% AEP

Figure E.2.1



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.2.2_E008_SY_d.mxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

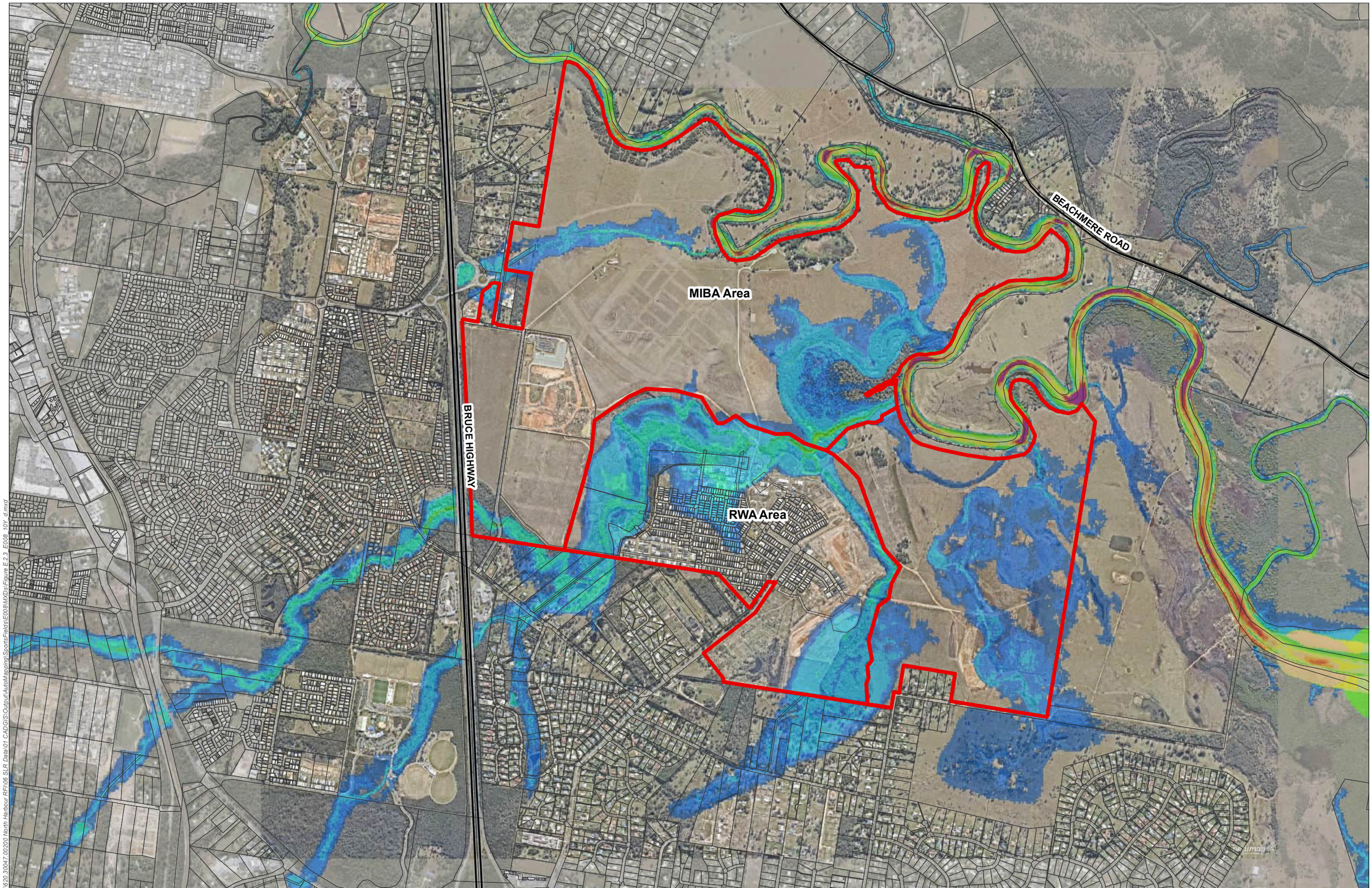
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Depths - 20% AEP

Figure E.2.2



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.2.3_E008_10Y_d.mxd

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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

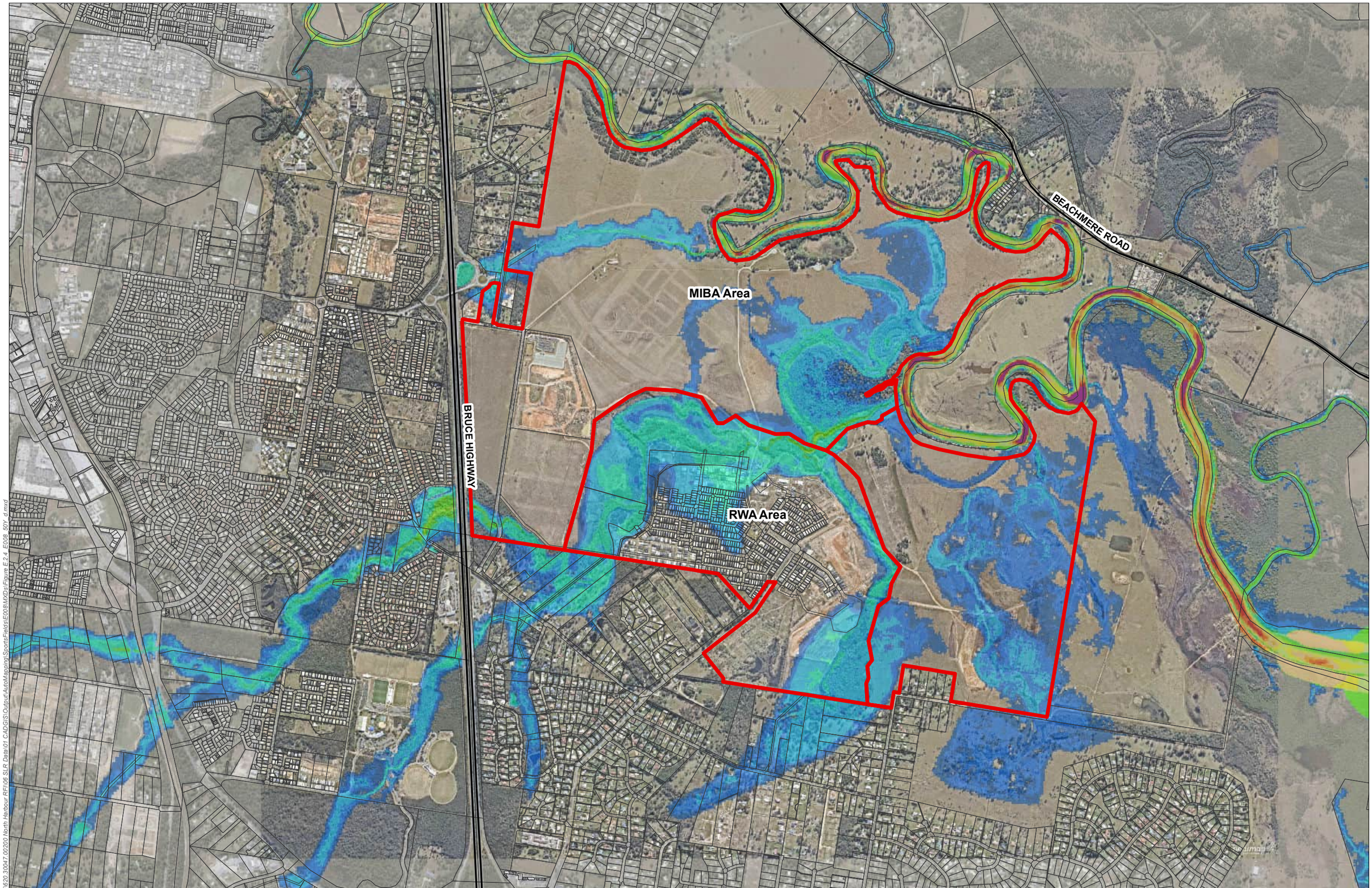
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Depths - 10% AEP

Figure E.2.3



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.2.4_E008_50Y_d.mxd

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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

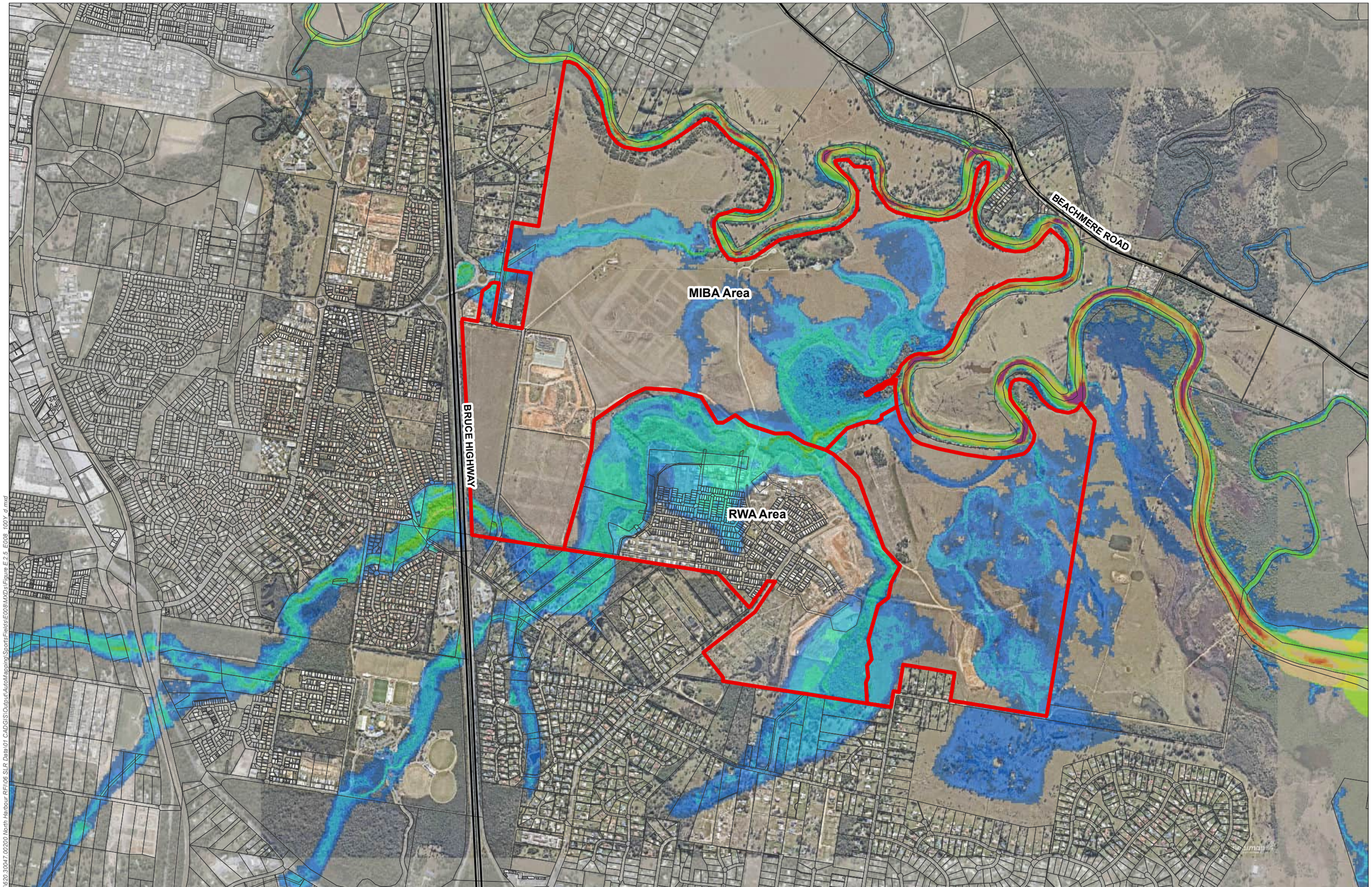
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Depths - 2% AEP

Figure E.2.4



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.2.5_E008_100Y_4.mxd

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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

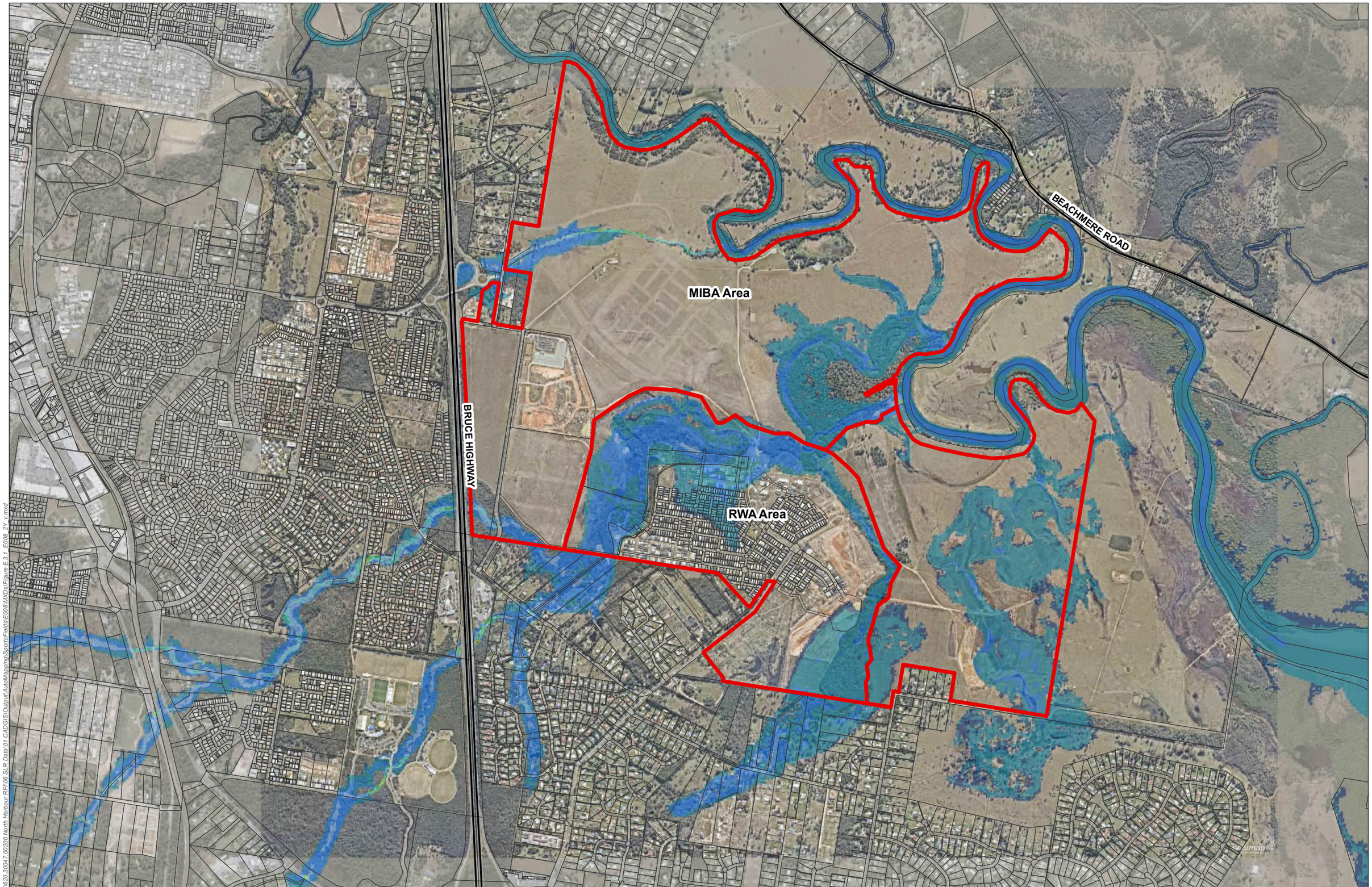
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Depths - 1 % AEP

Figure E.2.5



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.3.1_E008_2V.vmxd

SLR
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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

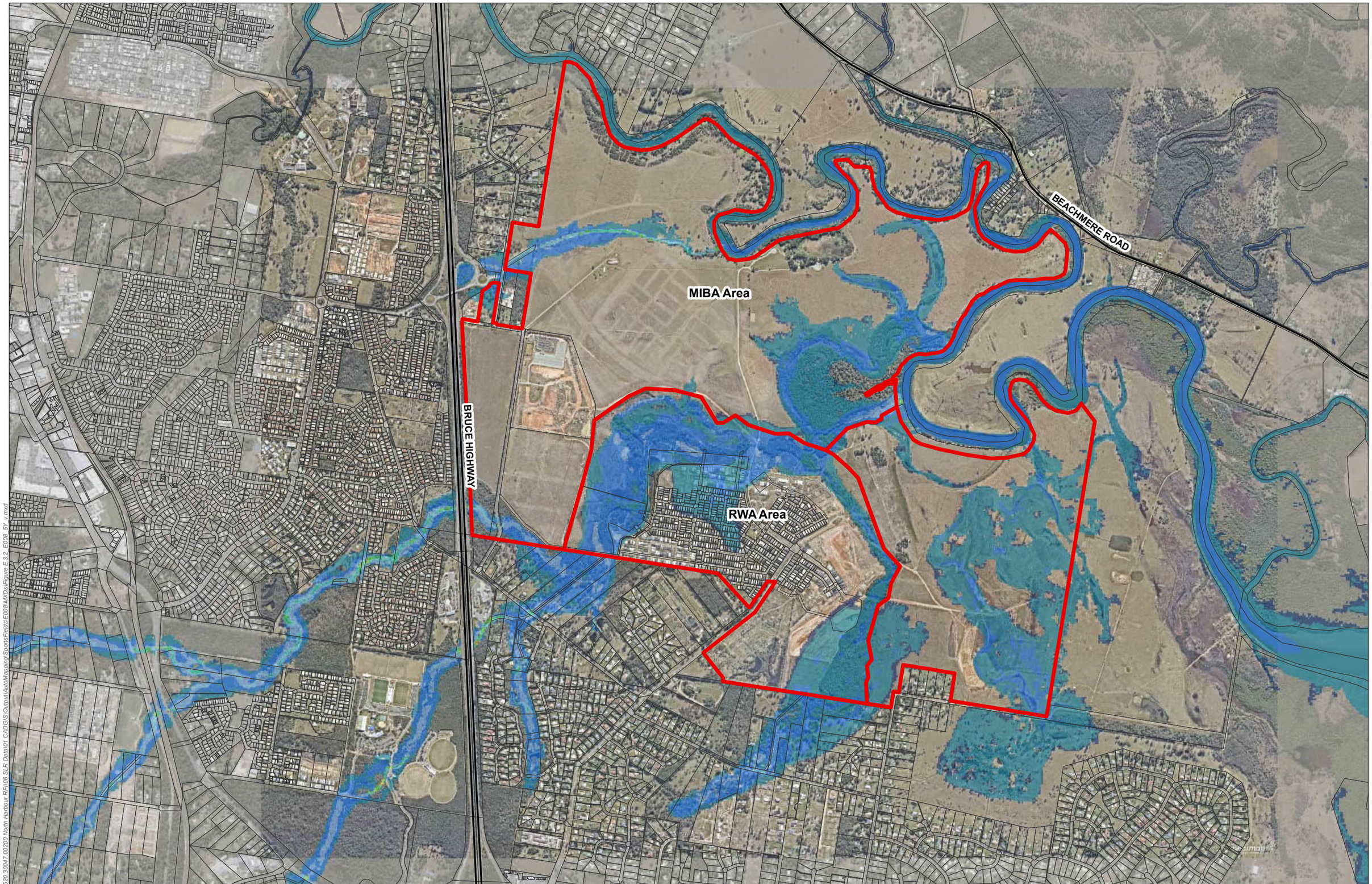
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Velocities - 39% AEP

Figure E.3.1



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.3.2_E008_SV.vmxd

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0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

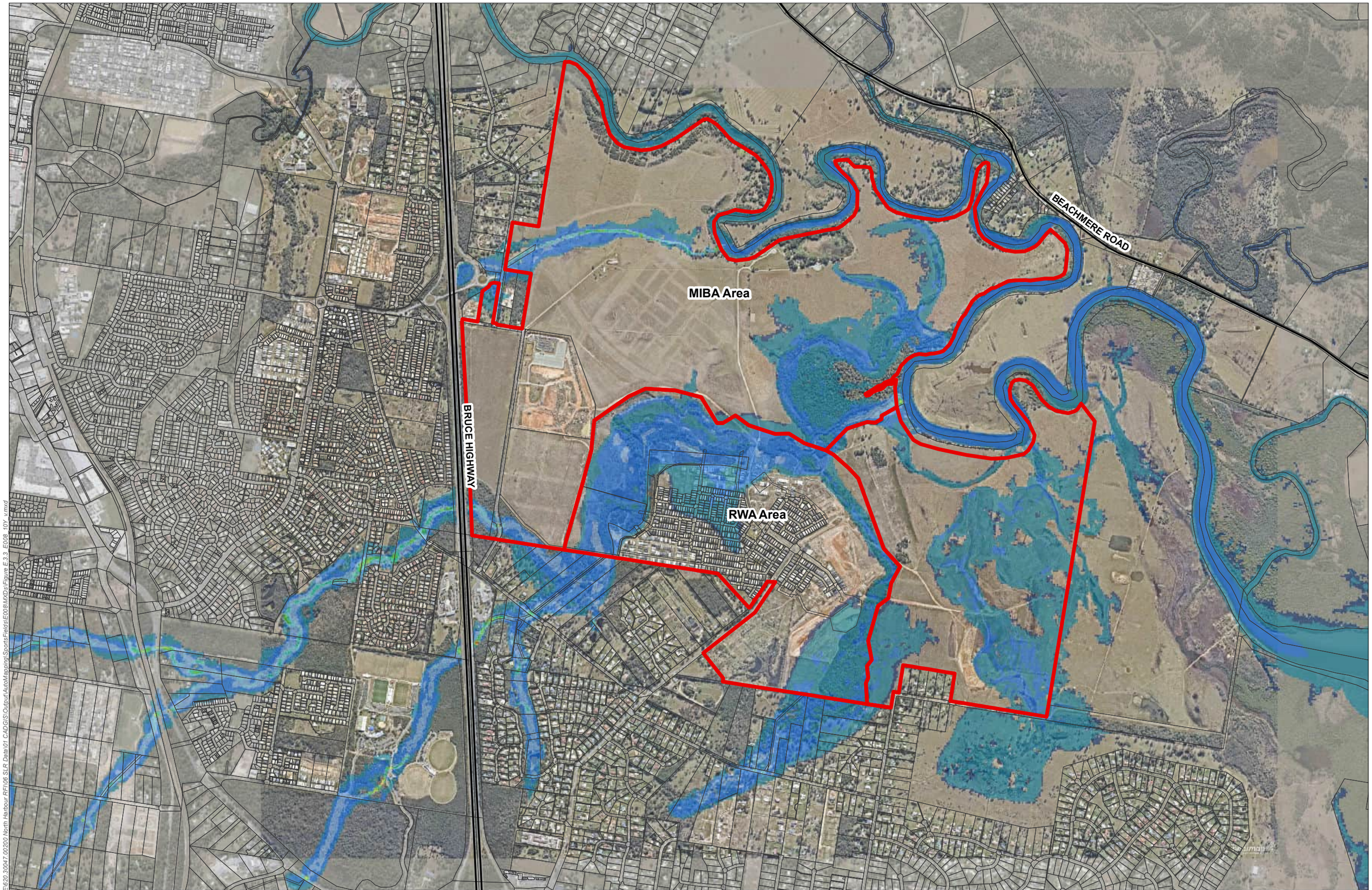
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Velocities - 20% AEP

Figure E.3.2



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.3.3_E008_10Y_v.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Velocities - 10% AEP

Figure E.3.3

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

Site Boundary

Cadastre Boundary

Velocity (m/s)

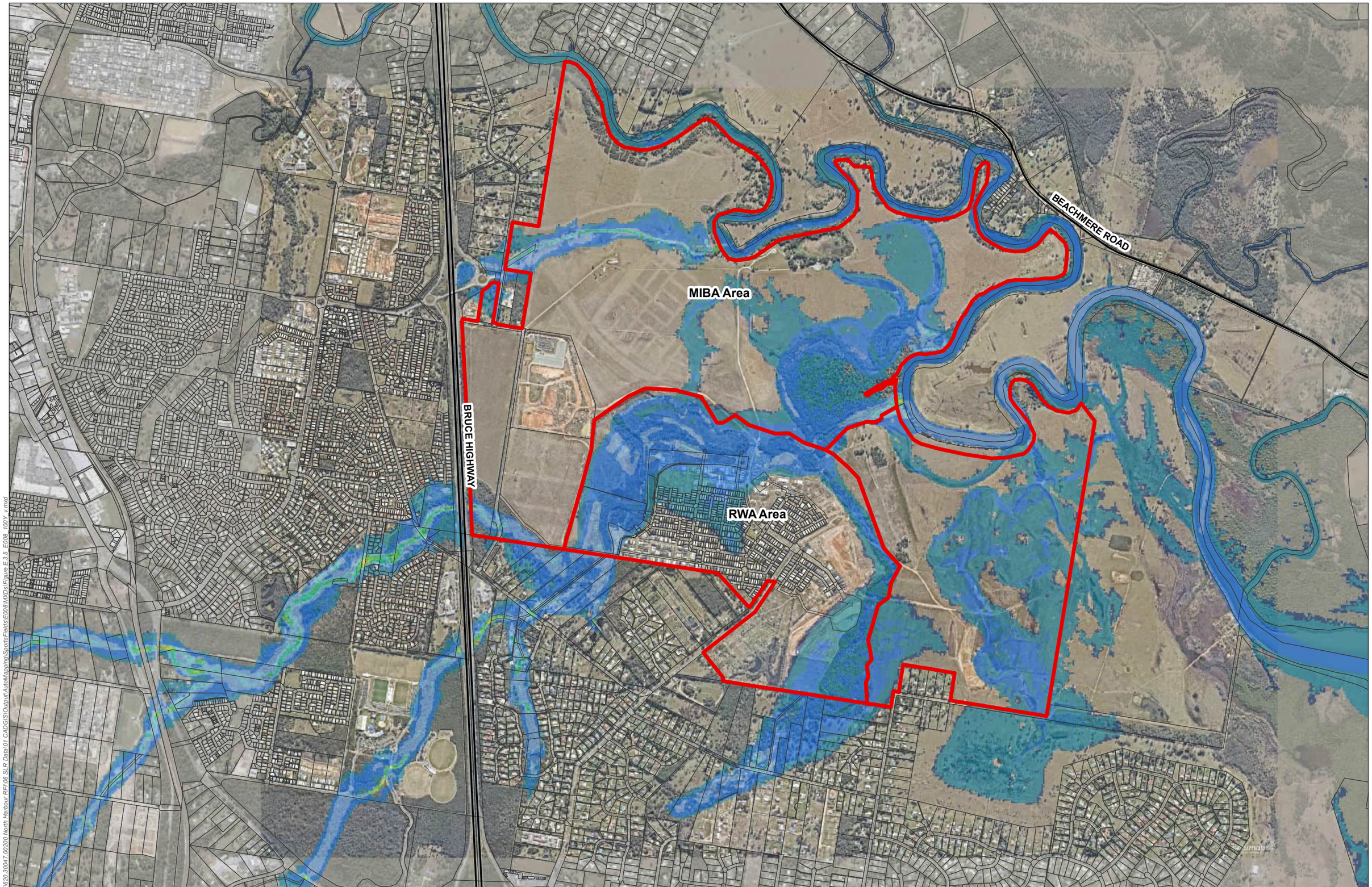
Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Velocities - 2% AEP

