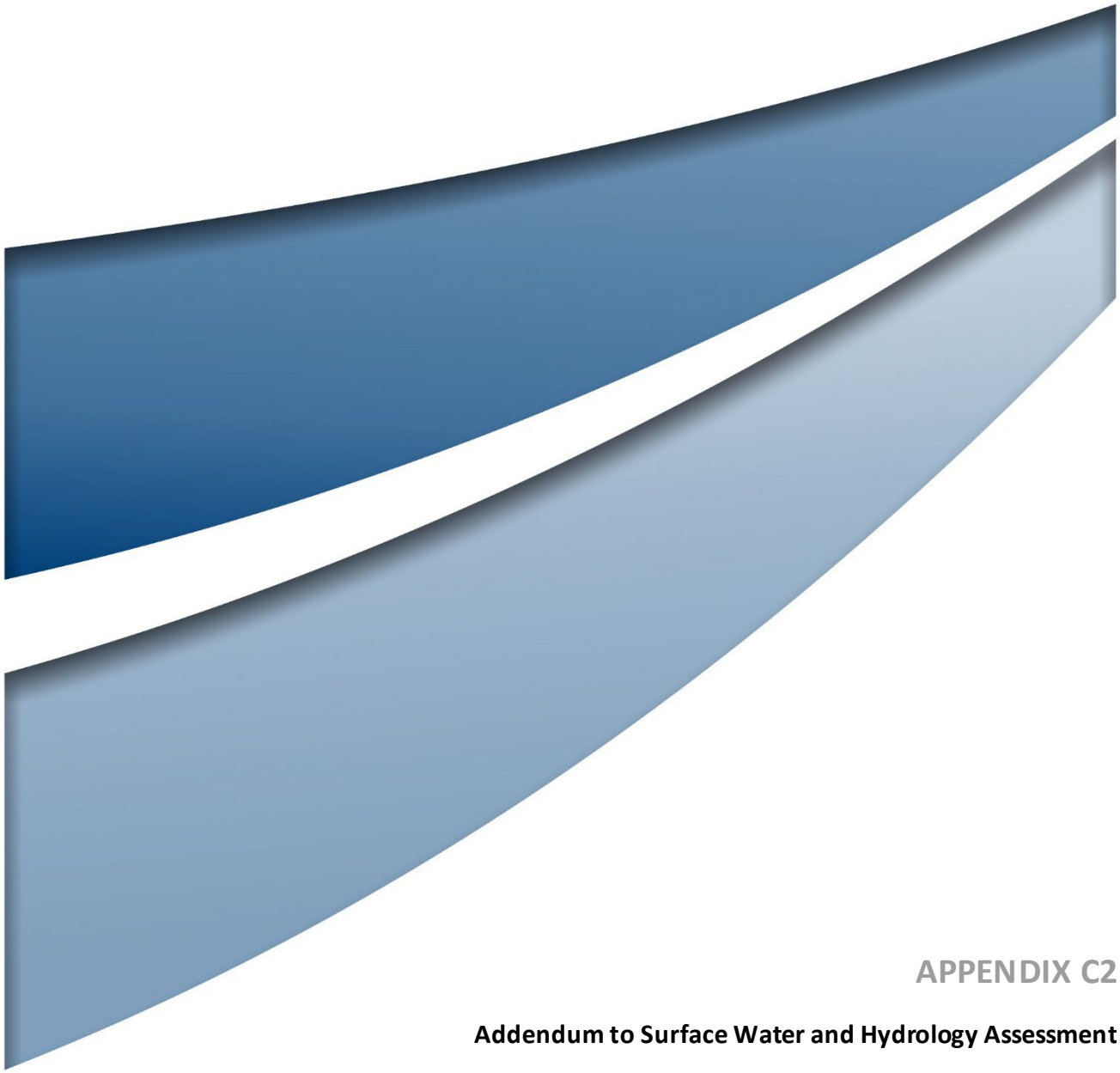

# APPENDIX C2

**Addendum to Surface Water and Hydrology Assessment**

umwelt
Environmental & Social Consultants

# KURRI KURRI LATERAL PIPELINE PROJECT

Surface Water and Hydrology Impact Assessment Addendum

**FINAL**

**September 2022**

# KURRI KURRI LATERAL PIPELINE PROJECT

Surface Water and Hydrology Impact Assessment Addendum

## FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
APA Group

| | |
|---|---|
| Project Director: | Paul Douglass |
| Project Manager: | Marion O'Neil |
| Technical Director: | Darren Lyons |
| Technical Manager: | Matilda Mathieu |
| Report No. | 21450/R06A |
| Date: | September 2022 |

umwelt
Environmental & Social Consultants

APPROVED COMPANY ISO 9001
QMS Certification Services

This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

***Acknowledgement of Country***

*Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.*



**Document Status**

| Rev No. | Reviewer | | Approved for Issue | |
|---|---|---|---|---|
| | Name | Date | Name | Date |
| V1 | Darren Lyons | 14/09/2021 | Darren Lyons | 28/09/2021 |
| | | | | |

# Table of Contents



# Figures

# Photos

# 1.0 Introduction

Umwelt (Australia) Pty Ltd (Umwelt) was engaged by APA Group (APA) to prepare a Surface Water and Hydrology Impact Assessment as part of the Environmental Impact Statement (EIS) for the Kurri Kurri Lateral Pipeline (KKLP) Project.

The assessment was prepared in accordance with the requirements of the Planning Secretary's Environmental Assessment Requirements (SEARs) for the Project and all relevant guidelines and policies relating to water resources and hydrology.

The EIS was placed on public exhibition between April and May 2022. Several submissions were received from government agencies in relation to water resources. These submissions have been addressed in the Submissions Report prepared separately by Umwelt.

Following the receipt of submissions during the EIS exhibition and ongoing consultation with affected landholders, several amendments were made to the Project construction footprint, including a revised location for the JGN offtake facility adjacent Lenaghans Drive (refer to Figure 1.1 and **Photo 1.1**). Flood modelling undertaken for the Surface Water and Hydrology Assessment were extended to include the new location of the JGN offtake facility. This addendum report presents the updates to the flood modelling and the outcomes of the flood assessment undertaken for the revised location of JGN offtake facility. This report should be read in conjunction with the previous investigations documented in the Surface Water and Hydrology Assessment and EIS and does not reproduce the background information or legislative context.

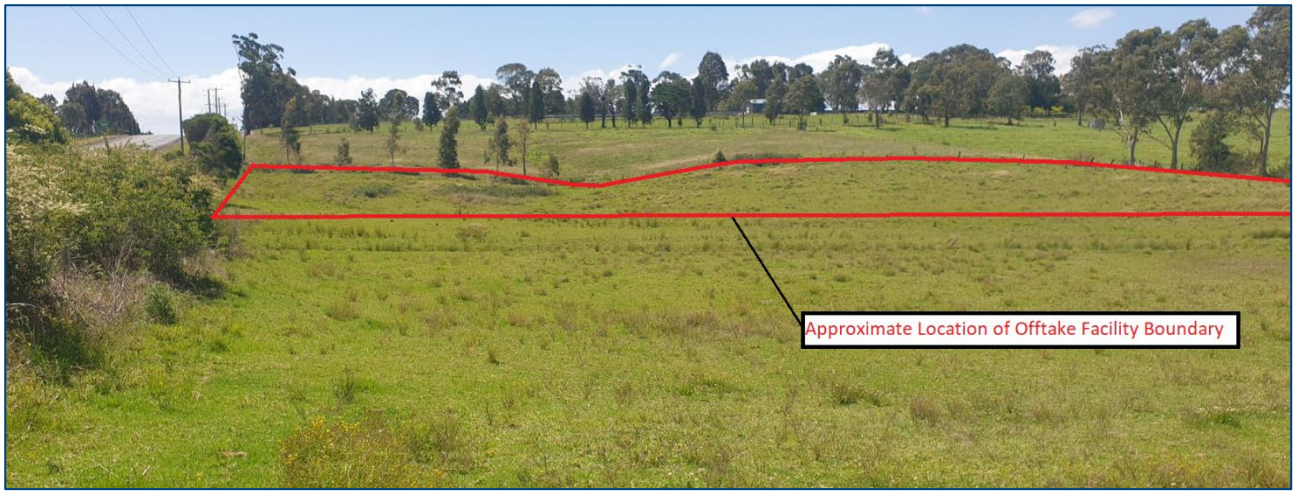


**Photo 1.1 Approximate Location of the Offtake Facility Boundary–Photo Taken East of Lenaghans Drive Looking North (October 2021)**


**Figure 1.1 Revised Location of the JGN Offtake Facility**

# 2.0 Updated Flood Modelling

## 2.1 Approach

The 2-dimensional TUFLOW hydraulic model developed for the *Kurri Kurri Lateral Pipeline Surface Water and Hydrology Assessment* (Umwelt, 2022) was used as the basis for this assessment. This model was extended to include the new JGN offtake facility location and to incorporate appropriate flood levels for Hexham Swamp as this location may be influenced by tailwater conditions. The Hexham Swamp flood levels were obtained from the Upgrading of the *Lower Hunter Flood Model at Hexham* study that was completed for Newcastle City Council in 2008 by DHI. The study produced flood maps and estimated flood levels for the 10%, 5%, 2%, 1%, 0.5% Annual Exceedance Probability (AEP), and the Probable Maximum Flood (PMF) flood events.

