

Our ref: L.A11517.002_HexhamTSF_FIA.docx

18 March 2022

Aurizon Operations Limited
121 Woodstock Street
Mayfield NSW 2304

Attention: Harry Egan

Dear Harry,

RE: HEXHAM TRAIN SUPPORT FACILITY MODIFICATION PROPOSAL – FLOOD ASSESSMENT

Introduction

This flood assessment report has been prepared for the development of a depot, warehouse and wagon storage (the Modification Proposal) to support the ongoing operations of the Hexham Long Term Train Support Facility (Hexham LTTSF Project), Hexham (the Hexham LTTSF Site). The Modification Proposal is to be undertaken as a modification (under Part 5, Section 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act)) to the Hexham LTTSF Approval (MP 07_0171).

This report has been prepared in accordance with the following, identified within the Department of Planning, Industry and Environment (DPIE) letter (dated 17/09/2021):

- The Secretary's Environmental Assessment Requirements (SEARs) issued for SSI-6090 Mod 1 (previously MP 07_0171 Mod 1).
- The relevant industry specific SEARs applicable to warehouse development.

This report has been prepared by BMT Commercial Australia Pty Ltd (BMT) on behalf of Aurizon.

Progression of Assessments

The Hexham LTTSF Project was approved for construction in 2013 under State Significant Infrastructure (SSI) approval MP 07_0171. In 2019, Aurizon engaged BMT to undertake a flood assessment for the addition of a Turning Angle (TA) at the Hexham LTTSF Site. This assessment required the modification to the existing SSI approval MP 07_0171 and formed SSI-6090 Mod 1 (previously MP 07_0171 Mod 1).

Flood impacts relating to the TA assessment (BMT, 2019) were minor in nature and limited to peak flood conditions on the Hexham LTTSF Site. The TA assessment determined negligible impacts on flooding, and the modification was deemed to not affect the original SSI approval's consistency with applicable Newcastle City Council ("Council") floodplain risk management plans.

The flood assessment documented in this report focuses on the flood impacts of the Modification Proposal. All outcomes for the TA flood assessment for SSI-6090 Mod 1 are documented in '*Hexham TSF – Turning Angle Flood Assessment*' (Reference: L.N21143.005.pdf). Assessments prior to this report, and associated approvals, can be found on the Aurizon website¹.

¹ <https://www.aurizon.com.au/what-we-deliver/projects/hexham-turning-angle>

Site Description

The Hexham LTTSF site is located at Maitland Road, Hexham within the Newcastle Local Government Area (LGA) approximately 16 km north-west of Newcastle CBD. The Hexham LTTSF site has a total area of 255 ha with the Hexham LTTSF Project developed on a 38 ha portion of the site parallel to (and to the west of) the Great Northern Railway (GNR). The Hexham LTTSF site is located within an industrial setting with only a small number of dwellings within the local vicinity of the site.

The Modification Proposal are fully contained within Lot 104 DP 1189565 which is owned by Aurizon. The Hexham LTTSF Project Site covers multiple lots which are not affected by the Modification Proposal. The location of the Modification Proposal Site (the "Site" in the context of the Hexham LTTSF Project Site) is provided within Figure 1.1 and Figure 1.2.



Figure 1.1 Overview of the Hexham LTTSF Site (Source: Aurizon)



Figure 1.2 Location of the Modification Proposal (Source: Aurizon)

Overview of Modification Proposal

The Modification Proposal is to be located within the Hexham LTTSF site (identified within the Hexham LTTSF Project) at a location previously cleared and disturbed by historical coal handling activities and the LTTSF Project construction.

The Modification Proposal includes the development of a depot, warehouse, wagon storage and associated development to support the ongoing operations of the Hexham LTTSF Project.

An overview of the Modification Proposal is as follows:

- Site preparation and earthworks.
- Construction of the following elements:
 - A warehouse for the storage of rail maintenance equipment.
 - A depot for office staff and train crew.
 - Ancillary staff and visitor car park connected to the private roadway (existing main access road).
- Rail wagon storage area located on the western portion of the Site.
- Ancillary infrastructure (hardstand, water management, landscaping, lighting etc).
- Connection to utilities.

The depot and warehouse would be operated 24 hours per day, 7 days a week.

The purpose of this flood assessment is to determine whether the Modification Proposal at the Site has acceptable flood impacts and satisfies the Secretary's Environmental Assessment Requirements (SEARs) for Flooding and Flood Risk. The review of the proposed design and the context of potential flood impacts are documented within this report.

The details of the Modification Proposal were provided to BMT by Aurizon in the form of a series of design drawings². The design drawings include a general arrangement and a cut and fill plan. The latter is presented in Figure 1.3.

² 12560779_AURIZON_ARC_220223.pdf, 12560779_AURIZON_ARC-SITEAERIAL-897127.pdf, AUR-E-C030-7449.pdf

Flood Modelling

The hydraulic model developed for the TA assessment (BMT, 2019) has been used to establish the base case for the current assessment and includes additional ground survey provided by Aurizon³. The modelling for the Site includes simulations for the 5%, 2%, 1% AEP (Annual Exceedance Probability) and Probable Maximum Flood (PMF) events, as well as the 1% AEP event with climate change.

It should be noted that the proposed stormwater works have not been modelled herein and assumed as fully blocked (conservative assumption).

Existing Flood Conditions

The design flood conditions of the Hunter River are well documented, together with descriptions of flood behaviour in the *'Hexham Relief Roads and NSW Long-term Train Support Facility: Joint Flood Impact Assessment'* (Reference: R.N2335.003.01.pdf). The flood mechanisms relevant to the proposed TSF are also summarised in the TA report (Reference: L.N21143.005.pdf).

Flood mapping of the existing flood conditions for the 5%, 2%, 1% AEP, 1% AEP with climate change and PMF events are shown in Figures A1 to A5.

Flood Impact Assessment

The flood impact mapping (level and velocity impacts) compares the proposed development (with the Modification Proposal) scenario against the base case whereby both conditions include all development in the SSI 6090 Mod 1 approval (Figures B1 to B5 for peak flood level impacts and Figures C1 to C5 for peak velocity impacts).

The results from the inclusion of the proposed development at the Site, are very similar to the outcomes of the TA assessment, i.e. no off-site flood impacts. The proposed development remains flood free during events up to and including the 1% AEP event, resulting in no flood impacts for these events.

For the 1% AEP event with climate change (RCP 8.5 scenario), the northern entry of the carpark is inundated, as seen by the incursion of floodwater into the Site shown in Figure B4. The depot, warehouse and wagon stowage area are flood free during this event. Figure B4 also shows a very slight change in flood extent within the carpark due to the changed grading towards the stormwater outlet, as seen in Figure 1.3.

For the PMF event the Site is inundated by more than 2 metres of floodwater, as seen in Figure A5. Figure B5 shows that the depot and warehouse are still inundated, however no change in level is observed. This indicates that the proposed development at the Site has no influence on the broader hydraulic controls governing the flood behaviour of such an extreme event. The wagon stowage area remains generally flood free during the PMF event.

³ 210430A_01.dwg

Conclusions

BMT has reviewed the addition of the Modification Proposal at the Site in the context of the Hexham LTTSF Project (SSI-6090 Mod 1). The flood impacts relating to the Modification Proposal are negligible and occur within Aurizon’s land. No off-site flood impacts were observed. There were no changes in flood levels at the 1% AEP or lower at the Depot and Warehouse, and the wagon stowage area remains generally flood free across all events.

This flood impact assessment therefore sufficiently addresses the potential flood impacts relating to the Modification Proposal and hence the required modification to the Hexham LTTSF Approval (MP 07_0171).

As the assessment has determined a negligible impact on flooding, the Modification Proposal does not affect the original SSI approval’s consistency with applicable Council’s floodplain risk management plans. Also, the proposed works are consistent with the broader flood hazard compatibility of the original approval and do not impact the existing emergency management arrangements. Table 1.1 and Table 1.2 outline the SEARS conditions which have been met by this assessment.

Table 1.1 SEARs for Warehouses and Distribution Centres - Condition 14 Flooding Risk

SEARs Condition	BMT Comment
Identify any flood risk on-site having regard to adopted flood studies, the potential effects of climate change, and any relevant provisions of the NSW Floodplain Development Manual.	<u>Condition met:</u> The existing flood risk has been assessed against adopted studies. Potential effects from climate change, show that no off-site impacts occur. Therefore, no change in flood risk occurs due to this development.
Assess the impacts of the development, including any changes to flood risk on-site or off-site, and detail design solutions and operational procedures to mitigate flood risk where required.	<u>Condition met:</u> The assessment has determined a negligible impact on flooding and the Modification Proposal does not affect the original SSI approval’s consistency with applicable Council floodplain risk management plans.

Table 1.2 SEARs for SSI-6090 Mod 1 - Condition 7 Flooding

SEARs Condition	BMT Comment
<p>1 The Proponent must assess and (model where required) the impacts on flood behaviour during construction and operations for a full range of flood events up to the probable maximum flood (taking into account sea level rise and storm intensity due to climate change) including:</p> <ul style="list-style-type: none"> a Any detrimental increases in the potential flood affection of other properties, assets and infrastructure; b Consistency (or inconsistency) with applicable Council floodplain risk management plans; c Compatibility with the flood hazard of the land; d Compatibility with the hydraulic functions of flow conveyance in floodways and storage areas of the land; e Downstream velocity and scour potential; f Impacts the development may have upon existing community emergency management 	<p><u>Condition met:</u> The assessment has determined a negligible impact on flooding and the Modification Proposal does not affect the original SSI approval’s consistency with applicable Council floodplain risk management plans. The proposed works are consistent with the broader flood hazard compatibility of the original approval and do not impact the existing emergency management arrangements.</p> <p>Construction related impacts have not been assessed, however much of the Site remains flood free. Temporary storage of excavated fill or construction material should be placed outside the identified flood extents. This can be assessed when a staging plan has been completed.</p>

SEARs Condition	BMT Comment
arrangements for flooding. These matters must be discussed with the State Emergency Services and Council.	
2 Any impacts the development may have on the social and economic costs to the community as a consequence of flooding.	<u>Condition met:</u> The assessment has determined a negligible impact on flooding. There will be no social or economic impacts to the community.