Figure E.3.4

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.3.4_E008_50V_v.mxd



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\SportsFields\E008\MXDs\Figure E.3.5_E008_100Y_v.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

10/03/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

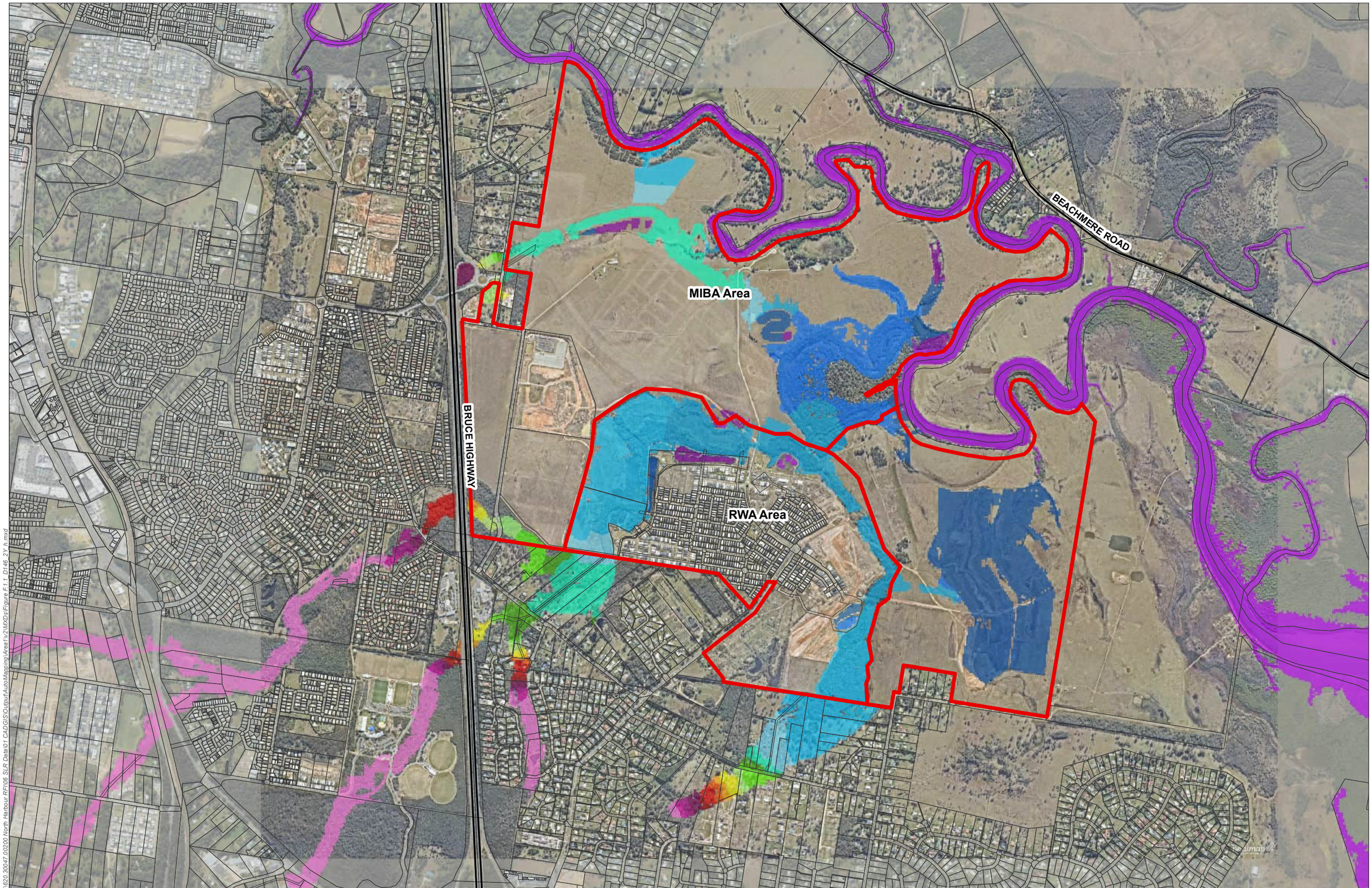
North Harbour
Flood Management Plan

Existing Conditions (E008) - Local Event
Peak Flood Velocities - 1 % AEP

Figure E.3.5

APPENDIX F

TUFLOW Results – Local Events, Post Development



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.1.1_D146_2Y_h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

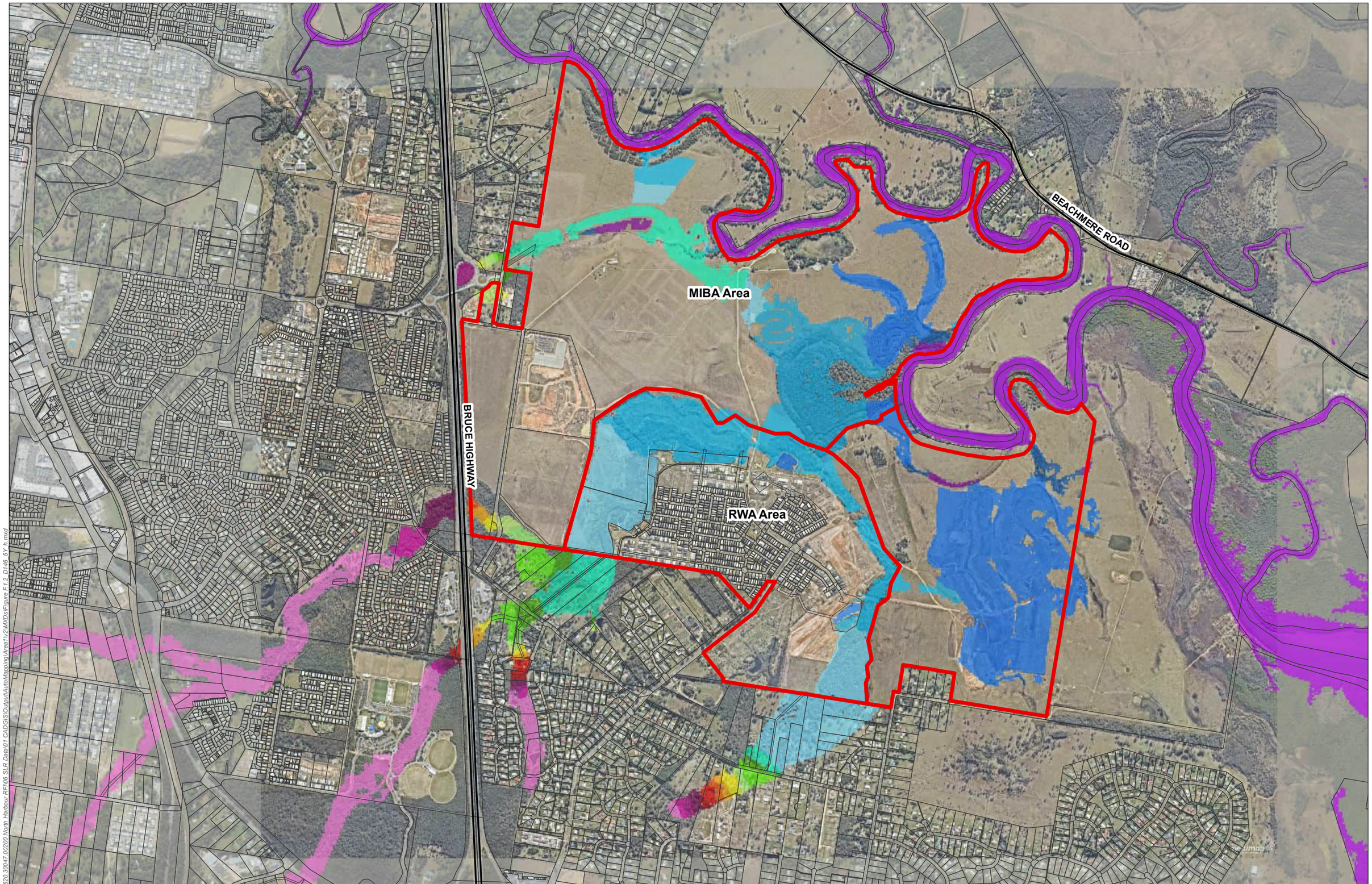
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Levels - 39% AEP

Figure F.1.1



H:\Projects-SLR\620.BNE\620.BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F1.2_D146_SY_h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

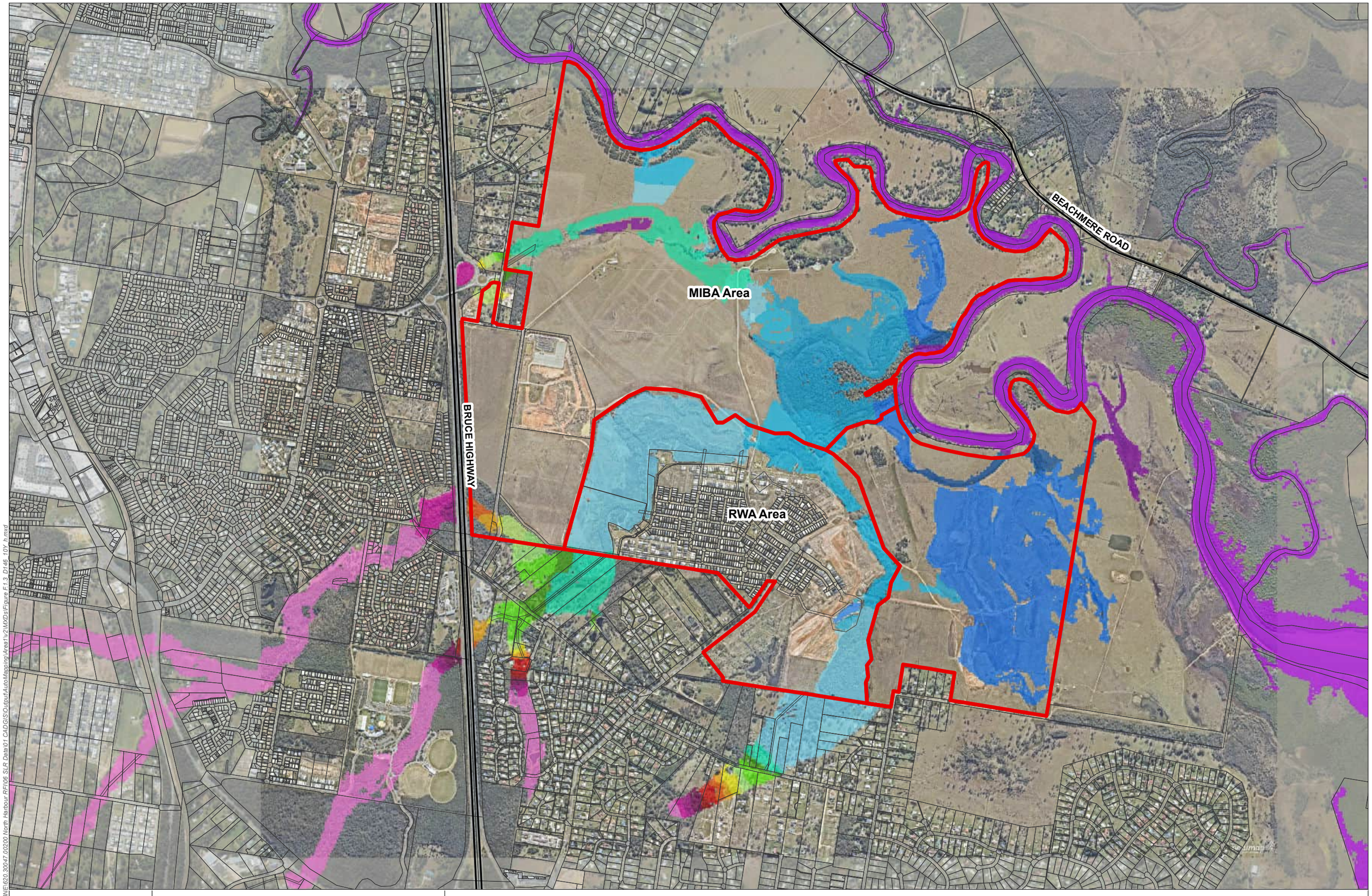
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Levels - 20% AEP

Figure F.1.2



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Outputs\AutoMapping\Area1\v2\MXDs\Figure F1.3_D146_10Y_h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

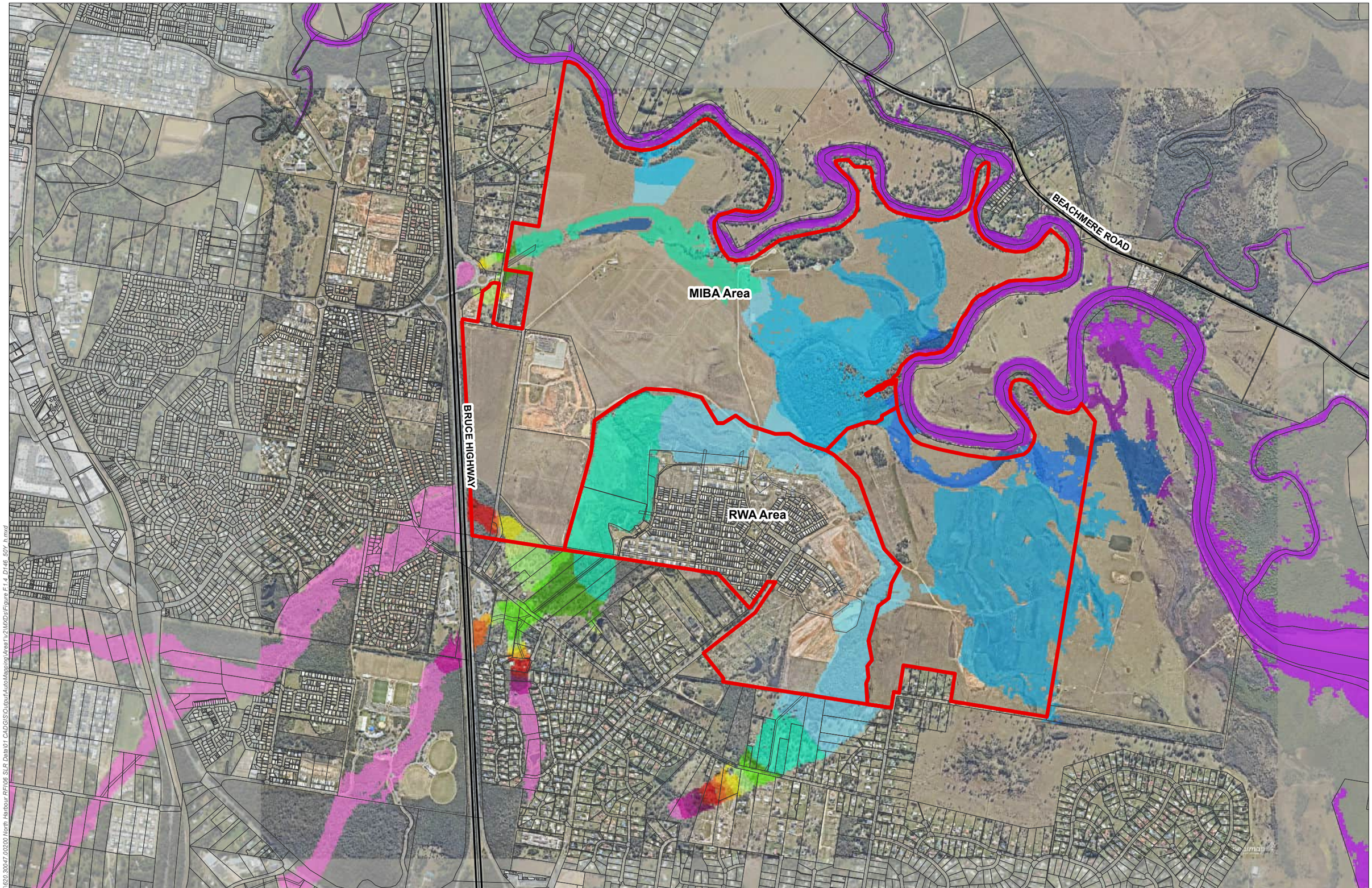
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Levels - 10% AEP

Figure F.1.3



H:\Projects-SL\Pl620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.1.4 D146 50Y h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

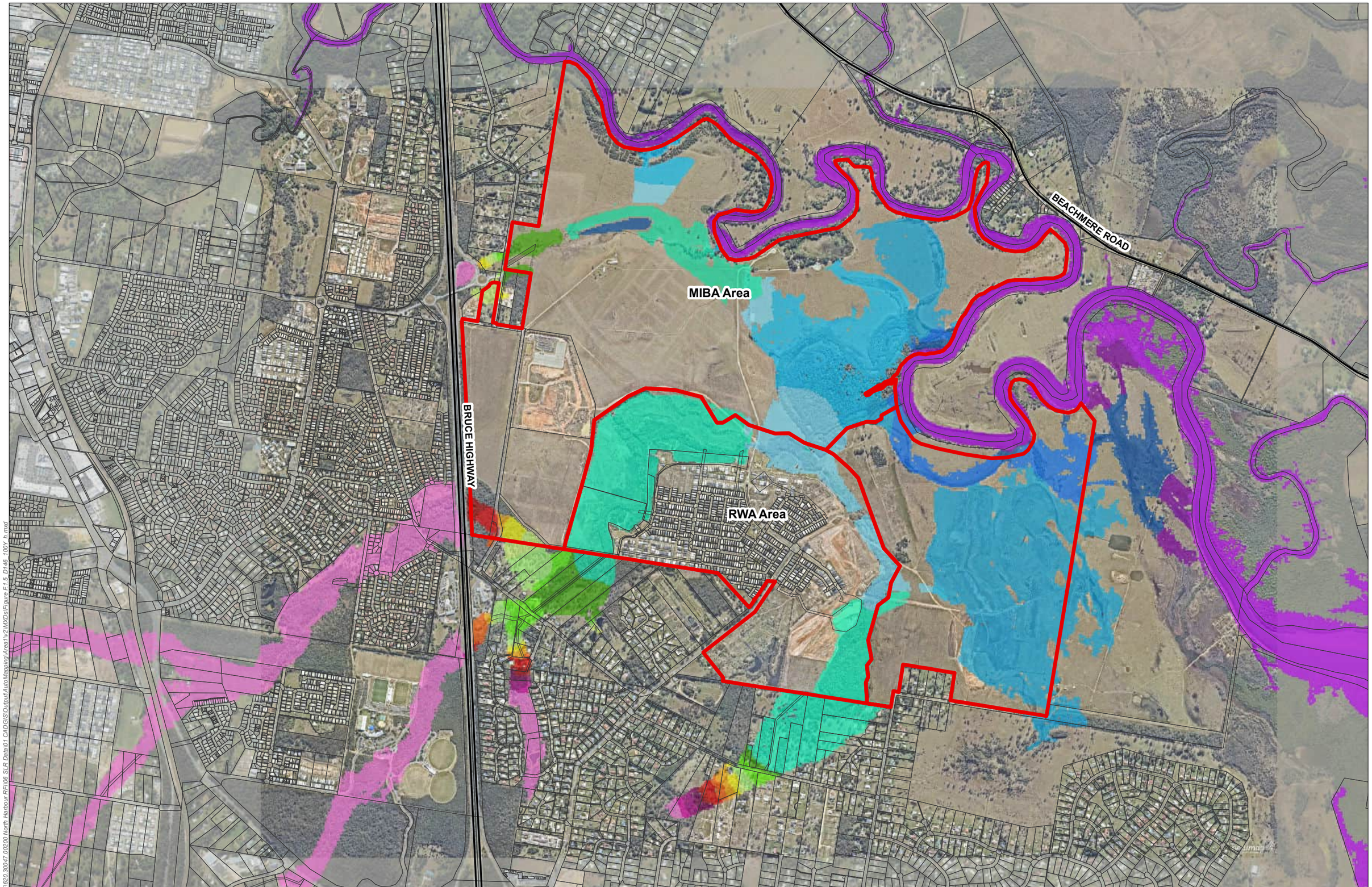
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Levels - 2% AEP

Figure F.1.4



H:\Projects-SL R\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.1.5_D146_100Y_h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

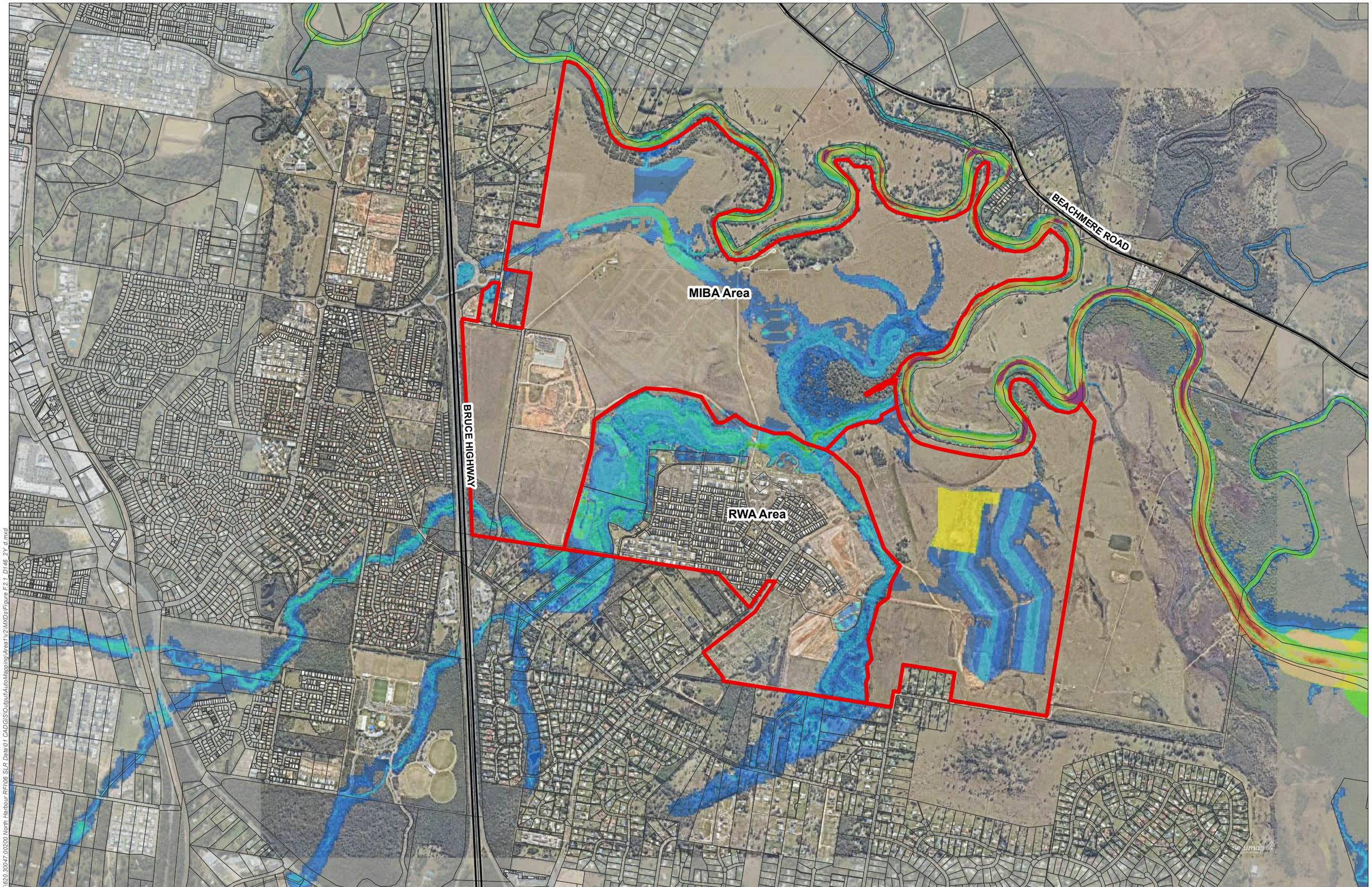
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Levels - 1 % AEP