The original approach and modelling parameters are described in detail in Appendix G of the *Kurri Kurri Lateral Pipeline Surface Water and Hydrology Assessment* report (Umwelt, 2022). The changes to the modelling made for the purpose of assessing flood risk at the revised JGN offtake facility location are described below:

- The flood model domain was extended downstream to Hexham Swamp to include the new location of offtake facility and pipeline and to model the downstream tailwater boundary condition of Hexham Swamp.
- A steady state downstream water level boundary condition was applied to the model using tailwater levels estimated from the flood level mapping provided in the *Lower Hunter Flood Model at Hexham* report (DHI, 2008) as follows:
    - 10% AEP Hexham Swamp Tailwater Level = 1.9 m AHD
    - 1% AEP Hexham Swamp Tailwater Level= 3.85 m AHD
    - 0.5% AEP Hexham Swamp Tailwater Level = 4.05 m AHD
    - 0.2% AEP Hexham Swamp Tailwater Level = 4.3 m AHD (interpolated)

    *Note that the 0.2% AEP event was not modelled in the Lower Hunter Flood Model at Hexham study (DHI, 2008) and therefore the tailwater levels for this event has been estimated using log-interpolation.*

    - PMF Hexham Swamp Tailwater Level = 6.7 m AHD
- The culvert at Lenaghans Drive (refer Photo 2.1) has been modelled as 2x1200 mm diameter culverts based on site inspection and aerial photography. The upstream and downstream invert levels were estimated from the 2014 LiDAR data (NSW Government). There are also a number of culvert structures at road/access crossings along the watercourse alignments upstream of Lenaghans Drive at Pacific Motorway and the model representation assumes that these structures do not impede flows.

**Photo 2.1 Culvert at Lenaghans Drive Upstream/Western Side**

## 2.2 Flood Results

The revised model was run for the 10%, 1%, 0.5% and 0.2% AEP events and the PMF for the local catchment critical storm duration determined (i.e. 30 minutes). Design event flood mapping comprising simulated peak flood depths, flood velocity and hazard classifications for the modelled events are attached.

The results show the following:

- 10% AEP event - Refer to **Figure 2.1**, **Figure 2.2** and **Figure 2.3** for the 10% AEP flood depths, velocities and hazard respectively. The new location of the JGN offtake facility is predicted to be free from flooding.

- 1% AEP event - Refer to **Figure 2.4, Figure 2.5 and Figure 2.6** for the 1% AEP flood depths, velocities and hazard respectively. The flood extents have increased and a small area at the southern boundary of the new location of the JGN offtake facility is inundated up to a depth of approximately 250 mm. This corresponds to the low point in the topography along the southern boundary which is also visible in the site photograph shown in **Photo 1.1**. Note that the flood mapping also shows some minor overland flooding associated with the local catchment /table drain runoff from the north being conveyed through the site. Typically, the flood velocities up to 1 m/s at the southern boundary. Flooding at the new location is dominated by runoff from the local catchment in the 1% AEP event, with limited influence from tailwater conditions in Hexham Swamp.

- 0.5% AEP event - Refer to **Figure 2.7, Figure 2.8 and Figure 2.9** for the 0.5% AEP flood depths, velocities and hazard respectively. The flood inundation extents within the JGN offtake facility have marginally increased, with inundation depths of 0.7 m at the low point along the southern boundary. Typically, the flood velocities are up to 1 m/s at the southern boundary.

- 0.2% AEP event - Refer to **Figure 2.10, Figure 2.11 and Figure 2.12** for the 0.2% AEP flood depths, velocities and hazard respectively. the south-west corner of the JGN offtake facility is predicted to experience flood depths up to approximately 1.3 m depth. Typically, the flood velocities are up to 1.8 m/s at the southern boundary

- PMF event - Refer to **Figure 2.13, Figure 2.14 and Figure 2.15** for the PMF flood depths, velocities and hazard respectively. The entire JGN offtake facility is inundated with maximum depth up to 6.3 m at the southern boundary. There is extensive overtopping of Lenaghans Drive which contributes to high flood velocities up to 8 m/s across the site. The combined flood depth and velocity distributions provide for a high flood hazard category (Hazard category 6). The PMF event represents the largest flood conceivable that could occur at a location.