Based upon the potential impacts of the Modification Proposal, the previously established mitigation measures as part of the Hexham LTTSF Project (SSI-6090 Mod 1) are sufficient for the Modification Proposal.

We trust the above provides a suitable assessment of the flood behaviour at the Site and the potential for flood impacts associated with the Modification Proposal at the Hexham LTTSF Site. Please feel free to contact the undersigned to discuss further as required.

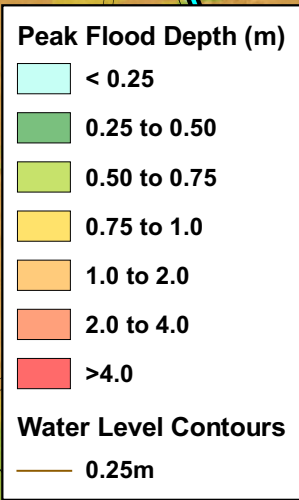
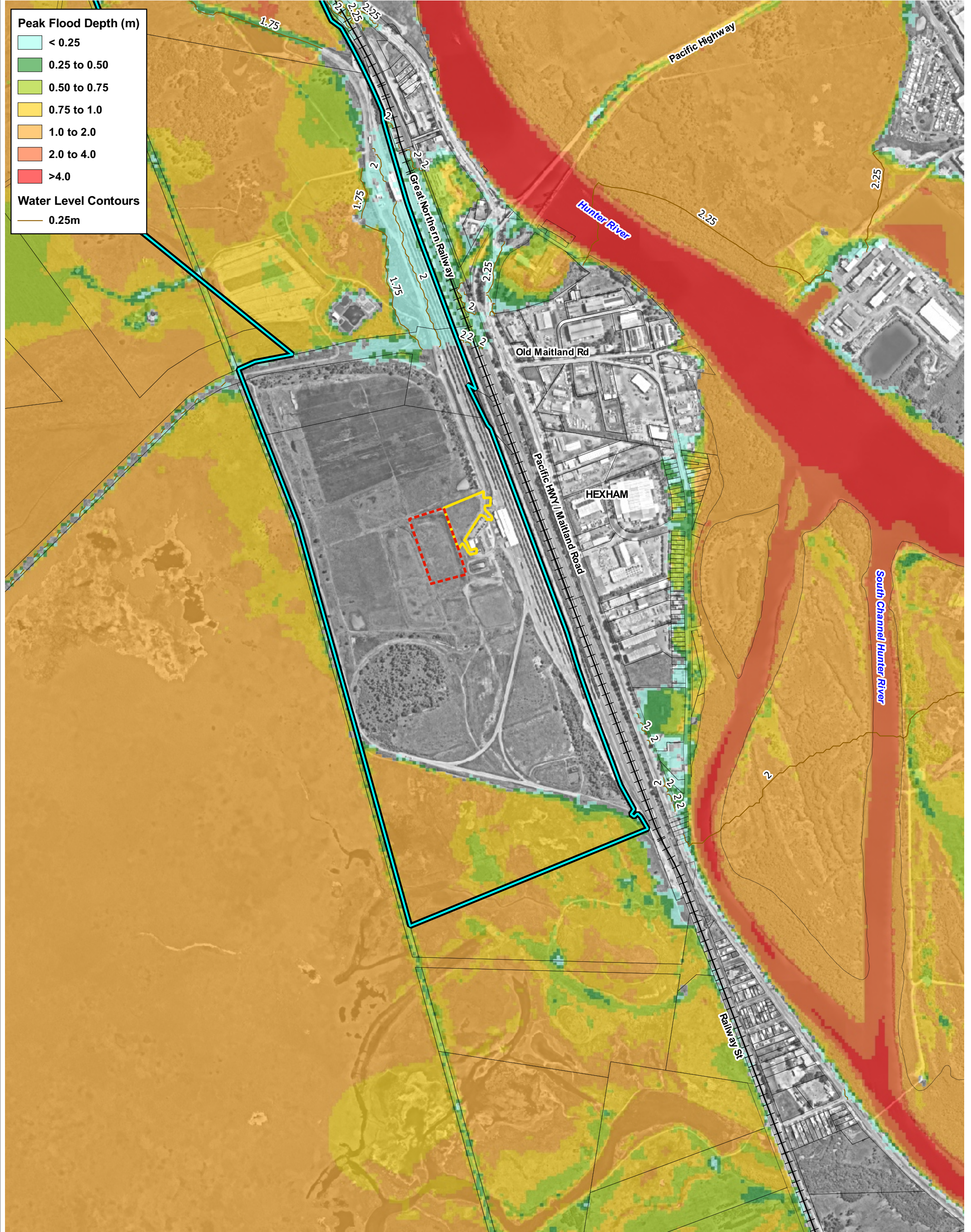
Yours Faithfully

BMT






Nathan Cheah
Associate Principal Engineer

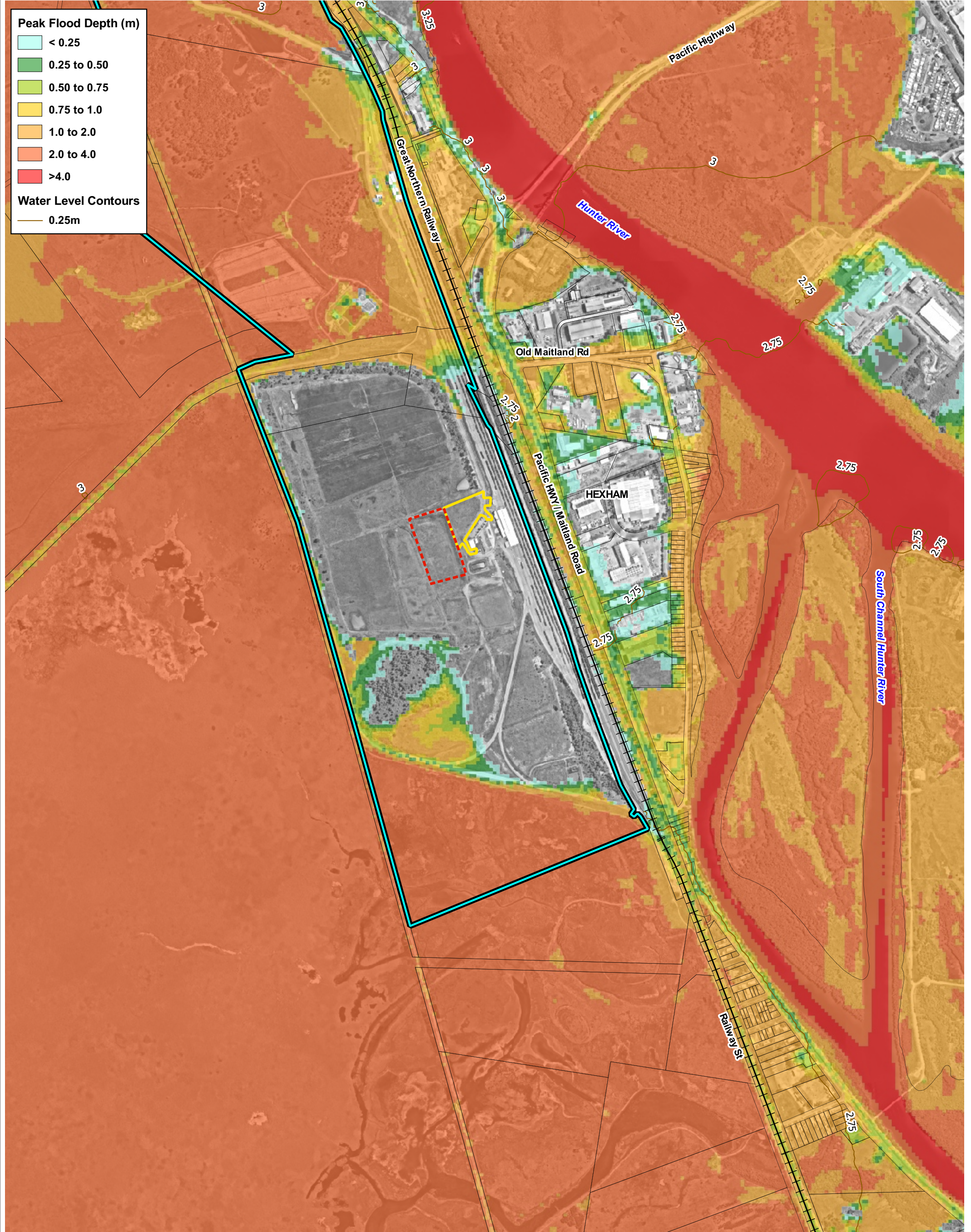
Attachment: Flood maps



Legend	
	The Hexham LTTSF Site
	Proposed Wagon Storage
	Proposed Depot, Warehouse and Carpark
	Cadastral Boundaries
	Railwayline

Title: 5% AEP Flood Depth - Existing	
BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.	
	