Figure F.1.5



0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

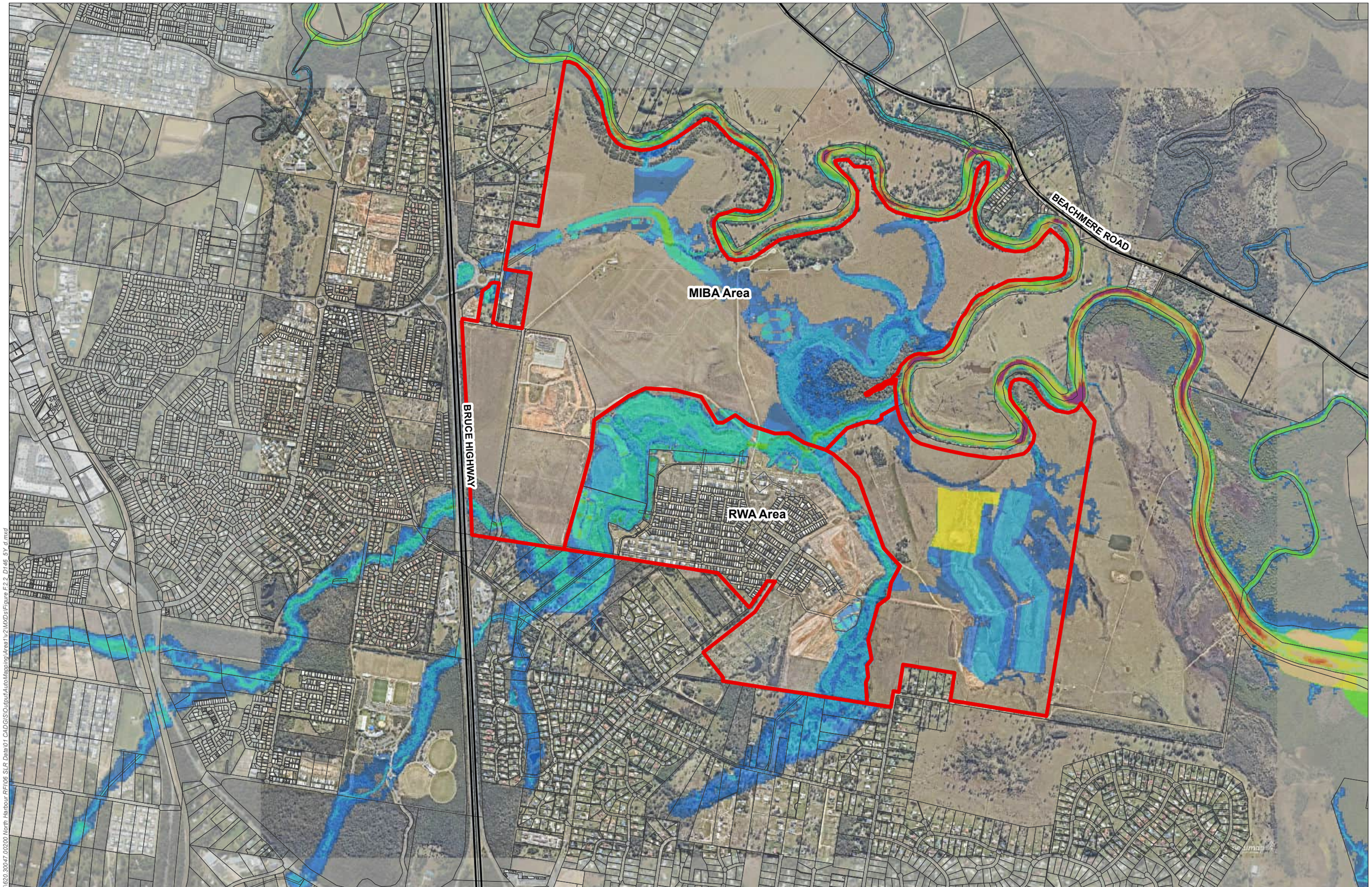
0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Depths - 39% AEP

Figure F.2.1

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.2.1_D146_2Y_d.mxd



SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

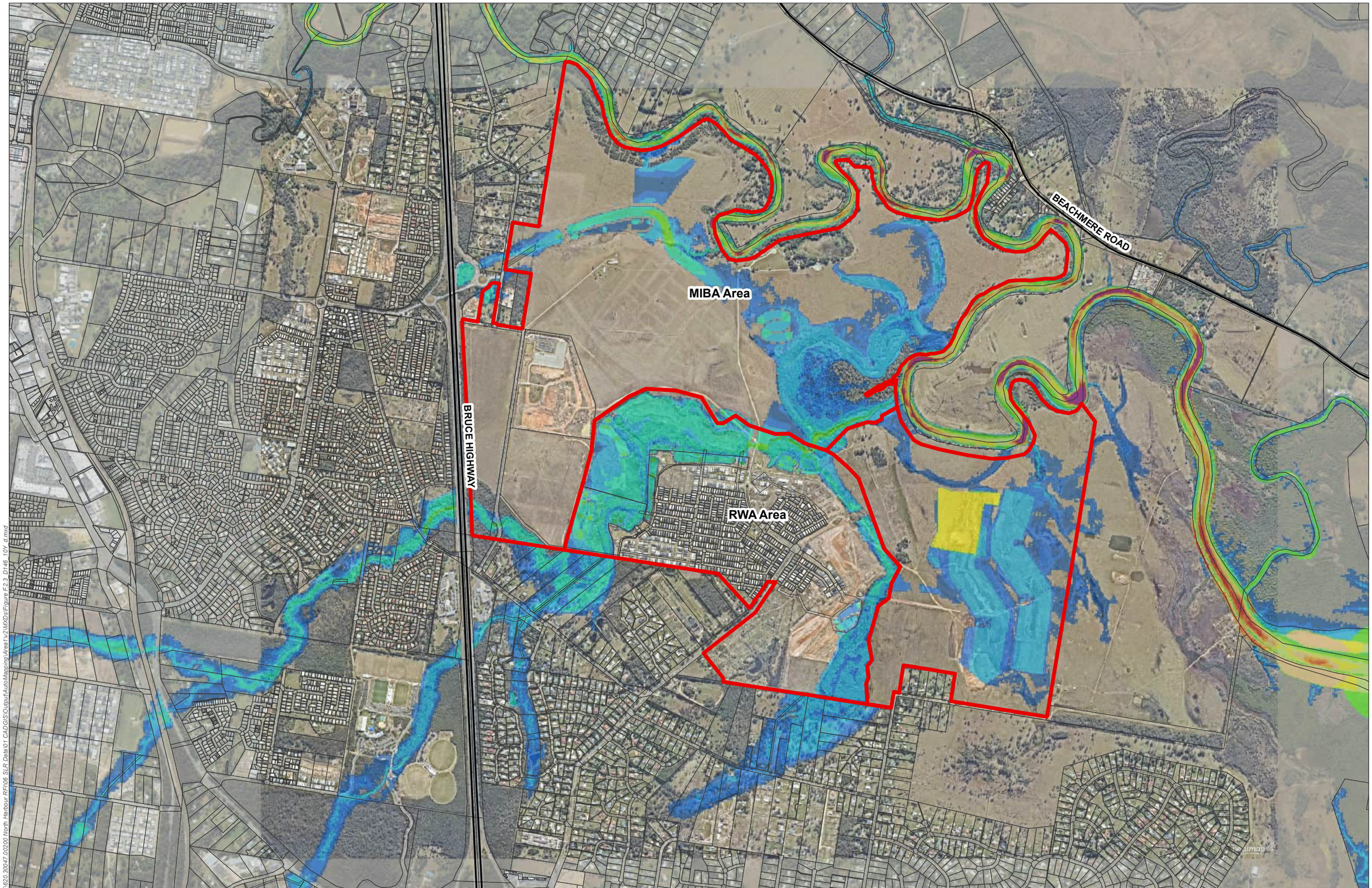
0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Depths - 20% AEP

Figure F.2.2

H:\Projects-SL\Ri620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.2.2_D146_5Y_d.mxd



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.2.3_D146_10Y_d.mxd

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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

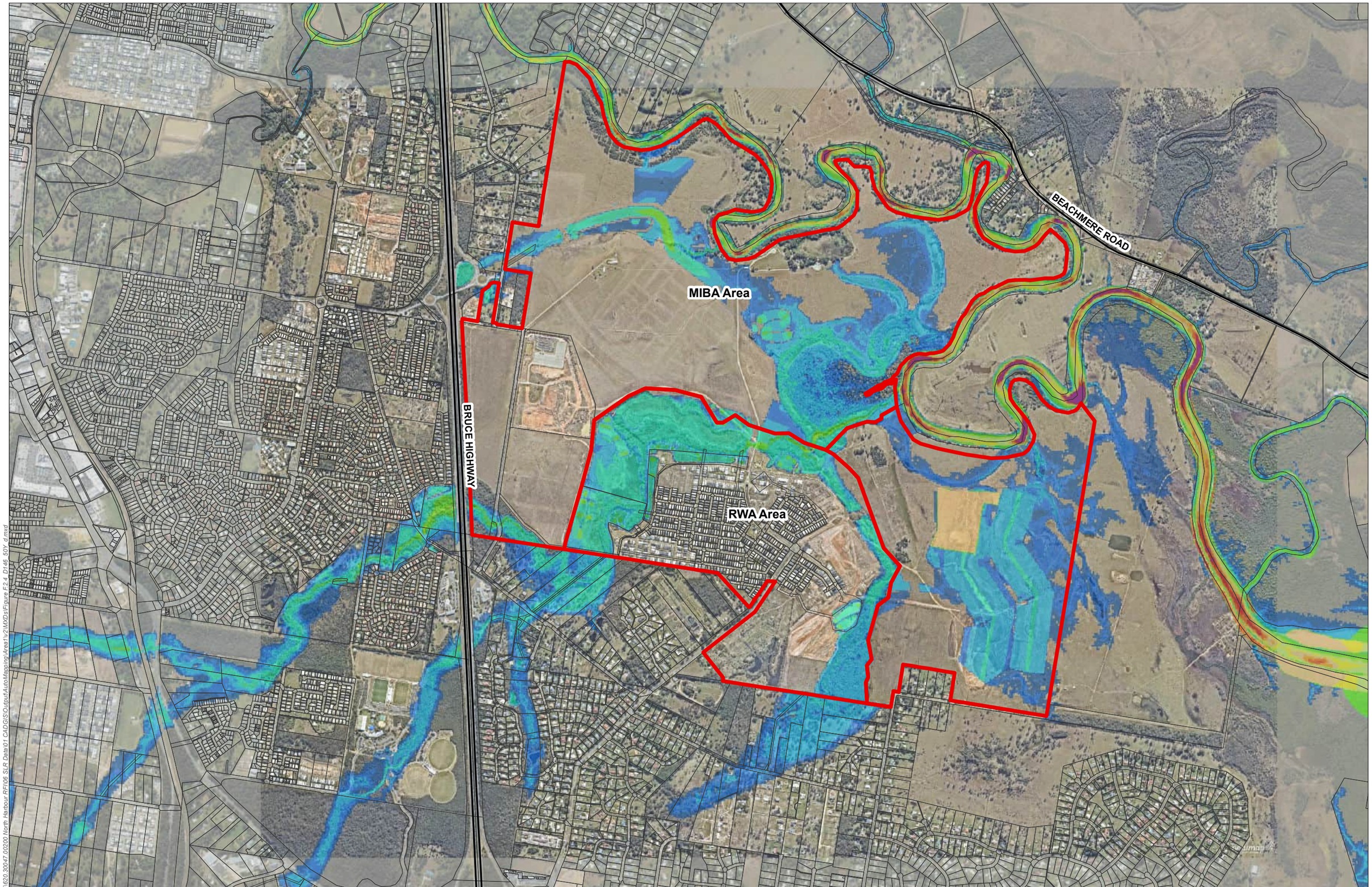
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Depths - 10% AEP

Figure F.2.3



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.2.4_D146_50Y_d.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

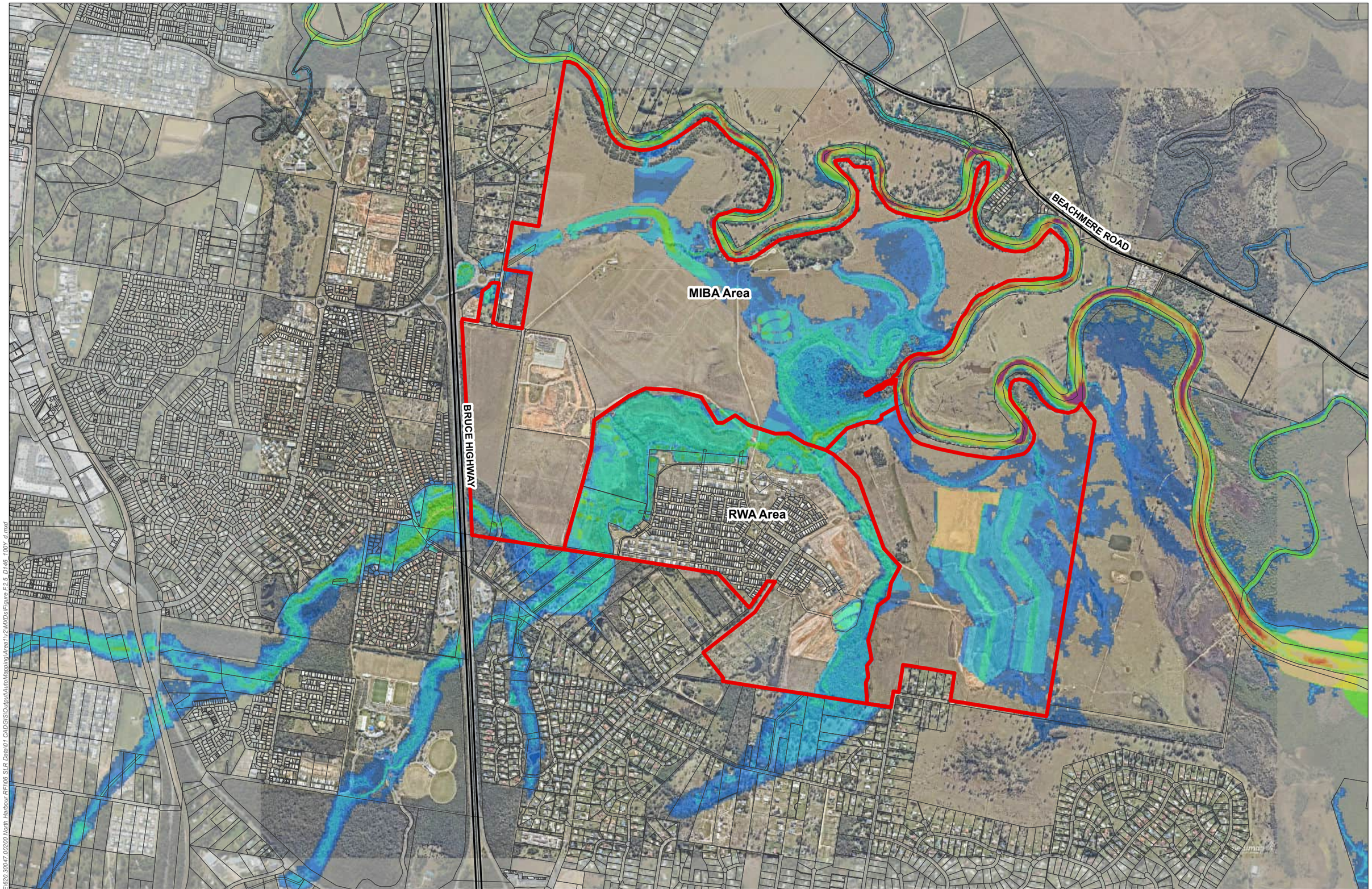
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Depths - 2% AEP

Figure F.2.4



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.2.5_D146_100Y_d.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

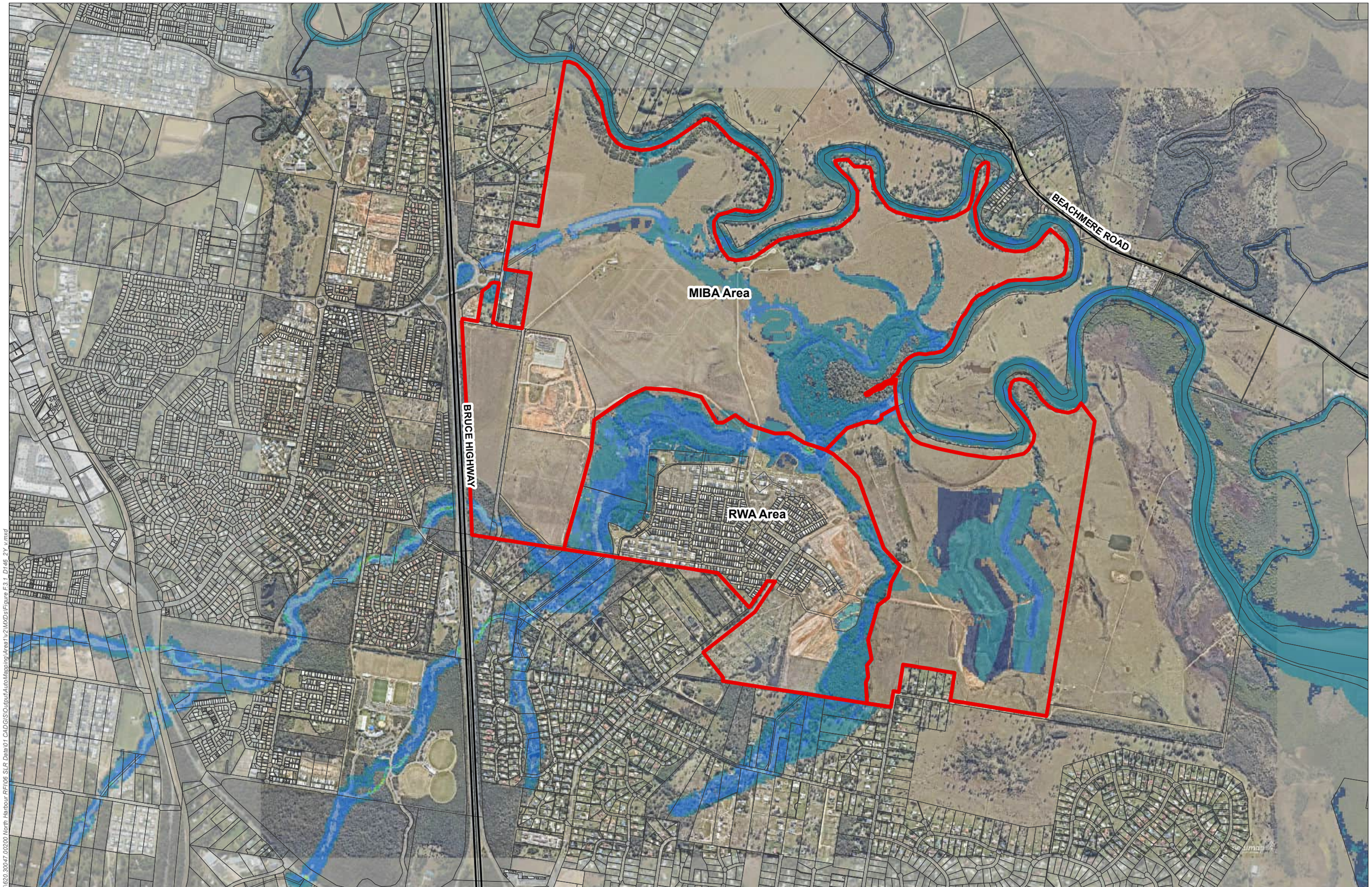
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Depths - 1 % AEP

Figure F.2.5



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F3.1_D146_PV_v1.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

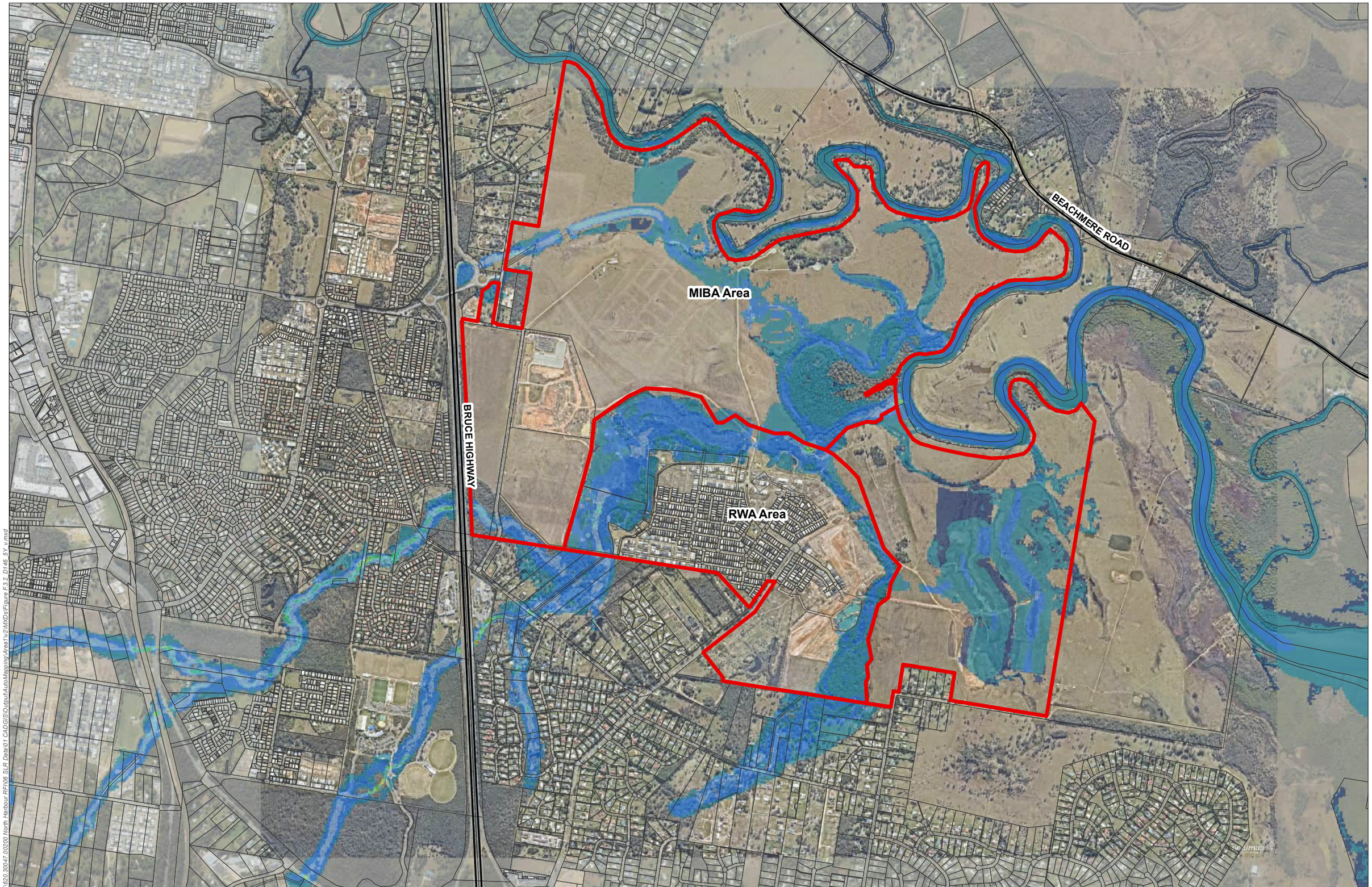
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Velocities - 39% AEP

Figure F.3.1



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.3.2_D146_5Y v1.mxd

SLR
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0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Velocities - 20% AEP

Figure F.3.2

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

Site Boundary

Cadastre Boundary

Velocity (m/s)

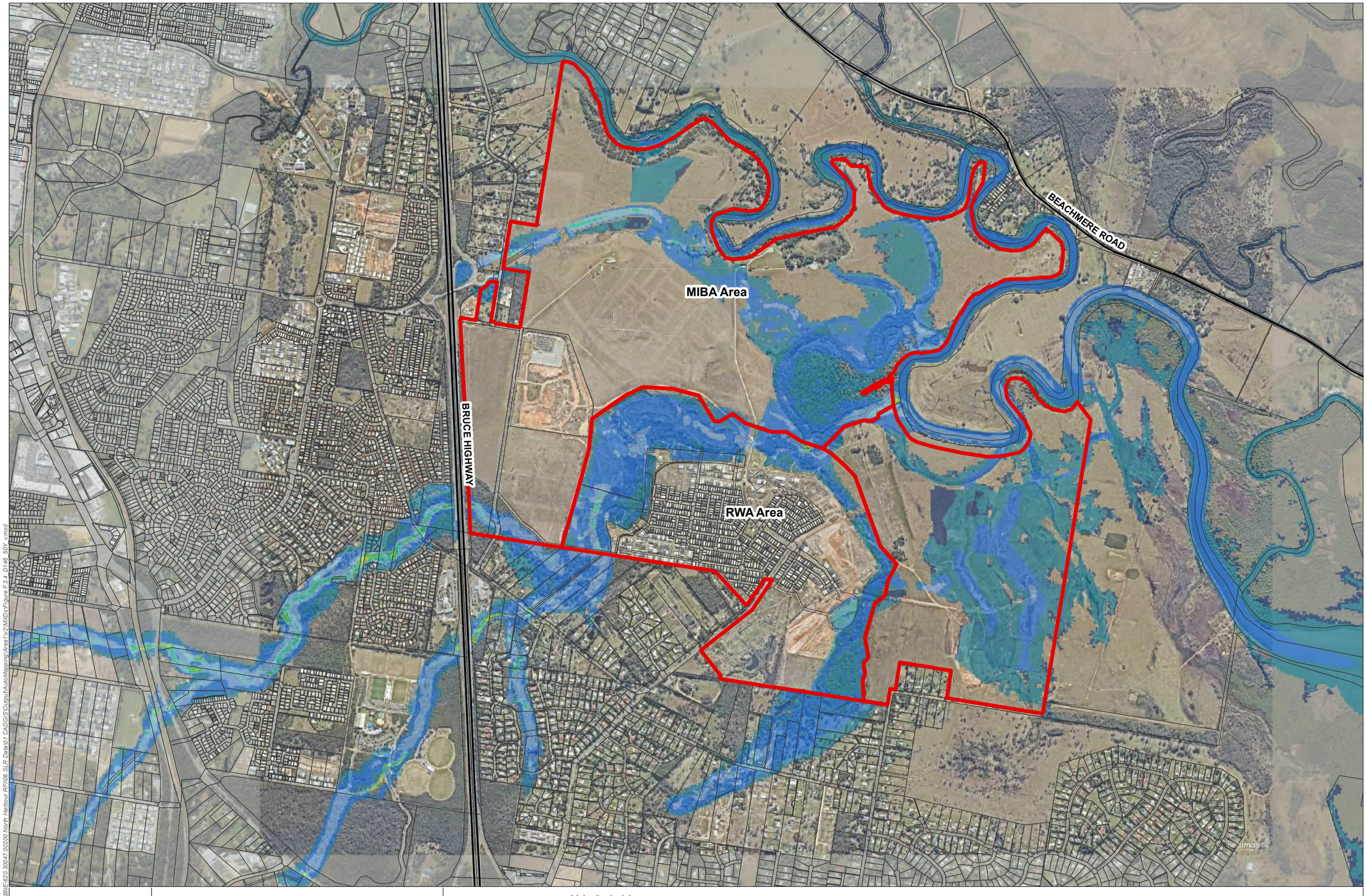
Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Velocities - 10% AEP