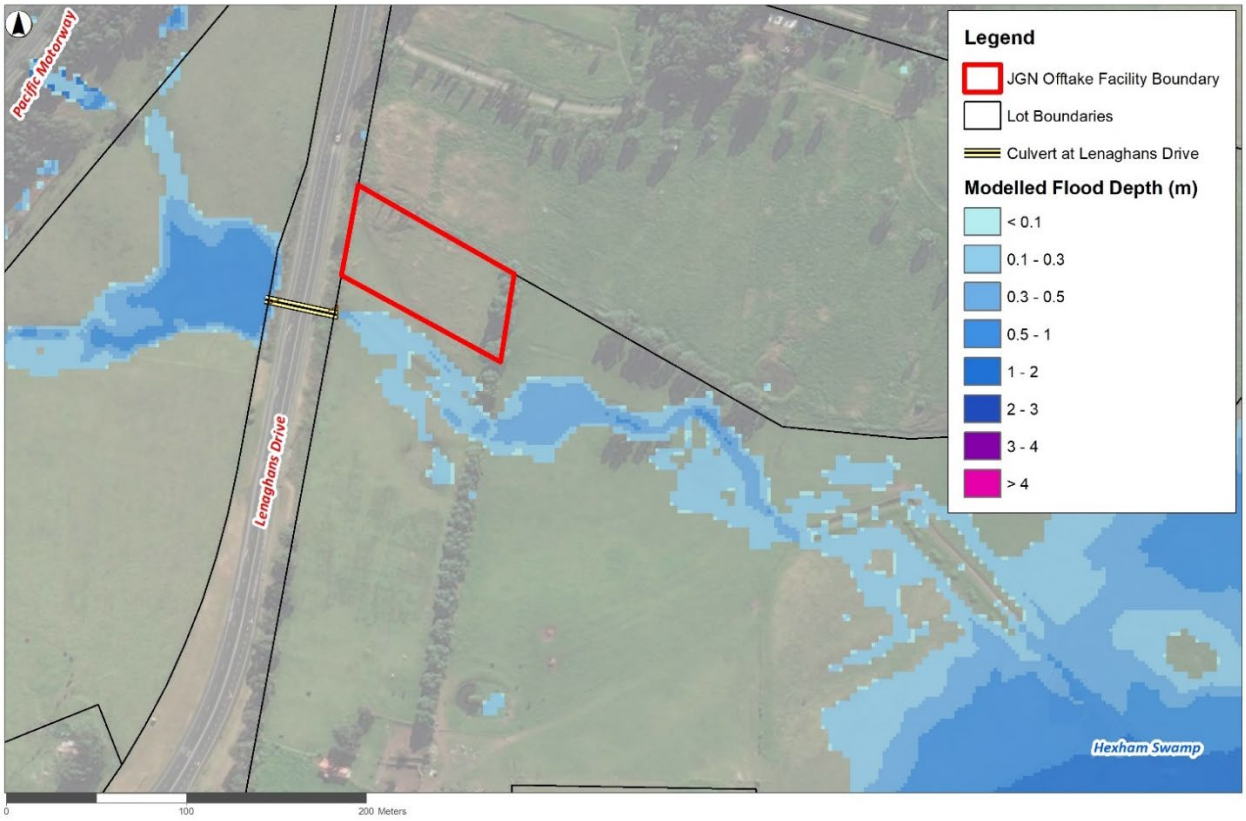


**Figure 2.1 10% AEP Flood Depths**

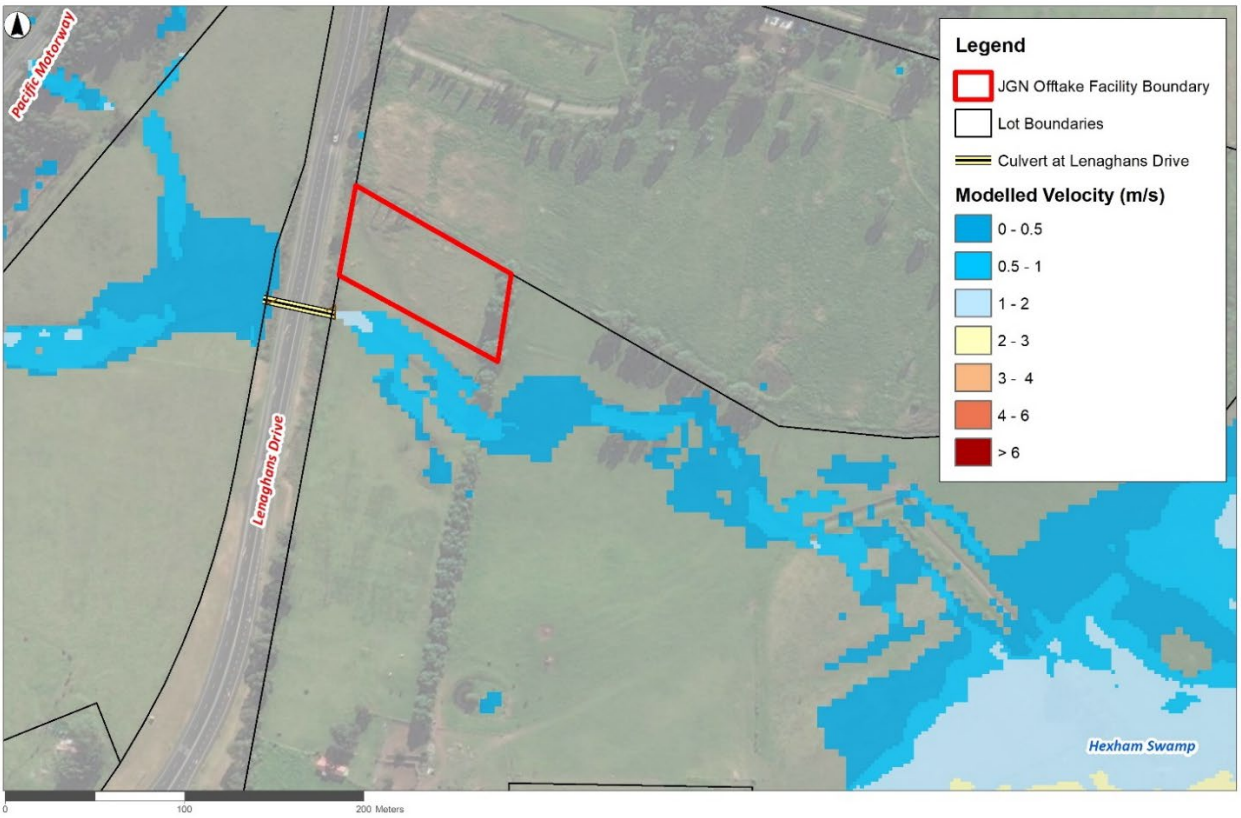


**Figure 2.2 10% AEP Flood Velocities**

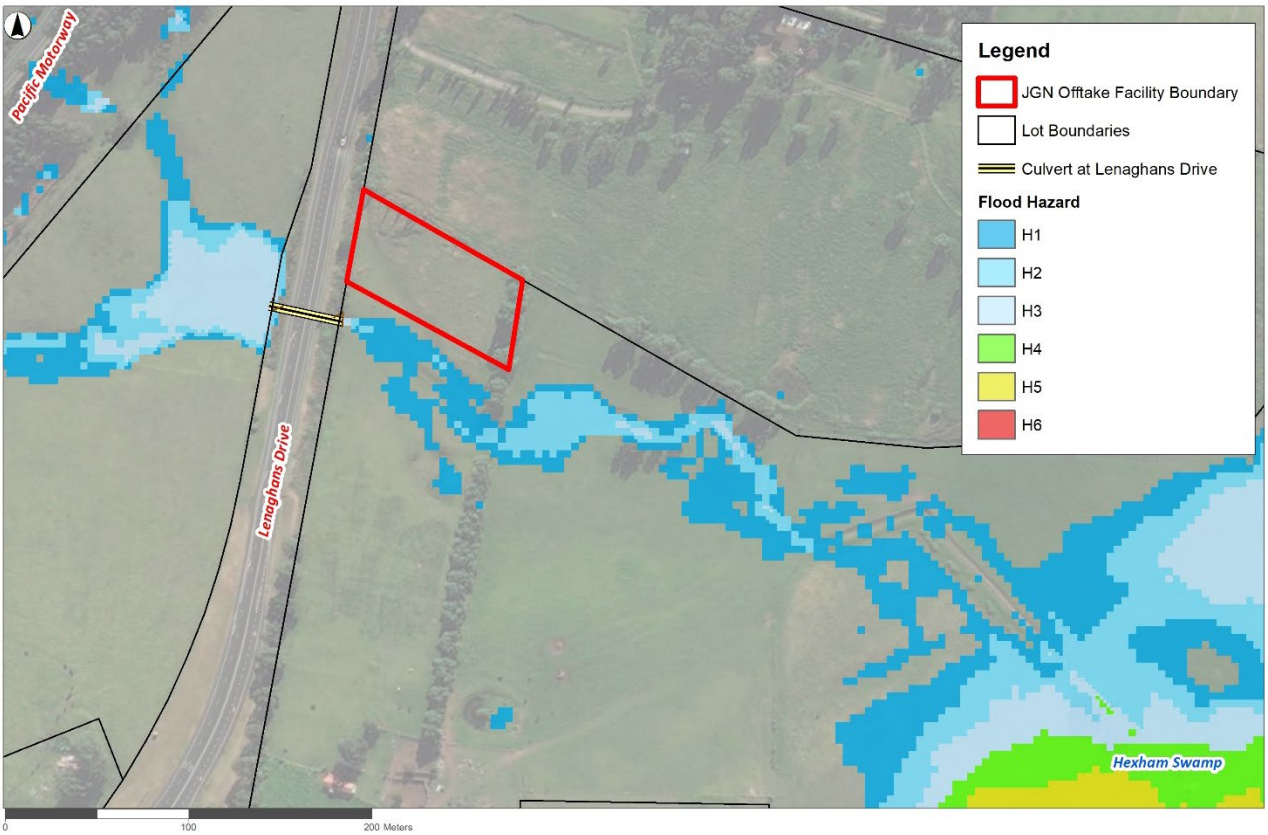


**Figure 2.3 10% AEP Flood Hazard**

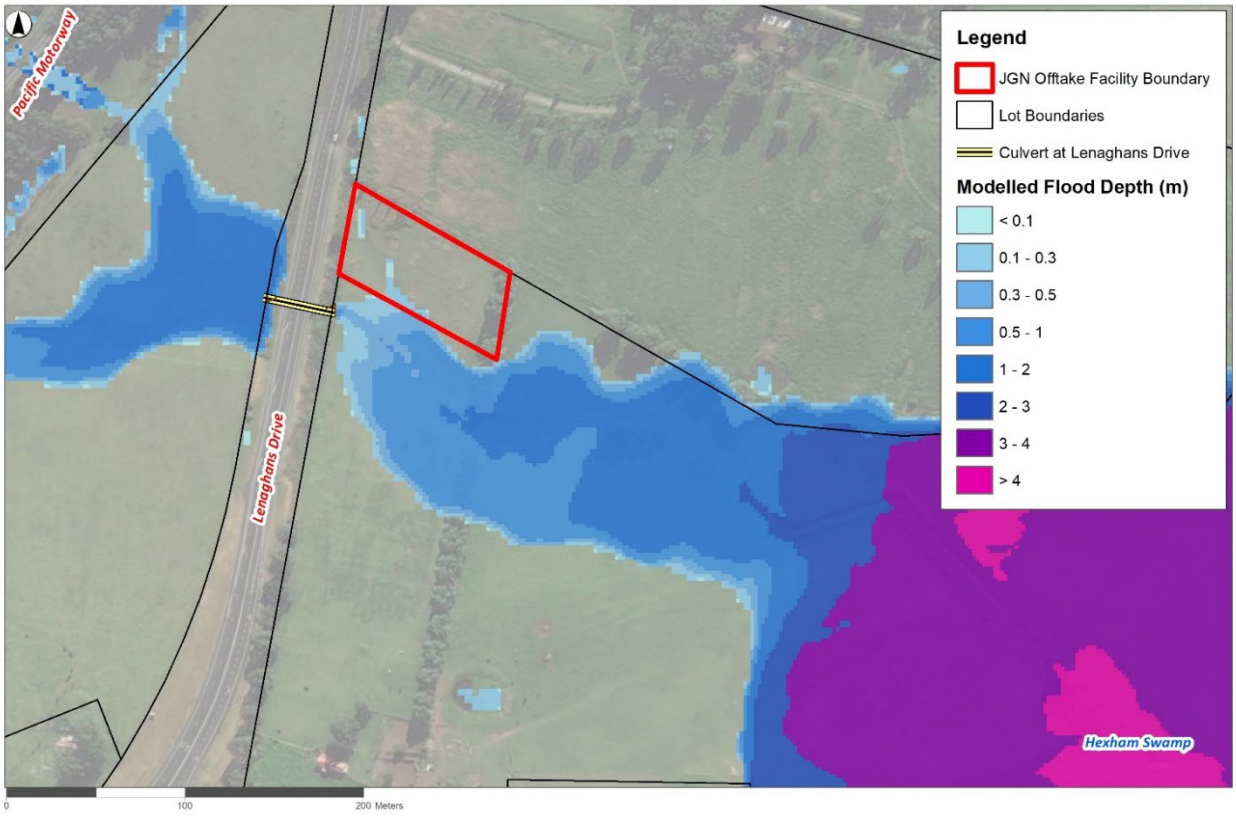


**Figure 2.4 1% AEP Flood Depths**

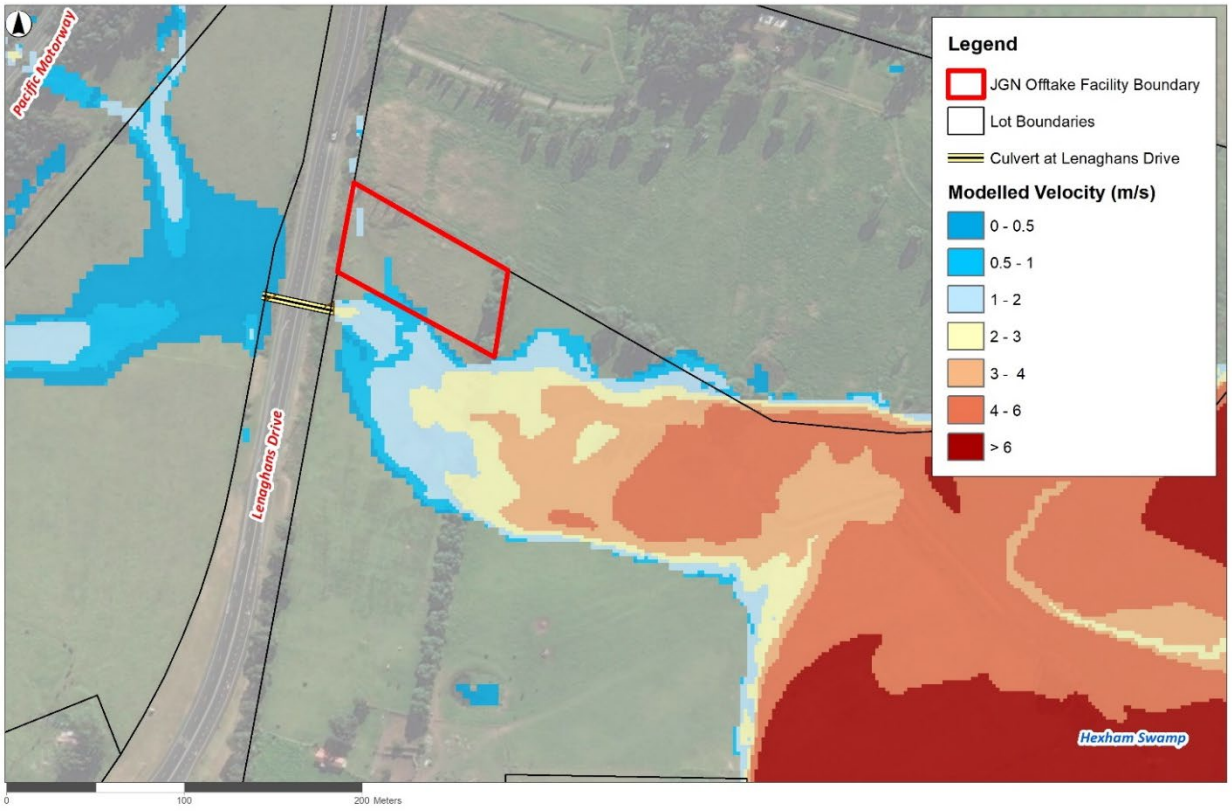


**Figure 2.5 1% AEP Flood Velocities**

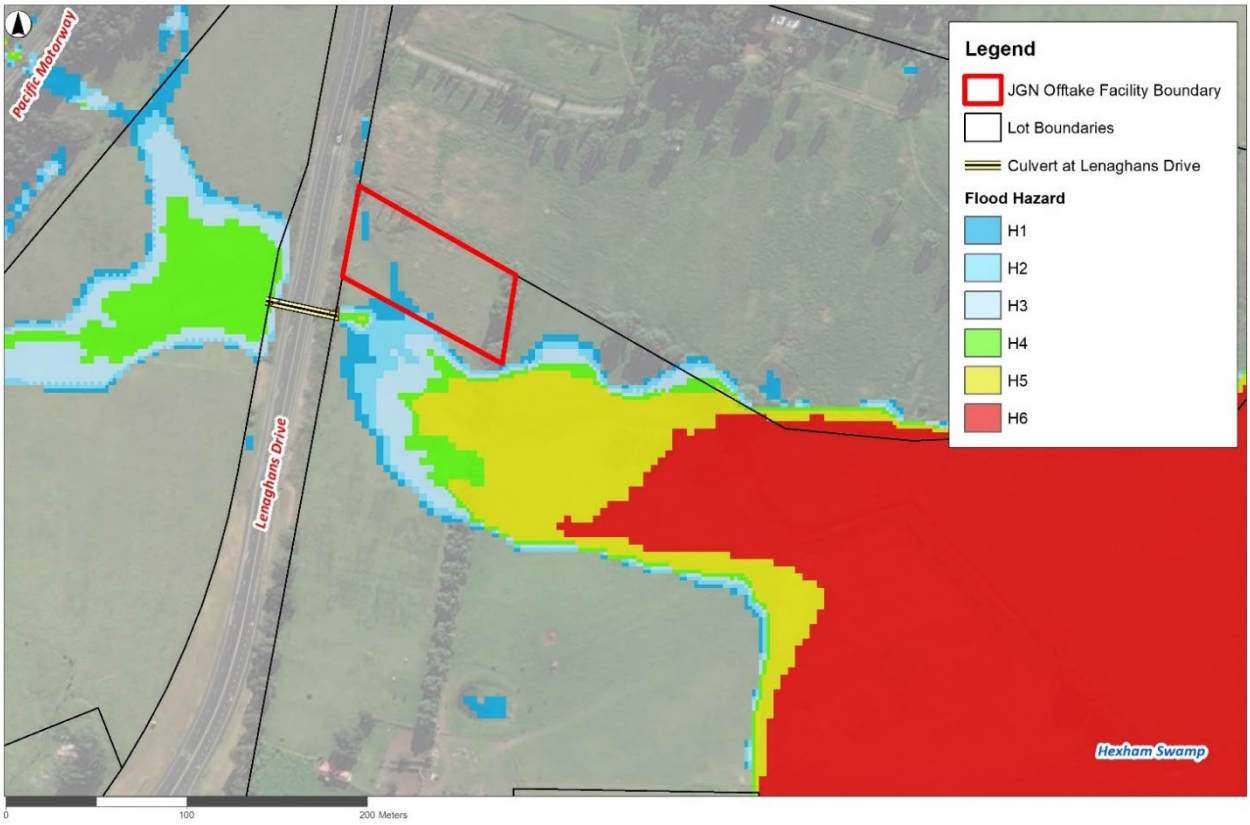


**Figure 2.6 1% AEP Flood Hazard**

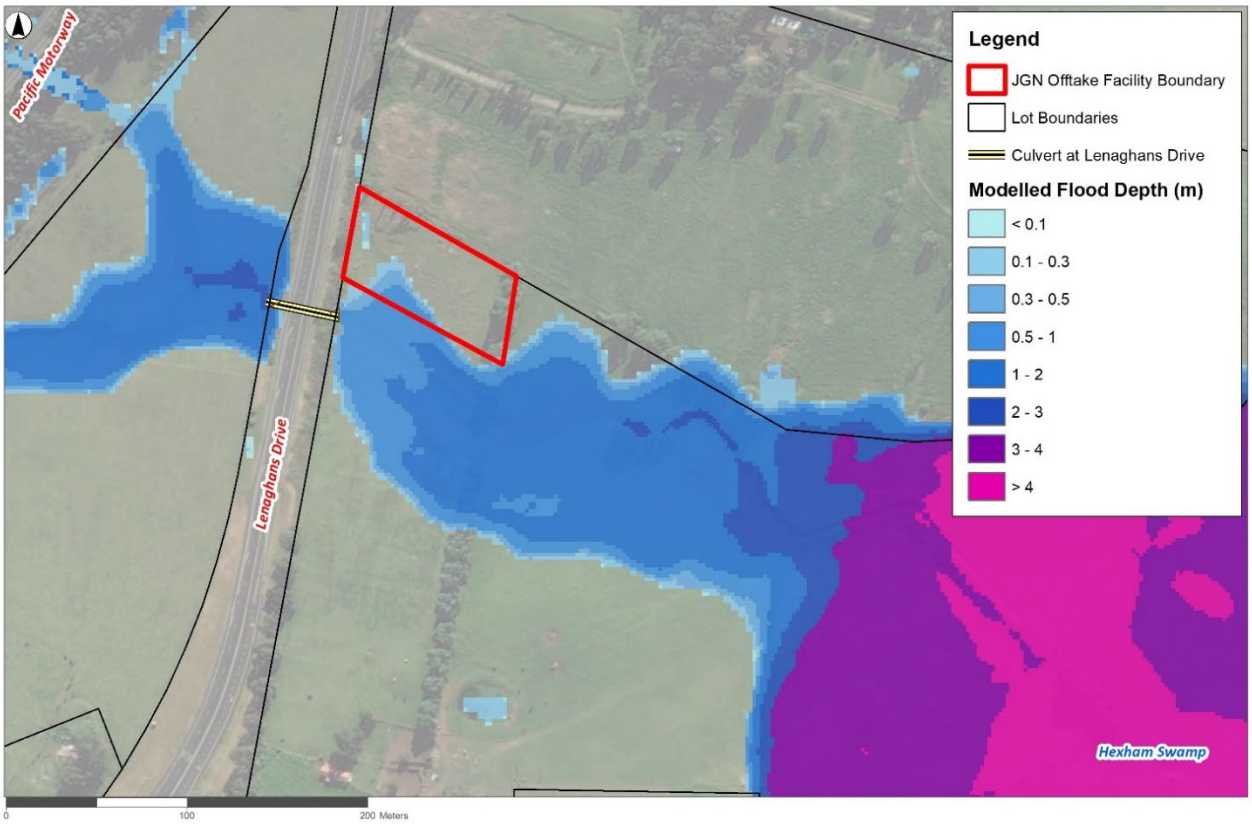


**Figure 2.7 0.5% AEP Flood Depths**

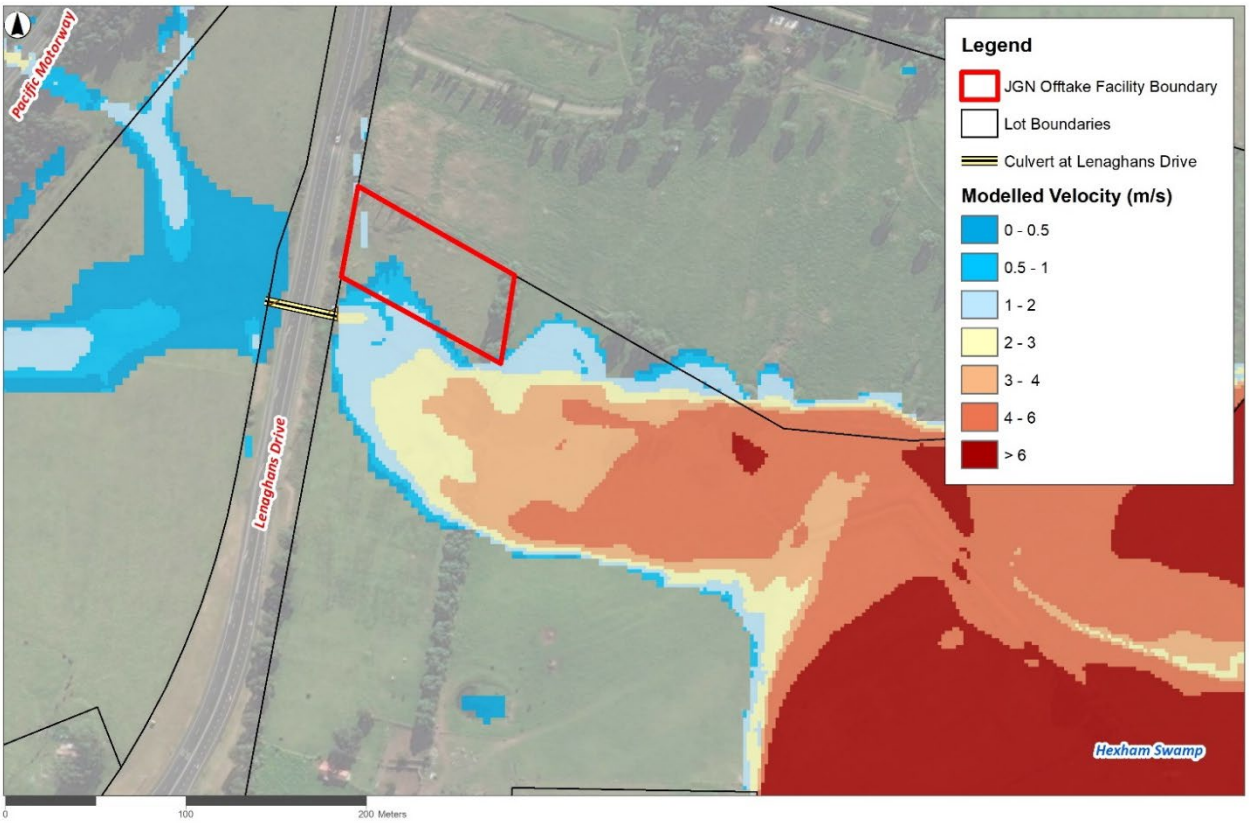


**Figure 2.8 0.5% AEP Flood Velocities**

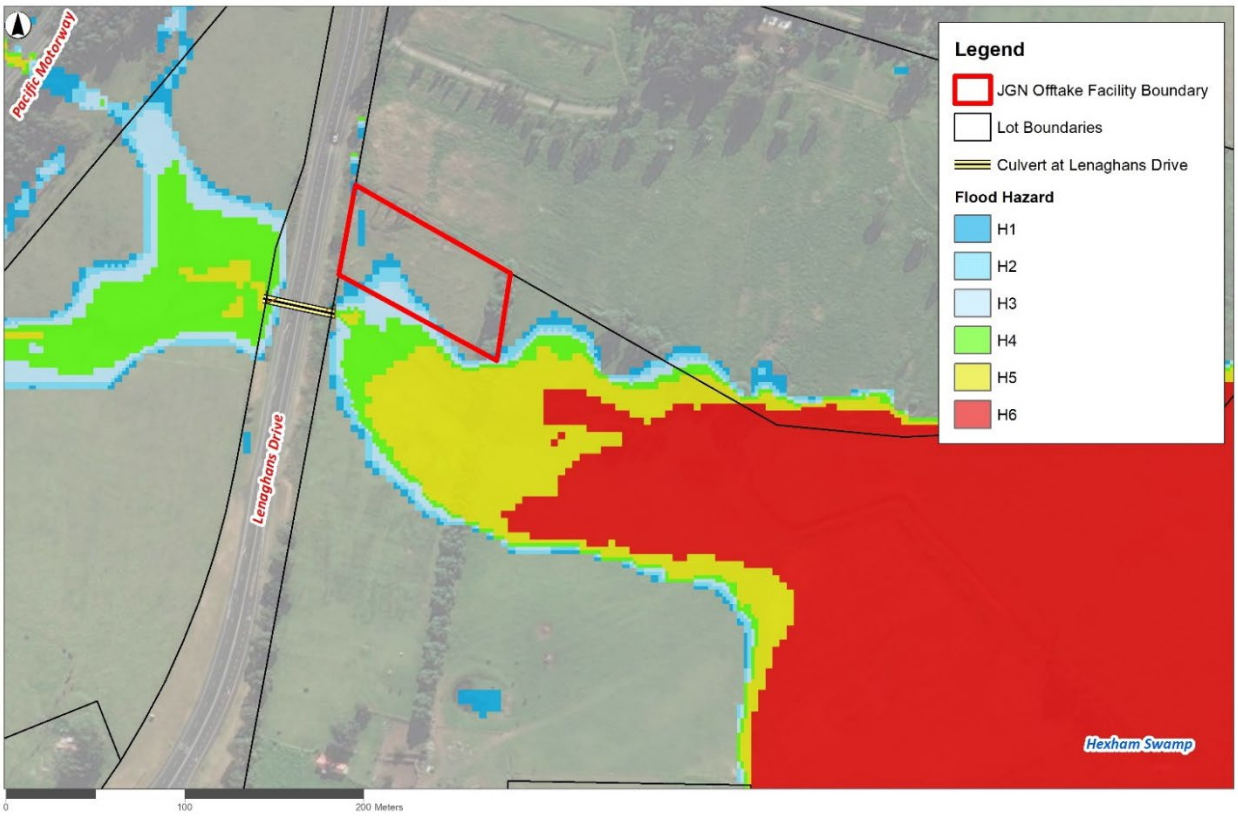


**Figure 2.9 0.5% AEP Flood Hazard**

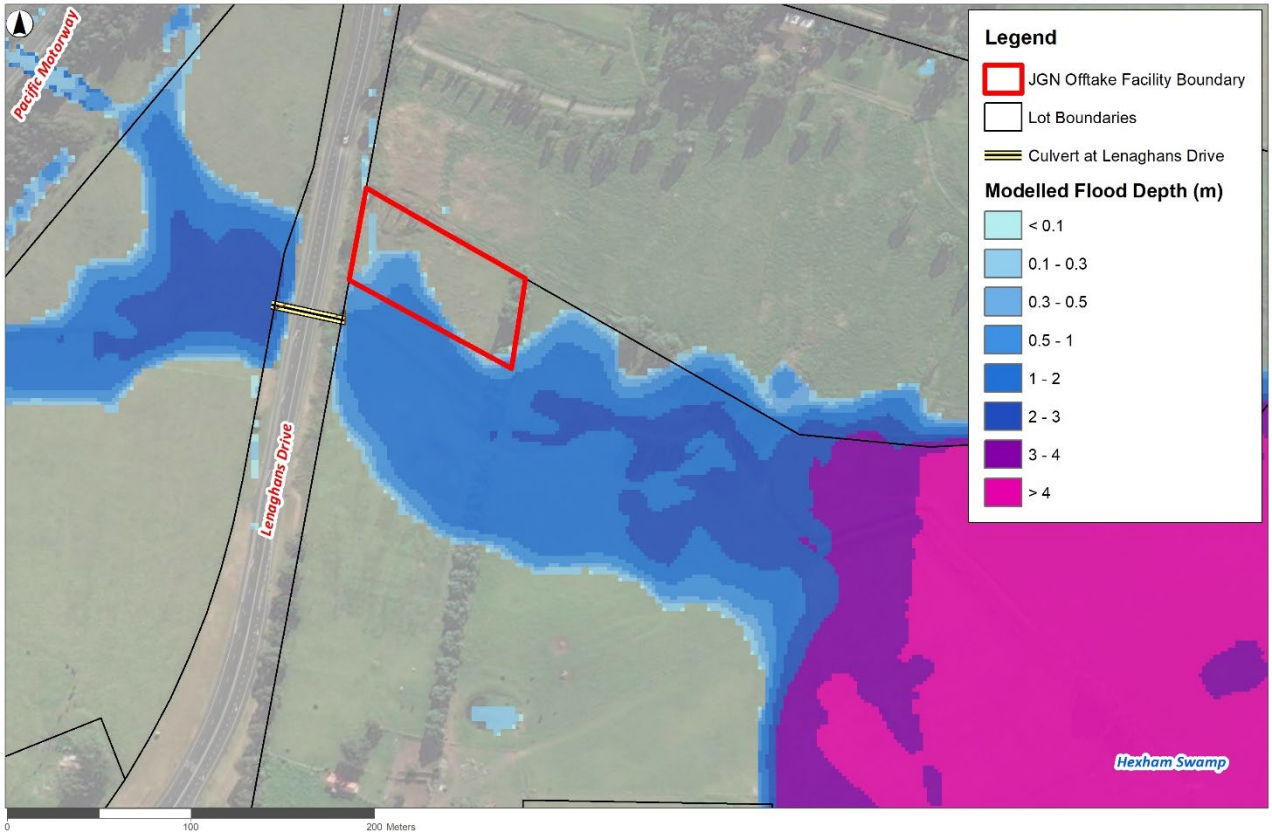


**Figure 2.10 0.2% AEP Flood Depths**

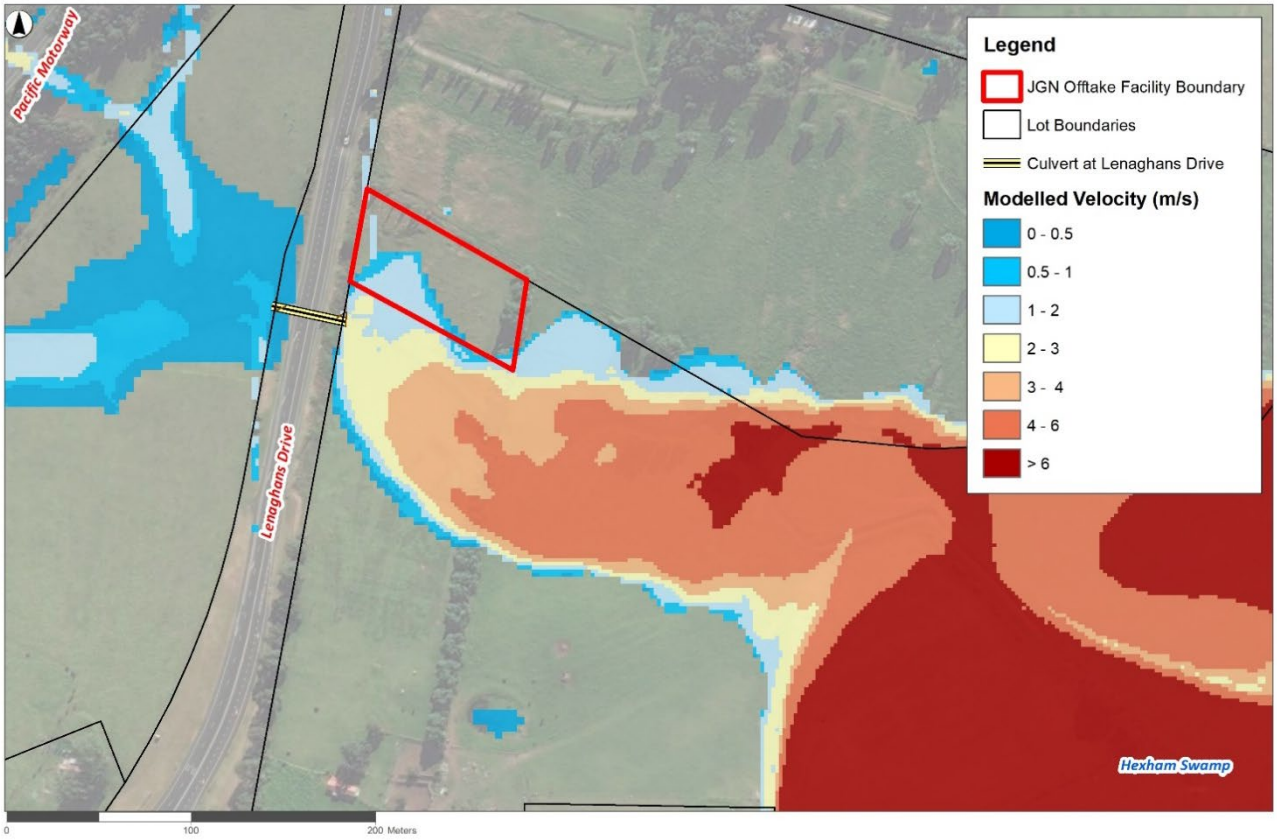


**Figure 2.11 0.2% AEP Flood Velocities**

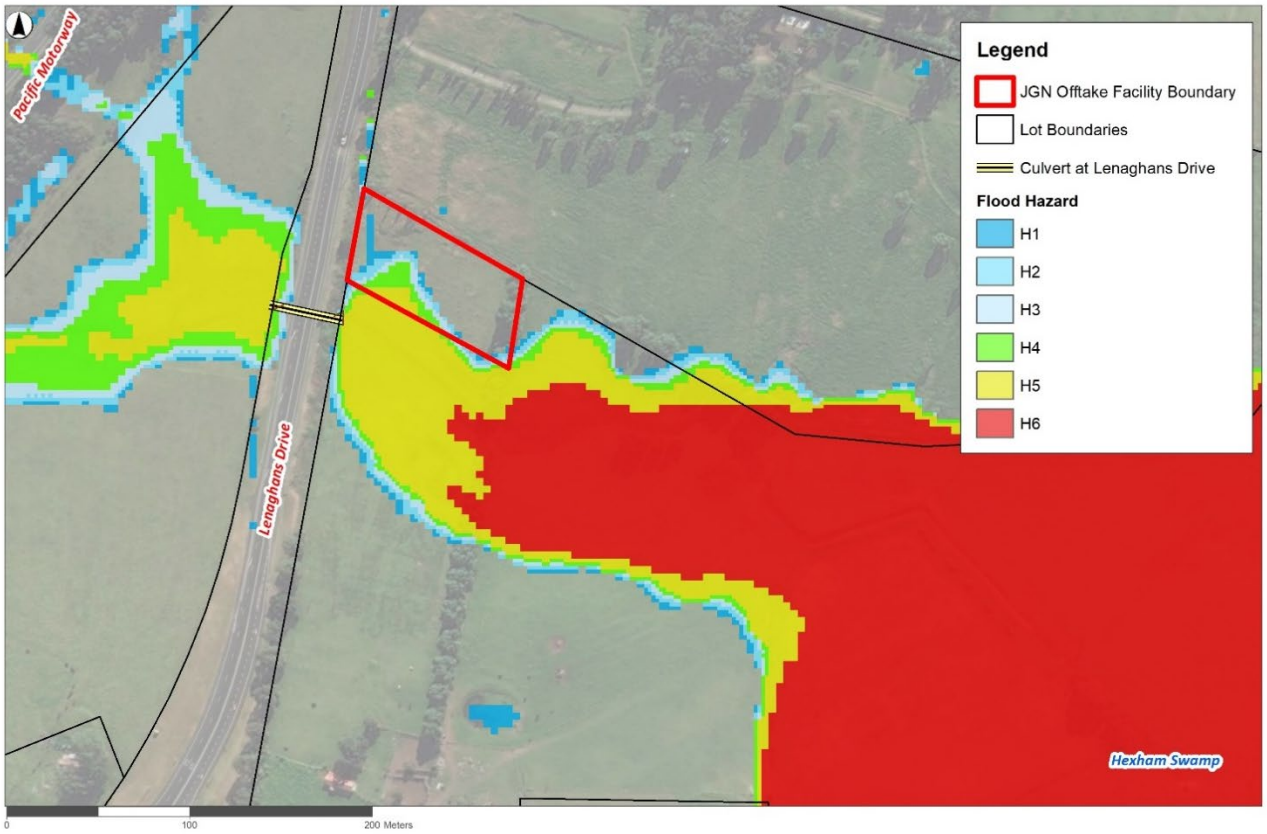


**Figure 2.12 0.2% AEP Flood Hazard**

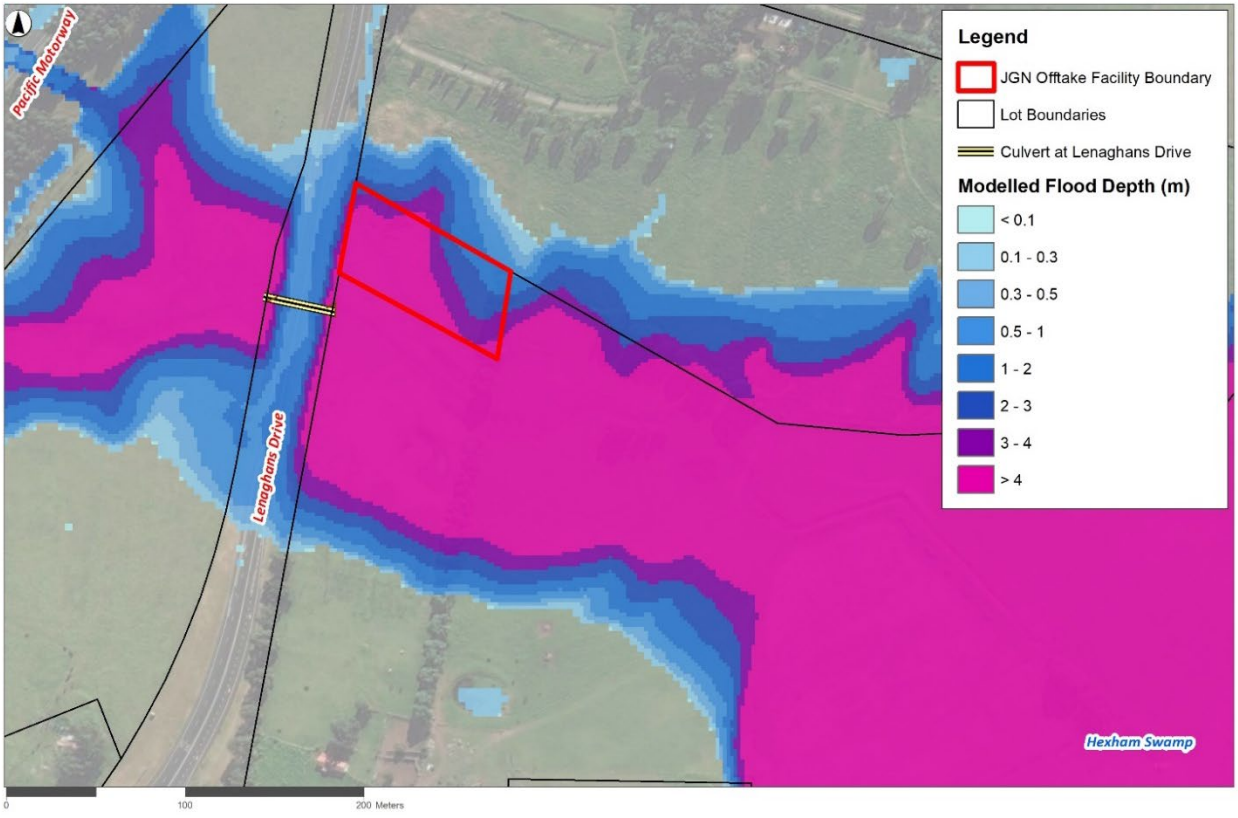


**Figure 2.13 PMF Flood Depths**

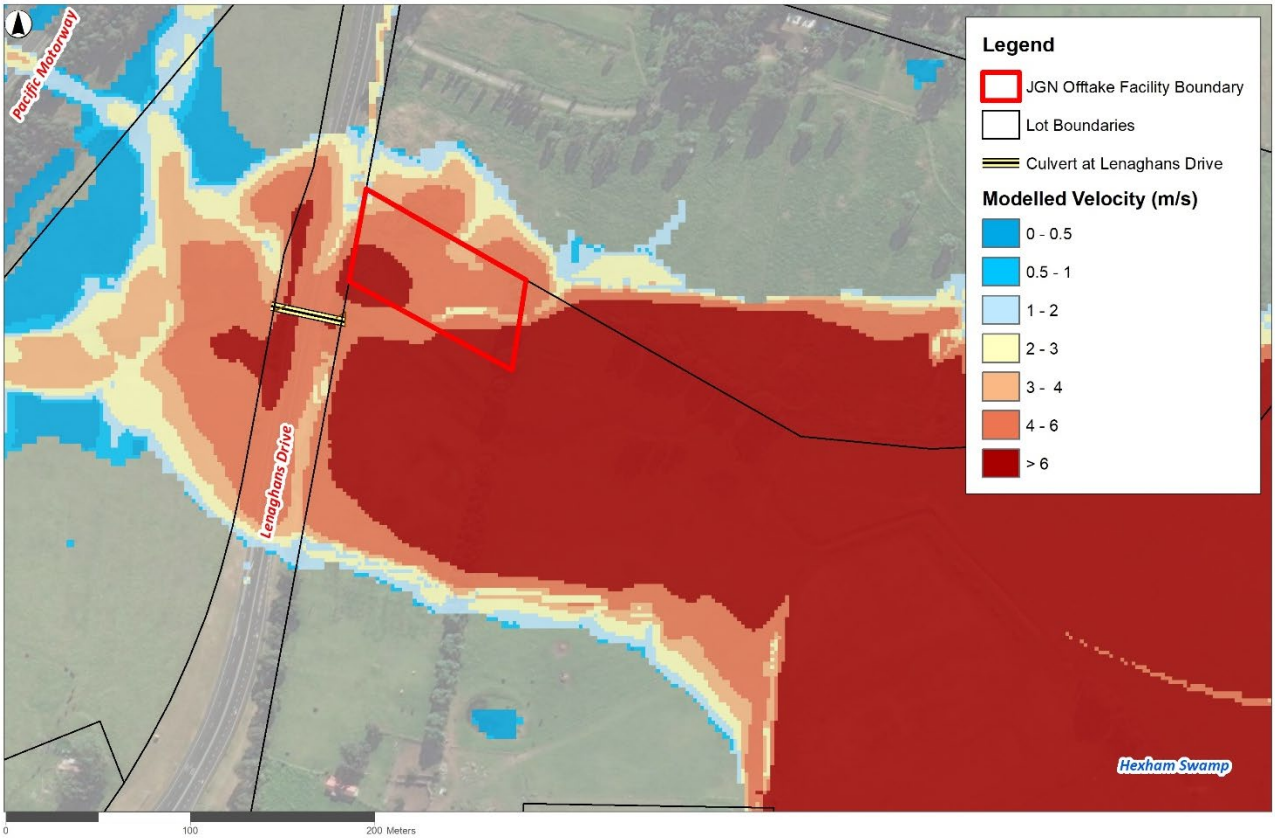


**Figure 2.14 PMF Flood Velocities**

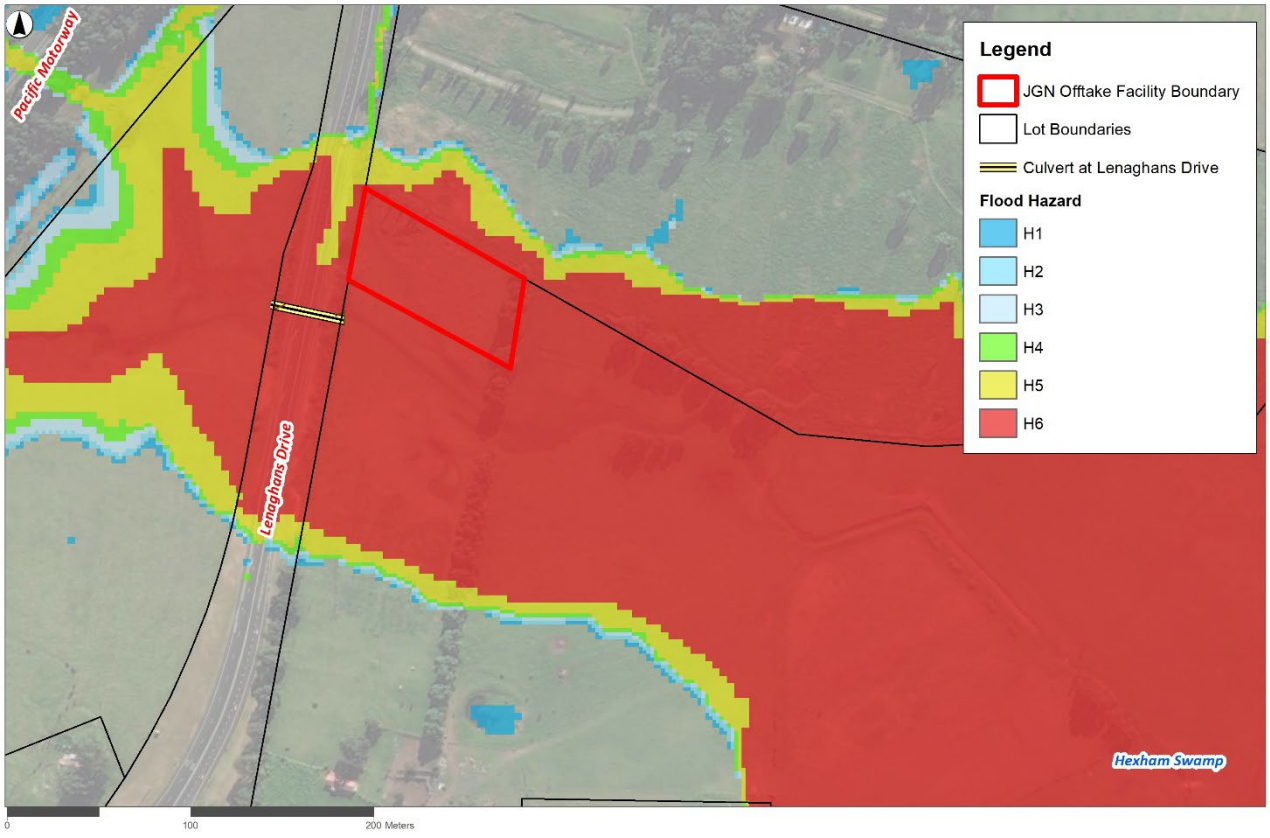