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Peak Flood Depth (m)

- < 0.25
- 0.25 to 0.50
- 0.50 to 0.75
- 0.75 to 1.0
- 1.0 to 2.0
- 2.0 to 4.0
- >4.0

Water Level Contours

- 0.25m

Legend

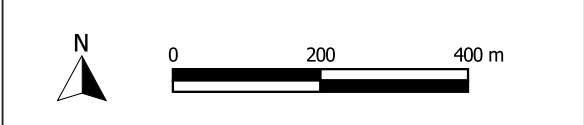
- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

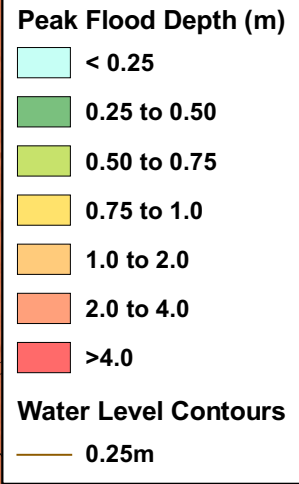
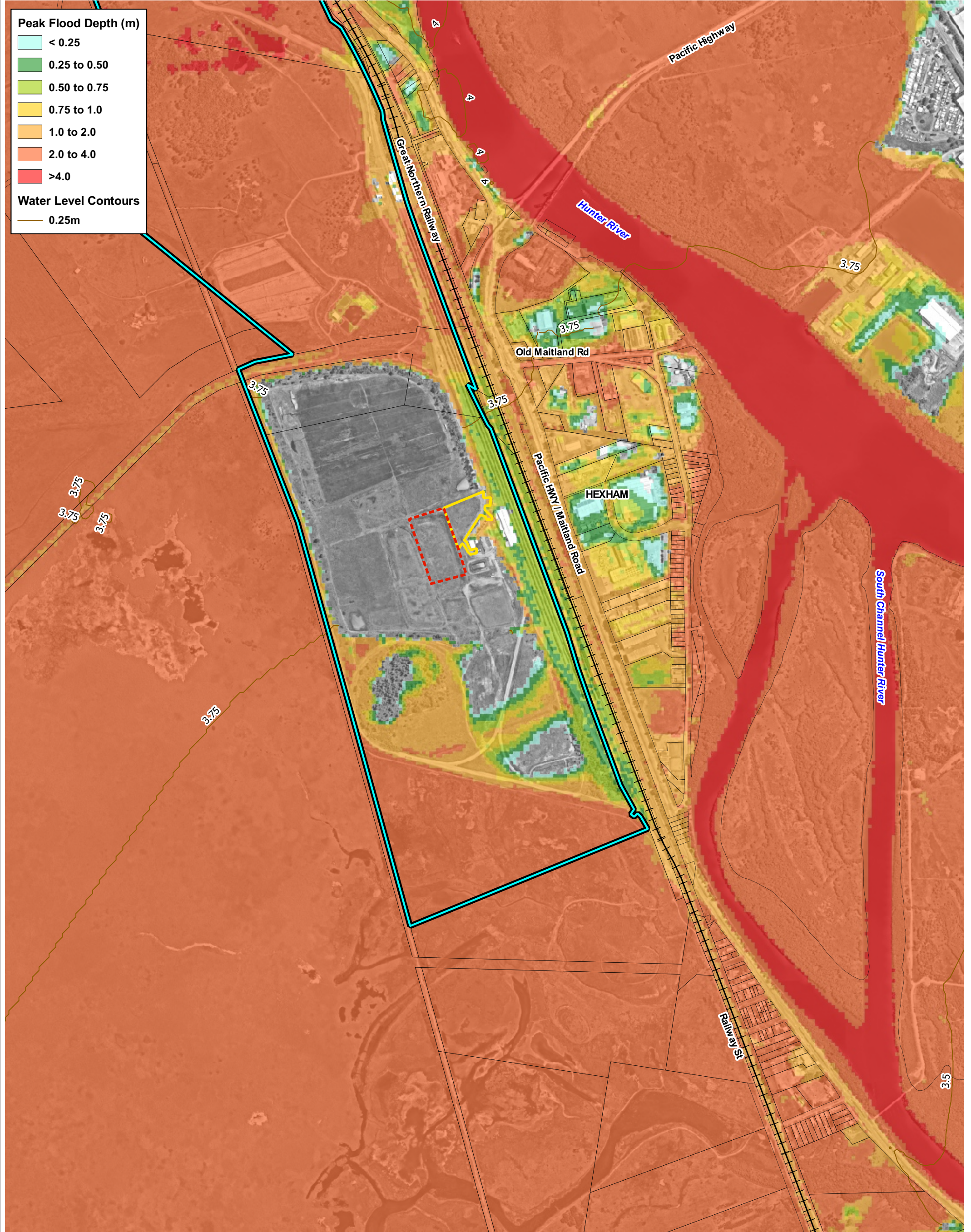
Title:
2% AEP Flood Depth - Existing

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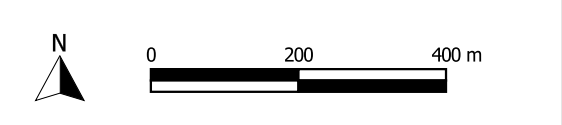




Legend	
	The Hexham LTTSF Site
	Proposed Wagon Storage
	Proposed Depot, Warehouse and Carpark
	Cadastral Boundaries
	Railwayline

Title:
1% AEP Flood Depth - Existing

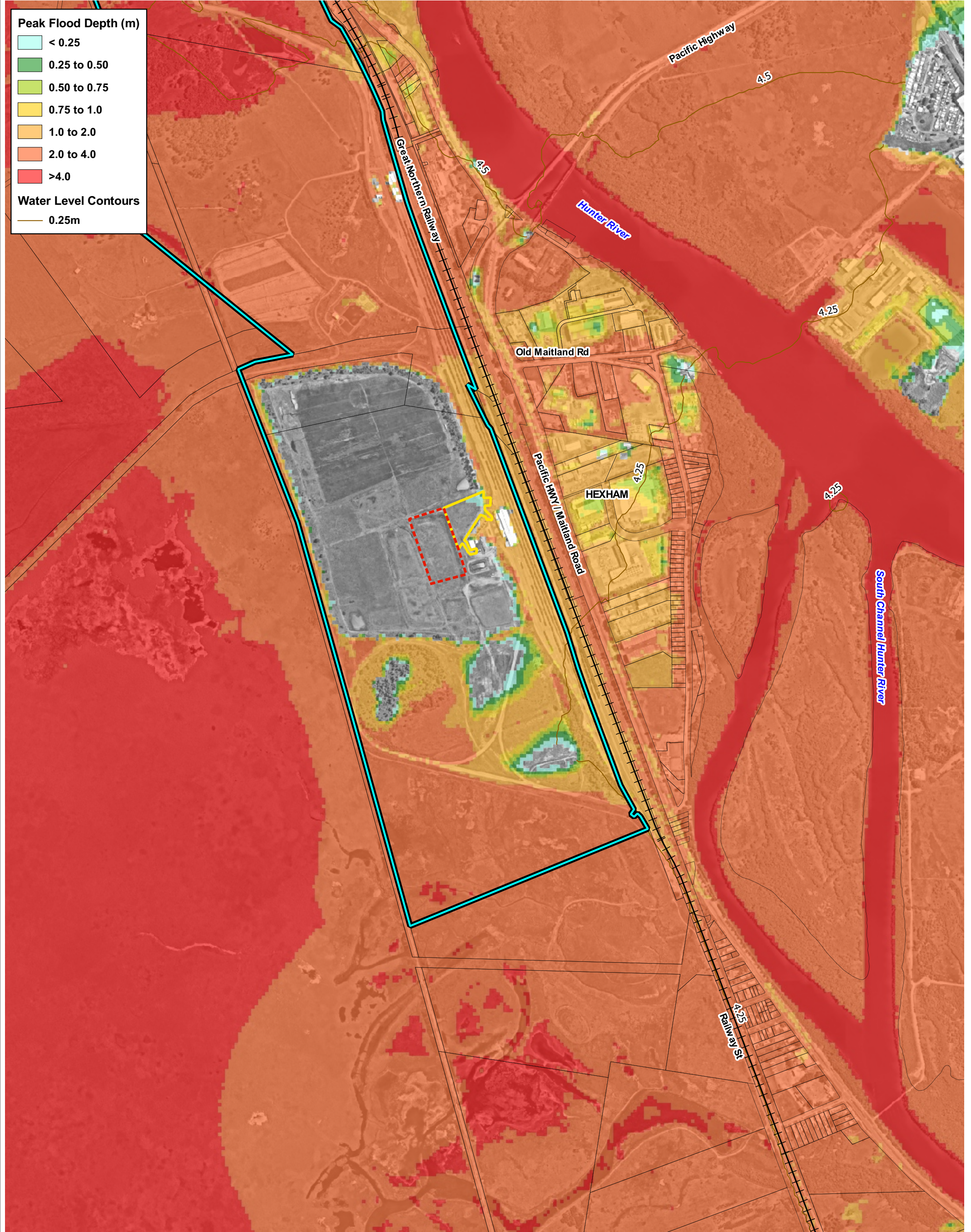
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Peak Flood Depth (m)

- < 0.25
- 0.25 to 0.50
- 0.50 to 0.75
- 0.75 to 1.0
- 1.0 to 2.0
- 2.0 to 4.0
- >4.0