Figure F.3.3

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F3.3_D146_10Y_v1.mxd



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXD\[Figure F3.4_D146_50Y.vmxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

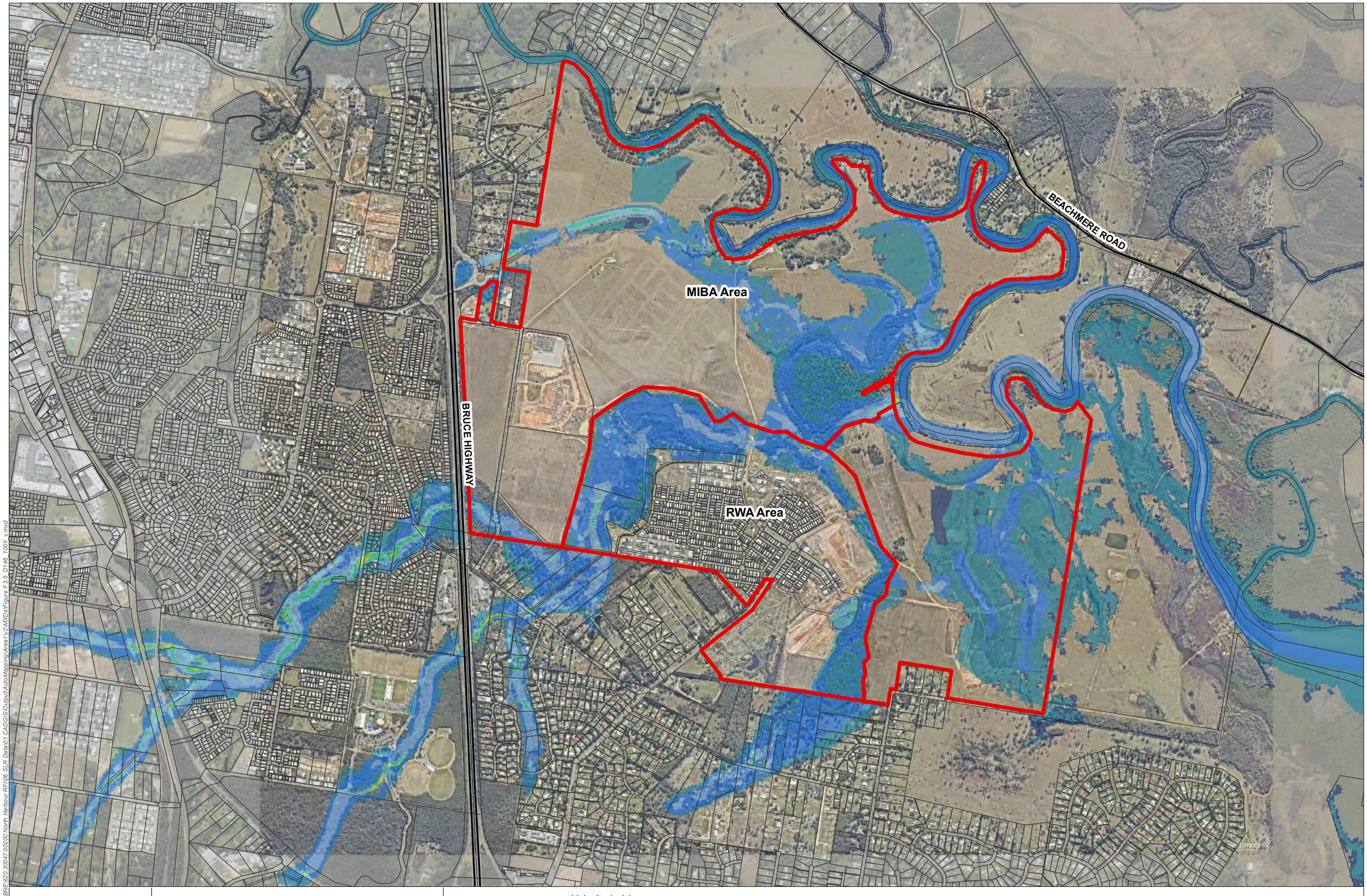
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Velocities - 2% AEP

Figure F.3.4



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXD\[Figure F3.5_D146_100Y_v.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

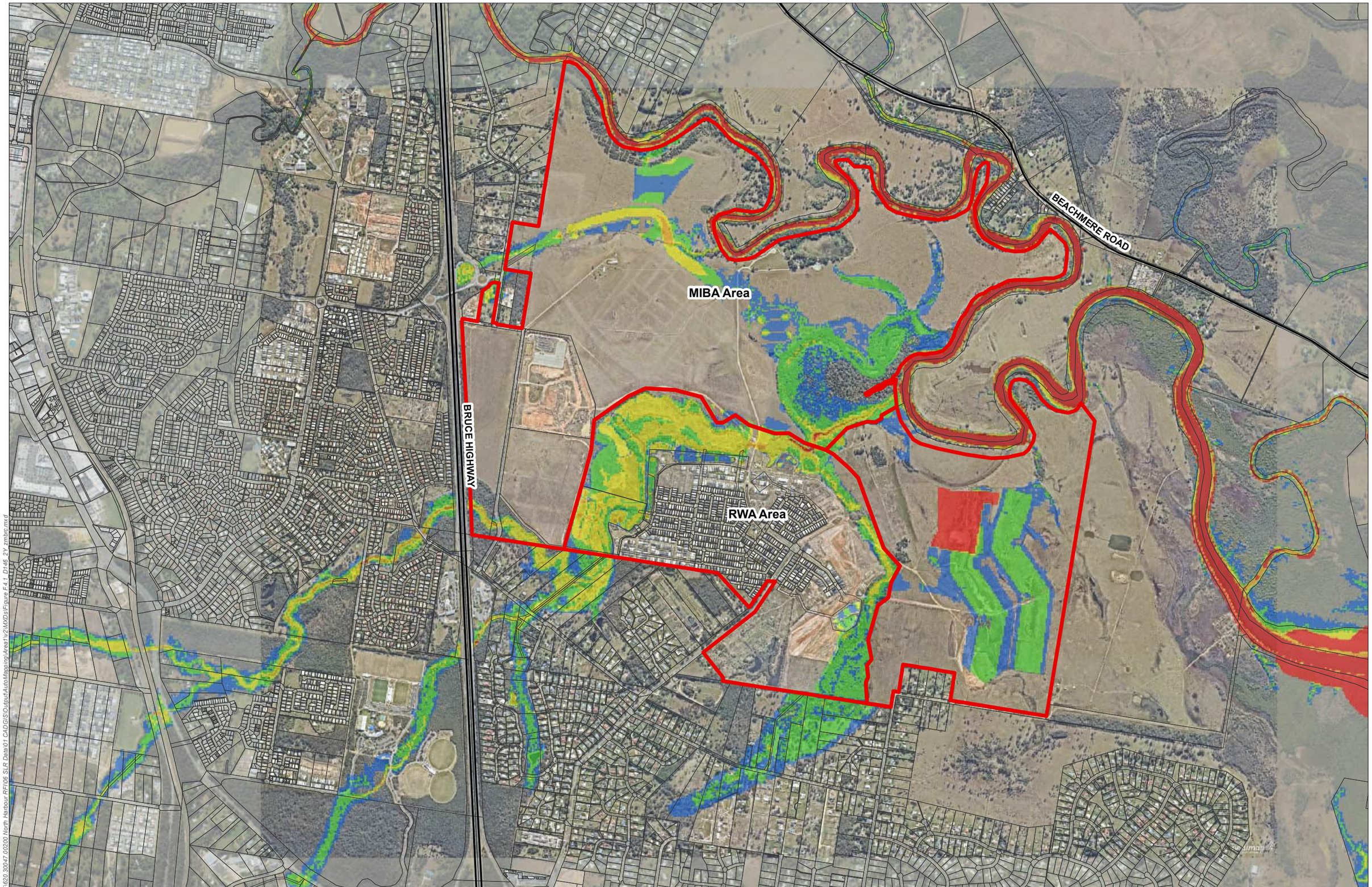
Velocity (m/s)

Below 0.01	0.75 - 1.00	1.75 to 2.00	2.75 to 3.00
0.01 to 0.20	1.00 to 1.25	2.00 to 2.25	3.00 to 3.25
0.2 - 0.50	1.25 to 1.50	2.25 to 2.50	3.25 to 3.50
0.5 - 0.75	1.50 to 1.75	2.50 to 2.75	Above 3.50

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Velocities - 1 % AEP

Figure F.3.5



H:\Projects-SLR\620-BNE\620-BNE620.300\47.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.4.1_D146_2Y_zmbrs.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

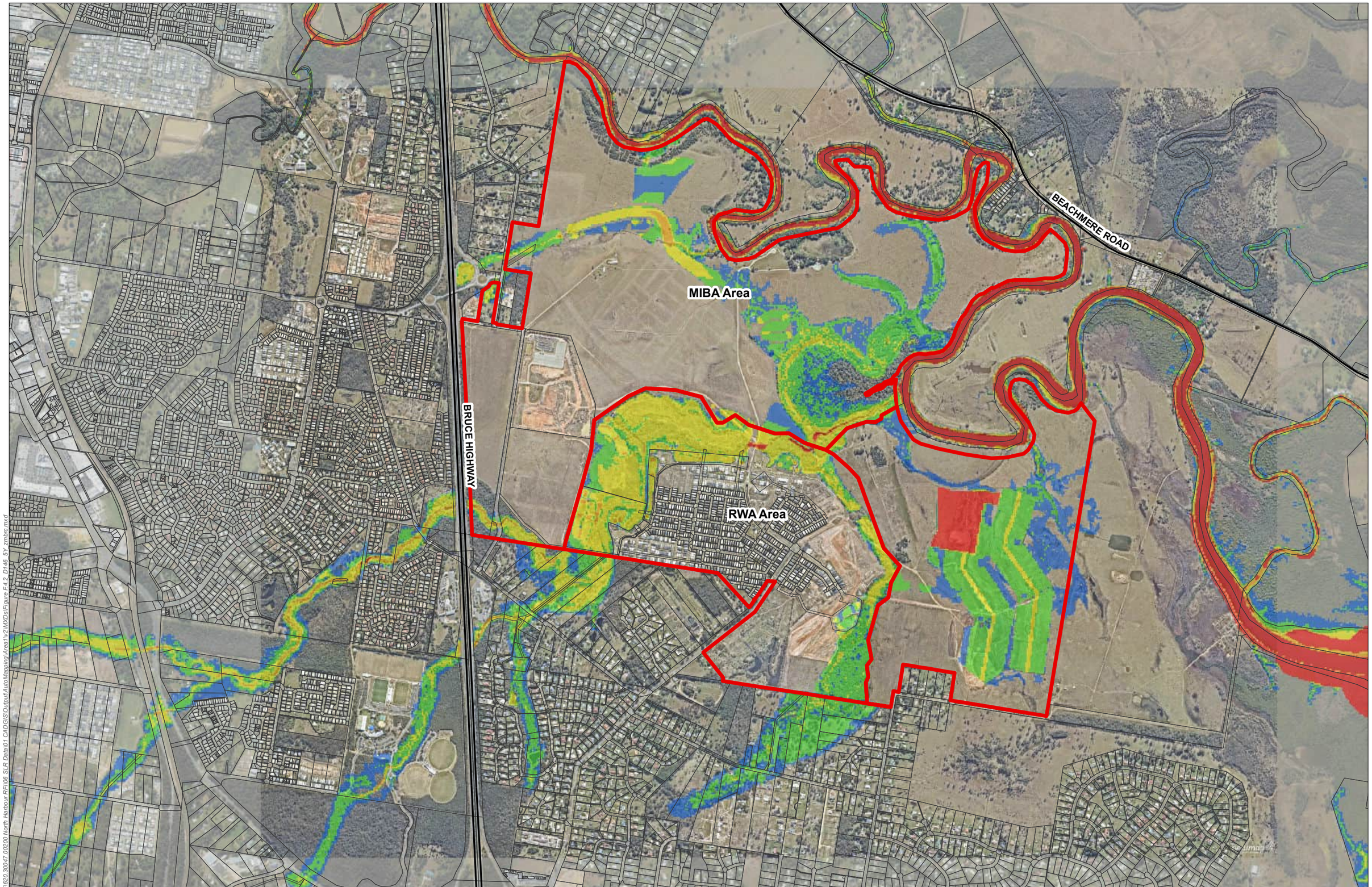
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Hazard - 39% AEP

Figure F.4.1



H:\Projects-SL\EK620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.4.2_D146_SY_zmbre.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

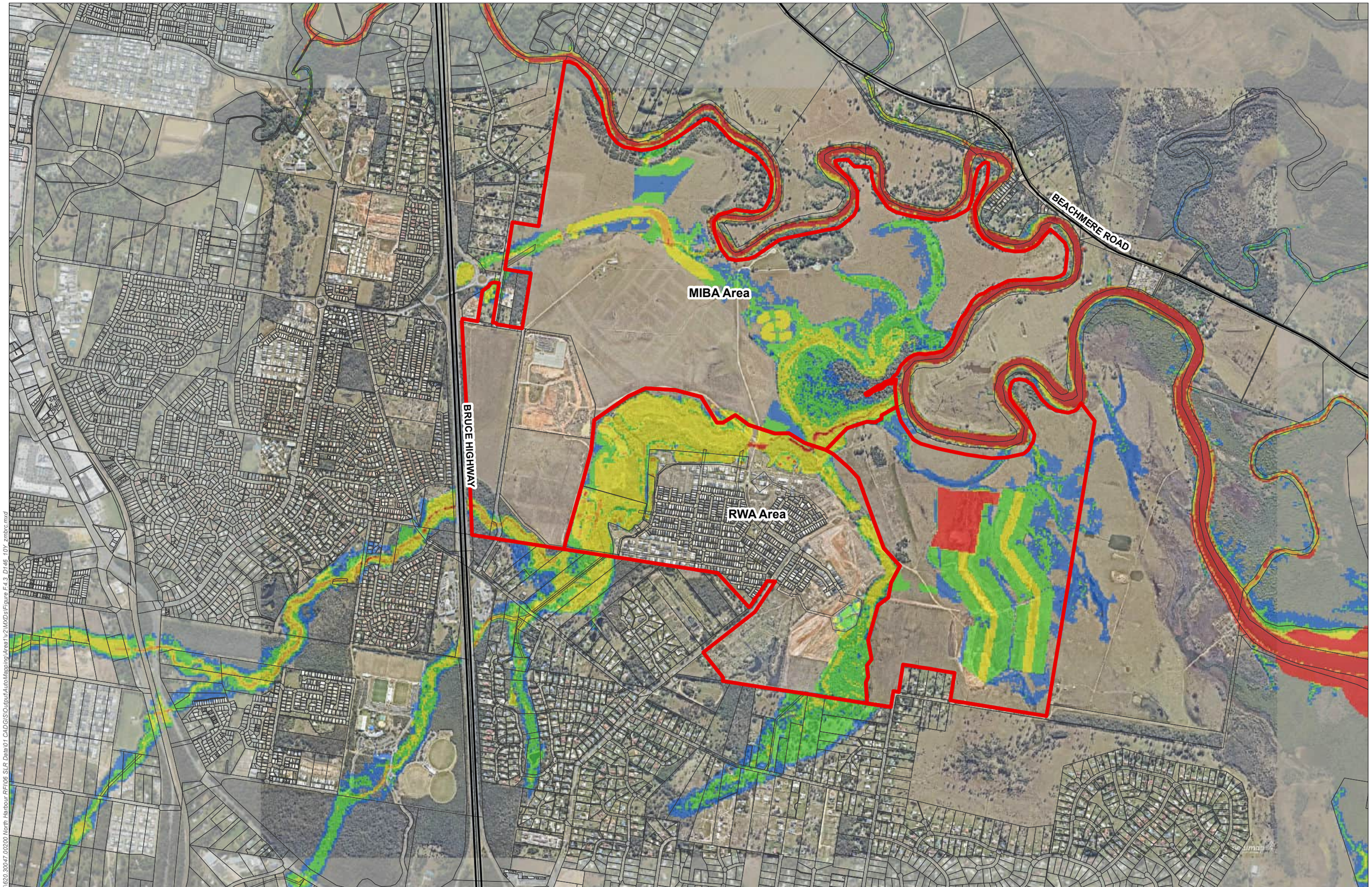
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Hazard - 20% AEP

Figure F.4.2



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.4.3_D146_10Y_zmbc.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

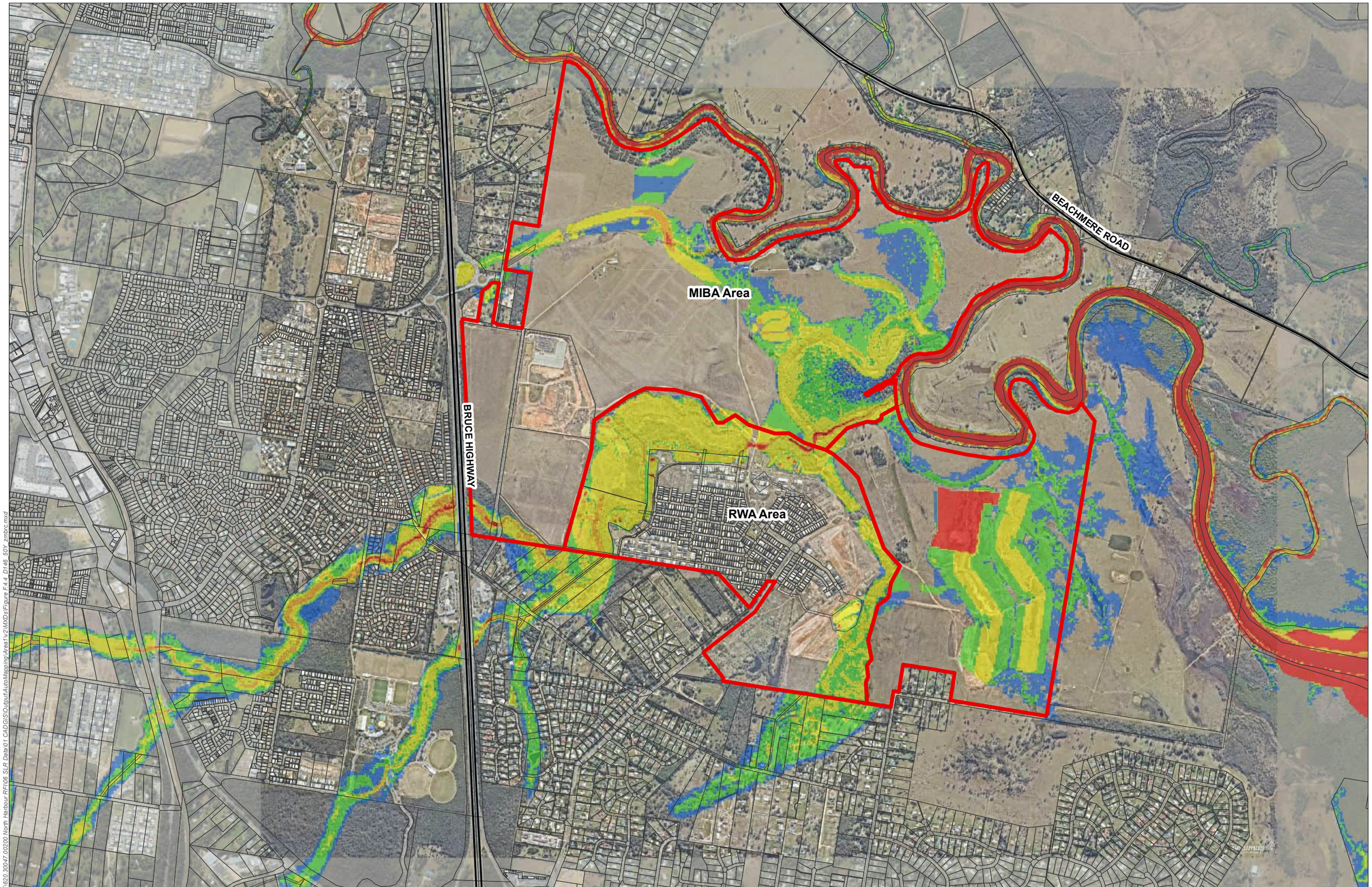
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Hazard - 10% AEP

Figure F.4.3



H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RP106 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.4.4_D146_50Y_zmbrc.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

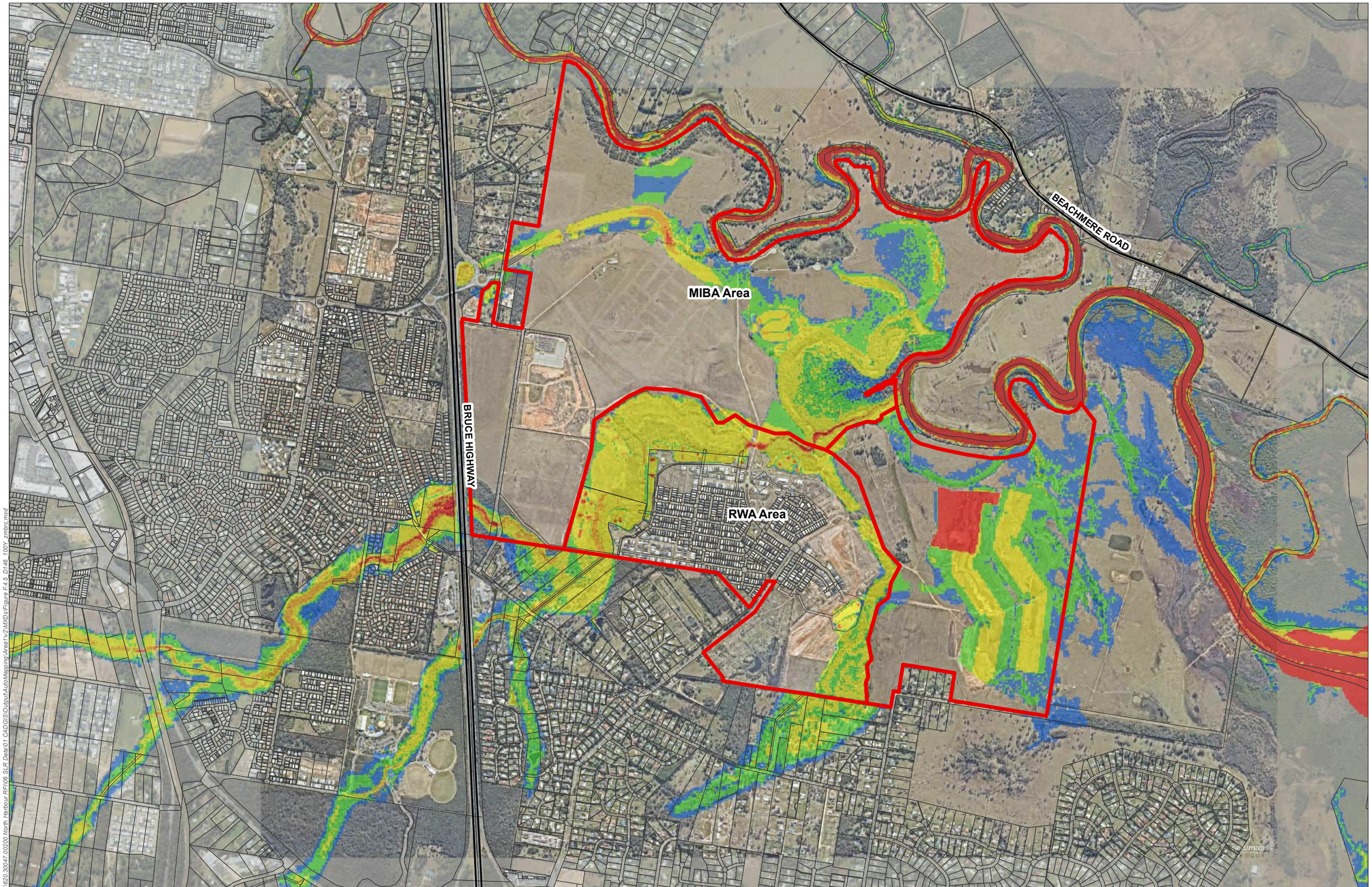
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Hazard - 2% AEP

Figure F.4.4



H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RP\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.4.5_D146_100Y_zmbce.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