**Figure 2.15 PMF Flood Hazard**

# 3.0 Updated Assessment of Impacts

## 3.1 Flooding

Potential impacts on flooding regimes are typically related to changes to existing flow distributions and/or loss of temporary flood storage. These changes in hydraulic conditions may provide for localised increases in peak flood levels or flow velocities thereby increasing flood hazard.

The 1% AEP design flood magnitude is typically the flood planning event applied for setting design flood levels and considering potential flood impacts of the development proposal. The 1% AEP design flood inundation extent shown in **Figure 2.4** provides for only a small area of inundation within the JGN offtake facility boundary. This inundation is limited to the low point in the local topography at the southern boundary. Given the limited inundation extent, any proposed works within the offtake facility boundary will have not have any significant impacts on the existing 1% AEP flooding condition.

It is noted that flood inundation within the offtake facility boundary increases with the larger design flood magnitudes. However, even up to the 0.2% AEP flood magnitude the flood inundation across the site remains limited in extent as shown in **Figure 2.10**. These higher magnitude flood conditions may warrant consideration in design of site infrastructure. Any localised filling of existing flood storage for these higher flood magnitude events would not have any significant impact on existing flood conditions given the small flood storage area within the offtake facility boundary compared to the overall flood volumes derived from the wider catchment area and overall flood storage within Hexham Swamp immediately downstream.

The PMF event is typically considered for flood emergency response planning. The PMF event provides for extensive inundation within the JGN offtake facility boundary as shown in **Figure 2.13**. Site flooding conditions at the PMF may be considered for site operational and management plans.

## 3.2 Hydrology

Construction of the Project could potentially affect hydrology (frequency, volume, rate, duration and velocity) and increase peak stormwater flows during storm events as a result of additional impervious surfaces. The site infrastructure layout and associated stormwater drainage would be confirmed in detailed design.