Water Level Contours

- 0.25m

Legend

- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

Title: **1% AEP (RCP8.5 - 2100) Flood Depth - Existing**

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0 200 400 m

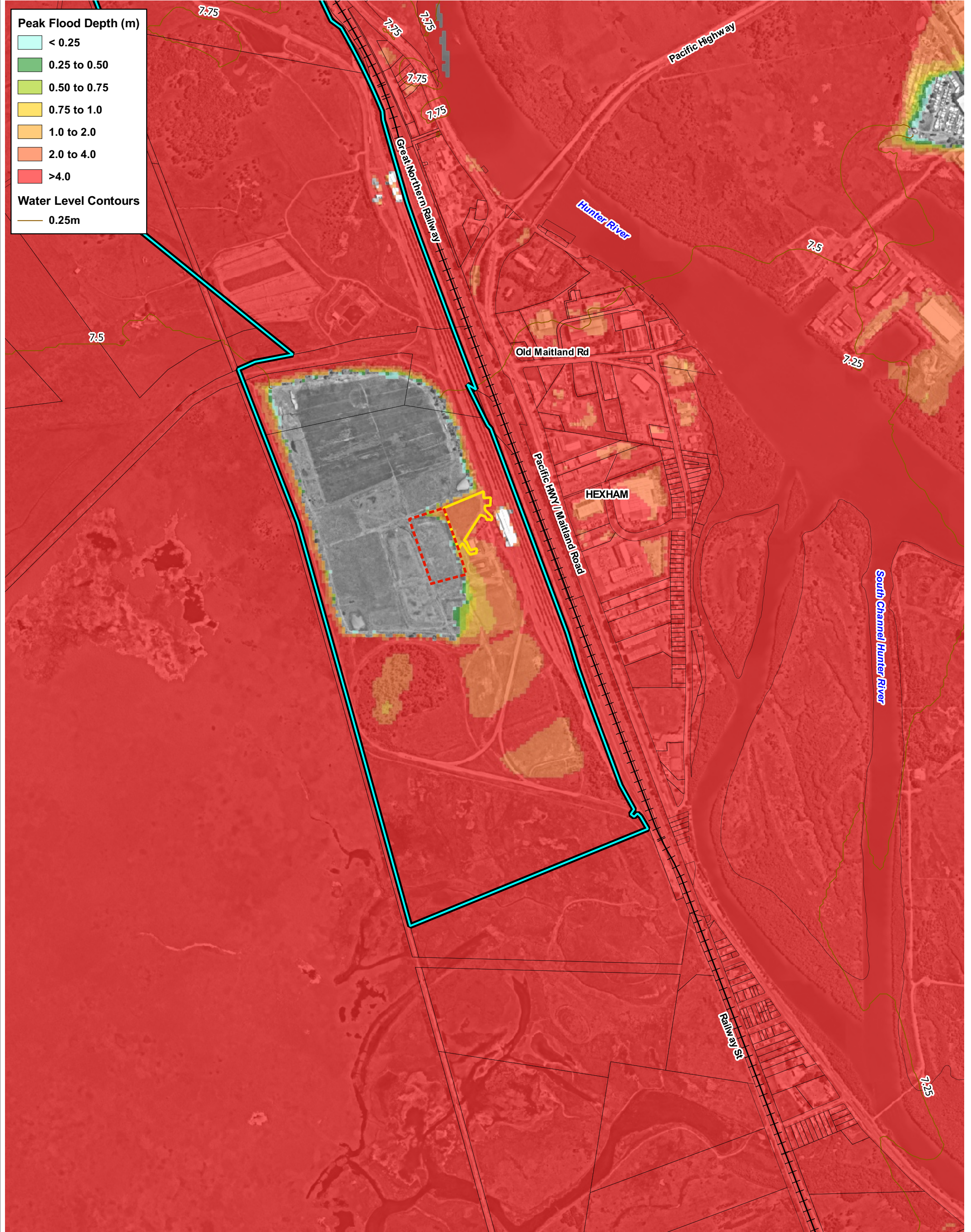
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Peak Flood Depth (m)

- < 0.25
- 0.25 to 0.50
- 0.50 to 0.75
- 0.75 to 1.0
- 1.0 to 2.0
- 2.0 to 4.0
- >4.0

Water Level Contours

- 0.25m

Legend

- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

Title: **PMF Flood Depth - Existing**

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0 200 400 m

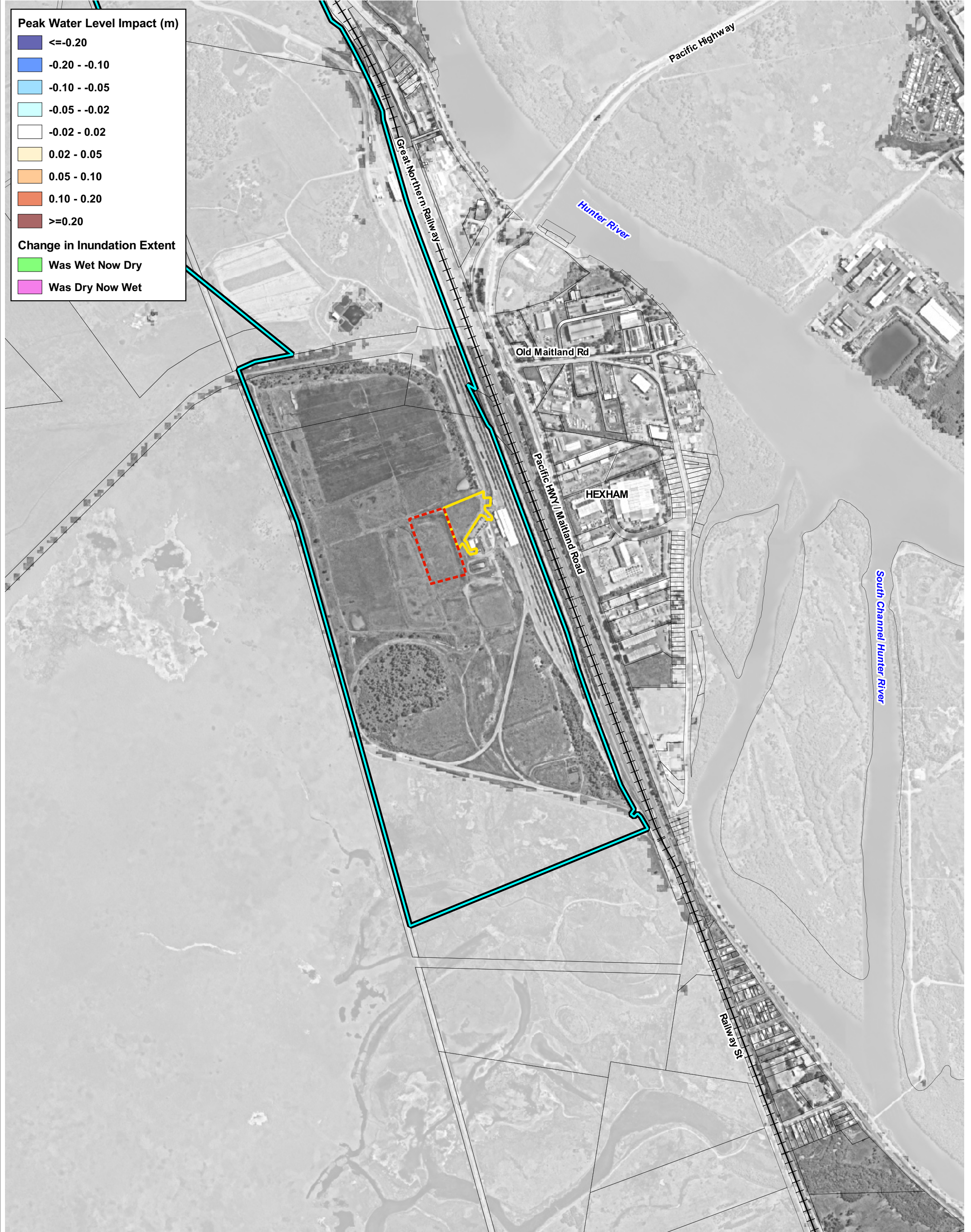
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Peak Water Level Impact (m)

- <=-0.20
- 0.20 - -0.10
- 0.10 - -0.05
- 0.05 - -0.02
- 0.02 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- >=0.20

Change in Inundation Extent

- Was Wet Now Dry
- Was Dry Now Wet

Legend

- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

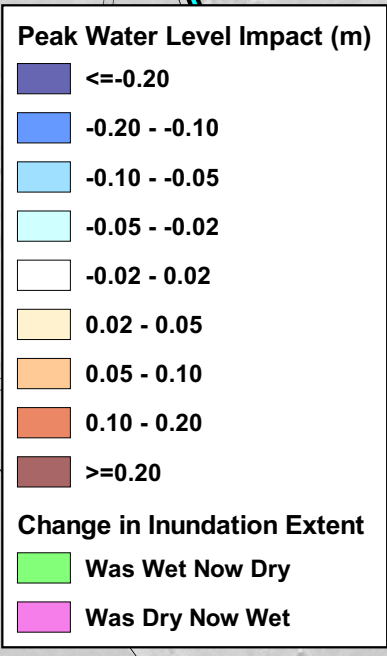
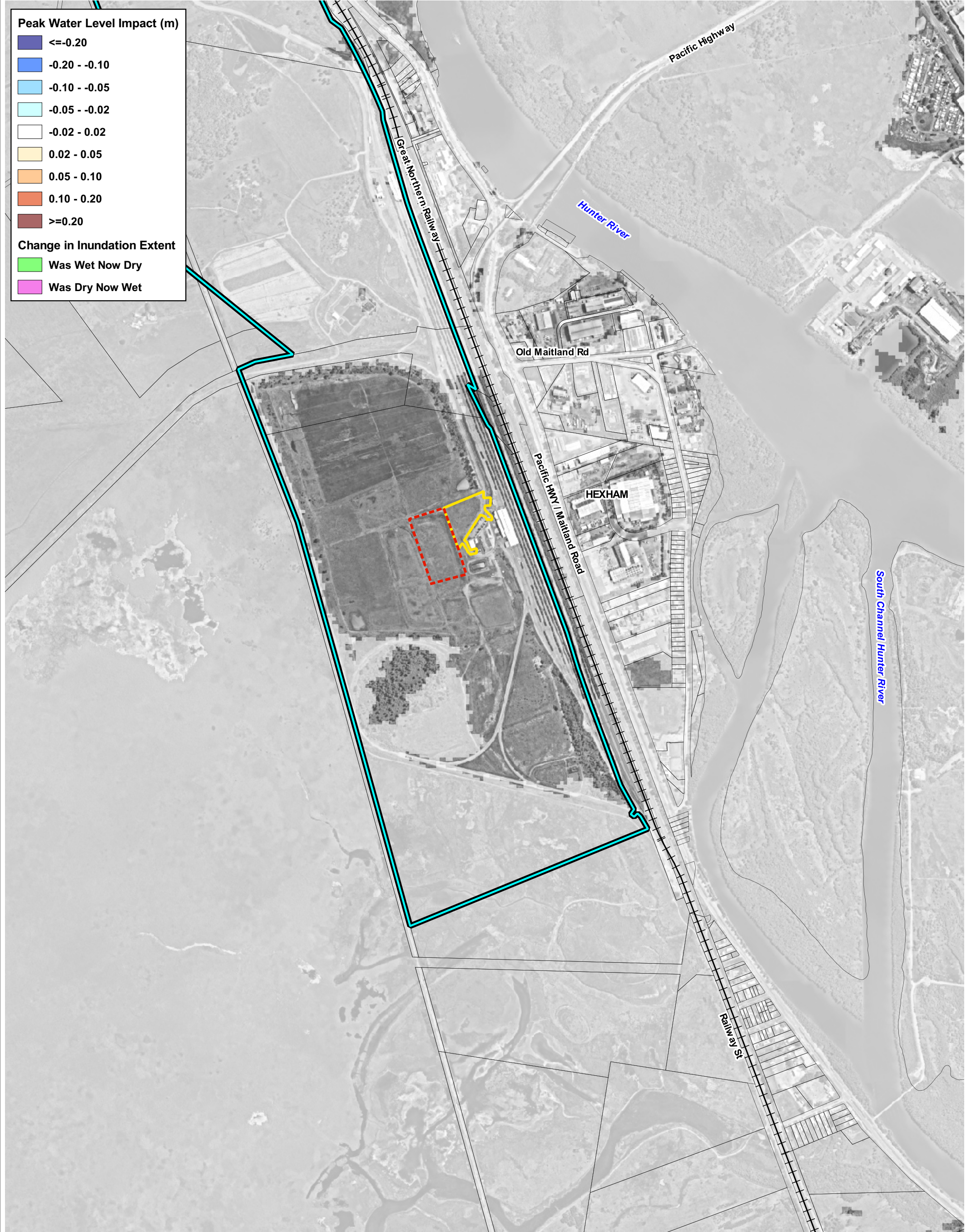
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5% AEP Flood Level Impacts