2/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

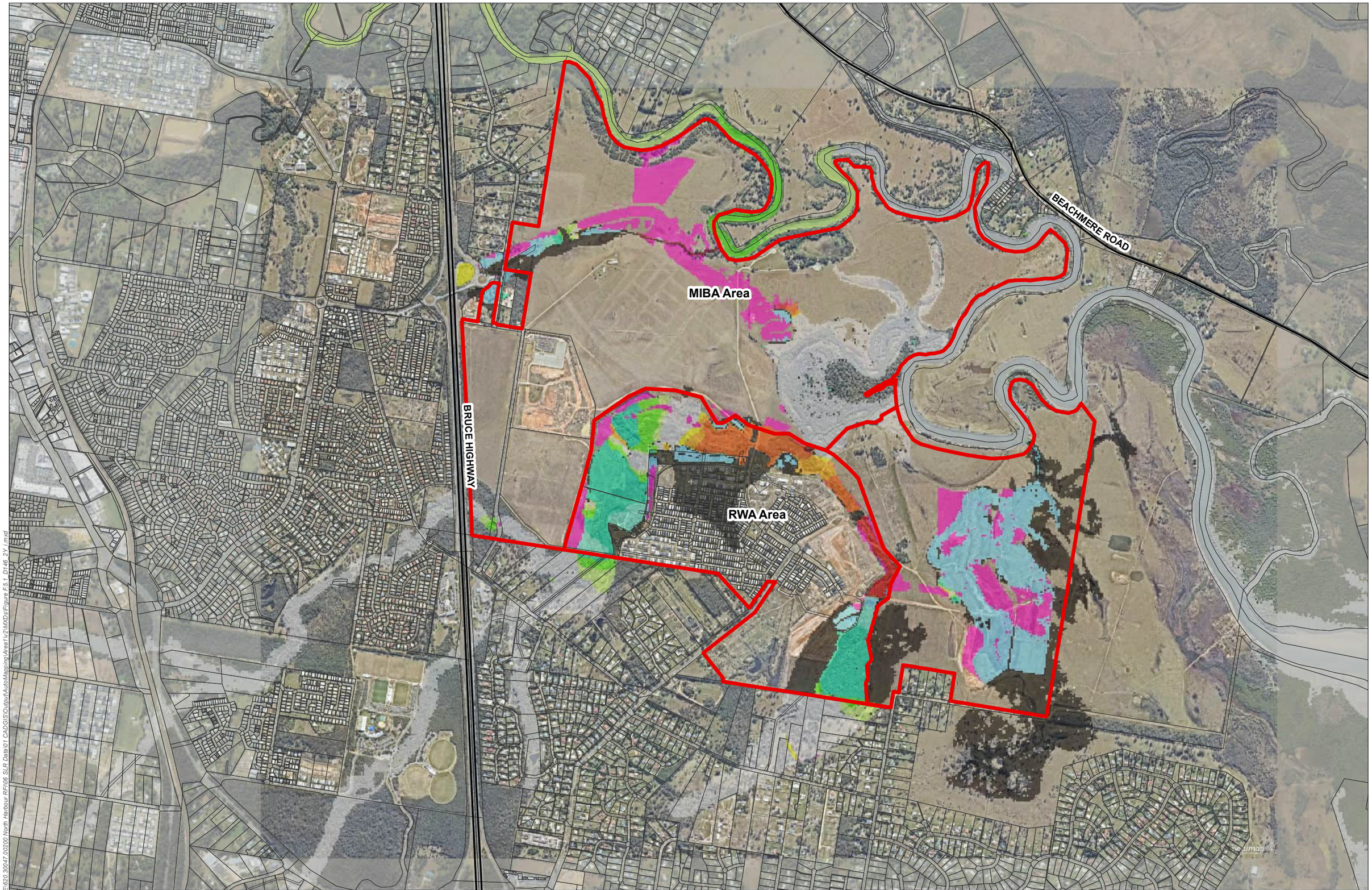
Hazard (m²/s)

- H1
- H2
- H3
- H4
- H5

North Harbour
Flood Management Plan

Developed Conditions (D146) - Local Event
Peak Flood Hazard - 1 % AEP

Figure F.4.5



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F5.1_D146_2Y_i.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

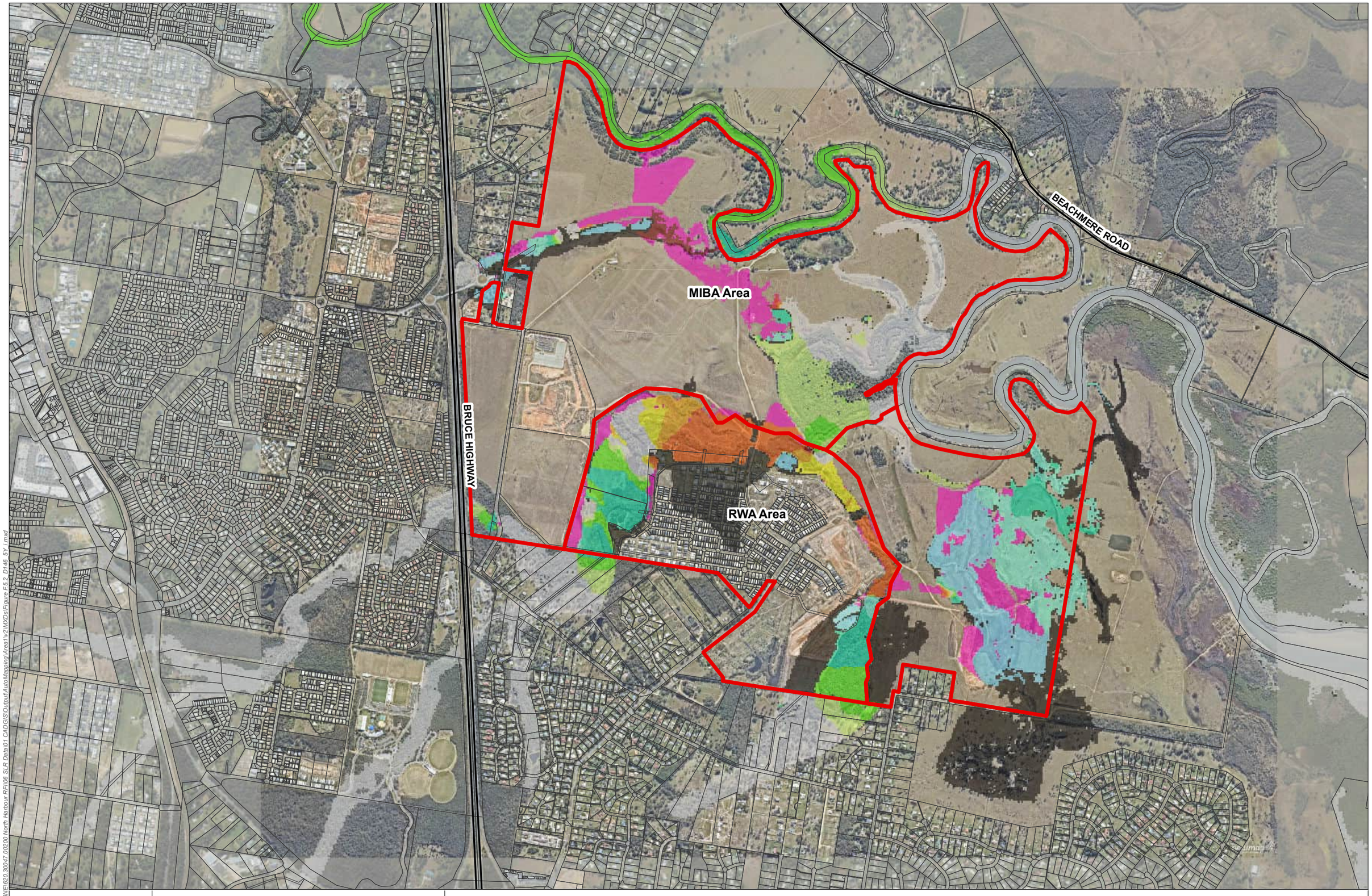
Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Afflux - 39% AEP

Figure F.5.1



0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Afflux - 20% AEP

Figure F.5.2

H:\Projects-SLR\620.BNE\620.BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Outputs\AutoMapping\Area1\v2\MXDs\Figure F.5.2_D146_5Y.mxd

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Outputs\AutoMapping\Area1\v2\MXDs\Figure F.5.3_D146_10Y.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

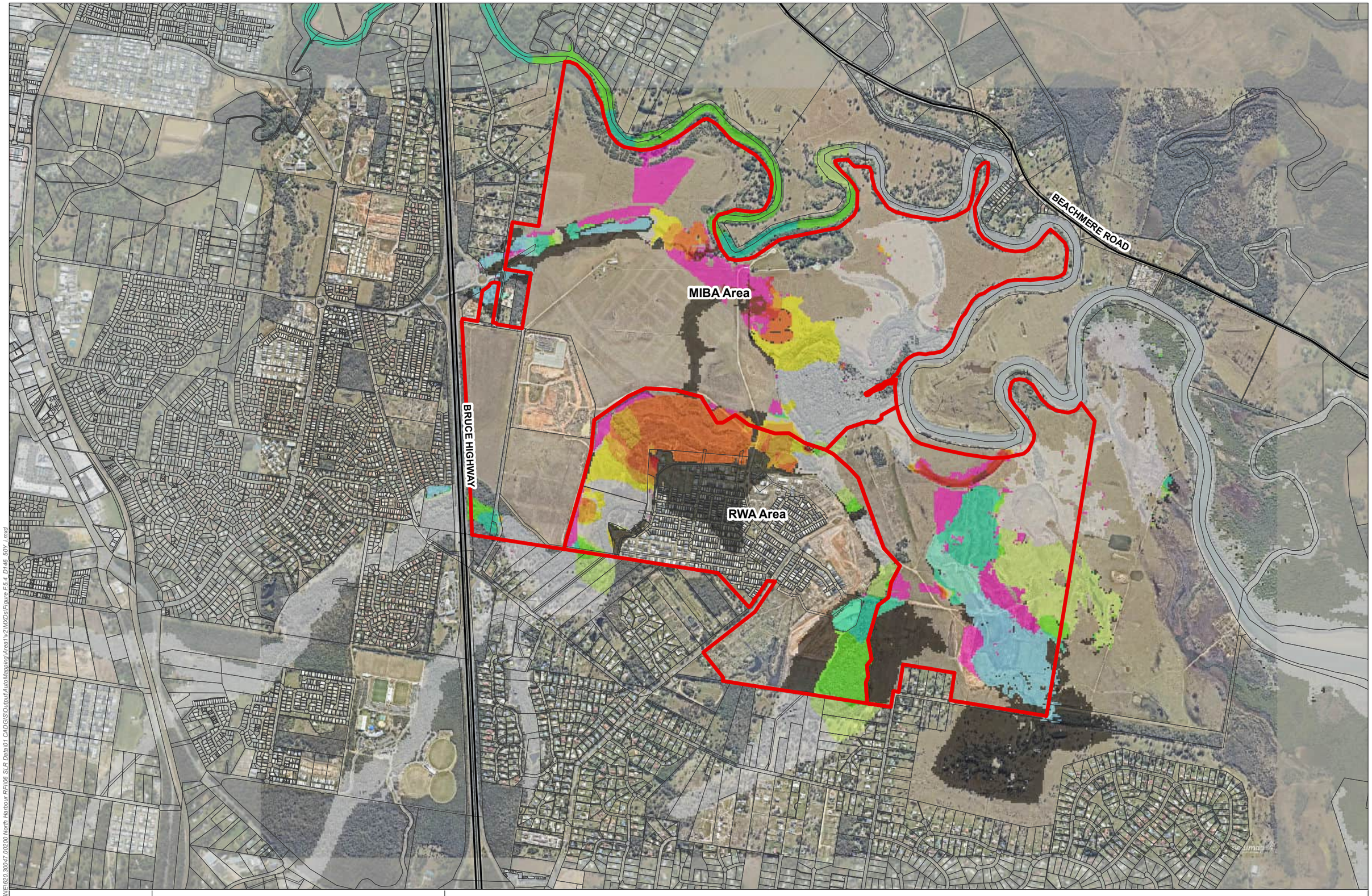
Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Afflux - 10% AEP

Figure F.5.3



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Outputs\AutoMapping\Area1\v2\MXDs\Figure F.5.4_D146_50Y_i.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

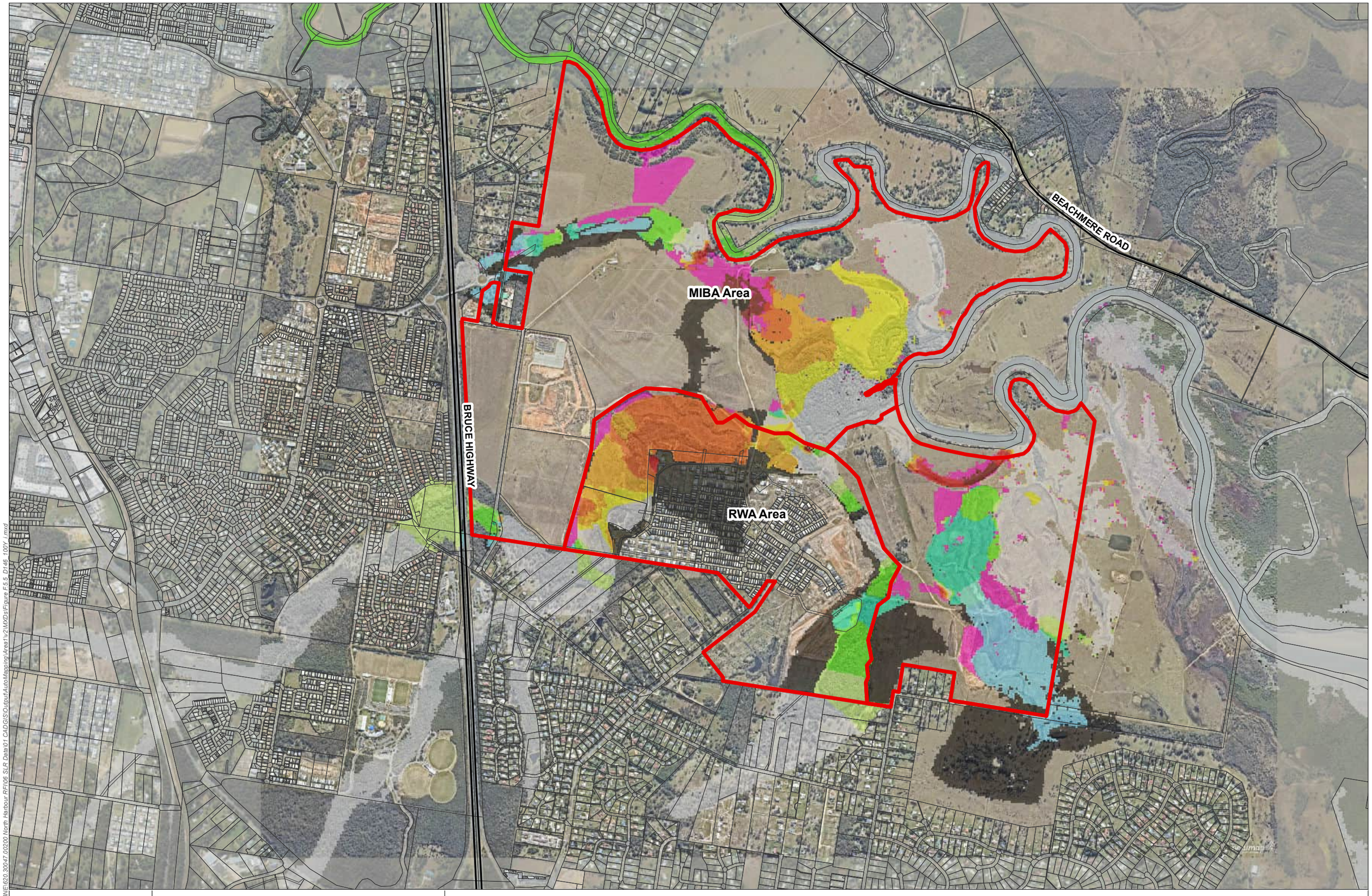
Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Afflux - 2% AEP

Figure F.5.4



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Outputs\AutoMapping\Area1\v2\MXDs\Figure F.5.5_D146_100Y.mxd

SLR
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0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

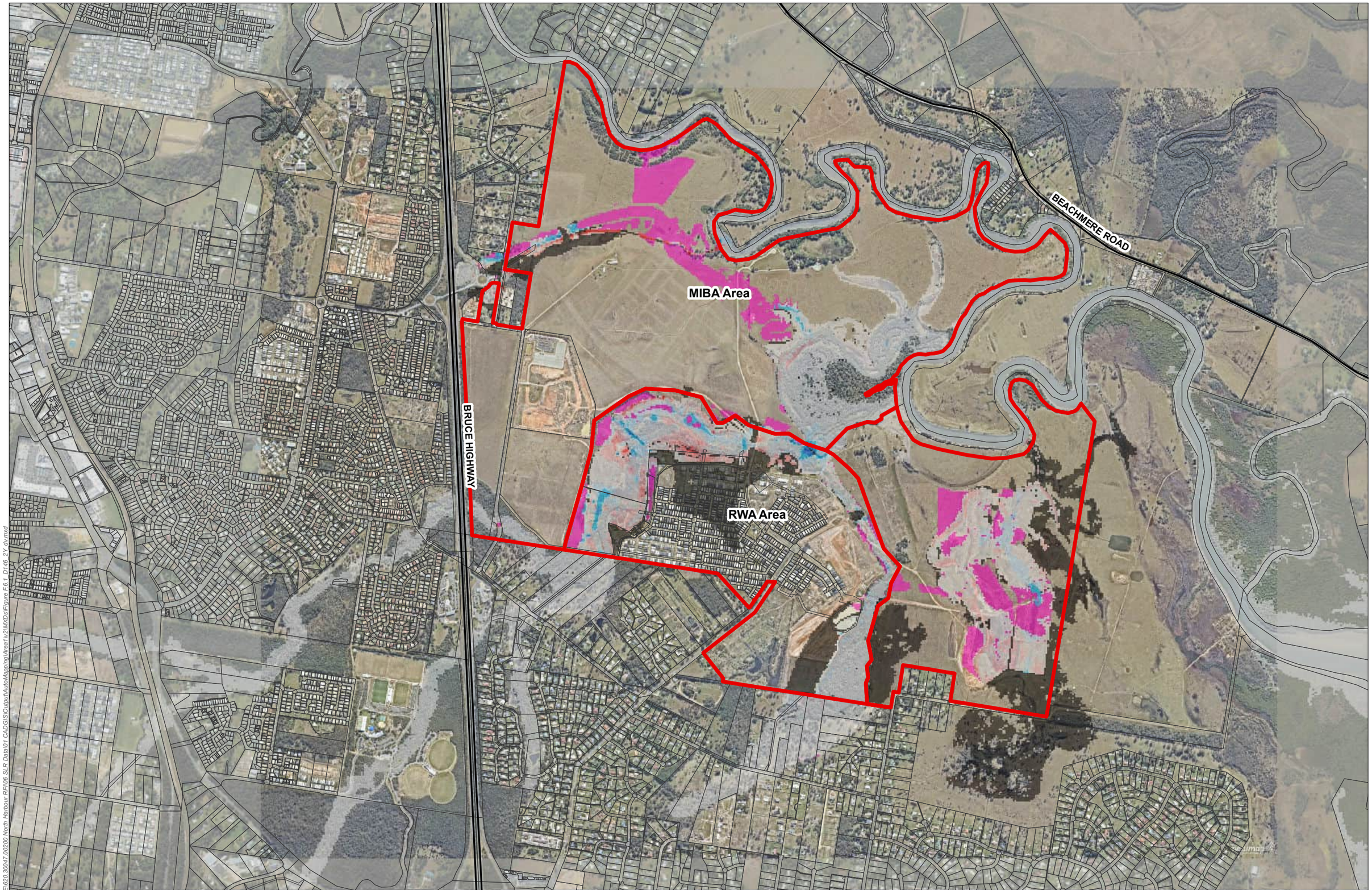
Afflux (m)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Afflux - 1 % AEP

Figure F.5.5



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0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Impact (m/s)

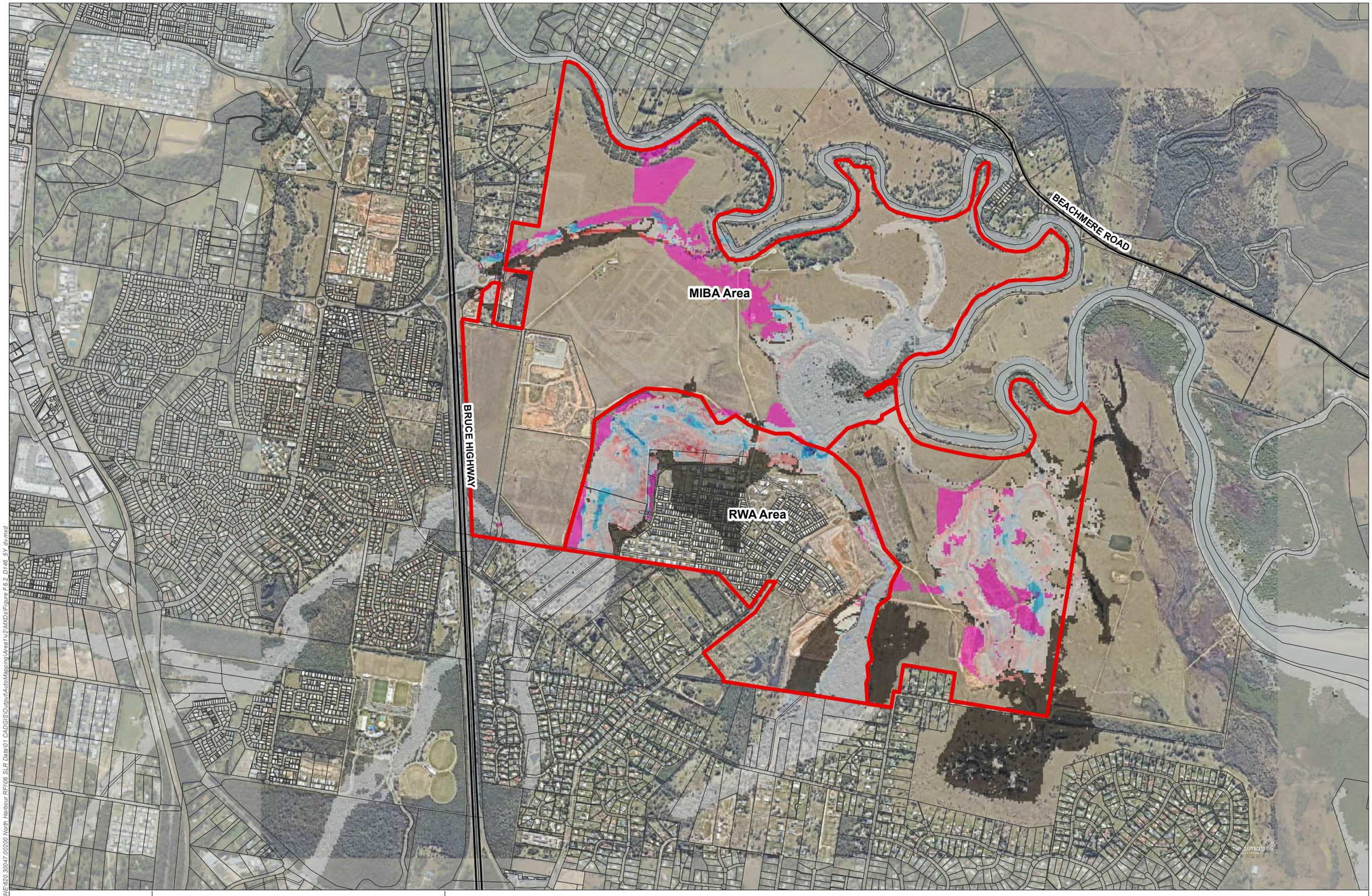
- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Velocity Impact - 39% AEP

Figure F.6.1

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.6.1_D146_2Y_dv.mxd



H:\Projects\SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.6.2_D146_SY_dunmxd

SLR
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0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

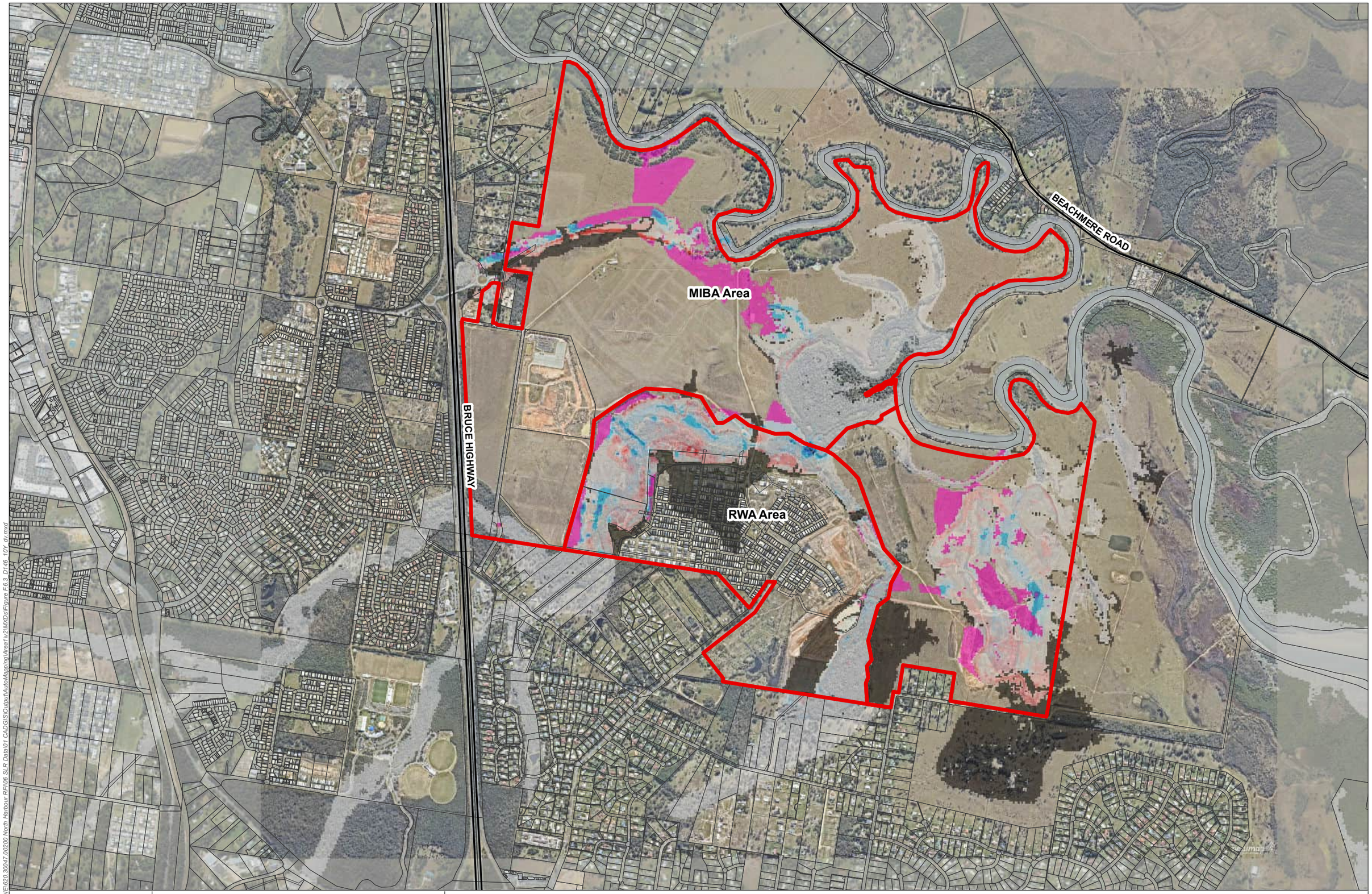
Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Velocity Impact - 20% AEP