Stormwater runoff from the offtake facility area discharges directly to the minor watercourse just downstream of Lenaghans Drive, and conveyed a short distance to the broader Hexham Swamp area. Given that JGN offtake facility area represents a relatively small proportion of the overall catchment area, the potential impacts to hydrology as a result of the Project are not considered significant.

## 3.3 Proposed Turkeys Nest Dam

A turkeys nest dam is proposed to be located near the centre of the storage pipeline construction footprint within the Black Waterholes Creek/Swamp Creek catchment. The proposed use of the turkeys nest, as described in Section 2.3.6.4 of the EIS, is to store water prior to and during the hydrotest of the storage pipeline. The turkeys nest dam may be retained following construction.

Following the exhibition of the EIS, APA has made a decision to internally line the storage pipeline. This means that water can be reused between test sections of the storage pipeline, reducing the total volume of water required for hydrotesting from 23ML to 14.5ML. The volume of water storage provided by the turkeys nest can therefore be reduced and is proposed to be 14.5ML.

Water is proposed to be purchased from Hunter Water who have an industrial supply line to the smelter site. As the proposed water source for the turkeys nest dam is the municipal water supply from Hunter Water and will not capture water from land runoff, a water access licence requirement is not applicable. Additionally, water access licence exemption applies under the *Water Management (General) Regulation 2018* as the proposed use is “hydrostatic testing of gas pipelines”.

# 4.0 Conclusions and Recommendations

The numerical flood model (TUFLOW software) developed for the Kurri Kurri Lateral Pipeline Surface Water and Hydrology Assessment has been updated to define the existing flood behaviour for the revised JGN offtake facility location. The model has been used to simulate the design 10%, 1%, 0.5%, 0.2% AEP and Probable Maximum Flood inundation extents and associated hydraulic properties (depth, velocity, hazard) to consider flood risk to the KKLP Project amendments.

The flood modelling has demonstrated that the JGN offtake facility location is predicted to be free from flooding in the 10% AEP event, a small area of the site is predicted inundated in the 1% AEP event up to a depth of approximately 250 mm along the southern site boundary. The corresponding flood velocities provide for low flood hazard only in the affected site area. Greater proportions of the site area are potentially inundated for the higher order flood events, with flood depths up to 1.3m in 0.2% AEP event.

The flood assessment has not considered any potential changes to site ground levels, however there is limited inundation within the JGN offtake facility boundary for the 1% AEP event which is the principal flood planning event. Accordingly, any future works within the boundary will not have any significant impact on existing 1% AEP flood conditions. Moreover, given the relative size of the JGN offtake facility in relation to the total local catchment area, and the broader Hexham Swamp and associated Hunter River catchments, JGN offtake facility works will have insignificant impact on local hydrological and flooding regimes.

Design flood conditions and associated flood risk for higher magnitude events above the 1% AEP design event may warrant consideration in the design of site infrastructure and ongoing site operation and management.

# 5.0 References

DHI (2008). *Upgrading of the Lower Hunter Flood Model at Hexham Study.* Newcastle City Council.

Umwelt (2022). *Kurri Kurri Lateral Pipeline Surface Water and Hydrology Assessment.* APA Group.

umwelt
Environmental & Social Consultants

**Umwelt (Australia) Pty Limited**

T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au