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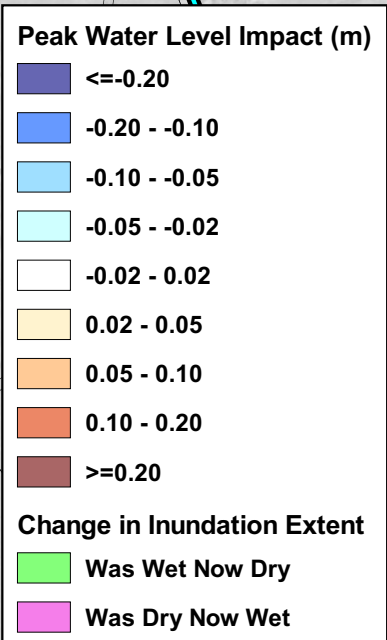
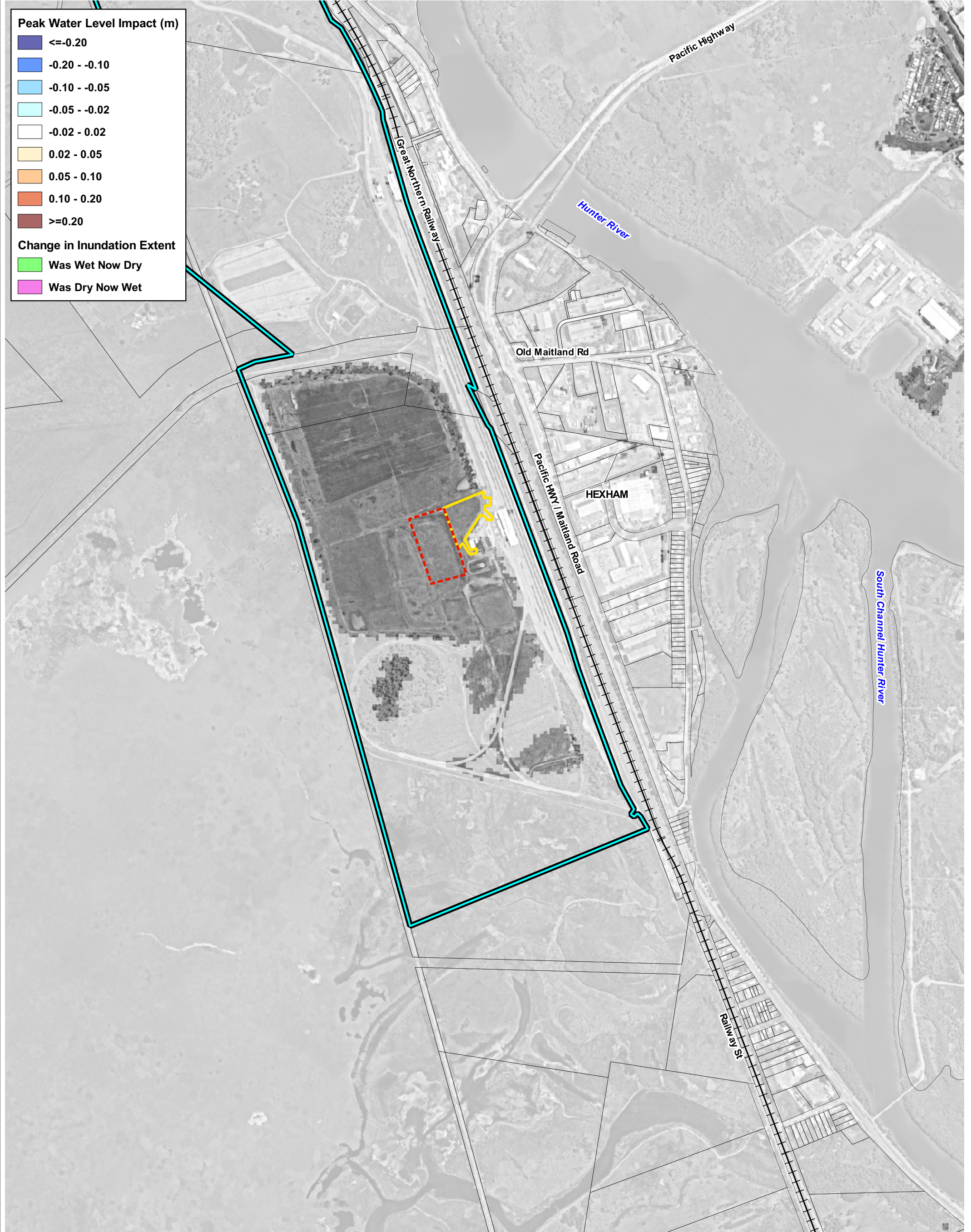
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Legend	
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 	Proposed Wagon Storage
 	Proposed Depot, Warehouse and Carpark
 	Cadastral Boundaries
	Railwayline

Title: 2% AEP Flood Level Impacts	
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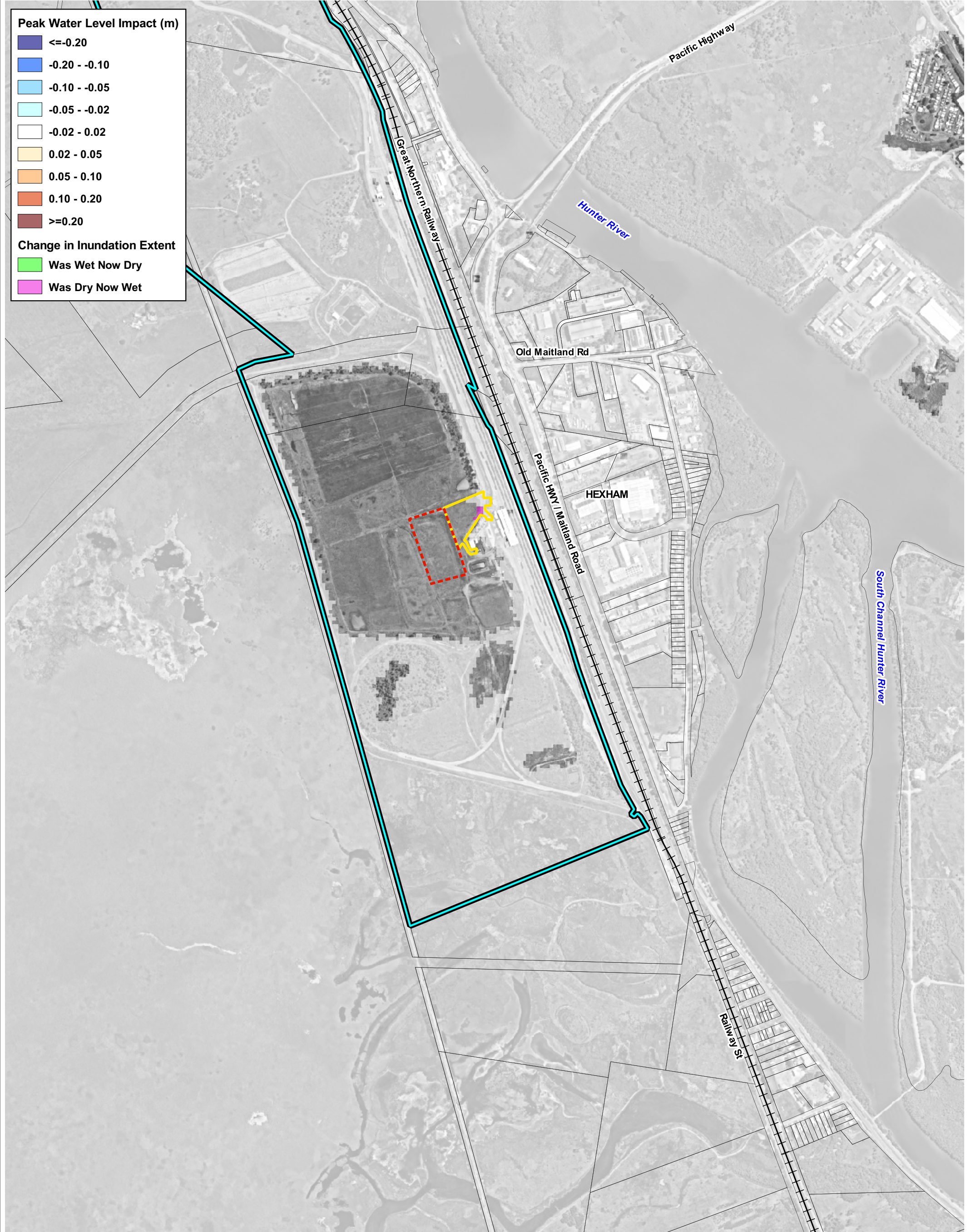
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Legend	
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 	Proposed Wagon Storage
 	Proposed Depot, Warehouse and Carpark
 	Cadastral Boundaries
	Railwayline