Figure F.6.2



H:\Projects-SL\610.BNE\620.BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.6.3_D146_10Y_dy.mxd

SLR
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0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

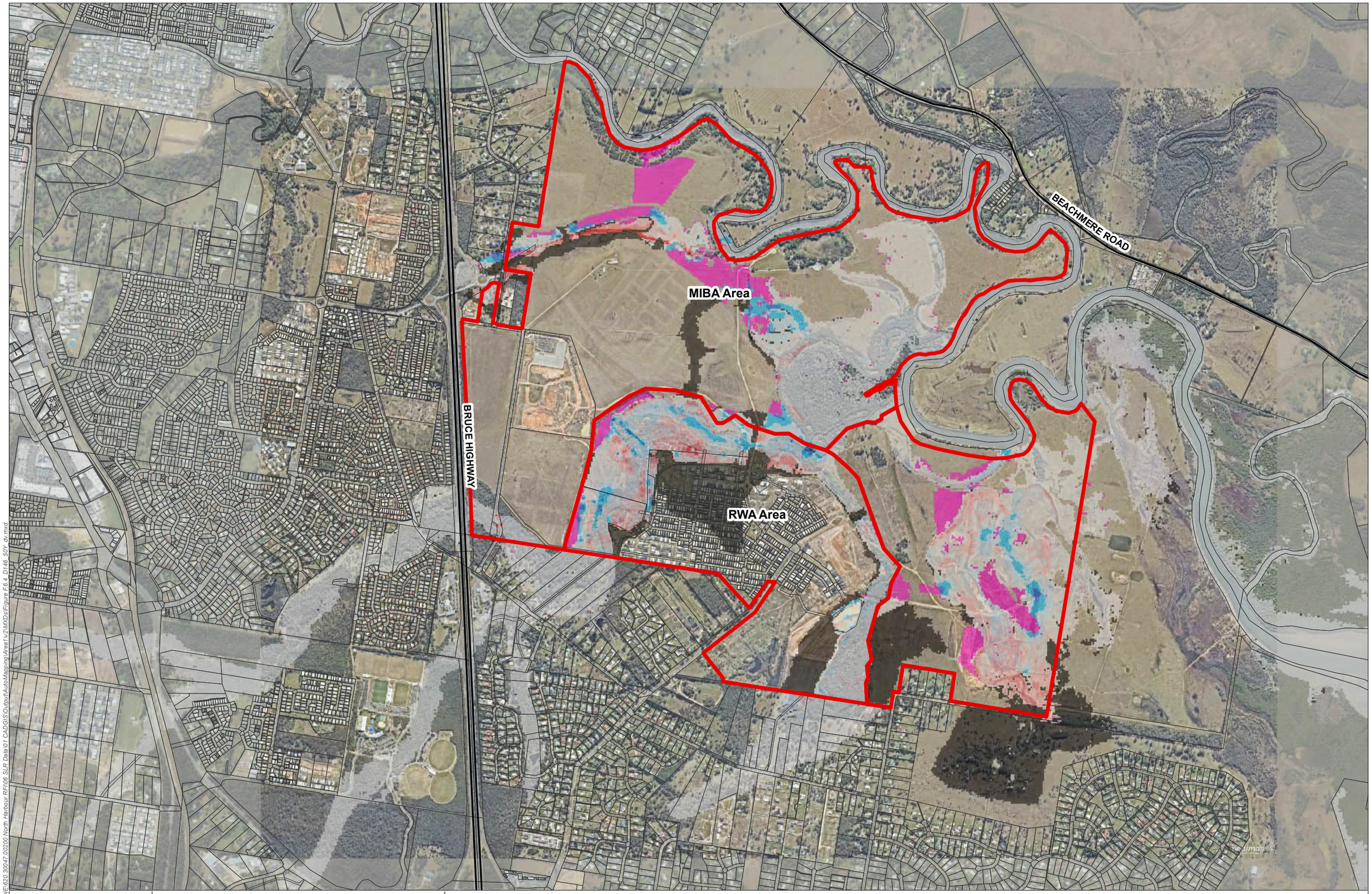
Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Velocity Impact - 10% AEP

Figure F.6.3



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.6.4 D146_E08_50Y_dy.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Developed Conditions (D146 - E008) Local Event
Peak Flood Velocity Impact - 2% AEP

Figure F.6.4

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

3/12/2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

- Site Boundary
- Cadastre Boundary

Impact (m/s)

- < -0.50
- -0.50 - -0.25
- -0.25 - -0.10
- -0.10 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- > 0.50
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

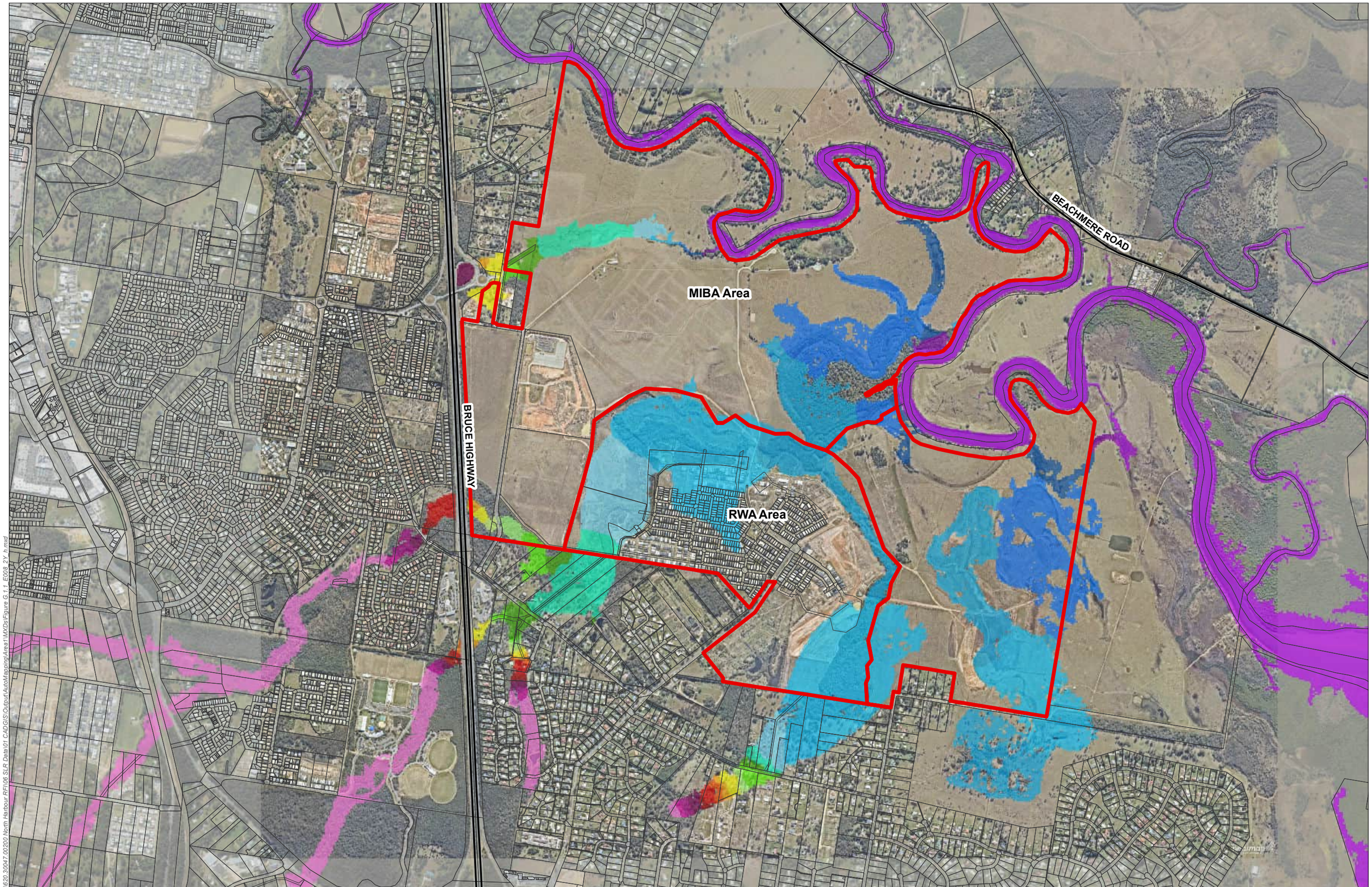
Developed Conditions (D146 - E008) Local Event
Peak Flood Velocity Impact - 1 % AEP

Figure F.6.5

H:\Projects-SLR\620.BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\v2\MXDs\Figure F.6.5_D146_100Y_dv.mxd

APPENDIX G

TUFLOW Results – Revised Roughness Scenario



SLR
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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00	
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25	
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25	
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75		

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event
Peak Flood Levels - 39% AEP

Figure G.1.1

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.1.1_E008_2Y_h.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

Site Boundary

Cadastre Boundary

Level (m AHD)

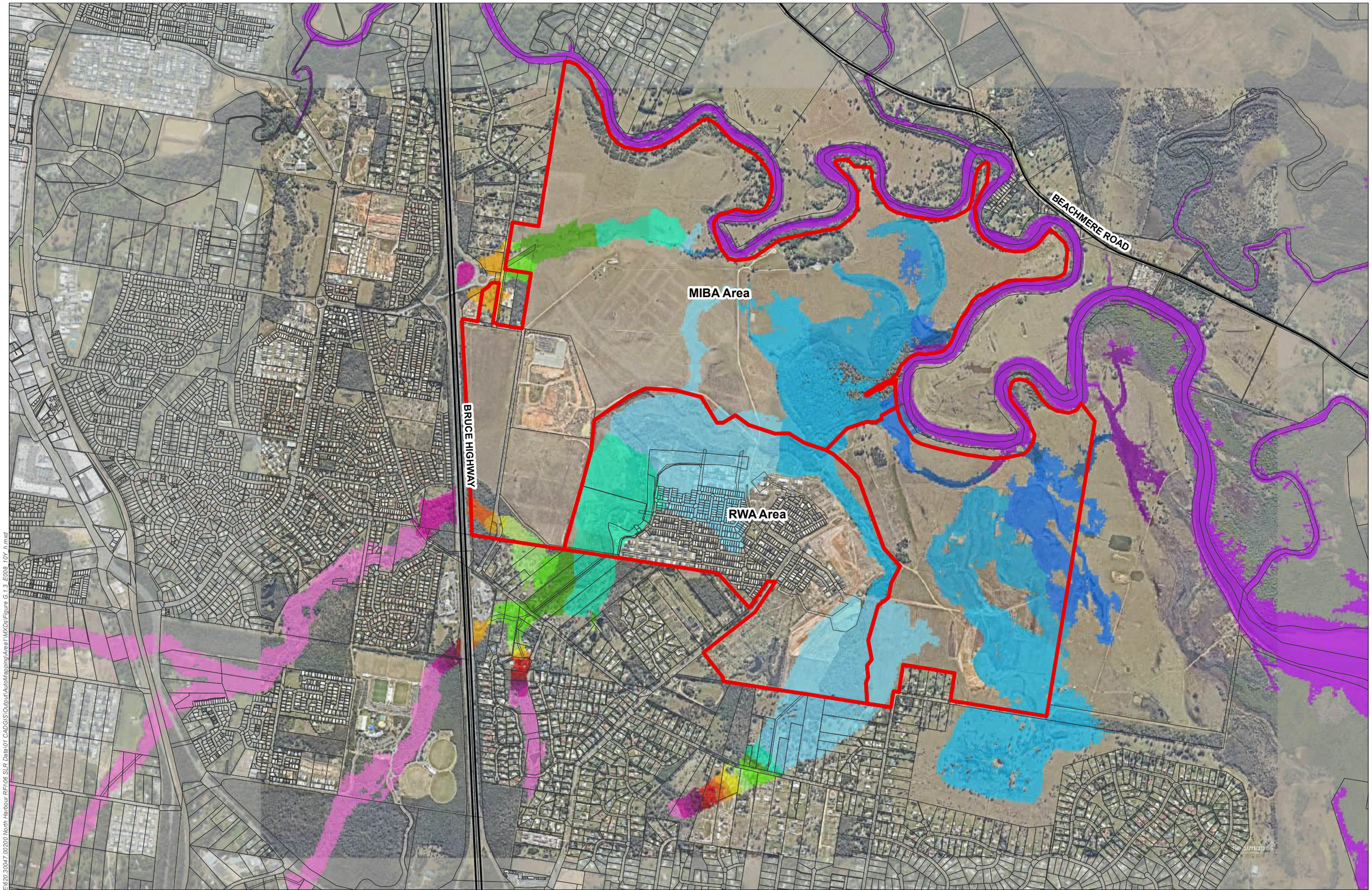
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event Peak Flood Levels - 20% AEP

Figure G.1.2

H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.1.2_E008_sY_h.mxd



H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.1.3_E008_10Y_A.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

Site Boundary

Cadastre Boundary

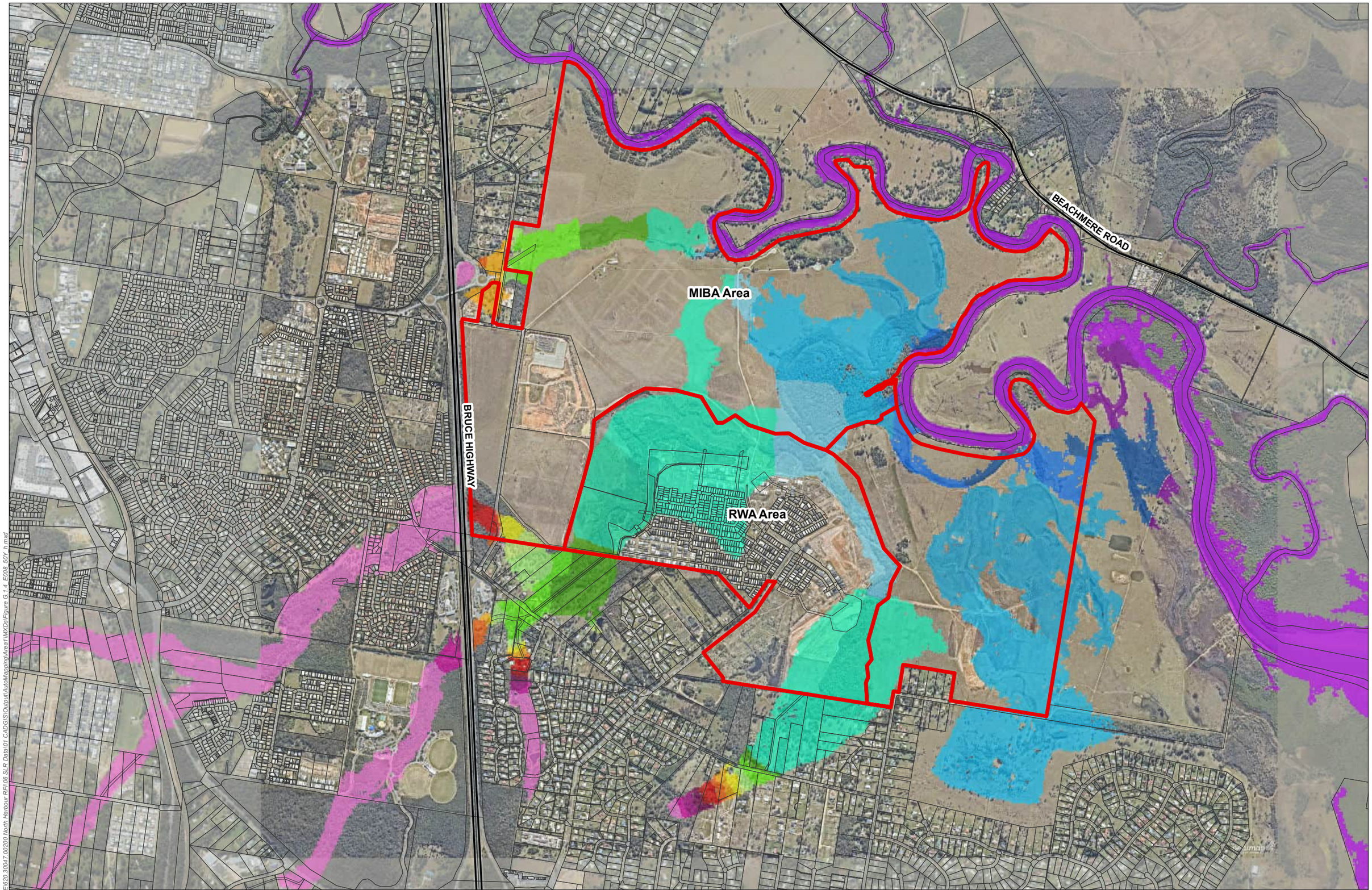
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event Peak Flood Levels - 10% AEP

Figure G.1.3



H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.1.4_E008_50Y_A.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

Site Boundary

Cadastre Boundary

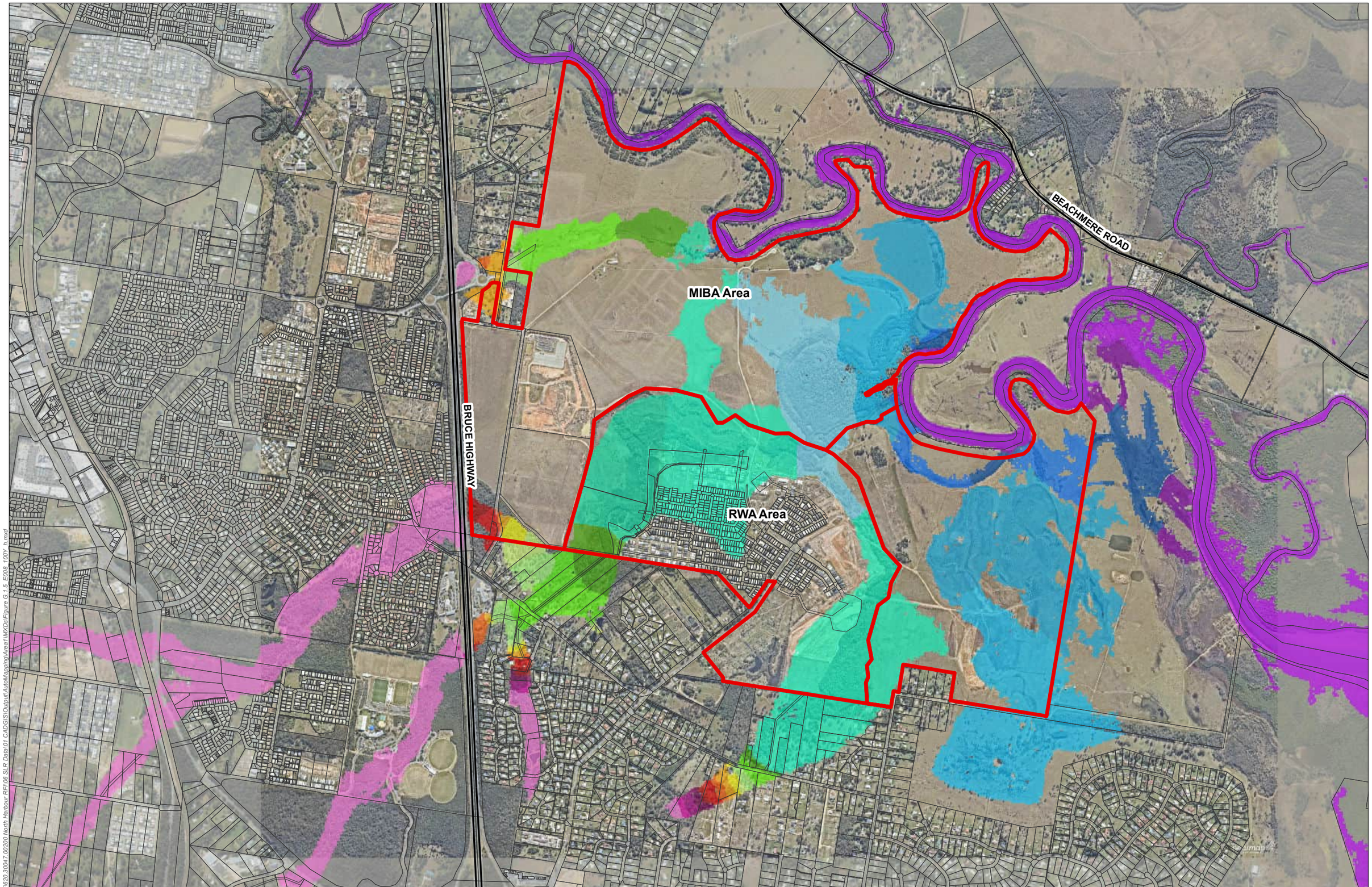
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event Peak Flood Levels - 2% AEP

Figure G.1.4



H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.1.5_E008_100Y_h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

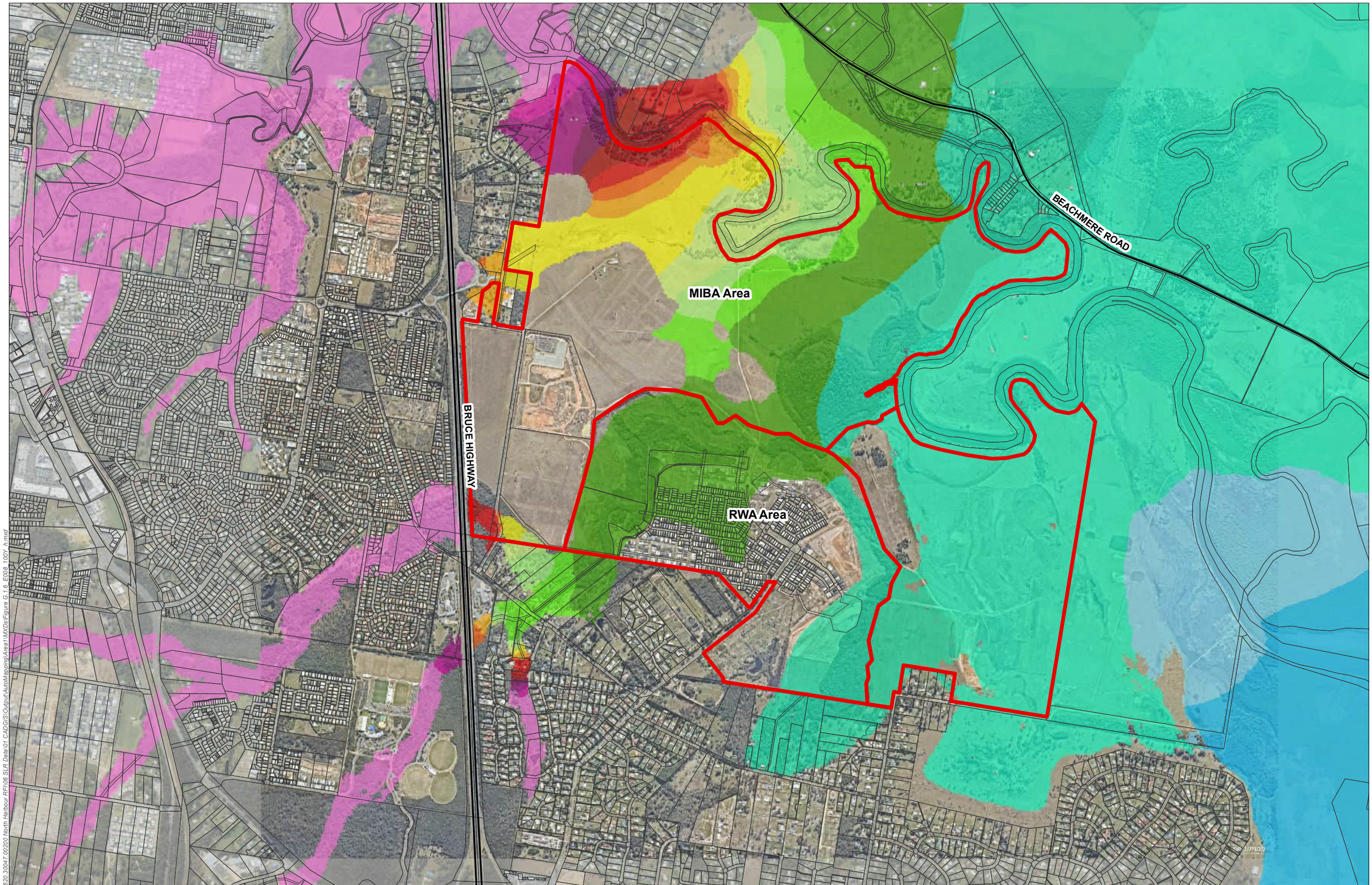
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event Peak Flood Levels - 1 % AEP

Figure G.1.5



H:\Projects-SLR\620.BNE620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.1.6_E008_100Y_h.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