<p>Title:</p> <h2 style="margin: 0;">1% AEP Flood Level Impacts</h2>	<p>Drawing:</p> <h2 style="margin: 0;">B-3</h2>
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Peak Water Level Impact (m)

- <=-0.20
- 0.20 - -0.10
- 0.10 - -0.05
- 0.05 - -0.02
- 0.02 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- >=0.20

Change in Inundation Extent

- Was Wet Now Dry
- Was Dry Now Wet

Legend

- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

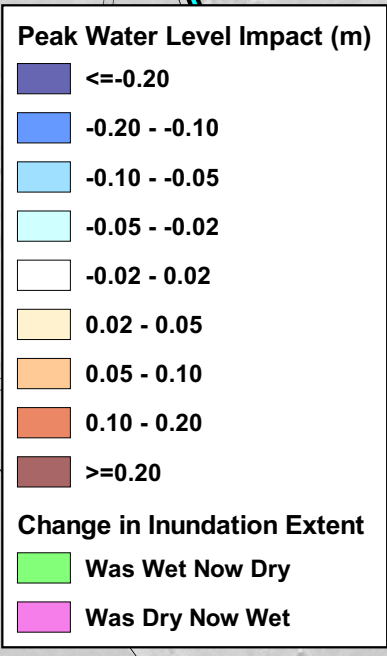
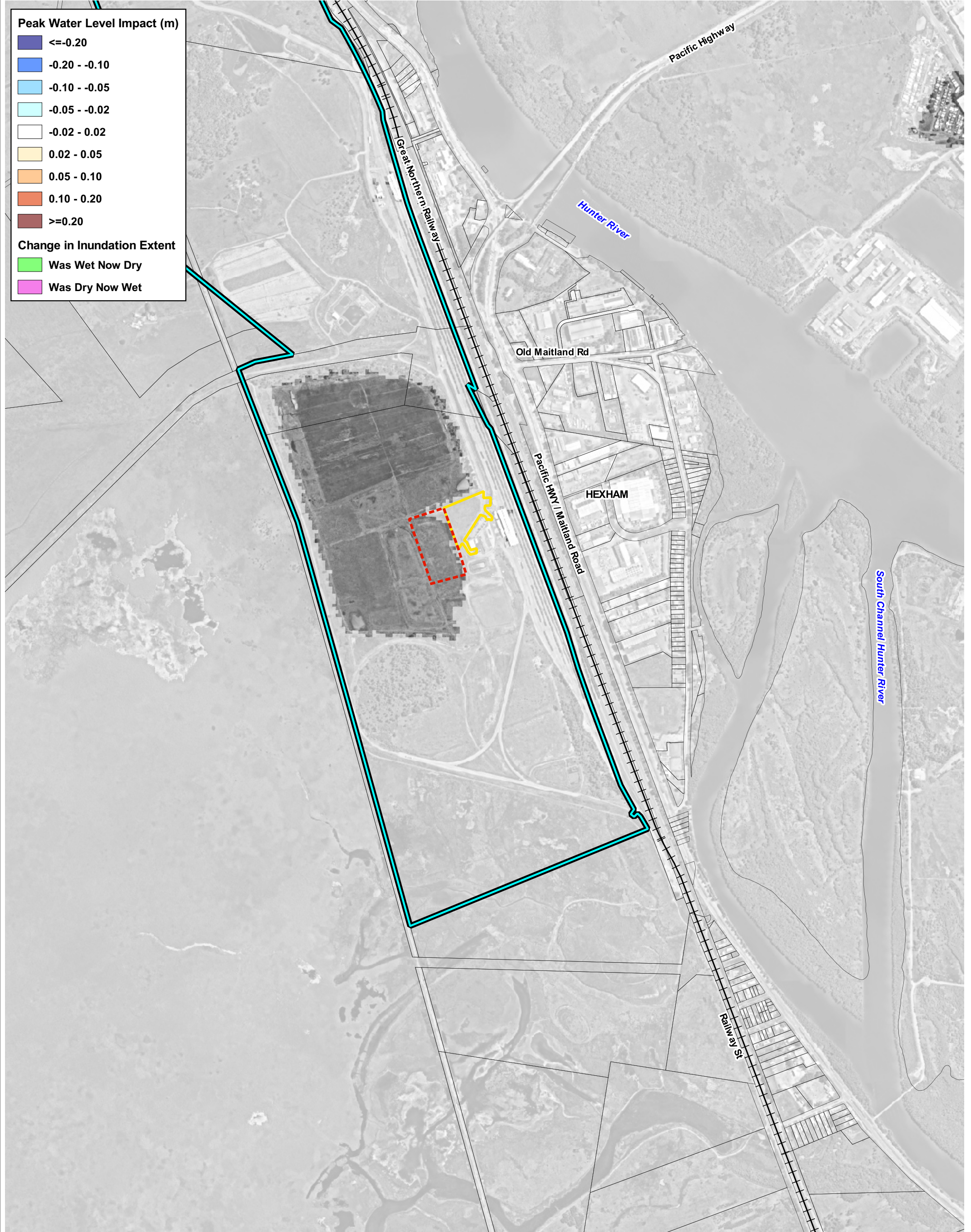
Title: **1% AEP (RCP8.5 - 2100) Flood Level Impacts**

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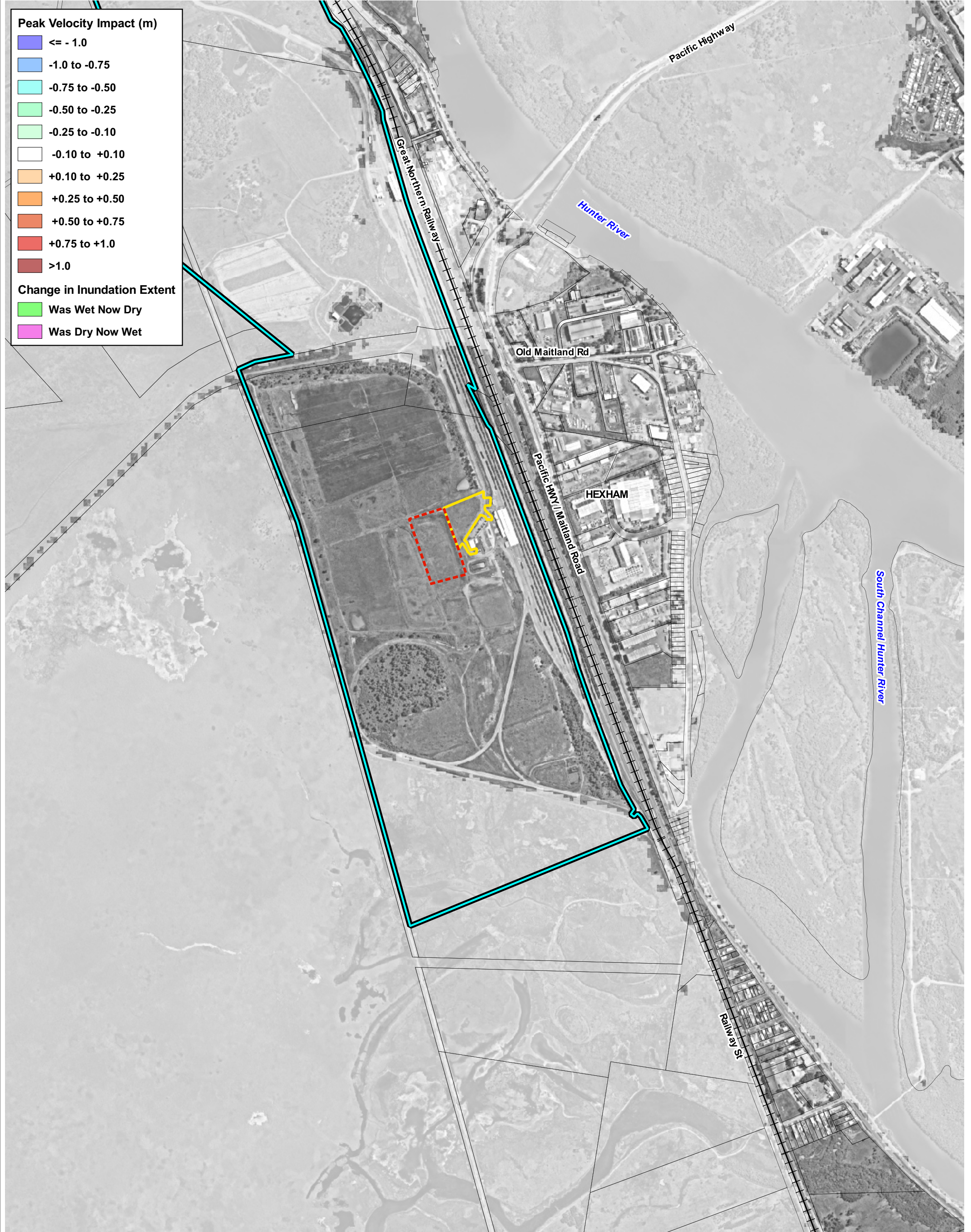
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Legend	
 	The Hexham LTTSF Site
 	Proposed Wagon Storage
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 	Cadastral Boundaries
	Railwayline