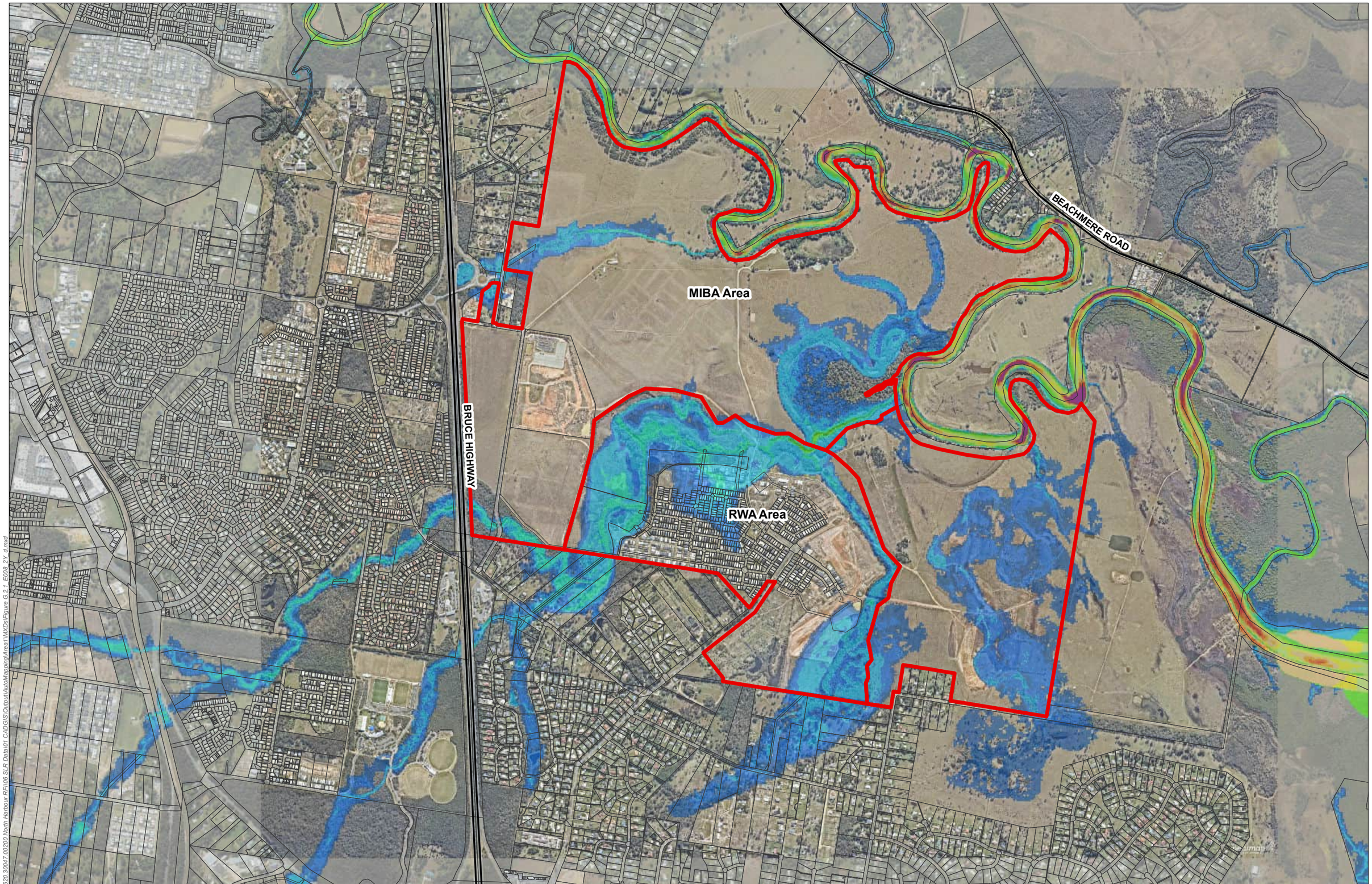
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Regional Event
Peak Flood Levels - 1 % AEP

Figure G.1.6



H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.2.1_E008_2Y_d.mxd

SLR
www.slrconsultingaustralia.com.au

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event
Peak Flood Depths - 39% AEP

Figure G.2.1

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

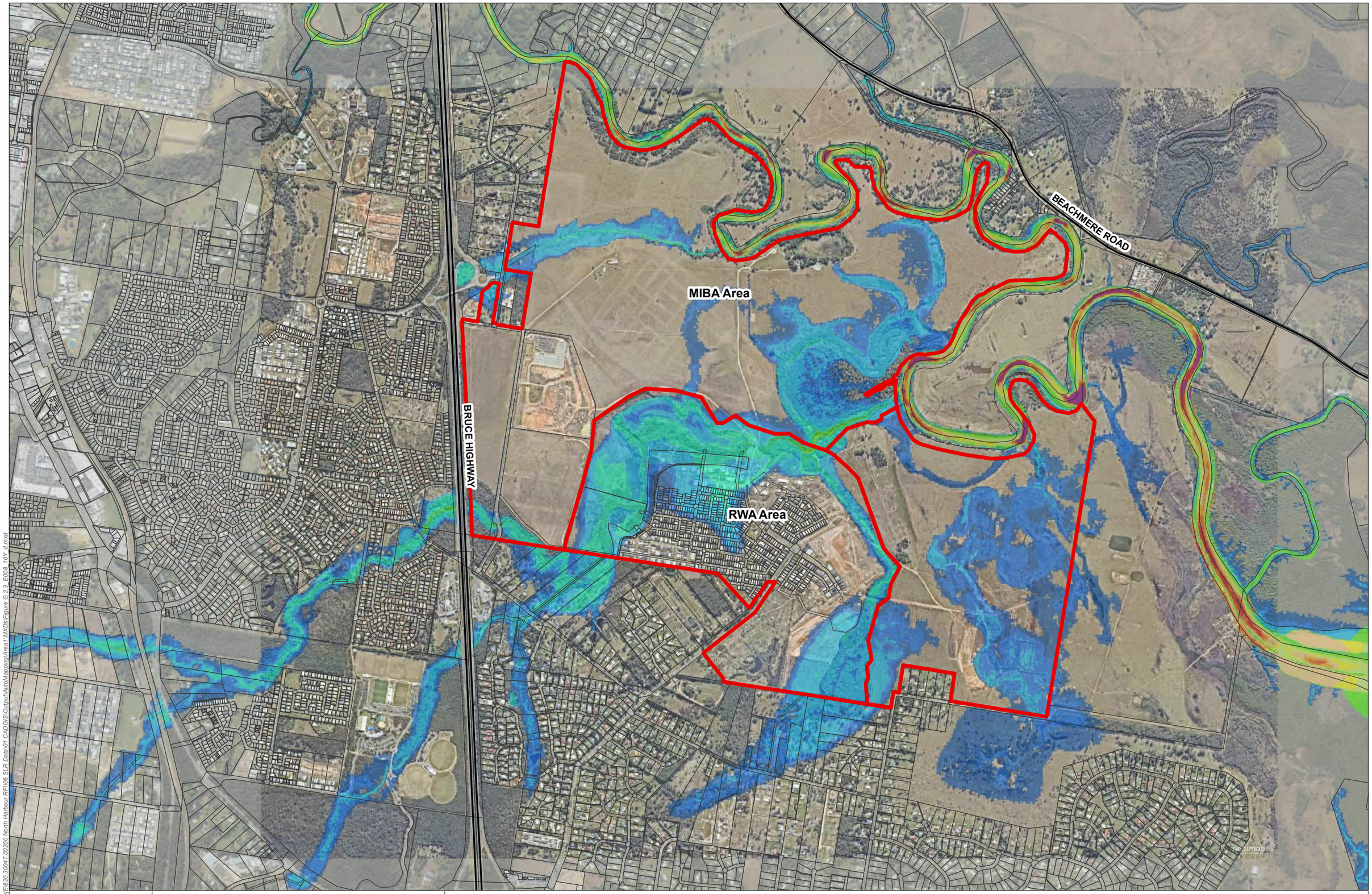
0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event Peak Flood Depths - 20% AEP

Figure G.2.2

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.2.2_E008_sY_d.mxd



SLR
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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

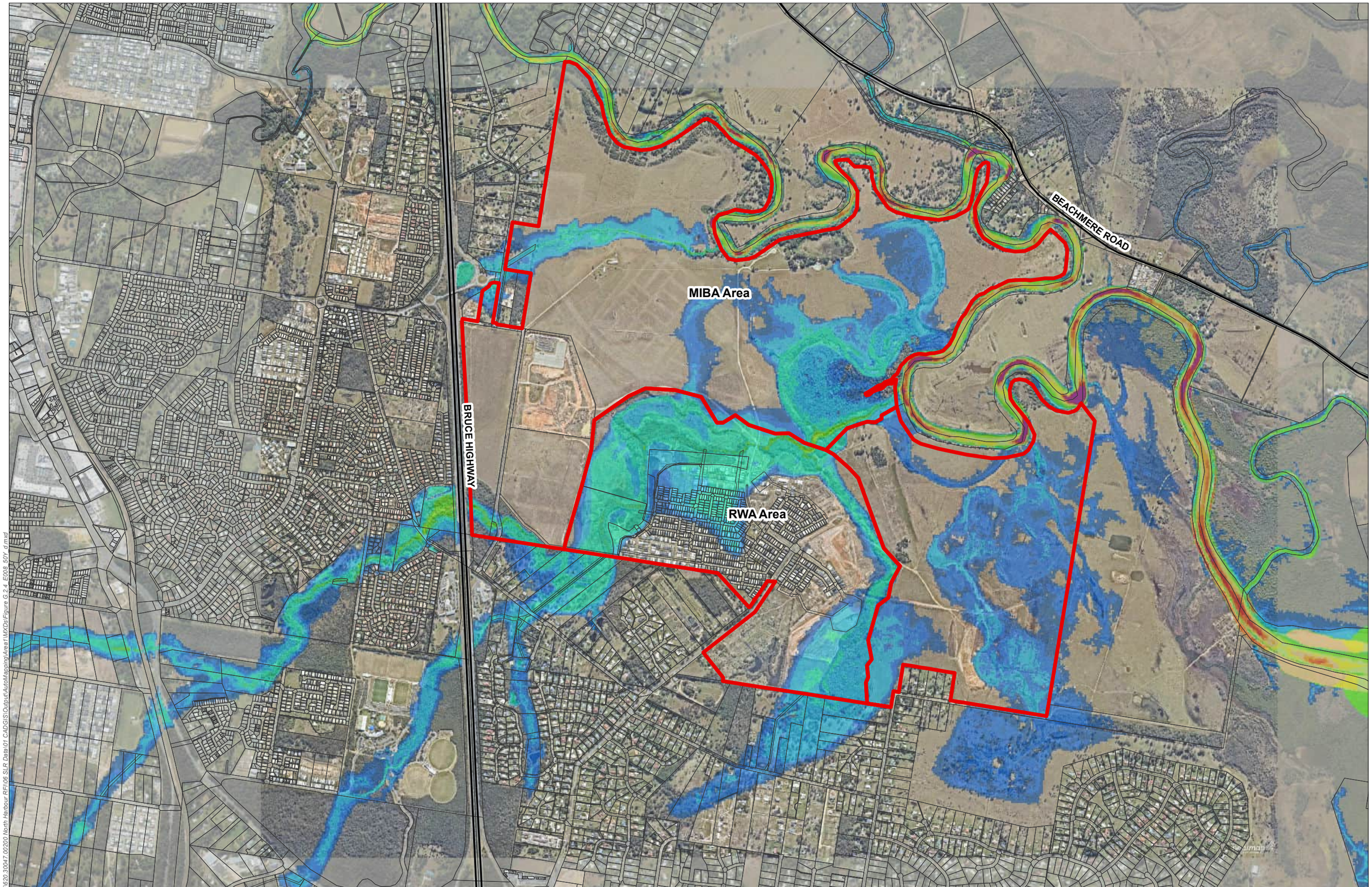
0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event
Peak Flood Depths - 10% AEP

Figure G.2.3

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.2.3_E008_10Y_4.mxd



H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.2.4_E008_50Y_d.mxd

SLR
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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

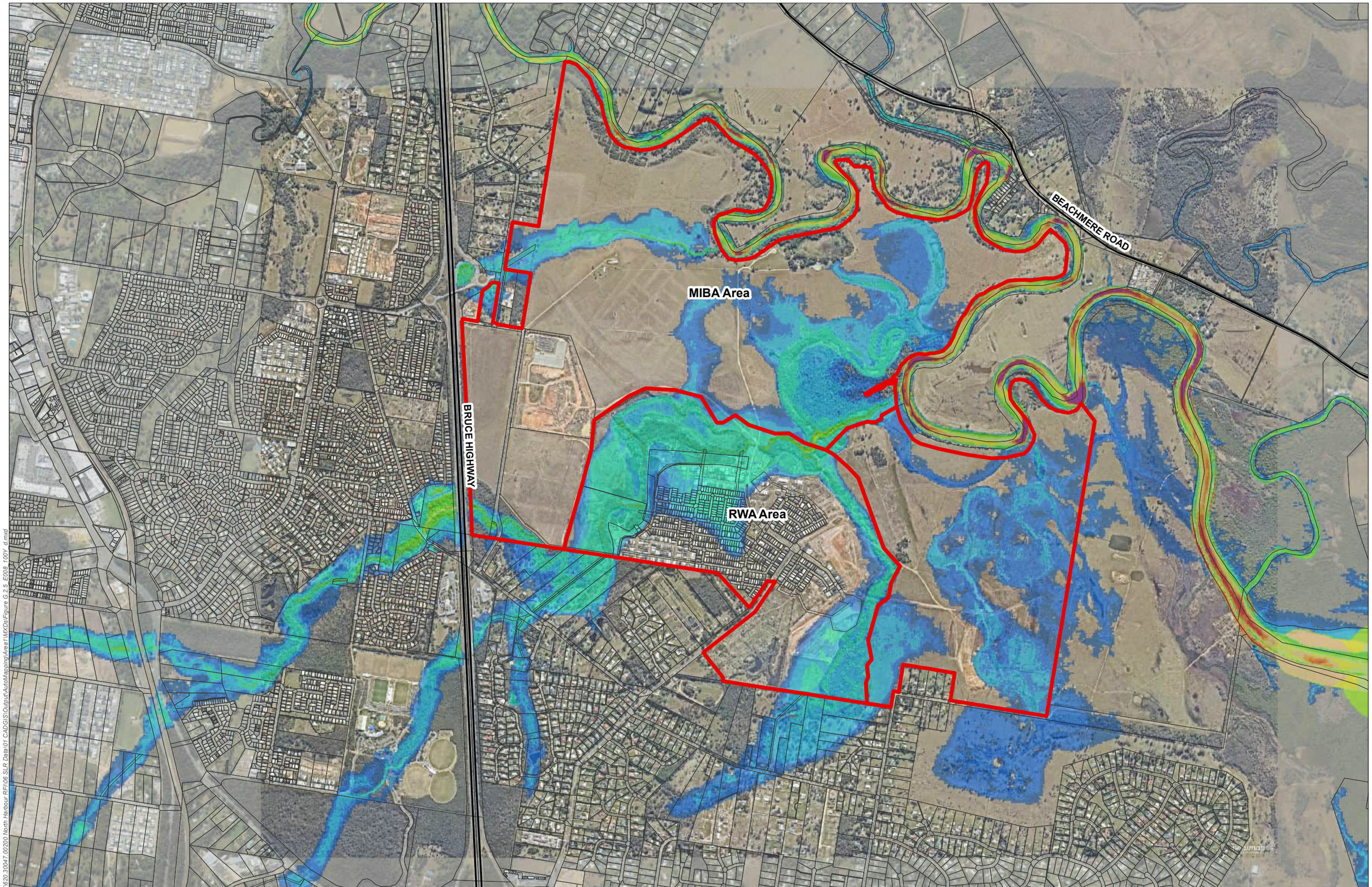
Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event
Peak Flood Depths - 2% AEP

Figure G.2.4



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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

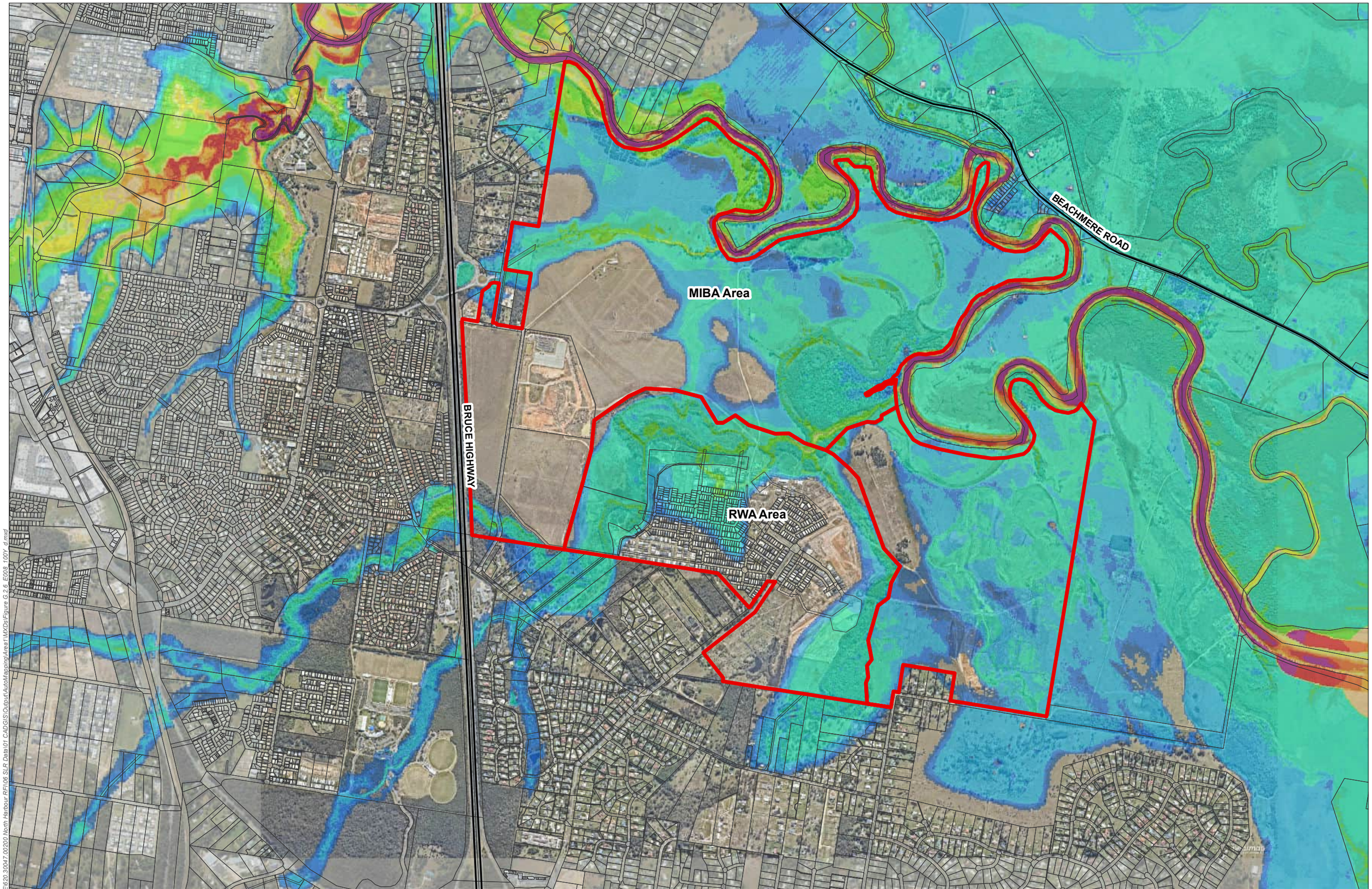
0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Local Event
Peak Flood Depths - 1 % AEP

Figure G.2.5

H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.2.5_E008_100Y_d.mxd



H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.2.6_E008_100Y_d.mxd

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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Existing Conditions (E008R) Regional Event
Peak Flood Depths - 1 % AEP

Figure G.2.6

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

Site Boundary

Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00	
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25	
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25	
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75		

North Harbour
Flood Management Plan

Raised Roughness Developed Conditions (D146R) Local Event
Peak Flood Levels - 39% AEP

Figure G.3.1

H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.3.1_D146_2V_h.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

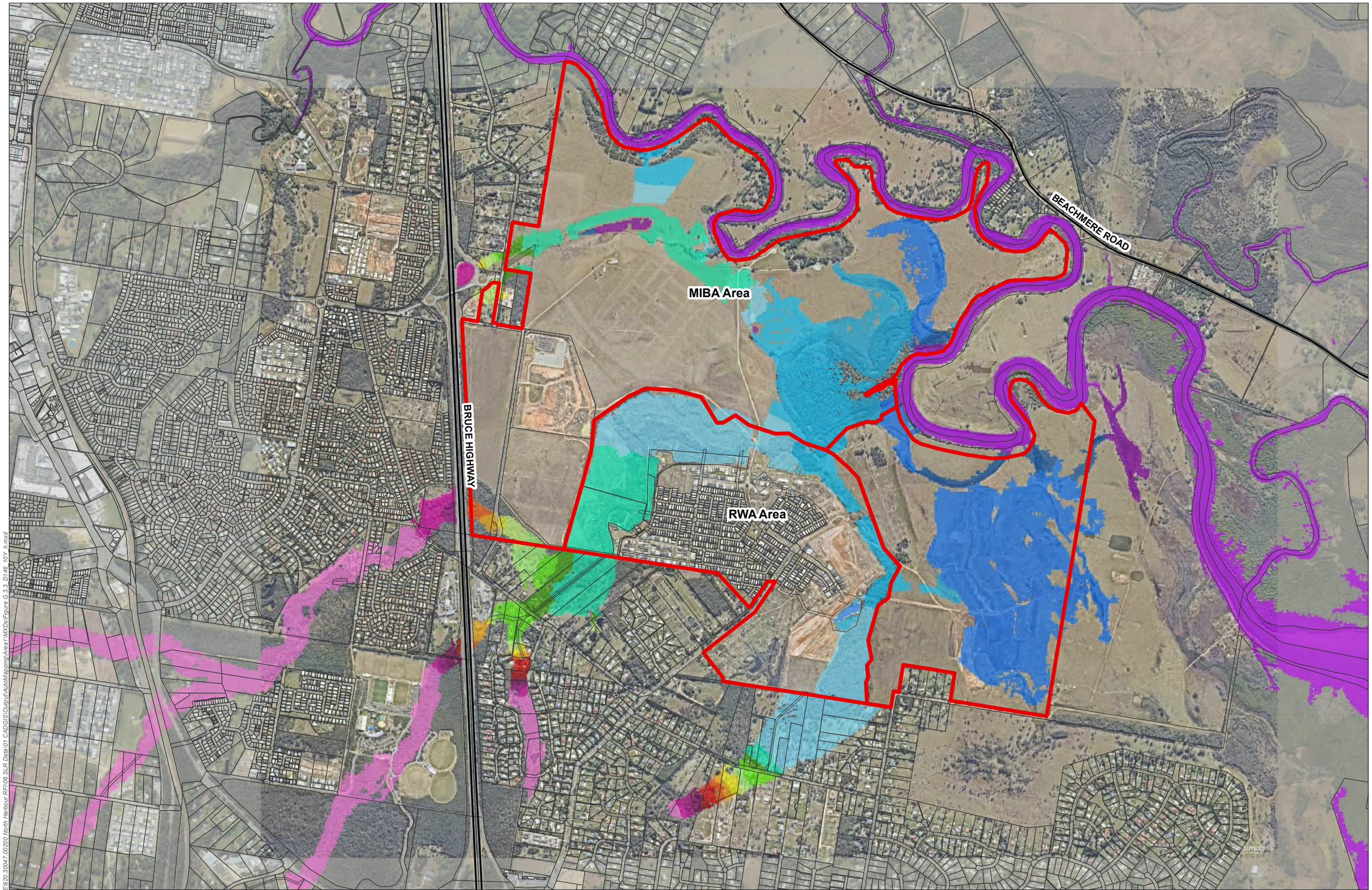
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Raised Roughness Developed Conditions (D146R) Local Event
Peak Flood Levels - 20% AEP

Figure G.3.2

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.3.2_D146_SV_h.mxd



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.3.3_D146_10Y_h.mxd

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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Raised Roughness Developed Conditions (D146R) Local Event
Peak Flood Levels - 10% AEP

Figure G.3.3

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CADGIS\Output\AutoMapping\Area1\MXDs\Figure G.3.4 D146_50Y.mxd

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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

Site Boundary

Cadastre Boundary

Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00	
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25	
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25	
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75		

North Harbour
Flood Management Plan

Raised Roughness Developed Conditions (D146R) Local Event
Peak Flood Levels - 2% AEP

Figure G.3.4

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CADGIS\Output\AutoMapping\Area1\MXDs\Figure G.3.5_D146_100Y_A.mxd

SLR
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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