Title: PMF Flood Level Impacts	
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Peak Velocity Impact (m)

- <= - 1.0
- 1.0 to -0.75
- 0.75 to -0.50
- 0.50 to -0.25
- 0.25 to -0.10
- 0.10 to +0.10
- +0.10 to +0.25
- +0.25 to +0.50
- +0.50 to +0.75
- +0.75 to +1.0
- >1.0

Change in Inundation Extent

- Was Wet Now Dry
- Was Dry Now Wet

Legend

- The Hexham LTTSF Site
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- Railwayline

Title: **5% AEP Velocity Impacts**

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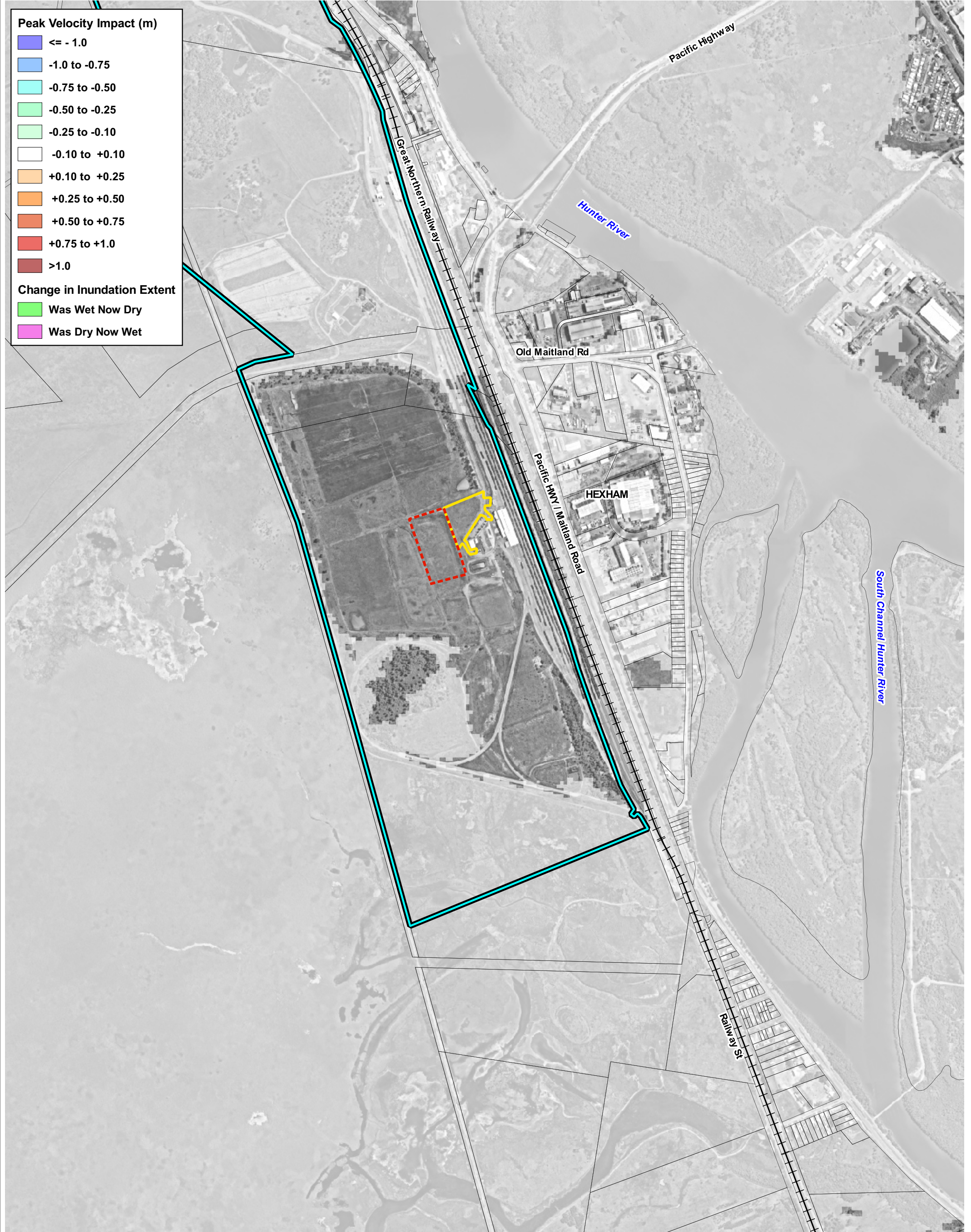
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Rev: **A**



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Peak Velocity Impact (m)

- <= - 1.0
- 1.0 to -0.75
- 0.75 to -0.50
- 0.50 to -0.25
- 0.25 to -0.10
- 0.10 to +0.10
- +0.10 to +0.25
- +0.25 to +0.50
- +0.50 to +0.75
- +0.75 to +1.0
- >1.0

Change in Inundation Extent

- Was Wet Now Dry
- Was Dry Now Wet

Legend

- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

Title:
2% AEP Velocity Impacts

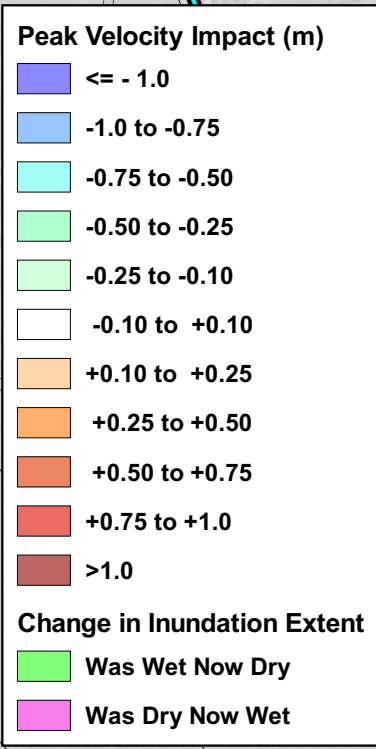
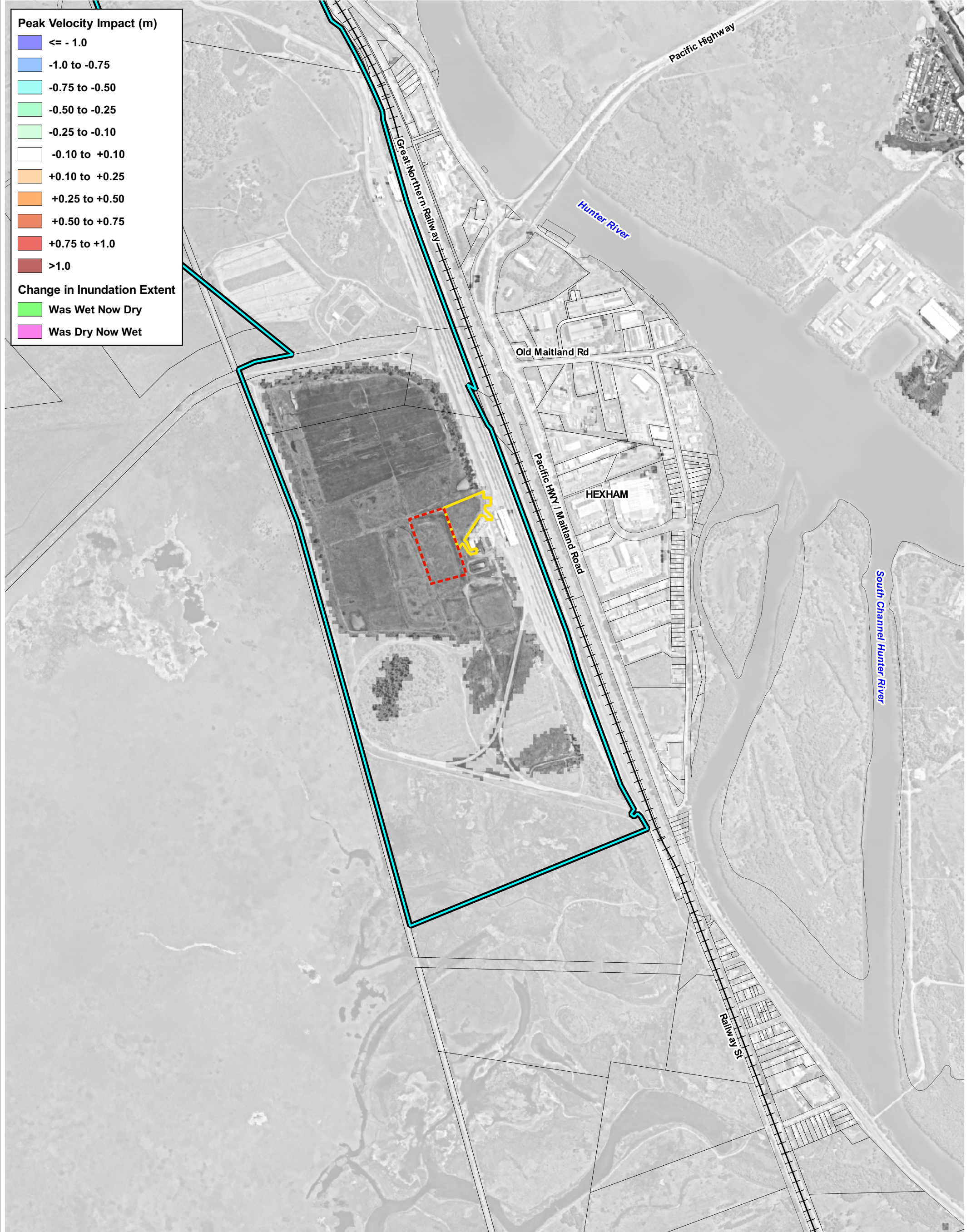
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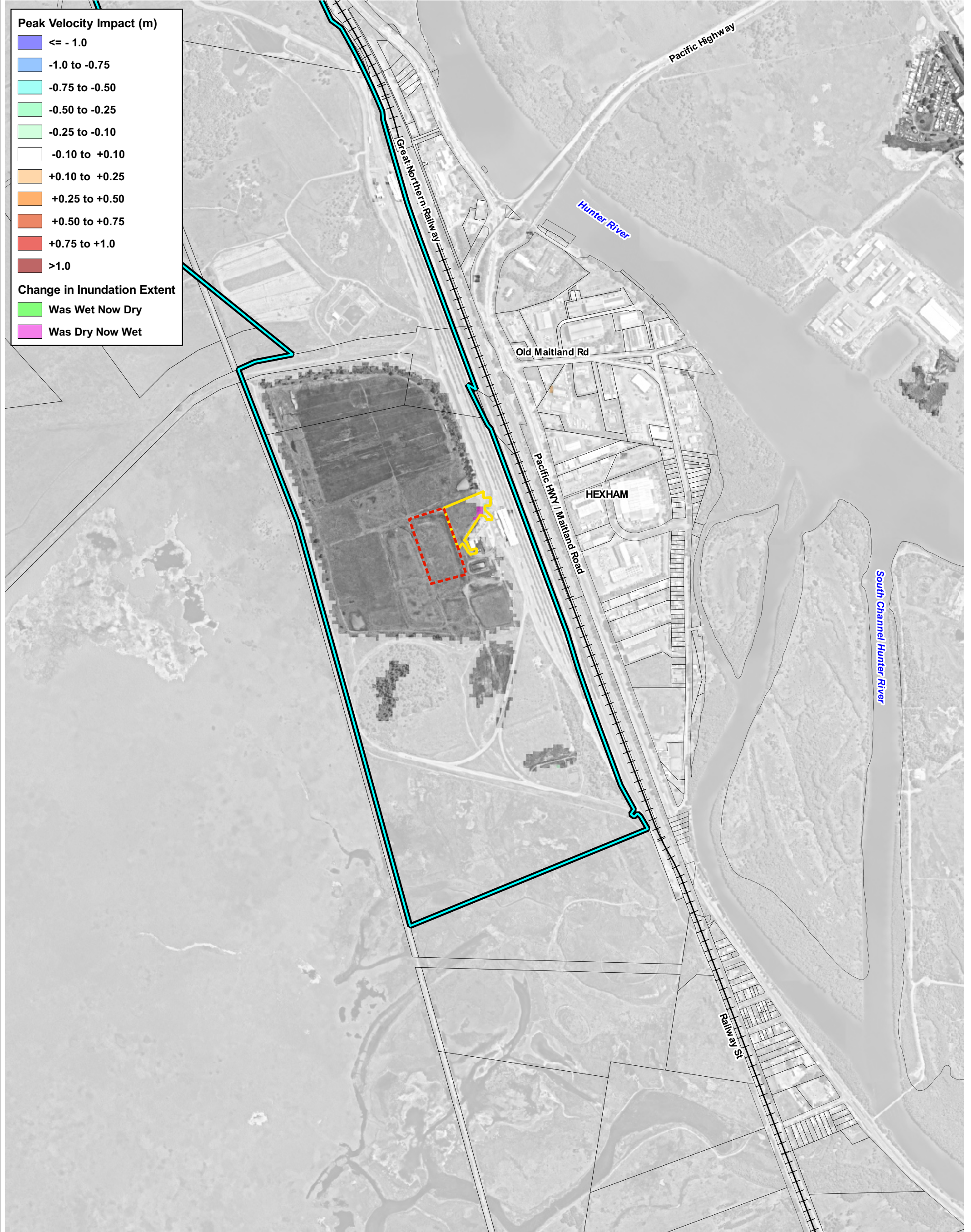




Legend	
	The Hexham LTTSF Site
	Proposed Wagon Storage
	Proposed Depot, Warehouse and Carpark
	Cadastral Boundaries
	Railwayline

<p>Title:</p> <h2 style="margin: 0;">1% AEP Velocity Impacts</h2>	<p>Drawing:</p> <h2 style="margin: 0;">C-3</h2>
<p>BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.</p>	<p>Rev:</p> <h2 style="margin: 0;">A</h2>
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Peak Velocity Impact (m)

- <= - 1.0
- 1.0 to -0.75
- 0.75 to -0.50
- 0.50 to -0.25
- 0.25 to -0.10
- 0.10 to +0.10
- +0.10 to +0.25
- +0.25 to +0.50
- +0.50 to +0.75
- +0.75 to +1.0
- >1.0

Change in Inundation Extent

- Was Wet Now Dry
- Was Dry Now Wet

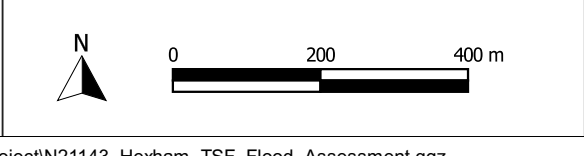
Legend

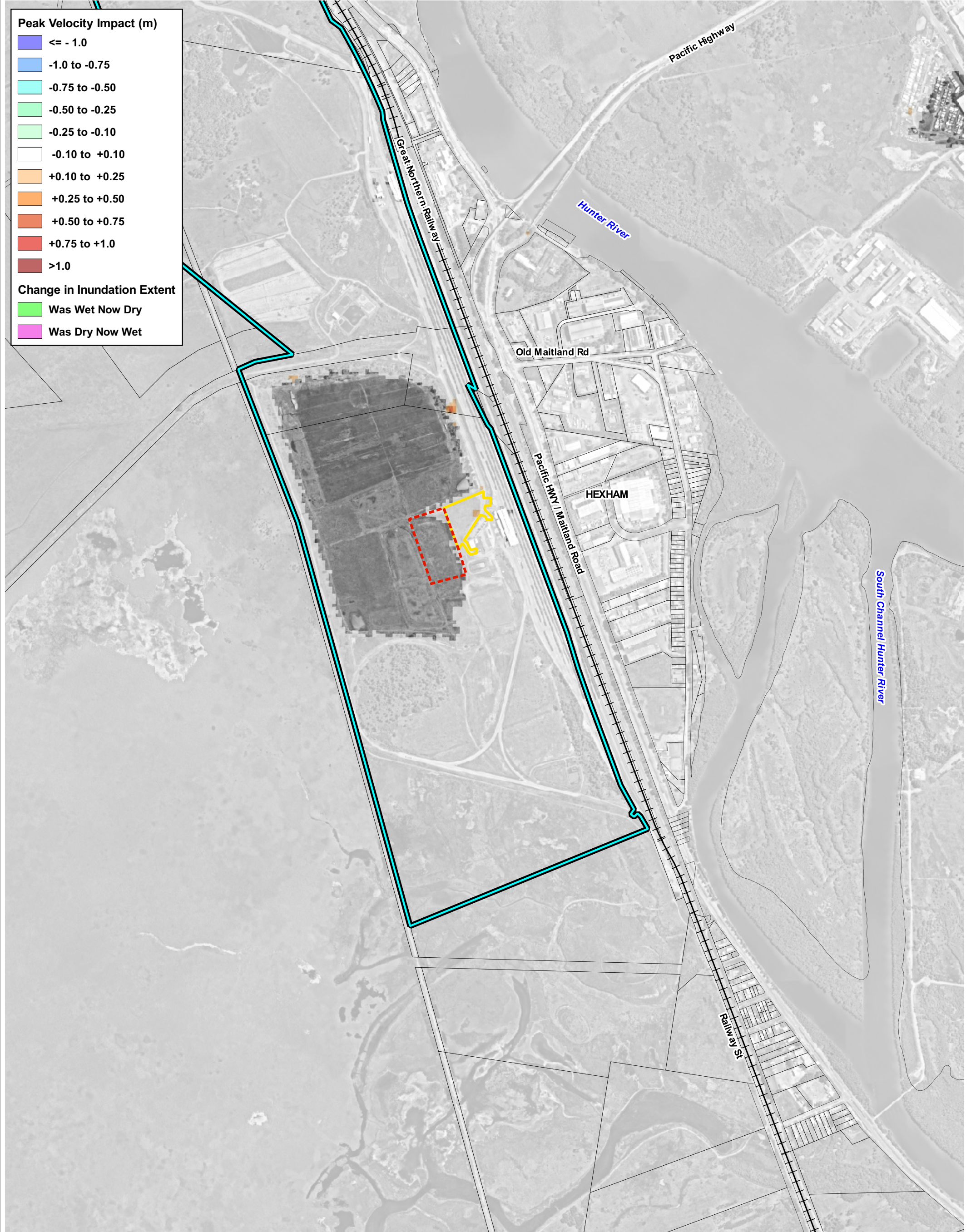
- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

Title: **1% AEP (RCP8.5 - 2100) Velocity Impacts**

Drawing: **C-4** Rev: **A**

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Peak Velocity Impact (m)

- <= - 1.0
- 1.0 to -0.75
- 0.75 to -0.50
- 0.50 to -0.25
- 0.25 to -0.10
- 0.10 to +0.10
- +0.10 to +0.25
- +0.25 to +0.50
- +0.50 to +0.75
- +0.75 to +1.0
- >1.0

Change in Inundation Extent

- Was Wet Now Dry
- Was Dry Now Wet

Legend

- The Hexham LTTSF Site
- Proposed Wagon Storage
- Proposed Depot, Warehouse and Carpark
- Cadastral Boundaries
- Railwayline

Title: **PMF Velocity Impacts**

BMT endeavours to ensure that the information provided in this map is correct at the time of publication. BMT does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

Filepath: K:\A11517.k.mm.HexhamTSF_FIAMapping\QGIS\Project\N21143_Hexham_TSF_Flood_Assessment.qgz

Drawing: **C-5** Rev: **A**

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