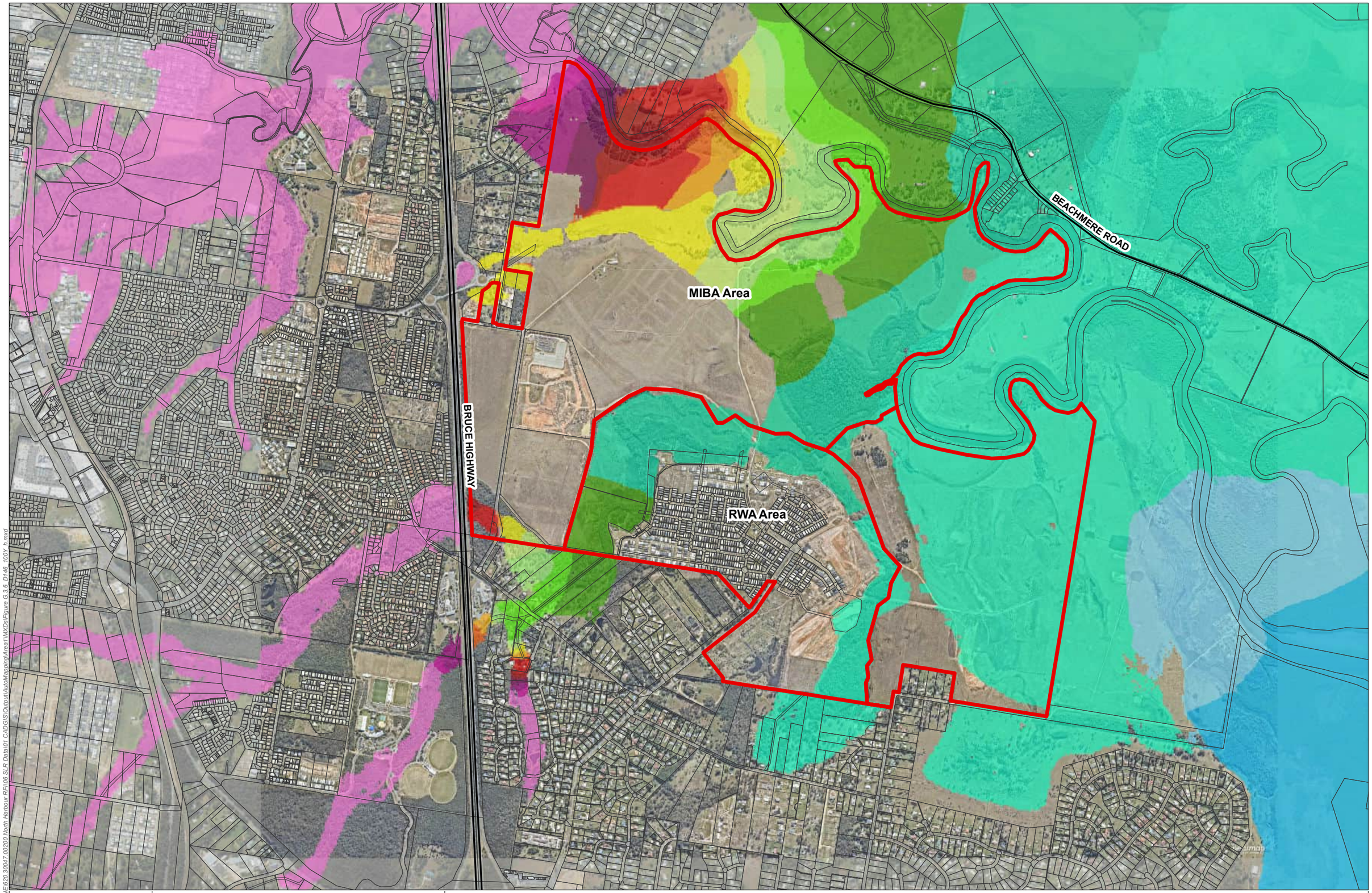
Level (m AHD)

Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Raised Roughness Developed Conditions (D146R) Local Event
Peak Flood Levels - 1 % AEP

Figure G.3.5



0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

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Legend

- Site Boundary
- Cadastre Boundary

Level (m AHD)

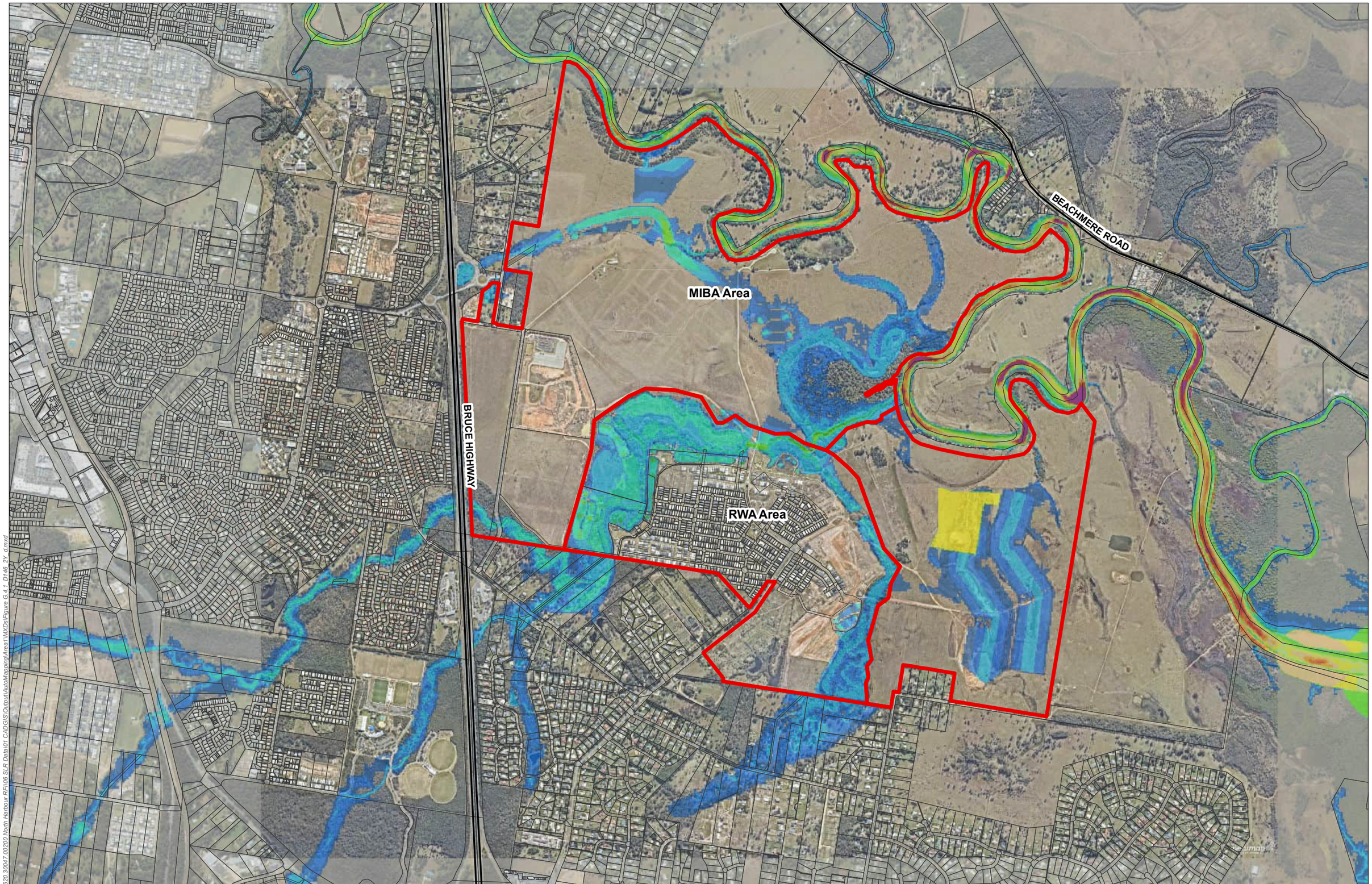
Below 1.00	1.75 to 2.00	2.75 to 3.00	3.75 to 4.00	4.75 to 5.00	5.75 to 6.00
1.00 to 1.25	2.00 to 2.25	3.00 to 3.25	4.00 to 4.25	5.00 to 5.25	6.00 to 6.25
1.25 to 1.50	2.25 to 2.50	3.25 to 3.50	4.25 to 4.50	5.25 to 5.50	Above 6.25
1.50 to 1.75	2.50 to 2.75	3.50 to 3.75	4.50 to 4.75	5.50 to 5.75	

North Harbour
Flood Management Plan

Revised Roughness Developed Conditions (D146R) Regional Event
Peak Flood Levels - 1 % AEP

Figure G.3.6

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.3.6_D146_100Y_h.mxd



0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Developed Conditions (D146R) Local Event
Peak Flood Depths - 39% AEP

Figure G.4.1

H:\Projects-SLR\620-BNE\620.30047.00200-North Harbour RFI\06-SLR Data\01-CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.4.1_D146_2yr_4hr.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Developed Conditions (D146R) Local Event
Peak Flood Depths - 20% AEP

Figure G.4.2

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.4.2_D146_SV_d.mxd

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Developed Conditions (D146R) Local Event
Peak Flood Depths - 10% AEP

Figure G.4.3

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.4.3_D146_10Y_4.mxd

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Developed Conditions (D146R) Local Event
Peak Flood Depths - 2% AEP

Figure G.4.4

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.4.4_D146_50Y_4.mxd

BRUCE HIGHWAY

BEACHMERE ROAD

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
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Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Developed Conditions (D146R) Local Event
Peak Flood Depths - 1 % AEP

Figure G.4.5

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.4.5_D146_100Y_d.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

SLR
www.slrconsultingaustralia.com.au

Legend

- Site Boundary
- Cadastre Boundary

Depth (m)

0.01 to 0.25	1.50 to 2.00	3.50 to 4.00	5.50 to 6.00
0.25 to 0.50	2.00 to 2.50	4.00 to 4.50	6.00 to 6.50
0.50 to 1.00	2.50 to 3.00	4.50 to 5.00	Above 6.50
1.00 to 1.50	3.00 to 3.50	5.00 to 5.50	

North Harbour
Flood Management Plan

Revised Roughness Developed Conditions (D146R) Regional Event
Peak Flood Depths - 1 % AEP

Figure G.4.6

H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.4.6_D146_100Y_d.mxd

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.5.1_D146_2Y_r.mxd

SLR
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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

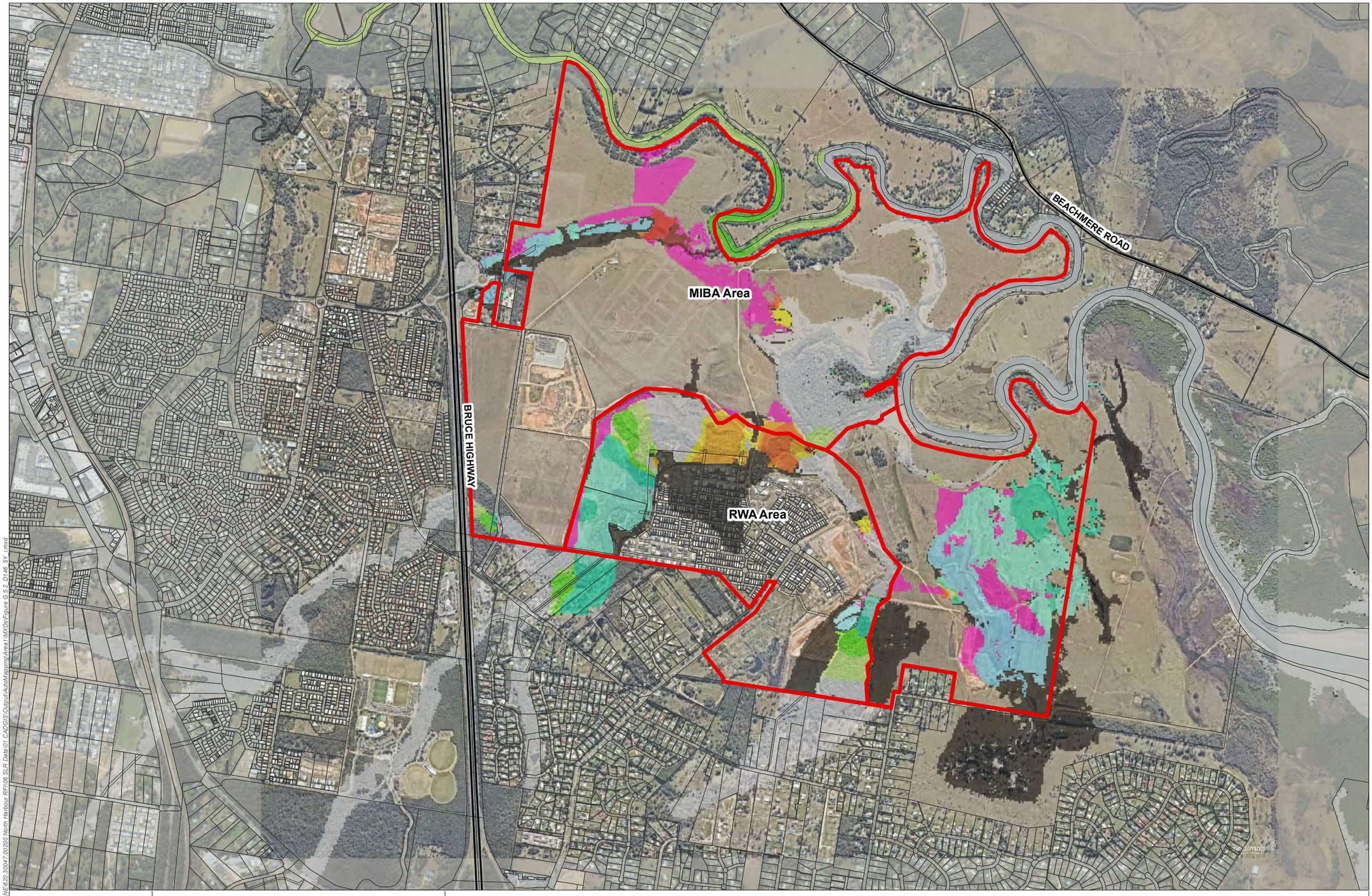
Afflux (mm)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Revised Roughness (D146R - E008R) Local Event
Peak Flood Afflux - 39% AEP

Figure G.5.1



H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.5.2_D146_SV_1.mxd

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06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

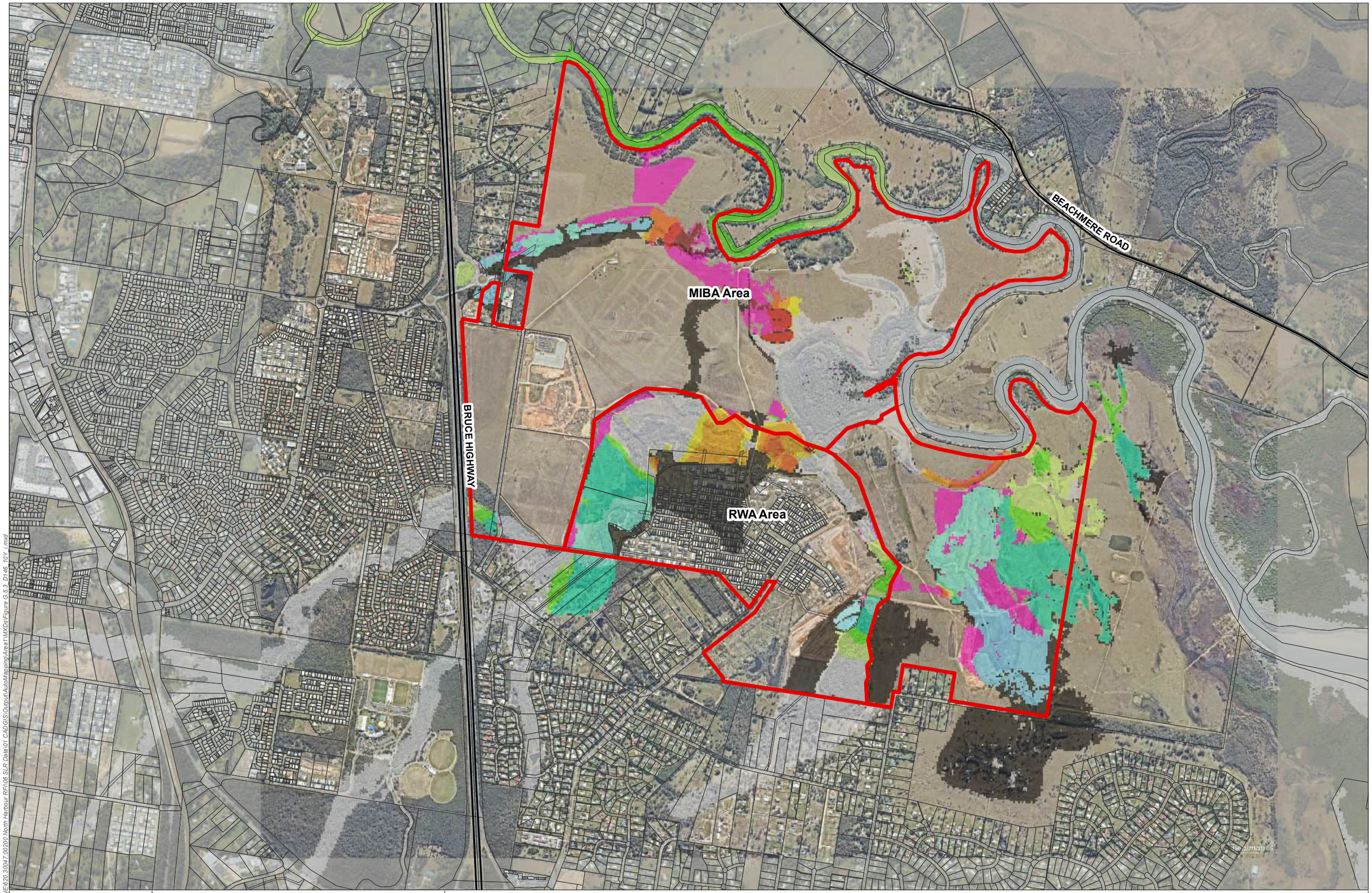
Afflux (mm)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Revised Roughness (D146R - E008R) Local Event
Peak Flood Afflux - 20% AEP

Figure G.5.2



H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.5.3_D146_10Y_I.mxd

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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

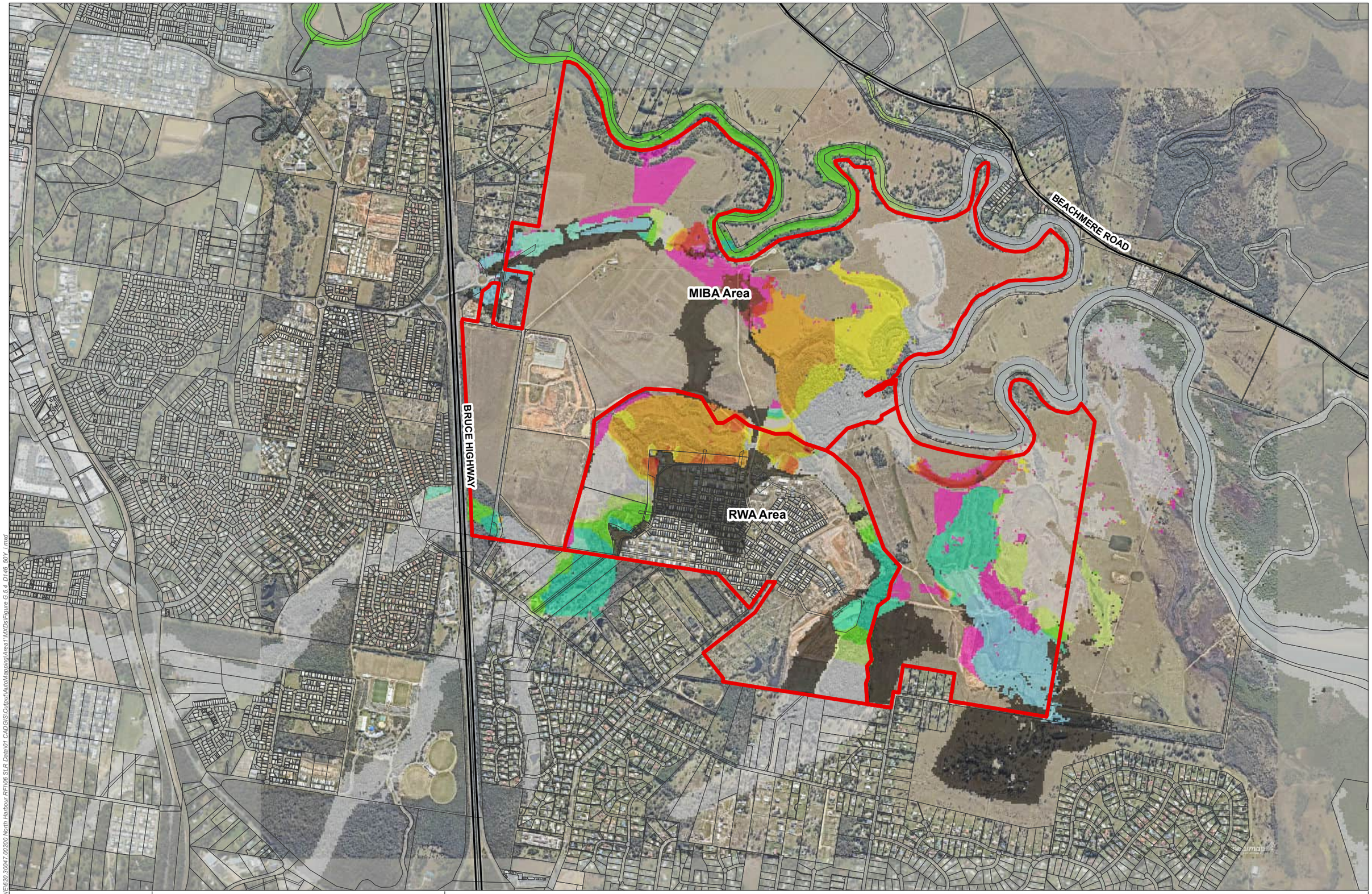
Afflux (mm)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Revised Roughness (D146R - E008R) Local Event
Peak Flood Afflux - 10% AEP

Figure G.5.3



H:\Projects-SLR\620-BNE\620-BNE620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.5.4_D146_50Y_I.mxd

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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

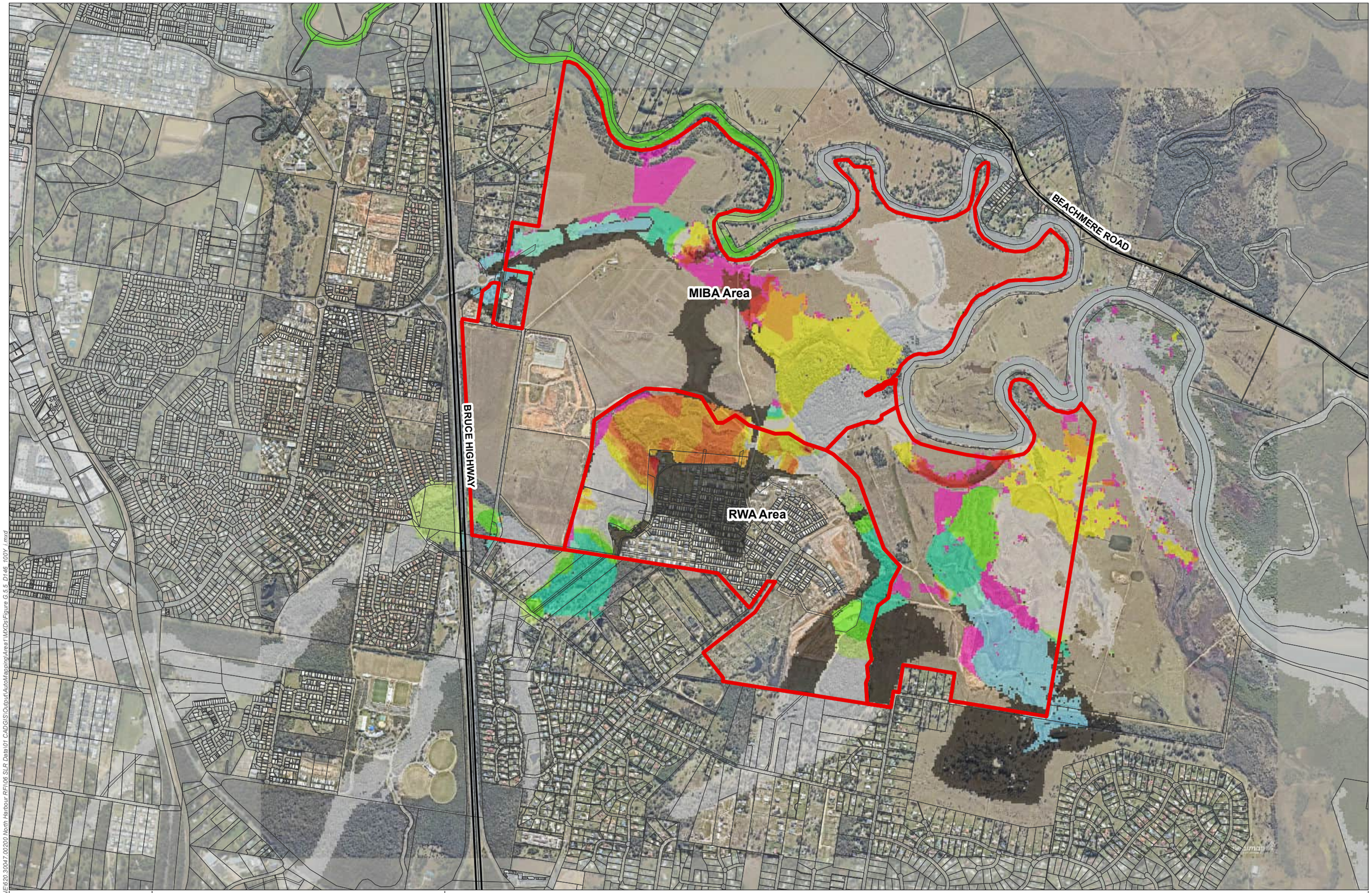
Afflux (mm)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Revised Roughness (D146R - E008R) Local Event
Peak Flood Afflux - 2% AEP

Figure G.5.4



H:\Projects-SLR\620-BNE\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.5.5_D146_100Y_i.mxd

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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Afflux (mm)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Revised Roughness (D146R - E008R) Local Event
Peak Flood Afflux - 1 % AEP

Figure G.5.5

BEACHMERE ROAD

BRUCE HIGHWAY

MIBA Area

RWA Area

H:\Projects-SLR\620-BNE\620.30047.00200 North Harbour RFI\06 SLR Data\01 CAD\GIS\Output\AutoMapping\Area1\MXDs\Figure G.5.6_D146_100Y_i.mxd

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0 500 1,000 1,500 Meters

06-Jul-2025 Scale: 1:20,000

Sheet Size : A3 GDA 1994 MGA Zone 56

Legend

- Site Boundary
- Cadastre Boundary

Afflux (mm)

- Below -0.200
- -0.200 to -0.100
- -0.100 to -0.050
- -0.050 to -0.030
- -0.030 to -0.020
- -0.020 to 0.020
- 0.020 to 0.030
- 0.030 to 0.050
- 0.050 to 0.100
- 0.100 to 0.200
- Above 0.200
- Was wet now dry
- Was dry now wet

North Harbour
Flood Management Plan

Revised Roughness (D146R - E008R) Regional Event
Peak Flood Afflux - 1 % AEP

Figure G.5.6